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REVISED PHASE III REMEDIAL ACTION PLAN & PHASE IV REMEDY IMPLEMENTATION PLAN
284 Winter Street
Haverhill, Massachusetts

RTNs 3-32792 and 3-32875

June 2024
File No. 01.0172397.10

PREPARED FOR:
Boston Gas Company d/b/a National Grid
Waltham, Massachusetts

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June 13, 2024
File No. 0172397.10

Massachusetts Department of Environmental Protection
Northeast Regional Office
Bureau of Waste Site Cleanup
150 Presidential Way
Woburn, Massachusetts 01887

Re: Revised Phase III Remedial Action Plan (RAP) &
Phase IV Remedy Implementation Plan (RIP)
284 Winter Street
Haverhill, Massachusetts
Release Tracking Numbers (RTNs) 3-32792 and 3-32875

Dear Sir/Madam:

On behalf of Boston Gas Company d/b/a National Grid (National Grid), GZA GeoEnvironmental, Inc. (GZA) is pleased to submit this Revised Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan (RIP) for the above referenced Site. The Site has been designated by the Massachusetts Department of Environmental Protection (MassDEP) as Release Tracking Numbers 3-32792 and 3-32875. This document has been prepared by GZA in accordance with Sections 310 CMR 40.0861 and 40.0874 of the Massachusetts Contingency Plan (MCP) to describe the selection of a revised Comprehensive Remedial Alternative and provide engineering design information for this option. A preliminary Phase IV RIP which documents updates to the evaluation of remedial options has also been prepared by Anchor QEA for the Little River portion of the Site and is included as Appendix A.

Should you have any questions, please contact Mr. Charles Lindberg, LSP, at 781-278-3830.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles A. Lindberg, LSP
Senior Principal

John A. Colbert
Consultant/Reviewer

Attachment: Revised Phase III RAP/Phase IV RIP

cc: Jesse Edmands, National Grid

An Equal Opportunity Employer M/F/V/H

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1.0 INTRODUCTION

On behalf of Boston Gas Company d/b/a National Grid (National Grid), GZA GeoEnvironmental, Inc. (GZA) and Anchor QEA LLC of Amesbury, Massachusetts (Anchor) have prepared this revised Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan (RIP) for the Disposal Site located at 284 Winter Street in Haverhill, Massachusetts (the "Site"). The primary Massachusetts Department of Environmental Protection (MassDEP) release tracking number (RTN) for the Site is 3-32792. RTN-3-32875, which was assigned in connection with a notification condition requiring an Immediate Response Action (IRA), also remains active for the Site. A Site Locus Plan is included as Figure 1, and Figure 2 presents the Disposal Site boundary and other pertinent site features.

The 284 Winter Street property (Property) is currently owned by HEG 284 Winter Street LLC (HEG), which acquired the parcel from Haffner Realty Trust (Haffner) in 2022, and is occupied by a gasoline service station and car wash facility. In March 2015, Haffner filed a Release Notification Form (RNF) notifying MassDEP that concentrations of certain Oil and/or Hazardous Materials (OHM) in soil samples exceeded the Reportable Concentrations (RCs) established by the Massachusetts Contingency Plan (MCP, 310 CMR 40.0000). MassDEP issued a Notice of Responsibility (NOR) to Haffner in April 2015 and assigned RTN 3-32792 to this 120-day reporting condition. Subsequently, in May 2015, MassDEP assigned RTN 3-32875 to a 2-hour reporting condition associated with a petroleum sheen on the surface water of the Little River adjacent to the Property[1].

Between 2015 and 2019, response actions associated with both RTNs were conducted by Ramboll US Corporation, formerly known as Ramboll Environ, of Westford, Massachusetts (Ramboll) on behalf of Haffner. As required by the MCP, Ramboll submitted a Phase I Initial Site Investigation (ISI) and Tier Classification in April 2016, classifying the Site as a Tier I Site. The Phase I ISI documented that the Site had been the location of a former Manufactured Gas Plant (MGP) operated by Haverhill Gas Works.

In November 2016, MassDEP issued an NOR to National Grid, a successor company to a former owner of the Property, noting that the liability was joint and several between Haffner and National Grid. In November 2019, following Haffner's signing of a settlement agreement between the two potentially responsible parties (PRPs), National Grid assumed the role of Responsible Party for the two RTNs via a Tier Classification Transfer. GZA submitted a Phase II Comprehensive Site Assessment (Phase II CSA) report on behalf of National Grid in April 2022 and a Phase III RAP in July 2022 which outlined the selected Comprehensive Remedial Alternative (CRA) for both the upland and Little River portions of the Site. Information generated during predesign investigations and evaluations completed following the Phase III RAP submittal has indicated that certain elements of the selected CRA may not be feasible to implement and that additional elements may be required to achieve a Permanent Solution at the Site. The updated assessment is summarized in the following section.

1.1 REASON FOR REVISED PHASE III RAP

Anchor selected partial dredging and capping of sediments within the Little River and sealing of any preferential migration pathways in the retaining wall as the preferred remedial alternative for this area. During design studies for the cap in late 2022-2023, Anchor evaluated pore water conditions in the Little River and concluded that benzene concentrations may pose an unacceptable risk to environmental receptors in the river. Additionally, Anchor's data suggested that benzene in

[1] A third RTN (3-34906) was assigned to the property in May 2018, when an elevated headspace reading was detected in a soil sample during the removal of an underground storage tank (UST).

upland groundwater within the Property was contributing to the pore water concentrations and that sediment capping alone may not sufficiently mitigate the condition. Based on this information, GZA initiated an expanded assessment of groundwater conditions at the Property and an evaluation of remedial options to reduce benzene flux to the river. GZA and Anchor concluded that completion of a revised review of remedial alternatives was appropriate prior to issuing a Phase IV RIP. The requirements of a Phase IV RIP for the revised CRA are also addressed in this submittal.

1.2 REPORT ORGANIZATION

The RAP has been organized as follows:

- Section 2.0 provides a description the Site and summarizes regulatory history;
- Section 3.0 summarizes supplemental assessment and testing completed following submittal of the Phase III RAP;
- Section 4.0 describes conditions requiring remediation, summarizes remedial objectives and provides an update of the conceptual site model (CSM);
- Section 5.0 reviews remedial technologies and alternatives that were evaluated in the July 2022 Phase III RAP and the updated remedial technology screening;
- Section 6.0 identifies and evaluates the Remedial Action Alternative (RAA) that was selected and presents the Remedial Action Plan, i.e. a description of the selected RAA(s) and a discussion of how they will be implemented.
- Section 7.0 provides the supporting information required by the MCP, including feasibility evaluation(s); the Phase III Completion Statement; and the conclusions of the Revised Phase III RAP;
- Section 8.0 presents the information required by Section 310 CMR 40.0874(3) of the MCP for a Phase IV RIP. The section headings are cross-referenced to the MCP, but have been re-organized in some cases to enhance the readability of this document. In particular, information about the environmental media to be treated by the remedial system is provided in Section 2.0 along with other information about Site conditions. This section also documents compliance with the public involvement provisions of the MCP as described in Section 310 CMR 40.1403, including notifications to public officials and property owners; and
- **Appendix A**, prepared by Anchor, summarizes modifications to the remedy selection process for the Little River portion of the Site and provides preliminary Phase IV documentation for the selected alternative.

This report has been prepared in accordance with the requirements of 310 CMR 40.0861 and 40.0874. This submittal is subject to the limitations in **Appendix B**. In accordance with MassDEP policy, the report and transmittal form BWSC-108 were submitted electronically via eDEP. A copy of the transmittal form is included in **Appendix C. Appendices D** through **J** provide various supporting technical documentation. **Appendix K** provides public notice information and data transmittals. **Appendix L** provides plans and specifications for the upland remedy. **Appendix M** provides the Site Health and Safety Plan.

2.0 BACKGROUND

Background information on the Disposal Site and a summary of the remedial goals are provided in the following sections. Additional information on the Site is provided in the April 2022 Phase II and July 2022 Phase III reports.

2.1 SITE DESCRIPTION AND HISTORY

The Disposal Site consists of the property located at 284 Winter Street in Haverhill, Massachusetts, which is currently occupied by a Haffner's gasoline service station and car wash, along with surrounding areas to the southeast, southwest, west and northwest. An adjacent vacant property to the southeast of the 284 Winter Street parcel, a portion of the Little River that flows along the Property's western boundary, and a portion of the Winter Street right-of-way to the north of the Property all lie within the Disposal Site boundary. The property to the southeast includes an upland area situated between a railroad embankment to the east and the Little River to the west and a steep bank sloping to the river on the west. The Site occupies approximately 2 acres of land including the relatively level upland area, which is separated from the Little River (at an elevation approximately 15-20 feet below that of the Site's upland area) by a masonry retaining wall. The masonry retaining wall transitions to a steep soil slope and a stone wall south of the Property.

The Site lies within a commercial/industrial area in the downtown portion of Haverhill. No water supplies are located in the vicinity of the Site and other environmentally sensitive areas other than the Little River have not been identified in the Site area. The Little River has been channelized in the Site area and it enters a concrete flood conduit at the downstream edge of the Disposal Site; this conduit flows beneath downtown Haverhill and discharges to the Merrimack River.

An MGP operated at the 284 Winter Street property between approximately 1853 and 1970, with various manufactured gas production processes utilized over this period. The Property has been used as a gasoline service station, fuel oil distribution facility, and a car wash since 1977.

2.2 REGULATORY HISTORY

During a site assessment for a planned real estate transaction in November 2014, certain constituents were reported in soil and groundwater samples at concentrations exceeding the MCP RCs. The owner of the property (Haffner) notified MassDEP regarding this finding in March 2015 and RTN 3-32792 was assigned. During assessment of this RTN in May 2015, Haffner's consultant (Ramboll) noted a sheen on the Little River that appeared to be emanating from the Property. An additional notification to MassDEP was made and an additional RTN (3-32875) was assigned. IRA activities were initiated in May 2015 in response to this finding which included gauging and recovery of non-aqueous phase liquid (NAPL) in Site monitoring wells and installation of absorbent booms in the Little River. A semi-permanent boom system was installed within the River in November 2016 and has been maintained through the present under the IRA.

Ramboll completed a Phase I ISI on behalf of Haffner in April 2016 for RTNs 3-32792 and 3-32875 and continued IRA activities through October 2019. The Phase II work required under the MCP was not completed by the specified deadline; as a result, MassDEP issued a Notice of Noncompliance (NON). National Grid assumed responsibility for the MCP response actions for the two RTNs in November 2019 with the filing of a Tier Classification transfer. National Grid and MassDEP signed an Administrative Consent Order (ACO) in October 2020 which established a deadline of April 6, 2022 for submittal of the Phase II report. The Phase II was submitted by the relevant deadline and a Phase III RAP was then submitted in July 2022. The CRA selected to achieve a Permanent Solution under the July 2022 Phase III RAP included relocation of an electrical line in the upland portion of the Site (to address potential risks to emergency utility workers) and partial dredging and capping of sediments within the Little River to address the presence of visible oil and/or tar (VOT) which resulted in a condition of Readily Apparent Harm. Remedial design studies were initiated following submittal of the Phase III RAP.

3.0 SUPPLEMENTAL ASSESSMENT AND TESTING

Based on initial Phase IV design investigations, Anchor identified benzene in sediment pore water as a potential risk to aquatic receptors in the Little River which could not be readily addressed feasibly by the selected remedy (dredging and capping of impacted sediments). Observed pore water concentrations and the estimated flux of benzene migrating from the upland portion of the Site to the Little River sediments in the central portion of the Site would require a cap of substantial thickness to reduce the levels in shallow sediment to below risk-based concentrations. Due to the uncertainty associated with the retaining wall construction details and the expected requirement to maintain sediment surface elevations within the river, construction of a cap that would effectively address the benzene migration was deemed to be infeasible. Accordingly, a supplemental evaluation of upland groundwater conditions was initiated with the goal of developing a remedial approach that would substantially reduce benzene flux to the Little River.

Assessment and supplemental analyses completed on the upland portion of the Site following submittal of the July 2022 Phase III RAP are outlined in the following sections.

3.1 GEOPHYSICAL STUDY

GZA subcontracted with Hager-Richter Geoscience Inc. of Salem, New Hampshire (HRGS), to perform a geophysical survey of the southern portion of the Property prior to initiating supplemental subsurface explorations. The purpose of the survey was to confirm the location of the electrical line that was present in the footprint of the former gas holder[2] at the Property and identify any other subsurface utilities that might be present in that area. On August 29, 2022, GZA personnel observed HRGS conduct ground penetrating radar (GPR), time domain electromagnetic induction metal detection (EM-61), and Precision Utility Locating (PUL) surveys. The surveys confirmed the location of the electrical line within the former holder footprint and identified an additional subsurface feature running parallel to the electrical line to the west. The geophysical methods used by HRGS were unable to locate the walls or base on the former holder. However, other subsurface utilities were identified in the area surrounding the holder, consistent with prior studies documented in the April 2022 Phase II Comprehensive Site Assessment report. HRGS's report is included as **Appendix D** of this report.

3.2 SUBSURFACE EXPLORATIONS

Two phases of supplemental explorations were completed to support the revised Phase III and Phase IV design, one in September 2022 through January 2023 and an additional program in March through April 2024. These are outlined below.

3.2.1 September 2022 – January 2023 Program

On September 20, 2022, Geosearch, Inc., of Sterling, Massachusetts (Geosearch) excavated four test pits using vacuum methods to confirm the location and depth of the existing electrical line and to investigate an unknown utility line marked out by HRGS during their geophysical study of the area in August 2022. Vacuum-excavated test pit locations are shown on Figure 2. The July 2022 Phase III RAP for the Site had identified relocation of the electrical line as the selected remedial approach for the upland portion of the Site. This existing electrical line was observed in three of the test pits, VE-4, VE-5, and VE-6, at depths ranging between 0.5 and 1.5 feet below ground surface (bgs). An apparently abandoned 6-inch cast iron pipe was observed approximately 2.3 feet bgs in test pit VE-7, and is presumed to be associated with former MGP

[2] This gas holder is labeled on various historical plans as "gas holder", "gasometer" and "relief holder". Subsequent references to "gas holder", "relief holder" or "holder" in this report refer to this structure. Documentation regarding the precise use of this structure was not available.

operations at the Site. This correlated with the unidentified structure running parallel to the electrical line identified by HRGS. Logs for the vacuum excavation test pits are included in **Appendix E**.

On September 20 and 21, and December 16, 2022, Geosearch also performed vacuum excavation for utility clearance in advance of drilling. The September explorations were designated B201 through B211 and the December 2022 vacuum borings were labeled VE-8 through VE-12; locations of the B200 series borings are shown on Figure 2. Vacuum probe VE-12 was collocated with B212-MW, while VE-8 through VE-11 were advanced within a 10-foot radius of that exploration (actual locations are not shown on Figure 2). Geosearch collected soil samples in advance of the vacuum excavator using a hand auger and GZA performed headspace-screening with a photoionization detector (PID). During the September drilling program, subsurface concrete obstructions prevented the clearance of three proposed locations along the northwestern edge of the Site, adjacent to the Little River—the proposed B209, B210, and B211 locations. One boring was advanced to the desired depth in this area (VE-12/B212) during the December vacuum excavation program following nine attempts.

Between September 22, 2022 and January 13, 2023, Geosearch drilled nine borings (B201 through B208 and B212) using hollow-stem auger (HSA) methods. Explorations ranged from 14 to 37 feet bgs; four were completed as monitoring wells (B205-MW, B206-MW, B208-MW, and B212-MW). Three explorations were completed within the footprint of the historical holder, two of which encountered the apparent holder bottom at approximately 14 feet bgs. B203 indicated conditions similar to those observed at B107 (fill materials saturated with coal tar NAPL in the 4-foot interval above the holder bottom). Significant quantities of coal tar NAPL were not observed at B201 and no evidence of a hard bottom was noted at B202, which was advanced to 20 feet bgs. Impacts from MGP residuals and/or petroleum were noted in soil samples below 5 feet bgs at B202, including odors, staining, and PID readings of greater than 100 parts per million by volume (ppmv).

At B204, stained soils with moderate PID readings were observed between 16 to 22 feet bgs, but evidence of NAPL was not observed. Small (less than 0.5 inch in diameter) pieces of hardened-tar-like material mixed with soil were observed at approximately 11 feet bgs, and NAPL-coated silt was observed between 14 and 18 feet bgs at B205, which was completed as a well screened from 10 to 20 feet bgs. At exploration B206, NAPL-saturated sand was observed between 26 and 30 feet bgs, and the exploration was completed as a well screened from 20 to 30 feet bgs. At B207, a PID reading of 162 ppmv was observed at 21 to 22 feet bgs, and thin lenses of NAPL-saturated sand were observed in the same depth range. HSA and split-spoon refusal was encountered at 29 feet bgs. Elevated PID readings greater than 500 ppmv were observed between 20 and22 feet bgs and NAPL-coated sand was observed in samples from 20 to22 feet, 25 to27 feet, and 30 to 32 feet at B208. That boring was completed as a well screened from 22 to 32 feet bgs. At boring B212, NAPL-coated soils were observed between 14 and 24 feet and a monitoring well was installed with the screen set in that interval. Wells consisted of 2-inch-diameter PVC well screen attached to solid PVC riser with uniform fine sand filter packs around the screens and bentonite seals above the filter pack. A flush mounted road box set within a concrete pad was installed for surface protection at each well location. Excess drilling spoils were placed in drums and stored in the rear portion of the Property for later disposal.

Exploration logs for the B200 series borings are included in **Appendix F**.

3.2.2 March - April 2024 Explorations

Between March 25 and April 12, 2024, Geosearch installed 17 additional wells at the 284 Winter Street property under GZA's oversight. The new wells were designated B208S-MW, B208D–MW, AS-1, SVE-1, PZ-1 through PZ-5, and B301-MW through B307; locations are shown on **Figure 2**. At each location, Geosearch used vacuum excavation to advance an initial

boring to a depth of 5 to 7 feet bgs to clear potential utilities. The explorations were then advanced to depths ranging from 15 to 49 feet bgs using a truck-mounted drilling rig and either HSA or driven casing methods. At selected locations soil samples were collected for classification and field PID screening purposes for additional stratigraphic information. Five soil samples were also submitted to ESS Laboratory in Cranston, Rhode Island (ESS) for volatile petroleum hydrocarbon (VPH) analysis. Results of the supplemental soil analyses are presented in **Appendix G** and are summarized on **Table 1**.

The air sparging (AS) and soil vapor extraction (SVE) wells for the pilot testing (outlined in Section 3.5 below) were installed in borings completed in the area of well B208-MW, along with five multi-level monitoring points (designated PZ-1 through PZ-5), which included a groundwater monitoring well and a soil gas monitoring point. Ten other wells were installed in the target area, most of which were either deep or shallow companion monitoring points for existing wells, intended to further delineate the vertical distribution of benzene in groundwater. Groundwater monitoring wells consisted of 2-inch-diameter PVC well screen attached to solid PVC riser with uniform fine sand filter packs around the screens and either bentonite seals or cement-bentonite grout above the filter packs. The AS well and the soil gas monitoring points installed as part of the multi-level installations consisted of 1-inch diameter PVC; the SVE well was constructed of 4-inch diameter PVC. A flush mounted road box set within a concrete pad was installed for surface protection at each new installation. Logs for the 2024 explorations depicting well installation details are included in **Appendix F**. **Table 2** provides an inventory of the additional wells and monitoring points installed in March and April 2024 with screen intervals and key observations. Excess drilling spoils and drilling fluids were placed in drums and stored in the rear portion of the Property for later disposal.

3.3 GAUGING AND NAPL EVALUATIONS

The four monitoring wells installed during the initial Phase IV assessment work (B205-MW, B206-MW, B208-MW, and B212-MW) were developed and then gauged for the presence of NAPL. Dense NAPL (DNAPL) was observed at B206-MW and B208-MW; this material was present at B206-MW immediately following well installation but was not measured at B208-MW until approximately one month following well completion. Measured DNAPL thicknesses have ranged from 0.1 to 2.2 feet at B206-MW and from less than 0.1 to 2.4 feet at B208-MW (**Table 3**). GZA collected NAPL samples from each well and submitted them for laboratory analysis of viscosity by ASTM Method D7042 and density/specific gravity by ASTM D4052. The results (**Appendix H**) were within the range of values typically observed for coal tar DNAPL, with densities of 1.05 to 1.09 grams per cubic centimeter (g/cm^3) and viscosities of approximately 150 to 200 centipoise (at 70 degrees Fahrenheit).

Conditions at B206-MW and B208-MW were not suitable for NAPL bail down testing; accordingly, GZA calculated NAPL transmissivity (Tn) based on the NAPL saturated hydraulic conductivity and the estimated thickness of the NAPL zone. Water hydraulic conductivity testing had been conducted at several locations within the 284 Winter Street property during the previous Phase II studies. Calculated hydraulic conductivity (K) values ranged from 0.02 to 0.6 feet per day (ft/d). GZA used the upper bound of the measured water hydraulic conductivity (as a conservative approach), available subsurface and gauging data (regarding the thickness of the NAPL-impacted zone), and the measured fluid properties of the NAPL from B206-MW and B208-MW to calculate Tn at these locations. The estimated values were 0.009 and 0.007 ft^2/day, respectively, which are well below the value provided in the MassDEP guidance [3] (0.8 ft^2/day) for "Conditionally Infeasible" recovery. Recovery rates at these two wells have also been well below the MassDEP Guidance criteria of 1 gallon over

[3] MassDEP Policy #WSC-16-450 "Light Non-Aqueous Phase Liquids (LNAPL) and the MCP: Guidance for Site Assessment and Closure". This guidance does not directly address DNAPL; however, it is GZA's opinion that some of the general principles and concepts can be applied.

any three-month period for an infeasibility demonstration. (Total volumes of NAPL recovered since installation of the wells in October 2022 through February 2024 were 0.75 and 1.54 gallons, respectively, yielding a total recovery of 2.3 gallons over 17 months or less than 0.5-gallons in a 3-month period.) The Tn calculations are documented in **Appendix H**.

In February 2024, GZA collected samples of NAPL from several monitoring wells at the Site (NFSB-02(MW) and B208-MW) along with samples of groundwater in direct contact with NAPL at those locations and at B206-MW. The aqueous and NAPL samples were analyzed for aromatic volatile organic compounds (VOCs) by EPA Method 8260 and the two NAPL samples were also subjected to an equilibration analysis involving tumbling with deionized water and then laboratory analysis of the aqueous phase by modified EPA Method 8270. Results of that testing are presented in **Appendix I** and summarized on **Table 4**.

GZA completed a site-wide gauging and water level measurement round following completion of the additional well installations on April 17, 2024; data from that round is summarized on **Table 5**. In addition to the four wells with measurable thicknesses of NAPL that have been monitored under the IRA (NFSB-02(MW), B107, B206-MW and B208-MW), NAPL was also measured at two of the new wells in the air sparge/soil vapor extraction (AS/SVE) pilot test area – AS-1 and PZ-4D. Approximately 1.3 feet of DNAPL was reported at AS-1, although subsequent measurements indicated that the April 17 reading was incorrect and the actual accumulation of NAPL in the well was less than that value. Monitoring point PZ-4D, which is screened below the water table, indicated 0.34 feet of LNAPL on April 17. In addition to the April 17 measurements, NAPL was noted in the drilling return water during the advancement of borings for AS-1, PZ-2, and PZ-4.

3.4 SUPPLEMENTAL GROUNDWATER SAMPLING AND ANALYSES

GZA collected groundwater samples from the four monitoring wells installed between September 2022 and January 2023 (B205-MW, B206-MW, B208-MW, and B212-MW) on March 17 and April 7, 2023 to supplement the Phase II groundwater data and provide additional data for the sediment cap design. Samples were collected using a peristaltic pump and methods consistent with those documented in the April 2022 Phase II CSA; the samples were submitted to ESS for analysis of VOCs and semi-VOCs. A laboratory report with the results of the analyses is attached as **Appendix I**; results are summarized on **Table 6**. Note that analytical results for the wells where NAPL was observed (B206-MW and B208-MW) may represent upper-bound concentrations for dissolved constituents in groundwater and should be viewed with that limitation. Analytical data from a sampling round completed by the property owner's consultant in September 2022 is also included in **Appendix I**.

In April 2024, GZA completed supplemental groundwater sampling encompassing the newly installed monitoring wells and selected existing wells. Samples were collected using low-flow methods consistent with those documented in the April 2022 Phase II CSA and were submitted to ESS for analysis of VPH. Results are presented in **Appendix I** and summarized on **Table 6**. **Figure 4** depicts the benzene concentrations in groundwater, incorporating both the recent and historical data and includes pore water and surface water samples collected by Anchor and documented in **Appendix A**. (Note that GZA has used benzene as a surrogate to represent constituent of concern (COC) distribution in groundwater because that constituent is the primary risk driver; the other COCs generally exhibit similar distribution trends although there is some degree of variability.) Benzene concentrations exceeding 2,000 micrograms per liter (µg/l) were reported in an approximately 7,000 square foot area in the west-central portion of the Property. Elevated benzene concentrations were also reported in MW-1 (within the former holder footprint) and at B304-MW on the southern end of the Property. The highest concentrations of benzene generally appeared to be confined to the top 15 feet of the saturated zone (approximately 25 feet bgs), although elevated levels extended to depths of 30 to 32 feet bgs at several locations.

As noted above, a site-wide groundwater elevation round was completed on April 17, 2024, encompassing newly installed and existing wells. The groundwater elevation data, summarized on **Table 5**, indicated flow patterns consistent with those documented in the Phase II CSA report, with flow generally to the southwest (toward the Little River). The mounding/perched water condition in the former holder footprint was again noted; groundwater elevations in wells B107 and MW-1 were approximately 10 feet higher than other Site wells. While the overall flow pattern was consistent with anticipated conditions, individual elevations were variable and reflected a complex flow regime. Vertical head differences were erratic across the site, with some locations near the river indicating upward vertical gradients (B208 and B303 clusters), as would be expected, and others showing apparent downward gradients (B205/B305, B206/B306).

3.5 AIR SPARGING/SOIL VAPOR EXTRACTION PILOT STUDY

Based on an initial evaluation of potential remedial alternatives to address benzene in upland groundwater, GZA identified air sparging/soil vapor extraction (AS/SVE) as a candidate remedy. To further evaluate this option, we completed a pilot test in April 2024. The pilot test protocols are outlined in the following sections; pilot test data is presented in **Appendix J**. **Figure 5** shows the SVE well, AS well, five multi-level piezometers and surrounding wells which were used for the study.

The pilot test activities are described in the sections that follow.

3.5.1 Equipment Setup

Prior to mobilizing for the pilot study, GZA set-up a temporary chain link fence around the Study Area, which encompassed approximately 400 square feet. A conex box was set-up within the fenced area to store equipment and materials for the pilot study. The equipment included a 1 horsepower (Hp) regenerative blower (for SVE) and 1 Hp rotary vane air compressor (for AS). Above-ground PVC piping was installed to accommodate connection of the SVE well to the blower and braided tubing was used to connect the AS well to the air compressor; shut-off valves were placed at each location for air flow and pressure control. Two granular activated carbon (GAC) drums were connected in series to the SVE blower inlet for off-gas treatment, and a vent stack was connected to the discharge end of the SVE blower to vent outside of the container. Electrical power for the equipment was provided by portable generators.

3.5.2 Baseline Data Collection

On April 22, 2024, prior to the start of the pilot test, baseline water level and NAPL measurements and soil vapor readings were collected from monitoring wells within 50 feet of the pilot test area. Water/NAPL measurements were collected using an oil/water interface probe. The baseline soil gas screening measurements included vacuum measurements using a digital manometer, total VOC concentrations using a PID, and oxygen (O2), carbon dioxide (CO2), methane (CH4), and lower explosive limit (LEL) levels using a multi-gas meter. [Note: TVOC readings were corrected for elevated concentrations of CO2 and/or CH4]. The results are summarized in **Table J-1** in **Appendix J**.

3.5.3 Pilot Test

The pilot test was completed in two stages. The first stage included independent testing of the SVE well to evaluate the flow/vacuum relationship and SVE radius of capture/radius of influence. The second stage of the test included operation of the AS system in conjunction with the SVE system. The results of these tests are described below.

3.5.3.1 SVE Test

The SVE test was performed on April 22, 2024 from approximately 11:35 am to 5:00 pm. The test was performed using a blower to exert an applied vacuum at select air flow rates on the SVE well. The air flow at the SVE well was varied with decreasing steps to measure changes in blower vacuum and vacuum within the shallow piezometers and selected monitoring wells in the test area. Refer to **Tables J-2** and **J-3** in **Appendix J** for the vacuum and flow data. During the first two hours of the test, the flow rate at the SVE well was set at approximately 34 standard cubic feet per minute (scfm) resulting in a vacuum of approximately 41 inches of water column ("WC) at the wellhead. At approximately 1:30 pm, the flow rate was decreased to about 26 scfm resulting in a vacuum of approximately 28 "WC at the wellhead, then to 20 scfm resulting in a vacuum of approx. 20 "WC at the wellhead, and finally 15 scfm resulting in a vacuum of approximately 14 "WC at the wellhead. A flow/vacuum curve for the SVE well was generated from this data and is included in **Appendix J** as Figure J-1. As expected, the flow/vacuum correlation for the SVE well was approximately linear.

Throughout the course of the test, GZA personnel measured vacuum and flow rate at the SVE well and measured vacuum at the nearby shallow piezometer locations and selected monitoring wells. The results are summarized on **Table J-3** included in **Appendix J**. These measurements were used to create a log-linear plot of distance vs. vacuum to evaluate the relationship between these two parameters as shown on Plot J-2 in **Appendix J**. Assuming a vacuum criterion of 0.04 "WC, the plot suggests a radius of capture for the SVE well of approximately 25 feet, at 20 scfm and a vacuum of approx. 20 "WC at the wellhead.

During the SVE test, GZA collected total VOC measurements with a PID at the SVE well. The results ranged from 69 to 50 parts per million by volume (ppm_v) as summarized on **Table J-2**. GZA also collected one sample of the exhaust air prior to carbon treatment for laboratory analysis. The sample was collected following the completion of the SVE pilot test (flow rate of 34 scfm). The sample was submitted under chain-of-custody protocol to Alpha Analytical of Mansfield, Massachusetts, (Alpha) for laboratory analysis by EPA Method TO-15 and MassDEP Air Phase Petroleum Hydrocarbons (APH) method to assess potential carbon loading rates for the off-gas treatment system. The laboratory analytical report is included in **Appendix J** and the results are summarized in **Table J-5**. VOC mass removal rates will be further evaluated during initial operation of the SVE system.

3.5.3.2 AS/SVE Test

The second stage of the pilot test commenced on April 23 and 24, 2024 and included the operation of the AS system in conjunction with the SVE system. There were two separate AS/SVE tests; one run at the "typical" air sparging flow rates at AS-1 on April 23, 2024 and one run at the "typical" air sparging flow rates at PZ-3D on April 24, 2024. **Table J-4** (in **Appendix J**) shows the AS well air flow rates and well head pressures, as well as the compressor pressure over the course of the two AS/SVE tests. Note, the SVE system was operated continuously throughout each of the two tests at a flow rate of approximately 34 to 37 scfm resulting in a vacuum between 29 and 40 "WC at the SVE wellhead. See the summary table below for the time frames and air sparge flow rates for each test.

Test ID	Operating Time	AS Flow Rate
AS-1	*Approximately 6.3 hours* April 23, 2024 from 10:44 am to 5:10 pm	2.7 to 3.6 scfm
PZ-3D	*Approximately 4 hours* April 24, 2024 at 10:43 am to 2:40 pm	3.3 to 3.5 scfm

The parameters collected during the AS/SVE tests included the following:

- At the SVE well - flow rate, vacuum, total VOCs, O2 levels, CO2 levels, CH4 levels, and LEL levels (see **Table J-1** and **J-2**);
- At the air sparge wells - flow rate and air pressure (see **Table J-4**);
- At the shallow piezometers and surrounding monitoring wells that span the unsaturated zone - vacuum, total VOCs, O2 levels, CO2 levels, CH4 levels, and LEL levels (see **Table J-1**); and
- At the deeper piezometers and surrounding monitoring wells that span/submerged within the saturated zone – water table elevations, air pressure readings, and dissolved oxygen (DO) readings in the well casing (see **Table J-1**).

3.5.3.3 Total Head Measurements

Plot J-3 (in **Appendix J**) shows water table elevation changes in the site monitoring wells during the two AS/SVE tests. During the first test on April 23, 2024 at AS-1, the total head in pilot test monitoring wells began increasing upon initiation of the AS test. Total heads generally increased from 0.15 to 7.9 feet (average of 1.7 feet) within the first 3.5 hours of the test, and approximately 0.27 to 7.7 feet (average of 1.3 feet) after 6 hours of the test. Note: There was a slight decrease in water table elevation between the two measurements, likely due to the apparent short circuiting of air to the Little River that happened 4 hours after pilot test startup (as indicated by the appearance of small air bubbles within the eastern portion of the river).

During the second test on April 24, 2024 at PZ-3D, the total head in all pilot test monitoring wells began increasing upon initiation of the AS test. Total heads generally increased by from 0.18 to 3.5 feet (average of 1.3 feet) during the 3.75-hour test.

The results are provided in **Table J-1** and **Plot J-3**.

3.5.3.4 Dissolved Oxygen Levels

DO levels were measured in the groundwater before and after the AS/SVE test in the site monitoring wells (**Table J-1**). For the first test on April 23, 2024 at AS-1, Plot J-4 (in **Appendix J**) shows that DO levels increased from 0.2 to 10 milligrams per liter (mg/l) (average of 1.3 mg/l) during the 6 hour test. During the second test on April 24, 2024 at PZ-3D, DO levels generally did not increase, likely due to the short circuiting of air to the Little River that happened during the sparging phase of the testing.

3.5.3.5 Soil Vapor Exhaust Air Sampling

GZA also collected one sample of the SVE exhaust air prior to carbon treatment for laboratory analysis at the end of each SVE/AS pilot test. The laboratory analytical report is included in **Appendix J** and the results are summarized in **Table J-5**.

3.5.4 Groundwater Sampling

On May 2 and 6, 2024, GZA collected groundwater samples from selected wells within the pilot test area following the AS/SVE test to provide supplemental information on groundwater conditions. Sampling protocols were consistent with those described above. Results are summarized on **Table 6** and included in **Appendix I**.

4.0 CONCEPTUAL SITE MODEL UPDATE AND REMEDIAL OBJECTIVES

Site conditions based on the supplemental explorations and previous studies are summarized in the following sections and an update of the prior CSM is provided.

4.1 SUBSURFACE CONDITIONS

The Site is underlain by an historic fill layer of varying thickness and composition which overlies a fine-grained deposit consisting of silt or silty sand. The fill underlying the 284 Winter Street property is typical of an historic urban fill, composed of reworked natural soils with significant quantities of debris, including concrete, asphalt, brick, wood, coal, and glass. Remnants of former structures were encountered at a number of locations during subsurface explorations at the Property. Cross-sections depicting Site stratigraphy are presented as **Figures 3A, 3B,** and **3C**. The silty sand/silt deposit appears to be the primary stratum governing groundwater flow at the property and was observed to range from approximately 20 to 40 feet in thickness at the locations where it was fully penetrated. A sand and gravel deposit which transitions to a glacial till was noted below the silt/silty sand.

Note that isolated fragments or lenses of materials resembling hardened coal tar or MGP purifier box wastes were noted on boring logs for seven of the approximately 100 subsurface explorations completed at the Site, based on GZA's review. Revisions to the MCP that became effective on March 1, 2024 identified "visible coal tar waste deposits" (VCTWDs) as materials requiring unique assessment and remedial protocols in the context of achieving a Temporary or Permanent Solution. While use of the term "deposit" implies some minimum spatial dimensions would be required to prompt these provisions, a definition of VCTWDs was not provided in the revised MCP and MassDEP has not issued any guidance regarding de minimis quantities. In GZA's opinion, the isolated occurrences of hardened tar and purifier box wastes at the 284 Winter Street property do not warrant focused remedial action beyond the filing of an Activity and Use Limitation (AUL) to control potential exposures, which is a component of the selected CRA. Accordingly, these materials are not addressed in this Revised Phase III/Phase IV. Should additional guidance or policy be issued by MassDEP clarifying the requirements for addressing isolated coal tar waste occurrences, additional revisions to the Phase III may be required.

Note that coal tar materials have also been observed within the Little River and on the retaining wall on the east bank of the river as documented in Anchor's report in **Appendix A** (Section 7.1.8). These will be addressed during the planned remedial work in that area.

Groundwater flow at the Property is generally toward the west/southwest, with the Little River as the main discharge point. A "perched" groundwater condition exists within the footprint of the historical MGP relief holder in the central portion of the Property, with groundwater elevations typically 8 to 10 feet higher than elsewhere on the property and within 2 to 4 feet of ground surface. Total groundwater flow through the Site is estimated to be approximately 1 gallon per minute (gpm), with flow rates restricted by the relatively low permeability of Site soils. The estimated transport velocity for groundwater at the Site is approximately 0.1 feet/day (37 feet/year).

Petroleum and MGP-related constituents including naphthalene, other polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbon (EPH), VPH fractions, and aromatic VOCs are present in soils throughout the Property, with the most significant impacts found at the 5- to 25-foot depth range below ground surface. While COC concentrations in soil exceeded the MCP Method 1 cleanup standards at a number of locations, average concentrations were below Method 3 Ceiling Limits (M3CLs, formerly known as upper concentration limits or UCLs).

The primary COCs detected in groundwater samples at levels above the Method 1 standards included naphthalene, C9-C10 aromatics, and benzene, with the highest concentrations reported in the central, western, and southern portions of the Property. Significant impacts to groundwater extend from the eastern portion of the Property to the Little River; wells installed on the western side of the river to the southwest of the 284 Winter Street property did not indicate detectable levels of the primary Site COCs.

Concentrations of constituents detected in soil gas at the Site during the Phase II investigation appear to be primarily related to incidental emissions and spills associated with the active gasoline and diesel storage and dispensing operations. GZA's evaluation concluded that the reported concentrations do not indicate significant potential for vapor intrusion into occupied structures at the Site.

NAPL has been observed at several locations across the western, central, and southern portions of the Site, but significant accumulations of separate-phase materials have only been observed sporadically. Evaluations of NAPL mobility and recoverability completed under MassDEP guidance concluded that these materials are not feasible to recover. NAPL has historically migrated to the Little River and has been periodically observed seeping from the retaining wall at the edge of the Property under certain conditions, as noted in the IRA Status Reports submitted between 2015 and the present.

During the Phase II CSA, significant impacts were observed in the sediments beneath the Little River adjacent to the Property, including elevated concentrations of Site COCs and the presence of VOT over a substantial area. Anchor completed an evaluation of the Little River portion of the Site under contract to National Grid; that assessment was documented in the April 2022 Phase II report. Supplemental assessment of the Little River was completed in 2022 through 2024, as documented in **Appendix A**.

4.2 CONCEPTUAL SITE MODEL UPDATE

Based on the supplemental explorations and testing outlined above, GZA developed the following conclusions regarding benzene in groundwater at the Site:

1. Benzene concentrations in the range of 2,000 to 16,600 micrograms per liter (µg/l) are consistently present in groundwater in the west-central portion of the 284 Winter Street property (between monitoring wells ENV-3MW and B206-MW – **Figure 4**). This correlates with elevated concentrations of benzene in pore water at sample locations AQPW-04 and AQPW-05 (5,300 to 16,000 µg/l). Groundwater in the southern portion of the Site has also indicated benzene concentrations in the range of approximately 2,000 to 10,000 µg/l, with substantially lower levels between these two zones.

2. In this west-central area, the highest concentrations of benzene occur within the zone extending from the water table (typically 13 to 15 feet bgs) to approximately 30 feet bgs.

3. While both LNAPL and DNAPL samples from the Site contain significant concentrations of benzene, this constituent comprises only a small fraction of the NAPL composition (less than 0.02% of the LNAPL and less than 0.2% of the DNAPL). The primary components of the NAPLs at the Site include naphthalene and other hydrocarbons that are not VPH target compounds. Benzene concentrations in the DNAPL samples were considerably higher (approximately 5 to 10 times) than those reported for the LNAPL sample.

4. The benzene concentration reported for the laboratory-prepared aqueous sample in equilibration with LNAPL (1,200 µg/l) was substantially lower than that for the sample in equilibration with DNAPL (6,540 µg/l) and both

were lower than the maximum groundwater and pore water concentrations. The difference in results between the equilibrated water samples and groundwater/pore water samples may be partly attributable to the fact that the equilibration study was run with deionized water, whereas groundwater samples collected in the field may have suspended solid materials that adsorb organics.

5. Groundwater and NAPL testing data indicate that the residual LNAPL on the upland portion of the Property is not the primary source of the benzene in groundwater and porewater. Additionally, while the DNAPL currently present at the Property is contributing to benzene concentrations in groundwater and pore water, it appears that other sources may also be present (e.g. residual NAPL below the Little River).

6. While the primary source of benzene in groundwater and pore water has not been conclusively identified, groundwater within an approximately 7,000 square foot area in the west-central portion of the 284 Winter Street property consistently indicates elevated concentrations and is migrating to the Little River. A separate area with benzene concentrations exceeding 2,000 µg/l was observed on the southern end of the Site.

Pilot testing of AS/SVE at the Site has indicated that this remedial approach would be effective at reducing benzene concentrations in groundwater within the target areas. However, potential impacts on the Little River associated with air sparging would require the incorporation of monitoring and potential mitigation measures into an AS/SVE remedial program.

4.3 REMEDIAL OBJECTIVES

The Phase II Report identified the need for additional response actions in the following areas of the Site:

- A Method 3 Risk Characterization (M3RC) indicated that quantitative human health risk estimates were above the relevant MCP criteria for one receptor group/exposure scenario: construction/utility workers excavating below the water table within the former holder area. The risk estimate for this scenario was driven by benzene and naphthalene concentrations in the perched groundwater within the former holder, where an active electrical line (believed to be powering an exterior light pole) is present.
- Sediment conditions within the Little River adjacent to the Site pose a risk of environmental harm and represent a condition of Readily Apparent Harm (RAH) to environmental receptors due to the widespread VOT.

With the exception of these issues, the Phase II study concluded that conditions within the Disposal Site did not pose a significant risk to human health or public welfare assuming the filing of an AUL that would restrict certain future Site uses (e.g., residential use). Accordingly, the July 2022 Phase III evaluation focused on the two items above (construction/utility worker exposures to benzene and naphthalene in perched groundwater and Little River sediment conditions).

Supplemental explorations and testing at the Site following submittal of the Phase III RAP has indicated that benzene concentrations in groundwater in the west-central and southern portions of the 284 Winter Street property are contributing to impacts on Little River pore water which may pose significant risk to aquatic receptors. Accordingly, the remedial objective for the upland portion of the Site for this revised Phase III RAP is focused on reducing benzene migration/flux from the upland to the Little River.

5.0 INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

The initial screening of remedial technologies is intended to identify RAAs that are deemed reasonably likely to be feasible based on OHM present, media contaminated, and site characteristics. Per 310 CMR 40.0856, RAAs (which may comprise one or more technologies) are reasonably likely to be feasible if the following is true:

- The technologies to be employed by the alternative are reasonably likely to achieve a Permanent Solution or Temporary Solution; and
- Individuals with the expertise needed to effectively implement available solutions would be available, regardless of arrangements for securing their services.

To prepare this revised RAP, GZA reviewed the technologies identified in the 2022 RAP, as well as additional technologies that may be feasible under current Site conditions. A remedial technology was judged to be potentially feasible if: (1) it was likely to reduce risks to levels that would permit the achievement of a Permanent Solution; and (2) the technology appeared to be technically and economically implementable at the Site.

5.1 TECHNOLOGIES SCREENED IN 2022

GZA screened the following remedial technologies to address groundwater conditions in the upland portion of the Site in the 2022 RAP:

- Natural attenuation;
- Vertical barriers (cut-off walls);
- Groundwater extraction and treatment;
- NAPL recovery;
- AS/SVE;
- In situ chemical oxidation (ISCO);
- In situ solidification/stabilization (ISS); and
- Bioremediation.

These technologies were not retained for the development of the 2022 CRA due to the fact that addressing upland groundwater was not identified as a remedial objective to achieve a Permanent Solution at that time. (The 2022 M3RC concluded that groundwater did not pose a risk to human or environmental receptors, with the exception of possible construction/utility worker exposures to perched groundwater within the former gas holder footprint.) GZA re-visited these technologies in the context of the additional pore water and ecological risk evaluation completed following the submittal of the 2022 Phase III RAP. Based on this review, we completed an updated evaluation of technologies to address benzene in groundwater, which is summarized in the following sections.

5.2 UPDATED REVIEW OF TECHNOLOGIES

Based on the supplemental studies outlined above and the updated remedial objectives for the Site, GZA identified the following potential technologies to address benzene migration in upland groundwater:

- Vertical barriers (cut-off wall);
- Groundwater extraction and treatment;
- AS/SVE;
- ISCO;
- Permeable reactive barrier (new technology added following the 2022 RAP); and
- ISS.

The following sections summarize our evaluations of these remedial approaches based on Site conditions.

5.2.1 Vertical Barriers

Cut-off walls constructed of steel sheet piling or, soil-bentonite/cement-bentonite mixtures installed within slurry trenches can effectively reduce groundwater contaminant flux under the appropriate conditions. Typically, for a cut-off wall to be effective, it should be keyed into a confining layer below the zone of primary groundwater transport. A distinct and continuous confining layer has not been identified at the Site. Additionally, cut-off walls will result in mounding of groundwater behind the wall and the deflection of groundwater flow around and below the wall, which could result in further spreading of the contaminant plume. While vertical barriers could reduce flux to the Little River, they would not result in the removal or destruction of contaminant mass; benzene-impacted groundwater would remain in the upland portion of the Site. Installation of a cut-off wall would disrupt activities at the property and require closure of the retail operations. For these reasons, vertical barriers/cut-off walls were eliminated as a remedial technology for this Site.

5.2.2 Groundwater Extraction and Treatment

This technology, also known as “pump and treat”, utilizes groundwater depression pumps, typically set in extraction wells or sumps below the groundwater table, that depress the groundwater table providing containment of the impacted groundwater. Following treatment, the groundwater may be discharged back into the aquifer using injection wells or recharge galleries, discharged to surface water, discharged to a sanitary sewer system, or transported off-site for treatment/disposal. Groundwater depression is most effective in homogeneous saturated soils with moderate to high hydraulic conductivity. The layered and heterogeneous sand and silt deposits at the Site would present challenges with respect to maintaining effective groundwater capture. Treatment of extracted groundwater would be required, most likely using a conventional technology such as GAC. Pump and treat remedial approaches carry substantial long-term operation, maintenance, and monitoring (OMM) requirements and are generally not effective at eliminating contaminant sources. A treatment system would need to be housed somewhere on the Property for an indefinite period under this option, which is a logistical concern due to space limitations. GZA has eliminated this technology based on the limitations and Site-specific constraints.

5.2.3 AS/SVE

As outlined in the Phase III RAP, AS/SVE is an effective technology for addressing volatile compounds in groundwater, as injected air essentially strips these constituents from the impacted groundwater and soil vapor extraction removes them for treatment/destruction. This approach has the added benefit of increasing oxygen levels in the subsurface and thereby promoting aerobic degradation, which is effective for most petroleum hydrocarbons. This technique is not particularly effective for semi-VOCs (SVOCs), which constitute the majority of the COCs in groundwater at the Site. Additionally, recovery of sparged air can be challenging in heterogenous subsurface environments like those at the subject Site. This technology was eliminated in the previous Phase III RAP evaluation for those reasons. However, with the revised remedial goal of reducing benzene in groundwater, AS/SVE would be an effective approach. Pilot testing indicated that it can be effectively implemented within the target remedial zone but that sparged air may impact the Little River under certain injection conditions. A traditional AS/SVE remedial approach would need to include monitoring and mitigation measures to address this concern.

If permitting impacts associated with in-river mitigation measures would result in unacceptable delays to remediation, two variations to traditional AS/SVE may offer a technically feasible means of achieving the remedial objectives with fewer potential impacts to the river – biosparging, and in-well air stripping. In biosparging, air (or oxygen) and nutrients (if needed) are injected into the saturated zone to increase the biological activity of indigenous microorganisms, resulting in the biodegradation of VOCs in the saturated zone. A vapor extraction system implemented in conjunction with biosparging would create a negative pressure in the vadose zone through a series of extraction wells that control the vapor plume migration. The process is similar to air sparging; however, while air sparging removes constituents primarily through volatilization, biosparging promotes biodegradation of constituents rather than volatilization (generally by using lower flow rates than are used in air sparging). In practice, some degree of volatilization and biodegradation occurs when either air sparging or biosparging is used. The SVE/AS pilot test confirmed that air can be successfully injected into the saturation zone, indicating that biosparging would be technically feasible, but such a system would have to be operated for a longer period of time compared to traditional sparging.

In-well air stripping is an extension of air sparging technology that removes dissolved VOCs from groundwater by stripping the VOCs to the vapor phase within the well, without bringing groundwater to the ground surface. In-well stripping creates a groundwater circulation cell by injecting air into a double-screened well, lifting the water in the well and forcing it out the upper screen (within the vadose zone) while additional water is drawn into the lower screen (within the saturated zone). Once in the well, some of the VOCs are transferred from the dissolved phase to the vapor phase by air stripping. The contaminated air rises within the well to the water surface where vapors are drawn off and treated by a vapor extraction system. In-well air stripping may offer a viable alternative to traditional AS/SVE at this Site.

5.2.4 ISCO

ISCO is a chemical treatment technology that involves the injection of an oxidizing agent, such as permanganate, hydrogen peroxide, persulfate, or ozone, to break down OHM through a series of oxidation reactions. The oxidizing agents are typically injected in liquid or gaseous form into soils and groundwater. Factors that limit the effectiveness of this technology include distribution of oxidant into the subsurface and incomplete oxidation, which can occur depending on the contaminants and oxidizing agents used. The persistence and migration of the oxidant in the subsurface must also be evaluated under site-specific conditions, particularly in cases such as this, where environmentally sensitive receptors may be present in the Little River adjacent to the treatment area. Although ISCO can be successfully used to treat a wide range of contaminants, including halogenated VOCs and SVOCs, it is generally less effective on heavier-end petroleum

compounds and NAPL (or NAPL-saturated soils). Its effectiveness would also be limited by the nature of the fill material and underlying natural soils and the presence of buried MGP infrastructure beneath the Site. Therefore, chemical oxidation was not retained for further evaluation at the Site.

5.2.5 Permeable Reactive Barriers

Permeable reactive barriers (PRBs), also referred to as passive/reactive treatment walls, are vertical barriers installed through the saturated zone that use a reactive medium to treat specific COCs in groundwater in situ. As groundwater flows through the permeable medium, the COCs are either absorbed or chemically converted to less toxic byproducts. The reactive wall can be installed either by excavation and placement of the media (typically using slurry trench methods) or by injecting a liquid medium suspension within drill holes (typically advanced by direct-push techniques). Our evaluation indicates that an injection approach would be the appropriate method at the Site. For the aromatic VOCs and petroleum hydrocarbons at the Site, a colloidal activated carbon remedial fluid paired with soluble, anaerobic electron acceptors (such as the Petrofix® product marketed by Regenesis) could be effective.

Soil conditions at the Site (silts and silty sands) and the concentrations of COCs (including constituents other than benzene) in groundwater would require closely spaced injection points to create an effective PRB in the target area. An initial evaluation by Regenesis indicated that up to 210 injection points would be required. Additionally, these products are typically not recommended where significant quantities of NAPL are present. For these reasons, a PRB was not selected as part of the CRA for the Site.

5.2.6 ISS

ISS reduces the mobility of OHM in the environment through both physical and chemical means. The process, which can be performed either ex situ or in situ, physically binds or encapsulates contaminants within a stabilized mass. ISS uses conventional excavators or auger/caisson systems and injector heads to add polymer-, clay- and/or cement-based binders to the impacted soil, leaving the resultant stabilized material in place. Portland cement is the most commonly used binder for MGP site applications; this remedial approach has been successfully implemented at a number of sites in Massachusetts. ISS is typically employed to address residual coal tar source areas and eliminate M3CL exceedances. To address the remedial objectives for the Site, ISS would have to be conducted through the zone of elevated benzene concentrations (15 to 30 feet bgs), and in close proximity to the masonry retaining wall. Current wall conditions and construction details would need to be considered in the ISS design, which could greatly increase the complexity and cost of the process, and would likely leave a zone of untreated material between the ISS monolith and the wall. Additionally, the presence of numerous remnant MGP structures and other obstructions would complicate ISS implementation. ISS would disrupt activities at the property and require closure of the retail operations for the duration of the work. Based on these factors, this technology was deemed less effective than other technologies capable of achieving the remedial objectives for the Site.

5.3 SUMMARY OF UPDATED REMEDIAL TECHNOLOGY SCREENING

GZA's updated review of remedial technologies has indicated that AS/SVE (including its variations, biosparging, and in-well air stripping) is the most feasible approach to addressing the additional remedial objective of reducing benzene concentrations in groundwater in the upland portion of the Site in a timely manner and thereby reducing benzene flux to the Little River.

6.0 REMEDIAL ACTION ALTERNATIVE SELECTION

AS/SVE has been selected as a technically and economically feasible component of the CRA to achieve a Permanent Solution at the 284 Winter Street Site. It will be coupled with institutional controls in the form of an AUL restricting future uses of the property, elimination of the construction/utility worker groundwater exposure pathway, and dredging/capping of the Little River sediments to comprise the approach to achieving a Permanent Solution. The selection process completed in accordance with the MCP for the AS/SVE element of the remedy is summarized in this section. The other elements of the upland remedy were documented in the July 2022 Phase III RAP and remain unchanged; an updated discussion of the remedy selection process for the Little River portion of the Site is included in **Appendix A**.

6.1 TECHNOLOGY DESCRIPTION

AS/SVE is a combined in situ physical treatment technology that is fully developed and widely utilized to remediate volatile compounds in saturated and unsaturated zone soil and groundwater. AS requires the installation of air injection wells extending below the water table to inject air below the impacted groundwater zone, following which the SVE system applies a vacuum to wells screened in the unsaturated zone to capture the resulting vapors. The volatile compounds captured by the SVE system are treated via vapor-phase GAC (VGAC) adsorption prior to atmospheric discharge. As noted earlier, in addition to removing constituents via volatilization, an AS/SVE system can also promote biodegradation (i.e., "bioventing") by stimulating indigenous bacterial growth and associated aerobic biodegradation through the introduction of oxygen into the subsurface.

6.2 PILOT STUDY

GZA evaluated the potential applicability of AS/SVE to remediate benzene and other volatile MGP compounds in soil and groundwater at the Site through the performance of a pilot study in April 2024. GZA performed the pilot test as a modification to the existing IRA Plan and outlined the pilot work in a combined IRA Status Report and Plan Modification dated March 11, 2024. That work is documented in Section 3.5 of this report. The pilot test confirmed the effectiveness of the technology and provided information on design details. Conditions observed during the test indicated an SVE radius of capture (ROC) of approximately 25 feet and also confirmed that injected air had moved laterally from the AS wells to nearby piezometer and monitoring well locations within the study area. A 25-foot radius of influence (ROI) was estimated for an AS well operating at approximately 3.5 scfm. This is a conservative estimate of the ROI since apparent effects from the air sparging were observed within the Little River (air bubbles) at distances of 30 to 40 feet from the sparge locations.

6.3 DETAILED EVALUATION OF REMEDIAL ACTION ALTERNATIVES

In most cases, the initial screening of RAAs must be followed by a detailed evaluation using specific criteria established by the MCP. However, Section 310 CMR 40.0857(2) provides an exemption from a detailed evaluation in those cases where an RAA identified during the initial screening meets the following criteria:

(a) is proven to be effective in remediating the types of oil and hazardous material present at the disposal site, based upon experience gained at other disposal sites with similar site and contaminant conditions;

(b) results in the reuse, recycling, destruction, detoxification, treatment or any combination thereof of the OHM present at the disposal site;

(c) can be implemented in a manner that will not pose a significant risk of harm to health, safety, public welfare or the environment, as described in 310 CMR 40.0900; and

(d) is likely to result in the reduction and/or control of oil and/or hazardous material at the disposal site to a degree and in a manner such that the requirements of a Permanent Solution as set forth in 310 CMR 40.1000 will be met.

AS/SVE is effective at remediating volatile organic compounds in the saturated and unsaturated zones. The site-specific effectiveness of this technology has been documented by the successful implementation of an AS/SVE pilot study, and the process will result in the destruction of OHM (assuming regeneration or incineration of the spent VGAC). The planned implementation details and monitoring will allow for AS/SVE to be implemented without significant risk of harm to health, safety, or public welfare. Due to the potential for discharges of sparged air to the Little River, the potential impacts on the environment from a AS/SVE system would need to be carefully monitored and mitigated, as appropriate. The anticipated end result for an AS/SVE remedy would be reduction of benzene concentrations such that the MCP criteria for a Permanent Solution can be achieved for the Little River. In summary, AS/SVE can be implemented to meet the criteria listed above, and therefore no further detailed evaluation of RAAs is required.

6.4 SELECTION OF REMEDIAL ACTION ALTERNATIVE

It was estimated that AS/SVE could be successfully implemented by installing AS and SVE wells within the target remediation area and treating the vapor stream via VGAC to absorb the VOCs. The cost for installation and operation of an AS/SVE system was estimated at approximately $4.0 million (M) (**Table 7**), significantly less than the costs that had been estimated for a cut-off wall or ISS. The technology is known to be an effective and reliable means of reducing VOCs, and equipment and personnel are readily available to implement it at the Site. AS addresses the dissolved constituents in groundwater and saturated soils and the use of SVE provides control of the vapor-phase plume and capture of vapors generated by AS.

6.5 GREEN REMEDIATION EVALUATION

The June 2014 MCP revisions included requirements to include assessment of "green" remediation approaches when evaluating and selecting remedial alternatives under the MCP. MassDEP issued guidance for implementing this requirement in October 2014 ("Greener Cleanup Guidance, WSC#14-150). This guidance references the USEPA definition of "green" remediation as "the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions". As indicated in the guidance, the principal regulatory authority relevant to green remediation is part of the Response Action Performance Standards (RAPS) of the MCP (310 CMR 40.0191(3)(e)). The RAPS citation follows:

(3) The application of RAPS shall be protective of health, safety, public welfare, and the environment and shall include, without limitation, in the context of meeting the requirements of this Contingency Plan, consideration of the following:

(e) eliminating or reducing, to the extent practicable and consistent with response action requirements and objectives, total energy use, air pollutant emissions, greenhouse gases, water use, materials consumption, and ecosystem and water resources impacts, resulting from the performance of response actions through energy efficiency, renewable energy use, materials management, waste reduction, land management, and ecosystem protection.

The green remediation requirements are also incorporated into the detailed evaluation of remedial alternatives under the comparative cost criteria (310 CMR 40.0858(4)).

MassDEP's guidance is directed at supporting environmental professionals in the consideration and use of approaches that eliminate or reduce the environmental footprint of cleanup activities to the extent possible. Five core elements to be addressed by such approaches are identified within the guidance:

- Minimizing total energy use while maximizing the use of renewable energy;
- Minimizing emissions of greenhouse gases and other air pollutants;
- Minimizing water use and impacts to water resources;
- Reducing, reusing, and recycling materials and waste; and
- Avoiding or reducing adverse impacts to ecosystems and land resources.

Unlike other remedial approaches that could generate larger volumes of soil to be removed from the Site, AS/SVE would generate significantly smaller volumes of remediation waste, mostly in the form of soil generated during drilling of borings for SVE/AS wells and limited trenching for piping and spent VGAC. This would in turn result in significantly fewer truckloads of material to be transported from the Site and backfill material imported to the Site, resulting in a lower carbon footprint associated with such transportation. Impacted soils to be removed from the Site will be thermally treated and recycled to the extent feasible; any asphalt or concrete removed during the remedial work will be recycled.

Rigorous controls will be implemented during the remedial process to limit air and dust emissions, runoff, and noise. Construction vehicle idling and emissions will be limited to the extent feasible. The project schedule will be arranged to combine tasks, where appropriate, and limit trips to the Site.

AS/SVE will result in the complete destruction of OHM (assuming regeneration or incineration of spent VGAC), with no adverse impacts to land resources such as those associated with landfilling of hazardous waste. The system can be optimized for efficiency by determining if a well in a manifold system is not contributing contaminants, and if so, taking the well offline, and by operating pulsed air injections during off-peak hours of electrical demand. Remote data collection can be incorporated into the operation and maintenance plan, significantly reducing onsite field work and associated labor cost, fuel consumption, and vehicular emissions; remote systems also provide real-time data access in the event of treatment system breakdown and allow for ongoing optimization of the system. These elements will be included in the SVE/AS system design to the extent possible.

It is GZA's opinion that the proposed remedial plan addresses the relevant requirements of 310 CMR 40.0191(3)(e).

6.6 CLIMATE RESILIENCY

Changes to the MCP that became effective on March 1, 2024 mandate selection of "response actions that incorporate climate change resilience to the extent practicable and consistent with response action requirements" (310 CMR 40.0191(3)(f)) and consideration of "anticipated impacts associated with climate change" in evaluating a Permanent Solution (310 CMR 40.1005(1)). The proposed AS/SVE system will be located in the upland portion of the Site, where its components will not be vulnerable to flooding from the Little River or other potential climate change impacts. We have not identified additional impacts associated with climate change that may occur over the anticipated design life of the AS/SVE system, which is less than 5 years.

7.0 ADDITIONAL PHASE III RAP REQUIREMENTS

Following the selection of a CRA, the MCP prescribes certain evaluations that must be documented in a Phase III RAP. The items listed under Sections 310 CMR 40.0861(2)(d), (f) and (h) are only required in cases where the selected CRA will result in a Temporary Solution and hence do not apply to the upland remediation documented in this report. The following sections address the remaining requirements of Section 310 CMR 40.0861. These requirements were addressed in Section 7 of Anchor's prior (July 2022) Phase III report for the selected RAA for the Little River portion of the Site. Proposed modifications to the selected Little River RAA would not impact the text from the 2022 report.

7.1 DISCUSSION OF PERMANENT SOLUTION (310 CMR 40.0861(2)(E))

Section 310 CMR 40.0861(2)(e) requires that, if a Permanent Solution is selected as the Comprehensive Remedial Alternative, the Phase III RAP include a discussion of (i) how the alternative is likely to achieve a level of No Significant Risk and (ii) the projected timeframe, based on available information, for meeting the requirements for a Permanent Solution.

The selected CRA can be implemented expeditiously to achieve a Condition of No Significant Risk. Specifically, the AS/SVE system can be installed and activated promptly. It is anticipated this portion of the CRA can be implemented within the next six to twelve months and then operated until remedial goals are attained. Design and permitting efforts for the Little River portion of the remedy will govern the remedial schedule for the CRA at the Site.

7.2 FEASIBILITY OF ACHIEVING/APPROACHING BACKGROUND (310 CMR 40.0861(2)(G))

Under Section 310 CMR 40.0861(2)(g), if a Permanent Solution is selected, the RAP must include the results of the evaluation under 310 CMR 40.0860 of the feasibility of reducing the concentrations of OHM in the environment at the disposal site to levels that achieve or approach background, unless it includes a demonstration that the selected alternative is designed to achieve background.

In the upland portion of 284 Winter Street, approaching background would require that soil across the property, including soil beneath the car wash building, be excavated to a depth of 10 to 20 feet bgs and replaced with clean fill material and that groundwater concentrations be reduced to non-detectable levels. The costs for demolition and restoration of the building, and excavation of an approximately 45,000 square foot area to a depth of 15 feet with associated retaining wall reconstruction, groundwater management and soil disposal costs, and temporary business closure are estimated to exceed $20M. Remediation of groundwater to background levels (which is not technically feasible) would entail additional substantial costs. In contrast, the cost for the selected CRA is estimated at $4.0M. MassDEP policy has established that the incremental costs of remediation to achieve or approach background may be deemed substantial and disproportionate (i.e., economically infeasible) if they exceed 20 percent of the cost to remediate to a condition of NSR; accordingly, achieving background is deemed infeasible at the Site.

7.3 PROJECTED SCHEDULE FOR IMPLEMENTATION OF PHASE IV ACTIVITIES (310 CMR 40.0861(2)(I))

Design and permitting efforts for the Little River portion of the remedy will govern the remedial schedule for the CRA at the Site. It is anticipated that a complete package of plans and specifications will be developed upon completion of permitting for the alternative and further negotiations with property owners. Any design changes or additions will be presented to MassDEP with a Modified Phase IV RIP. Initiation of Little River remedy implementation will be largely dependent on the permitting process and property owner access negotiations and approvals. The upland remediation

components would be implemented in advance of the Little River work if permitting of in-water mitigation measures for potential sparged air excursions/short circuiting can be implemented more expeditiously.

Following completion of remedy implementation, a Phase IV completion statement will be filed. It is anticipated that some level of inspection and monitoring may be required under the MCP following submittal of the Phase IV completion statement.

7.4 PHASE III COMPLETION STATEMENT (310 CMR 40.0862)

In accordance with Section 310 CMR 40.0862 of the MCP, GZA hereby provides this LSP Opinion that:

- the selected Comprehensive Remedial Alternative is likely to achieve a Permanent Solution for both the upland and Little River portions of the Site, and
- the Revised Phase III conforms with applicable Phase III performance standards and requirements.

The certification required by 310 CMR 40.0009 is provided on the accompanying BWSC-108 form (copy in **Appendix B**).

7.5 PUBLIC NOTIFICATION (310 CMR 40.0863)

In keeping with the public notification requirements established by Section 310 CMR 40.1403(3)(e) of the MCP, the Chief Municipal Officer and Board of Health for the City of Haverhill have been notified of the availability of this Revised Phase III Remedial Action Plan. Copies of the notification letters, which included the conclusions from this evaluation, are included in **Appendix K**.

8.0 PHASE IV RIP

This section documents the Phase IV RIP requirements for the selected CRA in the upland portion of the Site in accordance with 310 CMR 40.0874. Sections 3 through 14 of Anchor's Phase IV RIP (**Appendix A**) address these requirements for the selected Little River CRA. Note that some of the components of 310 CMR 40.0874 (goals of the remedial action, new Site information, environmental media, etc.) were addressed in previous report sections for the upland remedy. The upland CRA includes the rerouting of the electrical line that had been identified as the appropriate remedial alternative in GZA's July 2022 Phase III RAP in addition to the proposed AS/SVE remedy for Site groundwater that was described above.

8.1 PROJECT CONTACTS (310 CMR 40.0874 (3)(A))

Person Undertaking Response Action

Name: Mr. Jesse Edmands
Address: Boston Gas Company d/b/a National Grid
170 Data Drive, Waltham, MA 02451
Phone: 781-906-3987

Licensed Site Professional

Name: Mr. Charles A. Lindberg, LSP (LSP License Number 6891)
Address: GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue, Norwood, MA 02062
Phone: 781-278-3830

Owner/Operator of Comprehensive Response Action

National Grid will be the "owner" of the selected CRA in accordance with the MCP terminology. The upland remedial work is being conducted under an access agreement with the owner of the property (HEG); the CRA for the Little River portion of the Site will require access from multiple property owners, as outlined in Anchor's report in **Appendix A**. Construction management, system operation, and MCP reporting will be performed by GZA and Anchor.

8.2 DISPOSAL SITE MAPS, PLANS AND SPECIFICATIONS, AND SCHEDULE (310 CMR 40.0874 (3)(B)(3) AND (3)(C))

Figures 1 and 2 present a Site Locus Map and a Site Plan showing the disposal Site boundary, key Site features and exploration locations. In support of the remedy implementation, GZA prepared a preliminary set of drawings to accompany the specifications for the project. These drawings, which show the proposed AS/SVE system layout and details of system construction, are provided in **Appendix L** and include the following:

1. Proposed Soil Vapor Extraction/Air Sparge System Layout
2. Proposed Soil Vapor Extraction/Air Sparge Header Piping Layout
3. Remediation Design SVE/AS System Header and Details

Appendix L also includes the specifications that will be issued to selected contractors to procure installation services for the AS/SVE portion of the project. Means-and-methods changes to the drawings and specifications may be proposed by the project contractor and implemented if deemed appropriate by the project engineers. In such cases, the modifications will be documented either in a Modified Phase IV RIP or in the Phase IV Final Inspection Report (FIR) that will be prepared following system installation.

Supplemental evaluation of potential permitting requirements associated with mitigation of potential Little River impacts and further pilot testing of a variation on conventional AS/SVE (described below) will be completed following submittal of this Phase IV RIP. This work is anticipated to require two to four months to complete. AS/SVE well and piping installation (or wells and piping for the possible variation) is anticipated to take approximately 2 to 3 months, followed by system start-up and OMM activities. It is anticipated that the system will be operated until the criteria for reduction of benzene concentrations in groundwater have been met.

8.3 DESCRIPTION AND CONCEPTUAL PLAN OF REMEDIAL ACTIVITIES, INCLUDING RELEVANT DESIGN PARAMETERS (310 CMR 40.0874(3)(B)(5) AND (6))

The design and conceptual plan for the remedial system is based on data collected during the pilot study described in Section 3.5. Due to the observed impacts on the Little River during the pilot testing, an AS/SVE system would be implemented in phases with enhanced monitoring and contingency plans for mitigation of effects on the river. The general system design includes the installation of eight AS wells and eight SVE wells, to be installed within the target remedial

zone at the approximate locations shown on the drawings in **Appendix L**. Up to eight SVE wells and four primary AS wells would be installed initially along with the required piping and a number of spare lines to accommodate potential future system expansion or modification. Several secondary AS wells would also be installed as part of the initial phase of remediation and selected SVE locations would be installed with the potential to function as in-well air stripping wells. As outlined below, pilot testing of the in-well air stripping approach (also known as recirculation wells) will be implemented to further refine the design.

Each well will be piped underground to an aboveground manifold as shown on the drawings. As documented in the specifications in **Appendix L**, the SVE and subgrade AS piping and fittings will be constructed of rigid Schedule 40 PVC. Piping will be installed in trenches excavated to approximately 4 feet bgs, as documented on **Figure 2** in **Appendix L**. The aboveground AS piping and fittings will be constructed of IPEX Duraplus™ Air-Line Acrylonitrile Butadiene Styrene (ABS) pipe or an approved equivalent material, which is resistant to shattering under pressure.

At the time of AS/SVE piping installation, the electrical line currently running through the former holder will be rerouted, as shown on **Figure 1** in **Appendix L**. A new electrical handhole will be installed in the landscaped area at the southwestern corner of the car wash building and a shallow trench excavated to the southeastern corner of the building, as shown on the figure. The line would then be routed through the car wash building to the existing feed on the western side of the building.

The AS/SVE piping manifold will be connected to an AS/SVE treatment system located adjacent to the southwestern corner of the car wash building, as depicted on **Figure 1** in **Appendix L**. (Note that National Grid will coordinate the location of the treatment system with the property owner and it is subject to change.) Treatment of extracted vapors will be provided by VGAC absorption.

The treatment system will be fabricated as a pre-packaged turnkey system. It will include the following components:

- An 8 foot wide x 8.5 foot tall x 20 foot long cargo box for housing the SVE blower, AS compressor, and their associated components. The cargo box will be insulated and finished with heat, lighting, ventilation, and sound attenuation;
- One 15 Hp regenerative design blower for SVE, capable of 250 scfm with an inlet vacuum of 80 “WC and a discharge pressure of 100 “WC. The design well-head flow is 20 to 30 scfm at a vacuum of 40 “WC;
- A vapor liquid separator (VLS) tank and transfer pump for condensate separation prior to the inlet of the SVE blower;
- Two, 2,000-pound VGAC vessels plumbed in series;
- One 7.5 Hp rotary claw air compressor for AS, capable of 70 scfm at a pressure of 29 pounds per square inch (psi). The design well-head flow is 3 to 5 scfm at a pressure of 20 psi;
- An air-to-air heat exchanger for cooling the air from the rotary claw air compressor; and
- Instrumentation, programmable logic controller, and cellular-based telemetry system.

A Process and Instrumentation Diagram and other design drawings for the system are provided in **Appendix L** along with specifications for the AS/SVE system installation**.**

As noted above, GZA will conduct a pilot test of an in-well air stripping/sparging (recirculation well) remedial technology as the initial step of the Phase IV implementation. The pilot test will follow the approach for the AS/SVE testing outlined in Section 3.5, employing a new recirculation that will be installed in the immediate vicinity of the prior AS and SVE wells.

If the recirculation well alternative is demonstrated to be a cost-effective alternative to conventional AS/SVE, a Modified Phase IV RIP will be submitted summarizing the design changes and this alternative will be implemented. Otherwise, the conventional AS/SVE approach would be implemented as outlined below.

The conceptual plan for the conventional AS/SVE implementation calls for the SVE wells to be activated first, followed by sequential startup of the four primary AS wells. Conditions within the Little River will be closely monitored following activation of the AS wells. If impacts on the river are observed, attempts will initially be made to reduce air pressures and flows. AS wells in the area of any observed impacts would be shut down if the pressure reductions do not address the impacts. At that point, GZA would evaluate implementation of temporary mitigation measures for the impacted portion of the river. The preferred approach to address air excursions to the Little River would be placement of a temporary cap, likely consisting of a reactive core mat (RCM) or marine armor mattress (MAM) with organoclay as the reactive media. A Modified Phase IV RIP would be submitted to document the selected mitigation approach and appropriate permits would be obtained. AS/SVE operation would then resume with enhanced monitoring of the river conditions. If that approach cannot be readily permitted or implemented, air sparging rates and durations would be reduced at the wells in the impact areas and the system would be operated in a "bio-sparge" mode, with air injections primarily directed at enhancing biodegradation of COCs. The sparge wells would be operated in a pulsed mode, with monitoring of river conditions.

8.4 DESIGN FEATURES FOR CONTROL OF SPILLS, ACCIDENTAL DISCHARGE, OR SYSTEM MALFUNCTION (310 CMR 40.0874(3)(B)(7))

The following controls will be put in place to limit potential adverse impacts at the Site due to spills, accidental discharges, and potential odor and VOC emissions during construction.

8.4.1 Spill Control

Fluids generated during the remediation are anticipated to be limited to drilling water generated during AS well installations and decontamination water (drill rigs and excavation equipment). These liquids will be stored in 55-gallon drums with appropriate secondary containment. Soil generated during drilling and excavation activities will either be stored in 55-gallon drums or staged within small lined and covered stockpiles. Any stored soils will be covered to minimize rainwater infiltration and stockpile areas will be bermed to allow for the collection and proper handling of accumulated water from rain events and prevent uncontrolled discharges of water and sediment from the storage areas.

A supply of containment products, including oil-sorbent pads and granular absorbent, will be maintained at the Site to facilitate spill cleanup. In the event of a spill or release, the release area will be contained and spilled fluids will be absorbed or otherwise collected. Used absorbent materials will be properly staged in containers or on an impermeable surface separate from clean materials. The impacted materials will be covered (as necessary), labeled as a separate waste stream, tested for disposal requirements, and disposed of off Site in accordance with relevant regulatory requirements.

8.4.2 Erosion and Sedimentation Controls

Erosion and sedimentation controls will be installed around the excavation areas for the AS/SVE piping, soil storage areas and in the vicinity of stormwater catch basins in the work areas. These controls will be installed prior to the initiation of work and will not be removed until the work is completed and the Site has been restored.

Erosion and sedimentation controls will likely consist of straw wattles and a combination of silt socks and straw bales for catch basin inlet protection. In addition, all stockpiles will be placed on 20-mil polyethylene sheeting and covered with

stockpile covers that are secured with sandbags or equivalent weights and a grid of ropes. Roll-off containers will be lined and covered to prevent rainwater infiltration and leakage from the units. Erosion and sedimentation controls will be inspected on a daily basis and maintenance/repairs or replacement completed as necessary.

8.4.3 Air Controls

Measures will be implemented to monitor and control potential VOC and dust emissions and nuisance odors during the implementation of the remedial actions. Monitoring for dust and VOCs will be conducted using portable equipment within the excavation areas and conservative target levels for emission controls have been established as part of the Site-specific Health and Safety Plan (HASP) which is included in **Appendix M**. Misting or spraying of active construction areas will be conducted as necessary to limit dust generation.

The effectiveness of dust and odor controls will be evaluated based on work zone monitoring using hand-held, direct-reading particulate meters. Additionally, particulate and VOC monitoring will be performed at perimeter locations during excavation and backfilling activities using hand-held equipment. This will include the use of dust monitors and PIDs for VOCs at locations upwind and downwind of the work area and in the direction of the nearest potential receptor(s).

Once the system has been installed, additional monitoring of conditions at the Site, including the adjacent river, will be performed as described in Section 8.7.

8.4.4 Decontamination

The contractor will be required to decontaminate any equipment or vehicles that come in contact with impacted soil or fill materials during the remediation work to preclude the potential transfer of COCs to areas that are not impacted. Vehicles and equipment exiting work zones where contact with impacted materials has occurred will be decontaminated to remove visible soil, sediment or residuals.

8.4.5 AS/SVE System Spill Control Features

The system design includes the following features to limit the potential for accidental discharge or system malfunction:

- The treatment system is equipped with an emergency stop switch to immediately shut down all components if needed.
- The system includes an instrument control panel with lights, alarm indicators, and on-off switches. The following conditions will trigger a shutdown of all SVE/AS system components, and will transmit a remote alarm notification to GZA: main electrical power failure; enclosure lower explosive limit (LEL) alarm/fault; VLS transfer pump overload; VLS high-high level (i.e., moisture tank is full); or high SVE blower discharge temperature. In the case of a power outage, the system will also transmit a notification when the power is restored.
- In addition to the system-wide shutdown described above, the following conditions will trigger a shutdown of select components related to the AS system operation (i.e., the compressor, heat exchanger, and AS solenoid valves): low SVE manifold vacuum; low/high AS compressor discharge pressure; high heat exchanger discharge temperature; compressor variable frequency drive (VFD) fault; or heat exchanger overload.
- In the event of an SVE blower VFD fault, a switch will shut down the AS system components listed above as well as the SVE blower so that vapor control can be maintained.

- The system is equipped with an auto-dialer to provide timely notice to GZA in the event of any of the conditions described above. In addition, the system has data logging capabilities to record SVE manifold vacuum/air flow differential pressures, compressor discharge pressures, and enclosure LELs. These data can be used to diagnose system operational issues and reduce the likelihood of malfunction.

8.5 REMEDIATION WASTE MANAGEMENT (310 CMR 40.0874(3)(B)(8))

During AS/SVE system installation, small quantities of soil will be generated during trenching for sub-surface piping and will be temporarily stockpiled or placed in roll-off containers pending off-Site disposal. The stockpile(s) will be placed on a minimum of 2 layers of polyethylene sheeting and will be covered with polyethylene sheeting, secured with sandbags or other measures to prevent exposure to wind and precipitation. It is anticipated that the stockpiled soil will be shipped off-Site under a bill-of-lading to a thermal processing facility such as the Clean Earth thermal treatment facility in Loudon, New Hampshire. Asphalt, brick, and concrete (ABC) material generated during the work will be segregated from the soil and properly recycled at an appropriately permitted off-Site facility.

Once the system has been started up, AS/SVE operation will result in the generation of vapor phase OHM, which will be absorbed by VGAC. Spent VGAC will be transported to licensed facilities for regeneration or incineration. The primary remediation waste stream (other than spent VGAC) that will be generated during the system operation will be condensed moisture associated with the SVE system. To manage this condensate, the specifications require that the SVE piping be installed either level or sloping back toward the SVE wells. Condensate that does not return to the wells will be collected in the VLS tank (i.e., knockout tank) and will be handled in accordance with relevant MCP requirements.

8.6 EFFECT OF SITE-SPECIFIC FEATURES ON REMEDIAL ACTION, AND ADVERSE IMPACTS (310 CMR 40.0874(3)(B)(9) AND (10))

The Site-specific information and features impacting the design the remedy and the steps to limit potential adverse impacts on the environment are outlined in the following sections.

8.6.1 Relationship to Existing Activities or Operations

The 284 Winter Street property is an active gasoline fueling station and car wash owned by an entity other than National Grid, and National Grid's intent is to allow these operations to continue during the remedial work, to the extent feasible. The remedial contractor will be required to confine operations to designated areas, with temporary fencing delineating the work boundaries. Specific traffic and parking patterns will be established to limit interference with facility operations. Temporary closures of the car wash access lane will be required for installation of AS and SVE wells and associated piping. These will be communicated to the property owner in advance and coordinated with on-site personnel.

Work will generally be conducted on weekdays during normal business hours. Any temporary deactivation of electrical service, which may be required to connect the AS/SVE system to site power, will be coordinated with property owner facilities representatives, with work conducted outside business hours, if necessary, to limit impacts to site activities. Throughout the AS/SVE work, access will be available to the fueling area at the Property.

8.6.2 Relationship to Drainage Features

The remedial work is not anticipated to impact Site drainage features with the exception of well and piping installation activities in the vicinity of catch basin CB-3, which are expected to be of short duration. The catch basin inlet will be protected with erosion controls during this work, as outlined above.

8.6.3 Natural Resource Areas, Impacts to Environmental Receptors, Local Planning and Development Issues

The AS/SVE work will occur within the 100-foot buffer zone for the Little River bank that is subject to the requirements of the Massachusetts Wetlands Protection Act (WPA; M.G.L. Chapter 131, Section 40). The work will also be subject to the Haverhill Wetlands Ordinance (Wetlands Ordinance) for activities under the WPA and its associated Regulations (Chapter 253 of the City of Haverhill's Code of Rules and Regulations). Although the proposed remediation work will only temporarily disturb this Buffer Zone area (which is currently paved parking and roadway areas), National Grid will submit a Request for Determination of Applicability (RDA) to the Haverhill Conservation Commission (HCC) as a conservative approach. Areas situated within WPA Buffer Zones that are located within 25 feet and 50 feet, respectively, of the resource area (in this case the river bank) are designated as "No-Build-No Disturb" and "No Build" zones, respectively, under the Wetlands Ordinance. Note that the planned locations of system piping and AS/SVE wells fall within these zones. Any conditions imposed by the HCC will be incorporated into project documents and adhered to by the contractor. Other natural resource areas beyond the Buffer Zone for the Little River which could be impacted by the proposed remedial work in the upland areas of the Property have not been identified.

If the remedy will include mitigation measures to limit potential impacts of sparged air excursions or short-circuiting to the Little River, additional natural resource impacts would be anticipated and supplemental permitting would be required, likely including a filing under Massachusetts General Laws Chapter 91, the waterways licensing program. In this scenario, additional permitting would be addressed in the Modified Phase IV RIP.

Construction Best Management Practices (BMPs) will also be implemented during the course of the project. Construction BMPs include, but are not limited to, fugitive dust emission controls through air monitoring for particulates, established action levels, engineering controls such as stockpile covering when not in active use, dust suppression, and sweeping the Site as needed. The use of work stoppages or pauses during periods of increased winds or shifting site work to activities that are less likely to produce increased fugitive dust emissions will also help limit dust emissions during construction if windy weather occurs.

BMPs for soil management will include the use of temporary covers when stockpiles are not in active use and the use of erosion controls around the perimeter of the soil/stockpile management areas to minimize erosion and silt transport during any storm events. Stockpile covers will extend beyond the edges of the storage area to direct precipitation away from the stockpiles and limit erosion potential. Daily inspection of stockpiles and roll-offs and replacement of liners and covers as appropriate will be incorporated into worksite procedures.

GZA has not identified adverse impacts to local planning or development issues associated with the project.

8.6.4 Soil Characteristics and Groundwater Characteristics

The proposed remedial work is anticipated to improve soil and groundwater quality at the Site. Construction activities, in the near term, are not expected to have significant negative impacts on soil or groundwater characteristics at the Site. Operation of the AS/SVE system should effectively reduce concentrations of benzene in groundwater and the associated

flux to the Little River. This should result in measurable improvements to pore water quality downgradient of the AS/SVE area. AS/SVE will also promote natural attenuation of residual OHM in groundwater, resulting in long-term improvements in groundwater quality.

8.7 INSPECTIONS AND PERFORMANCE MONITORING (310 CMR 40.0874(3)(B)(11))

The specifications in **Appendix L** establish key requirements that are intended to facilitate the construction and performance of the remediation system to meet design objectives. As outlined in the specifications, the following practices will be implemented to maintain quality control during the project:

Pre-Construction Bid Walk: A mandatory pre-construction bid walk will be held to provide the contractors with the opportunity to inspect the Site and understand the conditions under which the project will be performed.

Contractor Experience: The contractor selected for the AS/SVE work will be required to demonstrate experience installing such systems at contaminated Sites including an on-Site superintendent who has relevant experience with AS/SVE system installation, piping installation, and tightness testing.

Pre-Construction Meeting: Prior to the commencement of work, the contractor will hold an on-Site health and safety coordination meeting to inform workers about the Site conditions, health and safety procedures, and contingency actions.

Daily Tailgate Meetings: The contractor is required to designate a Site Safety Officer (SSO) and GZA and the contractor will participate in daily tailgate safety meetings to review planned work, identify potential hazards, and review safe work practices.

Weekly Construction Meetings: Weekly construction meetings will be held to discuss the progress of the work, identify any problems impeding its performance, and design solutions with a schedule for their implementation.

Field Inspection: During remedy implementation, a GZA field engineer will be present on Site to evaluate and document the work being performed assisted by a field supervisor who will split time between the Site and office to document the construction progress, keep the design team abreast of any required changes or other issues, and be responsible for keeping the project on schedule. The specifications require that certain key phases of the work, including pipe testing, be conducted in the presence of the GZA engineer. In addition, the engineer may, at their discretion, conduct performance testing to check that the project meets specifications.

Air Monitoring: Dust levels will be monitored during construction using a dust meter and will be compared to time-weighted average particulate total dust level of 150 micrograms per cubic meter (µg/m3). If measured levels at the Site perimeter are found to exceed this value, or if excessive visible dust is observed, a temporary work stoppage will occur and excavations will be misted or sprayed, with care taken to prevent runoff outside the boundaries of erosion controls described above. In addition, measures will be in place to limit dust generation, including the covering of trucks hauling excavated and clean loose materials and the covering of roll-off containers and temporary stockpiles at the end of each day.

River Monitoring: The Little River will be visually monitored on a daily basis upon startup of the AS wells for the first week of operation, with the frequency reduced to weekly after that initial startup period and then monthly after the first four weeks of operation. Additionally, an automated remote monitoring system will be established to continuously monitor air quality just above the river surface at three locations within the treatment zone. This system will be installed at least

two weeks prior to system startup and background conditions will be established prior to activation of the AS/SVE system. Continuous monitoring will be conducted over the initial three months of system operation; at that time the data will be evaluated and the need for continued operation of the system will be assessed. Surface water samples will also be collected from the Little River at upstream, midstream, and downstream locations for VPH analyses during AS/SVE system operation. Sampling frequency will be weekly for the first month and then monthly for the initial six-month operating period.

8.8 OPERATION, MAINTENANCE AND MONITORING (310 CMR 40.0874(3)(D))

An overview of the planned AS/SVE system startup and operation, based on the proposed system installation, is presented below. Modifications to this program will be documented in a Modified Phase IV or Phase IV Status Report

Once the AS/SVE wells, piping, and treatment system have been installed, the system will be started up over a period of approximately two weeks. Initially, the SVE wells will be operated followed by activation of the AS wells, with monitoring of river conditions as outlined above. During the startup period, vacuum data will be collected from soil gas and shallow piezometer monitoring points in the vicinity of the SVE wells to evaluate the ROC of these wells. Total VOCs, oxygen, carbon dioxide, methane, and LEL levels will be measured at the surrounding monitoring points, and pressure measurements will be collected from deep piezometers, to evaluate air injection through the subsurface. A PID will be used to measure influent VOCs to the treatment system, and influent air samples will be submitted for laboratory analysis via APH and EPA Method TO-15.

Following the startup period, routine OMM visits will be made at least once a week to check system performance and make adjustments as necessary. An OMM log for these visits will be developed and included with the OMM plan in the Phase IV RIP Modification or status report. Vacuum and other monitoring data (VOC, oxygen, and other gas levels) will be collected from the monitoring points at least monthly, and the data will be used to optimize system operation. On a monthly basis initially and then approximately once every quarter, the system will be shut down and groundwater samples will be collected from monitoring wells to evaluate system efficacy in achieving desired benzene concentration reductions. The OMM results will be documented in Phase IV status reports submitted to MassDEP every six months.

8.9 ADDITIONAL REQUIREMENTS (310 CMR 40.0874(3)(E)(F)(G))

8.9.1 Health and Safety Plan

The specifications include requirements for a project-specific HASP that will govern contractor and subcontractor activities during system installation. A copy of the HASP will be kept on Site during the project, and the site safety officer will be responsible for its implementation. A copy of GZA's HASP for this project is included in **Appendix M**.

8.9.2 List of Permits

An electrical permit from the City of Haverhill will be obtained for the rerouting of the electrical line and the installation of the treatment system by the licensed electrician who will connect the electrical services for the system equipment. As noted above, an RDA will be submitted to the HCC. If mitigation within the Little River is required due to sparged air excursions, additional permitting will be required and outlined in a Modified Phase IV RIP. No additional permits, other than Dig Safe clearance prior to subsurface excavation, are known to be required for the design, construction, or operation of the AS/SVE system.

8.9.3 Property Access

National Grid has an access agreement with the property owner that allows for implementation of the AS/SVE remedial action. No other access agreements are required to complete the AS/SVE work.

8.10 PUBLIC INVOLVEMENT

In keeping with the public notification requirements established by Sections 310 CMR 40.1403(3)(e) of the MCP) of the MCP, the Chief Municipal Officer and Board of Health have been notified of the availability of this Phase IV RIP; a copy of the description of the Remedy has also been provided. Copies of the notification letters are included in **Appendix K**.

As required by Section 310 CMR 40.1403(10)(c) of the MCP, laboratory results of environmental samples presented in this report (see Section 3.0 – Supplemental Assessment and Testing) were transmitted to the property owner and future laboratory data collected during the remedy will be provided during implementation as necessary. Copies of the transmittal forms are included in **Appendix K.**

TABLES

TABLE 1
SOIL ANALYTICAL DATA
284 Winter Street
Haverhill, Massachusetts

Location			B208-D			AS-1	B302
Sample ID			S-7	S-16	S-18	S-1	S-2
Sample Depth (ft bgs)			21-23	39-41	43-45	31-33	27-29
Sampling Date			3/27/2024	3/27/2024	3/27/2024	4/8/2024	4/9/2024
MCP Standard	M3CL	S-3/GW-3					
Volatile Petroleum Hydrocarbons (mg/kg)							
C_5-C_8 Aliphatics	5,000	500	**629**	27.8	<7.68	**1050**	136
C_9-C_{12} Aliphatics	20,000	5,000	217	<31.2	<15.3	1820	373
C_9-C_{10} Aromatics	5,000	500	**1130**	**611**	<7.35	**2930**	**1310**
Benzene	10,000	1,000	350	1.3	<0.15	75.3	2.31
Toluene	10,000	3,000	100	15.7	<0.15	397	6
Ethylbenzene	10,000	3,000	167	48.4	<0.15	430	127
p/m-Xylene	10,000	3,000	182	70.4	<0.29	455	73.3
o-Xylene	10,000	3,000	99.8	33.4	<0.15	232	77.4
Total Xylene (calculated)	10,000	3,000	282	104	<0.3	687	151
Methyl tert butyl ether	5,000	500	<0.05	<0.04	<0.04	<0.05	<0.04
Naphthalene	10,000	3,000	1070	738	1.54	2510	1010

Notes:
1. All results in milligrams per kilogram (mg/kg) dry weight
2. Method 3 Ceiling Limits (M3CL) and S-3/GW-3 standards from Massachusetts Contingency Plan (310 CMR 40.0000) effective 3/1/24.
3. Bold values exceed S-3/GW-3 standard.

TABLE 2
WELL INVENTORY
MARCH-APRIL 2024
284 Winter Street
Haverhill, Massachusetts

Well Designation	Installation Date	Development Date	Screen Depth (ft)	Depth to Groundwater (ft)	NAPL Observed	Notes
B208(D)-MW	3/28/2024	4/1/2024	40-45	11.98	No	
B208(S)-MW	3/28/2024	4/1/2024	5-20	13.20	Trace	Trace NAPL in well sediments.
B301-MW	4/1/2024	4/12/2024	25-30	12.75	No	
B302-MW	4/9/2024	4/11/2024	27-32	11.92	No	
B303(S)-MW	4/2/2024	4/8/2024	13-23	13.50	Sheen	Sheen during development.
B303(D)-MW	4/5/2024	4/8/2024	30-35	13.37	No	
B304-MW	3/29/2024	4/11/2024	13-23	13.83	No	
B305-MW	4/3/2024	4/8/2024	27-32	14.10	No	
B306-MW	3/28/2024	4/11/2024	8-18	12.75	Sheen	Sheen during development.
B307-MW	4/5/2024	4/8/2024	27-32	13.68	No	
PZ-1D	4/12/2024	4/16/2024	20-25	13.50	Sheen	
PZ-1S	4/12/2024	4/16/2024	8-13	>12.90	NA	
PZ-2D	4/11/2024	4/12/2024	20-25	13.06	No	NAPL observed in drill water (20').
PZ-2S	4/11/2024	4/12/2024	8-13	12.38	No	
PZ-3D	4/12/2024	4/16/2024	20-25	12.47	No	
PZ-3S	4/12/2024	4/16/2024	8-13	11.90	No	
PZ-4D	4/10/2024	4/12/2024	20-25	12.80	0.34'	LNAPL measured following development.
PZ-4S	4/10/2024	4/12/2024	8-13	11.98	Sheen	
PZ-5D	4/10/2024	4/12/2024	20-25	12.53	No	
PZ-5S	4/10/2024	4/12/2024	8-13	12.06	Sheen	
AS-1	4/8/2024	4/11/2024	30-35	12.12	1.3'	NAPL in drill water (32-35'); DNAPL in well sump.
SVE-1	3/29/2024	NA	4-14	12.78	No	

Notes:

1. Depth to groundwater measured between April 2 and April 17, 2024, upon completion of well installation, prior to development or during Site-wide gauging round.
2. Presence of Non-Aqueous Phase Liquid (NAPL) evaluated using oil/water interface probe prior to and following development.

TABLE 3
NAPL GAUGING AND RECOVERY DATA
284 Winter Street
Haverhill, Massachusetts

Well ID	Well screen interval (feet)	Reference Elevation (feet MSL)	Date	Depth to Water (feet)	Water Elevation (feet MSL)	Depth to LNAPL (feet)	Depth to DNAPL (feet)	Depth to Bottom (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Est. Vol. of NAPL Recovered (gallons)	Cumulative NAPL Removed (gallons)
			1/26/2017	12.92	11.61	12.92	ND	--	Sheen	ND	0.00	0.00
			2/24/2017	13.40	11.13	13.37	ND	--	0.03	ND	0.00	0.00
			3/23/2017	15.28	9.25	13.03	ND	--	2.25	ND	0.75	0.75
			4/27/2017	15.02	9.51	12.07	ND	--	2.95	ND	1.00	1.75
			5/25/2017	15.96	8.57	13.04	ND	--	2.92	ND	1.00	2.75
			6/29/2017	17.82	6.71	13.87	ND	--	3.95	ND	1.50	4.25
			7/27/2017	15.63	8.90	13.77	ND	--	1.86	ND	0.50	4.75
			8/29/2017	16.10	8.43	14.10	ND	--	2.00	ND	0.25	5.00
			9/28/2017	15.94	8.59	14.02	ND	--	1.92	ND	1.50	6.50
			11/1/2017	15.92	8.61	14.36	ND	--	1.56	ND	0.75	7.25
			11/21/2017	15.21	9.32	15.01	ND	--	0.20	ND	0.15	7.40
			12/29/2017	15.21	9.32	15.01	ND	--	0.20	ND	0.20	7.60
			1/26/2018	14.95	9.58	14.19	ND	--	0.76	ND	0.10	7.70
			2/27/2018	14.23	10.30	12.71	ND	--	1.52	ND	0.15	7.85
			3/23/2018	16.85	7.68	12.95	ND	--	3.90	ND	1.50	9.35
			4/26/2018	16.15	8.38	12.42	ND	--	3.73	ND	1.00	10.35
			6/4/2018	16.81	7.72	12.62	ND	--	4.19	ND	2.00	12.35
			6/26/2018	14.21	10.32	13.10	ND	--	1.11	ND	0.25	12.60
			7/31/2018	14.56	9.97	14.01	ND	--	0.55	ND	0.15	12.75
			8/27/2018	13.01	11.52	12.78	ND	--	0.23	ND	0.20	12.95
			10/3/2018	12.82	11.71	12.18	ND	--	0.64	ND	0.75	13.70
			10/30/2018	14.10	10.43	12.84	ND	--	1.26	ND	1.50	15.20
			11/29/2018	11.03	13.50	8.55	ND	--	2.48	ND	1.00	16.20
			1/3/2019	14.61	9.92	12.31	ND	--	2.30	ND	1.50	17.70
			1/31/2019	15.12	9.41	12.96	ND	--	2.16	ND	1.00	18.70
			2/19/2019	15.14	9.39	13.21	ND	--	1.93	ND	1.00	19.70
			3/28/2019	15.01	9.52	12.85	ND	--	2.16	ND	1.50	21.20
			4/30/2019	14.46	10.07	12.49	ND	--	1.97	ND	1.00	22.20
			6/5/2019	14.54	9.99	13.13	ND	--	1.41	ND	1.00	23.20
			7/3/2019	15.46	9.07	13.52	ND	--	1.94	ND	1.50	24.70
			8/1/2019	15.29	9.24	13.68	ND	--	1.61	ND	1.00	25.70
			9/3/2019	15.41	9.12	13.80	ND	--	1.61	ND	1.50	27.20
			10/1/2019	15.58	8.95	14.06	ND	--	1.52	ND	1.00	28.20
			11/5/2019	16.00	8.53	13.50	ND	--	2.50	ND	0.75	28.95
			12/18/2019	14.35	10.18	12.44	ND	NM	1.91	ND	0.30	29.25
			1/8/2020	14.57	9.96	12.80	ND	NM	1.77	ND	0.30	29.55
			2/5/2020	14.63	9.90	13.20	ND	21.55	1.43	ND	0.50	30.05
			3/11/2020	15.17	9.36	13.33	ND	21.70	1.84	ND	0.50	30.55
			5/7/2020	12.81	11.72	NAPL visible on probe; probe not reading accurately				ND	0.25	30.80
			6/17/2020	15.28	9.25	13.77	ND	22.12	1.51	ND	0.25	31.05
			7/14/2020	NM	NM	14.01	NM	NM	NM	ND	0.25	31.30
			8/11/2020	15.87	8.66	14.35	ND	21.66	1.52	ND	0.25	31.55
			8/31/2020	14.45	10.08	NAPL visible on probe; could not be accurately gauged				ND	0.25	31.80
NFSB-02(MW)	12-22	24.53	9/15/2020	14.45	10.08	NAPL visible on probe; could not be accurately gauged				ND	0.25	31.80
			10/21/2020	15.38	9.15	14.48	ND	NM	0.90	ND	0.25	32.05
			11/20/2020	15.32	9.21	14.31	ND	21.72	1.01	ND	0.30	32.35
			12/30/2020	14.40	10.13	13.35	ND	NM	1.05	ND	0.30	32.65
			1/15/2021	15.08	9.45	13.60	ND	21.62	1.48	ND	0.25	32.90
			2/9/2021	14.73	9.80	13.71	ND	20.21	1.02	ND	0.50	33.40
			3/12/2021	13.90	10.63	13.10	ND	NM	0.80	ND	0.25	33.65
			4/8/2021	14.80	9.73	13.57	ND	21.70	1.23	ND	0.25	33.90
			5/11/2021	14.48	10.05	13.14	ND	17.30	1.34	ND	0.20	34.10
			6/8/2021	NM	NM	NM	NM	NM	NM	NM	0.00	34.10
			7/14/2021	13.25	11.28	NM	NM	NM	NM	NM	0.40	34.50
			8/11/2021	15.16	9.37	13.07	ND	NM	2.09	ND	0.30	34.80
			9/24/2021	14.22	10.31	13.29	ND	NM	0.93	ND	0.15	34.95
			10/28/2021	13.74	10.79	12.76	ND	14.48	0.98	ND	0.16	35.11
			11/23/2021	14.25	10.28	12.92	ND	NM	1.33	ND	0.22	35.33
			12/13/2021	14.44	10.09	13.02	ND	17.73	1.42	ND	0.23	35.56
			1/5/2022	14.01	10.52	13.08	ND	NM	0.93	ND	0.15	35.71
			2/8/2022	13.78	10.75	12.82	ND	17.68	0.96	ND	0.16	35.87
			3/4/2022	14.10	10.43	12.96	ND	NM	1.14	ND	0.15	36.02
			4/4/2022	14.18	10.35	13.00	ND	NM	1.18	ND	0.20	36.22
			5/3/2022	14.35	10.18	13.08	ND	NM	1.27	ND	0.25	36.47
			6/3/2022	NM	NM	NM	NM	NM	NM	NM	0.00	36.47
			7/1/2022	13.48	11.05	12.92	ND	NM	0.56	ND	0.15	36.62
			8/4/2022	16.06	8.47	14.72	ND	NM	1.34	ND	0.20	36.82
			9/1/2022	15.94	8.59	14.98	ND	NM	0.96	ND	0.05	36.87
			10/4/2022	15.46	9.07	14.39	ND	NM	1.07	ND	0.20	37.07
			11/2/2022	14.97	9.56	14.23	ND	18.81	0.74	ND	0.10	37.17
			12/22/2022	NM	NM	NM	NM	NM	NM	NM	0.00	37.17
			1/13/2023	NM	NM	NM	NM	NM	NM	NM	0.00	37.17
			2/2/2023	14.29	10.24	12.56	ND	17.69	1.73	ND	0.5	37.67
			3/1/2023	14.85	9.68	13.35	ND	17.68	1.5	ND	0.10	37.77
			5/17/2023	13.90	10.63	13.30	ND	NM	0.6	ND	0.20	37.97
			6/14/2023	13.38	11.15	13.28	NM	NM	0.1	NM	0.00	37.97
			7/19/2023	14.48	10.05	12.84	ND	17.87	1.64	ND	0.20	38.17
			8/24/2023	13.03	11.50	ND	ND	17.73	ND	ND	0	38.17
			9/21/2023	12.11	12.42	ND	ND	17.95	ND	ND	0	38.17
			10/10/2023	13.35	11.18	ND	ND	17.78	ND	ND	0.00	38.17
			11/14/2023	13.65	10.88	ND	ND	17.68	ND	ND	0.00	38.17
			12/14/2023	11.74	12.79	ND	ND	15.12	ND	ND	0.00	38.17
			1/18/2024	12.72	11.81	ND	ND	17.65	ND	ND	0.00	38.17
			2/12/2024	13.09	11.44	12.88	ND	17.59	0.21	ND	0.05	38.22
			2/22/2024	13.55	10.98	13.37	ND	17.67	0.18	ND	0.05	38.27
			3/14/2024	12.47	12.06	ND	ND	17.61	ND	ND	0.00	38.27
			4/17/2024	12.31	12.22	12.25	ND	17.68	0.06	ND	0.00	38.27

TABLE 3
NAPL GAUGING AND RECOVERY DATA
284 Winter Street
Haverhill, Massachusetts

Well ID	Well screen interval (feet)	Reference Elevation (feet MSL)	Date	Depth to Water (feet)	Water Elevation (feet MSL)	Depth to LNAPL (feet)	Depth to DNAPL (feet)	Depth to Bottom (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Est. Vol. of NAPL Recovered (gallons)	Cumulative NAPL Removed (gallons)
B107	3.0-15.0	25.32	2/5/2020	2.63	22.69	ND	12.50	NM	ND	2.22	0.00	0.00
			3/11/2020	2.66	22.66	ND	11.56	14.40	ND	3.16	0.00	0.00
			5/7/2020	NM	NM	NM	NM	NM	NM	NM	0.00	0.00
			6/17/2020	NM	NM	NM	NM	NM	NM	NM	0.00	0.00
			7/14/2020	NM	NM	NM	NM	NM	NM	NM	0.00	0.00
			8/11/2020	3.30	22.02	ND	10.81	11.81	ND	3.91	0.00	0.00
			8/31/2020	3.44	21.88	ND	11.55	NM	ND	3.17	0.00	0.00
			9/15/2020	3.40	21.92	ND	11.85	NM	ND	2.87	0.00	0.00
			10/21/2020	3.43	21.89	ND	11.52	14.72	ND	3.20	0.50	0.50
			11/20/2020	NM	NM	ND	NM	NM	NM	NM	0.00	0.00
			12/30/2020	2.34	22.98	ND	11.67	NM	ND	3.05	0.00	0.00
			1/15/2021	2.65	22.67	ND	11.48	NM	ND	3.24	0.00	0.00
			2/9/2021	2.82	22.50	ND	11.25	NM	ND	3.47	0.00	0.00
			3/12/2021	2.06	23.26	ND	11.35	NM	ND	3.37	0.00	0.00
			4/8/2021	2.53	22.79	ND	11.33	NM	ND	3.39	0.00	0.00
			5/11/2021	2.46	22.86	ND	11.48	NM	ND	3.24	0.00	0.00
			6/8/2021	2.62	22.70	ND	11.27	NM	ND	3.45	0.00	0.00
			7/14/2021	1.84	23.48	ND	NM	NM	ND	NM	0.00	0.00
			8/11/2021	2.52	22.80	ND	11.40	14.44	ND	3.32	0.30	0.80
			9/24/2021	2.70	22.62	ND	12.89	NM	NM	1.83	0.00	0.80
			10/28/2021	2.37	22.95	ND	12.97	NM	NM	1.75	0.00	0.80
			11/23/2021	2.53	22.79	ND	12.28	NM	NM	2.44	0.00	0.80
			12/13/2021	3.78	21.54	ND	12.70	NM	NM	2.02	0.00	0.80
			1/5/2022	2.44	22.88	ND	*	NM	NM	NM	0.00	0.80
			2/8/2022	2.42	22.90	ND	*	NM	NM	NM	0.00	0.80
			3/4/2022	2.48	22.84	ND	12.12	NM	NM	2.60	0.00	0.80
			4/4/2022	2.54	22.78	ND	12.00	NM	NM	2.72	0.00	0.80
			5/3/2022	3.64	21.68	ND	12.68	NM	NM	2.04	0.00	0.80
			6/3/2022	2.95	22.37	ND	12.64	NM	NM	2.08	0.00	0.80
			7/1/2022	2.91	22.41	ND	12.61	NM	NM	2.11	0.00	0.80
			8/4/2022	3.79	21.53	ND	*	NM	NM	NM	0.00	0.80
			9/1/2022	4.15	21.17	ND	13.12	NM	ND	1.32	0.00	0.80
			10/4/2022	3.34	21.98	ND	11.58	NM	ND	2.86	0.00	0.80
			11/2/2022	2.98	22.34	ND	12.60	NM	ND	1.84	0.00	0.80
			12/22/2022	2.50	22.82	ND	12.10	NM	ND	2.34	0.00	0.80
			1/13/2023	2.35	22.97	ND	12.40	NM	ND	2.04	0.00	0.80
			2/2/2023	2.28	23.04	ND	11.98	14.68	ND	2.70	0.00	0.80
			3/1/2023	2.62	22.70	ND	12.45	NM	ND	2.27	0.00	0.80
			4/7/2023	2.65	22.67	ND	12.20	NM	ND	2.52	0.00	0.80
			5/17/2023	2.58	22.74	ND	12.30	NM	ND	2.42	0.00	0.80
			6/14/2023	2.65	22.67	ND	11.98	NM	ND	2.70	0.00	0.80
			7/19/2023	2.40	22.92	ND	*	NM	ND	NM	0.13	0.93
			8/24/2023	NM	NM	NM	NM	NM	ND	NM	0	0.93
			9/21/2023	2.02	23.30	ND	12.50	NM	ND	2.22	0	0.93
			10/10/2023	2.70	22.62	ND	13.00	NM	ND	1.72	0	0.93
			11/14/2023	2.94	22.38	ND	13.13	NM	ND	1.59	0	0.93
			12/14/2023	2.40	22.92	ND	12.63	NM	ND	2.09	0	0.93
			1/18/2024	3.50	21.82	ND	12.90	NM	ND	1.82	0	0.93
			2/12/2024	2.33	22.99	ND	12.87	NM	ND	1.85	0	0.93
			3/14/2024	2.10	23.22	ND	12.95	NM	ND	1.77	0	0.93
			4/17/2024	2.24	23.08	ND	12.53	NM	ND	2.19	0	0.93
B205-MW	10.0-20.0	26.06	10/4/2022	15.92	10.14	ND	ND	19.70	ND	ND	0.00	0.00
			10/12/2022	15.91	10.15	ND	ND	19.53	ND	ND	0.00	0.00
			11/2/2022	15.72	10.34	ND	ND	19.42	ND	ND	0.00	0.00
			12/22/2022	15.10	10.96	ND	ND	20.00	ND	ND	0.00	0.00
			1/13/2023	14.56	11.50	ND	ND	NM	ND	ND	0.00	0.00
			2/2/2023	14.38	11.68	ND	ND	19.45	ND	ND	0.00	0.00
			3/1/2023	14.85	11.21	ND	#	19.55	ND	#	0.00	0.00
			4/7/2023	14.23	11.83	ND	ND	19.40	ND	ND	0.00	0.00
			5/17/2023	14.54	11.52	ND	ND	19.43	ND	ND	0.00	0.00
			6/14/2023	14.68	11.38	ND	ND	19.40	ND	ND	0.00	0.00
			7/19/2023	14.89	11.17	ND	ND	19.34	ND	ND	0.00	0.00
			8/24/2023	14.38	11.68	ND	ND	19.43	ND	ND	0	0.00
			9/21/2023	13.90	12.16	ND	ND	19.50	ND	ND	0	0.00
			10/10/2023	14.65	11.41	ND	ND	19.44	ND	ND	0	0.00
			12/14/2023	12.44	13.62	ND	ND	19.41	ND	ND	0	0.00
B206-MW	20.0-30.0	25.44	10/4/2022	15.36	10.08	ND	**	29.55	ND	0.58	0.00	0.00
			10/12/2022	15.36	10.08	ND	28.98	29.58	ND	0.60	0.15	0.15
			11/2/2022	15.17	10.27	ND	29.20	29.60	ND	0.80	0.00	0.15
			12/22/2022	14.52	10.92	ND	29.50	30.00	ND	0.50	0.25	0.40
			1/13/2023	13.95	11.49	ND	29.64	NM	ND	0.36	0.00	0.40
			2/2/2023	13.68	11.76	ND	27.79	29.69	ND	2.21	0.25	0.65
			3/1/2023	14.22	11.22	ND	#	29.71	ND	#	0.00	0.65
			4/7/2023	12.46	12.98	ND	29.45	29.60	ND	0.55	0.00	0.65
			5/17/2023	14.03	11.41	ND	29.60	29.80	ND	0.40	0.00	0.65
			6/14/2023	14.17	11.27	ND	ND	28.40	ND	<1.6	0.00	0.65
			7/19/2023	13.82	11.62	ND	ND	28.30	ND	<1.7	0.00	0.65
			8/24/2023	13.75	11.69	ND	29.35	29.76	ND	0.65	0.05	0.7
			9/21/2023	13.32	12.12	ND	29.40	29.60	ND	0.60	0	0.7
			10/10/2023	14.11	11.33	ND	29.58	29.61	ND	0.42	0	0.7
			11/14/2023	14.47	10.97	ND	29.45	29.59	ND	0.55	0	0.7
			12/14/2023	11.14	14.30	ND	29.1	29.52	ND	0.90	0	0.7
			1/18/2024	13.35	12.09	ND	28.64	29.56	ND	1.36	0.05	0.75
			2/12/2024	13.7	11.74	ND	29.3	29.57	ND	0.70	0	0.75
			2/22/2024	13.97	11.47	ND	29.75	29.75	ND	trace	0	0.75
			3/14/2024	13.58	11.86	ND	29.58	29.71	ND	0.42	0.25	1
			4/17/2024	13.24	12.20	ND	28.98	29.31	ND	1.02	0.2	1.2

TABLE 3
NAPL GAUGING AND RECOVERY DATA
284 Winter Street
Haverhill, Massachusetts

Well ID	Well screen interval (feet)	Reference Elevation (feet MSL)	Date	Depth to Water (feet)	Water Elevation (feet MSL)	Depth to LNAPL (feet)	Depth to DNAPL (feet)	Depth to Bottom (feet)	LNAPL Thickness (feet)	DNAPL Thickness (feet)	Est. Vol. of NAPL Recovered (gallons)	Cumulative NAPL Removed (gallons)
B208-MW	22.0-32.0	24.42	10/4/2022	15.31	9.11	ND	ND	32.00	ND	ND	0.00	0.00
			10/12/2022	15.32	10.12	ND	ND	31.96	ND	ND	0.00	0.00
			11/2/2022	15.09	9.33	ND	31.42	31.97	ND	0.58	0.00	0.00
			12/22/2022	14.33	10.09	ND	30.98	32.00	ND	1.02	0.17	0.17
			1/13/2023	13.46	10.96	ND	31.00	NM	ND	1.00	0.00	0.17
			2/2/2023	NM	NM	NM	NM	NM	NM	NM	0.00	0.17
			3/1/2023	13.44	10.98	ND	#	NM	ND	#	0.00	0.17
			4/7/2023	13.90	10.52	ND	29.75	31.86	ND	2.25	0.10	0.27
			5/17/2023	14.86	9.56	ND	29.70	31.90	ND	2.30	0.00	0.27
			6/14/2023	14.24	10.18	ND	29.56	31.95	ND	2.44	0.36	0.63
			7/19/2023	13.67	10.75	ND	29.61	31.85	ND	2.39	0.00	0.63
			8/24/2023	14.31	10.11	ND	29.50	31.82	ND	2.50	0.25	0.88
			9/21/2023	13.10	11.32	ND	31.40	31.95	ND	0.60	0.06	0.94
			10/10/2023	14.41	10.01	ND	30.38	31.85	ND	1.62	0.25	1.19
			11/14/2023	14.53	9.89	ND	29.81	31.78	ND	2.19	0.1	1.29
			12/14/2023	13.40	11.02	ND	29.80	32.1	ND	2.20	0.25	1.54
			2/12/2024	13.98	10.44	ND	29.14	31.69	ND	2.86	0	1.54
			2/22/2024	14.29	10.13	ND	29.85	NM	ND	2.15	0.05	1.59
			3/14/2024	13.50	10.92	ND	30.17	31.77	ND	1.83	0.5	2.09
			4/17/2024	13.52	10.90	ND	31.40	31.81	ND	0.60	0.25	2.34
B212-MW	14.0-24.0	24.14	2/2/2023	12.82	11.32	ND	#	23.68	ND	#	0.00	0.00
			3/1/2023	13.26	10.88	ND	ND	NM	ND	ND	0.00	0.00
			4/7/2023	13.04	11.10	ND	ND	23.68	ND	ND	0.00	0.00
			5/17/2023	13.48	10.66	ND	ND	23.77	ND	ND	0.00	0.00
			6/14/2023	13.39	10.75	ND	ND	23.72	ND	ND	0.00	0.00
			7/19/2023	12.86	11.28	ND	ND	23.79	ND	ND	0.00	0.00
			8/24/2023	13.36	10.78	ND	ND	23.74	ND	ND	0.00	0.00
			9/21/2023	12.25	11.89	ND	ND	23.77	ND	ND	0.00	0.00
			10/10/2023	13.55	10.59	ND	ND	23.76	ND	ND	0.00	0.00
			11/14/2023	13.72	10.42	ND	ND	23.73	ND	ND	0.00	0.00
			12/14/2023	12.24	11.90	ND	ND	23.76	ND	ND	0.00	0.00
			1/18/2024	12.55	11.59	ND	ND	23.75	ND	ND	0.00	0.00
Upstream Surface Water	NA	26.87	5/7/2020	18.03	8.84	NA	NA	NA	NA	NA	NA	NA
			7/14/2020	18.56	8.31	NA	NA	NA	NA	NA	NA	NA
			8/11/2020	19.11	7.76	NA	NA	NA	NA	NA	NA	NA
			8/31/2020	19.11	7.76	NA	NA	NA	NA	NA	NA	NA
			9/15/2020	19.18	7.69	NA	NA	NA	NA	NA	NA	NA
			10/21/2020	18.89	7.98	NA	NA	NA	NA	NA	NA	NA
			11/20/2020	19.08	7.79	NA	NA	NA	NA	NA	NA	NA
			12/30/2020	18.29	8.58	NA	NA	NA	NA	NA	NA	NA
			1/15/2021	18.55	8.32	NA	NA	NA	NA	NA	NA	NA
			2/9/2021	18.65	8.22	NA	NA	NA	NA	NA	NA	NA
			3/12/2021	17.88	8.99	NA	NA	NA	NA	NA	NA	NA
			4/8/2021	18.78	8.09	NA	NA	NA	NA	NA	NA	NA
			5/11/2021	18.18	8.69	NA	NA	NA	NA	NA	NA	NA
			6/8/2021	18.62	8.25	NA	NA	NA	NA	NA	NA	NA
			7/14/2021	16.61	10.26	NA	NA	NA	NA	NA	NA	NA
			8/11/2021	18.39	8.48	NA	NA	NA	NA	NA	NA	NA
			9/24/2021	18.67	8.20	NA	NA	NA	NA	NA	NA	NA
			10/28/2021	17.42	9.45	NA	NA	NA	NA	NA	NA	NA
			11/23/2021	17.95	8.92	NA	NA	NA	NA	NA	NA	NA
			12/13/2021	17.98	8.89	NA	NA	NA	NA	NA	NA	NA
			1/5/2022	18.18	8.69	NA	NA	NA	NA	NA	NA	NA
			2/8/2022	18.50	8.37	NA	NA	NA	NA	NA	NA	NA
			3/4/2022	17.70	9.17	NA	NA	NA	NA	NA	NA	NA
			4/4/2022	17.95	8.92	NA	NA	NA	NA	NA	NA	NA
			5/3/2022	17.90	8.97	NA	NA	NA	NA	NA	NA	NA
			6/3/2022	18.60	8.27	NA	NA	NA	NA	NA	NA	NA
			8/4/2022	18.97	7.90	NA	NA	NA	NA	NA	NA	NA
			9/1/2022	19.00	7.87	NA	NA	NA	NA	NA	NA	NA
			10/4/2022	18.89	7.98	NA	NA	NA	NA	NA	NA	NA
			11/2/2022	18.72	8.15	NA	NA	NA	NA	NA	NA	NA
			1/13/2023	17.20	9.67	NA	NA	NA	NA	NA	NA	NA
			2/2/2023	17.68	9.19	NA	NA	NA	NA	NA	NA	NA
			3/1/2023	18.25	8.62	NA	NA	NA	NA	NA	NA	NA
			4/7/2023	17.94	8.93	NA	NA	NA	NA	NA	NA	NA
			5/17/2023	18.48	8.39	NA	NA	NA	NA	NA	NA	NA
			6/14/2023	18.21	8.66	NA	NA	NA	NA	NA	NA	NA
			7/19/2023	17.63	9.24	NA	NA	NA	NA	NA	NA	NA
			8/24/2023	18.43	8.44	NA	NA	NA	NA	NA	NA	NA
			9/21/2023	17.05	9.82	NA	NA	NA	NA	NA	NA	NA
			10/10/2023	18.41	8.46	NA	NA	NA	NA	NA	NA	NA
			11/14/2023	18.48	8.39	NA	NA	NA	NA	NA	NA	NA
			12/14/2023	17.60	9.27	NA	NA	NA	NA	NA	NA	NA
			1/18/2024	17.41	9.46	NA	NA	NA	NA	NA	NA	NA
			2/12/2024	18.44	8.43	NA	NA	NA	NA	NA	NA	NA
			3/14/2024	17.49	9.38	NA	NA	NA	NA	NA	NA	NA
			3/25/2024	16.83	10.04	NA	NA	NA	NA	NA	NA	NA
			3/27/2024	17.45	9.42	NA	NA	NA	NA	NA	NA	NA
			3/28/2024	16.69	10.18	NA	NA	NA	NA	NA	NA	NA
			3/29/2024	15.63	11.24	NA	NA	NA	NA	NA	NA	NA
			4/2/2024	17.45	9.42	NA	NA	NA	NA	NA	NA	NA
			4/3/2024	17.62	9.25	NA	NA	NA	NA	NA	NA	NA
			4/5/2024	15.48	11.39	NA	NA	NA	NA	NA	NA	NA
			4/8/2024	16.72	10.15	NA	NA	NA	NA	NA	NA	NA
			4/9/2024	16.98	9.89	NA	NA	NA	NA	NA	NA	NA
			4/10/2024	17.27	9.60	NA	NA	NA	NA	NA	NA	NA
			4/11/2024	17.18	9.69	NA	NA	NA	NA	NA	NA	NA
			4/12/2024	16.49	10.38	NA	NA	NA	NA	NA	NA	NA
			4/17/2024	17.60	9.27	NA	NA	NA	NA	NA	NA	NA

Notes:
1. NAPL = Non-Aqueous Phase Liquid; ND = Not Detected; -- = Data not available; NM = Not Measured; NA = Not Applicable.
2. All depths expressed in feet below the top of the PVC well casing.
3. Data from May 2015 through November 5, 2019 collected by Ramboll Environ; subsequent data collected by GZA.
4. The probe does not reliably penetrate through the coal tar in B107 to reach the bottom of the holder. The well was evacuated on October 21, 2020 and the depth to bottom was confirmed to be 14.72 feet from top of well casing (15.2 feet from ground). DNAPL thickness measurements on the other dates in the table are based on the measured depth to the top of the DNAPL and this bottom depth. * indicates apparent interface probe malfunction on 1/5/22, 2/8/22, 8/4/22 and 7/19/23 inconsistent readings).
5. Reference elevations surveyed by GZA on May 7, 2020, except MW series.
6. A blockage in the well casing was noted in June 2021 and June 2022 at NFSB-02. In July 2021 but the interface probe did not register the NAPL surface.
7. # indicates residual NAPL on interface probe but device did not register.
8. 1.5 gallons total fluids recovered from B212-MW on 3/14/24, subsequently determined to be 0.5 gallons NAPL and 1 gallon water.
9. Upstream River elevation measured from plaque on Winter Street Bridge (Elevation 26.87).

TABLE 4
NAPL ANALYTICAL RESULTS
284 Winter Street
Haverhill, Massachusetts

ANALYTE	Well Number	NFSB-02 (MW)				B208-MW			
	Sample Date:	02/22/2024				02/22/2024			
	Method:	8260D	8260D	8270 (Mod)	8270 (Mod)	8260D	8260D	8270 (Mod)	8270 (Mod)
	Sample Description:	LNAPL - Mixed	LNAPL (Top Layer)	LNAPL	Aqueous	DNAPL (Mixed)	DNAPL (Top Layer)	DNAPL	Aqueous
		mg/kg (wet)			ug/L	mg/kg (wet)			ug/L
Benzene		**3.84**	**156**	**180**	**1,200**	**622**	**1430**	**860**	**6,540**
Ethylbenzene		**13.3**	**451**	NA	NA	**2410**	**5910**	NA	NA
Methyl tert-Butyl Ether		<3.00	<17.6	NA	NA	<30.0	<150	NA	NA
Naphthalene		**228**	**12800**	NA	NA	**31100**	**53900**	NA	NA
Styrene		<3.00	<17.6	NA	NA	<30.0	<150	NA	NA
Toluene		<3.00	**34.6**	NA	NA	**1210**	**2810**	NA	NA
Xylene O		**10.8**	**631**	NA	NA	**1300**	**3400**	NA	NA
Xylene P,M		**13**	**738**	NA	NA	**2780**	**6870**	NA	NA
Xylenes (Total)		**23.8**	**1370**	NA	NA	**4080**	**10300**	NA	NA

Notes:
1. Light Non-Aqeuous Phase Liquid (LNAPL) sample from NFSB-02 was a mixture of water and Non-Aqueous Phase Liquid (NAPL). Initial analysis was on mixed sample; subsequent analysis was run on top (NAPL) layer.
2. < indicates not detected at listed reporting limit. NA - not analyzed for this constituent.
3. 8270 (Mod) analysis for NAPL samples represents alkylated polycyclic aromatic hydrocarbon (PAH) analysis of NAPL with reporting for benzene only.
4. 8270 (Mod) for aqueous samples was equilibrium analysis of deionized water tumbled with NAPL for 5 days and then separated and analyzed for alkylated PAHs.

Table 5
Groundwater Elevation and Gauging Data

Well ID	Well screen interval (feet)	Well Screen Depth (feet)	Reference Elevation (feet)	Depth to Water (feet)	Water Elevation (feet MSL)	Depth to LNAPL (feet)	LNAPL Thickness (feet)	Depth to DNAPL (feet)	DNAPL Thickness (feet)	Depth to Bottom (feet)
MW-1	5-15	15	25.89	3.79	22.10	ND	ND	ND	ND	11.06
ENV-1MW	11-21	21	23.40	12.58	10.82	ND	ND	ND	ND	19.85
ENV-3MW	10-20	20	24.12	12.52	11.60	ND	ND	ND	ND	17.67
ENV-5MW	12-22	22	25.46	13.50	11.96	ND	ND	ND	ND	19.90
ENV-8MW	10-20	20	26.44	13.67	12.77	ND	ND	ND	ND	18.90
NFSB-01(MW)	12-22	22	24.53	11.81	12.72	ND	ND	ND	ND	22.13
NFSB-02(MW)	12-22	22	24.53	12.31	12.22	12.25	0.06	ND	ND	17.68
B102	10-20	20	24.54	10.64	13.90	ND	ND	ND	ND	18.14
B106	10-20	20	25.23	11.43	13.80	ND	ND	ND	ND	19.24
B107	3.0-15	16	25.32	2.24	23.08	ND	ND	12.53	2.22	14.75
B205-MW	10-20	20	26.09	13.81	12.28	ND	ND	ND	ND	19.44
B206-MW	20-30	30	25.79	13.24	12.55	ND	ND	28.98	0.33	29.31
B208-MW	22-32	32	24.41	13.52	10.89	ND	ND	31.40	0.41	31.81
B212-MW	14-24	24	24.14	12.56	11.58	ND	ND	ND	ND	24.73
B208(S)-MW	5-20	20	24.10	13.28	10.82	ND	ND	ND	ND	19.84
B208(D)-MW	40-45	45	24.43	11.71	12.72	ND	ND	ND	ND	44.85
B301-MW	25-30	30	24.13	12.75	11.38	ND	ND	ND	ND	29.95
B302-MW	27-32	32	24.41	13.18	11.23	ND	ND	ND	ND	31.95
B303(S)-MW	13-23	23	24.73	13.50	11.23	ND	ND	ND	ND	22.70
B303(D)-MW	30-35	35	24.96	13.37	11.59	ND	ND	ND	ND	33.05
B304-MW	13-23	23	25.64	14.09	11.55	ND	ND	ND	ND	21.27
B305-MW	27-32	32	26.11	14.10	12.01	ND	ND	ND	ND	31.87
B306-MW	8-18	18	25.61	12.55	13.06	ND	ND	ND	ND	17.55
B307-MW	27-32	32	25.43	13.68	11.75	ND	ND	ND	ND	31.50
PZ-1(D)	20-25	25	24.54	13.50	11.04	ND	ND	ND	ND	24.27
PZ-2(D)	20-25	25	24.54	13.06	11.48	ND	ND	ND	ND	24.22
PZ-3(D)	20-25	25	24.11	12.47	11.64	ND	ND	ND	ND	24.36
PZ-4(D)	20-25	25	24.10	12.80	11.30	12.46	0.34	ND	ND	24.55
PZ-5(D)	20-25	25	24.15	12.53	11.62	ND	ND	ND	ND	24.72
AS-1	30-35	35	23.97	12.50	11.47	ND	ND	36.20	1.32	37.52
SVE-1	4-14	14	24.29	12.78	11.51	ND	ND	ND	ND	14.00

Notes:
1) Water level and NAPL measurements made on April 17, 2024 using oil-water interface probe.
2) NAPL - non aqueous phase liquid; ND- not detected
3) Reference elevations (top of PVC well casing) established by GZA via level surveys in May 2020 and April 2024.
4) Wells MW-2, MW-3, NFSB-08 and ENV-9MW could not be located/accessed on 4/17/24.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location	GW-2	GW-3	M3CL	Units	MW-1				MW-2				MW-3			
Screened Interval (ft bgs)					5-15				5-15				8-18			
Sample ID					MW-1	MW-1-20150512	MW-1	MW-1	MW-2	MW-2-20150512	MW-2	MW-2	MW-3	MW-3-20150512	MW-3	MW-3
Sampling Date					12/1/2014	5/12/2015	9/15/2020	10/12/2022	12/1/2014	5/12/2015	2/12/2020	5/7/2020	12/1/2014	5/12/2015	2/12/2020	10/12/2022
Lab Sample ID						L1510372-07	L2038556-04	L2256974-04		L1510372-06	L2006490-04	L2019097-04		L1510372-05	L2006490-06	L2256974-03
Extractable Petroleum Hydrocarbons (µg/L)																
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	610	<4,000	<5,000	<1,820	--	<1,000	<100	<500	--	<100	<100	--
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	1,500	<4,000	<5,000	<1,820	--	<1,000	<100	<500	--	<100	<100	--
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	2,900	<4,000	<5,000	**15,100**	--	<1,000	250	<500	--	560	235	--
Naphthalene	700	20,000	100,000	µg/l	*3,100*	*3,560*	*6,630*	<182	--	*1,520*	165	220	--	37.3	166	--
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	590	<400	549	989	--	279	34	<50	--	30.4	33.9	--
Acenaphthylene	10,000	40	100,000	µg/l	**130**	<400	**140**	**225**	--	<100	<10	<50	--	28.4	<10	--
Acenaphthene	~	10,000	100,000	µg/l	35	<400	<100	<182	--	<100	<10	<50	--	14.9	<10	--
Fluorene	~	40	400	µg/l	**91**	<400	<100	<182	--	<100	<10	<50	--	13.9	<10	--
Phenanthrene	~	10,000	100,000	µg/l	230	<400	<100	<182	--	<100	<10	<50	--	16.2	<10	--
Anthracene	~	30	1,000	µg/l	**59**	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Fluoranthene	~	200	2,000	µg/l	79	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Pyrene	~	20	700	µg/l	**110**	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Benzo(a)anthracene	~	1,000	10,000	µg/l	35	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Chrysene	~	70	700	µg/l	38	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Benzo(b)fluoranthene	~	400	4,000	µg/l	24	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Benzo(a)pyrene	~	500	5,000	µg/l	27	<400	<50	<182	--	<100	<10	<50	--	<10	<10	--
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	13	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Benzo(g,h,i)perylene	~	20	500	µg/l	17	<400	<100	<182	--	<100	<10	<50	--	<10	<10	--
Volatile Petroleum Hydrocarbons (µg/L)																
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	<10,000	<2,500	<10,000	<10,000	*11,000*	2,680	554	697	1,000	270	478	187
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	<10,000	*5,410*	<10,000	<10,000	<10,000	<2,500	<400	<400	910	165	132	<100
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	<10,000	*5,450*	<10,000	<10,000	*20,000*	*6,430*	<400	<400	710	311	<100	<100
Benzene	1,000	10,000	100,000	µg/l	***16,000***	*9,150*	***19,500***	***12,000***	400	<100	66	96	15	5	3	<2
Toluene	50,000	40,000	100,000	µg/l	2,500	1,150	4,060	2,100	430	<100	13	19	2.1	<5	<2	<2
Ethylbenzene	20,000	5,000	100,000	µg/l	510	620	697	660	**7,000**	1,220	146	214	2.8	<5	<2	<2
p/m-Xylene	3,000	5,000	100,000	µg/l	770	335	718	610	*3,600*	551	38	49	8.4	5	3	<2
o-Xylene	3,000	5,000	100,000	µg/l	380	390	1,450	505	2,700	656	64	133	6.7	6	4	<2
Total Xylene	3,000	5,000	100,000	µg/l	1,150	725	2,168	1,115	***6,300***	1,207	102	182	15.1	11	8	<2
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	<500	<150	<300	<200	<500	<150	35	42	<5	<7.5	<3	<3
Naphthalene	700	20,000	100,000	µg/l	*8,200*	*5,610*	*9,600*	*9,300*	*11,000*	*3,510*	402	558	350	64	195	29
Volatile Organic Compounds (µg/L)																
Styrene	100	6,000	60,000	µg/l	--	--	--	*110*	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	<100	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	<100	--	--	--	--	--	--	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	<200	--	--	--	--	--	--	--	--
Inorganics and Miscellaneous																
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	--	--	--	--	--	--	--	--	--	--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

3. * According to the analytical data table provided by Ramboll Environ, "The laboratory noted high relative percent differences between the original and the re-analysis due to dilution for VPH sample ENV-5MW-20150512. The laboratory attributed the difference to varying analyte concentrations between the sample vials. The field duplicate pair to sample ENV-5MW-20150512 (DUP-20150512) was analyzed and confirmed the sample re-analysis result; as such, precision criterion between the sample and duplicate were met. Therefore, the original reported results are considered estimated values due to poor precision." As such, the original reported results were not compared to standards.
4. Massachusetts Contingency Plan (MCP) Method 1 standards and Method 3 Ceiling Limits (M3CLs) are from the tables in the 2024 MCP. Exceedances of applicable standards are highlighted as described below.

Italics, pale shading	concentration exceeds Method 1 GW-2 standard (sample collected from 0-15' bgs within 30 feet of an occupied building)
Bold, pale shading	concentration exceeds Method 1 GW-3 standard (sample collected deeper than 15' bgs or greater than 30 feet away from an occupied building)
Bold italics, pale shading	concentration exceeds both Method 1 GW-2 and GW-3 standards (sample collected from 0-15' bgs and within 30 feet of an occupied building)
Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location	GW-2	GW-3	M3CL	Units	ENV-1MW				ENV-3MW				ENV-5MW			
Screened Interval (ft bgs)					11-21				10-20				12-22			
Sample ID					ENV-1MW-	ENV-1MW	ENV-1MW	ENV-1MW	ENV-3MW	ENV-3MW	ENV-3MW	ENV-3MW	ENV-5MW-	ENV-5MW-	DUP-20150512	ENV-5MW
Sampling Date					5/12/2015	2/12/2020	8/11/2021	10/12/2022	5/7/2020	8/11/2021	10/25/2022	05/02/2024	5/12/2015	5/12/2015	5/12/2015	2/12/2020
Lab Sample ID					L1510372-04	L2006490-02	L214432-01	L2256974-06	L2019097-01	L2143342-02	L2256974-05	24E0141-07	L1510372-02	L1510372-02	L1510372-03	L2006490-05
Extractable Petroleum Hydrocarbons (µg/L)																
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	<1,000	172	--	--	<2000	<5000	--	--	<1,000	--	<1,000	<1000
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	<1,000	<100	--	--	<2000	<5000	--	--	<1,000	--	<1,000	<1000
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	<1,000	<100	--	--	<2000	<5000	--	--	<1,000	--	<1,000	1,750
Naphthalene	700	20,000	100,000	µg/l	*1,080*	<10	--	--	*3,630*	*5,290*	--	--	*854*	--	*905*	*1,580*
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	219	<10	--	--	378	<500	--	--	146	--	154	322
Acenaphthylene	10,000	40	100,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Acenaphthene	~	10,000	100,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Fluorene	~	40	400	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Phenanthrene	~	10,000	100,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Anthracene	~	30	1,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Fluoranthene	~	200	2,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Pyrene	~	20	700	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Benzo(a)anthracene	~	1,000	10,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Chrysene	~	70	700	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Benzo(b)fluoranthene	~	400	4,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Benzo(a)pyrene	~	500	5,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Benzo(g,h,i)perylene	~	20	500	µg/l	<100	<10	--	--	<200	<500	--	--	<100	--	<100	<100
Volatile Petroleum Hydrocarbons (µg/L)																
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	*5,720*	*6,150*	2,800	1,440	*7,930*	*7,080*	*5,860*	*5,530*	<1,250*	<5,000	<2,500	<5000
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	<2500	<2000	<500	<500	<5000	<5000	<5,000	*6820*	6,550*	<5,000	*5,060*	<5000
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	*11,500*	<2000	<500	<500	<5000	<5000	<5,000	3050	<1,250*	*5,810*	*5,940*	<5000
Benzene	1,000	10,000	100,000	µg/l	<100	<40	14	14	*8,820*	*8,390*	*6,110*	*6,960*	***12,000****	*6,710*	*8,260*	*9730*
Toluene	50,000	40,000	100,000	µg/l	<100	308	178	<10	<100	<100	<100	68	1,230*	664	834	382
Ethylbenzene	20,000	5,000	100,000	µg/l	1,630	2,280	764	174	2,900	2,740	2,100	2,150	1,230*	661	812	1210
p/m-Xylene	3,000	5,000	100,000	µg/l	1,230	1,410	593	27	1,190	1,070	787	857	855*	492	572	771
o-Xylene	3,000	5,000	100,000	µg/l	797	1,300	786	129	1,590	1,520	1,190	1,170	562*	332	386	754
Total Xylene	3,000	5,000	100,000	µg/l	2,027	2,710	1,379	156	2,780	2,590	1,977	2,027	1,417	824	958	1525
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	<150	<60	<15.0	<15	<150	164	<150	74	<75*	<300	<150	<150
Naphthalene	700	20,000	100,000	µg/l	*2,490*	*2,220*	*906*	554	*8,770*	*7,690*	*5,530*	*5,290*	2,210*	*1,580*	*1,740*	*3700*
Volatile Organic Compounds (µg/L)																
Styrene	100	6,000	60,000	µg/l	--	--	*100*	--	--	<25	--	--	--	--	--	--
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--
Inorganics and Miscellaneous																
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	--	0.059	--	--	0.367	--	--	--	--	--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

3. * According to the analytical data table provided by Ramboll Environ, "The laboratory noted high relative percent differences between the original and the re-analysis due to dilution for VPH sample ENV-5MW-20150512. The laboratory attributed the difference to varying analyte concentrations between the sample vials. The field duplicate pair to sample ENV-5MW-20150512 (DUP-20150512) was analyzed and confirmed the sample re-analysis result; as such, precision criterion between the sample and duplicate were met. Therefore, the original reported results are considered estimated values due to poor precision." As such, the original reported results were not compared to standards.
4. Massachusetts Contingency Plan (MCP) Method 1 standards and Method 3 Ceiling Limits (M3CLs) are from the tables in the 2024 MCP. Exceedances of applicable standards are highlighted as described below.

Italics, pale shading	concentration exceeds Method 1 GW-2 standard (sample collected from 0-15' bgs within 30 feet of an occupied building)
Bold, pale shading	concentration exceeds Method 1 GW-3 standard (sample collected deeper than 15' bgs or greater than 30 feet away from an occupied building)
Bold italics, pale shading	concentration exceeds both Method 1 GW-2 and GW-3 standards (sample collected from 0-15' bgs and within 30 feet of an occupied building)
Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location					ENV-5MW			ENV-8MW		B-102				B-106			NFSB-01 (MW)	NFSB-02
Screened Interval (ft bgs)					12-22			10-20		10-20				10-20			12-22	
Sample ID	GW-2	GW-3	M3CL	Units	ENV-5MW	ENV-5MW	ENV-5MW	ENV-8MW-	ENV-8MW	B102	B102	B102	B-102	B106	B106	B-106	NFSB-01 (MW)	NFSB-02-Water
Sampling Date					5/7/2020	8/11/2021	05/06/2024	5/12/2015	8/11/2021	2/12/2020	5/7/2020	8/11/2021	10/12/2022	2/12/2020	5/7/2020	10/12/2022	5/7/2020	2/22/2024
Lab Sample ID					L2019097-02	L2143342-03	24E0264-01	L1510372-01	L2143342-04	L2006490-01	L2019097-06	L2143342-05	L2256974-02	L2006490-03	L2019097-05	L2256974-01	L2019097-03	24B0717-02
Extractable Petroleum Hydrocarbons (µg/L)																		
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	<1000	<1000	--	<1,000	--	<2,000	<2,000	--	--	616	<4.000	--	<500	--
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	<1000	<1000	--	<1,000	--	<2,000	<2,000	--	--	<100	<4,000	--	<500	--
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	1,300	2,410	--	1,250	--	<2,000	<2,000	--	--	547	<4,000	--	828	--
Naphthalene	700	20,000	100,000	µg/l	*12,800*	*1,610*	--	*1,290*	--	*2,000*	*1,660*	--	--	49	*4,230*	--	200	--
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	215	332	--	204	--	220	<200	--	--	<10	479	--	<50	--
Acenaphthylene	10,000	40	100,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	20	<400	--	<50	--
Acenaphthene	~	10,000	100,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	15.8	<400	--	<50	--
Fluorene	~	40	400	µg/l	<100	<100	--	<100	--	<200	<200	--	--	10.3	<400	--	<50	--
Phenanthrene	~	10,000	100,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	18.2	<400	--	<50	--
Anthracene	~	30	1,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Fluoranthene	~	200	2,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Pyrene	~	20	700	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Benzo(a)anthracene	~	1,000	10,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Chrysene	~	70	700	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Benzo(b)fluoranthene	~	400	4,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Benzo(a)pyrene	~	500	5,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Benzo(g,h,i)perylene	~	20	500	µg/l	<100	<100	--	<100	--	<200	<200	--	--	<10	<400	--	<50	--
Volatile Petroleum Hydrocarbons (µg/L)																		
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	*5120*	<5000	3260	2,900	1,190	*19,900*	*15,200*	*13,100*	*8,930*	*10,200*	*6,840*	*8,720*	2,730	--
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	<5000	<5000	*7330*	2,530	<1000	<5,000	<2,500	<2500	--	<5,000	<5,000	<4,000	<1,000	--
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	<5000	<5000	1390	*14,700*	<1000	<5,000	<2,500	<2500	--	<5,000	<5,000	<4,000	<1,000	--
Benzene	1,000	10,000	100,000	µg/l	*8340*	*8020*	*7560*	*4,010*	*1,990*	<100	<50	<2500	<10	*3,680*	*1,720*	*3,600*	*1,020*	*2,180*
Toluene	50,000	40,000	100,000	µg/l	374	253	144	51	<20.0	<100	<50	<2500	<20	688	<100	240	3,704	<100
Ethylbenzene	20,000	5,000	100,000	µg/l	988	844	1030	3,530	1,450	2,180	1,500	1,210	690	2,570	1,210	2,600	620	221
p/m-Xylene	3,000	5,000	100,000	µg/l	640	578	581	2,700	958	***5,150***	*3,460*	2,900	2,100	2,180	579	2,100	183	<200
o-Xylene	3,000	5,000	100,000	µg/l	626	550	622	1,380	619	2,720	1,950	1,730	730	1,580	803	1,700	207	162
Total Xylene	3,000	5,000	100,000	µg/l	1266	1128	1203	*4,080*	1,577	***7,870***	***5,410***	*4,630*	***2,830***	*3,760*	1,382	*3,800*	390	330
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	<150	<150	2.8	<60	<30.0	<150	<75	<75	<40	<150	<150	<120	<30	<100
Naphthalene	700	20,000	100,000	µg/l	*3200*	*3020*	*2630*	*3,180*	*1,210*	*4,910*	*4,280*	*3,960*	*3,600*	*9,950*	*9,640*	*13,000*	477	*1460*
Volatile Organic Compounds (µg/L)																		
Styrene	100	6,000	60,000	µg/l	--	<25	--	--	<25	--	--	*440*	*340*	--	--	<100	--	<100
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	1,300	--	--	800	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	--	--	--	--	--	<20	--	--	<100	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	650	--	--	210	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	--	--	--	--	--	<20	--	--	<100	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	<40	--	--	<200	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	<40	--	--	<200	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	65	--	--	<200	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	<40	--	--	<200	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	310	--	--	<200	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	<40	--	--	<200	--	--
Inorganics and Miscellaneous																		
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	0.518	--	--	0.185	--	--	0.005		--	--		--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

3. * According to the analytical data table provided by Ramboll Environ, "The laboratory noted high relative percent differences between the original and the re-analysis due to dilution for VPH sample ENV-5MW-20150512. The laboratory attributed the difference to varying analyte concentrations between the sample vials. The field duplicate pair to sample ENV-5MW-20150512 (DUP-20150512) was analyzed and confirmed the sample re-analysis result; as such, precision criterion between the sample and duplicate were met. Therefore, the original reported results are considered estimated values due to poor precision." As such, the original reported results were not compared to standards.
4. Massachusetts Contingency Plan (MCP) Method 1 standards and Method 3 Ceiling Limits (M3CLs) are from the tables in the 2024 MCP. Exceedances of applicable standards are highlighted as described below.

Italics, pale shading	concentration exceeds Method 1 GW-2 standard (sample collected from 0-15' bgs within 30 feet of an occupied building)
Bold, pale shading	concentration exceeds Method 1 GW-3 standard (sample collected deeper than 15' bgs or greater than 30 feet away from an occupied building)
Bold italics, pale shading	concentration exceeds both Method 1 GW-2 and GW-3 standards (sample collected from 0-15' bgs and within 30 feet of an occupied building)
Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location					NFSB-08(MW)	GZA-1		GZA-1A		GZA-2		B205-MW	B206-MW		B208-MW			
Screened Interval (ft bgs)					12-22	15-25		14-24		15-25		10-20	20-30		22-32			
Sample ID	GW-2	GW-3	M3CL	Units	NFSB-08(MW)	GZA-1	GZA-1	GZA-1A	GZA-1A	GZA-2	GZA-2	B205-MW	B206-MW	B206-Water	B208-MW	B208-Water	B208-MW	B208-MW
Sampling Date					5/7/2020	9/15/2020	11/20/2020	9/15/2020	11/20/2020	9/15/2020	11/20/2020	03/17/2023	03/17/2023	2/22/2024	04/07/2023	2/22/2024	4/2/2024	05/06/2024
Lab Sample ID					L2019097-07	L2038556-01	L2052184-01	L2038556-02	L2052184-02	L2038556-03	L2052184-03	23C0579-02	23C0579-03	24B0717-01	23D0279-01	24B0717-03	24D0067-03	24E0264-03
Extractable Petroleum Hydrocarbons (µg/L)																		
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	<100	<100	<100	<100	<100	<100	<100	--	--	--	--	--	--	--
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	<100	<100	<100	<100	<100	<100	<100	--	--	--	--	--	--	--
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	109	<100	<100	<100	<100	<100	<100	--	--	--	--	--	--	--
Naphthalene	700	20,000	100,000	µg/l	<10	0.886	<100	1.22	<100	<100	<100	228	*3320*	--	*3380*	--	--	--
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	59.9	728	--	469	--	--	--
Acenaphthylene	10,000	40	100,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	4.85	8.42	--	**48.4**	--	--	--
Acenaphthene	~	10,000	100,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.66	97.8	--	2.3	--	--	--
Fluorene	~	40	400	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	4.56	28.1	--	23.7	--	--	--
Phenanthrene	~	10,000	100,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	7.78	29.6	--	22.1	--	--	--
Anthracene	~	30	1,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	1.18	2.19	--	2.49	--	--	--
Fluoranthene	~	200	2,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.49	<0.19	--	0.77	--	--	--
Pyrene	~	20	700	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	0.78	<0.19	--	0.6	--	--	--
Benzo(a)anthracene	~	1,000	10,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.05	<0.05	--	<0.05	--	--	--
Chrysene	~	70	700	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.05	<0.05	--	<0.05	--	--	--
Benzo(b)fluoranthene	~	400	4,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.05	<0.05	--	<0.05	--	--	--
Benzo(a)pyrene	~	500	5,000	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.05	<0.05	--	<0.05	--	--	--
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	<10	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.05	<0.05	--	<0.05	--	--	--
Benzo(g,h,i)perylene	~	20	500	µg/l	<10	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.19	<0.19	--	<0.19	--	--	--
Volatile Petroleum Hydrocarbons (µg/L)																		
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	170	<100	<100	100	<100	<100	<100	--	--	--	--	--	*6540*	*6300*
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	183	<100	<100	114	<100	<100	<100	--	--	--	--	--	*5170*	*8110*
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	<100	103	<100	<100	<100	<100	<100	--	--	--	--	--	2880	3280
Benzene	1,000	10,000	100,000	µg/l	<2	<2	<2	<2	<2	<2	<2	199	*6150*	***11100***	*5720*	***12500***	*3970*	*6030*
Toluene	50,000	40,000	100,000	µg/l	<2	<2	<2	<2	<2	<2	<2	1.5	234	<500	250	825	284	488
Ethylbenzene	20,000	5,000	100,000	µg/l	<2	<2	<2	<2	<2	<2	<2	90.2	1470	1810	2070	2300	2300	2280
p/m-Xylene	3,000	5,000	100,000	µg/l	<2	2.32	<2	6.16	<2	<2	<2	13.8	1630	1870	1420	1820	1380	1450
o-Xylene	3,000	5,000	100,000	µg/l	<2	<2	<2	<2	<2	<2	<2	41.8	1010	1280	1070	1300	1090	1110
Total Xylene	3,000	5,000	100,000	µg/l	<2	2.32	<2	6.16	<2	<2	<2	55.6	2640	*3150*	2490	*3120*	2470	2560
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	<3	<3	<3	<3	<3	<3	<3	<1.0	<1.0	<500	6.6	<500	<1.5	40.9
Naphthalene	700	20,000	100,000	µg/l	<4	<4	<4	<4	<4	<4	<4	372	*5120*	*6850*	*7450*	*9200*	*7430*	*7600*
Volatile Organic Compounds (µg/L)																		
Styrene	100	6,000	60,000	µg/l	--	--	--	--	--	--	--	<1.0	9.6	<500	<1.0	<500	--	--
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	29.9	401	--	410	--	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	--	--	--	--	<1.0	<1.0	--	<1.0	--	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	3	102	--	100	--	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	--	--	--	--	<1.0	<1.0	--	<1.0	--	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	--	--	--	--	1.6	3.5	--	10.8	--	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	--	--	--	--	3.4	<1.0	--	1.1	--	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	3.4	39.7	--	84.2	--	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	<1.0	3.3	--	7.2	--	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	1.7	18.3	--	23.8	--	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	<1.0	<1.0	--	<1.0	--	--	--
Inorganics and Miscellaneous																		
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

3. * According to the analytical data table provided by Ramboll Environ, "The laboratory noted high relative percent differences between the original and the re-analysis due to dilution for VPH sample ENV-5MW-20150512. The laboratory attributed the difference to varying analyte concentrations between the sample vials. The field duplicate pair to sample ENV-5MW-20150512 (DUP-20150512) was analyzed and confirmed the sample re-analysis result; as such, precision criterion between the sample and duplicate were met. Therefore, the original reported results are considered estimated values due to poor precision." As such, the original reported results were not compared to standards.
4. Massachusetts Contingency Plan (MCP) Method 1 standards and Method 3 Ceiling Limits (M3CLs) are from the tables in the 2024 MCP. Exceedances of applicable standards are highlighted as described below.

Italics, pale shading	concentration exceeds Method 1 GW-2 standard (sample collected from 0-15' bgs within 30 feet of an occupied building)
Bold, pale shading	concentration exceeds Method 1 GW-3 standard (sample collected deeper than 15' bgs or greater than 30 feet away from an occupied building)
Bold italics, pale shading	concentration exceeds both Method 1 GW-2 and GW-3 standards (sample collected from 0-15' bgs and within 30 feet of an occupied building)
Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location					B208(S)-MW		B208(D)-MW		B212-MW		B301-MW	B302-MW	B303(S)-MW	B303(D)-MW	B304-MW	B305-MW	B306-MW	B307-MW
Screened Interval (ft bgs)					5-20		40-45		14-24		25-30	27-32	13-23	30-35	13-23	27-32	8-18	27-32
Sample ID	GW-2	GW-3	M3CL	Units	B208(S)-MW	B208(S)-MW	B208(D)-MW	B208(D)-MW	B212-MW	B212-MW	B301-MW	B302-MW	B303(S)-MW	B303(D)-MW	B304-MW	B305-MW	B306-MW	B307-MW
Sampling Date					4/2/2024	05/02/2024	4/2/2024	05/02/2024	03/17/2023	05/02/2024	04/18/2024	04/17/2024	04/17/2024	04/17/2024	04/11/2024	04/16/2024	04/16/2024	04/12/2024
Lab Sample ID					24D0067-01	24E0141-05	24D0067-02	24E0141-04	23C0579-01	24E0141-06	24D0705-11	24D0705-12	24D0705-13	24D0705-14	24D0705-01	24D0705-02	24D0705-03	24D0705-04
Extractable Petroleum Hydrocarbons (µg/L)																		
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	700	20,000	100,000	µg/l	--	--	--	--	*1680*	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	--	--	--	--	298	--	--	--	--	--	--	--	--	--
Acenaphthylene	10,000	40	100,000	µg/l	--	--	--	--	**68**	--	--	--	--	--	--	--	--	--
Acenaphthene	~	10,000	100,000	µg/l	--	--	--	--	3.75	--	--	--	--	--	--	--	--	--
Fluorene	~	40	400	µg/l	--	--	--	--	32.7	--	--	--	--	--	--	--	--	--
Phenanthrene	~	10,000	100,000	µg/l	--	--	--	--	32.7	--	--	--	--	--	--	--	--	--
Anthracene	~	30	1,000	µg/l	--	--	--	--	3.35	--	--	--	--	--	--	--	--	--
Fluoranthene	~	200	2,000	µg/l	--	--	--	--	0.75	--	--	--	--	--	--	--	--	--
Pyrene	~	20	700	µg/l	--	--	--	--	1.06	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	~	1,000	10,000	µg/l	--	--	--	--	<0.05	--	--	--	--	--	--	--	--	--
Chrysene	~	70	700	µg/l	--	--	--	--	<0.05	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	~	400	4,000	µg/l	--	--	--	--	<0.05	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	~	500	5,000	µg/l	--	--	--	--	<0.05	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	--	--	--	--	<0.05	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	~	20	500	µg/l	--	--	--	--	<0.19	--	--	--	--	--	--	--	--	--
Volatile Petroleum Hydrocarbons (µg/L)																		
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	2870	3320	<100	<100	--	3290	*7120*	406	*6080*	335	3750	1180	1780	1260
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	*6700*	*3320*	<158	<158	--	732	1150	207	*16100*	<158	*12000*	<158	493	397
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	1580	1890	<270	<270	--	1200	1320	<270	1480	<270	1760	279	729	384
Benzene	1,000	10,000	100,000	µg/l	*7030*	*3240*	<1.5	<1.5	33.3	159	143	21.4	***14300***	7.6	***10400***	4.9	166	319
Toluene	50,000	40,000	100,000	µg/l	47.1	32.4	<5.0	<5.0	16.1	33.7	114	7.2	1910	<5.0	2990	9	115	13.7
Ethylbenzene	20,000	5,000	100,000	µg/l	1310	1430	<5.0	<5.0	425	693	894	54.3	1140	12.6	564	82.9	521	190
p/m-Xylene	3,000	5,000	100,000	µg/l	572	234	<10.0	<10.0	160	179	1080	37.9	1050	<10.0	2460	89.6	299	146
o-Xylene	3,000	5,000	100,000	µg/l	340	434	<5.0	<5.0	228	260	908	63.9	822	<5.0	1370	76.8	194	97.7
Total Xylene	3,000	5,000	100,000	µg/l	912	668	<10.0	<10.0	388	439	1988	101.8	1872	<10.0	*3830*	166.4	493	243.7
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	<1.5	<1.5	<1.5	<1.5	1.8	25.8	5	<1.5	20.3	<1.5	3.1	<1.5	<1.5	<1.5
Naphthalene	700	20,000	100,000	µg/l	*1990*	*1960*	7.7	<5.0	*2680*	*1900*	*5230*	214	*5790*	85.5	*7000*	351	*964*	*950*
Volatile Organic Compounds (µg/L)																		
Styrene	100	6,000	60,000	µg/l	--	--	--	--	<1.0	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	244	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	--	10.7	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	66.4	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	--	2.2	--	--	--	--	--	--	--	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	--	10	--	--	--	--	--	--	--	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	--	<1.0	--	--	--	--	--	--	--	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	--	77.5	--	--	--	--	--	--	--	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	9.1	--	--	--	--	--	--	--	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	--	45.8	--	--	--	--	--	--	--	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	1.1	--	--	--	--	--	--	--	--	--
Inorganics and Miscellaneous																		
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

3. * According to the analytical data table provided by Ramboll Environ, "The laboratory noted high relative percent differences between the original and the re-analysis due to dilution for VPH sample ENV-5MW-20150512. The laboratory attributed the difference to varying analyte concentrations between the sample vials. The field duplicate pair to sample ENV-5MW-20150512 (DUP-20150512) was analyzed and confirmed the sample re-analysis result; as such, precision criterion between the sample and duplicate were met. Therefore, the original reported results are considered estimated values due to poor precision." As such, the original reported results were not compared to standards.
4. Massachusetts Contingency Plan (MCP) Method 1 standards and Method 3 Ceiling Limits (M3CLs) are from the tables in the 2024 MCP. Exceedances of applicable standards are highlighted as described below.

Italics, pale shading	concentration exceeds Method 1 GW-2 standard (sample collected from 0-15' bgs within 30 feet of an occupied building)
Bold, pale shading	concentration exceeds Method 1 GW-3 standard (sample collected deeper than 15' bgs or greater than 30 feet away from an occupied building)
Bold italics, pale shading	concentration exceeds both Method 1 GW-2 and GW-3 standards (sample collected from 0-15' bgs and within 30 feet of an occupied building)
Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

TABLE 6
GROUNDWATER ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

Location	GW-2	GW-3	M3CL	Units	PZ-1(D)		PZ-2(D)	PZ-3(D)		PZ-4(D)		PZ-5(D)	AS-1	
Screened Interval (ft bgs)					20-25		20-25	20-25		20-25		20-25	30-35	
Sample ID					PZ-1(D)	PZ-1(D)	PZ-2(D)	PZ-3(D)	PZ-3(D)	PZ-4(D)	PZ-4(D)	PZ-5(D)	AS-1	AS-1
Sampling Date					04/17/2024	5/2/2024	04/17/2024	04/17/2024	05/02/2024	04/18/2024	05/02/2024	04/18/2024	04/18/2024	05/06/2024
Lab Sample ID					24D0705-05	24E0141-01	24D0705-06	24D0705-07	24E0141-02	24D0705-08	24E0141-03	24D0705-09	24D0705-10	24E0264-02
Extractable Petroleum Hydrocarbons (µg/L)														
C_9-C_{18} Aliphatics	5,000	50,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
C_{19}-C_{36} Aliphatics	~	50,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
C_{11}-C_{22} Aromatics, Adjusted	50,000	5,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
Naphthalene	700	20,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	2,000	20,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	10,000	40	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
Acenaphthene	~	10,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
Fluorene	~	40	400	µg/l	--	--	--	--	--	--	--	--	--	--
Phenanthrene	~	10,000	100,000	µg/l	--	--	--	--	--	--	--	--	--	--
Anthracene	~	30	1,000	µg/l	--	--	--	--	--	--	--	--	--	--
Fluoranthene	~	200	2,000	µg/l	--	--	--	--	--	--	--	--	--	--
Pyrene	~	20	700	µg/l	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	~	1,000	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
Chrysene	~	70	700	µg/l	--	--	--	--	--	--	--	--	--	--
Benzo(b)fluoranthene	~	400	4,000	µg/l	--	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	~	500	5,000	µg/l	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-cd)Pyrene	~	100	1,000	µg/l	--	--	--	--	--	--	--	--	--	--
Benzo(g,h,i)perylene	~	20	500	µg/l	--	--	--	--	--	--	--	--	--	--
Volatile Petroleum Hydrocarbons (µg/L)														
C_9-C_{10} Aromatics	4,000	50,000	100,000	µg/l	3700	3800	*5020*	*5720*	3630	*6790*	*6140*	*6260*	*5520*	*5020*
C_5-C_8 Aliphatics, Adjusted	3,000	50,000	100,000	µg/l	*15700*	*18600*	*3580*	*3740*	696	*3490*	*6550*	1490	1510	1160
C_9-C_{12} Aliphatics, Adjusted	5,000	50,000	100,000	µg/l	1790	2090	1930	1730	881	3440	3660	1370	2180	1960
Benzene	1,000	10,000	100,000	µg/l	***15600***	***16600***	*2280*	*2620*	879	*1690*	*3240*	141	728	420
Toluene	50,000	40,000	100,000	µg/l	188	223	286	456	120	1030	2340	97.8	780	722
Ethylbenzene	20,000	5,000	100,000	µg/l	1530	1680	1700	2660	731	2080	2090	820	1170	910
p/m-Xylene	3,000	5,000	100,000	µg/l	1010	1230	899	495	150	2650	2530	929	1270	998
o-Xylene	3,000	5,000	100,000	µg/l	838	959	816	813	311	1290	1240	787	696	569
Total Xylene	3,000	5,000	100,000	µg/l	1848	2189	1715	1308	461	*3940*	*3770*	1716	1966	1567
Methyl tert butyl ether	50,000	50,000	100,000	µg/l	68.9	66.4	161	37.1	39.9	36.6	46.5	6.2	<1.5	<1.5
Naphthalene	700	20,000	100,000	µg/l	*5160*	*4530*	*6040*	*7410*	*6870*	*8920*	*8160*	*4660*	*5320*	*5260*
Volatile Organic Compounds (µg/L)														
Styrene	100	6,000	60,000	µg/l	--	--	--	--	--	--	--	--	--	--
1,2,4-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	8,000	2,000	80,000	µg/l	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	60	8,000	80,000	µg/l	--	--	--	--	--	--	--	--	--	--
4-Isopropyltoluene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
Carbon Disulfide	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
Isopropylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
n-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
n-Propylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
sec-Butylbenzene	~	~	10,000	µg/l	--	--	--	--	--	--	--	--	--	--
Inorganics and Miscellaneous														
Cyanide, Physiologically Available (PAC)	~	30	2,000	mg/L	--	--	--	--	--	--	--	--	--	--

Notes

1. <X indicates analyte not detected above laboratory reporting limit; "~" indicates no MCP Method 1 standard; "--" indicates sample was not analyzed for this analyte.
2. "Total Xylenes" was calculated as the sum of m/p-xylene and o-xylene. When neither was detected, the maximum detection limit was used. For sample "NFSB-02-Water", collected on 2/22/2024, the Total Xylenes result was reported separately in the laboratory analytical report.

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Bold italics, dark shading	concentration exceeds M3CL, applicable to all samples

5. Non-detect samples with high reported detection limits were not compared to MCP standards; instead, data collected at a later date with lower detection results were used to evaluate conditions at the well.

6. The 2023 samples B205-MW, B206-MW, B208-MW, and B212-MW were analyzed for Volatile Organic Compounds by EPA Method 8260B and for Semivolatile Organic Compounds by EPA Method 8270D(SIM). Results for VOC analytes that are also VPH analytes are displayed in the corresponding VPH rows. Results for other VOC analytes are listed in the Volatile Organic Compounds rows. Results for SVOC analytes are displayed in the corresponding EPH rows. Analytes that were not detected above the laboratory Reporting Limits are not listed.

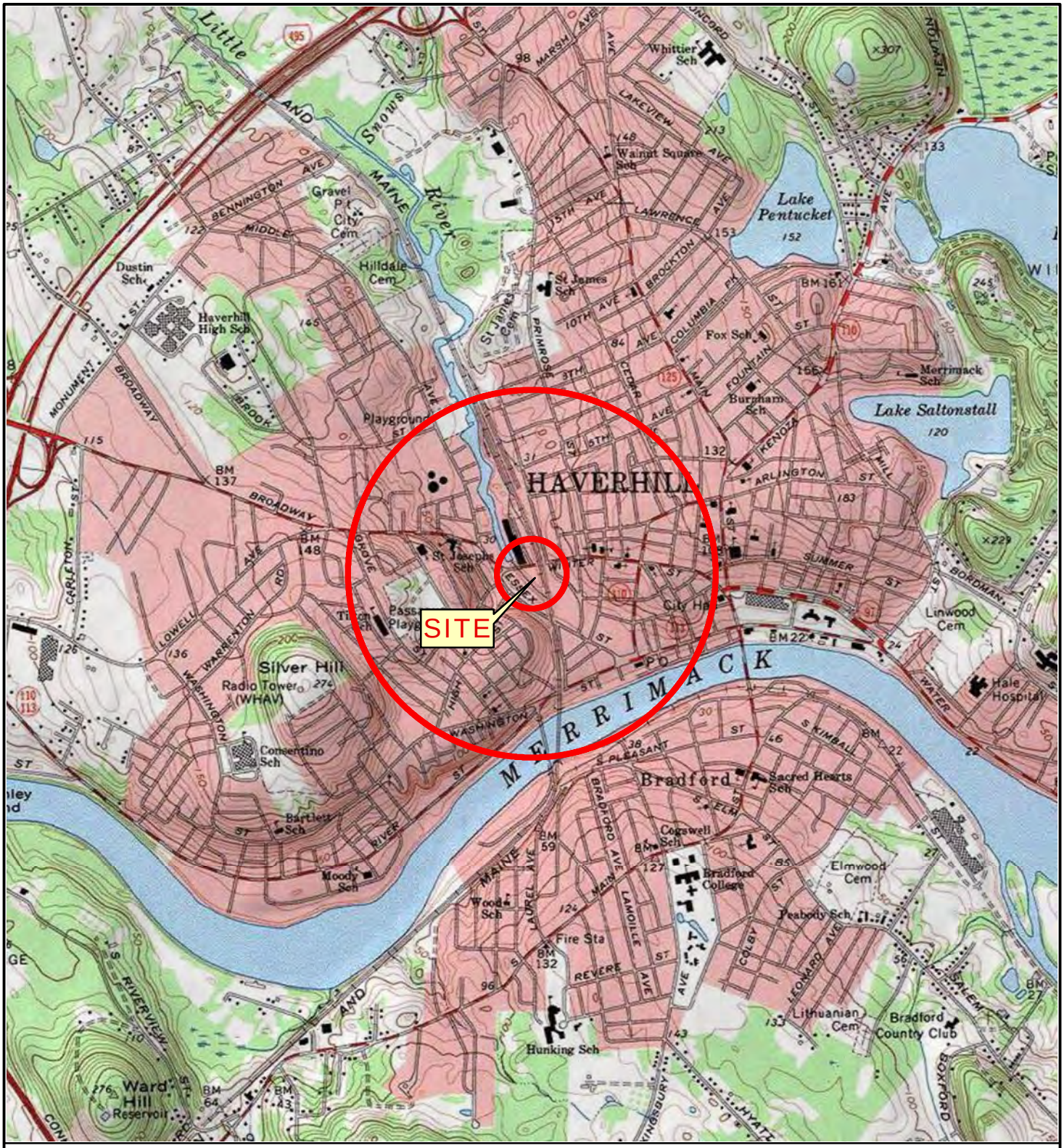
7. The 2022 samples MW-1, B-102, and B-106 were analyzed for both VPH and VOCs. Results for analytes that are listed in both VOC and VPH analyses are displayed in the VPH rows--in cases where an analyte was detected by both methods, the higher result is displayed. In cases where the analyte was not detected, the lower reporting limit is displayed.

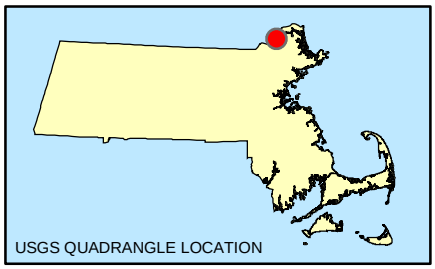
TABLE 7 - COST ESTIMATE
Air Sparging/Soil Vapor Extraction
284 Winter Street
Haverhill, Massachusetts

TASK	NAME	QUANTITY	UNITS	UNIT COST	ESTIMATE COST	NOTES
1.0 - DRILLING PROGRAM						
1.1	Mobilization	1	LS	$ 10,000	$ 10,000	
1.2	Utility Clearance and Vacuum Excavation	5	DAY	$ 3,000	$ 16,000	Assumes 3 to 4 locations per rig/day.
1.3	Obstruction Clearance/Drilling Through Buried Slabs	1	LS	$ 25,000	$ 25,000	
1.4	AS Well Installations (approx. 30 ft deep)	4	DAY	$ 4,000	$ 16,000	Assumes 8 AS wells with 2 wells installed per day.
1.5	SVE Well Installations (approx. 10 ft deep)	3	DAY	$ 4,000	$ 12,000	Assumes 8 SVE wells with 3 wells installed per day.
				SUBTOTAL:	**$ 79,000**	
2.0 - TRENCHING, PIPING, INSTRUMENTATION						
2.1	Mobilization	1	LS	$ 25,000	$ 25,000	
2.2	Site Preparation	1	LS	$ 20,000	$ 20,000	
2.3	Asphalt Cutting	1,000	LF	$ 8	$ 8,000	250 ft long trench plus laterals to each SVE & AS well (250 ft).
2.4	Asphalt Removal	2	DAY	$ 3,500	$ 7,000	Removal and disposal (recycling).
2.5	Excavation and Trenching	5	DAY	$ 5,000	$ 25,000	Assume 100 ft per day.
2.6	AS Piping Installation	330	LF	$ 10	$ 3,300	Assumes a main header and branches to each AS well.
2.7	SVE Piping Installation	370	LF	$ 15	$ 5,550	Assumes a main header and branches to each SVE well.
2.8	Fitting to Wells/Well Covers/Instrumentation/Valves	16	EA	$ 1,000	$ 16,000	
2.9	Backfill Trenches for AS & SVE Lines	296	CY	$ 30	$ 8,889	
2.10	Patch Asphalt	3000	SF	$ 5	$ 15,000	
2.11	Health and Safety Officer (Independent Firm)	87	Day	$ 700	$ 60,620	Assumes 4 months.
2.12	Site Security (24 hrs per day x 7 days per week)	120	Day	$ 1,200	$ 144,000	Assumes 4 months.
2.13	Restore Landscaping	1	LS	$ 20,000	$ 20,000	
				SUBTOTAL:	**$ 358,359**	
3.0 - TEMPORARY SEDIMENT CAP						
3.1	Preliminary Estimate	1	LS	$ 500,000	$ 500,000	Initial estimate provided by Anchor QEA
				SUBTOTAL:	**$ 500,000**	
4.0 - TREATMENT SYSTEM						
4.1	Controls (Instrumentation, AS Blower, Moisture Separation, SVE Blower)	1	LS	$ 360,000	$ 360,000	Based on experience with similar project.
4.2	Vapor Phase Carbon Vessels	2	EA	$ 20,000	$ 40,000	Two 2,000 lbs vessels plumbed in series
4.3	AS and SVE Piping Connections	1	LS	$ 10,000	$ 10,000	
4.4	Electrical and Mechanical Contractors	1	LS	$ 15,000	$ 15,000	
4.5	Treatment System Enclosure	1	LS	$ 15,000	$ 15,000	
4.6	Electrical Service	1	LS	$ 20,000	$ 20,000	
4.7	Fencing Rental (Treatment System Area)	1	LS	$ 20,000	$ 20,000	
4.8	Start-up and Prove Out	10	DAY	$ 3,500	$ 35,000	
				SUBTOTAL HIGH:	**$ 515,000**	
5.0 - WASTE MANAGEMENT						
5.1	Disposal Characterization	2	EA	$ 1,500	$ 3,000	
5.2	Soil Disposal	259	TON	$ 100	$ 25,926	Assume 50% from trenches will be disposed.
5.3	Liquid Disposal	10	DM	$ 150	$ 1,500	
5.4	Drill Cuttings	12	DM	$ 250	$ 3,000	
				SUBTOTAL HIGH:	**$ 33,426**	
6.0 - DECOMMISSIONING						
6.1	Mob/Demob	1	EA	$ 10,000	$ 10,000	
6.2	Cut and Cap Piping at AS/SVE Wells	16	EA	$ 300	$ 4,800	
6.3	Grout AS/SVE Wells	5	DAY	$ 3,000	$ 16,000	
6.4	Sawcut and Remove Well Road boxes	16	EA	$ 250	$ 4,000	
6.5	Decommission Treatment System	1	LS	$ 20,000	$ 20,000	
6.6	Exterior Restoration/Remove Fence/Landscaping	1	LS	$ 25,000	$ 25,000	
6.7	Remove Electrical Service Drop	1	LS	$ 7,500	$ 7,500	
				SUBTOTAL:	**$ 87,300**	
7.0 - TOTALS (NOT INCLUDING O&M or ENGINEERING)						
7.1	Subtotals			SUBTOTAL (1-6)	$ 1,573,085	
7.2	Contingency (20%)				$ 314,617	
7.3	Totals (not including O&M or Engineering)			**TOTAL:**	**$ 1,888,000**	
8.0 - ENGINEERING AND DESIGN						
8.1	Engineering Design & Reporting (10% of Construction)	NA	%	10%	$ 188,800	Plans and Specs, MCP Reporting.
8.2	Project/Construction Management (20% of Construction)	NA	%	20%	$ 377,600	Assumes GZA Construction Manager/Oversight.
8.3	Recirculation Well Pilot Testing	1	LS	$ 100,000	$ 100,000	
8.4	Permitting	1	EA	$ 25,000	$ 25,000	Assumes Electrical and Building Permits through City of Haverhill. RDA filing with Haverhill ConCom
8.5	Engineering Contingency	NA	%	10%	$ 188,800	
	SUBTOTAL DESIGN AND ENGINEERING COSTS			**TOTAL:**	**$ 881,000**	
9.0 - OMM COSTS	(assumes 3 years of operation)					
9.1	Quarterly Sampling	12	QTR	$ 7,500	$ 90,000	10 wells per quarter during operations.
9.2	Air and Surface Water Monitoring	1	LS	$ 150,000	$ 150,000	Estimated level of effort to monitor Little River for air emissions and water quality
9.3	Condensate Disposal	12	DM	$ 250	$ 3,000	Manual collection during project (2 drums per year).
9.4	Field Equipment Rental	36	MO	$ 750	$ 27,000	
9.5	Laboratory Analyses	38	EA	$ 500	$ 19,000	2 start-up and 3 years of monthly TO15 analyses of extracted soil vapor samples for mass removal tracking.
9.6	Equipment repair/replacement	10%	%	$ 425,000	$ 42,500	Industry Standard for Mechanical Components.
9.7	Electrical usage	788,400	KWH	$ 0.30	$ 236,520	Assumes 40 HP, 24 HR/day, 365 days/year, 3 years operation
9.8	Vapor Phase Carbon Change-outs	24,000	LBS	$ 4.00	$ 96,000	Assumes approx. 2,000 lbs of carbon changed out each quarter and the spent carbon is regenerated
9.9	OMM Labor	150	WEEK	$ 2,000	$ 300,000	OMM, sample collection, project management.
9.10	OMM Contingency	1	%	$ 0	$ 192,804	
9.11	MCP Reporting	6	EA	$ 10,000	$ 60,000	Semi-annual reports.
	SUBTOTAL OMM COSTS			**TOTAL:**	**$ 1,217,000**	
				TOTAL ESTIMATED COSTS:	**$ 3,986,000**	

Assumptions/Notes:
1. Conceptual estimates do not include disposal of unknown/unanticipated impacted materials that may be encountered during work or business.
2. Assumptions regarding remediation areas are based on previous soil and groundwater analytical data and exploration logs.
3. Intent of conceptual estimates is to provide 'order of magnitude' costs for comparative purposes; unit costs may fluctuate based on market or other conditions.
4. Unit costs developed from experience with similar projects.

FIGURES





SOURCE : THIS MAP CONTAINS THE ESRI ARCGIS ONLINE USA TOPOGRAPHIC MAP SERVICE, PUBLISHED JUNE 19, 2019 BY ESRI ARCIMS SERVICES AND UPDATED AS NEEDED. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

Data Supplied by : esri

0 1,000 2,000 4,000 6,000

SCALE IN FEET

N W E S

GZA	PROJ. MGR.: JAI DESIGNED BY: JAI REVIEWED BY: CAL OPERATOR: SMW/EMD DATE: 06-13-2024	LOCUS PLAN SHOWING 500 FOOT & 1/2 MILE RADII	JOB NO. 01.0172397.10
		PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN 284 WINTER STREET - HAVERHILL, MASSACHUSETTS	FIGURE NO. 1

© 2024 - GZA GeoEnvironmental, Inc., \\Gzanor\jobs\170,000-179,999\172397\172397-10.KM\Figures\GIS\172397-10_PH3RAP_PH4RIP_FIG1_siteLocus.mxd, 6/13/2024, 3:58:03 PM, elaine.donohue

LEGEND

- MONITORING WELL INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- PIEZOMETER INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- AIR SPARGE POINT INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- SOIL VAPOR EXTRACTION WELL, INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- MONITORING WELL INSTALLED BY GEOSEARCH SEPTEMBER 20-21, 2022 AND/OR JANUARY 13, 2023 AND OBSERVED BY GZA
- SOIL BORING PERFORMED BY GEOSEARCH SEPTEMBER 20-21, 2022 AND OBSERVED BY GZA
- VACUUM EXCAVATION PROBE PERFORMED BY GEOSEARCH SEPTEMBER 20, 2022 AND OBSERVED BY GZA
- APPROXIMATE LOCATION OF POREWATER SAMPLE COLLECTED BY ANCHOR IN 2022
- VACUUM EXCAVATION PROBE PERFORMED BY GEOSEARCH AUGUST 11, 2021
- MONITORING WELL INSTALLED BY GEOSEARCH AUGUST 31 - SEPTEMBER 1, 2020
- SEDIMENT SAMPLE COLLECTED BY GZA ON JUNE 8-10, 2020
- PIPE OR SEEP LOCATION
- SOIL GAS POINT PERFORMED BY GZA ON FEBRUARY 5, 2020
- MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA
- SOIL BORING PERFORMED BY GEOSEARCH (2020) AND OBSERVED BY GZA
- NAPL SAMPLE COLLECTED BY GZA PERSONNEL NOVEMBER 1, 2016
- MONITORING WELL INSTALLED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- SOIL BORING PERFORMED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- AMBIENT AIR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 19, 2016
- SOIL VAPOR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- CATCH BASIN SEDIMENT SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- MONITORING WELL INSTALLED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- SOIL BORING COMPLETED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- MONITORING WELL INSTALLED BY LESSARD ENVIRONMENTAL
- APPROXIMATE SEDIMENT CORE LOCATION (ANCHOR QEA - 2021 & 2022)
- DISPOSAL SITE BOUNDARY
- 284 WINTER STREET PROPERTY BOUNDARY AS RECORDED ON ALTA/ ACSM LAND TITLE SURVEY PLAN PERFORMED BY MHF DESIGN CONSULTANTS (STAMPED FEBRUARY 12, 2015) NOTE: THIS BOUNDARY DIFFERS FROM THE MASSGIS ASSESSORS' PARCEL DATA
- ASSESSORS PARCEL DATA PROVIDED BY MASSGIS ON APRIL 23, 2024

SOURCE

1) THE 2023 AERIAL IMAGERY MAP SERVICE WAS DISTRIBUTED BY MASSGIS ON MAY 3, 2024. THE FUNDING FOR THIS IMAGERY WAS PROVIDED BY MASSDOT, THE STATE 911 DEPARTMENT AND THE EXECUTIVE OFFICE OF TECHNOLOGY SERVICES AND SECURITY (EOTSS).
2) THE LOCATIONS OF THE MONITORING WELLS, PIEZOMETERS, AIR SPARGE POINT, AND SOIL VAPOR EXTRACTION WELL PERFORMED BY GEOSEARCH IN SEPTEMBER 2022, JANUARY 2023, AND MARCH-APRIL 2024 WERE APPROXIMATELY DETERMINED BY GZA PERSONNEL USING A TRIMBLE R2 GPS ON 9-20-2022, 10-12-2022, 01-13-2023, 03-18-2024, AND 04-02-2024.
3) THE LOCATIONS OF THE MONITORING WELLS INSTALLED BY GEOSEARCH AUGUST 31 - SEPTEMBER 1, 2020 WERE LOCATED FROM A SURVEY PERFORMED BY THE MORIN-CAMERON GROUP, INC. ON SEPTEMBER 29, 2020. THE LOCATIONS OF THE SEDIMENT SAMPLES COLLECTED BY GZA IN JUNE 2020 AND THE PIPE LOCATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE GEO-7X HAND-HELD GPS ON 06-10-2020. THE LOCATIONS OF THE MONITORING WELLS AND SOIL BORINGS PERFORMED BY GEOSEARCH IN JANUARY 2020 WERE APPROXIMATELY DETERMINED USING A TRIMBLE GEO-7X HAND-HELD GPS ON 05-07-2020. THE LOCATIONS OF THE NF SERIES OF EXPLORATIONS AND SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED USING A TRIMBLE GEO-XH HAND-HELD GPS ON 10-18-2016. THE LOCATIONS OF THE SOIL GAS POINTS INSTALLED BY GZA IN FEBRUARY 2020, SOIL BORING INSTALLED BY GEOSEARCH AUGUST 31, 2021 (GZA-2A), AND THE VACUUM EXCAVATION PROBES PERFORMED BY GEOSEARCH AUGUST 11, 2021 WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC AND MAN-MADE FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
4) THE LOCATIONS OF THE SOIL BORINGS AND MONITORING WELLS PERFORMED BY RAMBOLL AND THE MONITORING WELLS PERFORMED BY LESSARD WERE APPROXIMATELY DETERMINED FROM A PLAN PREPARED BY RAMBOLL ENTITLED: "SITE LAYOUT", FIGURE 2, DATED: 02-10-2017, PROJECT: 1690006598.
5) THE LOCATIONS OF THE APPROXIMATE SEDIMENT CORE LOCATIONS PERFORMED BY ANCHOR QEA IN 2021 WERE DETERMINED FROM A GEODATABASE FILE PROVIDED BY ANCHOR QEA ON MARCH 29, 2022, FILE: AQ SAMPLE LOCATIONS 20220329.GDB. THE LOCATIONS OF SEDIMENT CORE (AQSS-22) AND POREWATER SAMPLES (AQPW-01 - AQPW-10) WERE APPROXIMATELY DETERMINED BY TRACING A PDF GENERATED BY ANCHOR QEA ENTITLED "FIGURE 1 APPROXIMATE SAMPLE LOCATIONS", DATED: 10-13-2022.
6) THE HISTORIC RELIEF GAS HOLDER WAS APPROXIMATELY LOCATED FROM AN "UNDATED HISTORICAL PLAN" IN THE RAMBOLL ENVIRON PHASE I INITIAL SITE INVESTIGATION REPORT, DATED APRIL 2016.

0 15 30 60 90
SCALE IN FEET

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN

284 WINTER STREET - HAVERHILL, MASSACHUSETTS

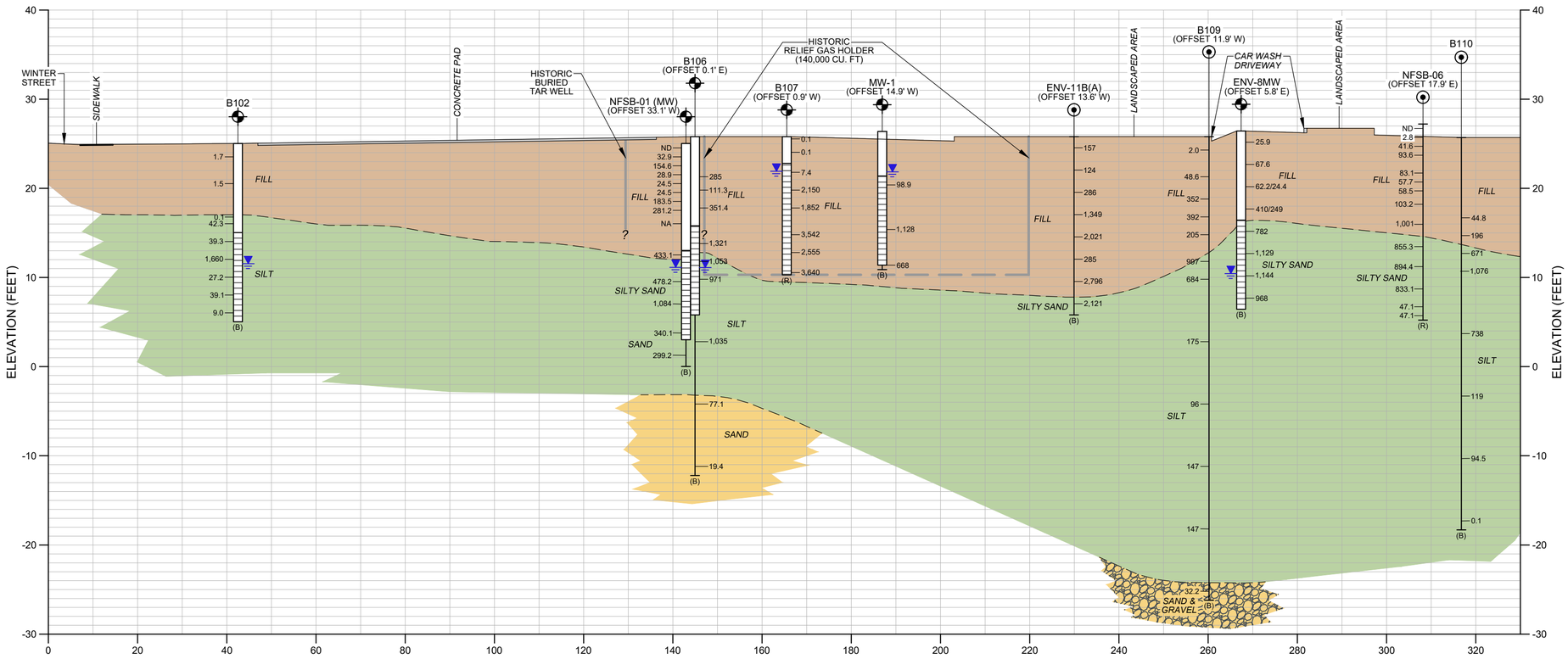
EXPLORATION LOCATION PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
nationalgrid

PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: AJR	FIGURE
DESIGNED BY: JAI	DRAWN BY: EMD	SCALE: 1" = 30 FEET	2
DATE: 06-13-2024	PROJECT NO: 01.0172397.10	REVISION NO:	

J:\178.000-179.999\172397\172397-10.MAP\gzaArcGIS\172397-10_FIG2_explorationLocationPlan_v13.mxd, June 13, 2024 - 11:59:09 AM, elaine.donohue



GEOLOGIC CROSS-SECTION A-A'

LEGEND

B106 (OFFSET 0.1' E) — MONITORING WELL DESIGNATION; OFFSET DIRECTION & DISTANCE

GROUND SURFACE

WELL CASING

285 — PID RESULT (PPMV)

WELL SCREEN

GROUNDWATER ELEVATION IN FEET (SEPTEMBER 15, 2020 GAUGING)

APPROXIMATE STRATUM CHANGE

(B) — BOTTOM OF BORING

(R) - REFUSAL OF BORING
PID - PHOTOIONIZATION DETECTOR
PPMV - PARTS PER MILLION BY VOLUME
ND - INDICATES NOT DETECTED ABOVE INSTRUMENT DETECTION LIMIT (<0.1 PPMV)
NA - INDICATES NOT ANALYZED

STRATUM KEY

- FILL
- SILTY SAND / SILT
- SAND
- SAND & GRAVEL

NOTES:

1. THE STRATIFICATION LINES ARE APPROXIMATE, BASED UPON DATA FROM A LIMITED NUMBER OF WIDELY SPACED EXPLORATIONS AND THUS REPRESENT APPROXIMATE BOUNDARIES BETWEEN STRATUM TYPES. THE ACTUAL TRANSITIONS ARE EXPECTED TO BE MORE GRADUAL AND VARY FROM THOSE SHOWN.

VERTICAL SCALE IN FEET
0 5' 10' 20'
0 10' 20' 40'
HORIZONTAL SCALE IN FEET

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN

284 WINTER STREET - HAVERHILL, MASSACHUSETTS

GEOLOGIC CROSS-SECTION A-A'

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com

PREPARED FOR: nationalgrid

PROJ MGR: KFM	REVIEWED BY: CAL	CHECKED BY: KFM	FIGURE 3A
DESIGNED BY: KFM	DRAWN BY: EMD	SCALE: AS NOTED	
DATE: 06-13-2024	PROJECT NO. 01.0172397.10	REVISION NO.	

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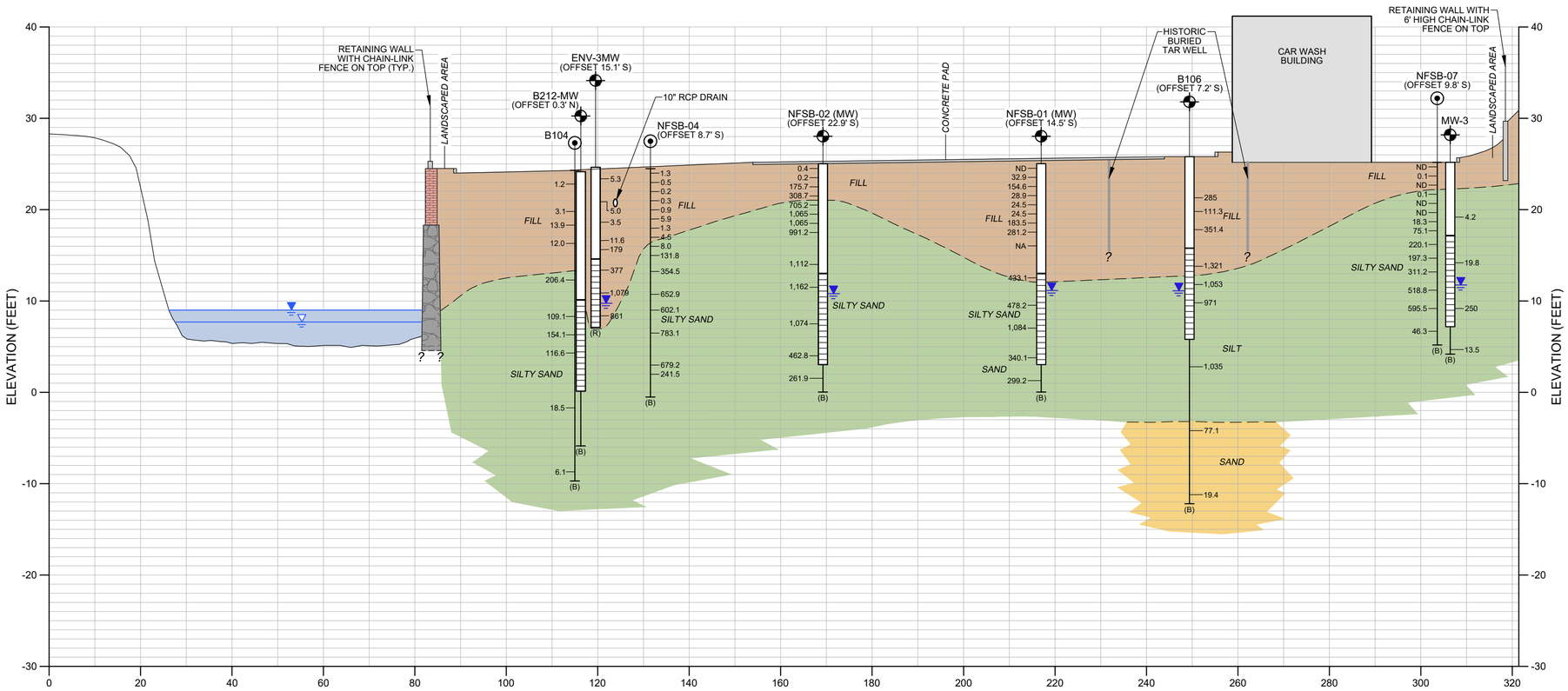
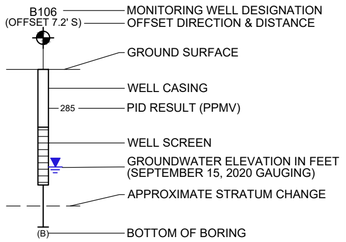
G:\ZA-A\170,000-179,999\172397\172397-10\KM\Figures\CAD\172397-10_RevisedPH3RAP-PH4RIP_CrossSections_rev2.dwg [XS-AA_FIG3A] June 13, 2024 – 11:40am elaine.donohue



GEOLOGIC CROSS-SECTION B-B'

LEGEND



(R) - REFUSAL OF BORING
PID - PHOTOIONIZATION DETECTOR
PPMV - PARTS PER MILLION BY VOLUME
ND - INDICATES NOT DETECTED ABOVE INSTRUMENT DETECTION LIMIT (<0.1 PPMV)
NA - INDICATES NOT ANALYZED

STRATUM KEY

- FILL
- SILTY SAND / SILT
- SAND

NOTES:

1. THE STRATIFICATION LINES ARE APPROXIMATE, BASED UPON DATA FROM A LIMITED NUMBER OF WIDELY SPACED EXPLORATIONS AND THUS REPRESENT APPROXIMATE BOUNDARIES BETWEEN STRATUM TYPES. THE ACTUAL TRANSITIONS ARE EXPECTED TO BE MORE GRADUAL AND VARY FROM THOSE SHOWN.

VERTICAL SCALE IN FEET
0 5' 10' 20'
0 10' 20' 40'
HORIZONTAL SCALE IN FEET

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN
284 WINTER STREET - HAVERHILL, MASSACHUSETTS

GEOLOGIC CROSS-SECTION B-B'

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: KFM	REVIEWED BY: CAL	CHECKED BY: KFM	FIGURE 3B
DESIGNED BY: KFM	DRAWN BY: EMD	SCALE: AS NOTED	
DATE: 06-13-2024	PROJECT NO. 01.0172397.10	REVISION NO.	

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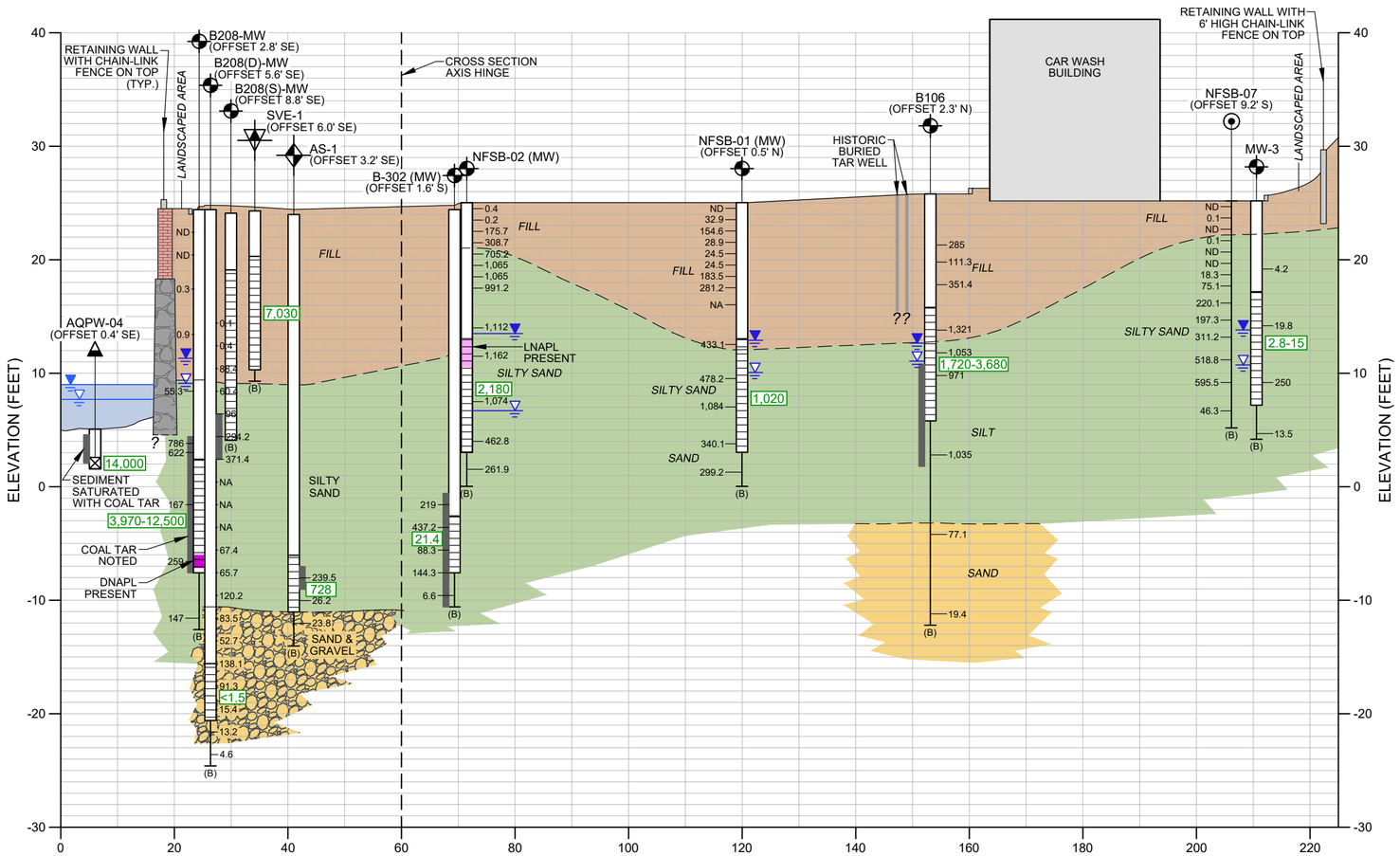
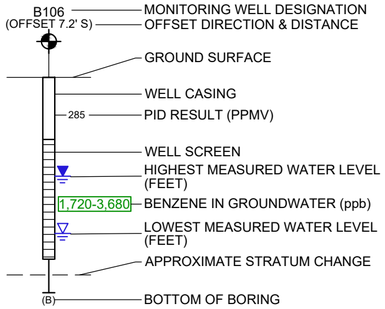
GZA-J:\170,000-179,999\172397\172397-10.KM\Figures\CAD\172397-10_RevisedPH3RAP-PH4RIP_CrossSections_rev2.dwg [XS-BB_FIG3B] June 13, 2024 – 11:40am elaine.donohue



LEGEND



(R) - REFUSAL OF BORING
PID - PHOTOIONIZATION DETECTOR
PPMV - PARTS PER MILLION BY VOLUME
ND - INDICATES NOT DETECTED ABOVE INSTRUMENT DETECTION LIMIT (<0.1 PPMV)
NA - INDICATES NOT ANALYZED

STRATUM KEY

- FILL
- SILTY SAND / SILT
- SAND
- SAND & GRAVEL

NOTES:

1. THE STRATIFICATION LINES ARE APPROXIMATE, BASED UPON DATA FROM A LIMITED NUMBER OF WIDELY SPACED EXPLORATIONS AND THUS REPRESENT APPROXIMATE BOUNDARIES BETWEEN STRATUM TYPES. THE ACTUAL TRANSITIONS ARE EXPECTED TO BE MORE GRADUAL AND VARY FROM THOSE SHOWN.

VERTICAL SCALE IN FEET
0 5' 10' 20'
0 10' 20' 40'
HORIZONTAL SCALE IN FEET

THE INFORMATION SHOWN ON THE DRAWING IS SOLELY FOR USE BY NATIONAL GRID OR THE NATIONAL GRID'S DESIGNATED REPRESENTATIVE FOR THE SPECIFIC PROJECT AND LOCATION IDENTIFIED ON THE DRAWING. THE DRAWING SHALL NOT BE TRANSFERRED, REUSED, COPIED, OR ALTERED IN ANY MANNER FOR USE AT ANY OTHER LOCATION OR FOR ANY OTHER PURPOSE WITHOUT THE PRIOR WRITTEN CONSENT OF GZA AND NATIONAL GRID. ANY TRANSFER, REUSE, OR MODIFICATION TO THE DRAWING BY OTHERS, WITHOUT THE PRIOR WRITTEN EXPRESS CONSENT OF GZA AND NATIONAL GRID, WILL BE AT THE USER'S SOLE RISK AND WITHOUT ANY RISK OR LIABILITY TO GZA AND NATIONAL GRID.

REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN
284 WINTER STREET - HAVERHILL, MASSACHUSETTS

GEOLOGIC CROSS-SECTION C-C'

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: CAL	FIGURE
DESIGNED BY: JAI	DRAWN BY: EMD	SCALE: AS NOTED	3C
DATE: 06-13-2024	PROJECT NO. 01.0172397.10	REVISION NO.	

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GZA-J:\170,000-179,999\172397\172397-10.KM\Figures\CAD\172397-10_RevisedPH3RAP-PH4RIP_CrossSections_rev2.dwg [XS-CC_FIG3C] June 13, 2024 – 11:41am elaine.donohue

LEGEND

WELL ID
WELL SCREEN DEPTH IN FEET
BENZENE CONCENTRATION/CONCENTRATION RANGE IN µG/L

- MONITORING WELL INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- PIEZOMETER INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- AIR SPARGE POINT INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- MONITORING WELL INSTALLED BY GEOSEARCH SEPTEMBER 20-21, 2022 AND/OR JANUARY 13, 2023 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- MONITORING WELL INSTALLED BY LESSARD ENVIRONMENTAL

POREWATER SAMPLE ID
BENZENE CONCENTRATION/CONCENTRATION RANGE IN µG/L

- APPROXIMATE LOCATION OF POREWATER SAMPLE COLLECTED BY ANCHOR IN 2022 AND/OR 2024
- DISPOSAL SITE BOUNDARY
- 284 WINTER STREET PROPERTY BOUNDARY AS RECORDED ON ALTA/ ACSM LAND TITLE SURVEY PLAN PERFORMED BY MHF DESIGN CONSULTANTS (STAMPED FEBRUARY 12, 2015) NOTE: THIS BOUNDARY DIFFERS FROM THE MASSGIS ASSESSORS' PARCEL DATA

SOURCE

1) THE 2023 AERIAL IMAGERY MAP SERVICE WAS DISTRIBUTED BY MASSGIS ON MAY 3, 2024. THE FUNDING FOR THIS IMAGERY WAS PROVIDED BY MASSDOT, THE STATE 911 DEPARTMENT, AND THE EXECUTIVE OFFICE OF TECHNOLOGY SERVICES AND SECURITY).
2) BENZENE CONCENTRATIONS AND CONCENTRATION RANGES IN GROUNDWATER ARE ALSO PRESENTED IN TABLE 6 - GROUNDWATER ANALYTICAL DATA TABLE. CONCENTRATIONS ARE DISPLAYED IN µg/L.
3) BENZENE CONCENTRATIONS AND CONCENTRATION RANGES IN POREWATER PROVIDED BY ANCHOR QEA IN DATA TRANSMITTALS DATED DECEMBER 16, 2022 AND MAY 28, 2024. CONCENTRATIONS ARE DISPLAYED IN µg/L.

0 15 30 60
SCALE IN FEET

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REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN
284 WINTER STREET - HAVERHILL, MASSACHUSETTS

BENZENE CONCENTRATIONS IN GROUNDWATER AND POREWATER

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
nationalgrid

PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: MDD	FIGURE
DESIGNED BY: AF/MDD	DRAWN BY: EMD / JAI	SCALE: 1 " = 30 FEET	4
DATE: 06/13/2024	PROJECT NO: 01.0172397.10	REVISION NO:	

J:\170,000-179,999\172397\172397-10.KM\Figures\GIS\172397-10_FIG4_BenzeneConcentrationsInGW.mxd, June 13, 2024 - 10:28:58 AM, justin.ivas

LEGEND

- MONITORING WELL INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- PIEZOMETER INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- AIR SPARGE POINT INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- SOIL VAPOR EXTRACTION WELL, INSTALLED BY GEOSEARCH MARCH-APRIL 2024
- MONITORING WELL INSTALLED BY GEOSEARCH SEPTEMBER 20-21, 2022 AND/OR JANUARY 13, 2023 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY GEOSEARCH AUGUST 31 - SEPTEMBER 1, 2020
- MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- MONITORING WELL INSTALLED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- MONITORING WELL INSTALLED BY LESSARD ENVIRONMENTAL
- DISPOSAL SITE BOUNDARY
- 284 WINTER STREET PROPERTY BOUNDARY AS RECORDED ON ALTA/ ACSM LAND TITLE SURVEY PLAN PERFORMED BY MHF DESIGN CONSULTANTS (STAMPED FEBRUARY 12, 2015) NOTE: THIS BOUNDARY DIFFERS FROM THE MASSGIS ASSESSORS' PARCEL DATA

SOURCE

1) THE 2023 AERIAL IMAGERY MAP SERVICE WAS DISTRIBUTED BY MASSGIS ON MAY 3, 2024. THE FUNDING FOR THIS IMAGERY WAS PROVIDED BY MASSDOT, THE STATE 911 DEPARTMENT, AND THE EXECUTIVE OFFICE OF TECHNOLOGY SERVICES AND SECURITY).

2) THE LOCATIONS OF THE MONITORING WELLS, PIEZOMETERS, AIR SPARGE POINT, AND SOIL VAPOR EXTRACTION WELL WERE APPROXIMATELY DETERMINED BY GPS. REFER TO FIGURE 2.

0 15 30 60

SCALE IN FEET

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REVISED PHASE III REMEDIAL ACTION PLAN AND PHASE IV REMEDY IMPLEMENTATION PLAN

284 WINTER STREET - HAVERHILL, MASSACHUSETTS

EXPLORATION LOCATION PLAN PILOT TEST AREA

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com

PREPARED FOR: nationalgrid

PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: MDD	FIGURE 5
DESIGNED BY: AF/MDD	DRAWN BY: EMD / JAI	SCALE: 1 " = 30 FEET	
DATE: 06/13/2024	PROJECT NO: 01.0172397.10	REVISION NO:	

J:\170,000-179,999\172397\172397-10.KM\Figures\GIS\172397-10_FIG5_PilotTestArea.mxd, June 13, 2024 - 12:00:13 PM, elaine.donohue

APPENDIX A - ANCHOR QEA PRELIMINARY PHASE IV (LITTLE RIVER)

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Phase IV Remedy Implementation Plan – Little River

Prepared for Boston Gas Company d/b/a National Grid

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Phase IV Remedy Implementation Plan – Little River

Prepared for
National Grid
170 Data Drive
Waltham, Massachusetts 02451

Prepared by
Anchor QEA
9 Water Street, First Floor
Amesbury, Massachusetts 01913

Project Number: 180327-08.01
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ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
ABC	asphalt, brick, and concrete
Anchor QEA	Anchor QEA, Inc.
AS	air sparging
AUL	activity and use limitation
BMP	best management practice
CIL	chemical isolation layer
CMR	Code of Massachusetts Regulations
CRA	Comprehensive Remedial Action
CSA	Comprehensive Site Assessment
CSM	conceptual site model
CSO	combined sewer outfall
cy	cubic yard
D_{50}	median stone size
DAR	Daily Activity Report
EENF	Expanded Environmental Notification Form
EIR	Environmental Impact Report
ESC	erosion and sedimentation control
frac	fractionation
GAC	granular activated carbon
GPS	global positioning system
GZA	GZA GeoEnvironmental, Inc.
H:V	horizontal to vertical
Haffner	Haffner Realty Trust (an Energy North Company)
HASP	Health and Safety Plan
K_v	vertical hydraulic conductivity
LSP	Licensed Site Professional
MassDEP	Massachusetts Department of Environmental Protection
MCP	Massachusetts Contingency Plan
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
National Grid	Boston Gas Company d/b/a National Grid
NAPL	nonaqueous phase liquid
NSR	No Significant Risk
OC	organoclay

OHM	oil and/or hazardous material
PAC	powdered activated carbon
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PDI	pre-design investigation
PEC	probable effects concentration
Phase II CSA Report	*Phase II Comprehensive Site Assessment Report*
Phase III RAP	*Phase III Remedial Action Plan*
Phase III RAP Addendum	*Phase III Remedial Action Plan Addendum*
Phase IV RIP	*Phase IV Remedy Implementation Plan*
PID	photoionization detector
RAH	readily apparent harm
RAP	Remedial Action Plan
RCM	Reactive Core Mat
RTN	Release Tracking Number
sf	square feet
Site	284 Winter Street, Haverhill, Massachusetts
SPA	Sediment Processing Area
SVE	soil vapor extraction
TPAH16	total polycyclic aromatic hydrocarbons (16 priority pollutants)
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
VOC	volatile organic compound
VOT	visible oil and/or tar
WQC	Water Quality Certification

1 Introduction

This *Phase IV Remedy Implementation Plan* (Phase IV RIP) for the Little River portion of the former Haverhill manufactured gas plant (MGP) site was prepared by Anchor QEA, Inc. (Anchor QEA), on behalf of Boston Gas Company d/b/a National Grid (National Grid) in accordance with the Massachusetts Contingency Plan (MCP) requirements for a Phase IV RIP. The former MGP was located at 284 Winter Street in Haverhill, Massachusetts (Site; Figure 1) on property that abuts the Little River to the east and is currently owned by HEG 284 Winter Street LLC, which acquired the parcel from Haffner Realty Trust (Haffner) in 2022. The Site comprises an upland component and an in-river component and has been assigned Release Tracking Number (RTN) 3-32792 by the Massachusetts Department of Environmental Protection (MassDEP). GZA GeoEnvironmental, Inc. (GZA) of Norwood, Massachusetts, is conducting the upland investigation and remediation.

This report applies primarily to the Little River portion of the Site and is intended to be an appendix to the *Revised Phase III Remedial Action Plan* (Revised Phase III RAP)/Phase IV RIP submittal being prepared by GZA (GZA 2024) for the Site on behalf of National Grid.

1.1 Report Objective

This Phase IV RIP provides a detailed plan for implementing the selected Comprehensive Remedial Action (CRA) proposed for the in-river portion of the Site. The proposed CRA is being performed to satisfy the requirements of 310 Code of Massachusetts Regulations (CMR) 40.0800 under the guidance of a Licensed Site Professional (LSP) to address the presence of oil and/or hazardous material (OHM)-impacted sediment within the Little River.

The proposed CRA will be conducted by National Grid to achieve a Permanent Solution (as defined by the MCP at CMR 40.1040) for the Site. The designer and Engineer of Record for the in-river portion of the Site is Anchor QEA, and the proposed CRA will be implemented under the guidance of Charles Lindberg, LSP of GZA.

1.2 Report Organization

This Phase IV RIP has been developed in accordance with Section 310 CMR 40.0874(3) of the MCP to present the design, construction, and monitoring associated with implementation of the selected CRA.

The remainder of the report presents the information required by Section 310 CMR 40.0874(3)(b) of the MCP. The section headings are cross-referenced to the MCP but have been reorganized in some cases to enhance the readability of this document. The report is organized as follows:

- Section 2 discusses the Site background and existing Site uses.
- Section 3 provides relevant project contact information.

- Section 4 describes remedial goals and performance requirements.
- Section 5 presents new Site information since development of the *Phase III Remedial Action Plan* (Phase III RAP; GZA 2022a).
- Section 6 directs the reader to the Drawings.
- Section 7 describes the Conceptual Plan for remedial action, including relevant design parameters.
- Section 8 presents design features and measures for the control of spills, accidental discharge, or system malfunctions.
- Section 9 presents the characteristics, quantities, and locations of environmental media to be treated and managed.
- Section 10 identifies site-specific characteristics that may affect or be affected by the design, construction, or operation of the selected CRA.
- Section 11 describes measures to be incorporated into the design, construction, and operation of the CRA to avoid any deleterious impact on the environmental receptors and natural resource areas.
- Section 12 provides the construction schedule and directs the reader to the project Technical Specifications and Drawings.
- Section 13 provides a general description of the inspections and monitoring that will be performed to ensure adequate construction and performance of the CRA.
- Section 14 documents compliance with the public involvement provisions of the MCP as described in Section 310 CMR 40.140(3)(e).

A CRA Transmittal Form (BWSC-108) was submitted electronically to MassDEP using their electronic filing program. A copy of this form is included within this report as Appendix A.

Appendices B and C provide the Engineering Drawings and Technical Specifications required by Section 310 CMR 40.0874(3)(c).

Appendices D and E provide laboratory reports and design memorandums, respectively.

Appendices F and G provide the Health and Safety Plan (HASP) and public notices, respectively.

2 Site Background

This section presents a brief description and history of the Site, with a focus on the areas at which remedial actions will be implemented under the Phase IV RIP. A more comprehensive Site description, ownership history, and regulatory history were provided in the *Phase II Comprehensive Site Assessment Report* (Phase II CSA Report; GZA 2022b) and Phase III RAP (GZA 2022a), submitted to MassDEP in April 2022 and July 2022, respectively.

2.1 Site Uses and Existing Conditions

A detailed description of the general Site and regulatory history associated with the Site is presented in the Phase III RAP (GZA 2022a).

2.2 Site Description

2.2.1 284 Winter Street

The 284 Winter Street property, where the former MGP once was located, is currently occupied and is operated by Haffner as a gas station and car wash (Drawing E-1 in Appendix B). The upland portion of the Site is almost entirely covered by pavement or structures and is separated from the adjacent Little River to the west by a masonry retaining wall. An MGP operated by the Haverhill Gas Company was present at the Site from 1853 and 1970. Commercial and industrial properties surround the property, which is located within downtown Haverhill.

2.2.2 Little River

The portion of the Little River that comprises the Site is adjacent to the upland portion of the Site where the former MGP was located (Drawing E-1 in Appendix B). Within the river portion of the Site, the width of the river is variable, ranging from approximately 20 to 50 feet wide. During periods of low water, portions of the riverbed are exposed, but generally, water several feet deep remains in a meandering channel. The sediment surface is a combination of sand, gravel, and cobbles with occasional boulders and debris scattered throughout. Vegetation (e.g., grass, weeds) is also present in the channel at several locations.

The entire Little River is approximately 12.9 miles long and rises in Kingston, New Hampshire. The river and associated watershed are relatively undeveloped until the river reaches Haverhill, where it becomes urbanized. There is only one dam on the river, located immediately upstream of the "Richard J Winnell All Volunteer Bridge"(Winter Street Bridge). After flowing through a conduit beneath various properties in Haverhill, the Little River discharges into the Merrimack River approximately one-quarter mile south of the Site. The distance between the Winter Street Bridge and the opening of the conduit is approximately 530 feet.

The Merrimack River is tidally influenced for 22 miles from the Atlantic Ocean to Haverhill. The Little River may be tidally influenced up to the Little River dam, which is just upstream of the Site (refer to Figure 1). Tidal conditions in the Little River were evaluated by Fuss & O'Neill for the Little River dam removal feasibility study, and they concluded most of the Little River within the conduit just downstream of the Site experienced daily impacts from tides (Fuss & O'Neill 2021). However, only extreme high tides or coastal storm surges appear to have an impact on the Little River upstream of the conduit due to the channel bottom elevations (including the reach adjacent to the Site).

The in-river portion of the Site is constrained by several structures. Approximately 70 feet upstream of the Site is the Little River dam, a stone masonry structure built in the 1800s. The dam and the adjacent mill building likely predate the former MGP. Immediately downstream of the dam is the Winter Street Bridge. Approximately 500 feet south of the Winter Street Bridge is the headwall for the Little River Conduit, which was constructed from 1937 to 1938 as part of the U.S. Army Corps of Engineers' (USACE) Haverhill Local Protection Project. The conduit is operated and maintained by the City of Haverhill.

A vertical retaining wall ranging from 15 to 20 feet tall runs along most of the eastern side of the Little River. The river's western bank slope and the southern portion of the eastern bank are heavily overgrown, steep, and include remnants of former structures such as retaining walls. Photographs of the Winter Street Bridge, the Little River dam, and the river's eastern and western banks are included in the Phase II CSA Report (GZA 2022b; Appendix C).

Properties abutting the western bank of the Little River include the following:

- 284 Winter Street (upland portion of the Site)
- 25 Lafayette Square (Parcel ID 515-296-11)
- 1 Lafayette Square (Parcel ID 515-296-5-1)
- 235 Essex Street (Parcel ID 515-296-5)
- 221 Essex Street (Parcel ID 515-296-3)
- 203 Essex Street (Parcel ID 515-296-18)

Additional properties include a parcel on the downstream end of the Site (Massachusetts Bay Transit Authority [Parcel ID 307-2-3]) and a 10-foot right of way for the City of Haverhill immediately upstream and downstream of the Winter Street Bridge.

3 Project Contacts (310 CMR 40.084 (3)(a))

3.1 Person Undertaking Response Action

Name: Jesse Edmands

Address: National Grid
170 Data Drive
Waltham, Massachusetts 02451

Phone: 781-906-3987

3.2 Licensed Site Professional

Charles Lindberg of GZA is the LSP of Record for the Site (License Number 6891). His contact information, which is also provided in form BWSC-108, included in Appendix A, is as follows:

Name: Charles Lindberg, LSP

Address: GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, Massachusetts 02062

Phone: 781-278-3830

3.3 Owner/Operator of the Selected Comprehensive Remedial Alternative

This is the same entity as the Person Undertaking Response Actions noted above.

4 Goals of the Remedial Action (310 CMR 40.0874 (3)(b)(1))

The goal of implementing the remedial action detailed in this Phase IV RIP is to achieve a Condition of No Significant Risk (NSR), with source control, subsurface migration control, and OHM-impacted sediment removal, in support of filing a Permanent Solution with Conditions for the overall Site.

4.1 Requirements for Permanent Solution

As documented in the Phase II CSA Report (GZA 2022b), an MCP Stage I environmental risk characterization determined that a condition of "no significant risk of harm" does not currently exist for the Little River portion of the Site due to a condition of readily apparent harm (RAH)[1] and concentrations of polycyclic aromatic hydrocarbons (PAHs), chromium, and polychlorinated biphenyl (PCBs) present in sediment at concentrations equal to or greater than applicable screening levels.

The Phase III RAP (GZA 2022a) evaluated current and potential future risks, as well as potential sources of OHM, in the Little River sediment to determine whether a permanent or temporary solution can be achieved for the Little River portion of the Site. The Phase III RAP also documented the evaluation and selection of remedial action alternatives to address these conditions.

The findings of the Phase II and Phase III reports, as they pertain to risk drivers and the selected CRA, concluded that the following conditions must be addressed to achieve a Permanent Solution in the Little River portion of the Site:

- Bulk sediment total PAH-16 (TPAH16) concentrations greater than or equal to the average local conditions concentration of 29.9 milligrams per kilogram (mg/kg; GZA 2022b)
- Bulk sediment chromium concentrations greater than or equal to the probable effects concentration (PEC) of 111 mg/kg (MacDonald et al. 2000)
- Bulk sediment PCB concentrations greater than or equal to the PEC of 0.676 mg/kg (MacDonald et al. 2000)
- Bulk sediment benzene concentrations greater than or equal to the risk-based concentration of 1.9 mg/kg (NYSDEC 2014)
- Visible oil and/or tar (VOT) present in the top 1-foot of sediment over an area equal to or greater than 1,000 square feet (sf; i.e., RAH)

4.2 Remedial Action Summary

The selection of the CRA for both the upland and in-river components of the Site was initially presented in the Phase III RAP (GZA 2022a) submitted to MassDEP in July 2022. The recommended CRA for the in-river portion of the Site is a dredge and cap alternative that includes the partial

[1] Readily apparent harm is identified under 310 CMR 40.0995(3)(b)1c as the visible presence of oil, tar, or other non-aqueous phase hazardous material in the top 1-foot of sediment over an area equal to or greater than1,000 square feet.

removal of the OHM- and VOT-impacted sediment, followed by installation of an engineered cap to address OHM in bulk sediment, dissolved-phase OHM in porewater, RAH condition, and pathways for sheen and nonaqueous phase liquid (NAPL) migration through the retaining wall adjacent to the Little River. In addition, Institutional Controls (i.e., an Activity and Use Limitation [AUL]) will be implemented on properties where a cap is placed to monitor and maintain the integrity of the cap. Implementation of the CRA will meet the criterion of a condition of NSR and achieve a Permanent Solution.

Following the submission of the Phase III RAP (GZA 2022a), additional pre-design field investigations were conducted at the Site as part of the routine design process. The results of these investigations suggested the need to re-assess upland source mitigation strategies required to achieve a Permanent Solution at the overall Site. A revised approach to source control and, therefore, a revised CRA in the upland portion of the Site is presented as a Revised Phase III RAP being submitted concurrently with this document. The proposed upland CRA includes air sparging (AS) and soil vapor extraction (SVE) as a remedial technology. This technology is presented in more detail in GZA's Revised Phase III RAP /Phase IV RIP report (GZA 2024).

A Revised Phase III RAP for the in-river portion of the Site is not required at this time as the CRA recommended in the initial Phase III RAP (GZA 2022a; dredging and capping) will be effective in meeting the criteria of NSR and achieve a Permanent Solution for the in-water portion of the Site when coupled with the dissolved-phase OHM source control measures now being recommended for the upland in the revised Phase III RAP. Prior to implementing the recommended in-water CRA, data from upland AS/SVE activities will be required to show that the AS/SVE removal technology has sufficiently decreased dissolved-phase OHM concentrations necessary for the in-water CRA to be effective.

5 New Site Information (310 CMR 40.0874 (3)(b)(2))

Since development of the Phase III RAP in July 2022 (GZA 2022a), additional data were collected in October and November 2022 to support design activities. Data collected during these field events supplemented data collected in 2020 by GZA and in 2021 by Anchor QEA within the Little River.

Additional data are currently being collected as part of an SVE pilot project for the upland portion of the Site. Porewater and surface water data were collected in April 2024 prior to the start of the pilot project and in May 2024 following the completion of the AS. A third sampling event is anticipated to be conducted in summer 2024. Additional data are also being collected to support the evaluation of groundwater seepage rates. The results of the three sampling events will be presented in a future deliverable, following data validation and evaluation. Following a preliminary qualitative review of the data, the benzene concentration trends in porewater are similar to those from the 2022 pre-design investigation (PDI) sampling event (GZA 2022a).

Based on Site conditions (e.g., the relative existing steepness of the western bank slope) and characteristics (e.g., seepage rates), the Little River has been divided into three segments for further analysis associated with the CRA. These segments comprise an "Upstream" segment approximately 150 feet in length southwards (downstream) from the Winter Street Bridge, a "Midstream" segment approximately 145 feet in length, and a "Downstream" segment approximately 260 feet north (upstream) from the head of the conduit to the Merrimack River, which forms the southern extent of the Site. These segments are depicted on Drawing C-2 in Appendix B.

5.1 Pre-Design Investigation

The pre-design investigation was conducted during September, October, and November 2022. The data collection and associated analyses are discussed in this section (Section 5). The objectives of the PDI included collecting additional data to:

- Refine the lateral and vertical extents of sediment impacts
- Evaluate dissolved-phase concentrations of OHM in porewater
- Collect data to support the calculation of groundwater seepage rates and selection of an amendment to be integrated into the cap design

The PDI also included a topographic survey to document existing conditions at the Site for use in further design development. In addition, based on observations of sheen during the field data collection, a sheen net sample was collected to analyze sheen composition. The composition was used to evaluate the source of the sheen to support the refinement of the conceptual site model (CSM).

The field investigation included the following activities:

- Sediment coring and sample analysis
- Installation of temporary wellpoints to collect porewater samples and pressure transducers to measure vertical gradients
  - Collection of porewater samples from 10 locations
  - Installation of pressure transducers at three locations
- Vertical hydraulic conductivity (K_v) testing via gravity drainage
- Topographic surveying to document existing conditions
- Collection of groundwater to support a site-specific isotherm study which was intended to evaluate the preferred amendment to address dissolved-phase OHM in porewater and inform the cap design

The vertical gradient and vertical hydraulic conductivity measurements were used to calculate seepage rates to support the cap design. Table 1 summarizes the PDI sampling locations. A description of each of these activities is presented in the following sections.

5.1.1 Sediment Coring

Sediment coring was attempted at five locations using both vibracoring and hand auger methods to evaluate the nature and extent of impacted sediments within the Little River adjacent to the former MGP site. The field sampling plan called for the collection of three sediment cores with a target depth of 10 feet. During implementation, the field crew used a metal rod to probe multiple locations in the vicinity of the proposed sediment core locations to find locations with fewer cobbles and where a core could be advanced. Due to the presence of cobbles, sediment coring by vibracoring was attempted at three of the locations, two of which hit refusal, and sediment was unable to be collected. At one location (AQSS-22; Drawing E-2 in Appendix B), sediment was successfully recovered, although refusal was encountered at 3.0 feet below mudline. Bulk sediment samples were collected from two intervals: 1.5 to 2.0 feet and 2.0 to 2.5 feet below mudline.

Two hand auger cores were attempted for lateral delineation in the southern portion of the Site in the vicinity of the entrance to the Little River conduit. The hand auger was only able to be advanced at one location on the western edge of the river (AQHA-01; Drawing E-2 in Appendix B) due to the presence of cobbles. Refusal due to the presence of rocks was encountered at 1.2 feet below mudline.

Due to Site conditions (i.e., overhanging trees and the adjacent riverbank and retaining wall precluded the use of global positioning system [GPS] technology), GPS coordinates for sediment core locations could not be obtained. Therefore, sediment core locations noted on Table 1 were estimated based on measurements made from existing structures, where available.

The following general sequence for sediment coring using vibracoring methods was followed:

- A crane was used to position the vibracore equipment. The core barrel was advanced into the sediment to the required end depth or refusal, whichever was encountered first.
- Field staff recorded the estimated core location, sample identification, time of sample collection, penetration depth, and general penetration resistance at the sample location.
- After retrieval, cores were transported to the upland area where the liner was split. Cores were screened in the field for elevated volatile organic compounds (VOCs) with a photoionization detector (PID), and measurements were recorded. Sediment was photographed and logged in accordance with ASTM Method D2487. Observations of NAPL were recorded.
- Samples were identified, extracted, and containerized for laboratory analysis.

Samples were collected from two depth intervals at the vibracore location (AQSS-22) and from the surface at the hand auger location (AQHA-01). Samples were submitted to Alpha Analytical Laboratory (now part of Pace Analytical) of Mansfield, Massachusetts, for chemical analyses. Sample locations are depicted on Drawing E-2 in Appendix B.

5.1.1.1 Sediment Core Results

Sediment core locations and sample depths were selected to characterize sediment visually and chemically and to evaluate the nature and extent of the impacted sediments within the Little River.

Drawing E-2 in Appendix B depicts the locations of the successfully collected cores, which included one core collected via vibracore methods (AQSS-22) and one core collected via hand auger methods (AQHA-01). Table 1 provides the core locations. No VOT was identified in the core collected from location AQSS-22. Heavy rainbow sheen was observed throughout the core collected from location AQHA-01.

Table 2 summarizes the results of the analytical testing of sediment samples. Concentrations of TPAH16 from all samples exceed the local conditions concentration of 29.9 mg/kg, confirming these locations are within the remedial footprint. Concentrations of benzene range from 0.160 J[2] to 0.740 mg/kg and are below the risk-based concentration of 1.9 mg/kg. Analytical data reports are included in Appendix D.

Data from the two sediment core sample locations (AQSS-22 and AQHA-01) were used to refine the expected depth of impacted sediment requiring remediation. Location AQSS-22 was located near the upstream end of the Site and was used to further delineate the extents of impacted sediment, both in terms of depth and lateral extent on the northern portion of the area. Location AQHA-01 was

[2] J definition: Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

located on the downstream end of the Site and confirmed the delineation of impacted sediment in this southern area. Refer to Drawing E-2 in Appendix B for sediment sample locations.

5.1.2 Porewater Sampling

Concentrations of dissolved-phase OHM in porewater were calculated from bulk sediment concentrations to support Phase III RAP cap modeling (GZA 2022a; Appendix C). During this PDI, porewater samples were extracted and analyzed to further characterize dissolved-phase OHM and assist in design refinement. Sample locations were selected to provide representative coverage of the Site, and sample depths were targeted for collection below the proposed dredge cut.

Porewater samples were collected at 10 locations and analyzed for TPAH16 and VOCs to characterize dissolved-phase concentrations. Porewater sampling locations are depicted on Drawing E-2 in Appendix B and summarized in Table 1.

Dissolved-phase sampling was conducted using temporary wellpoints, which were installed manually. The wellpoints included a 1.25-inch-diameter stainless-steel pipe with a 1-foot slotted section above a drive point. The target penetration depth was approximately 4.5 feet, but all locations encountered refusal at shallower depths. Penetration and screened interval depths are summarized in Table 3. Penetration depths ranged from 3.5 to 4.1 feet below mudline. A YSI6920 probe was used to measure water quality parameters of the surface water outside the temporary wellpoint as well as the purge water from within the temporary wellpoint. Surface and purge water readings and purge water observations are summarized in Table 3. The difference between the surface water and purge water readings were used to confirm that no bypassing of surface water was occurring into the piezometer. A peristaltic pump was used to purge porewater from the piezometer and collected a porewater sample from within the screened interval at the bottom of the piezometer.

The presence of VOT in a target interval can allow for VOT to potentially be entrained by the pumping and, if analyzed, bias the dissolved-phase analytical result high. To avoid this condition, the porewater sample was pumped through an inert, porous ceramic water filter. The porous ceramic water filters are hydrophilic, inert, and have extremely small pore spaces that exclude VOT (and fine-grained particles) but have high porosity and sufficient permeability to allow for representative aqueous phase sample collection by pumping (Gefell et al. 2018). The use of ceramic filters also had the advantage of eliminating the need for time-consuming low-flow sampling that is typically used to reduce particle entrainment in the sample.

5.1.2.1 Porewater Sampling Results

Porewater samples were collected at 10 locations and analyzed for TPAH16 and VOCs to characterize dissolved-phase OHM concentrations.

Drawing E-2 in Appendix B depicts the porewater sampling locations. Table 4 summarizes the results of the porewater sampling analytical testing. Analytical data reports are included in Appendix D. These data were used to inform the cap design evaluations (refer to Section 4.2).

Concentrations of TPAH16 ranged from 0.6 micrograms per liter (µg/L) (AQPW-07) to 6.2 µg/L (AQPW-10). The relatively low concentration of TPAH16 detected in AQWP-07 correlates to a sediment interval with no visual NAPL impacts. There does not appear to be a strong correlation between the detected concentration of TPAH16 and the presence of visually impacted sediment or the presence of NAPL impacts in porewater. For example, porewater samples AQPW-02, -08, and -09 were collected from intervals with visual NAPL impacts in sediment, but the porewater concentrations range from 0.8 (the second lowest detected concentration) to 4.0 µg/L. NAPL droplets were observed when collecting porewater samples AQPW-02, -03, -04, and -05, and the porewater concentrations ranged from 0.8 (the second lowest) to 5.7 µg/L (the second highest). The highest detected concentration of TPAH16 (6.2 µg/L) was collected from location AQPW-10. Based on surrounding cores, it is assumed that this porewater sample was also collected from an interval with visually impacted sediment, but only a sheen was present on the porewater sample with no NAPL observed.

Concentrations of benzene range from 3.5 (AQPW-07) to 16,000 µg/L (AQPW-05). Concentrations of benzene are significantly higher at locations AQPW-04 and AQPW-05 than the other eight porewater sample locations; the next highest concentration of benzene was detected at location AQPW-09 (3,300 µg/L). The elevated concentrations of benzene in porewater correlate to elevated concentrations of benzene in groundwater at locations B206-MW, B208-MW, and ENV-5MW (GZA 2022b, 2024) and the area with the highest calculated groundwater seepage rate. Although risk-based OHM concentrations (in particular, benzene concentrations) protective of benthic organisms are relevant to porewater concentrations, comparisons to GW-3 and M3CLs are provided in Table 4 for comparison purposes; location AQPW-04 exceeds the MassDEP MCP GW-3 criteria for benzene and xylene; location AQPW-05 exceeds the GW-3 criteria for benzene (MassDEP 2024).

5.1.3 Vertical Hydraulic (K_v) Conductivity Tests

Gravity drainage tests were conducted in the field using intact sediment cores to calculate K_v.

K_v was measured empirically using sediment cores collected at three locations (Drawing E-2 in Appendix B) coincident to where the wellpoints were installed (Section 5.1.4). The objective was to collect sediment cores of a length equal to the depth the wellpoints penetrated below the mudline. Up to six attempts were made at each location using vibracoring methods supported by a crane, and the longest cores were retained. Due to Site conditions (presence of numerous cobbles), none of the cores achieved the target penetration depth. During K_v testing in the field, porewater was allowed to freely drain from the core by gravity through a perforated bottom cap. The rate of porewater flow

was recorded. These data were used to calculate the porewater discharge rate within the sediment and then ultimately used to calculate seepage rates. Calculated seepage rates, along with porewater quality data, have been used to characterize the dissolved-phase mass flux of VOCs and PAHs for remedial design evaluations.

K_v was calculated at three locations (coincident with the three piezometer locations) on November 4, 2022. The vertical hydraulic conductivity calculations are summarized in Table 5 and Appendix E-1.

5.1.4 Potentiometric Data Collection

To inform refinement of the cap design, potentiometric data were collected within the Little River to measure the rate of seepage into and through the Little River sediments. The potentiometric data collection incorporated manual measurements and the use of pressure transducers and data loggers.

Temporary metal wellpoints were installed using vibratory methods supported by a crane. The target depth of the wellpoints was 5.0 feet below the mudline, and the wellpoints had a 1-foot screen interval at the base of the wellpoint. Pressure transducers were installed on November 3, 2022, up to 5.3 feet below mudline at three locations with a second transducer attached to the outside of each wellpoint at the mudline. Transducer installation locations are depicted on Drawing E-2 in Appendix B, and the locations and installation depths are summarized in Table 6.

Data were downloaded from the transducers on December 12, 2022 (following approximately 1 month of data collection) to provide a preliminary data set in case ice, debris, or high-water conditions damaged the wellpoints and additional data were not able to be downloaded at a later date. The transducers were removed from the river on October 6, 2023. The data storage capacity of the transducers was exceeded on July 21, 2023, but the transducers could not be retrieved until October when the water level decreased, and it was safe to retrieve them. The results of the potentiometric data collection activities are summarized in Appendix E-1.

5.2 Site-Specific Isotherm Study

To further evaluate the chemical isolation layer (CIL) design for the proposed engineered cap, a site-specific isotherm study was conducted at Anchor QEA's Geochemistry Laboratory in Portland, Oregon. The intent of the study was to identify an amendment that would aid in adsorption of contaminants, thereby reducing the overall thickness of the cap CIL. Cap CIL amendments to address hydrophobic organic contaminants often include carbon-based products, usually granular activated carbon (GAC) or powdered activated carbon (PAC). A range of GAC and PAC amendments were selected for the study. The study evaluated the sorptive capacity and sorptive rate of the various PAC/GAC amendments.

The isotherm study results are presented in Appendix E-1.

5.3 Sheen Sample Analysis

On December 12, 2022, when field personnel were on site to collect pressure transducer data (refer to Section 5.1.4), the Anchor QEA Field Lead observed a sheen emanating inside the containment boom from a discrete location along the base of the retaining wall that runs along the eastern side of the Little River. Following coordination with National Grid and GZA, Anchor QEA collected a sheen sample for chemical analysis using a sheen net. The approximate location of the sheen net sample is depicted on Drawing E-2 in Appendix B. The sheen was sampled and analyzed for absolute values (in nanograms) of alkylated PAHs, three select alkylated PAH surrogates, petroleum hydrocarbons, and two petroleum hydrocarbon surrogates. The results of the analytical testing are provided in Table 7. The chemical composition of the sheen is consistent with current and historical Site sources; the specific sources are undetermined.

5.4 Topographic Survey

As part of the PDI, a topographic survey was conducted using drone techniques on September 1, 2022, by Hydro Data Inc. of Southbury, Connecticut. The survey was intended to document existing conditions within the Little River portion of the Site (Drawing E-1 in Appendix B); the survey was conducted during a period of low water conditions when significant portions of the mudline within the Little River were exposed. The survey is used for design evaluations and the development of drawings and figures representing existing, pre-remedial action conditions.

5.5 NAPL Migration Via Ebullition

As discussed in the Phase II CSA Report (GZA 2022b), the presence of sheen on surface water in the Little River may be partially due to ebullition-facilitated transport of NAPL from sediment. Gas ebullition is defined as the release of gas bubbles from sediments into the overlying water column. Biogenic gases such as methane and carbon dioxide are generated in organic-rich sediments from the microbial breakdown of sedimentary organic matter. When the gas bubbles contact NAPL in the sediment, the NAPL may be transported with the gas to the water column and the water surface, producing a sheen. Sheens on surface water are observed sporadically within the Little River.

A conservative estimate of the volume of NAPL generated from ebullition-facilitated NAPL transport was calculated to support the design of a NAPL sorbent layer in a cap (Appendix E-3). The estimate was based on Site observations conducted by Anchor QEA representatives between July 2020 and January 2024. Based on Site observations, sheens appeared to be generated sporadically; it was not apparent from Site observations that sheens were generated more frequently in specific areas of the Site or during specific times of the day. Sheen generation was observed to be more active during summer months when the water levels were lower and air temperatures were warmer. Due to the apparently sporadic nature of sheen generation, assumptions were made regarding the area over

which sheens could be produced, the average size of the sheens, the typical sheen color, and the frequency of production. Literature values were used to correlate the sheen color to thickness.

A conservative estimate of 0.4 inches of NAPL over the footprint of the Site within the Little River is anticipated to be transported via ebullition over a period of 100 years (i.e., design life of cap). Based on literature, organoclay can sorb NAPL at a 1:1 volume ratio. Therefore, approximately 0.5 inches of bulk organoclay would be required to manage the volume of NAPL estimated to be generated over a 100-year period. Alternatively, the same volume of NAPL could be managed by stacking four organoclay Reactive Core Mats (RCMs).

5.6 Cap Model Evaluation

Cap modeling was initially conducted to support the evaluation of remedial alternatives as part of the Phase III RAP process (GZA 2022a). As part of that process, data gaps were identified where additional data collection could be used to refine the cap model (e.g., site-specific seepage rate[s] and dissolved-phase concentrations of PAHs and benzene in porewater). The PDI included the following activities to refine the cap design:

- Installation of pressure transducers at three locations within the remedial footprint and collection of data over an 8-month period (November 2022 to July 2023). These data were used in combination with the vertical hydraulic gradient testing results from the three co-located sediment cores to calculate seepage rates for the Site.
- Installation of temporary wellpoints at 10 locations to collect porewater data below the anticipated dredge cut depth. Porewater samples were collected from the temporary wellpoints, filtered through a ceramic filter, and submitted to the laboratory for analysis of PAHs and VOCs to refine the cap design.

The results of the refined cap modeling using the PDI data are summarized in Appendix E-1 along with a discussion of the seepage rate calculations. Based on a comparison of Site data and the calculated seepage rates, the Site was subdivided into Upstream, Midstream, and Downstream segments to refine the cap design based on the Site conditions (Drawing C-2 in Appendix B). The thickness of the cap CIL varies per segment with the thinner CILs required in the Upstream and Downstream segments of the Site due to lower calculated seepage rates and lower detected dissolved-phase OHM concentrations in porewater.

The CIL is the cap component that isolates contaminants from surface sediment and water to remove or reduce the bioavailability of the contaminants to benthic organisms. A thicker CIL is required in the Midstream segment of the Site due to the higher calculated seepage rate and detected dissolved-phase OHM concentrations in porewater. Additional information regarding cap design is provided in Section 7.5.1.

5.7 Conceptual Site Model Update

The CSM for the Little River portion of the Site was originally presented in the Phase II Comprehensive Site Assessment (GZA 2022b, Appendix C) and briefly summarized here.

Potential sources of OHM to the Site include the former MGP, the use of the upland as a gasoline and fuel oil distribution facility since 1977, general historical industrial and commercial uses of the Little River, storm drains, nearby roadways, and discharges from combined sewer outfalls (CSOs). VOT was observed in Little River sediment at numerous sediment core and hand auger locations. Observations of VOT ranged from droplets to intervals apparently saturated with VOT. During the Site history research performed for this report, no information was found that clearly indicated the presence of primary OHM migration pathways (e.g., NAPL) between potential OHM sources and sediment OHM. Therefore, the primary OHM sources (e.g., NAPL) for sediment are likely historical discharges from the former MGP to surface water and deposition in sediment.

Potential OHM migration pathways also include OHM movement through the upland subsurface, either in dissolved form in groundwater transitioning to sediment porewater or as NAPL present in sufficient volume to migrate through soil pore spaces to sediment pore spaces. Following the completion of the porewater sampling conducted as part of PDI field investigations (Section 5.1.2), it became apparent that the groundwater migration pathway for dissolved-phase OHM (particularly benzene) had a more significant impact on OHM concentrations in porewater than previously identified in the Phase II CSA. Therefore, in addition to surface water, groundwater is considered a primary migration pathway connecting the sediment to the OHM source in the upland. It is assumed that OHM present in sediment is also a source of OHM to porewater. Dissolved-phase OHM and NAPL that migrate through sediment may migrate directly to surface water.

The remedial alternative has been developed to address sources of OHM and the presence of OHM in Little River sediment.

6 Construction Plans and Disposal Site Maps (310 CMR 40.0874 (3)(B)(3) and (3)(C))

A disposal site map is included as Figure 2 in GZA's Revised Phase III RAP/Phase IV RIP (GZA 2024). It shows the extent of the Disposal Site Boundary and the upland parcels and portions of the Little River within the boundary where the CRA will be implemented under this Phase IV RIP.

Appendix B provides a select subset of preliminary design drawings (Drawings) generated in support of the Phase IV Remedy Implementation. The objective of these Drawings is to illustrate the major design elements of the remedy as discussed within this Phase IV RIP, and they are not intended for construction purposes.

7 Description and Conceptual Plan of Remedial Activities, including Relevant Design Parameters (310 CMR 40.0874(3)(b)(5) and (6))

The implementation of the selected remedy for the in-water portion of the Site generally consists of Site preparation, dredging, engineered cap placement, and Site restoration. The remedy is taking place in the Little River; due to the nature of the hydraulics in the river, the size of the remedial area, and the components of this design, it is anticipated that the work will be conducted "in-the dry," requiring dewatering of the river during remedy implementation. This Phase IV RIP has been prepared with this assumption. The selected Contractor may propose alternate means and methods for conducting the work (i.e., under submerged conditions) and will be required to show that the proposed approach and construction verification methods are feasible and in accordance with the project Technical Specifications and applicable environmental permits. Significant changes to the approach described herein will be reported in a Phase IV RIP Addendum and may require amendments to permit applications.

7.1 Site Preparation

Site preparation activities will be as follows:

- Development of an Upland Staging Area, including a Sediment Processing Area (SPA), at the Site to support remediation (see Drawing S-1 for conceptual depiction of Upland Staging Area)
- Removal of vegetation along the wall, within the river, and on the western shoreline (as needed)
- Removal of the semi-permanent boom system within the river prior to in-water work
- Plugging historic, apparently inactive pipes that extend through the retaining wall with hydraulic cement
- Preparation of the river to conduct work "in-the–dry"
- Pre-conditions surveys
- Installation of required environmental controls (both upland and within the river)

7.1.1 Upland Staging Area and Sediment Processing Area

Drawing S-1 in Appendix B depicts a conceptual layout for the Upland Staging Area and SPA. Site preparation for the Upland Staging Area and SPA will include construction of the following areas at the Contractor's discretion:

- An area for the Contractor-installed, temporary administrative and equipment storage trailers, sanitary facilities, and temporary utility connections, as needed
- Designated area(s) for the Contractor's employees to safely access the river

- A crane pad to support the mobilization and demobilization of equipment into the river to implement the remedy as well as to assist with on-site dredged material management
- An SPA where dredged material from the river will be dewatered within containers and potentially stockpiled (if needed) prior to being transported off site for disposal
- A designated area within the SPA to house fractionation (frac) tanks with adequate spill containment. Water generated from construction activities within the SPA will be collected in a sump and temporarily containerized in the frac tanks prior to being transported off site for final treatment and disposal at an approved water treatment facility.
- A designated area for clean material stockpiles to stage clean cap materials prior to cap installation in the river

The area available at the Site for the Upland Staging Area and SPA along with a conceptual layout is shown on Drawing S-1 in Appendix B. The Contractor will determine the final layout within the limits of the available area and the Upland Staging Area and SPA constructed in accordance with project specifications and permits. The installation, maintenance, and demobilization or disposal of concrete barriers, and erosion and sedimentation controls (ESCs) required in upland staging areas, is the responsibility of the Contractor and will be conducted in accordance with project Technical Specifications and permits.

Additional off-site staging areas may be used by the Contractor for clean material stockpiling and staging of amended material; however, access agreements with property owners will need to be obtained.

7.1.2 Employee River Access

For the Contractor's employees to safely access the Little River, it is anticipated the Contractor will construct and maintain a footpath or stairway on the western bank slope or other approved area.

7.1.3 Crane Preparation

To mobilize equipment into the Little River from the Upland Staging Area and SPA, the Contractor will likely require a mobile crane to be set up on the Site. The crane would be used by the Contractor to lower the necessary equipment from the upland into the Little River to construct the remedy. The crane will also be used to lift containers filled with dredged material and clean capping materials to and from the river and staging area. A conceptual location of the crane within the Upland Staging Area is depicted on Drawing S-1 in Appendix B.

A 25-foot offset from the top of the wall for mobilization and operation of the crane is currently assumed and is depicted on the Drawings (Drawing S-1 in Appendix B). Additional geophysical evaluations of the existing wall are currently underway by GZA, and available information and recommendations will be included in the final design documents prior to bidding and construction.

7.1.4 Vegetation Removal

As part of Site preparation activities, vegetation will be removed to the extent necessary to facilitate remedial activities. Significant vegetation is present, growing on and through the retaining wall and on the western shoreline. To avoid impacting the retaining wall, vegetation will be cut near flush with the face of the retaining wall. In addition, vegetation will be removed or trimmed on the western shoreline to facilitate access, only to the extent necessary.

7.1.5 Removal of the Semi-Permanent Boom System

In November 2016, a semi-permanent boom system was installed by Ramboll Environ and Clean Harbors Environmental Services to address the appearance of sheens on surface water in the Little River (Ramboll Environ 2017). Because sheen producing sediments are being remediated via construction of the remedy, and to improve the overall aesthetic appearance of the river, removal of the boom system is included in this CRA. Removal will include both the NAPL and sheen absorbing booms and the steel structures attached to the retaining wall. The booms will be disposed of in an approved disposal facility, and the steel components will be disposed of or recycled in accordance with project Technical Specifications.

The existing booms are depicted on Drawing S-2 in Appendix B.

7.1.6 Dewatering of Little River

As noted, it is currently anticipated that the in-river remedial action will be conducted under dry conditions, which may include the construction of a temporary dam and use of water diversion methods (e.g., pumping system) to divert the water past the work areas for the duration of construction. The Site is downgradient from an existing dam owned by the City of Haverhill (refer to Drawing E-1 in Appendix B). The following hydraulic information for the Little River is available and will be provided to the Contractor at the time of bidding:

- River stage observations made within the in-water portion of the Site during previous field events
- Hydraulic analysis performed by Fuss and O'Neill for the Little River as part of the *Little Dam Removal Feasibility Study* (Fuss and O'Neill 2021)
- Additional hydraulic modeling to be conducted by Anchor QEA with further design on this remedy

The means and methods of conducting this work will be the responsibility of the Contractor and the work conducted in accordance with applicable environmental permits and project Technical Specifications. The Contractor will be required to provide a written submittal of the approach for Engineer and National Grid review and approval.

7.1.7 Installation of In-Water Environmental Controls

Because the remedy will be constructed "in the dry," resuspension and sheen mitigation controls to be installed in the Little River primarily include oil absorbent booms and absorbent mats. Turbidity controls will not be required if work is conducted in the dry as there will be no resuspension of sediments or clean materials into a water column outside of the work area. Oil absorbent booms and turbidity controls (as needed) will be placed downstream of the work areas and any equipment being used for remedial construction. These booms will contain sheens generated by dredging/excavation and placement of the cap. Additional sheen mitigation will be conducted using absorbent mats on an as-needed basis.

These controls will be inspected daily and will be modified as necessary to meet site-specific conditions and the requirements of the anticipated Water Quality Certification (WQC). The controls will remain in place until sheen-generating activities are complete and will then be decontaminated and disposed of in accordance with Specification Sections 02 51 29 – Surface Cleaning and Decontamination and 02 61 00 – Removal and Disposal of Waste Materials. Proposed ESCs for the Upland Staging Area are depicted on Drawing S-1 and for the Little River on Drawing S-2. The Drawings are included in Appendix B.

7.1.8 Existing Retaining Wall Activities

Prior to the start of remediation activities, historic, apparently inactive pipes not associated with Site or street drainage extruding from the retaining wall on the east side of the river will be removed as feasible (from the face of wall outward), and remaining pipes will be sealed with hydraulic cement to prevent recontamination potential.

In addition, apparent coal tar coating on the vertical face of the retaining wall will be further evaluated and addressed, and tar-impacted sediment observed near the base of the retaining wall will be removed prior to the start of remediation activities. The approximate locations of the observations are depicted on Drawing S-2 in Appendix B.

7.2 Pre-Construction Survey, Existing Conditions Inspection, and Debris Removal

Documentation of the pre-construction condition of the Upland Staging Area, the existing wall and riverbanks, and the Little River are required by the Technical Specifications prior to the start of work and will include a combination of third-party surveys and the Contractor collecting videos and photographs for the project record.

7.2.1 Existing Conditions of the Upland Staging Area

A pre-construction survey of the Upland Staging Area using topographic or other methods (e.g., aerial drone survey) will be conducted by a topographic surveyor licensed in Massachusetts as described in the Specification Section 02 21 00 – Surveys. The Contractor will be responsible for protecting existing features on the Site during construction and restoring the Upland Staging Area to existing conditions following construction as specified in Specification Section 32 30 00 – Site Restoration.

7.2.2 Existing Condition of Eastern Bank Retaining Wall

An initial conditions inspection of the wall, prior to the start of construction, will be performed as a baseline for future measurements. Inspections and monitoring of the retaining wall will be conducted pre-, during-, and post-construction by either the Contractor or a third-party and the results relayed to the Contractor and Engineer over the course of the work.

7.2.3 Existing Condition of Western Bank Slope

The existing condition of the Little River including the western bank slope prior to construction will be captured by topographic survey and Contractor photographs.

7.2.4 Debris Removal

Typical urban waterway debris (e.g., tires, bikes, logs, pieces of construction debris, plastic trash, miscellaneous metals) has been observed in the Little River. Additionally, on the western extent of the work area, there are existing granite block walls that have fallen into the river and will be removed by the Contractor prior to the start of dredging and treated as debris. If removal, in the opinion of the Contractor, may impact the stability of the western bank slope, the Contractor shall propose a plan to the Engineer for approval in accordance with the Specifications. The approximate area of remnant walls and debris are indicated on the Drawings (e.g., Drawing E-1 in Appendix B).

Prior to initial baseline survey of the dredge area and the start of dredging activities, surficial debris will be removed to facilitate removal of sediment to target dredge depths. It is assumed that debris removal will continue during dredging operations if debris is encountered at depth. Debris will be removed and lifted via crane to the Upland Staging Area where it will be decontaminated, if necessary, in a designated area, characterized for disposal, and stockpiled prior to being transported off site for disposal at an approved facility.

7.2.5 Pre-Dredge Survey

Following the removal of surficial debris, a pre-dredge topographic survey will be conducted per Specification Section 02 21 00 – Surveys. Due to the generally shallow water conditions, presence of debris, and water velocity, bathymetric survey methods are not viable. Therefore, topographic survey

methods will be used. The pre-dredge survey will be used as the basis for comparison with post-dredge surveys to estimate sediment removal volumes and verify implementation of the design.

7.3 Dredging

To remove OHM-impacted sediments and facilitate cap placement (see Section 7.5.3), dredging will be conducted over approximately 18,260 sf as shown on Drawing C-1 in Appendix B. The target dredge depth is 2.5 feet below the existing mudline within the footprint of dredging. An anticipated in situ volume of approximately 1,355 cubic yards (cy), including volume associated with a 0.5-foot overdredge allowance, will be removed during the Phase IV Remedy. Additional sediment volume may need to be removed based on visual observation and the nature and extent of OHM during dredging implementation and based on the presence of subsurface debris, if encountered. The proposed dredge plan, including target depth, and proposed dredge design contours is depicted on Drawing D-1 in Appendix B.

The target dredge depth is based on accommodating the installation of the engineered cap to return the riverbed of the Little River to existing elevations to the extent possible.

The requirements for dredging equipment and procedures are described in Specification Section 35 20 23 – Mechanical Dredging.

7.3.1 Dredging Slope Stability Evaluation

The proposed dredge plan includes internal and external side slopes designed to maintain short-term stability of the dredge cut during construction and for the long-term stability concerns associated with both the steep western bank slope and existing retaining wall on the eastern bank of the Little River. An initial geotechnical stability analysis was performed by Anchor QEA to evaluate the recommended slope angle to facilitate dredging and the placement of the engineered cap material along the Little River.

The results of the analysis show that existing slopes along the western bank of the Little River do not meet the typical USACE-recommended target factors of safety for engineered slopes (USACE 2003), which is common for natural shoreline slopes. Therefore, to evaluate the potential influence of sediment removal and cap placement on slope stability, the factors of safety following construction (post-dredging and post-capping) were compared against the factor of safety for the existing condition. The results of the analysis suggest a 2(H):1(V) dredge cut is the steepest slope condition that can meet targeted dredge depths under temporary conditions while maintaining a factor of safety similar to existing conditions for the western bank following construction.

There are portions within the Midstream segment of the river where the existing western bank slope is steeper than 2H:1V, perpendicular to the river flow, such that this dredge cut cannot feasibly be

made. Additional design refinements regarding the extent of this condition in Midstream segment will be presented in a Phase IV RIP Addendum. Specialized dredging techniques such as slot dredging will be considered to maximize the removal of material and minimize the destabilization of existing slopes.

In addition, at the start of construction, the Contractor will provide the existing conditions (i.e., pre-dredge) topographic survey as required by Specification Section 02 21 00 – Surveys to the Engineer for review and comparison with the data provided in the Drawings. The pre-dredge topographic survey will serve as the new baseline, and the dredge design will be optimized for construction, as needed based on pre-dredge conditions. Areas where alternate dredging techniques are required (e.g., slot dredging) will be identified through this process.

7.3.2 Dredging Offset from Structures

At the time of submission of this Phase IV RIP, additional geophysical data collection and analysis of the existing retaining wall along the eastern shoreline of the Little River is currently underway by GZA, which will result in recommendations for working and dredging in the vicinity of the retaining wall. For working purposes in this preliminary design phase, a 5-foot horizontal dredging offset from the base of the wall has been incorporated into the dredge design along the length of the retaining wall. The offset was determined by evaluating the existing geometry of the river channel, the western bank slope, and the retaining wall, and considered the preliminary geometry required to construct the "wedge" portion of the cap on existing grade (see Section 7.5). The 5-foot offset was not determined through geotechnical assessment. Any required refinements to the design based on GZA's findings regarding retaining wall stability and recommendations will be presented in a Phase IV RIP Addendum.

7.3.3 Dredging Approach

Dredging activities will be conducted using mechanical methods and will be sequenced from upstream to downstream. It is anticipated that dredging and debris removal will be performed using small excavators and skid-steers that are able to be lowered into the Little River via crane as described in Section 7.1.3. It is also anticipated that a small, toothed digging bucket, or similar, will be selected by the Contractor to perform the dredging (i.e., a closed environmental bucket will not be required because materials will not be transported through a water column [nor is it feasible based on material type]). The actual number and types of equipment will be determined by the Contractor and will be partially based on the capabilities of the selected crane used to lower and raise equipment and materials in and out of the Little River.

7.4 Dredged Material Management

Dredged materials will be placed into water-tight containers (currently assumed to be approximately 2 to 4 cy in capacity) and lifted from the river via crane to the SPA. Dredged material in the small 2 to 4 cy containers will be transferred into larger water-tight roll-on/roll-off containers (assumed to be approximately 20 to 25 cy in capacity) for dewatering, stabilization and then off-site transport and disposal.

Within the larger roll-on/roll-off container, dredged material will be dewatered and processed, which will include the collection of decanted or effluent water and solidification/stabilization through the application and manual mixing of stabilization additives (e.g., Portland cement or Calciment). Water generated during dredged material management processing will be collected, containerized in frac tanks, and transported off site via trucks for treatment and disposal.

Additional details on dredged material processing are discussed in Section 9.1.2. Water management is discussed in Section 9.3.

7.5 Engineered Capping

An engineered cap will be placed after dredging operations are verified by surveying and approved by the Engineer.

The objective of the cap is to address both OHM-impacted sediment and dissolved-phased OHM migrating from groundwater originating in the upland portion of the Site. In addition, the cap was designed to sorb NAPL that may migrate through the wall on the eastern bank of the Little River.

7.5.1 Cap Design

As noted in Section 5.3, for the purposes of capping, the remedial area is divided into three segments of the river: Upstream, Midstream, and Downstream. In general, the cap design for each segment includes the following:

- A multi-layered cap component placed on a post-dredge surface consisting of two CILs, a geotechnical filter layer, and an armor layer for erosion protection.
- A “wedge” component placed on the existing grade (i.e. no dredging will occur before placement) in the vicinity of the existing retaining wall, which will meet the objectives of the multi-layered cap but will also address potential NAPL seeps from the wall. The wedge will include the same cap layering and thicknesses as the adjacent cap segment type (i.e., Upstream, Midstream, or Downstream cap) but will also include RCM and a bedding layer as shown on Drawing D-2 in Appendix B.

Additional refinements to the physical cross sections of the caps and, in particular, the wedge portion of the cap are anticipated with forthcoming recommendations for working and dredging near the

retaining wall following the completion of the geophysical survey and evaluation by GZA. Based on GZA's forthcoming evaluation of the wall, the preliminary dredge offset from the base of the retaining wall may be revised or eliminated. Further, a temporary cap may be placed along a portion of the retaining wall while the upland AS/SVE remedy is underway. If installed, the temporary cap would be removed prior to installation of the final design or incorporated into the final design after evaluating the long-term maintenance of that cap. The AS/SVE system and potential temporary cap are discussed in GZA's Revised Phase III RAP/Phase IV RIP report.

7.5.1.1 Multi-Layered Cap

As noted, a multi-layered cap comprising granular materials will be a component of the wedge and will also be placed riverward of the wedge on the post-dredge surface over an area of approximately 20,220 sf as shown on Drawing C-2 in Appendix B. The thickness and amount of amendment needed in the CIL to address dissolved-phase OHM in porewater is dependent on the AS/SVE system reducing and managing OHM concentrations (particularly VOCs) in groundwater that discharges to the sediment in the Little River. As discussed in Appendix E-1, without management of OHM-concentration in groundwater, the construction of a cap in the Middle segment is not feasible. As the driver chemical, benzene concentrations in porewater would need to be reduced to at most 2,500 ug/L for cap construction to be feasible. The following cap design assumes this target concentration can be met.

The cap will consist of the following layers listed from sediment surface upwards:

- A 0.5-foot-thick CIL (CIL 1) consisting of a sand/organoclay mixture containing 4% CETCO PM-199 organoclay (OC) by weight to address VOT, overlain by
- A 0.5- or 1.0-foot-thick CIL (CIL 2) consisting of a sand/GAC mixture containing 1%, 5%, or 30% of GAC by weight for the Upstream, Middle, and Downstream segments, respectively, to address dissolved-phase OHM, overlain by
- A layer of gravel-sized filter material to minimize piping of smaller grained granular material through the larger-sized armor stone, overlain by
- A layer of armor stone to protect the underlying layers from erosion and damage due to extreme hydraulic flow conditions in the river.

The basis of design, including data and a discussion on cap modeling efforts for the CILs, is included as Appendix E-1.

Appendix E-2 presents the erosion protection evaluation conducted to identify the stable particle size to be protective of potential erosive forces anticipated in the Little River due to hydrodynamic flows (i.e. current velocities) from the 100-year return-interval flow event.

A summary of the cap layers, materials, and thickness is provided in Table 8.

Table 8
Summary of Engineered Cap Design

Cap Area	Layer	Material	CIL Composition	Placement Thickness[1]
Upstream	CIL 1	Sand/OC Mix	4% OC by weight	6 – 9 inches
	CIL 2	Sand/GAC Mix	1% GAC by weight	6 – 9 inches
	Filter	Gravel	—	6 – 9 inches
	Armor	Cobble D_{50} = 4 inches	—	12 – 18 inches
			Total	**2.5 – 3.75 feet**
Midstream	CIL 1	Sand/OC Mix	4% OC by weight	6 – 9 inches
	CIL 2	Sand/GAC Mix	30% GAC by weight	12 – 15 inches
	Filter	Gravel	—	6 – 9 inches
	Armor	Cobble D_{50} = 4 inches	—	12 – 18 inches
			Total	**3.0 – 4.25 feet**
Downstream	CIL 1	Sand/OC Mix	4% OC by weight	6 – 9 inches
	CIL 2	Sand/GAC Mix	5% GAC by weight	6 – 9 inches
	Filter	Gravel	—	6 – 9 inches
	Armor	Cobble D_{50} = 4 inches	—	12 – 18 inches
			Total	**2.5 – 3.75 feet**

Notes:
1. Placement thickness ranges from the minimum design thickness to the maximum layer thickness including an overplacement allowance.

"—" = not applicable
D50 = median stone size

7.5.1.2 Wedge Configuration

A wedge will be designed to be placed on the existing sediment surface adjacent to the wall over approximately 515 linear feet of wall and covering an area of approximately 2,575 sf.

A schematic cross section of the wedge portion of the cap is depicted on Drawing D-2 in Appendix B.

In general, the wedge will consist of the following:

- The two CIL layers required for each segment of the river (Upstream, Midstream, and Downstream) as summarized in Table 8.
- Three to four RCMs layered on top of a bedding slope and up the wall to a minimum height of 3 feet above the existing sediment surface to sorb potential NAPL seeps coming through the existing retaining wall. The RCMs will also extend a minimum of 5 feet outboard (west) from the base of the retaining wall. The RCMs will be placed on a 2H:1V wedge of sand blended with organoclay consistent with the dosage of the adjacent cap type (e.g., Upstream, Midstream, Downstream).
- A filter and armor layer consistent with the typical cap design will overlay the CIL and RCMs as shown on Drawing D-2 in Appendix D.

A sand-OC mix may be used to "seal" the RCM to the face of the retaining wall to the extent feasible. While not designed to support the toe of the wall, the weight of the material placed along the wall may provide additional stability. With additional information regarding limitations and recommendations for work adjacent to the retaining wall, the need for the wedge portion of the cap will be re-evaluated and presented in any Phase IV RIP Addendum.

7.5.2 Little River Hydraulics Assessment

The Site is located in the backwaters of the Little River (FEMA 2018). Over approximately 15,550 sf of the cap footprint, the top of cap elevation will meet pre-construction mudline elevations, based on the planned dredging and the cap design minimum thickness (refer to Table 8). Over the remaining approximately 4,650 sf of the cap (the Midstream cap segment), top of cap elevations will likely exceed pre-construction mudline elevations, based on the planned dredging and cap design minimum thicknesses and the restrictions related to dredging adjacent to the retaining wall.

As published in the FEMA Flood Insurance Study (FEMA 2018), the base flood elevations in this portion of the Little River are controlled by backwatering effects from the conduit located at the downstream end of the Site. Due to these backwater conditions, small increases in riverbed elevations due to the proposed placement of cap materials are not anticipated to have a significant impact on the base flood elevations.

Additional hydraulic modeling of the final cap design configuration will be performed to evaluate any potential effects of cap placement on Little River system hydraulics, if any. These evaluations will be presented in a Phase IV RIP Addendum.

7.5.3 Cap Placement Approach

The two cap CILs require bulk mixing of sand with OC (CIL 1) and sand with GAC (CIL 2). It is anticipated that the Contractor will mix this material on site or at an approved nearby staging area in a designated clean area and in accordance with Specification Section 35 20 50 – Capping.

Similar to dredging operations (refer to Section 7.3.3), it is anticipated that construction of the cap will be conducted in the dry and performed using small excavators and skid-steers that can be lowered into the Little River via crane. As with dredging, the Contractor will select the most appropriate equipment and means and methods to construct the project, subject to approval by National Grid.

Transporting cap materials to the river from the Upland Staging Area is anticipated to be the reverse operation as dredging—with materials being conveyed into the river using small (2 to 4 cy) containers. Cap materials will be lowered down into the river and immediately placed where required

in the cap footprint. It is also anticipated that RCMs for the wedge portion of the cap will be placed into the river using a crane.

Cap placement within the Little River will be conducted with a layer-by-layer approach. Layer placement verification will be conducted via topographic survey as required in Specification Section 02 21 00 – Surveys. Pre- and post-placement surveys for each individual layer will be compared to measure the thickness and estimate the volume of material placed, and the Contractor will require National Grid approval before constructing the next layer.

Following the completion of remediation activities, the integrity of the cap will be monitored over time, and maintenance will be conducted as needed, in accordance with the AULs required to reach a Permanent Solution under the MCP. It is anticipated that the AULs will allow pre-existing activities (i.e., activities consistent with the current uses of the properties) but will require notification to National Grid prior to invasive activities (e.g., dredging, pile driving) within the footprint of the cap. Post-construction conditions surveys of the engineered cap will be conducted by National Grid, as described in Section 13.

7.6 Site Restoration

Following the completion of remedial activities, upland conditions at 284 Winter Street will be restored to pre-existing conditions as shown on Drawing R-1 in Appendix B and verified by post-construction survey as required in Specification Section 02 21 00 – Surveys.

The portions of the Little River beyond the extents of the dredge and cap area will also be restored to existing conditions and verified by post-construction survey as required in Specification Section 32 30 00 – Site Restoration. Areas that were graded or where vegetation was removed will be seeded with multiple native seed mixes selected for restoration and aesthetic benefits.

Within the dredge and cap footprint, the Little River will have armor material placed that is of similar size to material currently observed in the river, and no additional habitat restoration is required.

8 Design Features for Control of Spills, Accidental Discharge, or System Malfunction (310 CMR 40.0874(3)(b)(7))

Spills or discharges may potentially occur during sediment removal activities; on-site dredged material management and the temporary storage of impacted environmental media pending off-site disposal; and water treatment. Specification Section 01 35 43 – Environmental Procedures outlines the requirements for spill controls, spill response, and the protection of soil, water, and fish and wildlife resources. This specification will be supplemented by an Environmental Procedures Plan to be prepared by the Contractor, which will document products to be used at the Site; spill and discharge control procedures, responses, and contingency plans; monitoring requirements; housekeeping requirements; and containment and cleanup procedures to be used in the event of an accidental discharge or malfunction.

The following sections summarize controls and procedures that will be put in place to limit potential adverse impacts at the Site due to spills, accidental discharges, or system malfunctions.

8.1 Containment

8.1.1 Dredged Material Containment

It is anticipated that the Contractor will place dredged material from the river into water-tight containers, with the containers then lifted into the SPA via a crane, and the dredged material dewatered within the containers or within larger roll-on/roll-off boxes. Conducting this work within a water-tight container will limit the need, if any, of stockpiling impacted materials. If stockpiles are required for impacted material management, the work will be conducted in designated areas lined with polyethylene sheeting and enclosed by concrete blocks, or equivalent. Stockpile areas will be sloped such that any fluids collected on the sheeting will drain to a sump and be collected for off-site disposal. Stockpiles and roll-off containers will require secured covers and the use of sandbags or equivalent weights to anchor the cover. A typical stockpile covering schematic is depicted on Drawing D-3 in Appendix B.

Best management practices (BMPs) related to the transport and containment of dredged material include the following:

- Filling any containers with dredged material to a safe transport level (assume a minimum of 1 foot of freeboard to the top of any container holding dredged material)
- Targeting periods of good weather (i.e., low wind and light to no rain) to transport the containers conveying dredged material via crane from the Little River to the SPA
- Preparing a trucking plan that will identify the most efficient transportation route for the trucks transporting dewatered dredged material from the Site to the disposal facility(s)

In addition, potential impacts from container releases on site will be minimized by requiring daily inspections of containers for integrity and inspections of the designated area where dredged material containers are stored prior to transport and disposal.

8.1.2 Water and Liquids Containment

Liquids containerized from the SPA or from dredged material dewatering will be temporarily contained on site in frac tanks. Frac tanks will include secondary containment of adequate size to contain a minimum of 110% of the volume being stored. If a sump and piping is required at the Site, it will also include secondary containment. A conceptual layout for the SPA, including a general location for the frac tanks, is depicted on Drawing S-1 in Appendix B.

8.2 Sheen Control

Based on previous work at the Site, it is anticipated that sheens will be observed during dredging and debris removal activities, and potentially during cap installation. Even with the Contractor likely electing to work in the dry, there may be sheens observed in any remaining surface water following river diversion.

Prior to the initiation of dredging activities, sheen controls will be installed and will include oil absorbent booms to be placed around work areas and the application of oil and sheen absorbent pads as required if sheens are observed. Sheens and oil and/or tar contained within the booms will be removed using sorbent pads or additional booms if necessary.

The Contractor will provide dedicated equipment and crew responsible for deploying these sorbent booms and pads to address sheen and/or oil and/or tar observed outside of work areas within the Little River. As necessary, dredging or capping equipment may be shut down to allow the crew to verify that the booms and absorbent materials are properly deployed to contain, control, and collect the sheen material.

Once contained, the color, spread, and thickness of the sheen will be assessed for indications of the type and extent of spill. For example, in the case of hydrocarbons, dark brown-black gradients may indicate the origin of sheen; rainbow colors indicate a more recent and typical sheen, and gray-silvery color may suggest a large spread and/or exposure. If the source of the sheen is deemed to be equipment-based, the equipment will be shut down until the problem is corrected. If the source of the sheen is related to dredging or intrusive work along the retaining wall, the deployment and integrity of the resuspension control system will be evaluated, adjusted, or amended as needed. Once the sheen has been properly addressed, the excess booms and absorbent materials will be removed, and work will resume.

8.3 Turbidity Control

Turbidity control measures will not be applicable under dry work conditions. Should the Contractor elect to perform the work in the dry and implement a river diversion system (i.e., pumping the river around the work areas via a pipeline), there may be discharge requirements associated with permitting that could include turbidity monitoring and controls.

8.4 Spill Response

In addition to the controls described above, the Contractor will be required to maintain an on-site supply of spill response and containment products per the project Technical Specifications. In the event of an accidental spill or release of oil or hazardous materials, Contractor personnel in personal protective equipment and trained in compliance with emergency response training will provide clean up and containment to the extent possible. In case of a spill that cannot be controlled by on-site personnel or that exceeds applicable reportable quantities, the Site health and safety officer will secure the area and notify National Grid, MassDEP, and a designated hazardous materials cleanup subcontractor with the appropriate training and compliance certificates for emergency response.

Decontamination procedures may be required after cleanup to remove spilled substance residue and will be conducted in accordance with Specification Section 02 51 29 – Surface Cleaning and Decontamination.

Impacted materials used for cleanup will be labeled as such and sent off site for disposal in accordance with Specification Section 02 61 00 – Removal and Disposal of Waste Materials.

8.5 Erosion and Sedimentation Controls

ESCs will be placed around the Upland Staging Area and SPA and in the vicinity of any stormwater catch basins within the work areas and deployed in accordance with Specification Section 01 57 13 – Temporary Environmental Controls. If the Contractor elects to conduct work in the dry, ESCs will also be placed along the base of the slope on the western side of the Little River. These controls will be installed prior to remedial construction or installation of any construction elements on the western bank slope (e.g., river diversion pipelines if work done in the dry) and will not be removed until the work is complete and the Site has been restored.

The ESCs, which will be deployed as shown on Drawings S-1 and S-2 in Appendix B, will generally consist of the following elements as described in Specification Section 01 57 13 – Temporary Environmental Controls:

- Silt fencing and hay bales embedded approximately 4 inches below ground surface;
- Straw wattles (anchored by stakes);
- Straw bales that are either staked into soil or placed over burlap on concrete or asphalt; and

- A combination of silt socks and straw bales for catch basin inlet protection.

The ESCs will be inspected at least daily and after a rainfall of 0.5 inches or more. Accumulated silt and debris will be removed from behind the face of erosion control devices, and damaged or failed ESC measures will be repaired or replaced.

9 Characteristics, Quantities, and Location of Environmental Media to be Treated (310 CMR 40.0874(3)(b)(4)), and Remediation Waste Management (310 CMR 40.0874(3)(b)(8)

Environmental media that will be generated during this project include the following:

- OHM-impacted sediment, including sediment with VOT
- Debris, including but not limited to potentially OHM-impacted debris removed from the river both before and during dredging operations, spent upland and in-river environmental controls, vegetation from grubbing activities, and the semi-permanent boom system
- OHM-impacted water from dredged material dewatering

The project has been designed to reduce the volume of material disposed of at off-site landfills by segregating and recycling or treating materials to the extent possible. Specification Section 02 61 00 – Removal and Disposal of Waste Materials describes the overall project approach to segregation, staging, and off-site transportation and disposal; additional information about each of the primary media that will be generated is provided as follows.

9.1 Sediment

Sediment from the Little River is the primary volume of solid remediation waste generated during this project. The physical characteristics of the surficial sediment were described in the April 2022 Phase II CSA (GZA 2022b) and are briefly summarized in the following subsection.

9.1.1 Characteristics, Quantities, and Location

The Phase II CSA noted surficial sediments in the vicinity of the Site are brown to black sand to gravelly sand with little silt/clay and trace organics and anthropogenic debris. Anthropogenic debris includes glass, plastic, brick, slag, clinkers, and fibrous layers. A sharp contact was observed between this surficial sediment and a deeper gray, brown, black tight fine sand unit.

The lateral and vertical extent of impacted sediment was defined based on the nature and extent of OHM in the Little River and the thickness of the required cap to obtain a Permanent Solution. Additional details on defining the characteristics, quantities, and location of impacted sediment based on Site contaminants of concern are provided in the Phase II CSA (GZA 2022b).

Based on the defined lateral and vertical extent of dredging shown on Drawing C-1 in Appendix B, the estimated volume of impacted sediment to be removed by dredging is approximately 1,355 cy, and up to approximately 2,050 cy of stabilized sediment will be sent off site for disposal.

9.1.2 Sediment Stabilization and Processing

As noted, it is anticipated that sediment dredged from the Little River will be loaded into small (2 to 4 cy) water-tight containers that will be lifted from the Little River via a crane to the Upland Staging Area for dewatering and stabilization in the SPA.

Once placed into the SPA, the 2 to 4 cy containers will be dumped into larger 20 to 25 cy roll-on/roll-off containers. These larger containers will be fitted with a water pump where decant water can be transferred to the tanks for the collection of construction water. Collected water will be pumped into trucks for transport off site for treatment and discharge.

Following dewatering, dredged material will be processed and stabilized to meet the requirements of the disposal facility. Oversized debris will be removed and stockpiled separately. Dredged material will be manually mixed using a backhoe or similar piece of equipment with additives that may include Portland cement or quicklime to remove any additional water and stabilize the dredged material. The type and amount of additive will be based on a bench-scale treatability evaluation that will be conducted by the Contractor prior to construction.

Stabilized dredged material will then be sampled by the Contractor to confirm the requirements of the receiving facility have been met. Once data have confirmed the material has been sufficiently stabilized and meets the receiving facility requirements, the containers will be loaded onto trucks for off-site disposal, assumed to be the Clean Earth Soil Treatment facility in Loudon, New Hampshire. An adjustable spill apron will be in place during offloading; spilled sediment will be moved from the apron back to the truck. Off-Site shipment is anticipated to occur within 1 to 2 days of dredging and stabilization.

9.1.3 Sediment Transport and Disposal

Sediment that has been sufficiently dewatered to meet the requirements of the processing facility will be loaded into trucks at the Upland Staging Area for transport to the Clean Earth Soil Treatment Facility in Loudon, New Hampshire. The containers loaded onto trucks will be covered during transport. A Transportation Plan will be prepared by the Contractor and is anticipated to include the following trip-specific information:

- Truck information
- Trucking route
- Bridges in route, including bridge and clearance information
- Known hazards along route
- Emergency contacts

Under normal weather conditions, the round trip from Haverhill to the Loudon Clean Earth Soil Treatment Facility is anticipated to take approximately 1.25 hours, plus an additional hour for

offloading at the facility. Multiple trips may be performed each day based on production rates and facility schedule; therefore, the Contractor may need to use multiple trucks to avoid delays.

Final processing of the sediment will take place at the Clean Earth Soil Treatment Facility in Loudon, New Hampshire. This facility is permitted to receive delivery of trucks 24 hours a day, 7 days per week, and can process in excess of 4,000 cy of dredged material daily. At the Clean Earth Soil Treatment Facility, the stabilized dredged material will be subject to thermal treatment prior to final disposal.

The treatment facility slated for OHM-impacted sediment has specific testing requirements per volume of material as well as varying environmental analyses that must be conducted to verify that the material meets the facility's pre-characterization acceptance criteria. The remediation waste will be transported throughout the process under bills-of-lading or manifest, as appropriate. Copies of the completed waste disposal documentation will be provided to MassDEP in the Phase IV Final Inspection Report.

9.2 Debris

Debris will be removed from the river prior to dredging where debris is visible on the sediment surface as well as during dredging operations to remove buried debris.

9.2.1 Characteristics and Locations

A visual debris survey will be conducted to identify debris that will be removed prior to dredging. Debris to be encountered are typical urban riverine debris and include concrete, brick, plastics, tires, bricks, wire/cable/chain, wood debris, and other miscellaneous materials. Additionally, granite blocks from a previously existing wall on the western side of the riverbank are within the work area and will require removal before the start of dredging. The existing semi-permanent boom system will also be disposed of as debris. Debris that is removed from OHM-impacted areas in the Little River will be decontaminated at the SPA and will then be transported to an off-site disposal facility.

Debris that is not visually impacted by MGP residuals will be directly loaded into containers or trucks for off-site transport. Debris that is visually impacted will be temporarily staged and decontaminated at the SPA in a containment area, which will include a liquid collection sump. The materials will be dry-decontaminated with brushes and then, if necessary, wet-decontaminated using pressure washing techniques in accordance with Specification Section 02 51 29 – Surface Cleaning and Decontamination.

9.2.2 Debris Quantities and Recycling or Disposal Destinations

Debris will be segregated into categories such as non-impacted asphalt, brick, and concrete (ABC) materials, non-hazardous waste landfill materials (e.g., impacted ABC, personal protective equipment,

oil sorbent booms, pads, and high-density polyethylene sheeting), solid waste landfill material (e.g., general refuse, trash, and untreated wood), and metals.

The material type and proposed destinations for disposal of debris are summarized as follows:

- Non-impacted ABC—Newport Materials in Westford, Massachusetts
- Non-hazardous waste landfill materials—Waste Management of New Hampshire, Turnkey Landfill Facility, Rochester, New Hampshire
- Solid Waste (e.g., general refuse and trash)—Waste Management of New Hampshire, Turnkey Landfill Facility, Rochester, New Hampshire
- Metals—Local salvage facility

Where possible, materials will be recycled instead of landfilled.

9.3 Water Management

Liquid waste generated during remediation will likely include water collected in roll-on/roll-off containers, water from decontamination activities, and storm runoff within the SPA. Liquid waste will be collected and contained in a temporary on-site frac tank with secondary containment and transported off site to Clean Harbors' Braintree facility for treatment and disposal. The water will be tested prior to being transported off site for disposal. It is anticipated that the water will be non-hazardous and will be transported off site under bill-of-landing to the final National Grid disposal facility.

It is anticipated that water generation from dredging operations will be less than subaqueous dredging projects due to the in-river work being conducted under dry conditions. A total of up to 25,300 gallons of water, including water generated from dewatering and decontamination activities in addition to collected storm runoff, is anticipated to be transported off site for treatment and disposal.

10 Interaction of Remedial Action with Site Features and Impact on Environmental Receptors (310 CMR 40.0874(3)(b)(9) and (10))

10.1 Interaction Between Remedial Activities and Existing or Future Site Activities/Operations

The Phase IV Remedy will be implemented across multiple properties with different ownership and uses, including an active gas station and car wash, commercial properties, a City of Haverhill Right-of-Way, and adjacent to a Massachusetts Bay Transit Authority rail line (see Section 2.2.2). National Grid will work with each of the property owners to gain Site access and sequence work such that the impact on their operations and property is limited to the extent possible.

Work at each of the properties will be conducted in accordance with the terms of access agreements between National Grid and the property owners as described in Specification Section 01 14 00 – Work Restrictions and Sequence.

An AUL will need to be implemented on all properties where a cap is installed to allow for inspection and maintenance of the cap.

10.1.1 Energy North Property (Existing Haffner Gas Station)

The Energy North property, located at 248 Winter Street, will serve as the Upland Staging Area, the SPA, and the project office(s) for the Contractor during implementation of the remedy.

10.1.2 Coordination with Dam Removal (As Needed)

Based on a review of the preliminary construction plans, dated June 30, 2022, for the Little River Dam Removal and River Restoration project, developed by Fuss & O'Neill for the City of Haverhill (Fuss & O'Neill 2022), the Phase IV remedy will overlap with a small portion of the city's project to remove the dam located upstream from the Site. The dam removal project includes construction of a fish channel that will extend below the Winter Street Bridge and approximately 50 feet south of the bridge that will need to be tied into.

Although the City of Haverhill continues to progress the design, permitting, and funding acquisition activities necessary to implement the dam removal project, the timing of execution is uncertain. National Grid will continue to work with the city to sequence Phase IV remedial work such that impact to the dam removal project is limited to the extent possible.

10.2 Relationship to Drainage Features and Natural Resource Area and Impacts to Environmental Receptors

As required by the MCP, this section provides a discussion of the measures that have been incorporated into the design, construction, and operation of the selected CRA to avoid deleterious impact on drainage features, environmental receptors, and natural resource areas (including surface water or wetland) or, where it is infeasible to avoid such impact, a discussion of measures to limit or mitigate impacts.

10.2.1 Drainage Features

Multiple drainage features have been identified at the Site, including catch basins directing surface water runoff from the 284 Winter Street property, catch basins directing surface water runoff from Winter Street, and two CSO structures.

Catch basins within the 284 Winter Street property will be appropriately protected as shown on Drawing D-3 in Appendix B and described in Specification Section 01 35 43 – Environmental Procedures to prevent discharge of water during construction activities and to maintain the condition of the structures.

According to the City of Haverhill, two sets of CSO regulators share an outfall upstream of the Site (CDM Smith 2017). They are Winter Street (#021G)/Winter & Hale (#021H) and Broadway (#037)/High Street (#038). The CSOs are managed under National Pollutant Discharge Elimination System permit MA0101621, and discharge is authorized under wet weather conditions. In 2022, the Winter Street regulator activated six times and discharged 26,647 gallons; the Winter & Hale regulator activated 18 times and discharged 776,149 gallons (City of Haverhill 2023). The High Street and Broadway regulators were not activated in 2022.

It is anticipated that the project will not impact the Winter Street (#021G)/Winter & Hale (#021H), which is shown to discharge parallel to Winter Street under the Winter Street Bridge. Dredging activities are not anticipated to impact the Broadway (#037)/High Street (#038) located on the western bank slope, and an aggregate rock splash pad will be constructed at the discharge point of the pipe.

10.2.2 Identification of Natural Resource Areas

In support of an anticipated Notice of Intent filing with the City of Haverhill Conservation Commission for implementation of the Phase IV Remedy, the following wetland resource areas were identified within the project boundary: Land Under Water Bodies and Waterways, Land Subject to Flooding, Bank, and Riverfront Area. As part of the Notice of Intent filing process, the wetland resource areas will be assessed to characterize existing conditions and potential impacts associated with the proposed remediation activities. Both temporary and permanent alterations to these

resource areas are anticipated with the implementation of the proposed remedial activities. Modification of the resource areas will be limited to the extent practical, while still allowing the project remediation goals to be accomplished.

Overall, the project will provide a net benefit to these wetland resource areas because OHM-related impacts, including sediment in the river and impacted groundwater behind the retaining wall, will be removed or mitigated. Dredging and cap placement will result in both permanent and temporary impacts to these resource areas because sediment will be removed, new clean material will be placed within the river, and the river bottom elevation and water depth is anticipated to be changed in portions of the resource areas. The change in river bottom elevation and water depth is not anticipated to significantly adversely impact the resource areas. Cap armor material is anticipated to be similar in size to existing materials in the river (cobble-sized stone). Benthic recolonization is anticipated to occur following dredging activities, and the quality of benthic habitat will be improved due to removal of OHM-impacted material and placement of clean cap material.

10.2.3 Best Management Practices to Limit Impacts

The Phase IV Remedy will be conducted in accordance with the terms of environmental permits issued by the MassDEP Wetlands Program and the City of Haverhill Conservation Commission. These permits will include conditions designed to limit the impacts of the project on the natural resource areas and environmental receptors of the Little River. In addition, as described earlier in this Phase IV RIP, a number of BMPs will be employed during the work, including the use of erosion and sedimentation controls in the vicinity of catch basins and drainage areas (Section 10.2.1) and resuspension controls around silt-generating activities, if any. Oil booms and pads will be used to address any observed sheens (Section 7.1.6).

10.2.4 Mitigation—Habitat Enhancement in Existing Areas

Mitigation in the form of enhancing existing habitat to improve conditions for biota of the area is anticipated. Following implementation of the Phase IV Remedy, a condition of NSR to the environment will be achieved, representing a significant enhancement of habitat conditions within the Little River.

Additional habitat enhancement for benthic invertebrate and fisheries species will be provided by elements of the project that will be implemented prior to, during, and following the proposed remedial dredging within the river. A key example is the removal of debris from within the dredge area, which will benefit benthic invertebrate production. Debris such as bricks, riprap, tires, bicycles, old pipes, and sections of former retaining walls have been observed and will be removed as part of the dredging remediation activities.

10.3 Relationship to Local Planning and Development Issues

10.3.1 Short-Term Impacts to Local Infrastructure

The primary short-term impact to local infrastructure is associated with the transport of equipment and materials to and from the Site. Dredged material, dredged material dewatering water, and debris will be transported off site via truck, and clean cap materials will be transported on site via truck. Alternative transportation methods such as rail or water transport are not viable options due to the location of the Site. It is not anticipated that street closures will be necessary to implement the proposed work; however, as necessary, traffic details will be utilized.

Access to the Little River will not be available during construction, but this is not anticipated to be a significant impact because there is currently no or limited use of the Little River adjacent to the Site due to access constraints.

10.3.2 Long-Term Impacts to Local Infrastructure

There are no anticipated long-term impacts to local infrastructure.

10.4 Soil Characteristics and Groundwater Characteristics

The remediation efforts will result in removal of OHM-impacted sediment from the Little River, and its replacement with clean cap material. The armor layer of the cap is anticipated to be a similar grain-size as existing material within the Little River. The placement of the wedge along the base of the retaining wall is anticipated to provide additional limited stability to the retaining wall and also improve surface water conditions by eliminating the release of sheen and product through the retaining wall.

11 Construction and Performance Monitoring (310 CMR 40.0874(3)(b)(11))

Construction and performance monitoring will be conducted over the course of construction to document that the work is being performed in accordance with the project plans, specifications, and applicable permits.

11.1 Retaining Wall Monitoring

Third-party monitoring of the existing retaining wall will be conducted before, during, and after construction activities. The scope of the monitoring will be determined with further review of limitations, if any, of working on or near to the wall. The third-party monitoring team will provide the Contractor with ongoing monitoring results and will alert the Contractor if work must be temporarily stopped and further evaluated.

11.2 Air Monitoring and Controls

Ambient air monitoring, both at the perimeter of the Site and within the work areas, will be conducted over the duration of the work in accordance with standard health and safety practices. Dust, VOC, and nuisance odors will be monitored and controlled, if required.

11.2.1 Dust and VOC Monitoring

Perimeter air monitoring will be conducted using an AirLogics' automated real-time monitoring system (or equivalent) with individual monitoring stations located around the Site. Each station will include analytical instrumentation, a meteorological system, a computer control system, and an alarm system linked to the analytical instrumentation by an integrated communications/telemetry package. The analytical instrumentation will consist of a total VOC PID and a respirable particulate meter to measure dust as an indicator for PAHs and inorganics. The system will be in place to monitor conditions against the background VOC and particulate dust levels.

In addition to perimeter air monitoring, VOC and dust will be monitored in the work areas using portable equipment, including a hand-held PID equipped with a 10.6 electron-volt lamp and a dust meter with real-time aerosol monitor.

11.2.2 Dust and VOC Controls

If site-specific air quality levels are exceeded, whether at the perimeter or the work zone, work will be temporarily stopped, and controls implemented.

Various BMPs will be taken within the work areas to manage dust generation before levels become elevated. Such measures include the following:

- Covering roll-off containers and stockpiles at the end of the workday
- Covering trucks transporting material off site for disposal
- Employing good housekeeping on site, including construction entrances and roadways
- Installation of a truck wheel-washing station to limit tracking of Site materials onto public roadways

If dust concentrations exceed site-specific levels, misting or spraying will be used to suppress the dust.

If excessive odors are noted or VOC levels exceed site-specific air quality levels, as with dust, work operations will be temporarily halted and control measures deployed and include the following:

- Applying odor suppressing foam to excavations, stockpiles, or roll-off containers with pneumatic foam units
- Covering roll-off containers and stockpiles throughout the workday
- More frequent backfilling of open excavations in the river

11.3 Noise and Vibration Monitoring

Work conducted during the implementation of this in-river remedy will comply with the City of Haverhill noise ordinances as well as a project-specific value of 80 decibels. Mitigation measures will be taken if noise levels exceed applicable values.

The need for vibration monitoring will be evaluated following the receipt and analysis of the geophysical data associated with the retaining wall.

11.4 Water Quality Monitoring and Controls

The in-river work will be conducted in accordance with the MassDEP Wetlands Program 401 WQC. As a condition of receiving the WQC, it is anticipated that the project team will prepare a Water Quality Monitoring and Notification Plan meeting program requirements and provide that plan to MassDEP for review and approval prior to the start of the work.

11.5 Performance Monitoring

Performance monitoring will be conducted throughout the implementation of the remedy. As required by the Specification Section 01 31 00 – Project Management and Coordination, the Contractor will be required to submit a Daily Activity Report (DAR). The DAR will include, but is not

limited to, the following information (the full list is provided in the Specification Section 01 31 00 – Project Management and Coordination:

- Daily health and safety briefings
- Quantities of materials delivered to and transported off site
- Summary and quantities of contracted work performed
- Equipment operating information, including equipment location and hours for both upland and in-river instrumentation
- Documenting the daily control check of dredging equipment and other equipment that requires quality control checks
- Area and volume of material removed and placed into the river
- Tonnage and daily waste shipment log of material transported off site for disposal
- Testing performed and the results of that testing
- Documentation of monitoring and inspections performed, including upland and in-river environmental controls, work zone air monitoring results, noise monitoring results, any notification of non-compliance, and a summary of the mitigation measures taken to address the non-compliance

On behalf of National Grid, the project Engineer will be responsible for reviewing the Contractor's technical submittals, DARs, and other project information to document and verify the work is being conducted in accordance with the Technical Specifications and permits. The project Engineer will provide National Grid with documentation of the following:

- Compliance with permit requirements
- Compliance with waste management regulations
- Verification of work being accomplished in accordance with the Drawings and Technical Specifications
- Verification of the quantities of materials both removed from and placed into the river
- Oversight of air and noise monitoring activities conducted during the remedy and any implementation measures when deployed

12 Construction Plans and Specifications and Schedule (310 CMR 40.0874(3)(C)

12.1 Construction Plans and Technical Specifications

Select preliminary Drawings and Technical Specifications are included as Appendices B and C, respectively, and illustrate the conceptual remedy presented in this Phase IV RIP. Major revisions to the design or implementation approach will be provided in a Phase IV RIP Addendum.

At the completion of construction, as-built construction drawings serving as record of the work conducted will be submitted with the Phase IV Final Inspection Report.

12.2 Construction Schedule

The project schedule will be driven by activities including, but not limited to, upland remediation activities, permitting, contractor procurement, and property owner and agency access restrictions, if applicable. It is anticipated that environmental permit/license applications will be submitted in fall 2024, and permit/license receipt will occur by fall 2025. In tandem with permitting, the specifications and drawings will be circulated to prospective contractors, and it will take 9 to 12 months for the procurement process to be complete. The project will be awarded following receipt of all environmental permits/licenses.

A Time of Year restriction established by the Massachusetts Division of Marine Fisheries restricts in-river activities between March 1 and June 30 (inclusive). Although in-water work cannot occur until after June 30, upland mobilization activities can occur prior to that date. Therefore, it is anticipated if remedial construction (i.e., mobilization activities) can begin in March, and in-water activities begin after the Time of Year restriction ends in June, remedial activities can be completed by the following January. The construction schedule may be revised if the Contractor proposes alternate means and methods to implement the project, and any changes suggested will require approval by National Grid and the project Engineer.

13 Operation, Maintenance and Monitoring (310 CMR 40.0874(3)(D))

Prior to implementing the remedy outlined in this Phase IV RIP, National Grid will develop a Cap Operations, Monitoring, and Maintenance Plan to evaluate the integrity of the cap over time after initial placement. The cap monitoring plan will generally consist of surveying the cap area at a determined frequency, a timeline for completing monitoring and observation events, and metrics for maintenance. The cap will be monitored over time and maintenance will be conducted, as needed, in accordance with the AUL or AUL-like instrument required to reach a Permanent Solution under the MCP.

14 Additional Requirements (310 CMR 40.0874(3)(e)(F)(G))

14.1 Health and Safety Plan

As described in Specification Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites, the project contractor is required to implement health and safety procedures designed to protect health, safety, public welfare, and the environment, including the following:

- Measures designed to ensure that construction activities are conducted in a safe manner, including specific procedures for working in the vicinity of heavy equipment, underground and overhead utilities, Site clearing and tree removal, demolition work, sediment dredging, capping, and reconstruction.
- Measures to protect people on the Site and its vicinity from exposure to OHM, hazardous wastes as defined by U.S. Environmental Protection Agency, hazardous materials as defined by Department of Transportation, and/or hazardous substances as defined by the Occupational Safety and Health Act that may originate from or be present at the Site.
- Air monitoring to evaluate potential exposure to airborne particulates and vapors by Site personnel.
- The institution of corrective actions in response to dust, VOCs, and/or odors above threshold values within the work area or at the Site perimeter.
- Measures necessary to contain OHM during the project, including the following:
  - Measures to control fugitive dust and other environmental media
  - Measures to decontaminate personnel, vehicles, and equipment to limit the spread of impacted soil and sediment from work areas
  - Measures to secure temporary stockpiles of MGP-impacted materials
  - Measures to mitigate conditions exceeding site-specific or regulatory threshold values and/or stabilize the work area as necessary to protect public health and safety

Contractor and subcontractor activities will be governed by a project-specific HASP prepared by a Certified Industrial Hygienist, who will be responsible for overseeing its implementation throughout the project. A copy of the contractor's HASP will be kept on site during the project.

A preliminary HASP has been prepared by Anchor QEA for construction oversight and is included as Appendix F.

14.2 List of Permits

A summary of anticipated permits, associated agencies, triggering conditions, and applicable regulations is provided in Table 9.

Table 9
Summary of Anticipated Environmental Permits

Permit	Agency	Trigger	Regulation
Expanded Environmental Notification Form (EENF)/Environmental Impact Report (EIR) (Dual EENF and Proposed EIR - 301 CMR 11.05(9))	Massachusetts Environmental Policy Act	Project is located within a Designated Geographic Area around an Environmental Justice Population	301 CMR 11.06(7)(b)
		Alteration of 500 or more linear feet of bank along a fish run or inland bank	301 CMR 11.03(3)(b)1.b
		Provided that a Chapter 91 License is required, New or existing unlicensed non-water dependent use of waterways or tidelands	301 CMR 11.03(3)(b)5
		Alteration of 1/2 or more acres or any other wetland	301 CMR 11.03(3)(b)1.f
Notice of Intent/ Order of Conditions	City of Haverhill Conservation Commission	Dredging and filling within a wetland resource area	310 CMR 10.02(2)(a)
401 Water Quality Certification (WW08 - minor dredging project - removal of less than 5,000 cy but more than 100 cy)	MassDEP – Wetlands	Dredging 100 cy or more	314 CMR 9.04(12)
		Placement of fill in more than 5,000 sf in land under water	314 CMR 9.04(1)
Chapter 91 Dredge Permit and Licenses	MassDEP – Waterways	Dredging	310 CMR 9.05(2)(b)
		Placement of fill within a waterway	310 CMR 9.05(1)(a)
Pre-Construction Notification Form	USACE	Dredging in any navigable waters (General Permit 15 – Less than 10,000 cy of new dredging)	33 CFR 320.2(b)
		Discharge of fill material into waters of the United States	33 CFR 323 (a)

14.3 Property Access

As described in Section 10.1, work will be conducted under the terms of access agreements negotiated between National Grid and the property owners located at the following properties:

- 284 Winter Street (Site)
- 25 Lafayette Square (Parcel ID 515-296-11)
- 1 Lafayette Square (Parcel ID 515-296-5-1)
- 235 Essex Street (Parcel ID 515-296-5)
- 221 Essex Street (Parcel ID 515-296-3)
- 203 Essex Street (Parcel ID 515-296-18)

- Massachusetts Bay Transit Authority (Parcel ID 307-2-3)
- City of Haverhill (10-foot Right of Way adjacent to the Winter Street Bridge)

National Grid anticipates access agreements with these parties will be in place prior to the start of construction. No other access agreements are anticipated to complete the work.

15 Public Involvement Requirements

In accordance with Section 310 CMR 40.1403(3) (e) of the MCP, GZA has notified the Haverhill Chief Municipal Officer and Board of Health of the availability of this Phase IV RIP; a copy of the description of the CRA has also been provided. Copies of these public involvement notices are included in Appendix K of GZA's revised Phase III RAP /Phase IV RIP.

As required by Section 310 CMR 40.1403(10)(c) of the MCP, laboratory results of environmental samples presented in this report (Section 5) were transmitted to the property owners and future laboratory data collected during the remedy will be provided during implementation, as necessary. Copies of the transmittal forms are included in Appendix G.

16 References

CDM Smith, 2017. *Integrated Final Combined Sewer Overflow (CSO) Long-Term control and Supplemental Environmental Impact Report (EOEA #12088)*. Prepared for the City of Haverhill. February 2017.

City of Haverhill, 2023. *Annual Combined Sewer Overflow Report – Calendar Year 2022.* NPDES Permit No. MA 0101621. Prepared by the City of Haverhill Department of Public Works Wastewater Division. March 2023.

FEMA (Federal Emergency Management Agency), 2018. *Flood Insurance Study, Essex County, Massachusetts (All Jurisdictions).* Flood Insurance Study Number 25009CV001C. July 19, 2018.

Fuss & O'Neill, 2021. *Little Dam Removal Feasibility Study, City of Haverhill, Massachusetts*. Prepared for the City of Haverhill. November 19, 2021.

Fuss & O'Neill, 2023. *Little River Dam Removal and River Restoration, Single Environmental Impact Report, EEA Number: 16601.* February 15, 2023.

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GZA (GZA GeoEnvironmental, Inc.), 2022a. *Phase III Remedial Action Plan, 284 Winter Street, Haverhill, Massachusetts RTNs 3-32792 and 3-32875.* Prepared for Boston Gas Company d/b/a National Grid. July 2022.

GZA, 2022b. *Phase II Comprehensive Site Assessment Report, 284 Winter Street, Haverhill, Massachusetts RTNs 3-32792 and 3-32875.* Prepared for Boston Gas Company d/b/a National Grid. April 5, 2022. Appendix C – Phase II Comprehensive Site Assessment – Little River.

GZA, 2024. *Revised Phase III Remedial Action Plan & Phase IV Remedy Implementation Plan, 284 Winter Street, Haverhill, Massachusetts RTNs 3-32792 and 3-32875*. Prepared for Boston Gas Company d/b/a National Grid. June 2024.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger, 2000. "Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Systems." *Archives of Environmental Contamination and Toxicology* 39:20-31.

MassDEP (Massachusetts Department of Environmental Protection), 2024. Massachusetts Contingency Plan (MCP) 310 CMR 40. March 1, 2024.

NYSDEC (New York State Department of Environmental Conservation), 2014. *Screening and Assessment of Contaminated Sediment.* Division of Fish, Wildlife, and Marine Resources. June

2014. Ramboll Environ 2017. Immediate Response Action Status Report No. 4 – Haffner Realty Trust 284 Winter Street Haverhill, MA. March 2017.

USACE, 2003. *Slope Stability*. EM 1110-2-1902. October 31, 2003.

Tables

Table 1
Pre-Design Investigation Sampling Locations

Activity	Location ID	Collection Date(s)	Sample/Measurement Location[1]		Notes
			Easting	Northing	
Sediment Coring - Vibracore	AQSS-21	NA	NA	NA	No recovery after multiple attempts
	AQSS-22	10/21/2022	766712.17	3108575.25	
	AQSS-23	NA	NA	NA	No recovery after multiple attempts
Sediment Coring - Hand Auger	AQHA-01	11/4/2022	767002.96	3108261.40	
	AQHA-02	NA	NA	NA	Refusal encountered due to cobbles at sediment surface
Porewater Sampling	AQPW-01	10/21/2022	766718.31	3108534.16	
	AQPW-02	10/20/2022	766743.83	3108499.78	
	AQPW-03	10/20/2022	766764.84	3108468.97	
	AQPW-04	10/20/2022	766790.44	3108445.53	
	AQPW-05	10/19/2022	766823.00	3108417.32	
	AQPW-06	10/19/2022	766872.91	3108373.48	
	AQPW-07	10/19/2022	766898.08	3108352.65	
	AQPW-08	10/19/2022	766921.09	3108334.42	
	AQPW-09	10/19/2022	766944.96	3108314.89	
	AQPW-10	10/19/2022	766969.26	3108293.19	
Potentiometric Data Collection and Hydraulic Conductivity	AQTD-N	11/03/22 12/12/22 10/04/23	766738.53	3108507.51	Hydraulic Conductivity measured on 11/04/22
	AQTD-C	11/03/22 12/12/22 10/04/23	766813.61	3108423.71	Hydraulic Conductivity measured on 11/04/22
	AQTD-S	11/03/22 12/12/22 10/04/23	766949.73	3108311.41	Hydraulic Conductivity measured on 11/04/22

Table 1
Pre-Design Investigation Sampling Locations

Activity	Location ID	Collection Date(s)	Sample/Measurement Location[1]		Notes
			Easting	Northing	
Sheen Net Sampling	AQSN-121222	12/12/2022	766957.38	3108317.32	

Note:

1. Project horizontal datum is Massachusetts State Plane, Mainland Zone, North American Datum of 1983 (NAD83), U.S. Survey Feet.

Table 2
Sediment Sampling Results

	Location ID	AQHA-01	AQHA-01	AQSS-22	AQSS-22	AQSS-22
	Sample ID	AQHA-01-102122	DUP2-102122	AQSS-22-110422-1.5-2.0	AQSS-22-110422-2.0-2.5	DUP1-110422
	Sample Date	10/21/2022	10/21/2022	11/4/2022	11/4/2022	11/4/2022
	Sample Depth			1.5 - 2 ft	2 - 2.5 ft	1.5 - 2 ft
Chemical	**Method**	**Results (Units For Each Parameter Are Noted)**				
Conventional Parameters (pct)						
Total organic carbon	SW9060A	**1.28**	**1.56**	**3.93**	**3.58**	**3.71**
Total solids	SM2540G	**78.4**	**77**	**86.5**	**88.8**	**86**
Volatile Organics (µg/kg)						
1,1,1,2-Tetrachloroethane	SW8260D	51 U	210 U	34 U	37 U	--
1,1,1-Trichloroethane	SW8260D	51 U	210 U	34 U	37 U	--
1,1,2,2-Tetrachloroethane	SW8260D	51 U	210 U	34 U	37 U	--
1,1,2-Trichloroethane	SW8260D	100 U	420 U	69 U	75 U	--
1,1-Dichloroethane	SW8260D	100 U	420 U	69 U	75 U	--
1,1-Dichloroethene	SW8260D	100 U	420 U	69 U	75 U	--
1,1-Dichloropropene	SW8260D	51 U	210 U	34 U	37 U	--
1,2,3-Trichlorobenzene	SW8260D	200 U	840 U	140 U	150 U	--
1,2,3-Trichloropropane	SW8260D	200 U	840 U	140 U	150 U	--
1,2,4-Trichlorobenzene	SW8260D	200 U	840 U	140 U	150 U	--
1,2,4-Trimethylbenzene	SW8260D	**3,400**	**20,000**	**200**	**75 J**	--
1,2-Dibromo-3-chloropropane	SW8260D	310 U	1300 U	210 U	220 U	--
1,2-Dichlorobenzene	SW8260D	200 U	840 U	140 U	150 U	--
1,2-Dichloroethane	SW8260D	100 U	420 U	**110**	75 U	--
1,2-Dichloroethene	SW8260D	100 U	420 U	**110**	**46 J**	--
1,2-Dichloroethene, cis-	SW8260D	100 U	420 U	**110**	**46 J**	--
1,2-Dichloroethene, trans-	SW8260D	150 U	630 U	100 U	110 U	--
1,2-Dichloropropane	SW8260D	100 U	420 U	69 U	75 U	--
1,3,5-Trimethylbenzene (Mesitylene)	SW8260D	**990**	**5,800**	**71 J**	**28 J**	--
1,3-Dichlorobenzene	SW8260D	200 U	840 U	140 U	150 U	--
1,3-Dichloropropane	SW8260D	200 U	840 U	140 U	150 U	--
1,3-Dichloropropene	SW8260D	51 U	210 U	34 U	37 U	--
1,3-Dichloropropene, cis-	SW8260D	51 U	210 U	34 U	37 U	--
1,3-Dichloropropene, trans-	SW8260D	100 U	420 U	69 U	75 U	--
1,4-Dichlorobenzene	SW8260D	200 U	840 U	**19 J**	150 U	--
1,4-Dioxane	SW8260D	8200 U	34000 U	5500 U	6000 U	--
2,2-Dichloropropane	SW8260D	200 U	840 U	140 U	150 U	--
2-Chlorotoluene	SW8260D	200 U	840 U	140 U	150 U	--
2-Hexanone (Methyl butyl ketone)	SW8260D	1000 U	4200 U	690 U	750 U	--
4-Chlorotoluene	SW8260D	200 U	840 U	140 U	150 U	--
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260D	1000 U	4200 U	690 U	750 U	--
Acetone	SW8260D	1000 U	4200 U	690 U	750 U	--

Table 2
Sediment Sampling Results

	Location ID	AQHA-01	AQHA-01	AQSS-22	AQSS-22	AQSS-22
	Sample ID	AQHA-01-102122	DUP2-102122	AQSS-22-110422-1.5-2.0	AQSS-22-110422-2.0-2.5	DUP1-110422
	Sample Date	10/21/2022	10/21/2022	11/4/2022	11/4/2022	11/4/2022
	Sample Depth			1.5 - 2 ft	2 - 2.5 ft	1.5 - 2 ft
Chemical	**Method**	**Results (Units For Each Parameter Are Noted)**				
Benzene	SW8260D	**280**	**160 J**	**740**	**420**	--
Bromobenzene	SW8260D	200 U	840 U	140 U	150 U	--
Bromochloromethane	SW8260D	200 U	840 U	140 U	150 U	--
Bromodichloromethane	SW8260D	51 U	210 U	34 U	37 U	--
Bromoform (Tribromomethane)	SW8260D	410 U	1700 U	280 U	300 U	--
Bromomethane (Methyl bromide)	SW8260D	200 U	840 U	140 U	150 U	--
Carbon disulfide	SW8260D	1000 U	4200 U	**82 J**	750 U	--
Carbon tetrachloride (Tetrachloromethane)	SW8260D	100 U	420 U	69 U	75 U	--
Chlorobenzene	SW8260D	51 U	210 U	34 U	37 U	--
Chloroethane	SW8260D	200 U	840 U	140 U	150 U	--
Chloroform	SW8260D	150 U	630 U	100 U	110 U	--
Chloromethane	SW8260D	410 U	1700 U	280 U	300 U	--
Cymene, p- (4-Isopropyltoluene)	SW8260D	**290**	**1,800**	**14 J**	75 U	--
Dibromochloromethane	SW8260D	100 U	420 U	69 U	75 U	--
Dibromomethane	SW8260D	200 U	840 U	140 U	150 U	--
Dichlorodifluoromethane	SW8260D	1000 U	4200 U	690 U	750 U	--
Dichloromethane (Methylene chloride)	SW8260D	510 U	2100 U	340 U	370 U	--
Diethyl ether	SW8260D	200 U	840 U	140 U	150 U	--
Diisopropylether (Isopropyl Ether)	SW8260D	200 U	840 U	140 U	150 U	--
Ethyl tert-butyl ether (ETBE)	SW8260D	200 U	840 U	140 U	150 U	--
Ethylbenzene	SW8260D	**1,300**	**2,100**	**250**	**120**	--
Ethylene dibromide (1,2-Dibromoethane)	SW8260D	100 U	420 U	69 U	75 U	--
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8260D	410 U	1700 U	280 U	300 U	--
Isopropylbenzene (Cumene)	SW8260D	**530**	**3,200**	**50 J**	75 U	--
m,p-Xylene	SW8260D	**460**	**420 J**	**210**	**120 J**	--
Methyl ethyl ketone (2-Butanone)	SW8260D	1000 U	4200 U	690 U	750 U	--
Methyl tert-butyl ether (MTBE)	SW8260D	200 U	840 U	140 U	150 U	--
Naphthalene	SW8260D	**29**	**200**	**21**	**6.9**	--
n-Butylbenzene	SW8260D	**110**	**530**	**18 J**	75 U	--
n-Propylbenzene	SW8260D	**320**	**1,700**	**25 J**	75 U	--
o-Xylene	SW8260D	**280**	**810**	**120**	**49 J**	--
sec-Butylbenzene	SW8260D	**29 J**	**170 J**	69 U	75 U	--
Styrene	SW8260D	100 U	420 U	**24 J**	75 U	--
tert-Amyl methyl ether (TAME)	SW8260D	200 U	840 U	140 U	150 U	--
tert-Butylbenzene	SW8260D	200 U	840 U	140 U	150 U	--
Tetrachloroethene (PCE)	SW8260D	51 U	210 U	34 U	37 U	--

Table 2
Sediment Sampling Results

	Location ID	AQHA-01	AQHA-01	AQSS-22	AQSS-22	AQSS-22
	Sample ID	AQHA-01-102122	DUP2-102122	AQSS-22-110422-1.5-2.0	AQSS-22-110422-2.0-2.5	DUP1-110422
	Sample Date	10/21/2022	10/21/2022	11/4/2022	11/4/2022	11/4/2022
	Sample Depth			1.5 - 2 ft	2 - 2.5 ft	1.5 - 2 ft
Chemical	**Method**	**Results (Units For Each Parameter Are Noted)**				
Tetrahydrofuran	SW8260D	410 U	1700 U	280 U	300 U	--
Toluene	SW8260D	**350**	**270 J**	**220**	**140**	--
Total xylene (reported, not calculated)	SW8260D	**740**	**1,200 J**	**330**	**170 J**	--
Trichloroethene (TCE)	SW8260D	51 U	210 U	**300**	**180**	--
Trichlorofluoromethane (Fluorotrichloromethane)	SW8260D	410 U	1700 U	280 U	300 U	--
Vinyl chloride	SW8260D	100 U	420 U	69 U	75 U	--
Polycyclic Aromatic Hydrocarbons (mg/kg)						
2-Methylnaphthalene	SW8270ESIM	**43**	**19**	**9.48**	**1.96**	**12.8**
2-Chloronaphthalene	SW8270ESIM	**0.0743 J**	**0.125 J**	0.901 U	0.414 U	1.76 U
Acenaphthene	SW8270ESIM	**51.7**	**13.7**	**10.7**	**3.24**	**15.1**
Acenaphthylene	SW8270ESIM	**10.1**	**0.713**	**11.4**	**3.37**	**14.8**
Anthracene	SW8270ESIM	**26.7**	**5.21**	**40.9**	**14.6**	**61.1**
Benzo(a)anthracene	SW8270ESIM	**19.8**	**2.51**	**81.7**	**27.4**	**106**
Benzo(a)pyrene	SW8270ESIM	**15.5**	**1.58**	**72.9**	**23.9**	**94.7**
Benzo(b)fluoranthene	SW8270ESIM	**8.93**	**1.26**	**53.1**	**17.9**	**68.6**
Benzo(g,h,i)perylene	SW8270ESIM	**8.32**	**0.9**	**34.4**	**11.3**	**43.9**
Benzo(k)fluoranthene	SW8270ESIM	**7.82**	**0.935**	**52.3**	**17**	**67.7**
Chrysene	SW8270ESIM	**19.6**	**2.59**	**66.8**	**22.5**	**87.8**
Dibenzo(a,h)anthracene	SW8270ESIM	**2.04**	**0.263**	**9.44**	**3.17**	**12.3**
Fluoranthene	SW8270ESIM	**38.5**	**6.1**	**172**	**61.9**	**230**
Fluorene	SW8270ESIM	**29.8**	**7.01**	**21.7**	**7.03**	**31.4**
Indeno(1,2,3-c,d)pyrene	SW8270ESIM	**6.96**	**0.773**	**40**	**13.2**	**53.2**
Naphthalene	SW8270ESIM	**87.7**	**42.9**	**30.9**	**6.7**	**38.3**
Phenanthrene	SW8270ESIM	**99.3**	**20.8**	**147**	**44.8**	**209**
Pyrene	SW8270ESIM	**41.2**	**7.18**	**138**	**48.4**	**181**
Total PAH16		**474.0**	**114.4**	**983**	**326**	**1,315**

Notes:
Bold: Detected result
J: Estimated value
U: Compound analyzed for, but not detected above detection limit
Total PAH16 calculated as the sum of the detected concentrations and 1/2 the detection limit for non-detect concentrations.

Table 3
Wellpoint Installation for Porewater Sampling Summary

Well ID	Height of Wellpoint Above Mudline (feet)	Depth of Wellpoint Below Mudline (feet)	Screened Interval Below Mudline (feet)	Height of Wellpoint Above Water Level (feet)	Depth to Water Inside Wellpoint (feet)	Water Type	Temperature (C°)	Conductivity (mS/cm)	DO (%)	DO (mg/L)	pH	Oxidation Reduction Potential	Turbidity (NTU)	Purge Water Observations
AQPW-01	3.18	3.49	2.49 - 3.49	2.57	2.59	Purge Water	12.72	4.035	44.7	4.51	6.77	-14.3	36.4	Trace sheen
						Surface Water	10.56	0.541	80.8	8.91	7.93	59.5	14.3	
AQPW-02	3.07	3.6	2.6 - 3.6	2.59	2.7	Purge Water	13.9	6.215	50.6	4.99	6.92	-39.5	81.6	Heavy sheen, NAPL, odor
						Surface Water	11.51	0.509	80.1	8.55	7.39	46.6	28.7	
AQPW-03	3.22	3.45	2.45 - 3.45	1.69	1.43	Purge Water	13.6	4.83	23.2	2.08	6.71	-41	108.9	Heavy sheen, NAPL, odor
						Surface Water	11.5	0.512	81.9	8.8	7.38	46.3	15.7	
AQPW-04	3.18	3.49	2.49 - 3.49	1.93	1.8	Purge Water	13.43	5.935	18	1.16	6.75	53.1	77.3	Heavy sheen, NAPL, odor
						Surface Water	11.49	0.496	74.6	8.1	7.09	73.6	14.1	
AQPW-05	3.16	3.51	2.51 - 3.51	1.95	1.73	Purge Water	13.82	7.687	53	4.97	6.47	-10.3	55.1	Trace NAPL, rainbow sheen
						Surface Water	12.65	0.461	71.6	7.53	7.05	65.2	15.4	
AQPW-06	2.83	3.84	2.84 - 3.84	1.92	0.53	Purge Water	15.24	1.049	35.6	3.39	6.57	-39.3	164.1	Black silty
						Surface Water	12.83	0.462	73.1	7.72	7.32	51.1	15.6	
AQPW-07	2.91	3.76	2.76 - 3.76	0.31	0	Purge Water	14.98	1.941	40.8	4.08	6.51	-26.8	78.5	Slightly black, turbid
						Surface Water	12.72	0.462	73.4	7.72	7.21	19.5	15.4	
AQPW-08	3.09	3.58	2.58 - 3.58	1.73	1.46	Purge Water	14.71	3.046	39.4	3.68	6.63	-34.8	79.7	Black, turbid, odor
						Surface Water	12.84	0.459	72.8	7.52	7.23	47.9	15.6	
AQPW-09	3.17	3.5	2.5 - 3.5	1.52	1.37	Purge Water	13.56	1.959	46.8	3.74	6.53	-48.6	40.6	Black, turbid, odor
						Surface Water	12.95	0.46	72.69	7.47	7.29	-0.5	15.9	
AQPW-10	2.6	4.07	3.07 - 4.07	1.7	1.52	Purge Water	13.47	2.54	31.5	2.84	6.45	-2.5	12.8	Sheen
						Surface Water	12.91	0.459	68	7.15	7.06	84.8	16.7	

Table 4
Porewater Sampling Results

Location ID Sample ID Sample Date		GW-3 (µg/L)[1,2]	M3CLs in Groundwater (µg/L)[1,2]	AQPW-01 AQPW-01-102122 10/21/2022	AQPW-02 AQPW-02-102022 10/20/2022	AQPW-03 AQPW-03-102022 10/20/2022	AQPW-04 AQPW-04-102022 10/20/2022	AQPW-05 AQPW-05-101922 10/19/2022	AQPW-06 AQPW-06-101922 10/19/2022
Sample Depth (feet)				**2.49 - 3.49**	**2.6 - 3.6**	**2.45 - 3.45**	**2.49 - 3.49**	**2.51 - 3.51**	**2.84 - 3.84**
Chemical	**Method**								
Volatile Organics (porewater) (µg/L)									
1,1,1,2-Tetrachloroethane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,1,1-Trichloroethane	SW8260D	20,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,1,2,2-Tetrachloroethane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,1,2-Trichloroethane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,1-Dichloroethane	SW8260D	20,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,1-Dichloroethene	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
1,1-Dichloropropene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
1,2,3-Trichlorobenzene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
1,2,3-Trichloropropane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
1,2,4-Trimethylbenzene	SW8260D			**170**	**61**	**330**	**510**	**230 J**	**140**
1,2,4-Trichlorobenzene	SW8260D	50,000	100,000	50 U	10 U	100 U	200 U	400 U	20 U
1,2-Dichlorobenzene	SW8260D	2,000	80,000	25 U	**3.0 J**	**11 J**	100 U	200 U	10 U
1,3-Dichlorobenzene	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,4-Dichlorobenzene	SW8260D	8,000	80,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,2-Dibromo-3-chloropropane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
1,2-Dichloroethane	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
1,2-Dichloroethene	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
1,2-Dichloroethene, cis-	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
1,2-Dichloroethene, trans-	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
1,2-Dichloropropane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
1,3,5-Trimethylbenzene (Mesitylene)	SW8260D			**30 J**	**16**	**89 J**	**140 J**	**63 J**	**16 J**
1,3-Dichloropropane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
1,3-Dichloropropene	SW8260D	200	2,000	10 U	2.0 U	20 U	40 U	80 U	4.0 U
1,3-Dichloropropene, cis-	SW8260D			10 U	2.0 U	20 U	40 U	80 U	4.0 U
1,3-Dichloropropene, trans-	SW8260D			10 U	2.0 U	20 U	40 U	80 U	4.0 U
1,4-Dioxane	SW8260D			6200 U	1200 U	12000 U	25000 U	50000 U	2500 U
2,2-Dichloropropane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
2-Chlorotoluene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
2-Hexanone (Methyl butyl ketone)	SW8260D			120 U	25 U	250 U	500 U	1000 U	50 U
4-Chlorotoluene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260D			120 U	25 U	250 U	500 U	1000 U	50 U
Acetone	SW8260D	50,000	100,000	120 U	**11 J**	250 U	500 U	1000 U	50 U
Benzene	SW8260D	10,000	100,000	**30**	**30**	**42**	**14,000**	**16,000**	**49**
Bromobenzene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Bromochloromethane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Bromodichloromethane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
Bromoform (Tribromomethane)	SW8260D	50,000	100,000	50 U	10 U	100 U	200 U	400 U	20 U
Bromomethane (Methyl bromide)	SW8260D	800	8,000	50 U	10 U	100 U	200 U	400 U	20 U

Table 4
Porewater Sampling Results

	Location ID Sample ID Sample Date	GW-3 (µg/L)[1,2]	M3CLs in Groundwater (µg/L)[1,2]	AQPW-01 AQPW-01-102122 10/21/2022	AQPW-02 AQPW-02-102022 10/20/2022	AQPW-03 AQPW-03-102022 10/20/2022	AQPW-04 AQPW-04-102022 10/20/2022	AQPW-05 AQPW-05-101922 10/19/2022	AQPW-06 AQPW-06-101922 10/19/2022
	Sample Depth (feet)			**2.49 - 3.49**	**2.6 - 3.6**	**2.45 - 3.45**	**2.49 - 3.49**	**2.51 - 3.51**	**2.84 - 3.84**
Chemical	**Method**								
Carbon disulfide	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Carbon tetrachloride (Tetrachloromethane)	SW8260D	5,000	50,000	25 U	5.0 U	50 U	100 U	200 U	10 U
Chlorobenzene	SW8260D	1,000	10,000	25 U	**4.1 J**	50 U	100 U	200 U	10 U
Chloroethane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Chloroform	SW8260D	20,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
Chloromethane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Cymene, p- (4-Isopropyltoluene)	SW8260D			**7.8 J**	**5.5 J**	**13 J**	200 U	400 U	**3.9 J**
Dibromochloromethane	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
Dibromomethane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Dichlorodifluoromethane	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Dichloromethane (Methylene chloride)	SW8260D	50,000	100,000	50 U	10 U	100 U	200 U	400 U	20 U
Diethyl ether	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Diisopropylether (Isopropyl Ether)	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Ethyl tert-butyl ether (ETBE)	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Ethylbenzene	SW8260D	5,000	100,000	**910**	**80**	**1,200**	**3,500**	**1,600**	**400**
Ethylene dibromide (1,2-Dibromoethane)	SW8260D	50,000	100,000	50 U	10 U	100 U	200 U	400 U	20 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8260D	3,000	30,000	15 U	3.0 U	30 U	60 U	120 U	6.0 U
Isopropylbenzene (Cumene)	SW8260D			**58**	**15**	**98 J**	**110 J**	**64 J**	**36**
m,p-Xylene	SW8260D			**320**	**10**	**500**	**3,400**	**590**	**36**
Methyl ethyl ketone (2-Butanone)	SW8260D	50,000	100,000	120 U	25 U	250 U	500 U	1000 U	50 U
Methyl tert-butyl ether (MTBE)	SW8260D	50,000	100,000	50 U	**10**	100 U	200 U	**210 J**	20 U
Naphthalene	SW8260D	20,000	100,000	**2,600**	**620**	**4,700**	**6,300**	**3,500**	**1,100**
n-Butylbenzene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
n-Propylbenzene	SW8260D			**17 J**	**8.4 J**	**38 J**	**35 J**	400 U	**13 J**
o-Xylene	SW8260D			**300**	**27**	**500**	**1,900**	**780**	**220**
sec-Butylbenzene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Styrene	SW8260D	6,000	60,000	25 U	5.0 U	50 U	100 U	200 U	10 U
tert-Amyl methyl ether (TAME)	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
tert-Butylbenzene	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Tetrachloroethene (PCE)	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
Tetrahydrofuran	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Toluene	SW8260D	40,000	100,000	**29**	**1.3 J**	**28 J**	**130**	**70 J**	**5.8 J**
Total xylene (reported, not calculated)	SW8260D	5,000	100,000	**620**	**37**	**1,000**	**5,300**	**1,400**	**260**
Trichloroethene (TCE)	SW8260D			25 U	5.0 U	50 U	100 U	200 U	10 U
Trichlorofluoromethane (Fluorotrichloromethane)	SW8260D			50 U	10 U	100 U	200 U	400 U	20 U
Vinyl chloride	SW8260D	50,000	100,000	25 U	5.0 U	50 U	100 U	200 U	10 U
Polycyclic Aromatic Hydrocarbons (porewater) (µg/L)									
2-Chloronaphthalene	SW8270ESIM			20 U	20.4 U	19.6 U	20 U	20 U	20 U
2-Methylnaphthalene	SW8270ESIM	20,000	100,000	**413**	**204**	**522**	**553**	**162**	**94**

Table 4
Porewater Sampling Results

	Location ID Sample ID Sample Date	GW-3 (µg/L)[1,2]	M3CLs in Groundwater (µg/L)[1,2]	AQPW-01 AQPW-01-102122 10/21/2022	AQPW-02 AQPW-02-102022 10/20/2022	AQPW-03 AQPW-03-102022 10/20/2022	AQPW-04 AQPW-04-102022 10/20/2022	AQPW-05 AQPW-05-101922 10/19/2022	AQPW-06 AQPW-06-101922 10/19/2022
	Sample Depth (feet)			**2.49 - 3.49**	**2.6 - 3.6**	**2.45 - 3.45**	**2.49 - 3.49**	**2.51 - 3.51**	**2.84 - 3.84**
Chemical	**Method**								
Acenaphthene	SW8270ESIM	10,000	100,000	**114**	**61.6**	**100**	**79.2**	**71**	**69.1**
Acenaphthylene	SW8270ESIM	40	100,000	20 U	20.4 U	19.6 U	20 U	**3.73 J**	20 U
Anthracene	SW8270ESIM	30	1,000	**9.46 J**	20.4 U	19.6 U	20 U	20 U	**11.10 J**
Benzo(a)anthracene	SW8270ESIM	1,000	10,000	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Benzo(a)pyrene	SW8270ESIM	500	5,000	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Benzo(b)fluoranthene	SW8270ESIM	400	4,000	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Benzo(g,h,i)perylene	SW8270ESIM	20	500	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Benzo(k)fluoranthene	SW8270ESIM	100	1,000	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Chrysene	SW8270ESIM	70	700	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Dibenzo(a,h)anthracene	SW8270ESIM	40	400	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Fluoranthene	SW8270ESIM	200	2,000	**3.87 J**	20.4 U	19.6 U	20 U	20 U	**5.81 J**
Fluorene	SW8270ESIM	40	400	**52.3**	**16.60 J**	**27**	**28**	**22.5**	**44.3**
Indeno(1,2,3-c,d)pyrene	SW8270ESIM	100	1,000	20 U	20.4 U	19.6 U	20 U	20 U	20 U
Naphthalene	SW8270ESIM	20,000	100,000	**2,480**	**581**	**3,630**	**5,420**	**2,720**	**1,280**
Phenanthrene	SW8270ESIM	10,000	100,000	**71.3**	**20.8**	**26.1**	**25**	**24.5**	**67.1**
Pyrene	SW8270ESIM	20	700	20 U	20.4 U	19.6 U	20 U	20 U	**3.98 J**
Total PAH16				2830.93	802.4	3900.7	5672.2	2951.73	1571.39

Table 4
Porewater Sampling Results

	Location ID	AQPW-07	AQPW-08	AQPW-09	AQPW-10	AQPW-10
	Sample ID	AQPW-07-101922	AQPW-08-101922	AQPW-09-101922	AQPW-10-101922	DUP1-101922
	Sample Date	10/19/2022	10/19/2022	10/19/2022	10/19/2022	10/19/2022
	Sample Depth (feet)	2.76 - 3.76	2.58 - 3.58	2.5 - 3.5	3.07 - 4.07	3.07 - 4.07
Chemical	**Method**					
Volatile Organics (porewater) (µg/L)						
1,1,1,2-Tetrachloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1,1-Trichloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1,2,2-Tetrachloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1,2-Trichloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1-Dichloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1-Dichloroethene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,1-Dichloropropene	SW8260D	10 U	20 U	100 U	200 U	100 U
1,2,3-Trichlorobenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
1,2,3-Trichloropropane	SW8260D	10 U	20 U	100 U	200 U	100 U
1,2,4-Trimethylbenzene	SW8260D	**53**	**150**	**660**	**900**	**860**
1,2,4-Trichlorobenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
1,2-Dichlorobenzene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,3-Dichlorobenzene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,4-Dichlorobenzene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,2-Dibromo-3-chloropropane	SW8260D	10 U	20 U	100 U	200 U	100 U
1,2-Dichloroethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,2-Dichloroethene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,2-Dichloroethene, cis-	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,2-Dichloroethene, trans-	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,2-Dichloropropane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
1,3,5-Trimethylbenzene (Mesitylene)	SW8260D	**16**	**24**	**200**	**260**	**240**
1,3-Dichloropropane	SW8260D	10 U	20 U	100 U	200 U	100 U
1,3-Dichloropropene	SW8260D	2.0 U	4.0 U	20 U	40 U	20 U
1,3-Dichloropropene, cis-	SW8260D	2.0 U	4.0 U	20 U	40 U	20 U
1,3-Dichloropropene, trans-	SW8260D	2.0 U	4.0 U	20 U	40 U	20 U
1,4-Dioxane	SW8260D	1200 U	2500 U	12000 U	25000 U	12000 U
2,2-Dichloropropane	SW8260D	10 U	20 U	100 U	200 U	100 U
2-Chlorotoluene	SW8260D	10 U	20 U	100 U	200 U	100 U
2-Hexanone (Methyl butyl ketone)	SW8260D	25 U	50 U	250 U	500 U	250 U
4-Chlorotoluene	SW8260D	10 U	20 U	100 U	200 U	100 U
4-Methyl-2-pentanone (Methyl isobutyl ketone)	SW8260D	25 U	50 U	250 U	500 U	250 U
Acetone	SW8260D	25 U	50 U	250 U	500 U	250 U
Benzene	SW8260D	**3.5**	**520**	**3,300**	**410**	**410**
Bromobenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
Bromochloromethane	SW8260D	10 U	20 U	100 U	200 U	100 U
Bromodichloromethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Bromoform (Tribromomethane)	SW8260D	10 U	20 U	100 U	200 U	100 U
Bromomethane (Methyl bromide)	SW8260D	10 U	20 U	100 U	200 U	100 U

Table 4
Porewater Sampling Results

	Location ID	AQPW-07	AQPW-08	AQPW-09	AQPW-10	AQPW-10
	Sample ID	AQPW-07-101922	AQPW-08-101922	AQPW-09-101922	AQPW-10-101922	DUP1-101922
	Sample Date	10/19/2022	10/19/2022	10/19/2022	10/19/2022	10/19/2022
	Sample Depth (feet)	2.76 - 3.76	2.58 - 3.58	2.5 - 3.5	3.07 - 4.07	3.07 - 4.07
Chemical	**Method**					
Carbon disulfide	SW8260D	10 U	20 U	100 U	200 U	100 U
Carbon tetrachloride (Tetrachloromethane)	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Chlorobenzene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Chloroethane	SW8260D	10 U	20 U	100 U	200 U	100 U
Chloroform	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Chloromethane	SW8260D	10 U	20 U	100 U	200 U	100 U
Cymene, p- (4-Isopropyltoluene)	SW8260D	**2.1 J**	**3.8 J**	**18 J**	**24 J**	**22 J**
Dibromochloromethane	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Dibromomethane	SW8260D	10 U	20 U	100 U	200 U	100 U
Dichlorodifluoromethane	SW8260D	10 U	20 U	100 U	200 U	100 U
Dichloromethane (Methylene chloride)	SW8260D	10 U	20 U	100 U	200 U	100 U
Diethyl ether	SW8260D	10 U	20 U	100 U	200 U	100 U
Diisopropylether (Isopropyl Ether)	SW8260D	10 U	20 U	100 U	200 U	100 U
Ethyl tert-butyl ether (ETBE)	SW8260D	10 U	20 U	100 U	200 U	100 U
Ethylbenzene	SW8260D	**60**	**250**	**1,500**	**1,600**	**1,600**
Ethylene dibromide (1,2-Dibromoethane)	SW8260D	10 U	20 U	100 U	200 U	100 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	SW8260D	3.0 U	6.0 U	30 U	60 U	30 U
Isopropylbenzene (Cumene)	SW8260D	**9.4 J**	**39**	**120**	**180 J**	**170**
m,p-Xylene	SW8260D	**22**	**23**	**970**	**1,300**	**1,300**
Methyl ethyl ketone (2-Butanone)	SW8260D	25 U	50 U	250 U	500 U	250 U
Methyl tert-butyl ether (MTBE)	SW8260D	10 U	20 U	100 U	200 U	100 U
Naphthalene	SW8260D	**570**	**1,200**	**7,300**	**9,900**	**9,400**
n-Butylbenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
n-Propylbenzene	SW8260D	**3.7 J**	**15 J**	**30 J**	**44 J**	**43 J**
o-Xylene	SW8260D	**25**	**66**	**730**	**790**	**820**
sec-Butylbenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
Styrene	SW8260D	5.0 U	10 U	50 U	100 U	50 U
tert-Amyl methyl ether (TAME)	SW8260D	10 U	20 U	100 U	200 U	100 U
tert-Butylbenzene	SW8260D	10 U	20 U	100 U	200 U	100 U
Tetrachloroethene (PCE)	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Tetrahydrofuran	SW8260D	10 U	20 U	100 U	200 U	100 U
Toluene	SW8260D	5.0 U	**3.5 J**	**40 J**	**34 J**	**33 J**
Total xylene (reported, not calculated)	SW8260D	**47**	**89**	**1,700**	**2,100**	**2,100**
Trichloroethene (TCE)	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Trichlorofluoromethane (Fluorotrichloromethane)	SW8260D	10 U	20 U	100 U	200 U	100 U
Vinyl chloride	SW8260D	5.0 U	10 U	50 U	100 U	50 U
Polycyclic Aromatic Hydrocarbons (porewater) (µg/L)						
2-Chloronaphthalene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
2-Methylnaphthalene	SW8270ESIM	**76.1**	**45.7**	**322**	**686**	**665**

Table 4
Porewater Sampling Results

	Location ID	AQPW-07	AQPW-08	AQPW-09	AQPW-10	AQPW-10
	Sample ID	AQPW-07-101922	AQPW-08-101922	AQPW-09-101922	AQPW-10-101922	DUP1-101922
	Sample Date	10/19/2022	10/19/2022	10/19/2022	10/19/2022	10/19/2022
	Sample Depth (feet)	2.76 - 3.76	2.58 - 3.58	2.5 - 3.5	3.07 - 4.07	3.07 - 4.07
Chemical	**Method**					
Acenaphthene	SW8270ESIM	**52.4**	**119**	**138**	**124**	**131**
Acenaphthylene	SW8270ESIM	**4.18 J**	**30.7**	20 U	20 U	20 U
Anthracene	SW8270ESIM	**6.49 J**	**7.39 J**	**4.23 J**	**6.44 J**	**6.24 J**
Benzo(a)anthracene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Benzo(a)pyrene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Benzo(b)fluoranthene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Benzo(g,h,i)perylene	SW8270ESIM	20 U	19 U	20 U	**3.13 J**	20 U
Benzo(k)fluoranthene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Chrysene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Dibenzo(a,h)anthracene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Fluoranthene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Fluorene	SW8270ESIM	**35.4**	**48.1**	**38.3**	**35.3**	**45.1**
Indeno(1,2,3-c,d)pyrene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Naphthalene	SW8270ESIM	**369**	**650**	**3,710**	**5,920**	**5,670**
Phenanthrene	SW8270ESIM	**54.3**	**49.2**	**33.3**	**34.3**	**36.7**
Pyrene	SW8270ESIM	20 U	19 U	20 U	20 U	20 U
Total PAH16		621.77	999.39	4033.83	6223.17	5999.04

Table 4
Porewater Sampling Results

Notes:

Bold: Detected result

J: Estimated value

U: Compound analyzed for, but not detected above detection limit

Total PAH16 calculated as the sum of the detected concentrations and 1/2 the detection limit for non-detect concentrations.

1. Source: Massachusetts Department of Environmental Protection, 2023. Massachusetts Contingency Plan (MCP) 310 CMR 40. September 1, 2023 (effective March 1, 2024).

2. GW-3 and M3CLs are being provided for context purposes only. Protectiveness of the remedy is in relation to risk-based concentrations.

Table 5
Summary of Vertical Hydraulic Conductivity Testing Results

Core ID	Sample Collection Depth Interval (feet)			Recovered Sample Length, z (feet)	Kv (cm/sec)	Midpoint Depth (feet)
	Top	Bottom	Interval Length, Z			
AQTD-S (0-3')	0	3	3	2.78	2.1E-04	1.5
AQTD-C (0-2')	0	2	2	2.04	6.1E-04	1
AQTD-N (0-3')	0	3	3	3.06	2.8E-05	1.5

Note:
1. Kv: Vertical hydraulic conductivity

Table 6
Transducer Wellpoint Installation Summary

Well ID	Date of Installation	Depth to Mudline (feet)	Depth to Water Outside Well (feet)	Depth to Water Inside Well (feet)	Top of Wellpoint to Bottom of Wellpoint (Inside) (feet)	Top of Deep to Top of Shallow Pipe (feet)	Well Screen Depth Interval (feet below grade)	Delta Z (feet below mudline)	Midpoint (feet below mudline)
AQTD-SD	11/3/2022	3.43	1.95	1.76	8.48	1.79	4-5	5.05	4.55
AQTD-SS	11/3/2022	1.7	0.13	0.15	1.74		NA		
AQTD-CD	11/3/2022	2.83	1.11	0.79	8.13	0.99	4-5	5.3	4.8
AQTD-CS	11/3/2022	1.88	0.12	0.12	1.74		NA		
AQTD-ND	11/3/2022	3.16	2.66	2.53	8.12	1.56	4-5	4.96	4.46
AQTD-NS	11/2/2022	1.61	1.11	1.1	1.72		NA		

Notes:
1. Delta Z: Vertical Separation.
2. Delta h: head difference over time
3. NA: not applicable

Table 7
Sheen Net Sampling Results

	Location ID	AQSN-121222
	Sample ID	AQSN-121222
	Sample Date	12/12/2022
Chemical	**Method**	**Results (Units For Each Parameter Are Noted)**
Alkylated PAHs (ng Abs)		
cis/trans-Decalin	8270E-SIM(M)	**81.1**
C1-Decalins	8270E-SIM(M)	**848**
C2-Decalins	8270E-SIM(M)	**3,530**
C3-Decalins	8270E-SIM(M)	**5,980**
C4-Decalins	8270E-SIM(M)	**22,600**
Naphthalene	8270E-SIM(M)	**1,000**
C1-Naphthalenes	8270E-SIM(M)	**7,770**
C2-Naphthalenes	8270E-SIM(M)	**37,600**
C3-Naphthalenes	8270E-SIM(M)	**38,100**
C4-Naphthalenes	8270E-SIM(M)	**16,900**
2-Methylnaphthalene	8270E-SIM(M)	**692**
1-Methylnaphthalene	8270E-SIM(M)	**11,700**
Benzothiophene	8270E-SIM(M)	**53.1**
C1-Benzo(b)thiophenes	8270E-SIM(M)	**817**
C2-Benzo(b)thiophenes	8270E-SIM(M)	**1,550**
C3-Benzo(b)thiophenes	8270E-SIM(M)	**2,390**
C4-Benzo(b)thiophenes	8270E-SIM(M)	**981**
Biphenyl	8270E-SIM(M)	**894**
2,6-Dimethylnaphthalene	8270E-SIM(M)	**18,200**
Dibenzofuran	8270E-SIM(M)	**915**
Acenaphthylene	8270E-SIM(M)	**1,450**
Acenaphthene	8270E-SIM(M)	**8,320**
2,3,5-Trimethylnaphthalene	8270E-SIM(M)	**2,630**
Fluorene	8270E-SIM(M)	**2,970**
C1-Fluorenes	8270E-SIM(M)	**4,210**
C2-Fluorenes	8270E-SIM(M)	**5,510**
C3-Fluorenes	8270E-SIM(M)	**2,730**
Dibenzothiophene	8270E-SIM(M)	**1,130**
4-Methyldibenzothiophene(4MDT)	8270E-SIM(M)	**1,130**
2/3-Methyldibenzothiophene(2MDT)	8270E-SIM(M)	**1,540**
1-Methyldibenzothiophene(1MDT)	8270E-SIM(M)	**228**
C1-Dibenzothiophenes BS	8270E-SIM(M)	**3,110**
C2-Dibenzothiophenes	8270E-SIM(M)	**2,360**
C3-Dibenzothiophenes	8270E-SIM(M)	**1,200**
C4-Dibenzothiophenes	8270E-SIM(M)	**402**
Phenanthrene	8270E-SIM(M)	**9,000**
3-Methylphenanthrene (3MP)	8270E-SIM(M)	**2,490**
2-Methylphenanthrene (2MP)	8270E-SIM(M)	**2,790**
2-Methylanthracene (2MA)	8270E-SIM(M)	**1,010**
9/4-Methylphenanthrene (9MP)	8270E-SIM(M)	**2,580**
C1-Phenanthrenes/Anthracenes	8270E-SIM(M)	**10,500**
C2-Phenanthrenes/Anthr BS	8270E-SIM(M)	**7,090**
C3-Phenanthrenes/Anthracenes	8270E-SIM(M)	**2,760**
C4-Phenanthrenes/Anthracenes	8270E-SIM(M)	**884**
Retene	8270E-SIM(M)	5.16 U
Anthracene	8270E-SIM(M)	**2,570**
Carbazole	8270E-SIM(M)	**34.4**
1-Methylphenanthrene	8270E-SIM(M)	**2,280**
Fluoranthene	8270E-SIM(M)	**3,300**
Benzo(b)fluorene	8270E-SIM(M)	**1,060**
7H-Benzo(c)fluorene	8270E-SIM(M)	**412**
2-Methylpyrene	8270E-SIM(M)	**914**
4-Methylpyrene	8270E-SIM(M)	**863**
1-Methylpyrene	8270E-SIM(M)	**1,030**
Pyrene	8270E-SIM(M)	**5,710**
C1-Fluoranthenes/Pyrenes	8270E-SIM(M)	**6,640**
C2-Fluoranthenes/Pyrenes	8270E-SIM(M)	**4,230**
C3-Fluoranthenes/Pyrenes	8270E-SIM(M)	**2,070**
C4-Fluoranthenes/Pyrenes	8270E-SIM(M)	**404**
Naphthobenzothiophenes	8270E-SIM(M)	**1,220**
C1-Naphthobenzothiophenes	8270E-SIM(M)	**1,370**
C2-Naphthobenzothiophenes	8270E-SIM(M)	**629**
C3-Naphthobenzothiophenes	8270E-SIM(M)	**342**
C4-Naphthobenzothiophenes	8270E-SIM(M)	**178**
Benz(a)anthracene	8270E-SIM(M)	**2,960**

Table 7
Sheen Net Sampling Results

	Location ID	AQSN-121222
	Sample ID	AQSN-121222
	Sample Date	12/12/2022
Chemical	**Method**	**Results (Units For Each Parameter Are Noted)**
Chrysene	8270E-SIM(M)	**2,950**
C1-Chrysenes	8270E-SIM(M)	**1,960**
C2-Chrysenes BS	8270E-SIM(M)	**1,090**
C3-Chrysenes	8270E-SIM(M)	**558**
C4-Chrysenes	8270E-SIM(M)	2.54 U
Benzo(b)fluoranthene	8270E-SIM(M)	**635**
Benzo(j)+(k)fluoranthene	8270E-SIM(M)	**669**
Benzo(a)fluoranthene	8270E-SIM(M)	**355**
Benzo(e)pyrene	8270E-SIM(M)	**636**
Benzo(a)pyrene	8270E-SIM(M)	**1,190**
Perylene	8270E-SIM(M)	**144**
Indeno(1,2,3-cd)pyrene	8270E-SIM(M)	**434**
Dibenz(a,h)+(a,c)anthracene	8270E-SIM(M)	**170**
Benzo(g,h,i)perylene	8270E-SIM(M)	**446**
Alkylated PAH Surrogates (% Recovery)		
Naphthalene-d8	8270E-SIM(M)	59
Phenanthrene-d10	8270E-SIM(M)	58
Benzo(a)pyrene-d12	8270E-SIM(M)	49
Petroleum Hydrocarbons (µg Abs)		
n-Nonane (C9)	8015D(M)	0.297 U
n-Decane (C10)	8015D(M)	**0.381 J**
n-Undecane (C11)	8015D(M)	**0.594 J**
n-Dodecane (C12)	8015D(M)	**1.3**
n-Tridecane (C13)	8015D(M)	**5.32**
2,6,10-Trimethyldodecane (1380)	8015D(M)	**19.3**
n-Tetradecane (C14)	8015D(M)	**5.62**
2,6,10-Trimethyltridecane (1470)	8015D(M)	**38.9**
n-Pentadecane (C15)	8015D(M)	0.119 U
n-Hexadecane (C16)	8015D(M)	**10.5**
Norpristane (1650)	8015D(M)	**34.5**
n-Heptadecane (C17)	8015D(M)	**4.63**
Pristane	8015D(M)	**57.2**
n-Octadecane (C18)	8015D(M)	0.201 U
Phytane	8015D(M)	**23.2**
n-Nonadecane (C19)	8015D(M)	0.257 U
n-Eicosane (C20)	8015D(M)	0.142 U
n-Heneicosane (C21)	8015D(M)	0.120 U
n-Docosane (C22)	8015D(M)	**0.548 J**
n-Tricosane (C23)	8015D(M)	**1.76**
n-Tetracosane (C24)	8015D(M)	**4.4**
n-Pentacosane (C25)	8015D(M)	**7.23**
n-Hexacosane (C26)	8015D(M)	**8.11**
n-Heptacosane (C27)	8015D(M)	**7.95**
n-Octacosane (C28)	8015D(M)	**7.11**
n-Nonacosane (C29)	8015D(M)	**9.66**
n-Triacontane (C30)	8015D(M)	**4.18**
n-Hentriacontane (C31)	8015D(M)	**2.68**
n-Dotriacontane (C32)	8015D(M)	**1.31**
n-Tritriacontane (C33)	8015D(M)	**0.770 J**
n-Tetratriacontane (C34)	8015D(M)	**0.507 J**
n-Pentatriacontane (C35)	8015D(M)	**0.391 J**
n-Hexatriacontane (C36)	8015D(M)	**0.264 J**
n-Heptatriacontane (C37)	8015D(M)	**0.323 J**
n-Octatriacontane (C38)	8015D(M)	0.233 U
n-Nonatriacontane (C39)	8015D(M)	0.325 U
n-Tetracontane (C40)	8015D(M)	0.325 U
Total Petroleum Hydrocarbons (C9-C44)	8015D(M)	**3,770**
Total Saturated Hydrocarbons	8015D(M)	**259 J**
Petroleum Hydrocarbons Surrogates (% Recovery)		
ortho-terphenyl	8015D(M)	88
d50-Tetracosane	8015D(M)	82

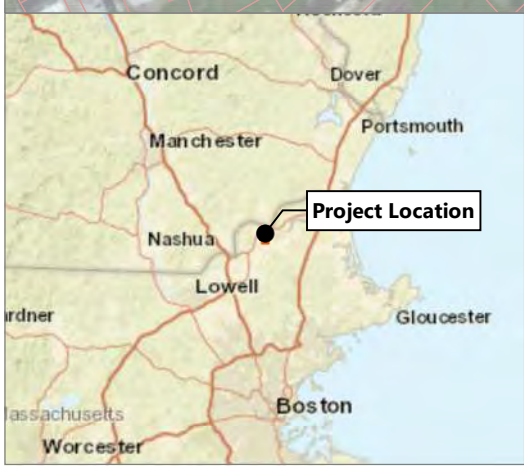
Notes:

Bold: Detected result

J: Estimated value

U: Compound analyzed for, but not detected above detection limit

Figure



LEGEND:

Project Location

Tax Parcel

NOTES:

1. Horizontal datum is Massachusetts State Plane, North American Datum of 1983, U.S. Feet.
2. Aerial image is acquired from MassGIS at https://www.mass.gov/info-details/massgis-data-layers. Image date is 2019.
3. Tax parcels acquired from MassGIS at https://massgis.maps.arcgis.com on August 27, 2019.

ANCHOR QEA

Figure 1
Site Location Map
Phase IV Remedy Implementation Plan – Little River
Former Haverhill MGP Site

Appendix A
Transmittal Form BWSC-108

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC 108

Release Tracking Number
3 - 32792

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

A. SITE LOCATION:

1. Site Name: HAFFNER'S

2. Street Address: 284 WINTER STREET

3. City/Town: HAVERHILL 4. ZIP Code: 018300000

☑ 5. Check here if the disposal site that is the source of the release is Tier Classified. Check the current Tier Classification Category:

☑ a. Tier I ☐ b. Tier ID ☐ c. Tier II

B. THIS FORM IS BEING USED TO: (check all that apply)

☐ 1. Submit a **Phase I Completion Statement,** pursuant to 310 CMR 40.0484.

☐ 2. Submit a **Revised Phase I Completion Statement,** pursuant to 310 CMR 40.0484.

☐ 3. Submit a **Phase II Scope of Work,** pursuant to 310 CMR 40.0834.

☐ 4. Submit an **interim Phase II Report.** This report does not satisfy the response action deadline requirements in 310 CMR 40.0500.

☐ 5. Submit a **final Phase II Report and Completion Statement,** pursuant to 310 CMR 40.0836.

☐ 6. Submit a **Revised Phase II Report and Completion Statement,** pursuant to 310 CMR 40.0836.

☐ 7. Submit a **Phase III Remedial Action Plan and Completion Statement,** pursuant to 310 CMR 40.0862.

☑ 8. Submit a **Revised Phase III Remedial Action Plan and Completion Statement,** pursuant to 310 CMR 40.0862.

☑ 9. Submit a **Phase IV Remedy Implementation Plan,** pursuant to 310 CMR 40.0874.

☐ 10. Submit a **Modified Phase IV Remedy Implementation Plan,** pursuant to 310 CMR 40.0874.

☐ 11. Submit an **As-Built Construction Report,** pursuant to 310 CMR 40.0875.

☐ 12. Submit a **Phase IV Status Report,** pursuant to 310 CMR 40.0877.

☐ 13. Submit a **Phase IV Completion Statement,** pursuant to 310 CMR 40.0878 and 40.0879.

Specify the outcome of Phase IV activities: (check one)

☐ a. Phase V Operation, Maintenance or Monitoring of the Comprehensive Remedial Action is necessary to achieve a Permanent or Temporary Solution.

☐ b. The requirements of a Permanent Solution have been met. A completed Permanent Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Temporary Solution have been met. A completed Temporary Solution Statement and Report (BWSC104) will be submitted to DEP.

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B. THIS FORM IS BEING USED TO (cont.): (check all that apply)

☐ 14. Submit a **Revised Phase IV Completion Statement,** pursuant to 310 CMR 40.0878 and 40.0879.

☐ 15. Submit a **Phase V Status Report,** pursuant to 310 CMR 40.0892.

☐ 16. Submit a **Remedial Monitoring Report.** (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☐ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

☐ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.

☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.

☐ iii. A Remedial Monitoring Report(s) submitted every six months, concurrent with a Status Report.

☐ iv. A Remedial Monitoring Report(s) submitted, concurrent with a Status Report.

c. Status of Site: (check one) ☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Temporary Solution

d. Number of Remedial Systems and/or Monitoring Programs: _____

A separate BWSC108A, CRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 17. Submit a **Remedy Operation Status,** pursuant to 310 CMR 40.0893.

☐ 18. Submit a **Status Report to maintain a Remedy Operation Status,** pursuant to 310 CMR 40.0893(2).

☐ 19. Submit a **Transfer and/or a Modification of Persons Maintaining a Remedy Operation Status (ROS),** pursuant to 310 CMR 40.0893(5) (check one, or both, if applicable).

☐ a. Submit a Transfer of Persons Maintaining an ROS (the transferee should be the person listed in Section D, "Person Undertaking Response Actions").

☐ b. Submit a Modification of Persons Maintaining an ROS (the primary representative should be the person listed in Section D, "Person Undertaking Response Actions").

c. Number of Persons Maintaining an ROS not including the primary representative: _____

☐ 20. Submit a **Termination of a Remedy Operation Status,** pursuant to 310 CMR 40.0893(6).(check one)

☐ a. Submit a notice indicating ROS performance standards have not been met. A plan and timetable pursuant to 310 CMR 40.0893(6)(b) for resuming the ROS are attached.

☐ b. Submit a notice of Termination of ROS.

☐ 21. Submit a **Phase V Completion Statement,** pursuant to 310 CMR 40.0894.

Specify the outcome of Phase V activities: (check one)

☐ a. The requirements of a Permanent Solution have been met. A completed Permanent Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ b. The requirements for a Temporary Solution have been met. A completed Temporary Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ 22. Submit a **Revised Phase V Completion Statement,** pursuant to 310 CMR 40.0894.

☐ 23. Submit a **Temporary Solution Status Report,** pursuant to 310 CMR 40.0898.

☐ 24. Submit a **Plan for the Application of Remedial Additives** near a sensitive receptor, pursuant to 310 CMR 40.0046(3).

a. Status of Site: (check one)

☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Temporary Solution

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C. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that a* ***Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement*** *and/or a* ***Termination of a Remedy Operation Status*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that a* ***Phase II Scope of Work*** *or a* ***Phase IV Remedy Implementation Plan*** *is being submitted,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that an* ***As-Built Construction Report,*** *a* ***Remedy Operation Status,*** *a* ***Phase IV, Phase V or Temporary Solution Status Report,*** *a* ***Status Report to Maintain a Remedy Operation Status,*** *a* ***Transfer or Modification of Persons Maintaining a Remedy Operation Status*** *and/or a* ***Remedial Monitoring Report*** *is being submitted,* the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

DRAFT COPY

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP#: 6891
2. First Name: CHARLES A
3. Last Name: LINDBERG
4. Telephone: 7812783830
5. Ext.:
6. Email: charles.lindberg@gza.com
7. Signature:
8. Date: (mm/dd/yyyy)
9. LSP Stamp:

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT
Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

D. PERSON UNDERTAKING RESPONSE ACTIONS:

1. Check all that apply: ☐ a. change in contact name ☑ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: BOSTON GAS COMPANY

3. Contact First Name: JESSE 4. Last Name: EDMANDS

5. Street: 170 DATA DRIVE 6. Title: PROGRAM MANAGER

7. City/Town: WALTHAM 8. State: MA 9. ZIP Code: 024512222

10. Telephone: 7819073682 11. Ext: 12. Email: jesse.edmands@nationalgrid.com

E. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTIONS: ☐ Check here to change relationship

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions Specify Relationship:

F. REQUIRED ATTACHMENT AND SUBMITTALS:

DRAFT COPY

☑ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of any Phase Reports to DEP.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase III Remedial Action Plan.

☑ 4. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase IV Remedy Implementation Plan.

☐ 5. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of any field work involving the implementation of a Phase IV Remedial Action.

☐ 6. If submitting a Transfer of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for the person making this submittal (transferee) is attached.

☐ 7. If submitting a Modification of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for each new person making this submittal is attached.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Release Address/Location Aid. Send corrections to: BWSC.eDEP@Mass.Gov.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data including, but not limited to: pressure measurements, maps, graphs, or diagrams, and other information is attached.

G. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTIONS:

1. I, _____, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

>*if Section B indicates that this is a* **Modification of a Remedy Operation Status (ROS),** I attest under the pains and penalties of perjury that I am fully authorized to act on behalf of all persons performing response actions under the ROS as stated in 310 CMR 40.0893(5)(d) to receive oral and written correspondence from MassDEP with respect to performance of response actions under the ROS, and to receive a statement of fee amount as per 4.03(3).

I understand that any material received by the Primary Representative from MassDEP shall be deemed received by all the persons performing response actions under the ROS, and I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate or incomplete information.

2. By: _____ (Signature) 3. Title: PROGRAM MANAGER

4. For: BOSTON GAS COMPANY (Name of person or entity recorded in Section D) 5. Date: _____ (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section D.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. Email: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

DRAFT COPY

Date Stamp (DEP USE ONLY:)

ATTACHMENT TO BWSC108 FORM, RTN 3-32792 (June 2024)

Statement Pursuant to Section F, Item 1.

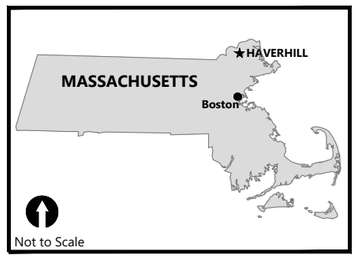
The Phase III work under Release Tracking Number (RTN) 3-32792 is subject to an Administrative Consent Order and Notice of Noncompliance (ACO Enforcement Document Number: 00009941NT) dated October 2, 2020 between the Massachusetts Department of Environmental Protection (MassDEP) and National Grid and modified on May 23, 2023.

Appendix B
Engineering Drawings

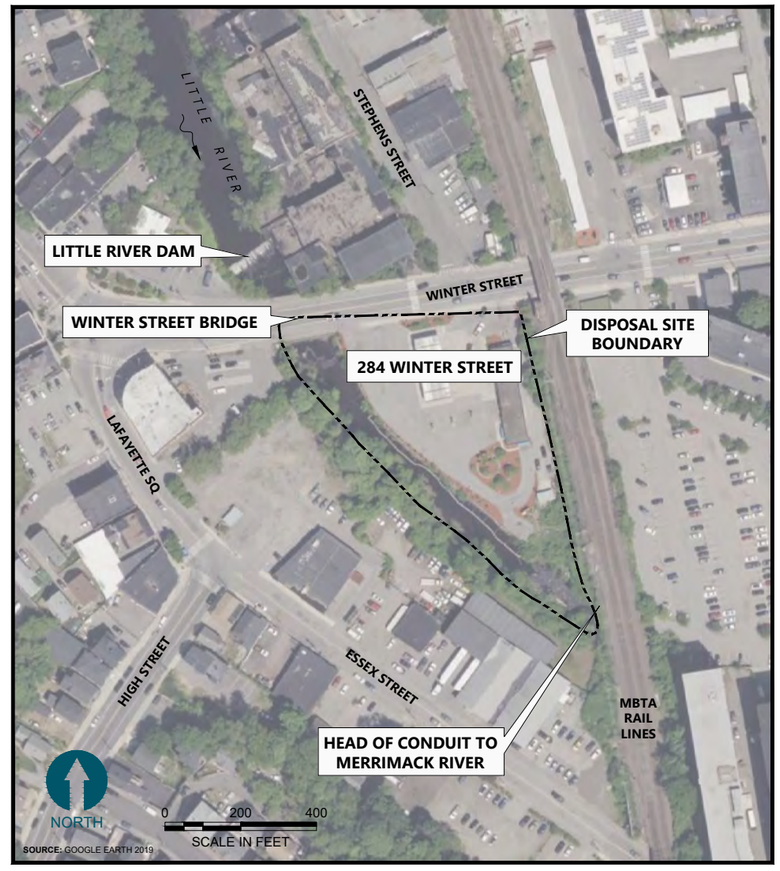
FORMER HAVERHILL MGP SITE - LITTLE RIVER

NATIONAL GRID

PROJECT LOCATION



VICINITY MAP



DRAWING INDEX

SHEET SEQUENCE	SHEET ID	SHEET TITLE
1.	T-1	TITLE SHEET AND INDEX
2.	T-2	GENERAL NOTES AND LEGEND
3.	E-1	EXISTING CONDITIONS
4.	E-2	SITE INVESTIGATIONS
5.	S-1	SITE PREPARATION - STAGING AREA
6.	S-2	SITE PREPARATION - LITTLE RIVER
7.	C-1	DREDGE PLAN
8.	C-2	CAPPING PLAN
9.	C-3	CONCEPTUAL CROSS SECTIONS
10.	R-1	SITE RESTORATION PLAN
11.	D-1	DETAILS (1 OF 3)
12.	D-2	DETAILS (2 OF 3)
13.	D-3	DETAILS (3 OF 3)

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

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Jun 12, 2024 12:27pm dbinkney

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

TITLE SHEET

T-1

SHEET # 1 OF 13

GENERAL NOTES

1. ANY ON-SITE PERSONNEL HAS THE AUTHORITY TO STOP WORK ACTIVITIES IF QUESTIONABLE OR UNSAFE PRACTICES OR CONDITIONS ARE OBSERVED PER SPECIFICATION SECTION 01 14 00 - WORK RESTRICTIONS AND SEQUENCE. CONTRACTOR SHALL TAKE PRECAUTIONS TO ADDRESS THE PRACTICES OR CONDITIONS TO THE SATISFACTION OF OWNER AND ENGINEER PRIOR TO RESTARTING WORK. FAILURE TO STOP WORK WILL NOT BE TOLERATED AND MAY RESULT IN PERSONNEL BEING BANNED FROM THE SITE AND REPLACED BY CONTRACTOR OR TERMINATION OF CONTRACTOR ENTIRELY AT NO ADDITIONAL COST TO OWNER.
2. ALL BASEMAP INFORMATION CAN ONLY BE CONSIDERED AS INDICATING THE CONDITIONS EXISTING AT THE TIME OF THE SURVEYS. REUSE OF THIS INFORMATION BY CONTRACTOR(S) OR OTHERS BEYOND THE SPECIFIC SCOPES OF WORK FOR WHICH CONTRACTOR WAS RETAINED SHALL BE AT THE SOLE RISK OF CONTRACTOR.
3. CONTRACTOR SHALL FIELD VERIFY EXISTING CONDITIONS WITHIN THE LIMITS OF WORK AND DETERMINE THE APPROPRIATE QUANTITIES AND REQUIRED MATERIALS TO COMPLETE THE WORK AS PRESENTED IN THE CONTRACT.
4. LOCATIONS OF UTILITIES ARE APPROXIMATE AND NOT ALL UTILITIES MAY BE SHOWN. CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL UTILITIES BOTH UNDERGROUND AND OVERHEAD.
5. LOCATIONS OF CATCH BASINS AND OUTFALLS ARE APPROXIMATE AND BASED ON CITY OF HAVERHILL ENGINEERING DIVISION PLAN - 284 WINTER STREET UTILITY PLAN. PRODUCED IN SEPTEMBER 2016.
6. CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL EXISTING STRUCTURES, OUTFALLS, BUILDINGS, AND UTILITIES. ANY DAMAGE TO EXISTING STRUCTURES ARE TO BE REPAIRED BY CONTRACTOR WITHOUT ADDITIONAL COST TO THE OWNER.
7. CROSS SECTIONS ARE DEPICTED FOR ILLUSTRATIVE PURPOSES ONLY.
8. DREDGING SHALL BE CONDUCTED TO WITHIN A SAFE DISTANCE FROM THE EXISTING RETAINING WALL AND WILL BE FIELD-VERIFIED BY CONTRACTOR AND ENGINEER.
9. THE DESIGN FOR DREDGING AND/OR CAPPING PRESENTED ON THESE DRAWINGS MAY BE SUBJECT TO CHANGE BASED ON ADDITIONAL DATA COLLECTION. ENGINEER WILL PROVIDE DIRECTION TO THE CONTRACTOR IF THERE ARE ANY CHANGES TO THE WORK.
10. CONSTRUCTION SHALL COMMENCE DURING THE SEASONAL LOW-FLOW PERIOD (JULY 1 THROUGH OCTOBER 31). MOBILIZATION MAY BEGIN BEFORE JULY 1, BUT NO IN-RIVER WORK IS PERMITTED BEFORE JULY 1.

SOURCES

1. TOPOGRAPHIC/BATHYMETRIC SURVEY AND AERIAL DRONE IMAGE BY HYDRO DATA, INC. (SEPTEMBER 2022).
2. 284 WINTER STREET PROPERTY BOUNDARY FROM ALTA SURVEY BY MHF DESIGN CONSULTANTS. (2015).
3. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

PROJECT DATUMS

1. HORIZONTAL DATUM: NORTH AMERICAN DATUM OF 1983 (NAD83) MASSACHUSETTS STATE PLANE, MAINLAND ZONE, U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988, FEET.

PLAN VIEW LEGEND (SHEETS E-1 THROUGH C-2):

- 25 — EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- APPARENT COAL TAR COATING OR TAR IMPACTED SEDIMENT
- EROSION AND SEDIMENTATION CONTROLS (STRAW WATTLES OR HAY BALES)
- JERSEY BARRIERS
- STAGING AREA (INCLUDES TRUCK ACCESS, LOADING AND UNLOADING AREA, ADMINISTRATIVE AREAS, AND CLEAN MATERIAL STOCKPILING)
- SEDIMENT PROCESSING AREA
- CRANE STAGING AREA
- SEMI-PERMANENT OIL BOOMS
- EXTENTS OF PROPOSED DREDGING
- 10 — PROPOSED DREDGE DESIGN SURFACE CONTOURS (1-FOOT INTERVAL)
- EXTENTS OF PROPOSED UPSTREAM CAP
- EXTENTS OF PROPOSED MIDSTREAM CAP
- EXTENTS OF PROPOSED DOWNSTREAM CAP
- A / C-3 — CROSS SECTIONS

CONCEPTUAL CROSS SECTIONS LEGEND (SHEET C-3):

- EXISTING GROUND SURFACE
- PROPOSED DREDGE DESIGN SURFACE
- PROPOSED ALLOWABLE 0.5 FT. OVERDREDGE SURFACE
- CAP MATERIAL
- 1 / D-1 — DETAIL

DETAILS LEGEND (SHEETS D-1 AND D-2):

- EXISTING GROUND SURFACE
- POST-DREDGE GROUND SURFACE
- REACTIVE CORE MATS
- CHEMICAL ISOLATION LAYERS (CIL 1 AND CIL 2)
- FILTER MATERIAL
- ARMOR MATERIAL

SITE INVESTIGATIONS LEGEND (SHEET E-3)

MW-1	LESSARD MONITORING WELL (NOV. 2014)
ENV-3B	RAMBOLL SOIL SAMPLE LOCATION (APRIL 2015)
ENV-9B	RAMBOLL TAR SAMPLE LOCATION (APRIL 2015)
ENV-1MW	RAMBOLL MONITORING WELL (APRIL 2015)
NFSB-03	TECHNICAL DRILLING SERVICES (TDS) SOIL BORING LOCATION (OCT. 2017)
NFSB-02(MW)	TDS MONITORING WELL (OCT. 2017)
B101	GEOSEARCH SOIL SAMPLE LOCATION (JAN. 2020)
B102	GEOSEARCH MONITORING WELL (JAN. 2020)
1A	GZA SEDIMENT SAMPLE LOCATION (JUNE 2020)
GZA-1	GEOSEARCH MONITORING WELL (SEPT. - OCT. 2020)
AQSS-03	ANCHOR QEA SEDIMENT SAMPLE LOCATION (SEPT. 2021)
AQHA-01	ANCHOR QEA SEDIMENT HAND AUGER LOCATION (SEPT. 2022)
B201	GEOSEARCH SOIL SAMPLE LOCATION (SEPT. 2022)
AQPW-01	ANCHOR QEA POREWATER SAMPLE LOCATION (OCT. 2022)
AQTD-N	ANCHOR QEA SEEPAGE SAMPLE LOCATION (NOV. 2022)
AQSN-121222	ANCHOR QEA SHEEN NET SAMPLE LOCATION (DEC. 2022)
AQTD-UP	ANCHOR QEA TRANSDUCER LOCATION (DEC. 2022)
B205-MW	GZA MONITORING WELL (MARCH 2023)
AQPW-10	ANCHOR QEA POREWATER SAMPLE LOCATION (MAY 2024)
SW-5-BASE	ANCHOR QEA SURFACE WATER SAMPLE LOCATION (MAY 2024)

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH — AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

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Jun 12, 2024 1:00pm dbinkney

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

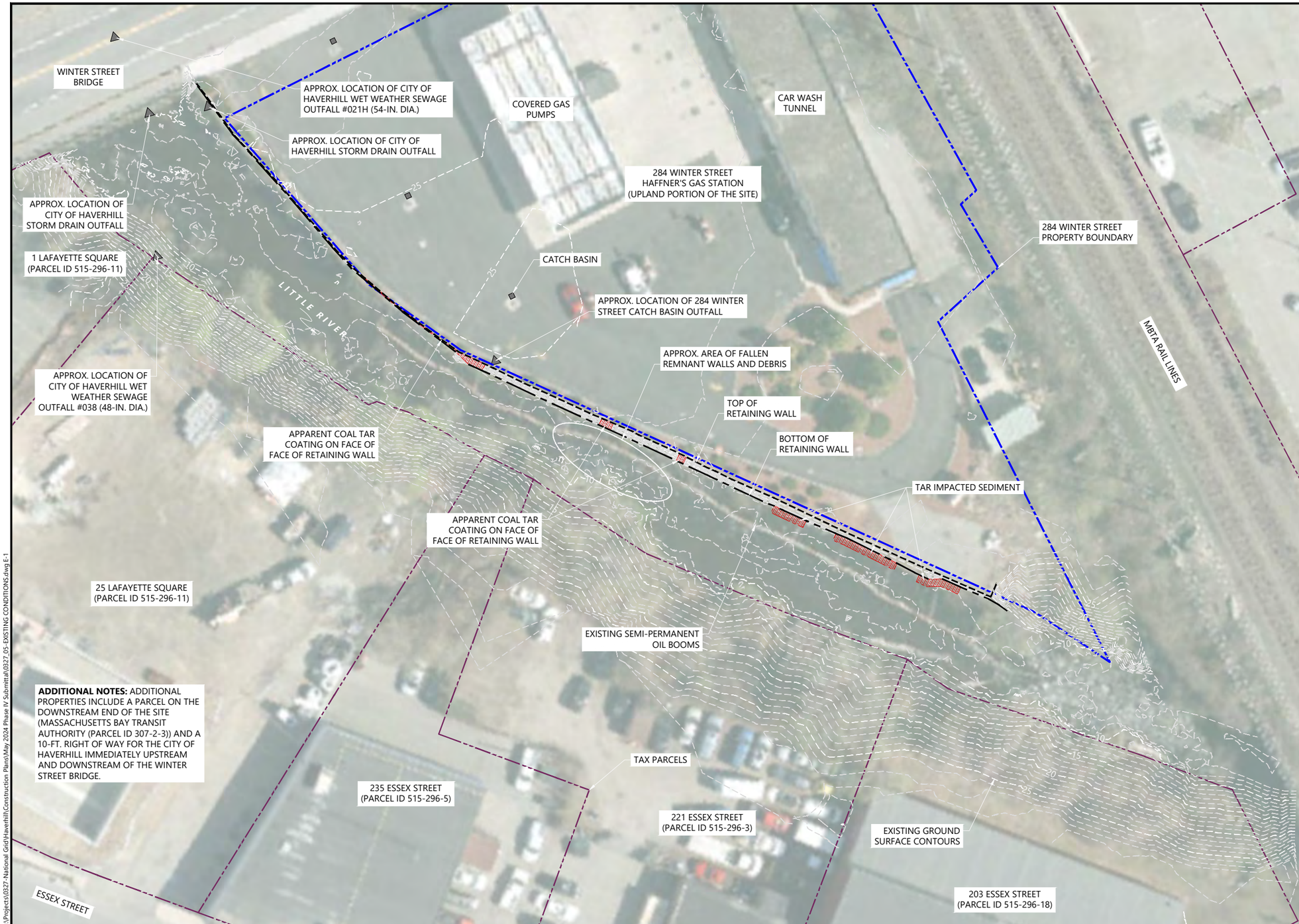
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

GENERAL NOTES AND LEGEND

T-2

SHEET # 2 OF 13



ADDITIONAL NOTES: ADDITIONAL PROPERTIES INCLUDE A PARCEL ON THE DOWNSTREAM END OF THE SITE (MASSACHUSETTS BAY TRANSIT AUTHORITY (PARCEL ID 307-2-3)) AND A 10-FT. RIGHT OF WAY FOR THE CITY OF HAVERHILL IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE WINTER STREET BRIDGE.

LEGEND:

- EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- APPARENT COAL TAR COATING OR TAR IMPACTED SEDIMENT

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
3. TOPOGRAPHIC/BATHYMETRIC SURVEY AND AERIAL DRONE IMAGE BY HYDRO DATA, INC. (SEPTEMBER 2022).
4. 284 WINTER STREET PROPERTY BOUNDARY FROM ALTA SURVEY BY MHF DESIGN CONSULTANTS. (2015).
5. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

NORTH

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SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

EXISTING CONDITIONS

E-1

SHEET # 3 OF 13

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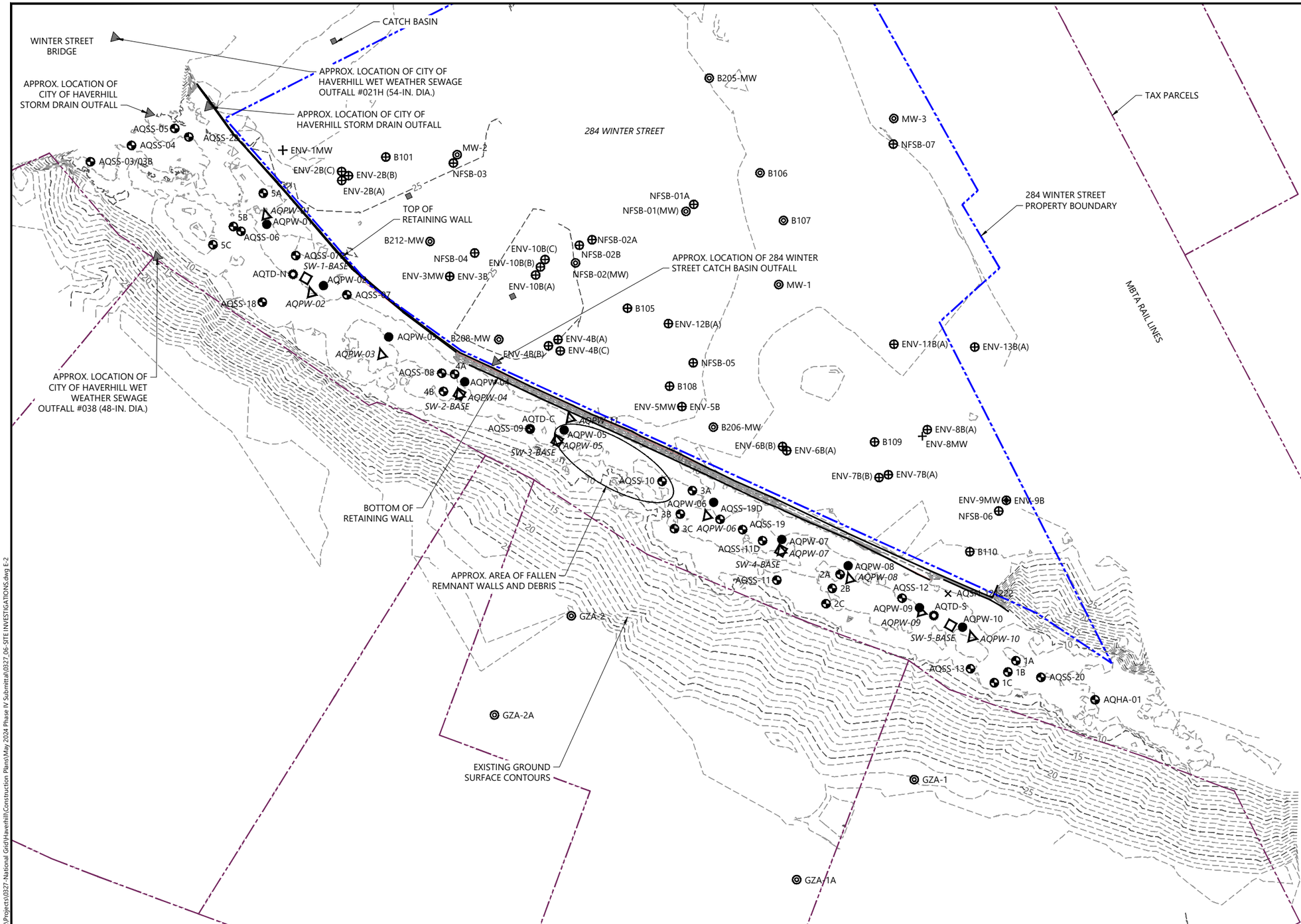

LEGEND:

SEE SHEET T-2 FOR GENERAL LEGEND ITEMS

MW-1	LESSARD MONITORING WELL (NOV. 2014)
ENV-3B	RAMBOLL SOIL SAMPLE LOCATION (APRIL 2015)
ENV-9B	RAMBOLL TAR SAMPLE LOCATION (APRIL 2015)
ENV-1MW	RAMBOLL MONITORING WELL (APRIL 2015)
NFSB-03	TECHNICAL DRILLING SERVICES (TDS) SOIL BORING LOCATION (OCT. 2017)
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B102	GEOSEARCH MONITORING WELL (JAN. 2020)
1A	GZA SEDIMENT SAMPLE LOCATION (JUNE 2020)
GZA-1	GEOSEARCH MONITORING WELL (SEPT. - OCT. 2020)
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B201	GEOSEARCH SOIL SAMPLE LOCATION (SEPT. 2022)
AQPW-01	ANCHOR QEA POREWATER SAMPLE LOCATION (OCT. 2022)
AQTD-N	ANCHOR QEA SEEPAGE SAMPLE LOCATION (NOV. 2022)
AQSN-121222	ANCHOR QEA SHEEN NET SAMPLE LOCATION (DEC. 2022)
AQTD-UP	ANCHOR QEA TRANSDUCER LOCATION (DEC. 2022)
B205-MW	GZA MONITORING WELL (MARCH 2023)
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NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
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NORTH

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SCALE IN FEET

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DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

SITE INVESTIGATIONS

E-2

SHEET # 4 OF 13

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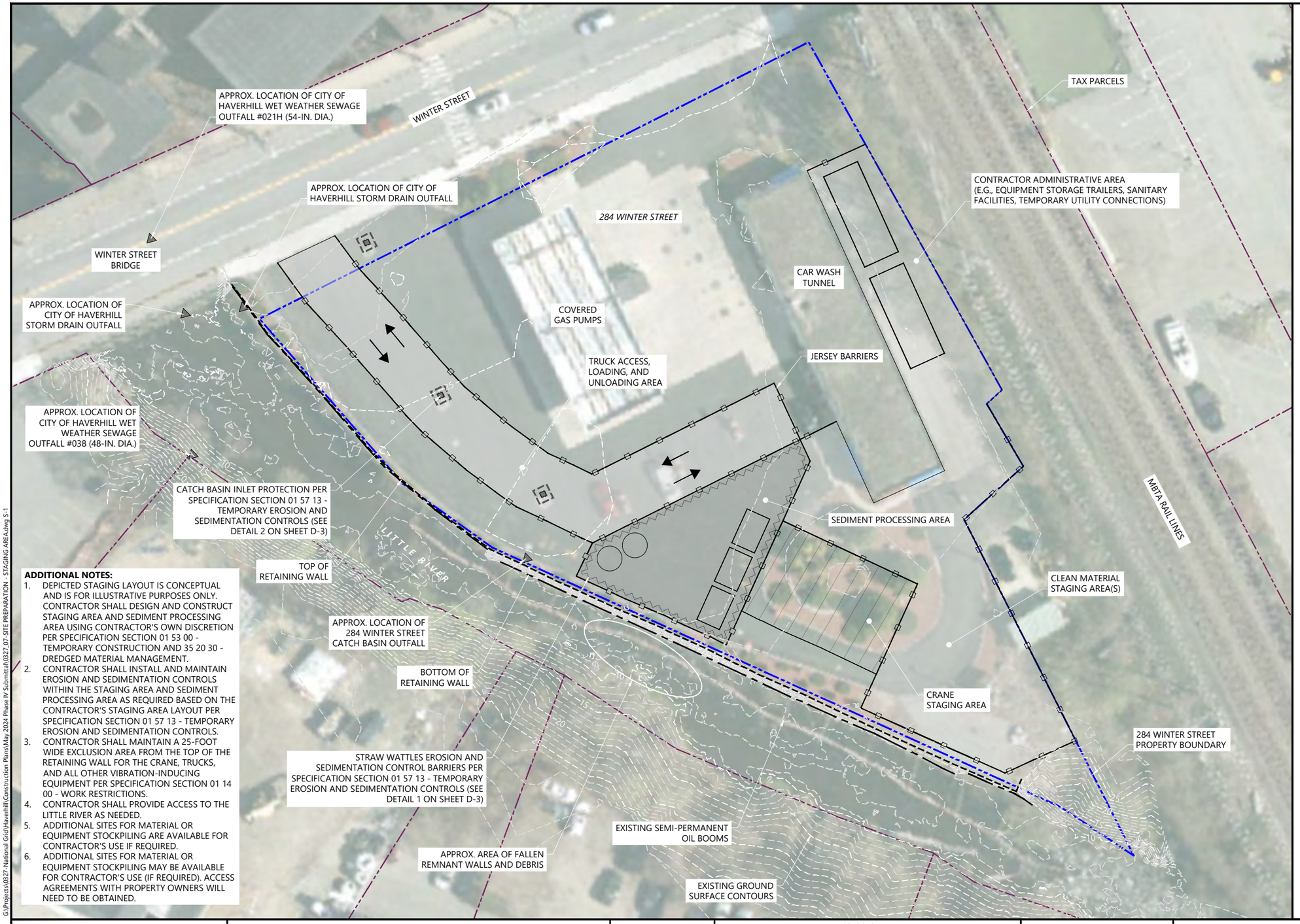
Jun 12, 2024 1:21pm dbinkney



ADDITIONAL NOTES:

1. DEPICTED STAGING LAYOUT IS CONCEPTUAL AND IS FOR ILLUSTRATIVE PURPOSES ONLY. CONTRACTOR SHALL DESIGN AND CONSTRUCT STAGING AREA AND SEDIMENT PROCESSING AREA USING CONTRACTOR'S OWN DISCRETION PER SPECIFICATION SECTION 01 53 00 - TEMPORARY CONSTRUCTION AND 35 20 30 - DREDGED MATERIAL MANAGEMENT.
2. CONTRACTOR SHALL INSTALL AND MAINTAIN EROSION AND SEDIMENTATION CONTROLS WITHIN THE STAGING AREA AND SEDIMENT PROCESSING AREA AS REQUIRED BASED ON THE CONTRACTOR'S STAGING AREA LAYOUT PER SPECIFICATION SECTION 01 57 13 - TEMPORARY EROSION AND SEDIMENTATION CONTROLS.
3. CONTRACTOR SHALL MAINTAIN A 25-FOOT WIDE EXCLUSION AREA FROM THE TOP OF THE RETAINING WALL FOR THE CRANE, TRUCKS, AND ALL OTHER VIBRATION-INDUCING EQUIPMENT PER SPECIFICATION SECTION 01 14 00 - WORK RESTRICTIONS.
4. CONTRACTOR SHALL PROVIDE ACCESS TO THE LITTLE RIVER AS NEEDED.
5. ADDITIONAL SITES FOR MATERIAL OR EQUIPMENT STOCKPILING ARE AVAILABLE FOR CONTRACTOR'S USE IF REQUIRED.
6. ADDITIONAL SITES FOR MATERIAL OR EQUIPMENT STOCKPILING MAY BE AVAILABLE FOR CONTRACTOR'S USE (IF REQUIRED). ACCESS AGREEMENTS WITH PROPERTY OWNERS WILL NEED TO BE OBTAINED.

LEGEND:

- EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- EROSION AND SEDIMENTATION CONTROLS (STRAW WATTLES OR HAY BALES)
- JERSEY BARRIERS
- STAGING AREA (INCLUDES TRUCK ACCESS, LOADING AND UNLOADING AREA, ADMINISTRATIVE AREAS, AND CLEAN MATERIAL STOCKPILING)
- SEDIMENT PROCESSING AREA
- CRANE STAGING AREA

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
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NORTH

0 20 40

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ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

G:\Projects\0327-National Grid\Haverhill\Construction Plans\May 2024 Phase IV Submittal\0327_07-SITE PREPARATION - STAGING AREA.dwg S-1

Jun 12, 2024 1:27pm dbinkney

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

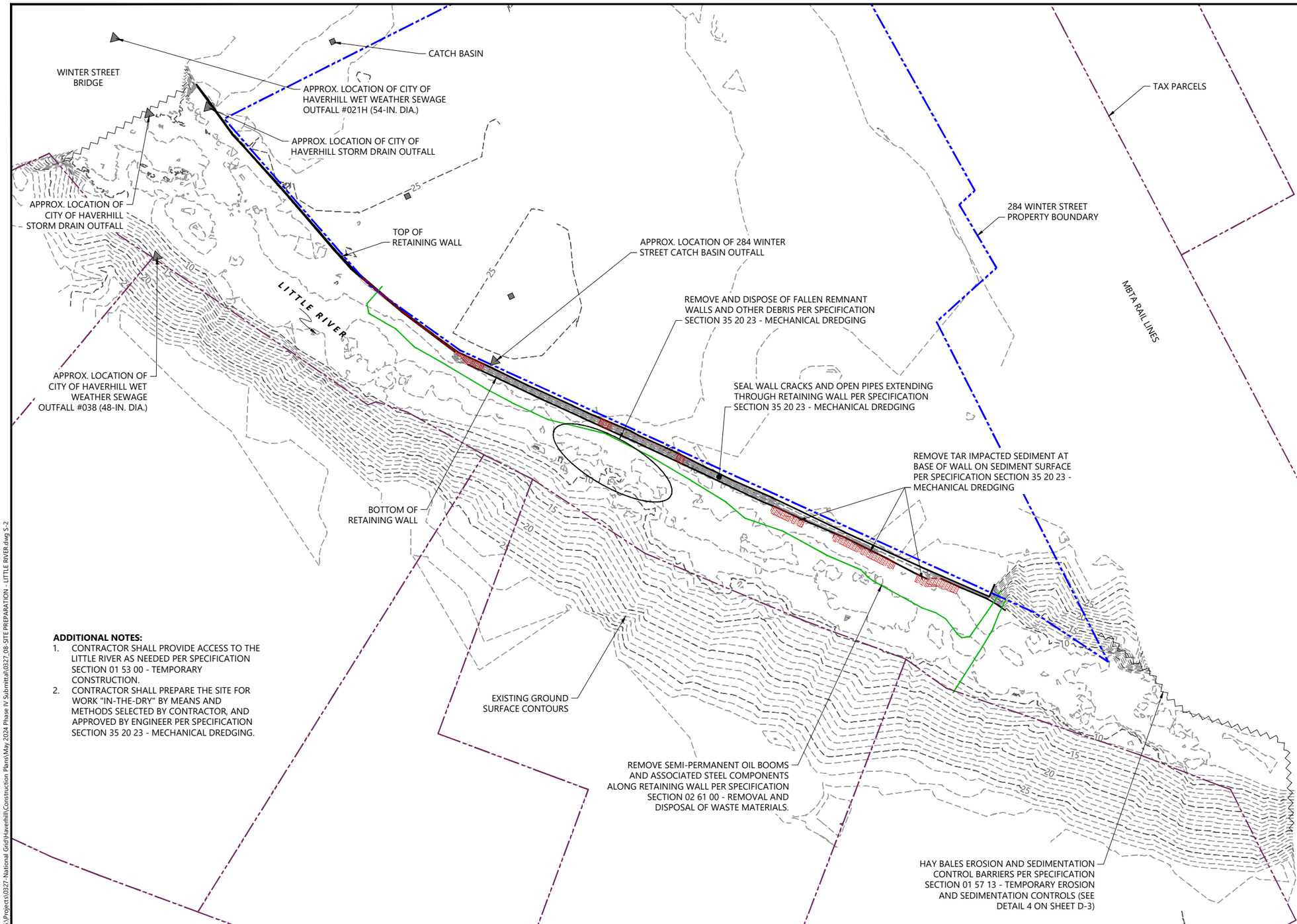
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

SITE PREPARATION - STAGING AREA

S-1

SHEET # 5 OF 13



ADDITIONAL NOTES:

1. CONTRACTOR SHALL PROVIDE ACCESS TO THE LITTLE RIVER AS NEEDED PER SPECIFICATION SECTION 01 53 00 - TEMPORARY CONSTRUCTION.
2. CONTRACTOR SHALL PREPARE THE SITE FOR WORK "IN-THE-DRY" BY MEANS AND METHODS SELECTED BY CONTRACTOR, AND APPROVED BY ENGINEER PER SPECIFICATION SECTION 35 20 23 - MECHANICAL DREDGING.

LEGEND:

- EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- SEMI-PERMANENT BOOM SYSTEM
- EROSION AND SEDIMENTATION CONTROLS (STRAW WATTLES OR HAY BALES)
- APPARENT COAL TAR COATING OR TAR IMPACTED SEDIMENT

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
3. TOPOGRAPHIC/BATHYMETRIC SURVEY AND AERIAL DRONE IMAGE BY HYDRO DATA, INC. (SEPTEMBER 2022).
4. 284 WINTER STREET PROPERTY BOUNDARY FROM ALTA SURVEY BY MHF DESIGN CONSULTANTS. (2015).
5. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

NORTH

0 20 40

SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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Jun 12, 2024 1:32pm dbinkney

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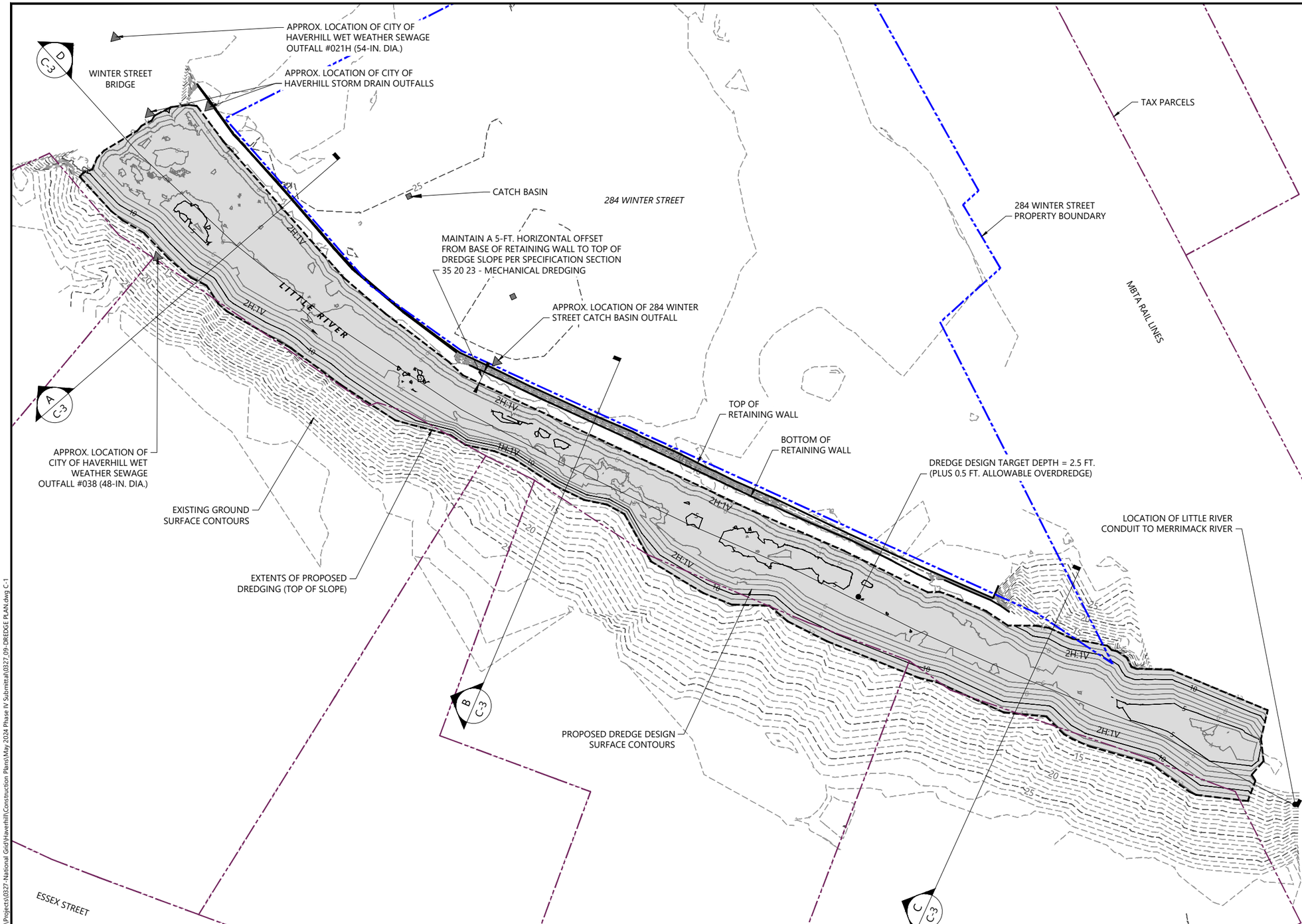
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

SITE PREPARATION - LITTLE RIVER

S-2

SHEET # 6 OF 13



LEGEND:

- 25 — EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- EXTENTS OF PROPOSED DREDGING
- 10 — PROPOSED DREDGE DESIGN SURFACE CONTOURS (1-FOOT INTERVAL)
- A C-3 — CROSS SECTIONS

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
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4. 284 WINTER STREET PROPERTY BOUNDARY FROM ALTA SURVEY BY MHF DESIGN CONSULTANTS. (2015).
5. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

NORTH

0 20 40

SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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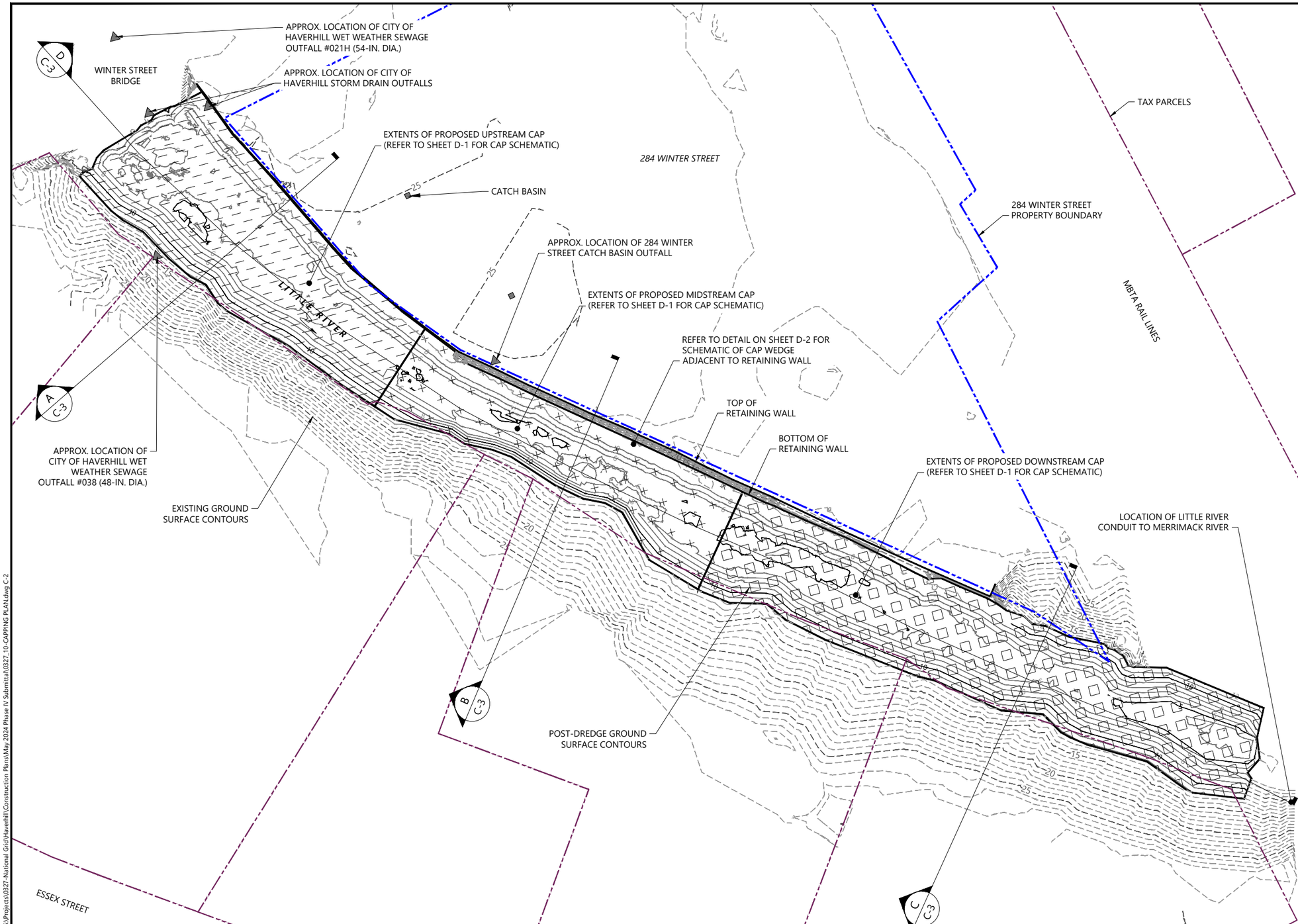
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

DREDGE PLAN

C-1

SHEET # 7 OF 13



LEGEND:

- 25 — EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL
- 10 — POST-DREDGE GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- EXTENTS OF PROPOSED UPSTREAM CAP
- EXTENTS OF PROPOSED MIDSTREAM CAP
- EXTENTS OF PROPOSED DOWNSTREAM CAP
- A C-3 — CROSS SECTIONS

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
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5. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

NORTH

0 20 40

SCALE IN FEET

DRAFT-NOT FOR CONSTRUCTION

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

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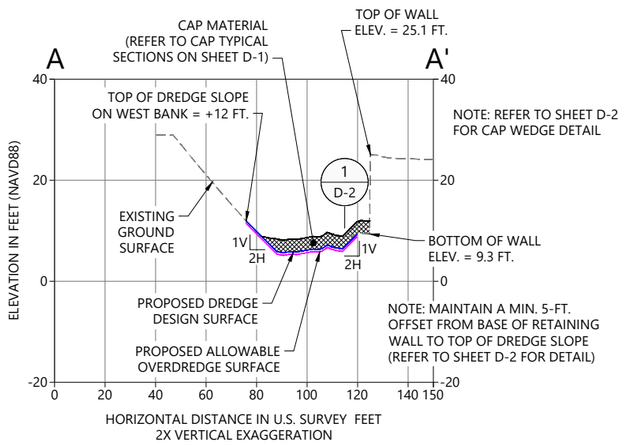
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

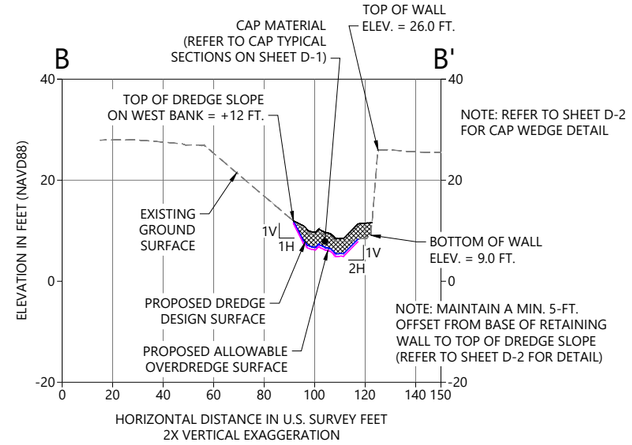
PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

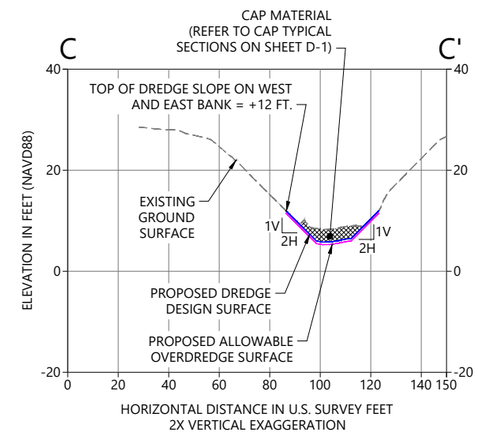
CAPPING PLAN

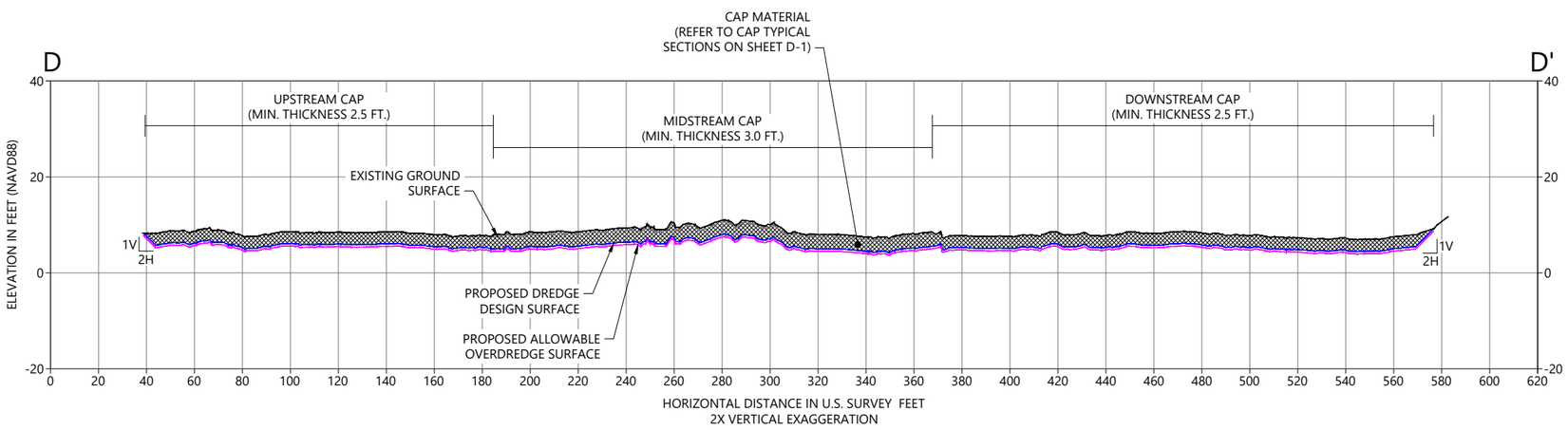
C-2

SHEET # 8 OF 13









LEGEND:

- EXISTING GROUND SURFACE
- PROPOSED DREDGE DESIGN SURFACE
- PROPOSED ALLOWABLE 0.5 FT. OVERDREDGE SURFACE
- CAP MATERIAL

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
3. TOPOGRAPHIC/BATHYMETRIC SURVEY AND AERIAL DRONE IMAGE BY HYDRO DATA, INC. (SEPTEMBER 2022).

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

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Jun 12, 2024 1:36pm dbinkney

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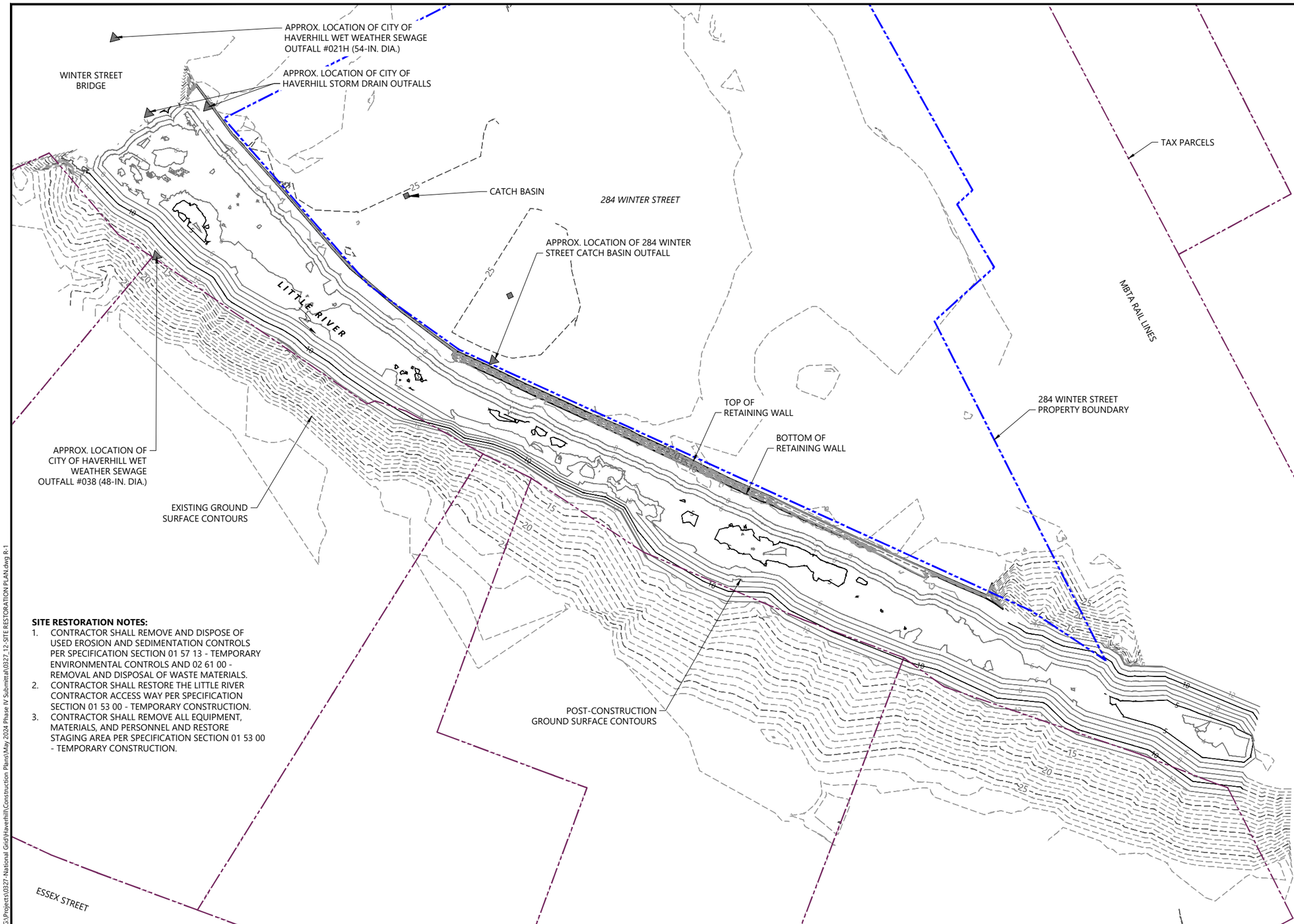
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

CONCEPTUAL CROSS SECTIONS

C-3

SHEET # 9 OF 13



LEGEND:

- 25 — EXISTING GROUND SURFACE CONTOURS (1-FOOT INTERVAL)
- 10 — POST-CONSTRUCTION SURFACE CONTOURS (1-FOOT INTERVAL)
- APPROX. LOCATION OF CATCH BASIN
- APPROX. LOCATION OF OUTFALL
- TAX PARCELS (MASS GIS)
- 284 WINTER STREET PROPERTY BOUNDARY
- TOP OF RETAINING WALL
- BOTTOM OF RETAINING WALL

SITE RESTORATION NOTES:

1. CONTRACTOR SHALL REMOVE AND DISPOSE OF USED EROSION AND SEDIMENTATION CONTROLS PER SPECIFICATION SECTION 01 57 13 - TEMPORARY ENVIRONMENTAL CONTROLS AND 02 61 00 - REMOVAL AND DISPOSAL OF WASTE MATERIALS.
2. CONTRACTOR SHALL RESTORE THE LITTLE RIVER CONTRACTOR ACCESS WAY PER SPECIFICATION SECTION 01 53 00 - TEMPORARY CONSTRUCTION.
3. CONTRACTOR SHALL REMOVE ALL EQUIPMENT, MATERIALS, AND PERSONNEL AND RESTORE STAGING AREA PER SPECIFICATION SECTION 01 53 00 - TEMPORARY CONSTRUCTION.

NOTES:

1. HORIZONTAL DATUM: MASSACHUSETTS STATE PLANE, NORTH AMERICAN DATUM OF 1983 (NAD83), U.S. SURVEY FEET.
2. VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), FEET.
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4. 284 WINTER STREET PROPERTY BOUNDARY FROM ALTA SURVEY BY MHF DESIGN CONSULTANTS. (2015).
5. TAX PARCEL BOUNDARIES ACQUIRED FROM MASS GIS. (2023).

NORTH

0 20 40

SCALE IN FEET

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

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Jun 12, 2024 1:39pm dbinkney

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

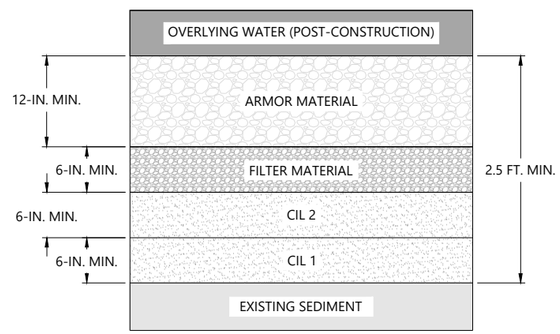
DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

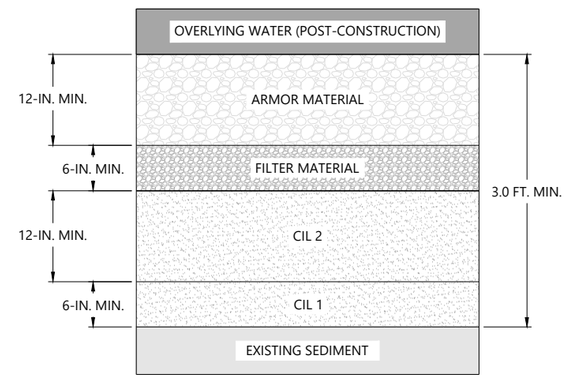
SITE RESTORATION PLAN

R-1

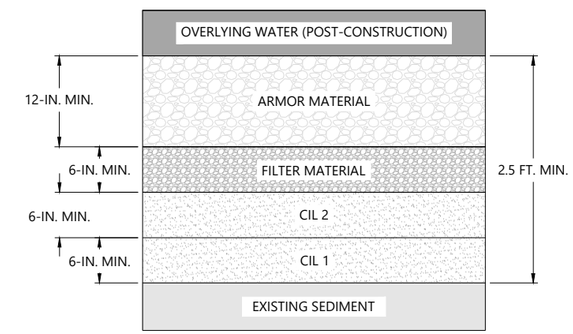
SHEET # **10** OF **13**



UPSTREAM CAP
NOT TO SCALE



MIDSTREAM CAP
NOT TO SCALE



DOWNSTREAM CAP
NOT TO SCALE

NOTE:

1. REFER TO SPECIFICATION SECTION 31 05 13 - AGGREGATES FOR CAP TYPE REQUIREMENTS BY LAYER.
2. CIL = CHEMICAL ISOLATION LAYER.

CAP TYPICAL SECTIONS
NOT TO SCALE

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

DETAILS (1 OF 3)

D-1

SHEET # **11** OF **13**

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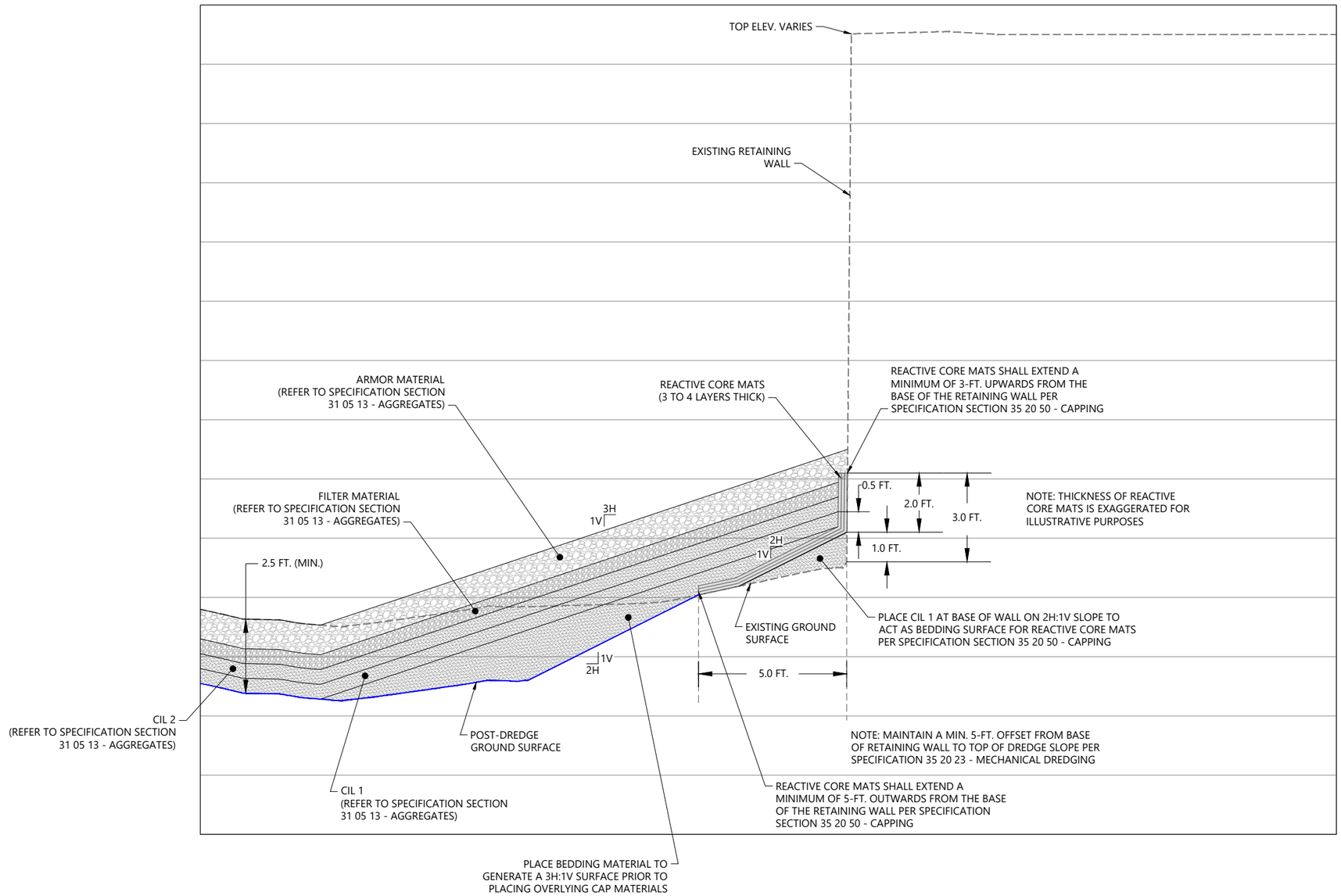
Jun 12, 2024 1:44pm dbinkney

LEGEND:

- EXISTING GROUND SURFACE
- POST-DREDGE GROUND SURFACE
- REACTIVE CORE MATS
- CHEMICAL ISOLATION LAYERS (CIL) AND BEDDING MATERIAL
- FILTER MATERIAL
- ARMOR MATERIAL



1 / C-3 WEDGE DETAIL
SCALE:--

NOT TO SCALE

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

REVISIONS

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DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

DETAILS (2 OF 3)

D-2

SHEET # 12 OF 13

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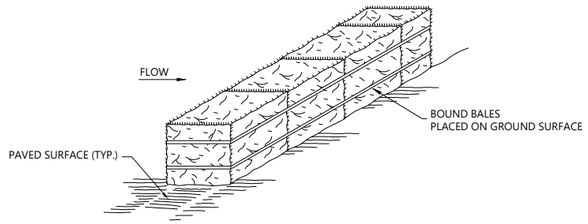
Jun 12, 2024 1:50pm dbinkney

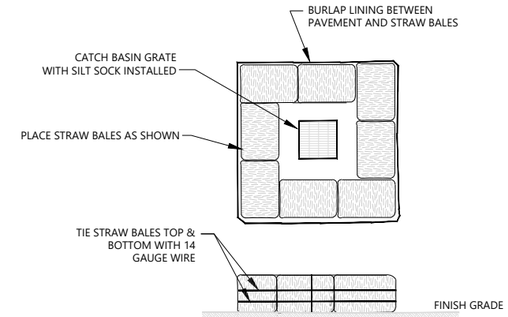


NOTES:

1. STRAW BALES SHALL BE PLACED AS SHOWN IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT STRAW BALES.
2. STRAW BALES SHALL BE USED ON PAVED SURFACES AND SHALL BE PLACED DIRECTLY ON BURLAP.
3. INSPECTION SHALL BE DAILY AND REPAIR/REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
4. STRAW BALES SHALL BE REMOVED ONLY AS DIRECTED BY ENGINEER.

1 / - SEDIMENT AND EROSION CONTROL BARRIER FOR PAVED AREAS (STRAW BALES)

SCALE: NOT TO SCALE

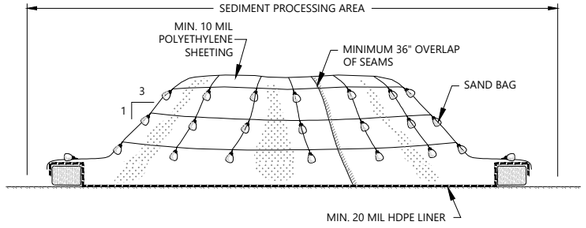


NOTES

1. INSERT SILT SOCK AND SURROUND DRAINAGE STRUCTURE INLET WITH STRAW BALES PRIOR TO CONSTRUCTION AND MAINTAIN UNTIL CONSTRUCTION IS COMPLETED. ACCUMULATED SEDIMENTS SHALL BE REMOVED.
2. STRAW BALES SHALL BE USED ON PAVED SURFACES AND SHALL BE PLACED DIRECTLY ON BURLAP.
3. INSPECTION SHALL BE DAILY AND REPAIR/REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
4. STRAW BALES SHALL BE REMOVED ONLY AS DIRECTED BY ENGINEER.

2 / - CATCH BASIN INLET PROTECTION WITH STRAW BALES

SCALE: NOT TO SCALE

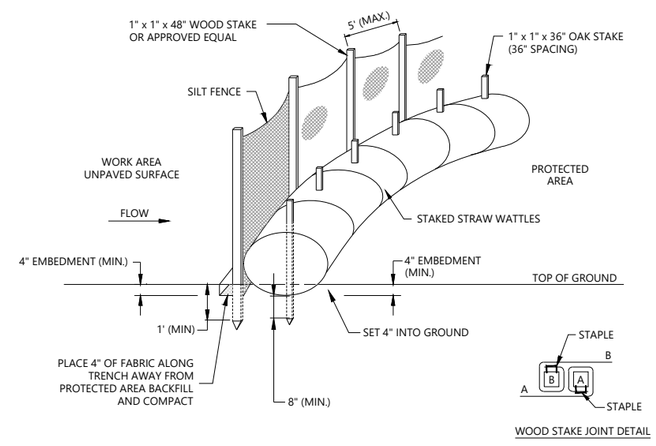


NOTES:

1. STOCKPILES SHALL BE PLACED ON MINIMUM 20 MIL HDPE LINER.
2. STOCKPILES SHALL BE COVERED WITH MINIMUM 10 MIL POLYETHYLENE SHEETING WHENEVER LOADING, STABILIZATION, OR PLACEMENT IS NOT OCCURRING.
3. STOCKPILE AREAS SHALL BE SUBJECT TO DUST / ODOR CONTROLS WHENEVER LOADING, STABILIZATION, OR PLACEMENT IS OCCURRING AND AS DIRECTED BY ENGINEER. STOCKPILES SHALL BE COVERED WITH POLYETHYLENE WHEN THESE ACTIVITIES ARE NOT BEING PERFORMED.
4. SHEETING COVERING STOCKPILE SHALL BE MAINTAINED TIGHTLY IN PLACE BY USING SAND BAGS ON ROPES WITH A MAXIMUM 10'-0" GRID SPACING IN ALL DIMENSIONS.
5. MINIMUM 36" OVERLAP OF ALL SEAMS REQUIRED.
6. STOCKPILE SIDE SLOPES SHALL BE NO STEEPER THAN 3 (HORIZONTAL) TO 1 (VERTICAL).
7. CONTRACTOR SHALL PLACE STRAW BALE BERMS AS SHOWN ON THE DETAIL ABOVE AROUND STOCKPILES GENERATED OUTSIDE OF THE SEDIMENT PROCESSING AREA. STRAW BALE BERMS, AS SHOWN ON THE DETAIL, ARE NOT REQUIRED FOR STOCKPILES IN THE SEDIMENT PROCESSING AREA.

3 / - TYPICAL STOCKPILE DETAIL

SCALE: NOT TO SCALE

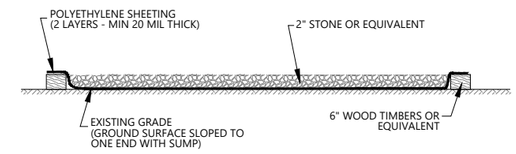


NOTES

1. WHERE SILT FENCES OVERLAP, OVERLAP DISTANCE SHALL BE 36-INCHES.
2. INSPECTION SHALL BE DAILY AND REPAIR/REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
3. STRAW WATTLES SHALL BE REMOVED ONLY AS DIRECTED BY ENGINEER.

4 / - SEDIMENTATION AND EROSION CONTROL BARRIER FOR UNPAVED AREAS (STRAW WATTLES)

SCALE: NOT TO SCALE



5 / - TYPICAL DECONTAMINATION PAD

SCALE: NOT TO SCALE

PLAN INTENDED TO BE VIEWED IN COLOR, ADJACENT BLOCK IS "BLUE"

ONE INCH

AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

DRAFT-NOT FOR CONSTRUCTION

ANCHOR QEA

REVISIONS

REV	DATE	BY	APP'D	DESCRIPTION

DESIGNED BY: B. GAULEY
DRAWN BY: D.BINKNEY
CHECKED BY: K. POWELL
APPROVED BY: --
SCALE: AS NOTED
DATE: JUNE 2024

PHASE IV REMEDY IMPLEMENTATION PLAN
FORMER HAVERHILL MGP SITE

DETAILS (3 OF 3)

D-3

SHEET # 13 OF 13

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Jun 12, 2024 1:50pm dbinkney

Appendix C
Technical Specifications

DIVISION 00—PROCUREMENT AND CONTRACTING REQUIREMENTS
Section 00 01 10 – Table of Contents

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

00 31 00 AVAILABLE PROJECT INFORMATION

DIVISION 01 – GENERAL REQUIREMENTS

01 00 00 GENERAL REQUIREMENTS

01 01 50 CONTROL OF WORK

01 11 00 SUMMARY OF WORK

01 14 00 WORK RESTRICTIONS AND SEQUENCE

01 20 00 PRICE AND PAYMENT PROCEDURES

01 31 00 PROJECT MANAGEMENT AND COORDINATION

01 33 00 SUBMITTAL PROCEDURES

01 33 00A TABLE A – SUBMITTAL LIST

01 35 29 HEALTH, SAFETY AND EMERGENCY RESPONSE PROCEDURES FOR CONTAMINATED SITES

01 35 43 ENVIRONMENTAL PROCEDURES

01 35 53 SECURITY PROCEDURES

01 41 26 PERMITS

01 45 00 QUALITY CONTROL

01 53 00 TEMPORARY CONSTRUCTION

01 57 13 TEMPORARY ENVIRONMENTAL CONTROLS

01 74 00 CLEANING AND WASTE MANAGEMENT

01 78 00 PROJECT RECORD DOCUMENTS

DIVISION 02 – EXISTING CONDITIONS

02 21 00 SURVEYS

02 51 29 SURFACE CLEANING AND DECONTAMINATION

02 61 00 REMOVAL AND DISPOSAL OF WASTE MATERIALS

DIVISION 31 – EARTHWORK

31 05 13 AGGREGATES

DIVISION 32 – SITE IMPROVEMENT AND RESTORATION

32 30 00 SITE RESTORATION

DIVISION 35 – WATERWAYS AND MARINE CONSTRUCTION

35 20 23 MECHANICAL DREDGING

35 20 30 DREDGED MATERIAL MANAGEMENT

35 20 50 CAPPING

APPENDICES [TO BE INCLUDED IN FUTURE DESIGN SUBMITTAL]

APPENDIX 1

1. Available Project Information
2. Preliminary Work Schedule

APPENDIX 2

1. GZA (GZA GeoEnvironmental, Inc.), 2022. *Phase II Comprehensive Site Assessment Report*. April 2022.
2. GZA, 2022. *Phase III Remedial Action Plan*. July 2022.
3. GZA, 2024. *Revised Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan*. June 2024.
4. Historical Utilities to be confirmed by the Contractor.
5. Topographic survey conducted by HydroData on September 1, 2022.
6. Schematic Drawings and photographs of the existing boom system
7. Location and approximate size of retaining wall pipes requiring sealing

APPENDIX 3

1. Received Permits

APPENDIX 4

1. National Grid Safety Procedures—Contractor Safety Requirements
2. National Grid Environmental Guidance and Environmental Policy Documents
3. National Grid Security Policies

APPENDIX 5

1. Owner-approved disposal facilities (owner-approved laboratories provided in applicable Specifications)

APPENDIX 6

1. Bid Form

END OF SECTION

DIVISION 00—PROCUREMENT AND CONTRACTING REQUIREMENTS
Section 00 31 00 – Available Project Information

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Related Sections

B. Preliminary Schedule

C. Existing Conditions Information

D. Environmental Assessment Information

E. Permits

F. Owner-Provided Information

1.02 RELATED SECTIONS

A. This Specification contains general information that applies to all Work performed under the Contract and is inherently made part of each Specification section.

1.03 PRELIMINARY SCHEDULE

A. A Preliminary Schedule outlining major Work activities associated with the Contract is provided in Appendix 1. The schedule outlines the key time restrictions associated with Work at the Site as further described in Section 01 14 00 – Work Restrictions and Sequence. The sequencing and duration estimates in the Preliminary Schedule are provided for informational purposes only.

B. Contractor shall review the Preliminary Schedule and the regulatory and access requirements and restrictions described in Section 01 14 00 – Work Restrictions and Sequence and shall provide a more detailed Preliminary Baseline Schedule in accordance with said section.

1.04 EXISTING CONDITIONS INFORMATION

A. The following Project Reports are included in Appendix 2.

1. Massachusetts Contingency Plan required documents:

a) GZA (GZA GeoEnvironmental, Inc.), 2022. *Phase II Comprehensive Site Assessment Report*. April 2022.

b) GZA, 2022. *Phase III Remedial Action Plan*. July 2022.

c) GZA, 2024. *Revised Phase III Remedial Action Plan/Phase IV Remedy Implementation Plan*. June 2024.

2. Historical Utilities to be confirmed by Contractor.

3. Topographic survey conducted by HydroData on September 1, 2022.

B. The Site is described in Section 01 11 00 – Summary of Work.

C. The Project Reports listed in this Specification provide information regarding conditions below grade, including potential obstructions and areas of visible oil and/or tar impacts. The data were collected and compiled primarily for use by Engineer to determine dredging limits and other dredging- and earthwork-related items.

D. These data, by their nature, cannot reveal all conditions existing on the Site and are provided to Contractor for information purposes only. Contractor shall understand that subsurface conditions may differ from those depicted on the available logs and figures. Neither Owner nor Engineer nor other parties whose information is presented in the above-referenced information shall be held liable for any error, discrepancy, or omission that reveals inconsistency with the information provided.

E. Contractor is responsible for reviewing the information contained in the referenced documentation. The information is made available to Contractor for information on factual data only and shall not be interpreted as a warranty of subsurface conditions whether interpreted from written text, logs, or other data.

F. If, during the course of construction, conditions differing substantially from those indicated in the above referenced information, and/or Contract Drawings are encountered, Contractor shall promptly notify Engineer in writing and shall not disturb such conditions until directed. Should subsurface conditions be found to vary substantially from the existing information, Owner or Engineer may require changes to the limits of excavation/dredging and/or earthwork or support of excavation to address Site conditions.

1.05 PERMITS

A. Descriptions of the permits obtained by Owner, the permit applications submitted by Owner and pending approval, and the permits Contractor is required to obtain are provided in Section 01 41 26 – Permits. As described in said section, copies of certain permits are included in Appendix 3 and/or will be provided to Contractor upon receipt.

B. As described in Section 01 41 26 – Permits, Work shall be performed consistent with Massachusetts Contingency Plan Phase IV Remedy Implementation Plan, a copy of which will be provided to Contactor prior to the initiation of Work.

1.06 OWNER-PROVIDED INFORMATION

A. National Grid Environmental Guidance and Environmental Policy Documents are provided in Appendix 4.

B. A list of Owner-approved disposal facilities is provided in Appendix 5.

C. Information regarding Owner-approved laboratories is provided in the applicable Specification sections.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 00 00 – General Requirements

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Related Sections

B. General Requirements

1.02 RELATED SECTIONS

A. Section 00 31 00 – Available Project Information

B. Section 01 11 00 – Summary of Work

C. Section 01 14 00 – Work Restrictions and Sequence

D. Section 01 31 00 – Project Management and Coordination

E. Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites

F. Section 01 35 43 – Environmental Procedures

G. Section 01 53 00 – Temporary Construction

H. Section 01 57 13 – Temporary Environmental Controls

I. Section 01 74 00 – Cleaning and Waste Management

J. Section 01 78 00 – Project Record Documents

K. Section 02 51 29 – Surface Cleaning and Decontamination

1.03 GENERAL REQUIREMENTS

A. Contractor shall comply with all requirements set forth in the STANDARD GENERAL CONDITIONS OF THE CONTRACT BETWEEN NATIONAL GRID USA SERVICE COMPANY, INC., AND AFFILIATED COMPANIES AND ENVIRONMENTAL REMEDIATOR (General Conditions), Project Special Conditions, the present amendments and/or modifications to the General Conditions for the work, and the other sections of the Contract Documents.

B. Contractor is responsible for becoming familiar with all aspects of the Work and the Site prior to performing the Work in accordance with the General Conditions.

C. Contractor shall cooperate with all other parties engaged in project-related activities; Owner’s employees, representatives, and contractors; and other property owners within the Limits of Work to the greatest extent possible.

Contractor shall make appropriate accommodations and scheduling to avoid disrupting or impeding ongoing operations during implementation of the Work. Contractor shall comply with restrictions regarding work hours and days, access to properties, Contractor's use of Site, and coordination with occupants in accordance with Section 01 14 00 – Work Restrictions and Sequence. Contractor shall verify with Owner during each weekly construction progress meeting, at a minimum, that ongoing operations at the properties within the Limits of Work will not be impacted by scheduled construction activities. Disputes or problems should be submitted in writing to Owner for resolution.

D. The Limits of Work are shown on the Contract Drawings and described in these Specifications. All Work shall be confined to the Limits of Work and completed to the lines, grades, and dimensions called for on the Contract Drawings and Specifications unless directed otherwise by Owner or Engineer. All Work performed beyond designated limits without prior approval shall be corrected to Owner's satisfaction, at no additional cost to Owner.

E. Work areas shall be accessed in accordance with Section 01 14 00 – Work Restrictions and Sequence and shall be secured in accordance with Section 01 53 00 – Temporary Construction. Access by vehicles, equipment and personnel shall comply with trucking routes, parking restrictions, and property-specific restrictions as shown on the Contract Drawings and described in these Specifications.

F. Contractor shall furnish and maintain a daily sign-in/sign-out log for all personnel and visitors on Site. The log shall meet, at a minimum, the requirements of Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites.

G. Contractor shall plan and schedule silt-producing Work activities conducted within the Site to between July 1 and February 28, inclusive, as required in the permits included in Appendix 3 and described in Section 01 14 00 – Work Restrictions and Sequence. These Time-of-Year Restrictions shall be reflected in Contractor's Preliminary Progress Plan and Schedule and shall not be deviated from without approval in writing from Owner.

H. These Contract Drawings and Specifications have been developed to comply with the requirements of permits and access agreements as described in Section 01 14 00 – Work Restrictions and Sequence and Section 01 41 26 – Permits. Contractor shall be held responsible for understanding and complying with all required permits provided in Appendix 3 and subsequent permits and addenda received by Owner. In addition, Contractor shall be held responsible for understanding, obtaining, paying all fees, and complying with all other permits required (in addition to those presented in Appendix 3) to complete the Work as shown in the Contract Drawings and Specifications. Contractor shall carefully review permit conditions in preparing the Bid to ensure that means and methods are consistent

with requirements and shall provide a bid for conducting Work in accordance with the Contract Drawings and Specifications and all required permits, authorizations, and approvals. Contractor may provide, in addition to a bid consistent with the Contract Drawings and Specifications, an alternate approach and cost for the alternate approach. Contractors that intend to provide an alternative approach in their bid that differs from the specified approach of conducting Work shall provide enough detail in the bid to confirm compliance of any alternative approach with all applicable permit conditions.

I. Contractor shall develop a Preliminary Progress Plan and Schedule (and subsequently, a Construction Progress Plan and Schedule) in accordance with Section 01 14 00 – Work Restrictions and Sequence to document the proposed sequence of activities and compliance with the regulatory and property-specific restrictions applicable to this Site. The schedule shall be updated, at a minimum, on a weekly basis for review during the Construction Period Meetings described in Section 01 31 00 – Project Management and Coordination. Work sequencing shall be conducted in a manner that prevents contamination or recontamination of areas not contaminated or already decontaminated, and in accordance with the Contract Documents. Any contamination or recontamination of materials that occurs as a result of Contractor's activities shall be restored by Contractor at no additional cost to Owner. Work sequencing shall be conducted in a manner to coordinate staging and loading of materials to be transported and treated/disposed of off Site. Contractor shall schedule all activities, including interim and final cleaning and restoration at each of the properties within the Limits of Work, to meet the timing restrictions established by each property owner as well as the overall Milestones for this project.

J. Contractor shall perform all Work in accordance with the requirements of Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites. Contractor shall be especially aware of health and safety issues related to performing Work within the limits of a remediation Site, with historical Manufactured Gas Plant and other contaminants as described in Section 01 11 00 – Summary of Work. Contractor shall engage an independent firm with a Certified Industrial Hygienist to prepare a Site-specific Health and Safety Plan (HASP) and shall comply with all requirements of said plan, including providing necessary health and safety training for all Contractor's and subcontractor's on-Site personnel in accordance with applicable local, state, and federal regulations. Owner will require evidence of health and safety training prior to the commencement of Work and may request evidence at any time for any of Contractor's or subcontractor's personnel working on the Site. The independent firm shall also provide Site Safety and Health Officers (SSHOs), who shall be responsible for day-to-day compliance with the requirements of the HASP, including overseeing Site health and safety and protection of public health and safety as it relates to the Work, air and noise monitoring, personnel and equipment decontamination, emergency response, and all required health and safety-related documentation.

K. Contractor shall exercise care to avoid disturbing or damaging any utilities and structures that exist at the Site and are to remain in service during and at the completion of the Work. Contractor shall be responsible for locating all subsurface utilities within the Limits of Work before excavating and for repairing any utility damaged as a result of the Work. Contractor shall contact Dig Safe, all other utility companies not conducted by Dig Safe, and Owner 72 hours prior to the initiation of excavation activities. Contractor shall also coordinate with the appropriate property representative to obtain available information on Site utilities, including those located underground, aboveground, and overhead, prior to commencing with the Work. If Contractor encounters any unexpected utilities during the course of the Work, Contractor shall inform Owner and Engineer immediately. The locations of any utilities shown on the Contract Drawings are approximate and shall be verified in the field by Contractor prior to initiation of Work.

L. Contractor is likely to encounter obstructions below ground surface (including below the Little River mudline) within the Limits of Work, including but not limited to former urban debris, large stones, and boulders. Owner has provided available information regarding subsurface and environmental conditions in Section 00 31 00 – Available Project Information. Contractor shall be responsible for becoming familiar with the information prior to bid submittal and for verifying conditions in the field as necessary for the performance of Work. Contractor shall notify Owner and Engineer immediately of any deviations in Site conditions. Contractor shall be responsible for providing all labor, equipment, and materials necessary to remove or otherwise penetrate all obstructions encountered as necessary to complete the Work as described in the Specifications and shown on the Contract Drawings, unless otherwise approved by Engineer. No separate payment will be made for obstruction or debris removal.

M. Contractor shall install and remove temporary utilities, construction facilities, and temporary construction at the Upland Staging Area and Sediment Processing Area as shown on the Contract Drawings and in accordance with Section 01 53 00 – Temporary Construction. These shall include electrical, water, fuel, and sanitary facilities during the performance of the Work; lighting, office and storage facilities, and signage to support Work activities; and temporary roads, work platforms, and material lay-down areas within the Limits of Work.

N. Contractor shall construct and maintain facilities for personnel, equipment, vehicle, and excess materials decontamination in accordance with Section 01 53 00 – Temporary Construction, Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites, Section 01 74 00 – Cleaning and Waste Management, and Section 02 51 29 – Surface Cleaning and Decontamination. Equipment and vehicles shall be clean prior to use and decontaminated following use in accordance with the Specifications and as directed by Engineer and SSHOs. All decontamination water shall be captured, managed, and disposed of in accordance with the Specifications.

O. Contractor shall comply with all requirements for protecting the environment, including, but not limited to, controlling erosion, water pollution, spills and releases, dust emissions, vapors, odors, noise, and vibrations resulting from construction activities without exception. If project-specific threshold limits are exceeded or complaints are received by Owner regarding noise, vibrations, odors, dust, vapors, or other Work-related disturbances or nuisance conditions, Contractor shall implement mitigation measures to address the condition to the satisfaction of Engineer and Owner at no additional cost to Owner. If the condition persists, Owner reserves the right to stop all Work until the condition has been eliminated or controlled to the satisfaction of Owner and Engineer. All costs associated with such Work delays, suspension, or stoppage shall be borne by Contractor. Refer to Section 01 35 43 – Environmental Procedures and Section 01 57 13 – Temporary Environmental Controls.

P. Contractor shall be responsible for general housekeeping during construction in accordance with the Contract Documents. Contractor shall segregate, handle, temporarily store, and treat or dispose of all excess materials generated during the Work as described in Section 01 74 00 – Cleaning and Waste Management. Accurate logs and records of interim and final transportation and disposal shall be maintained for all materials and shall be submitted to Owner in accordance with these Specifications. Upon completion of the Work, Contractor shall remove all of its equipment, facilities, construction materials, and trash.

Q. Contractor is responsible for control, management, and treatment or off-Site disposal of any stormwater or groundwater encountered or requiring management during all Site activities. Contractor is responsible for maintaining and protecting stormwater collection structures within the Limits of Work, on access roads outside the Limits of Work, and public roads from untreated stormwater, and water, soil, sediment, and debris generated during performance of Work.

R. Contractor shall exercise care and provide protection to avoid disturbing or damaging adjacent structures, notably the retaining wall that is present on the northwest portion of the Site. Any damage to existing features to remain shall be repaired to the satisfaction of Engineer at no additional cost to Owner.

S. Surveying shall be performed under the direction of a Professional Land Surveyor licensed to perform such Work in the Commonwealth of Massachusetts. All surveys shall use the grid system and datum of the Site, unless otherwise directed in writing by Engineer. Contractor shall furnish Owner with Record Drawings as specified in Section 01 78 00 – Project Record Documents. All Survey Record Drawings shall be signed and sealed by the licensed surveyor who directed the survey Work.

T. Construction tolerances shall be consistent with the Contract Drawings and Specifications. All surfaces shall be reasonably free from irregularities. Slopes or

grades shall not be less than specified minimums or greater than specified maximums as shown on the Contract Drawings.

U. Contractor is responsible for security within the Limits of Work throughout completion of Work activities. Contractor, including all personnel and subcontractors, shall be familiar with and shall comply with all security requirements and shall be responsible for the safety and condition of all of Contractor's tools and equipment. Owner and Owner's agents will not be responsible for lost or stolen materials or equipment.

V. Contractor shall retain ownership and responsibility for all Work until accepted by Owner.

W. Contractor is responsible to inform their employees and employees of subcontractors and distributors that any lewd actions, verbal harassment, and any racial or sexual comments directed toward any individual on the project Site is strictly prohibited. Incidents of this type may result in immediate and permanent dismissal of the employee(s) involved. Repeat offenses by a Contractor's employees may lead to the dismissal of Contractor and/or removal of Contractor from future bid considerations. Smoking by Contractor personnel is not allowed within the Limits of Work.

X. All incidents involving the health or safety of personnel or the public or affecting the environment must be reported to National Grid and Engineer. Each of these accidents must be accompanied by a follow-up investigation report in accordance with Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 01 50 – Control of Work

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Responsibilities of Parties

D. Interpretation of Engineering Drawings and Specifications

E. Order of Precedence

F. Temporary Suspension of the Work

1.02 SCOPE

A. This section describes the responsibilities of each party involved in the execution or monitoring of Work required by the Contract Documents.

1.03 RELATED SECTIONS

A. This section contains general information that applies to all Work performed under the Contract and is inherently made a part of each Specification section.

1.04 RESPONSIBILITIES OF PARTIES

A. Owner

1. Boston Gas Company d/b/a National Grid (National Grid) is the Owner responsible for facility administration, regulatory oversight, accounting, purchasing, etc. On-Site construction activities are monitored for National Grid by Engineer.

B. Engineer

1. Anchor QEA shall be referred to as “Engineer.” GZA Geoenvironmental, Inc. (GZA) is the Licensed Site Professional for the Project and is responsible for monitoring compliance with the MCP. Engineer reports to Owner and is responsible for the administration of Contract Drawings and Specifications and Contractor communications. Engineer will communicate directly with Contractor to coordinate activities and will receive information directly from Contractor to be conveyed to Owner.

2. Engineer is responsible for observing and documenting construction activities on the Site and evaluating conformance with the Contract Drawings and Specifications. Engineer will collect all material

certifications from Contractor. Engineer will be responsible for reviewing Contractor Submittals. Engineer has prepared the Contract Drawings and Specifications and is responsible for the interpretation of the Contract Drawings and Specifications. Engineer will review proposed alterations or modifications to the Project design as formally requested by Contractor. Engineer and Owner will decide all questions that arise regarding the interpretation of the Contract Drawings and Specifications.

3. Engineer will conduct certain monitoring activities throughout the Work, including, but not limited to, monitoring of perimeter ambient air, water quality, and sediment sampling to confirm compliance with MCP cleanup goals. This Work will be independent of monitoring requirements that are the responsibility of Contractor as specified in Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites and Section 01 35 43 – Environmental Procedures. Data collected from the monitoring will be used by Owner and Engineer to provide documentation of conditions at the Site. Owner and Engineer reserve the right to suspend or modify Work at the Site if threshold levels as identified in these Specifications or in applicable City of Haverhill ordinances or permits are exceeded. In the event these threshold levels are exceeded, resulting suspensions and/or modifications of Work shall be performed by Contractor at no additional cost to Owner. Engineer is responsible for preparing a final inspection report documenting that remediation activities were performed in accordance with the requirements of the Contract Drawings and Specifications.

C. Contractor

1. Contractor is responsible for implementing and ensuring the completion of the Work, for producing Record Drawings, and documenting the Work performed and the As-Built Conditions. Contractor is responsible for conducting Work using means and methods that are consistent conditions of permits obtained by Owner (provided in Appendix 3) and other applicable local, state, and federal laws. Contractor is responsible for procuring permits and completing notifications other than those provided in Appendix 3 to these Specifications.

2. Contractor shall procure the services of Subcontractors as necessary to complete the Work and is responsible for the Work of their Subcontractors as they are for their own Work. Subcontractors proposed but not included in Contractor’s original Bid shall be submitted for Owner and Engineer approval.

3. Contractor reports to Owner, but shall communicate directly with Engineer.

4. Contractor is subject to requirements of local, state, and federal agencies for implementation of the Work. Details pertaining to jurisdictional requirements governing the Work that are not specifically mentioned in the Contract Documents shall not relieve Contractor's obligation to be in compliance with applicable requirements.

1.05 INTERPRETATION OF ENGINEERING DRAWINGS AND SPECIFICATIONS

A. Should it appear that the Work to be done or any matters relative thereto are not sufficiently detailed or explained in the Contract Drawings and Specifications, upon written request, Engineer will further explain, clarify, or interpret, as may be necessary. In the event of any questions arising with respect to pay items resulting from Engineer's interpretation of the Contract Drawings and Specifications, the matter shall be referred to Owner for resolution, whose decision thereon shall be final.

B. Contract Drawings are intended to be illustrative and may not be an exact or a complete representation of actual field conditions or the actual finished Work. For the finished Work, Contractor shall include all necessary extra material required to make each installation satisfactory and operable for its intended purpose, even though some items may not be specifically depicted on the Contract Drawings.

1.06 ORDER OF PRECEDENCE

A. Reserved (if not covered in National Grid Terms and Conditions)

B. In the event of a discrepancy either on the Contract Drawings, or in these Specifications, the matter shall be promptly submitted to Engineer, who shall promptly make a determination in writing to resolve the discrepancy. Any Work performed by Contractor impacted by the discrepancy in the Contract Documents without such a determination shall be at Contractor's own risk and expense.

C. In the event of a conflict between the Contract Documents and applicable laws, codes, ordinances, regulations, permits, or orders of governmental authorities having jurisdiction over the Work or any portion thereof; or in the event of any conflict between such applicable laws, codes, ordinances, regulations, or orders; the most stringent requirements of any of the above shall govern and be considered as a part of this Contract in order to afford Owner the maximum benefits thereof.

1.07 TEMPORARY SUSPENSION OF THE WORK

A. Reserved (if not covered in National Grid Terms and Conditions)

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 11 00 – Summary of Work

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Site Description

D. Site History

E. Site Conditions

F. Description of Work Area

G. Description of Support Area

H. Scope of Work

1.02 SCOPE

A. This section includes summary of the Work including, location, and scope and schedule of Work.

1.03 RELATED SECTIONS

A. Section 00 31 00 – Available Project Information

B. Section 01 14 00 – Work Restrictions and Sequence

C. Section 01 33 00 – Submittal Procedures

D. Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites

E. Section 01 35 43 – Environmental Procedures

F. Section 01 35 53 – Security Procedures

G. Section 01 41 26 – Permits

H. Section 01 53 00 – Temporary Construction

I. Section 01 57 13 – Temporary Environmental Controls

J. Section 02 21 00 – Surveys

K. Section 02 61 00 – Removal and Disposal of Waste Materials

L. Section 35 20 23 – Mechanical Dredging

M. Section 35 20 30 – Dredged Material Management

N. Section 35 20 50 – Capping

1.04 SITE DESCRIPTION

A. Location of Work

1. The Work under this Contract is to be performed within the Little River (a tributary to the Merrimack River) in Haverhill, Essex County, Massachusetts, and in certain portions of the adjacent property at 284 Winter Street, Haverhill, Massachusetts (Upland Staging Area). The Little River work area consists of approximately 0.50 acres in the Little River bed up to elevation +12 feet referenced to the North American Vertical Datum of 1988 (NAVD88). The Upland Staging Area consists of approximately 0.70 acres, within the 284 Winter Street property boundary. The Work shall be performed within those primary areas. The Limits of Work include the following:

a) Remedial construction will occur within the Little River Limits of Work shown on the Contract Drawings located between the Winter Street Bridge (northern extent of the Limits of Work) and the Little River conduit, which forms the southern extent of the Limits of Work.

b) Stockpiling, staging of equipment and materials, sediment and water processing, and all other Contractor access and support facilities shall occur within the Upland Staging Area. Actual locations of support facilities and the layout of the Staging Area are to be determined by Contractor, as part of their Bid. These, along with Site access ways will become part of the Limits of Work.

2. Contractor access to, and use of, the properties within the Limits of Work shall be in accordance with the Contract Drawings and Section 01 14 00 – Work Restrictions and Sequence. Contractor will be strictly monitored by Owner and Engineer for compliance with these restrictions. No activities by Contractor will be allowed outside the Limits of Work shown on the Contract Drawings unless pre-approved by Owner.

3. Any support facilities located within the Limits of Work shall be designated by Contractor and approved by Owner. Work in all areas of the overall Site must comply with all applicable laws and permit conditions.

1.05 SITE HISTORY

A. A manufactured gas plant (MGP) was operated at 284 Winter Street by predecessors to the Boston Gas Company. Manufactured gas was produced and stored in holders at the Site until 1893. Between 1910 and 1912, the MGP facility was converted to a carbureted gas manufacturing facility that used gas oil to manufacture gas, also generating light oil and tar. In 1951, the MGP began producing oil gas until production ended in 1960. Most of the aboveground MGP infrastructure was demolished in the 1970s. In 1976, the property was sold by Haverhill Gas Company to Haffner's, which constructed and operated a gasoline filling station and car wash following underground storage tank construction in 1977. The former MGP currently consists of an active gasoline filling station and car wash.

1.06 SITE CONDITIONS

A. Owner has provided available information regarding subsurface and environmental conditions in Section 00 31 00 – Available Project Information. Contractor shall be responsible for familiarizing itself with the information prior to Bid submittal and for verifying conditions in the field as necessary for the performance of Work. Contractor shall notify Owner and Engineer immediately of any deviations in Site conditions.

B. The dredge area is located within the Little River. The sediment surface is a combination of sand, gravel, and cobbles. Vegetation (e.g., grass and weeds) is present in the channel at several locations. Sediment within the River Area is typically brown to black sand to gravelly sand with little silt/clay and trace organics and anthropomorphic debris. Debris includes glass, plastic, brick, slag, clinkers, and fibrous layers. A sharp contact was observed between the surficial sediment and deeper gray, brown, black tight fine sand unit between 2.7 and 4.9 feet below mudline. Sheen and nonaqueous phase liquids (NAPL) was not observed in the lower unit. Additional sediment data are provided in the *Phase II Comprehensive Site Assessment Report* (GZA 2022), included in Appendix 2.

C. Impacted sediment was delineated based on the sediment cores and analytical data collected during field investigations in 2020, 2021, and 2022. Investigation findings identified the following impacts:

1. Coal tar-impacted sediments are present in the Little River, which result in intermittent sheens on the surface water.

2. Visible oil and/or tar (VOT) was observed in 26 of 38 sediment cores and hand augers collected within the Little River. VOT ranged from discrete droplets to sediment saturated with NAPL. The area over which these cores containing VOT were collected covers approximately 0.3 acres.

3. VOT-impacted sediment was observed from the surface to approximately 5.5 feet below the mudline.

4. Oil and hazardous material compounds present in sediment and porewater include polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs), including benzene. PAH concentrations within the Site boundary exceed the local conditions concentration of 29.9 milligrams per kilogram (mg/kg) and benzene concentrations at several locations exceed the risk-based value of 1.9 mg/kg.

1.07 DESCRIPTION OF WORK AREA

A. The Little River Work area consists of the bed of the Little River between the Winter Street Bridge at the north end and the conduit to the Merrimack River at the south end. The Little River Work area includes the area between the retaining wall on the east side and the bank up to elevation +12 feet (NAVD88) on the western bank. The Little River Work area is depicted on the Contract Drawings.

1.08 DESCRIPTION OF SUPPORT AREA

A. Upland Staging Area: The Upland Staging Area consists of the area within the property boundaries of 284 Winter Street, Haverhill, Massachusetts. The Upland Staging Area includes the Sediment Processing Area (SPA), which shall be constructed as specified in Section 01 53 00 – Temporary Construction.

1.09 SCOPE OF WORK

A. Contractor shall furnish all labor, materials, services, insurance, tools, equipment, temporary facilities, decontamination facilities, and incidentals to perform Work in accordance with the Contract Documents, including applicable laws, permits, regulations, codes, access agreements, ordinances, and standards.

B. The Work consists of, but is not limited to, the activities listed below. Note that the list below shall not be considered all-inclusive of the Work to be completed by Contractor under the Contract. This list is solely provided to give an overall sense of the Work to be performed (i.e., a summary).

1. Preparation of Work Plans and Submittals as listed in Table A-1 in Section 01 33 00 – Submittal Procedures and as described in the individual Specifications.

2. Obtaining (including paying all fees) and maintaining all local, state, and federal permits required to facilitate performance of the Work. Refer to Section 01 41 26 – Permits.

3. Mobilization and Site Preparation

a) Prepare a Site-Specific Health and Safety Plan, provide documentation of required Occupational Safety and Health Administration training and medical monitoring for all employees and subcontractors, and conduct health and safety monitoring for the duration of the Work in accordance with Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites.

b) Mobilize necessary personnel, equipment, and materials necessary to perform the Work.

c) Perform Pre-Construction Conditions Surveys and inspections of the following areas: the Upland Staging Area, the retaining wall, the western bank of the Little River Work area, the Winter Street Bridge, City of Haverhill Wett Weather Sewage Outfall #38, the opening of the conduit to the Merrimack River, and the Little River bathymetry as described in Section 02 21 00 – Surveys.

d) Perform a pre-construction inspection of any buildings or structures within the 284 Winter Street property that are adjacent to the designated Upland Staging Area.

e) Install temporary utilities.

f) Provide and install temporary fencing, gates, and security as described in Section 01 35 53 – Security Procedures.

g) Construct support areas, including the SPA for dredged material dewatering and processing and construction water management; material stockpile areas; truck loading and unloading areas; the crane staging area; accessways for personnel to the Little River; and, as needed, support areas for temporary equipment (e.g., field office trailers, lighting, etc.) and personnel staging.

h) Install, monitor, and maintain temporary environmental controls (e.g., erosion, sedimentation, and sheen controls) in applicable areas within the Limits of Work as described in Section 01 35 43 – Environmental Procedures and Section 01 57 13 – Temporary Environmental Controls.

i) Install traffic controls and designated parking locations within the Project Area, Remediation Support Area, and adjacent roadways, as needed.

4. Conduct pre-dredge activities, including the following:

   a) Remove existing boom system in accordance with Section 35 20 23 – Mechanical Dredging.

   b) Seal existing pipes daylighting through retaining wall in accordance with Section 35 20 23 – Mechanical Dredging.

   c) Conduct debris survey and debris removal in accordance with Section 35 20 23 – Mechanical Dredging.

   d) Address apparent coal tar coating and tar-impacted sediment identified within the Little River in coordination with Engineer in accordance with Section 35 20 23 – Mechanical Dredging.

5. River Area Sediment Dredging, and Dredged Material/Water Management

   a) Conduct Pre-Dredge Survey to document initial conditions per Section 02 21 00 – Surveys.

   b) Remove MGP-impacted sediment from the Little River in accordance with Section 35 20 23 – Mechanical Dredging and as shown on the Contract Drawings.

   c) Transport dredged material to the SPA (located within the Upland Staging Area) for dewatering and stabilization (as necessary), in accordance with Section 35 20 30 – Dredged Material Management. Following processing, transport dredged material off Site to Owner-approved disposal facility in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

   d) Collect and containerize construction water (dewatering effluent, stormwater run-off, and decontamination water) and transport water off the Site for disposal in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

   e) Conduct Post-Dredge Survey to document final dredge conditions per Section 02 21 00 – Surveys.

6. River Area Cap Placement

   a) Transport cap materials from the Upland Staging Area cap material stockpiles to the River Area. Install cap in accordance with Section 35 20 50 – Capping and as shown on the Contract Drawings.

b) Conduct Post-Cap Layer Placement Survey in accordance with Section 02 21 00 – Surveys to document post-remediation conditions.

7. Perform restoration of all Contractor-disturbed surfaces to the satisfaction of Owner and Engineer and provide Post-Construction Upland Topographic Survey to confirm upland areas have been restored to pre-construction conditions per Section 02 21 00 – Surveys.

8. Conduct Post-Construction Conditions Survey per Section 02 21 00 – Surveys.

9. Perform final cleaning and demobilization of personnel, equipment, and materials from the Site.

10. Prepare and submit to Owner all required construction documentation and Record Drawings.

11. Provide any other miscellaneous items or work required to complete the Work.

C. Work shall include replacement, repair, and/or re-installation, as necessary and appropriate, of any items that do not comply with the Contract Drawings or Specifications at no additional cost to Owner.

D. If additional data become available during the execution of the Contract, Owner has the right to reevaluate the requirements of the Contract and modify the Work to be performed, as necessary.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 14 00 – Work Restrictions and Sequence

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Work Sequencing

D. In-River Work Restrictions

E. Utilities

F. Local Ordinances

G. Work Hours and Days

H. Access to Site

I. Contractor's Use of Site

J. Historical/Cultural Restrictions

1.02 SCOPE

A. This section describes the restrictions associated with the Work, including but not limited to Contractor Site access, Work hours and days, security measures, restricted portions of the Site, notifications, and information and restrictions related to day-to-day operation associated with the Work.

1.03 RELATED SECTIONS

A. Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites

B. Section 01 35 43 – Environmental Procedures

C. Section 01 41 26 – Permits

1.04 WORK SEQUENCING

A. The Work of the Contract shall be sequenced in accordance with Contractor's approved Final Baseline Schedule.

B. Work sequencing and scheduling shall be performed consistent with the requirements of this section, including but not limited to all permit-required restrictions.

C. Contractor shall perform Work in a manner that will be compliant with all applicable access agreements. Contractor must ensure that neighboring operations or activities are not disturbed, interrupted, or prohibited as a result of Work. Contractor shall comply with the applicable air, dust, odor, sheen, and noise requirements specified in Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites and Section 01 35 43 – Environmental Procedures.

D. Work sequencing shall be conducted in a manner that prevents contamination or recontamination of areas not contaminated or already decontaminated and in accordance with the Contract Documents. Any contamination or recontamination of materials that occurs as a result of Contractor's activities shall be restored by Contractor at no additional cost to Owner.

E. Work sequencing shall be conducted in a manner to coordinate staging and transporting materials to be treated/disposed of off Site.

F. The construction sequencing shall comply with the following minimum requirements, the regulatory and property-specific requirements described in this section, and the Contract Drawings.

1. All equipment, materials, supplies, and other items necessary to perform Work shall be staged and relocated as necessary to facilitate access to/from Work areas and Site entrances/exits.

2. All in-river activities shall be completed as specified in Section 01 41 26 – Permits, to comply with the Time-of-Year (TOY) Restrictions described in this paragraph 1.05A.

1.05 IN-RIVER WORK RESTRICTIONS

A. Contractor shall plan and schedule in-river (e.g., dredging and cap installation) Work activities conducted between July 1 and February 28 inclusive, unless otherwise required per Section 01 41 26– Permits in the Division of Marine Fisheries communication included in Appendix 3. These TOY restrictions shall be reflected in Contractor's Construction Baseline Schedule.

1.06 UTILITIES

A. The size and location of existing utilities, if noted on the Contract Drawings, are from information available as established from actual field observations and study of existing records. Information related to existing utilities provided herein or on the Contract Drawings is for informational purposes only. Contractor shall take sole responsibility for reviewing information and verifying the locations of utilities, as necessary, and for damage to any utilities line encountered, whether or not shown on the Contract Drawings and whether or not actually located in the field as shown on the Contract Drawings.

B. Contractors shall contact all relevant utilities and Dig Safe at least 5 days prior to beginning intrusive Work and follow Massachusetts Dig Safe ticket expiration requirements.

C. Contractor shall conduct a Pre-Construction Upland Topographic Survey to determine the actual location of all existing utilities prior to starting any Work that may cause damage to such utilities. If the exact location and depth of existing underground utilities are unknown, Contractor, prior to beginning construction, shall perform all necessary explorations and studies to locate these facilities that may affect the Work.

D. Contractor shall notify Engineer immediately of any utility discrepancies.

E. Contractor shall be liable for all damages done to existing utilities in the performance of the Work. Contract time shall not be extended to account for repair of utilities damaged by Contractor.

F. Contractor is required to coordinate as needed with utility companies during the Work. Contractor shall inform Engineer of existing utility installations that need relocation. Any such utility relocation shall be considered incidental to the Work, and no separate payment will be made.

G. Contractor shall exercise care and diligence to observe sustainable and conservational utility use practices throughout the Work.

1.07 LOCAL ORDINANCES

A. Work shall be performed in accordance with City of Haverhill regulations, including ordinances specified at:

1. Code of Ordinances, City of Haverhill, Massachusetts

B. If complaints are received by Owner regarding interferences due to Work activities, then no further Work shall be performed until reduction measures are implemented and approved by Owner.

1.08 WORK HOURS AND DAYS

A. Contractor shall plan and schedule Work activities to be limited to Monday through Friday, unless otherwise requested in advance (minimum 72 hours) and approved in writing by Owner.

B. Work shall only be performed during the hours between 7 a.m. to 7 p.m. in accordance with the City of Haverhill’s City Code unless otherwise approved by Owner and local officials. Contractor may alter work hours for Work only after receiving written approval from Owner and receiving appropriate approvals from local officials. After receiving the approvals, Engineer must be notified 72 hours

before each working day where the Work will be conducted outside the 7 a.m. to 7 p.m. window.

C. All Work conducted during non-daylight hours shall be performed in accordance with the lighting requirements.

1.09 ACCESS TO SITE

A. Contractor shall plan to access the Work Area from Engineer-approved accessways. Contractor may elect to negotiate access with other parties for access to the Work Area. Contractor shall be solely responsible for staging and storage of equipment during non-working hours and shall not impede flow of the Little River. Contractor shall provide access to any off-Site property to Owner and Engineer as requested.

B. Contractor shall be aware of and plan for the hydraulic conditions possible within the Little River. Owner will not compensate Contractor for delays or stoppages to the Work associated with hydraulic events effecting river flows or stage.

1.10 CONTRACTOR'S USE OF SITE

A. The Work shall be confined to the smallest reasonable and practicable area to perform Work in a safe and efficient manner within the Limits of Work shown on the Contract Drawings. Equipment staging areas, material storage areas, material staging areas, and decontamination stations shall be within the Limits of Work. Access to and from the Limits of Work shall only be by the means designated by Owner, described in these Specifications and/or as shown on the Contract Drawings. Under no circumstances shall Contractor perform any Work or conduct any activities at the Site outside of the Limits of Work. Any disturbed area(s) shall be restored to the original conditions by Contractor at no additional cost to Owner.

B. Contractor shall:

1. Assume responsibility for Site security within the Limits of Work and any Contractor-elected off-Site facilities. Contractor shall provide sufficient security to prevent trespassing and vandalism during non-working hours.

2. Protect adjacent properties and the existing Limits of Work.

a) During construction and until final acceptance of the Work, Contractor shall protect and be responsible for all Work performed by Contractor. Work shall be protected immediately after installation.

b) Existing features on or adjacent to the Limits of Work indicated on the Contract Drawings or marked in the field by Engineer shall be protected, as required, from damage of any type that might result

from Contractor's operations. In the event such features are damaged as a result of Contractor's operations, they shall be repaired by Contractor at no additional cost to Owner.

3. Conform to all applicable laws, regulations, codes, ordinances, and standards and Contract Documents.

4. Conform to the requirements of permits as described in Section 01 41 26 – Permits.

5. Assume full responsibility for health and safety of Contractor's employees and Subcontractor employees while at the Site and for implementation of Contractor's Health and Safety Plan for the Work.

6. Work harmoniously with Site personnel, Engineer, property owners, and all entities engaged by Owner necessary to complete the Work.

7. Retaining Wall

   a) Contractor shall strictly adhere to the work restrictions provided by Owner for work near the existing retaining wall at the 284 Winter Street property. Contractor will be supplied with the results of third-party wall monitoring data during construction and shall revise work plans, as required, based on that data and any engineer recommendations.

1.11 HISTORICAL/CULTURAL RESTRICTIONS

A. No archeological or historically significant structures exist within the Limit of Work to the knowledge of Owner and Engineer. However, any potential archeological or historically significant materials discovered by Contractor during the performance of the Work shall be immediately communicated to Engineer and Owner. Contractor shall comply with said requirements per Section 01 41 26 – Permits.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 31 00 – Project Management and Coordination

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Project Coordination

D. Contact Information

E. Schedules and Progress Updates

F. Pre-Construction Meeting

G. Construction Progress Reporting

H. Weekly Construction Period Meetings

I. Additional Meetings

1.02 SCOPE

A. Contractor shall coordinate with Engineer regarding Work scheduling and progress tracking to ensure efficient, orderly implementation of the Work.

1.03 RELATED SECTIONS

A. Section 01 11 00 – Summary of Work

B. Section 01 33 00 – Submittal Procedures

C. Section 01 35 43 – Environmental Procedures

1.04 PROJECT COORDINATION

A. Contractor shall establish on-Site lines of authority and communications and shall comply with procedures for communications and Submittals as described in these Specifications.

B. Contractor shall prepare and submit an organizational chart at the Pre-Construction Meeting describing the management structure of its on-Site and office support personnel, as well as any Subcontractors.

C. Contractor shall coordinate scheduling, Submittals, and Work of various sections of Contract Documents to ensure efficient and orderly sequence of installation of

interdependent construction elements, with provisions for accommodating items installed later.

D. Contractor shall coordinate space requirements, sequencing, permit compliance and monitoring, chain of communications, vehicle traffic, and roles and responsibilities. This includes, but is not limited to, physical or mechanical installation or removal of materials and equipment in accordance with the Contract Drawings and Specifications.

E. Contractor shall coordinate the Work of all Subcontractors and is responsible for such Work performed.

1.05 CONTACT INFORMATION

A. Contractor shall establish and maintain contact information including email addresses for Contractor's project managers and Site superintendents. Contractor's project manager and Site superintendent shall make available and maintain phone, email, and internet access at the Site.

1.06 SCHEDULES AND PROGRESS UPDATES

A. Contractor shall submit a Preliminary Baseline Schedule with their Bid outlining all major Work activities associated with the Contract described in Section 01 11 00 – Summary of Work and associated Contract Drawings and Specifications. This Preliminary Baseline Schedule shall address all major Work activities from the submission of pre-construction Submittals through demobilization. The Preliminary Baseline Schedule shall describe Contractor's sequence and schedule for each component of Work, the length of time required to complete each component of the Work, the necessary equipment that Contractor shall provide to meet schedule constraints, and a critical path analysis. and the Preliminary Baseline Schedule shall take into account the sequencing, property use and access limitations, and permitting restrictions described in this section and shown on the Contract Drawings. This Preliminary Baseline Schedule shall include a Gantt chart and supporting narrative describing, at a minimum, the following:

1. Mobilization.

2. Submittals with separate sub-headings for preliminary work plans.

3. Initial pre-construction surveys and inspections.

4. Installation of environmental controls.

5. Installation of temporary facilities and utilities to support construction.

6. Development of the Upland Staging Area and Sediment Processing Area.

7. Construction of the temporary dam and installation of a river diversion system.

8. Removal of the existing semi-permanent boom system.

9. Retaining wall management (sealing joints, cracks, voids, and pipes).

10. Surficial debris removal, handling, and disposal activities.

11. Addressing apparent coal tar coating and tar-impacted sediment in the Little River in coordination with Engineer.

12. Sediment dredging, subsurface debris removal, handling, and disposal activities including time for surveying and Engineer to perform confirmation sampling, if required.

13. Management and disposal of construction waters.

14. Engineered cap placement including time for surveying and Engineer to perform confirmation sampling, if required.

15. Progress and post-construction surveys.

16. Deconstruction and removal of the temporary dam materials and river diversion system.

17. Post-construction condition inspections.

18. Demobilization.

B. In accordance with the STANDARD GENERAL CONDITIONS OF THE CONTRACT BETWEEN NATIONAL GRID USA SERVICE COMPANY, INC. AND AFFILIATED COMPANIES AND ENVIRONMENTAL REMEDIATOR (General Conditions), within 10 days after Notice to Proceed (NTP), the Final Baseline Schedule shall be submitted electronically by Contractor as specified in Section 01 33 00 – Submittal Procedures.

C. Within 10 days after NTP, Contractor shall prepare the Final Baseline Schedule. This schedule shall identify all task items in sufficient detail to demonstrate how Contractor will execute and sequence the Work. The Final Baseline Schedule shall be consistent with the requirements of the General Conditions and the milestones, sequencing and completion dates, and restrictions described in this section.

D. The Construction Progress Schedule shall be in the form of a Gantt chart and shall consist of horizontal lines, or bars, plotted along a daily time scale. The schedule shall have a separate line for each section of Work and shall identify the first

working day of each week. It shall show the complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities, and shall indicate early and late start, early and late finish, float dates, and duration. The timescale shall indicate all required milestone and completion dates as set forth in the Contract Documents. The horizontal bar(s) shall indicate the start and finish dates as well as the total time period of performance for each activity. Contractor shall arrange the chart to show the activities that are necessary to fulfill each and every milestone and completion date requirement.

E. If Engineer finds that the submitted schedule does not comply with Project requirements, the corrective revisions will be noted on the Submittal copy and returned to Contractor. Contractor shall resubmit revised schedule within 5 working days.

F. Revisions to the accepted Final Baseline Schedule may be made only with the written approval of Owner and Engineer. A change affecting the Contract value of any activity including the Contract time may be made only in accordance with applicable provisions of the Contract Documents.

G. After construction starts, Contractor shall submit to Engineer revised Construction Progress Schedules prior to or during each weekly progress meeting. Each week's schedule shall be an updated version of the Final Baseline Schedule submitted by Contractor and shall include ongoing and proposed activities within the next 3 weeks (3-week "look ahead").

1. The format for all schedules shall be graphical Gantt (bar) charts using the Critical Path Method with the following characteristics:

   a) Each major Work element shall be represented. Significant subtasks shall be broken out from each major Work element.

   b) Time scale shall indicate the first working day of each week.

   c) Diagram shall allow space for notations.

   d) Minimum diagram size shall be 11×17 inches.

   e) Tasks shall be listed in chronological order with the activities that are to occur first at the top of the schedule.

   f) The critical path shall be clearly indicated.

2. Each progress schedule shall show the following:

   a) Complete sequence of Work by activity.

b) Dates for the beginning and completion of each major Work element and the sequence of significant subtasks.

3. Each revised progress update schedule shall include the following, at a minimum:

a) Progress of each activity to date of submission.

b) Projected percent completion for each item, as of the last day of the previous week.

c) Changes occurring since the previous schedule submission, including the following:

1) Changes in scope.

2) Activities modified since previous submission.

3) Revised projections of progress and completion.

4) Other identifiable changes.

d) A narrative report as needed to define:

1) Problem areas, anticipated delays, and impacts on schedule.

2) Corrective action recommended and its effect.

1.07 PRE-CONSTRUCTION MEETING

A. Engineer will schedule and conduct one pre-construction meeting prior to the commencement of any Work at the Site. The meeting will be held via video conference. Engineer will prepare and distribute an agenda for this Pre-Construction Meeting.

B. Attendance Required: Owner, Engineer, Contractor, Contractor's Superintendent, Certified Industrial Hygienist, Site Safety Health Officer (SSHOs), and all key Subcontractors (if applicable).

C. Anticipated Agenda:

1. Submission of executed bonds and insurance certificates.

2. Distribution of Contract Documents.

3. Submission of list of Subcontractors, list of products, Schedule of Values, Construction Progress Schedule, example of weekly progress meeting agenda and minutes, and example of Daily Reports.

4. Designation of personnel representing parties in Contract and Engineer.

5. Procedures and processing of field decisions, Submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

6. Permits and approval status.

7. Sequence of Work and schedule.

8. Health and safety requirements.

9. Site access by Owner and Contractor.

10. Owner's requirements.

11. Construction facilities and controls.

12. Temporary utilities.

13. Survey layout.

14. Application for payment procedures.

15. Procedures for testing.

16. Procedures for maintaining Record Documents.

17. Communications.

18. Interactions with media, regulators, and the public.

D. Engineer will record minutes and distribute copies to participants within 5 working days after meeting.

1.08 CONSTRUCTION PROGRESS REPORTING

A. Contractor shall review the progress and quality of the Work on a daily basis and shall prepare and submit to Engineer each day a Daily Activity Report (DAR) described herein. In addition, within 3 working days from the end of each month, Contractor shall prepare and submit to Engineer a Monthly Progress Summation Form prepared based on these DARs. Contractor shall submit an outline of the Monthly Progress Summation Form with the Contractor's Work Plan.

B. At a minimum, these DARs shall include the following information and shall be submitted to Engineer by the end of the following working day:

1. Project name.

2. Date.

3. Author of report.

4. Weather conditions including wind, precipitation, and temperature.

5. Personnel and equipment on-Site including a listing of all Subcontractors and Suppliers, and sign-in logs for employees, Subcontractors, and visitors, including regulatory agencies and/or testing and inspection entities.

6. Documentation of daily health and safety briefings, daily health and safety toolbox topics, and applicable Job Site Analyses.

7. Materials and equipment delivered, used and/or stored on Site, and demobilized.

8. Summary of Work performed.

9. All quantities of Work performed. For those requiring subsequent measurement or survey, these quantities shall be estimated for the purposes of these reports.

10. Equipment operating, and for each piece of equipment, the following information:

    a) Location of operation.

    b) Hours of operating time.

    c) Name of operator.

    d) Total area dredged or excavated.

    e) Daily production rate.

    f) Survey files (.xyz or digital elevation models) to show the dredging progress for the day.

    g) Equipment performance, maintenance, and hours of downtime due to equipment breakdowns.

11. Tonnage Report Log including weights of each full dredged material container sent to treatment and disposal facility. Contractor shall provide the total tonnage and volume of dredged material transported to the treatment and disposal facility by truck that day.

12. Description and details of the daily Quality Control check of all dredging equipment and positioning system sensors.

13. Cumulative area and volume dredged to date for the Project.

14. Cumulative area of cap placed to date for the Project.

15. Cumulative and daily waste shipment log of debris and dredged material exported off Site.

16. Daily and cumulative volume of water collected in storage tanks and disposed of.

17. Tests performed, including results.

18. Monitoring and inspections performed, including results. Documentation of inspections shall include, but not be limited to the following:

    a) Stability monitoring of the retaining wall

    b) Work Zone air monitoring test results, including air monitoring locations, volatile organic compounds and particulate concentration measurements, exceedance reporting, actions taken when exceedance occurred, and Work Zone Personal Protective Equipment level.

19. Any Notification of Non-Compliance, as described in Section 01 35 43 – Environmental Procedures.

20. Delays encountered and relevant details of the delay, such as the cause, resolution, and measures implemented to avoid similar delays in the future.

1.09 WEEKLY CONSTRUCTION PERIOD MEETINGS

A. Contractor shall schedule and administer meetings throughout progress of the Work at weekly intervals.

B. Contractor shall make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and Suppliers, third-party SSHO(s), Owner, and Engineer, as appropriate to agenda topics for each meeting.

D. Agenda: Contractor shall be responsible for developing the weekly meeting agenda, which at a minimum shall include the following:

1. Review minutes of previous meetings.
2. Health and safety issues.
3. Review of Work progress.
4. Review of monitoring results.
5. Field observations, problems, and decisions.
6. Identification of problems impeding planned progress.
7. Review of Submittals schedule and status of Submittals.
8. Review of off-Site fabrication and delivery schedules.
9. Review of Construction Progress Schedule in Gantt format.
10. Corrective measures to regain projected schedules.
11. Planned progress during succeeding Work period.
12. Identification of potential impacts to ongoing operations during succeeding Work period, and means and methods to reduce said impact.
13. Identification of noise and vibration-producing activities planned during succeeding Work period, and means and methods to control and monitor related impacts.
14. Coordination of projected progress.
15. Maintenance of quality and work standards.
16. Effect of proposed changes on Construction Progress Schedule and coordination.
17. Financials discussion.
18. Action items.
19. Other business relating to Work.

E. Contractor shall record minutes and distribute copies by the end of the following working day to all meeting participants. Engineer will review the draft and provide comments/edits to Contractor. Contractor shall modify and distribute a final version of the meeting minutes to Owner and Engineer prior to the subsequent weekly meeting.

F. The weekly meetings shall be conducted on a date to be determined following Contract award and as agreed to by Engineer and Owner.

1.10 ADDITIONAL MEETINGS

A. Contractor shall attend additional meetings requested by property owners, regulatory agencies, and/or local officials at no additional cost to Owner.

B. Engineer will prepare agenda and minutes for such meetings.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 33 00 – Submittal Procedures

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Submittal Requirements

C. Submittal Review

D. Work Plans

E. Shop Drawings

F. Design Data

G. Test Reports

1.02 SCOPE

A. Contractor shall submit required documents and materials for Engineer's review in accordance with the Contract Documents. The Submittal List (Table A) includes a Schedule of Submittals that are specified in the Contract Documents and the requirements for submittal timeframes, including those required to be submitted within 7 to 14 days of the Notice to Proceed. Contractor shall review the list of submittals provided in Table A and verify for accuracy and completeness.

B. This section includes requirements for administrative and Work-related submittals such as progress schedules, work plans, shop drawings, test results, operation and maintenance data, construction photographs, and other submittals required by the Contract Documents.

1.03 SUBMITTAL REQUIREMENTS

A. Required submittals are listed in Table A – Submittal List included at the end of this section which will serve as the preliminary Schedule of Submittals. Table A also includes the required Engineer review time for certain submittals. In the event of a discrepancy between Table A and the individual Specification sections, the submittal requirements of the individual Specification section will apply, and Contractor shall notify Engineer of this inconsistency in writing.

B. Engineer may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. Contractor shall provide these requested submittals at no additional cost to Owner.

C. Within 10 days following the Notice to Proceed, Contractor shall develop and maintain a submittal Tracking Register that includes at a minimum, a complete listing of all required Submittals (see Table A), including the subject matter of each Submittal (Submittal name), the corresponding Specification name and number(s), preparer, applicable unique tracking numbers, planned dates of Submittal submissions, the actual date of submissions with listing of subsequent resubmissions, and Engineer's approval action. The Submittal Tracking Register shall list Submittal dates for shop drawings, Product Data, and samples and shall indicate the dates by which Engineer review will be required and the decision dates for the selection of finishes. Contractor shall be responsible for generating and updating (and making available to Engineer) the Submittal Tracking Register with each Submittal and resubmittal document.

D. Contractor shall submit required Submittals to Owner and Engineer in accordance with the following:

1. Include with each Submittal a transmittal form that clearly identifies the Submittal name, Specification section name and number, preparer, and date submitted. Each Submittal form shall also include a unique tracking number.

2. Sequentially number transmittal forms. Mark revised Submittals with original number and sequential alphabetic suffix.

3. Identify on each Submittal the Project, Contractor, Subcontractor, and Supplier; pertinent drawing and detail number; Specification section name and number appropriate to Submittal; and date submitted.

4. Provide a separate Submittal for each Specification requiring Submittals. Where multiple Specifications relate to the same system or element and are being provided from the same source, a single combined Submittal is acceptable.

5. Contractor shall apply an Engineer's stamp (where required), signature or initials, certifying that review, approval, verification of product selections and designations, compatibility with field conditions and dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents. If Submittal requires a Professional Engineer's stamp, Contractor shall ensure the Submittal has been prepared and signed by a Professional Engineer currently licensed to practice in Massachusetts. Contractor shall verify compatibility of Submittal with requirements of the Contract Documents and shall return non-conforming Submittals to the preparer for revision rather than submitting for review by Engineer. Submittals that are incomplete, improperly packaged, or from sources other than Contractor will not be accepted.

6. Coordinate submission of related items and group Submittals of related products in a single transmission. Coordinate Submittals to avoid conflicts between various items of Work. Schedule Submittals to expedite Project, and deliver to Engineer and Owner.

7. Include all Submittal material requested for each Specification.

8. Clearly identify variations from requirements of Contract Documents in all Submittals. Failure to identify variations from the Contract Documents does not relieve Contractor of responsibilities to comply with the Contract Documents and will result in the Submittal being marked "Not Approved, Revise and Resubmit."

9. Clearly identify any proposed substitutions for materials or modifications to the procedures specified in the Contract Documents in each Submittal. State product or system limitations that may be detrimental to successful performance of completed Work. Failure to do so will result in the Submittal being marked "Not Approved, Revise and Resubmit."

10. Mark or show dimensions and values in same units as specified.

E. Submittals requiring Engineer approval shall be scheduled and made prior to acquisition of the material or equipment covered thereby and before any Work described is initiated. Contractor shall begin no fabrication or Work requiring the Submittals until return of the Submittals with Engineer's approval/comments. No delays, damages, or time extensions will be allowed for time lost in late Submittals.

F. Owner and/or Engineer may elect to stop Work activities at the Site in the event that Submittals have not been submitted or are not of acceptable quality (as determined by Owner or Engineer) and per the schedules specified herein. Any delays related to Submittal approvals shall not allow the construction schedule to be extended and shall not be reason to increase the Contract price.

G. For Work that does not have a Submittal specified in these Contract Documents, Contractor shall document any proposed variation from the Contract Drawings and Specifications in the form of a Submittal consistent with this section. Such Submittal shall be submitted to Engineer and Owner for review at least 10 days prior to the planned start date of the activity affected by the proposed variation.

H. Contractor must adhere to approved Submittals; deviation from the approved Submittals must be pre-approved by Engineer in writing.

I. Transmittal: Transmit all Submittals electronically via electronic mail or other approved electronic cloud-based file transfer service.

1.04 SUBMITTAL REVIEW

A. Engineer's review will only be for compliance with the design concept of the Project and for compliance with the information given in the Contract Documents, not extending to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence, or procedure of construction is indicated in or required by the Contract Documents), or to standards, codes, or regulations, or to safety precautions or programs incident thereto. Approval of Submittal by Engineer does not relieve Contractor of responsibility for correcting errors that may exist in a Submittal or from meeting the requirements of the Contract Documents.

B. Review time: Engineer will have at least 5 working days for initial review of each Submittal.

C. Engineer reserves right to withhold action on a Submittal that requires review of related Submittals before said Submittal can be approved until related Submittals are received. Additional time will be required if processing must be delayed to permit review of related subsequent Submittals.

D. Review actions: After review, Engineer will return Submittals marked as follows to indicate action taken:

1. **Approved**: Part of Work covered by Submittal may proceed provided it complies with requirements of Contract Documents. Final acceptance will depend upon that compliance. The term "Approved" shall only indicate that there is no exception taken to the Submittal.

2. **Approved Except as Noted:** Part of Work covered by Submittal may proceed provided it complies with notations and corrections on Submittal and requirements of Contract Documents. Final acceptance will depend upon that compliance.

3. **Not Approved, Revise and Resubmit:** Do not proceed with part of Work covered by Submittal including purchasing, fabricating, and delivering. Revise or prepare new Submittal in accordance with notations and resubmit.

E. Resubmission

1. When revised for resubmission, changes made since previous submission shall be submitted in redline/strikeout and/or other means to track changes made to previous Submittal.

2. Resubmissions shall be required within 5 days of return from Engineer review.

3. Revised Submittals shall be submitted following the procedures specified for initial Submittals.

4. Resubmittals shall include the original tracking number with a letter designation such as “A” for the first resubmittal or “B” for a second resubmittal.

5. Resubmittals are required until all comments by Owner and Engineer are addressed. All changes made in the resubmittal must be documented and must also indicate any changes made other than those requested by Owner and Engineer.

6. Final approved Submittals shall be provided without redline/strikeout.

F. Contractor shall distribute copies of reviewed Submittals as appropriate, and shall instruct parties to promptly report inability to comply with requirements. Deviations from approved Submittals must be pre-approved by Engineer in writing. After Submittals have been approved by Engineer, no resubmittal for the purpose of substituting materials or equipment will be given consideration unless accompanied by an explanation as to why a substitution is necessary.

G. Contractor shall distribute paper copies of Submittals that have been accepted by Owner to the following files:

1. Job Site file.

2. Record Documents file.

H. Submittals processed by Engineer do not become Contract Documents and are not to be considered Change Orders; the purpose of a Submittal review is to establish a reporting procedure and is intended for Contractor’s convenience in organizing the work and to permit Engineer to monitor Contractor’s progress and understanding of the design. Review, acceptance, or approval of Submittals shall not add to the Contract amount and additional costs that may result shall be solely the obligation of Contractor.

I. Contractor shall direct inquiries to Engineer regarding the procedure, purpose, or extent of any Submittal if clarifications are required prior to Submittal to avoid delays in approval.

1.05 WORK PLANS

A. Contractor shall prepare and submit the required work plans as listed and within the timeframe indicated on Table A.

B. Work plan requirements are included in individual Specification sections or on Contract Drawings.

C. Components of the Contractor's Work Plan are detailed in Table A.

D. Work relevant to the individual plans shall not be performed until the plan has been approved by Engineer.

E. Each section of each plan shall be indexed separately and referenced by a Table of Contents, and all pages shall be numbered.

1.06 SHOP DRAWINGS

A. Contractor shall submit shop drawings to Engineer for review for the limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Where required by the Specifications or otherwise needed, Contractor shall prepare drawings illustrating the portion of Work for use in fabricating, interfacing with other work, and installing products. Contract Drawings shall not be reproduced and submitted as shop drawings.

C. When required by individual Specifications sections, Contractor shall provide shop drawings signed and sealed by a Professional Engineer responsible for designing components shown on shop drawings.

1. Include signed and sealed calculations to support design.

2. Submit shop drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.

3. Make revisions and provide additional information when required by authorities having jurisdiction.

D. Electronic Format

1. Size printable to: 8.5 by 11 inches minimum and 22 by 34 inches maximum.

2. Present in a clear and thorough manner. Label each shop drawing with Project name. Identify each element of the shop drawing with reference number.

E. Submit number of opaque reproductions Contractor requires, plus two copies Engineer will retain.

1.07 DESIGN DATA

A. Contractor shall submit design data for Engineer's knowledge as Contract administrator or for Owner.

B. Contractor shall submit information for the limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.08 TEST REPORTS

A. Contractor shall submit test reports for Engineer's knowledge as Contract administrator or for Owner.

B. Contractor shall submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

TABLE A – PRELIMINARY LIST OF SUBMITTALS

The following represents the preliminary list of project submittals that the Contractor may use as the basis for its Submittal Tracking Register. The Contractor is responsible for reviewing and verifying the accuracy and completeness of this list. If additional submittals are identified in the Contract Documents, they should be brought to the attention of Owner and Engineer.

Submittal	Submittal Timeframe
01 31 00 – Project Management and Coordination	
Project Organization Chart	Submitted at Pre-construction Meeting
Preliminary Baseline Schedule	With Bid
Final Baseline Schedule	Within 10 days after NTP
Construction Progress Schedule Updates	Weekly
Daily Activity Report (DAR)	By the end of the following workday
Monthly Progress Summation Form	Monthly, within 3 working days from the end of each month.
Weekly Meeting Minutes	By the end of the working day following the meeting
01 33 00 – Submittal Procedures	
Submittal Tracking Register	Within 10 days after NTP
For Work that does not require a submittal, documentation of any proposed variation from Contract Drawings or Specifications	At least 10 days prior to the planned start date of the activity affected by the proposed variation
Contractor's Work Plan (CWP), per each Specification, including, but not limited to: • Environmental Procedures Plan • Temporary Construction Plan • Survey Work Plan • Decontamination Plan • Waste Management Plan • Dredge Work Plan • Dredged Material Management Plan • Capping Plan	Within 21 days after NTP. CWP component details provided in subsequent sections of this table.
Shop Drawings (as required by the Specifications)	At least 10 days prior to the planned start of associated work
Design Data (as required by the Specifications)	At least 10 days prior to the planned start of associated work
Test Reports (as required by the Specifications)	At least 10 days prior to the planned start of associated work

DIVISION 01—GENERAL REQUIREMENTS
Section 01 33 00A – Submittal Procedures – Table A

Submittal	Submittal Timeframe
01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites	
Qualifications and experience of independent firm who will oversee Health and Safety, and of assigned Certified Industrial Hygienist	With Bid
Qualifications of assigned Site Safety and Health Officers	Within 7 days of NTP, but no fewer than 14 days prior to commencement of field activities
Health and Safety Plan (including certification of HASP acknowledgment by workers, and Air Monitoring Plan)	Within 7 days of NTP, but no fewer than 14 days prior to commencement of field activities
Documentation of personnel training, medical monitoring, and respirator qualification and fit testing for personnel identified at start of project	Within 7 days of NTP, but no fewer than 14 days prior to commencement of field activities
Documentation of personnel training, medical monitoring, and respirator qualification and fit testing for all other Site workers	No fewer than 7 days before worker's mobilization to Site.
Work Zone and Work Zone Boundary Monitoring Results	By 10 a.m. the following working day. Complete monitoring results submitted 7 days following completion of monitoring activities
Incident Reports	Verbal within 2 hours; written by 10 a.m. the following day
01 35 43 – Environmental Procedures	
Environmental Procedures Plan (as part of CWP), Including but not limited to: • Product Specifications and Data Sheets • Spill and Discharge Control Procedures, Responses, and Contingency Plans • Spill Prevention, Control, and Countermeasure (SPCC) Plan (if necessary) • Dust, Odor, and Vapor Control Measures • Containment and Cleanup Procedures	Within 21 days after NTP
Spill/Release Notification	Immediate verbal notification to Owner and Engineer. Written notification of date and time in DAR. Notify regulators per applicable regulatory requirements.
Spill and Discharge Cleanup Report	Within 48 hours of completion of spill or discharge cleanup.
Response actions required during any water quality monitoring (if required) including date and time implemented.	Documentation with DAR

DIVISION 01—GENERAL REQUIREMENTS
Section 01 33 00A – Submittal Procedures – Table A

Submittal	Submittal Timeframe
01 35 53 – Security Procedures	
Name of employee, company, and ID	At least 7 days working days prior to the worker entering the Site.
Daily log of Site workers and visitors	With DAR
01 41 26 – Permits	
Copies of all applicable permits	At least 10 working days prior to start of relevant work
Additional correspondence or addenda related to Contractor-obtained permits	Within 2 working days of receipt
Shop drawings for signage	Within 30 days of NTP
01 45 00 – Quality Control	
Construction Quality Control Plan (CQCP)	Within 21 days of NTP
Daily Contractor Quality Control Report (CQC)	Attached to DAR
01 53 00 – Temporary Construction	
Temporary Construction Plan (component of CWP) and material specifications	Within 21 days of NTP
01 57 13 – Temporary Environmental Controls	
Temporary Environmental Control (TEC) material specifications	No later than 14 days prior to use and prior to delivery of material to the Site.
TEC daily monitoring and record of repairs, if required	Reported in DAR
01 78 00 – Project Record Documents	
Record Survey Drawings	See applicable specification section
Record Drawings	Due at Substantial Completion
Project Records	See applicable specification section
Contract Modifications and Addenda	Due at Substantial Completion
02 21 00 – Surveys	
Survey Work Plan (component of CWP)	Within 21 days of NTP
Pre-Construction Conditions Survey Pre-Construction Upland Topographic Survey Pre-Construction (i.e. Pre-dredge) In-River Topographic Survey	Perform surveys at least 14 days, but no more than 30 calendar days prior to Construction. Submit electronic results of the pre-construction Conditions and Topographic Surveys within 3 days after the survey is complete.
Survey submittals including pre-, interim-, and post-dredge and cap placement surveys	Within 3 days of survey data collection
Documentation of survey accuracy, logs, and field notes if requested by Engineer	Within 2 days of request
Survey Record Drawings and all survey logs and field notes	Within 10 calendar days of completing survey

DIVISION 01—GENERAL REQUIREMENTS
Section 01 33 00A – Submittal Procedures – Table A

Submittal	Submittal Timeframe
Post-Construction Conditions Survey	Within 14 days of completion of Work
02 51 29 – Surface Cleaning and Decontamination	
Decontamination Plan (component of CWP)	Within 21 days of NTP
02 61 00 – Removal and Disposal of Waste Materials	
Waste Management Plan (component of CWP) including required information regarding laboratories, disposal facilities, and transporters	Within 21 days of NTP
Name and addresses of all Owner approved recycling and treatment/disposal facilities proposed for use	With Bid
Disposal receipts	Within 5 days of transportation from Site
31 05 13 – Aggregates	
Results of chemical and physical property testing	At least two weeks prior to delivery of materials to the Site
Proposed material source, certification letters, and sample	Prior to material delivery to the Site
35 20 23 – Mechanical Dredging	
Dredge Work Plan (component of CWP)	Within 21 days from NTP
Description of dredging work activities and progress in accordance with specifications	With DAR
Written statement verifying results of visual debris survey for Engineer acceptance	Provide at least 5 days before proceeding with debris removal work
35 20 30 – Dredged Material Management	
Dredged Material Management Plan (component of CWP)	Within 21 days from NTP
35 20 50 – Capping	
Capping Plan (component of CWP)	Within 21 days from NTP
Description of capping work activities and progress in accordance with specifications	With DAR

DIVISION 01—GENERAL REQUIREMENTS
Section 01 35 29 – Health, Safety and Emergency Response Procedures for Contaminated Sites

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. References and Standards

D. General Requirements

E. Health and Safety Requirements

F. Submittals

G. Responsibilities of Contractor and Additional Subcontractors

H. Stop Work Authority

I. Employee Training

J. Hazard Communication

K. Site Access and Controls

L. Air Monitoring – General Requirements

M. Noise Monitoring

N. Perimeter Monitoring

1.02 SCOPE

A. Contractor shall provide all labor, materials, equipment, and services necessary for Contractor to protect health, safety, and public welfare of Site workers, on-Site personnel, Site visitors, trespassers, and the environment during the performance of all Work, including, but not limited to the following actions:

1. Developing, implementing, and adhering to the requirements of a Site-specific Health and Safety Plan (HASP) during execution of the Work.

2. Conducting Work Zone air quality monitoring in accordance with 29 Code of Federal Regulations (CFR) 1910.120(h) and 29 CFR 1926.65(h); noise monitoring in accordance with 29 CFR 1910.95(d); and responding to threshold exceedances during air and noise monitoring as specified herein.

1.03 RELATED SECTIONS

A. Section 01 11 00 – Summary of Work

B. Section 01 33 00 – Submittal Procedures

C. Section 01 35 43 – Environmental Procedures

1.04 REFERENCES AND STANDARDS

A. Federal Occupational Safety and Health Administration (OSHA) Standards.

1. Air Contaminants – Permissible Exposure Limits. OSHA 3112. 1989.

2. General Industry Standards and Interpretations. Volumes 1-3, OSHA 2077. U.S. Department of Labor, Occupational Safety and Health Administration. Specifically Sections: 29 CFR 1910.1000-1050 (air contaminants), 1910.120 (Hazardous Waste Operations and Emergency Response), 1910.1200 (Hazard Communication), 1910.301 Subpart S (Electrical), 1910.146 (Permit Required Confined Space) 1910.147 (Control of Hazardous Energy (Lockout/Tagout)), 1904 (Recordkeeping and Reporting Occupational Injuries and Illnesses), 1990 (Identification, Classification and Regulation of Potential Occupational Carcinogens), and 1926 (Safety and Health Regulations for Construction).

3. Hazardous Waste Inspections Reference Manual. U.S. Department of Labor. Occupational Safety and Health Administration. 1986.

4. OSHA Field Operations Manual. 2nd Edition. U.S. Department of Labor. Occupational Safety and Health Administration. 1987.

B. Health and Safety Procedures outlined in CMR 40.0018 of the MCP.

C. National Grid Safety Procedures – Contractor Safety Requirements.

D. National Grid Environmental Guidance documents.

1.05 GENERAL REQUIREMENTS

A. Contractor shall assist Owner with development of a Process Hazard Analysis (PHA) to meet the requirements of Owner's Environmental Guidelines. At a minimum, Contractor shall be required to:

1. Attend a meeting (or participate in a conference call, depending on Owner's requirements) with Owner at the National Grid office in Waltham, Massachusetts, to develop the PHA. Contractor's Project Director, Project Manager, Site Superintendent, and Site Health and Safety

Officer are required to be in attendance. The meeting is anticipated to last approximately 4 to 8 hours.

2. Assist Owner with addressing action items that result in the PHA meeting to the satisfaction of Owner.

B. Contractor shall implement health and safety procedures designed to protect health, safety, public welfare, and the environment during the performance of the Work. Such procedures shall include, without limitation, the following:

1. Measures to ensure that all construction activities are conducted in a safe manner, including specific procedures for working in the vicinity of heavy equipment, underground and overhead utilities, sediment dredging, and other activities anticipated during the execution of the Work.

2. Measures to protect all persons, on and off the Site, from exposure to oil and/or hazardous material as defined by Massachusetts Department of Environmental Protection (MassDEP), hazardous wastes as defined by the U.S. Environmental Protection Agency (USEPA), hazardous materials as defined by MassDOT, and/or hazardous substances as defined by the OSHA, which may originate from or be present at the Site.

3. The institution of air monitoring activities to determine potential exposure to airborne particulates and vapors by Contractor's employees and Subcontractors and all other on-Site personnel.

4. The institution of corrective actions in response to dust, VOCs, and/or odors above threshold values within the Work Zones or Site perimeter.

5. Measures necessary to contain oil and/or hazardous material during the performance of the Work, including:

a) Measures to control fugitive dust and other environmental media.

b) Measures to decontaminate personnel, vessels, and equipment to prevent the spread of impacted sediment from the work areas.

c) Measures to secure dredging and temporary staging of MGP-impacted materials, including transport to disposal facility.

d) Measures to mitigate conditions exceeding Site-specific or regulatory threshold values and/or stabilize the work area as necessary to protect public health and safety.

C. Contractor shall establish and maintain Support, Contamination Reduction, and Exclusion Zones at the Site in accordance with OSHA 29 CFR 1910.120.

D. Contractor shall provide all required personnel decontamination equipment and materials in accordance with OSHA 29 CFR 1910.120.

E. Contractor shall dispose of all PPE used by Contractor's employees, Subcontractors, Construction Manager, Engineer, Owner, and/or any other Site visitors in accordance with all applicable regulations.

F. Contractor shall engage an independent firm and CIH who will be charged with overseeing Site health and safety, instrument monitoring, personnel and equipment decontamination, control of equipment check-out, and emergency response.

G. Contractor's Site–specific HASP for their workers, including Subcontractors, shall specifically address all engagement in activities where exposure to coal tar and/or coal tar-impacted material is possible. The HASP shall be prepared by the CIH engaged by an independent third party as described herein, who is qualified by training and experience to perform this work. The nature of potential impacted materials may require the use of monitoring equipment, special personal protective clothing, and respiratory protection.

H. The purpose of the HASP is to establish Site-specific health and safety requirements for protecting the health and safety of on-Site personnel and public abutters during all activities conducted on-Site where a potential exists for exposure to potentially hazardous materials, including but not limited to coal tar and/or coal tar-impacted soil, sediment, water, or air. The HASP shall address Contractor and subcontractor(s) worker protection and their activities at this Site, and protection of public health and safety.

I. Contractor shall conduct a pre-construction health and safety coordination meeting prior to commencement of Work at the Site to inform workers of the Site conditions, health and safety procedures, and contingency actions. The pre-construction health and safety coordination meeting shall be held at least 3 working days prior to the commencement of Work. Contractor shall also inform new workers of the Site conditions and proposed health and safety contingency actions on a continuous basis. If changes in scope, materials, or methods used are selected after initial job brief or preconstruction health and safety coordination, then amendment to the HASP shall be made and documented and workers shall be notified of the changes.

J. Contractor shall provide all necessary health and safety equipment, including, but not limited to, PPE, respiratory equipment, and monitoring instruments.

K. Contractor shall ensure that decontamination of equipment and tools utilized in the Work is accomplished prior to removal from the Site.

L. The scope and detail of the health and safety procedures shall be commensurate with the degree and nature of the risks posed to human (worker and public) and ecological populations by the Work as determined by the CIH retained by Contractor.

M. Contractor shall be responsible for determining the appropriate level of personal protection required based on the criteria outlined in Contractor's HASP. Work shall be suspended whenever Contractor personnel are not equipped with a sufficient level of protective clothing and equipment for the hazards encountered. In the event Contractor determines that a level of protection higher than Level D is required, Contractor shall immediately or pre-emptively notify Engineer, and Contractor's personnel shall take the necessary steps outlined in the HASP.

N. The HASP shall contain provisions for maintaining the health and safety of the public as it relates to the Work.

O. Refer to Section 01 11 00 – Summary of Work for a description of environmental conditions at the Site.

1.06 HEALTH AND SAFETY REQUIREMENTS

A. Contractor shall at all times be solely responsible for exercising reasonable precaution to protect the health, safety, and welfare, of all on-Site personnel, the public, and the environment during performance of the Work described herein and shown on the Contract Drawings. Contractor shall comply with all applicable provisions of federal, state, and local health and safety and occupational health and safety statutes and codes. Contractor shall be responsible for any violations of applicable regulations including payment of costs involved with correction of violations, hearing or appeal procedures, and claims and/or fines associated with said violations at no additional cost to Owner.

B. Contractor shall also comply with conditions contained in permits or licenses obtained by Owner pertaining to the Work. Contractor shall make every effort to comply with requests from Owner.

C. Contractor shall follow all guidelines and procedures listed in the National Grid Contractor Safety Requirements documents included in the Contract Documents.

1. In any emergency threatening life or property, not considered by Contractor as coming under the preceding provisions, Contractor may act at its own discretion without authorization by Owner. In the case of such an event, Contractor shall notify Engineer and Owner as soon as possible.

D. Contractor shall be responsible for all notifications to utility companies or other parties regarding any intrusive Site work in compliance with OSHA 29 CFR 1926.650-652 and all applicable local and state requirements.

E. Contractor shall engage an independent firm and CIH recognized by the American Board of Industrial Hygiene to develop, implement, administer, and supervise a Site-specific HASP and associated procedures in accordance with these Specifications. The qualifications and prior relevant project experience of the firm and the assigned CIH shall be submitted with the Bid. Substitution of the Project-assigned firm, CIH, and/or SSHO will not be allowed without pre-approvals by Owner/Engineer and acceptance of qualified substitute by Owner/Engineer. The qualifications of the CIH shall include:

1. A minimum of ten (10) years working experience in the chemical or hazardous waste industry.

2. Demonstrable expertise developing, implementing, and overseeing projects of similar nature, including but not limited to heavy construction, earthwork, marine work, dredging, crane operations, etc.

3. Demonstrable expertise in air monitoring techniques and in the development of PPE programs for working in potentially toxic atmospheres.

4. Working knowledge of applicable state and federal occupational safety and health regulations.

F. The CIH shall review the available chemical and analytical data, the specified scope of work and Site conditions in the development of the HASP. The HASP shall be written in compliance with applicable sections of OSHA 29 CFR 1926 and 1910. The HASP must establish in detail the protocols necessary for protecting workers, on-Site personnel, visitors, and trespassers from potential physical and chemical hazards encountered during the Work. The HASP shall be prepared and submitted under cover of the independent CIH.

G. Daily health and safety briefings shall be conducted prior to each day's Work and documented in the DARs. Contractor is required to notify all workers of the history of the Site and source materials that are present, and to be alert for evidence of coal tar and MGP-impacted materials. Workers who are potentially in direct contact with on-Site coal tar and/or coal tar-impacted materials, shall, at a minimum, be trained in health and safety procedures according to the OSHA requirements (29 CFR 1910.120) and be current in their OSHA 8-hour refresher training. Site workers that are not in compliance with health and safety training requirements and medical monitoring will not be allowed to conduct Work at this Site.

H. Contractor shall designate two SSHOs, one primary and one backup, from the independent firm approved by Owner, who shall assist and represent the CIH in the continuous, day to day, implementation and enforcement of the HASP. The SSHOs shall be present on Site whenever Work is occurring and shall report to

the CIH matters pertaining to Site safety, health, and environmental concerns. The SSHOs shall be responsible for preparing and maintaining all daily health and safety Site logs and reports. The qualifications and prior relevant project experience of the SSHOs shall be submitted to Owner and Engineer for approval prior to their engagement on the Project. Substitution of the Project-assigned SSHOs shall not be allowed unless there has been a pre-approved (by Engineer and Owner) and qualified substitute. The qualifications of the SSHOs shall include:

1. A minimum of three (3) years working experience at hazardous materials or waste Sites.

2. Demonstrable expertise in overseeing health and safety programs similar in scope, including but not limited to heavy construction, earthwork, marine work, and dredging.

3. Working knowledge of applicable state and federal occupational safety and health regulations.

4. Specialized training in personal and respiratory equipment program implementation and in the proper use of air monitoring instruments, and air sampling methods and procedures.

5. Current certification in first aid and CPR by a recognized, approved organization such as the American Red Cross.

6. In addition to 40-hour OSHA training, annual refresher training, and medical monitoring, the SSHO shall also have Supervisor training in accordance with OSHA 29 CFR 1926.65 and 1910.120.

I. Contractor shall comply with the Site-specific air monitoring requirements as specified herein. The air monitoring requirements include, but are not limited to, monitoring frequency, action levels, monitoring equipment, monitoring locations and specific response actions to be taken in the event that any action levels are triggered. Contractor shall be responsible for conducting response actions if action levels are exceeded. Contractor’s HASP shall also include steps to be taken in the event that air monitoring action levels, on Site or perimeter, are approached or exceeded. Contractor’s HASP shall detail all corrective actions to be taken by Contractor to address action level exceedances, both within the work areas and at the Site perimeter, and shall include all equipment and materials proposed by Contractor to control dust, VOCs, and odors during construction. Engineer will be responsible for conducting perimeter air monitoring.

J. Contractor shall be required to conduct the Work in a manner that prevents vapor emissions and fugitive dust that may impact public health or result in nuisance conditions. Contractor shall control vapor emissions and dust so that perimeter

action levels are not exceeded as specified in this section. Requirements for Contractor to monitor ambient air for dust near excavations are included below. Contractor will be required to carefully cover and monitor the integrity of all material stockpiles. Contractor shall provide and have immediately available in adequate amounts, equipment, processes, or materials pre-approved by Engineer to mitigate reasonably foreseeable air or odor conditions commensurate with the type of remediation work being conducted at the time.

K. Opinions of Engineer or Owner regarding expected Site conditions do not relieve Contractor of his responsibility to protect the health and safety of his employees, all Subcontractor employees, the public welfare, and the environment. In the event Contractor discovers unknown, unforeseen, sudden or potentially hazardous conditions, or environmental conditions inconsistent with known existing conditions, Contractor shall notify Engineer and Owner immediately. The verbal notification of any environmental releases, injuries, near misses, or OSHA-reportable events shall be reported to Engineer and Owner immediately following the incident. At that time, Site actions may include a safety stand-down or safety work stoppage depending on the severity of the event. It shall be followed by a written description of the conditions. Written description shall be submitted to Engineer and Owner within 24 hours of the discovery. Contractor shall cooperate with any follow-up investigations conducted by Owner or Engineer of a reportable condition or other incident.

1.07 SUBMITTALS

A. With Bid: Qualifications and experience of the independent firm and assigned CIH shall be submitted with Contractor Bids.

B. Pre-Construction: Within 7 days of NTP but no less than 14 days prior to the Work's mobilization to the Site, in accordance with Section 01 33 00 – Submittal Procedures, Contractor shall submit the following to Engineer:

1. Qualifications of the assigned SSHOs employed by Owner- and Engineer-approved independent firm and under the guidance and direction of the approved CIH.

2. Documentation of medical monitoring for all on-Site workers anticipated to start the Project, including those employed directly by Contractor and all Subcontractors.

3. Documentation of 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and applicable 8-hour annual HAZWOPER refresher training and other applicable training (e.g., confined space entry).

4. Documentation of personnel respirator qualification and fit testing.

5. A Site-specific HASP that shall address all applicable requirements under OSHA 29 CFR 1910.120. The plan shall be written to avoid misinterpretation, ambiguity, and mistakes that verbal orders cause.

C. HASP Requirements: The HASP shall be prepared and implemented by the Owner-approved, independent health and safety firm engaged by Contractor and shall address all relevant Work the Contractor is to undertake to complete the Project. Contractor's HASP shall also address employee hazard control procedures for all contaminated soil, sediment, groundwater, process water, and stormwater handling and management. At a minimum, the HASP shall include the following information:

1. A Site Control Plan to establish Work Zones including but not limited to an Exclusion Zone, Contamination Reduction Zone, and Support Zone on the Site, based on the Contract Drawings and requirements specified in this section. Contractor shall also develop operational procedures in order to properly implement the plan.

2. Specific provisions for Stop Work authority consistent with this section.

3. Specific provisions for stopping work and re-evaluating safety procedures and equipment in the event an unanticipated work scope is required.

4. Site Description and Hazard Evaluation.

5. Names of key personnel and alternates responsible for Site safety and health (responsibilities and chain of command).

6. Safety and health hazard assessment and risk analysis for each task and operation, including physical, chemical, and biological hazards.

7. Identification of the independent firm, CIH, and SSHO as well as additional key personnel and alternates responsible for Site safety.

8. Requirements for training in accordance with applicable federal, state, and local regulations for each work task, and a record or schedule for training of Contractor's and Subcontractors' workers in the use of PPE.

9. Work task-specific levels of protection and a description of health and safety equipment including protective clothing, respiratory equipment, and monitoring instruments.

10. Medical Surveillance in accordance with applicable federal, state, and local regulations.

11. As part of the HASP, Contractor shall include a Site-specific Air Monitoring Plan. No Work shall be performed until Engineer has

determined that the Air Monitoring Plan is acceptable. The plan shall include, but not be limited to, the following information:

1) Contractor work area monitoring procedures, personnel, equipment, and documentation.

2) Corrective action trigger levels for Work Zone dust, VOCs, and odors (monitoring to be conducted by Contractor).

3) Corrective actions to be completed for on-Site dust, VOC, and odor action level exceedances (monitoring to be conducted by Contractor).

4) Air Monitoring Response Plan that outlines corrective actions to be completed following dust, VOC, and odor action level exceedances detected by the Perimeter Air Monitoring program or through complaints from the public (perimeter monitoring to be completed by others).

5) Equipment and materials to be used during corrective actions.

12. The Work Zone and Work Zone boundary dust, odor, vapor, and noise action levels in accordance with applicable federal, state, and local regulations.

13. Standard Operating Procedures for engineering controls for dust, odors, vapors, vibration and noise, and work practices.

14. Site control measures (Work Zones, communications, and security), including a map indicating route to hospital for emergency medical care.

15. Personnel hygiene and decontamination.

16. Equipment decontamination.

17. Logs, reports, and recordkeeping.

18. Emergency response plan.

19. Emergency procedures for occurrences such as personal injury, fire, and exposure to toxic substances.

20. Emergency contact information.

21. Contingency measures.

22. Task-specific Job Safety Analysis for each component of Work anticipated for the Project, including but not limited to:

    1) Mobilization operations

    2) Housekeeping.

    3) Fueling.

    4) General labor.

    5) Utility clearance and identification.

    6) Unloading of equipment and materials.

    7) Critical lift plans for cranes and similar sized equipment traffic control.

    8) Cold-weather work.

    9) Night work.

    10) Hot work for welding, splicing.

    11) Heavy equipment operation.

    12) Office trailer site setup.

    13) Turbidity controls installation/removal.

    14) Decontamination.

    15) Construction of the temporary dam and installation of the river diversion system

    16) Dredging

    17) Dredged materials handling.

    18) Capping

    19) Retaining wall sealing

    20) Demobilization operations.

    In the event a change in work scope occurs, that in the opinion of Engineer, Owner, SSHO, or CIH requires a new Job Safety Analysis be

prepared, such Work shall not be performed until Contractor submits the Job Safety Analysis for review and comment by Engineer.

23. Crane Lift Plan(s) for each proposed lifting or hoisting activity, if any are anticipated. The Crane Lift Plans shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts with a minimum of five (5) years of relevant experience. At a minimum, each Crane Lift Plan shall include:

    1) Cut sheets of crane equipment.

    2) Lift capacity.

    3) Weights of each proposed pick to be lifted.

    4) Swing Radius.

    5) Location plan of crane, picks, proximity to adjacent abutters, and restricted area where people are prohibited from entering during crane operations.

    6) Wind speed restrictions.

    7) Hoisting and associated supports.

    8) Description of how restricted area will be marked.

    9) Compliance with National Grid Safety Procedure E-502 – Crane and Hoist Inspections [reference pending].

24. The HASP shall contain provisions for maintaining the health and safety of the public as it relates to the Work.

D. During Construction:

1. All Submittals and associated documentation must be maintained on the Site at all times by Contractor. All required forms and OSHA records shall be maintained on the Site by Contractor as applicable.

2. Air monitoring results shall be continuously reviewed by Contractor. Contractor shall notify Engineer immediately of concentrations above established action levels. Contractor shall submit monitoring results by 10 a.m. the following working day after receipt of results, electronically, per Section 01 33 00 – Submittal Procedures. Complete monitoring results shall be submitted within 7 days of completion of monitoring activities.

1.08 RESPONSIBILITIES OF CONTRACTOR AND ADDITIONAL SUBCONTRACTORS

A. Minimum precautions noted in this section shall in no way relieve Contractor from the responsibility to implement stricter health and safety precautions as warranted by the Work.

B. Ambient Air Monitoring (Work Area Monitoring)

1. Contractor shall monitor air quality during all stages of the Work. The information collected shall be provided to Engineer on a daily basis. Independent monitoring by Engineer may be performed using equivalent instruments.

2. Contractor shall monitor air quality in the "breathing zone" of Contractor employees for the constituents of concern (vapors, gases, or particulates) during those activities where exposure to impacted soil, sediment, and/or groundwater is possible, using instruments as described in Contractor's HASP. Parameters to be monitored include, but are not limited to particulates, measured as PM_{10}, and total VOCs. The instruments shall be used in accordance with the procedures outlined in Contractor's HASP for their employees and Subcontractor's employees.

3. Contractor will be required to comply with the action levels included in the air monitoring section of the HASP and take measures to prevent and control dust and VOCs.

C. Perimeter Air Monitoring

1. Perimeter air monitoring will be performed by Engineer. Contractor shall comply with the action levels included in this section and take measures to prevent and control dust and VOCs.

D. Health and Safety Oversight

1. Overall responsibility for implementation of the HASP shall be the responsibility of the independent CIH hired by Contractor. The independent CIH shall conduct an initial survey to determine the appropriate safety procedures and level of worker safety equipment, shall prepare the HASP, and shall oversee the activities of the SSHOs. It shall be the CIH's responsibility to notify Contractor and Engineer of any deviations from the health and safety monitoring program.

2. The CIH shall be assisted by one independent SSHOs, who shall be assigned to the Site at all times during all stages of Site Work. The independent SSHOs shall maintain a continuous health and safety monitoring program throughout the performance of the Work. Contractor's SSHO responsibilities shall include, but not be limited to:

attendance and participation in all weekly construction meetings; administering and documenting daily tailgate meetings; overseeing Site health and safety; protection of public health and safety as it relates to the Work; air monitoring; personnel and equipment decontamination; control of safety equipment checkout; Site traffic control; and emergency response. Other responsibilities shall include monitoring workers for weather-related exposures or stresses during their use of PPE.

3. Prior to commencement of any Site activities, Contractor's SSHO shall review the HASP with, and provide appropriate training on required PPE use to all on-Site employees. New employees during the course of the Site work and visitors to the Site work areas shall be informed of the Site conditions and safety requirements by Contractor's SSHO.

4. Contractor's SSHO shall also be responsible for signing visitors onto the Site and providing them with information regarding the day's activities and related safety issues. Contractor shall maintain a daily visitor's log, recording at a minimum the name and affiliation of each visitor and documentation of the safety orientation. If visitors enter restricted (impacted) areas, the same PPE and training requirements being met by Contractor's personnel shall be required of the visitors.

5. Contractor shall also be responsible for implementation of the HASP by all other Subcontractors.

E. It shall be Contractor's responsibility to notify Engineer and Owner verbally and in writing as quickly as possible should any unforeseen safety hazard or condition become evident during the performance of the Work. In the interim, Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard workers, on-Site personnel, trespassers, and the environment in accordance with the established emergency response procedures detailed in Contractor's HASP.

1.09 STOP WORK AUTHORITY

A. Should any unforeseen safety-related factor, hazard, or condition that poses a potential threat of physical injury or harm to Site personnel or the environment become evident during the performance of the Work, all Site personnel shall have authority as granted by OSHA regulations to issue a Stop Work directive. In addition, Engineer and Owner shall also have authority to issue a Stop Work directive upon observation of a safety-related factor, hazard, or condition of potential injury or harm to the environment.

B. If a Stop Work directive is issued Contractor must immediately take prudent corrective action to secure the Work and provide safe conditions for Site personnel and the environment. This corrective action shall be followed by an

immediate written Incident Report to Engineer and Owner. The Incident Report shall be provided as soon as possible but, at a minimum, verbally within 2 hours of the incident, as described herein. Contractor shall conduct an investigation and provide a written report incorporating results of the investigation if directed to do so by Engineer or Owner.

C. Contractor shall not charge standby time during Stop Work directives initiated by Owner or Engineer, in accordance with published National Grid safety requirements, in response to Contractor's near miss, unsafe action, or reportable safety incident.

D. Should Contractor refuse to obey a Stop Work directive, Contractor shall immediately be excused from the Site.

1.10 EMPLOYEE TRAINING

A. Prior to the initiation of the Work, Contractor and all Subcontractors shall certify that all personnel assigned to perform or supervise work at the Site have received, and that new hires will receive, prior to being allowed on the Site, appropriate training in compliance with OSHA 29 CFR 1926.65/1910.120. The training for personnel working in the vicinity of environmentally impacted Site material shall consist of a minimum of 40 hours of health and safety training, 24 hours of on the job training, and 8 hours of refresher training annually thereafter. Training requirements for personnel or Subcontractors not expected to encounter impacted materials shall be specifically described in the Site-specific HASP. In addition, the designated supervisory personnel shall have a minimum of 8 hours additional specialized training for managing hazardous waste operations in compliance with OSHA 29 CFR 1926.65/1910/120e.

B. Annual medical monitoring in compliance with OSHA 29 CFR 1926.65(f)/1910.120(f), is also required for personnel working in the vicinity of environmentally impacted Site material.

C. It will be Contractor's responsibility to train its employees and to ensure that Contractor's Subcontractors are trained. Contractor shall be responsible for ensuring that only personnel having successfully completed the required training are permitted to enter the Site. Documentation of training for all Site employees shall be maintained on the Site by Contractor at all times.

D. Contractor and any Subcontractors shall comply with the following additional requirements:

1. Hazard communication.

2. Respiratory protection.

3. Emergency response procedures.

4. Site orientation.

5. Daily toolbox meetings.

6. Weekly safety meeting.

7. All other training as required by other applicable regulations within OSHA 29 CFR 1926 and 1910.

1.11 HAZARD COMMUNICATION

A. Contractor and each Subcontractor must have a written Hazard Communication Program. This program must be available on the Site at all times for review by Owner or Engineer.

B. Contractor shall ensure that Safety Data Sheets (SDSs) for chemicals brought onto the Site by Contractor and Subcontractors shall be maintained within a current and comprehensive Chemical Inventory located at the Site and must be made available to Owner or Engineer upon request.

1.12 SITE ACCESS AND CONTROLS

A. Contractor's HASP shall include Site access provisions that effectively limit access to active Work areas to only those persons in full compliance with the requirements of OSHA 29 CFR 1926.65/1910.120. Additionally, access into each specific Work Zone shall be restricted to those employees assigned to complete the specified tasks.

B. Contractor shall prepare Site control procedures to establish Work Zones, based on the proposed work locations and the requirements specified in this section. The HASP shall include operational procedures to properly implement the Site access and control provisions of the plan.

1. The Work Zones shall be defined as follows:

a) The Exclusion Zone shall include and encompass all areas designated for contaminated materials excavation, dredging, staging, and handling. The level of PPE required in the Exclusion Zone shall be in accordance with Contractor's accepted HASP as determined by the CIH and SSHOs.

b) The Contamination Reduction Zone shall be located at the interface of the Exclusion Zone and Support Zone. The function of the Contamination Reduction Zone is to provide the following:

1) An area to decontaminate personnel, equipment, and vehicles prior to entering the support zone from the exclusion zone.

2) A physical separation of the support and exclusion zones.

c) The Support Zone shall be clearly delineated and shall be secured against active or passive contamination from the Exclusion Zone. The function of the Support Zone is to provide:

1) An entry for personnel, materials, and equipment to the Exclusion Zone of Site operations.

2) An exit area for decontaminated personnel, materials, and equipment from the Exclusion Zone of Site operations.

3) Location for support facilities.

4) A storage area for clean work equipment.

C. Contractor shall modify Work Zones as necessary to support the specific Work being performed.

D. No eating or drinking will be allowed within Work Zones located in the vicinity of impacted Site materials.

E. No smoking is allowed on Site.

F. Contractor shall be required to make provisions for traffic control as necessary.

G. Contractor is responsible for securing the Site and individual Work areas at the end of each shift and ensuring that all Work areas are secured in such a way so as to prevent unauthorized or accidental access to Work areas or tampering with equipment or materials that may result in bodily injury or a release of hazardous materials.

1.13 AIR MONITORING – GENERAL REQUIREMENTS

A. Contractor shall be responsible for establishing an air monitoring program to monitor organic vapors, odors, and dust levels within active Work Zones and Work Zone boundaries.

B. The air monitoring program shall establish Work Zone and Work Zone boundary limits for organic vapors, odors, and dust designed to be protective of worker health and safety, compliant with the applicable federal, state, and local requirements, and to satisfy the Site perimeter limits described within these Specifications.

C. The air monitoring program shall include descriptions of organic vapor, odor, and dust suppression and control measures to be implemented if air monitoring results exceed the specified limits.

D. Information gathered during the air monitoring program shall be used by Contractor to determine appropriate safety and personnel protective measures to be implemented during Work and the handling of Waste Material and impacted materials, and to document on-Site employee exposures. Contractor shall use this information to implement appropriate employee hazard control measures, contingency plans, or both.

E. Action levels for the upgrading or downgrading of worker levels of protection shall be based upon information published by the American Conference of Governmental Industrial Hygienists (ACGIH), OSHA, and the USEPA. Action levels shall be based upon established OSHA Permissible Exposure Limits (PELs), ACGIH Threshold Limit Values (TLVs) and ACGIH Short-Term Exposure Limits (STELs). Action levels shall be established for each work activity and each contaminant present. A table summarizing each activity, the contaminant(s) to be monitored, monitoring instruments, frequency and duration of monitoring, action levels, and required response action shall be included in the HASP.

F. Air monitoring results shall be cataloged and maintained by the SSHOs and shall be provided to Engineer daily.

G. All required Work Zone and Work Zone boundary air monitoring equipment shall be provided by Contractor and shall be maintained and calibrated according to OSHA and National Institute for Occupational Safety and Health (NIOSH) analytical methods, the manufacturers' instructions, or both. Calibration field checks using the appropriate reference standards shall be made on the Site at the minimum frequency of twice per shift (pre and post sampling). A daily log of all instrument readings, as well as field reference checks and calibration information, must be maintained in Contractor's Record Documents.

H. The SSHOs shall be responsible for operating all air monitoring equipment.

1.14 NOISE MONITORING

A. Contractor shall conduct all operations so as to minimize noise and vibrations consistent with OSHA 29 CFR 1910.95 and with MassDEP Noise Control Regulation 310 CMR 7.10.

1.15 PERIMETER MONITORING

A. Engineer will perform Site perimeter monitoring for VOCs, odors, particulate dust, and noise/vibrations consistent with Section 01 35 43 – Environmental Procedures.

B. Contractor shall perform adequate control of dust, odor, vapor, and noise during Work at all times to achieve the perimeter limits established below. Contractor's Work Zone and Work Zone perimeter monitoring program shall be designed to meet these Site perimeter limits.

1. Dust: Instantaneous particulate dust levels (PM 10) in excess of 150 micrograms per cubic meter ($\mu g/m^3$) or visible dust at the Site perimeter shall not be allowed.

2. Odor: No objectionable odors resulting from the Work shall be allowed at the Site perimeter.

3. Organic Vapor: Organic vapors, as measured using a photoionization detector, in excess of 1 part per million above background levels at the Site perimeter shall not be allowed.

4. Noise and Vibrations: Limits for noise and vapors are specified by permits and local ordinances.

C. In the event any of the action levels described herein or within Section 01 35 43 – Environmental Procedures are met or exceeded, Contractor shall immediately address the source, modify work practices, and/or implement additional engineering controls prior to proceeding with additional work to the satisfaction of Engineer at no additional cost to Owner except as specified herein. These approved controls shall include, but are not limited to, covering of piles or excavation areas, application of water, and application of odor/vapor control foam.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Materials

B. Instruments

2.02 MATERIALS

A. Contractor and all Subcontractors shall provide on-Site personnel, when required by Contractor's Site-specific HASP, with the appropriate PPE and shall ensure that all PPE is kept clean and well maintained and disposed of in accordance with applicable regulations.

B. Minimum PPE to be worn in the Work area is anticipated to consist of modified Level D protection, which includes hard hats, steel-toed work boots/shoes, reflective safety vests, safety glasses, and standard work clothes. If at any time Contractors staff are working near the Little River while water is still in the river,

a U.S. Coast Guard (USCG)-approved personal flotation device (PFD) will be required. Additional PPE may be required depending on the specific task and requirements defined in the Site-specific HASP.

C. All health and safety materials and equipment shall conform, at a minimum, to OSHA, NIOSH, American National Standards Institute (ANSI), and ASTM International (ASTM) standards and requirements.

1. Levels A, B, and C, as described in the referenced standards, represent increased levels of protection that are not anticipated to be necessary for the Work on this Project. However, Contractor shall be prepared to conduct limited work in Level C protection if necessary.

D. Contractor shall supply eyewash stations, first aid supplies, and fire extinguishers at each Work area for the period of the Work.

E. Contractor shall supply any additional PPE or safety equipment for the period of construction as required by Contractor's HASP or OSHA.

2.03 INSTRUMENTS

A. Dust Meter

1. Contractor shall provide dust monitoring equipment as specified in Section 01 35 43 – Environmental Procedures.

B. Organic Vapor Meter

1. Contractor shall provide organic vapor monitoring equipment as specified in Section 01 35 43 – Environmental Procedures.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Implementation Requirements

B. Emergency/Contingency Planning

C. Logs, Reports, and Record Keeping

D. Incident Reporting Procedures

E. Walking And Working Surfaces

3.02 IMPLEMENTATION REQUIREMENTS

A. The HASP shall be implemented by Contractor and the Subcontractors under the direction of the CIH. It is Contractor's responsibility to ensure compliance with the HASP by all on-Site personnel. Modifications to Contractor's HASP shall be made by the CIH after consultation with Engineer.

B. Engineer may conduct quality assurance inspections and will have access to all of Contractor's Project-specific health and safety records.

C. The levels of protection are established in the referenced standards. It is anticipated that the Work will require personal protection provided by Level D. Upgrading the level of the protection shall be the sole responsibility of Contractor. The CIH shall notify Contractor and Engineer immediately of the need to upgrade levels of protection.

3.03 EMERGENCY/CONTINGENCY PLANNING

A. At a minimum, Contractor's HASP shall include emergency procedures for occurrences such as personal injury, fire, and exposure to toxic substances. The SSHO shall instruct all personnel, including Subcontractor personnel, on the Site during the daily safety briefings concerning these safety procedures.

B. Emergency response procedures shall include employee training, alarm systems, escape routes and procedures, critical operations or equipment, rescue and medical duty assignments, designation of responsible parties, emergency reporting procedures, and methods to account for all employees after evacuation.

C. Emergency contact information shall be included in Contractor's HASP and shall be posted by Contractor in accessible areas near the Work.

D. In the event that on-Site Work results in the accidental spill or release of oil or hazardous materials, containment to the extent possible by on-Site personnel (in proper PPE as designated by the SSHO) shall be required of Contractor and in accordance with Contractor's Environmental Protection Plan as described in Section 01 35 43 – Environmental Procedures. All Contractor personnel who perform activities involving a response to a release of hazardous substances shall be trained in compliance with the emergency response training requirements of 1926.65 and 1910.120.

E. Should any unforeseen hazardous condition that may affect the completion of this Work become evident, it shall be the CIH's responsibility to bring such to the attention of Contractor, Owner, and Engineer immediately both verbally and in writing. Resolution of the matter shall come through Owner. In the interim, the CIH shall take prudent action to establish and maintain safe working conditions and to safeguard all Site personnel, the public, and the environment.

3.04 LOGS, REPORTS, AND RECORD KEEPING

A. The SSHOs shall maintain daily logs and reports covering the implementation of the HASP including the Air Monitoring Program and daily safety meetings. The format shall be developed by the CIH to include daily logs and weekly reports. The CIH shall provide Contractor and Engineer with copies of all logs and reports as requested.

B. The SSHOs shall provide Contractor and Engineer with minutes of safety meetings, including topics discussed and attendance sheets, on a daily basis.

C. Contractor shall be solely responsible for compliance with all federal laws (such as OSHA 29 CFR 1926.33/1910.1020) that require that chemical exposure records and medical records be maintained by the employer for a specified length of time after the termination of the job.

3.05 INCIDENT REPORTING PROCEDURES

A. Incident Response Steps. In the event of a safety incident, including injuries and “near-misses” and vehicle accidents occurring during the performance of the Work, the CIH shall provide details of the incident to Contractor, Engineer, and Owner as soon as possible and, at a minimum, within 2 hours of the incident and shall follow up with a written Incident Report by 10 a.m. the following day. The report shall include a root-cause analysis, i.e., identification of contributing factors relating to the incident, and describe the corrective actions that will be taken to prevent recurrence. The report shall provide details regarding the following:

1. What happened?
2. Who and how many people were injured?
3. What treatment was administered?
4. What was the nature and seriousness of the injury?
5. Where did the incident occur?
6. When did the incident occur (date, time of day)?
7. Were there any witnesses?

B. All injuries, accidents, and illnesses occurring as a result of or during on-Site work must be recorded on Contractor’s or affected Subcontractor’s OSHA 300 and 301 or equivalent forms. These forms shall be forwarded to Owner and Engineer. Contractor shall report all injuries to the appropriate authorities and to Owner and Engineer immediately.

C. Contractor shall make arrangements with an ambulance service, medical professionals, and hospitals for the emergency treatment of its employees prior to commencing work on the Site. Owner and Engineer will not furnish any emergency medical treatment.

3.06 WALKING AND WORKING SURFACES

A. Contractor shall conduct work under dry conditions in the Little River, however, it is recognized that Contractor shall provide safe access for employees in and out of the river. Contractor shall provide anti-slip surfaces on all working decks, stair treads, vessel ladders, and other walking or working surfaces that may become wet during operations.

B. Contractor shall remove obstructions in walking and working surfaces if possible. Where obstructions cannot be removed, Contractor shall post appropriate warning signs or distinctively mark them in accordance with ANSI Z535.1.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 35 43 – Environmental Procedures

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. References

D. Submittals

1.02 SCOPE

A. This section describes Contractor's (including Subcontractors, fabricators, manufacturers, and any other parties performing Work on the Site) minimum requirements for prevention of environmental pollution and damage as the result of construction operations under the Contract and for those measures set forth in other requirements of the Specifications.

B. Contractor shall provide all labor, materials, equipment, and services necessary and incidental to protecting sediment, soil, groundwater, air, and surface water resources during the implementation of the Work.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions and Sequence

B. Section 01 33 00 – Submittal Procedures

C. Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites

D. Section 01 41 26 – Permits

E. Section 01 57 13 – Temporary Environmental Controls

F. Section 01 74 00 – Cleaning and Waste Management

G. Section 02 51 29 – Surface Cleaning and Decontamination

1.04 REFERENCES

A. CFR Title 40 – Protection of Environment.

B. Code of Massachusetts Regulations 310 CMR 40.0000 – MCP.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 – Submittal Procedures.

B. Pre-Construction

1. Environmental Procedures Plan: Contractor shall prepare and submit to Engineer within 21 days of the NTP a project-specific Environmental Procedures Plan (EPP). The EPP shall address protection of sediment and water resources, dust control, odor and air pollution control, and spill control to comply with all federal, state, and local regulations pertaining to air, sediment, soil, and water pollution and the Site-specific permits/approvals obtained for this Project by Owner, these Specifications, and the Contract Drawings. At a minimum, the EPP shall include the following:

a) A list of all potentially hazardous products and materials to be used at the Site, and Safety Data Sheets (SDS) to be used at the Project Area. Contractor shall provide to Engineer samples or additional technical information demonstrating the effectiveness of the products proposed to implement the EPP, upon request of Engineer.

b) Describe in the EPP how petroleum, oil, and lubricant (POL) tanks and containers must be stored, managed, and inspected and what protections must be provided.

1) Spill and discharge control procedures, responses, and contingency plans. This shall include a contamination prevention section listing all potentially hazardous products (including a copy of each associated SDS) at the Project Area and corresponding provisions to be taken to prevent accidental introduction of such materials and/or impacted materials into any waterway, the air, or the ground. This shall also include a description of Contractor’s secondary containment systems and a cleanup section that includes the procedures, instructions, and reports to be used in the event of an unforeseen incident requiring a contaminant release cleanup action. This section shall include a description of response equipment and materials Contractor will have available at the Project Area and the name and contact information for emergency response personnel and equipment.

c) If the way in which Contractor stores fuel or refuels equipment triggers the requirements for a Spill Prevention, Control, and Countermeasure (SPCC) Plan consistent with 40 CFR 112, Contractor shall prepare, submit for review, and implement an appropriate SPCC Plan in accordance with 40 CFR 112 as part of the EPP.

d) Contractor shall detail their methods for continuously monitoring the Work areas to ensure that no sediment is spilled outside these areas including during sediment transport or offloading. Any material contaminated by spilled sediment shall be promptly cleaned up and properly disposed of at no additional cost to Owner.

e) Contractor shall detail their methods for conducting daily housekeeping activities in accordance with Section 01 74 00 – Cleaning and Waste Management.

f) The details, means, and methods, and material specifications of dust, odor, and vapor control measures and procedures to comply with the requirements in this section and related specifications. Acceptable measures include covering stockpiles with polyethylene sheeting and application of an odor/organic vapor suppression foam or Engineer-approved equivalent.

g) A containment and cleanup section of the EPP shall include the procedures, instructions, and reports to be used in the event of an unforeseen incident requiring a contaminant release cleanup action. This section shall include, as a minimum, the following:

1) The name of the individual on each shift who will be responsible for reporting spills, implementing and supervising the containment and cleanup, and following up with complete documentation of the incident.

2) The names and locations of suppliers of containment materials and names and locations of additional oil recovery, cleanup, restoration, and disposal equipment available in case of an unforeseen spill emergency.

3) The methods and procedures to be used for expeditious cleanup.

4) Owner, agencies, and individuals with telephone numbers for same, including 24-hour telephone contact numbers to be used in the event of an unforeseen incident requiring a

contaminant release cleanup action. The EPP shall include direction to immediately contact Owner and Engineer.

2. Approval of the EPP shall not relieve Contractor of any responsibility for control of potential environmental protection issues.

C. During Construction

1. In the event of a spill or release, Contractor shall immediately notify Engineer and Owner. Contractor shall also be responsible for contacting and procuring a licensed Cleanup Contractor (as necessary) and for the preparation of a Release Notification Form consistent with the MassDEP requirements and The Clean Water Act (if applicable). In the event that a release to surface water occurs, Contractor must provide applicable notifications, including but not limited to the National Response Center, and the Massachusetts Emergency Management Agency. All documentation shall be provided to Owner and Engineer for review prior to submittal to these agencies.

a) Within 48 hours of the completion of spill or discharge cleanup, Contractor shall document the cleanup in a Spill and Discharge Cleanup Report. This report shall include the following at a minimum:

1) Identification of the source of the spill.

2) Nature and amount of material spilled.

3) Estimated or actual date and time of the spill occurrence.

4) Date, time, and contents of notifications made to the appropriate regulatory agencies.

5) Names of regulatory agency personnel contacted.

6) Spill reference numbers assigned by regulatory agencies.

7) A description of the spill location.

8) The date and time cleanup was completed or terminated (if cleanup was delayed by emergency or adverse weather, the nature and duration of the delay).

9) Sampling data taken prior to the cleanup and a description of the sampling methodology used to establish the spill boundaries.

10) Sampling data taken subsequent to the cleanup to confirm the removal of the spilled material.

11) If release was to a solid surface, a description of the solid surface that was cleaned and the wash/rinse method used.

12) If release was to surface water, approximate size of sheen, if generated.

13) A certification statement signed by Contractor stating that the cleanup requirements have been met and that the information contained in the record is true to the best of their knowledge.

14) Copies of the documents and certifications that were submitted to Engineer for review and acceptance.

2. If applicable, Engineer will perform the water quality monitoring required to show compliance with the 401 WQC. In the event that WQC criteria are exceeded, Engineer will notify Contractor immediately. Contractor shall assist Engineer in evaluating if the exceedances are due to Contractor's operation and if contingency measures (including work stoppage) are necessary. Contractor shall record the date, time and details of the response actions in the DAR if such a situation occurs.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Odor and VOC Control

B. Dust Meter

C. Organic Vapor Meter

2.02 ODOR AND VOC CONTROL

A. Soil Equivalent Foam Concentrate. Contractor shall provide and store either at the Project Area, or at an easily accessible location from the Project Area both short-term and long-term soil equivalent foam concentrate to be used to control odors and/or VOC emissions from impacting the properties surrounding the Project Area or for localized control within the Project Area according to the requirements of Contractor's HASP, results of Contractor personnel monitoring, Engineer's perimeter monitoring, or as otherwise required by Engineer.

1. The soil equivalent foam shall meet the requirements of Resource Conservation and Recovery Act (RCRA) Subtitle D.

2. The short-term soil equivalent foam shall be capable of controlling odors and/or vapors for up to 12 hours in a single application.

3. The long-term soil equivalent foam shall be capable of controlling odors and/or vapors for up to 15 days in a single application.

4. The short-term soil equivalent foam shall be vanilla scented AC-645, manufactured by Rusmar, Inc., of West Chester, Pennsylvania, or Engineer-approved equal.

5. The long-term soil equivalent foam shall be vanilla scented AC-904, manufactured by Rusmar, Inc. or Engineer-approved equal.

B. Contractor shall initially provide two 450-lb drums of concentrated (not diluted or pre-mixed) odor/organic vapor suppression short-term foam and maintain adequate equipment and supplies at the Project Area at all times to apply the foam to excavation areas, stockpiles, active areas, or other operations that are determined to be the source of odor as determined by Engineer. Short-term foam usage beyond this initial supply by Contractor will be compensated for on a unit price basis.

C. Pneumatic Foam Unit. Contractor shall supply and maintain a Pneumatic Foam Unit at the Project Area at all times. Foam shall be applied by a towable, self-contained pneumatic foam unit. The foam unit shall include an air compressor, pump, hoses, nozzles, 400-gallon solution storage tank, and freeze protection system. The foam application unit shall be capable of applying foam solution at a rate of at least 25 gallons per minute.

1. Pneumatic Foam Unit shall be Rusmar, Inc. model PFU400/25 or Engineer approved equal.

D. Odor Control Misters. Contractor shall furnish and install odor control misters to be used to control odors and/or VOC emissions from impacting the properties surrounding the Project Area or for localized control within the Project Area if requested by Engineer.

1. Each odor control mister shall be capable of providing a continuous mist into the air at a minimum fixed flow rate of 10 oz/min and have timer capabilities to control the duration of misting to allow for continuous operations.

2. Each odor control mister shall be capable of being affixed to a 55-gallon drum.

3. The concentration reagent used for misting shall be 100% biodegradable and shall be BioWorld Odor Neutralizer – Commercial Concentrate, manufactured by BioWorld Products, Inc. of Visalia, California, or equal.

4. Contractor shall provide adequate quantity of concentrated (not diluted or pre-mixed) concentration of misting reagent. Contractor shall mix the misting reagent with water in accordance with the manufacturer's recommendations.

2.03 DUST METER

A. Contractor shall provide dust monitoring equipment. Dust meter shall consist of a real time aerosol monitor with data logging capabilities and a range of 0.001 to 400 mg/m^3.

B. Dust meter shall be a Model pDR-1000AN personal DataRam manufactured by Thermo Scientific or Engineer-approved equivalent.

2.04 ORGANIC VAPOR METER

A. Contractor shall provide organic vapor monitoring equipment. The organic vapor meter shall consist of a handheld photoionization detector (PID) equipped with a 10.6 eV lamp and a range of 0 to 15,000 parts per million.

B. Organic vapor meter shall be a MiniRae 3000 PID manufactured by RAE Systems or Engineer-approved equivalent.

2.05 SORBENT BOOMS AND PADS

A. Sorbent booms and pads shall be as specified in Section 01 57 13 – Temporary Environmental Controls.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Environmental Requirements

B. Notification of Noncompliance

C. Protection of Water Resources

D. Protection of Fish and Wildlife

E. Spill and Discharge Control

F. Dust Monitoring and Control

G. Odor and Organic Vapor Monitoring and Control

3.02 ENVIRONMENTAL REQUIREMENTS

A. All environmental pollution shall be prevented, abated, and controlled; environmental degradation arising from construction activities shall be minimized by complying with all permit/license conditions and requirements; applicable federal, state, and local laws; and regulations concerning environmental pollution control and abatement, as well as the specific requirements contained within these Specifications.

3.03 NOTIFICATION OF NONCOMPLIANCE

A. Contractor will be notified by Owner or Engineer of noncompliance as described within the provisions of this section. Immediate corrective action shall be taken by Contractor to comply with this section and related sections. A notification by Owner or Engineer shall be sufficient for Contractor to take action, and the date and time of such notice shall be recorded in Contractor's DAR. Owner may issue an order stopping all or part of the Work for failure to comply until corrective action has been taken. No time lost due to such stop orders shall be the subject of a claim for extension of time or for costs or damages from Owner.

3.04 PROTECTION OF WATER RESOURCES

A. Contractor shall comply with all applicable federal, state, and local laws concerning pollution of surface and ground waters.

B. Contractor shall comply with all requirements regarding protection of water resources in the environmental permits referenced in Section 01 41 26 – Permits.

C. Except as provided in the Contract, disposal of any wastes, effluents, trash, grease, chemicals, or other contaminants in waterways shall not be allowed. If any waste material is dumped in unauthorized areas, the material shall be removed and the area restored to a condition approximating the adjacent undisturbed area. Contaminated material shall be contained, disposed of, and the area restored to its pre-disturbed condition at no additional cost to Owner.

D. Contractor shall conduct in-river work "in-the dry", and it is not anticipated that water quality monitoring will be required, however; Engineer will implement the Water Quality Monitoring Program required by the 401 Water Quality Certification including regular real-time monitoring if required and will communicate the monitoring results to Contractor.

1. During water quality monitoring, measurements of field parameters will be compared to background field parameters as outlined in the permits (Appendix 3).

2. If an exceedance of the criteria is detected during the field measurements, Engineer will check the instrument calibration and will immediately collect a second group of measurements to confirm the exceedance.

3. If the second group of measurements confirms the water quality criteria exceedance is related to Contractor's Work, Engineer will immediately notify Contractor. Contractor shall coordinate with Engineer and make the necessary modifications and/or operations to comply with the water quality criteria per permit conditions and 01 57 13 – Temporary Environmental Controls. In the event water quality criteria are exceeded, Contractor shall temporarily suspend all in-water work and implement modifications to operational procedures at no additional cost to Owner. Operations may resume subject to the approval of Engineer when the problem has been rectified, and water quality parameters are in compliance with performance criteria. Delays resulting in inefficient cleanup methods shall not allow the construction schedule to be extended and shall not be reason to increase the Contract price.

E. No sheen or floating oil/tar shall be allowed per 01 57 13 – Temporary Environmental Controls. Upon observation of sheen or floating oil/tar, Contractor shall immediately stop Work and begin implementation of the clean-up procedures approved as part of Engineer-approved EPP. Operations may resume subject to the approval of Engineer when the problem has been rectified.

3.05 PROTECTION OF FISH AND WILDLIFE

A. Work under this Contract shall be conducted in compliance with the time window established by the Massachusetts Division of Marine Fisheries for protection of fisheries and fish habitat (Section 01 14 00 – Work Restrictions and Sequence and Section 01 41 26 – Permits), and in compliance with fish and wildlife protection requirements established by local and state regulations and Project-specific permits. All Work shall be performed and all steps taken to prevent interference or disturbance to fish and wildlife. Habitat outside the Limits of Work is critical to fish or wildlife and shall not be altered or disturbed. Dredging or restoration shall be stopped and Engineer notified immediately if fish kill or distressed fish are observed.

3.06 SPILL AND DISCHARGE CONTROL

A. Contractor shall take all necessary measures to ensure that no contamination of the soil, sediments, groundwater, surface waters, or other uncontaminated areas will occur from any of the activities required to perform the Work or from equipment or materials used to perform the Work. Report all spills to Engineer and Owner immediately. Take corrective action immediately, using approved emergency response and spill containment techniques in accordance with Contractor's EPP and Section 01 35 29 – Health, Safety, and Emergency

Response Procedures for Contaminated Sites. These corrective actions shall be performed by Contractor at no additional cost to Owner. All spillages should be handled in accordance with the requirements set forth herein.

B. Contractor shall provide adequate secondary containment, in the form of impermeable berms and curbing and/or integrated double wall vessels for all tanks, vessels, and other containers of impacted, or potentially impacted liquids and/or fuels. In addition, all piping, valves, pumps, and other apparatus that contain impacted or potentially impacted liquids shall be provided with secondary containment. These secondary containment systems shall be of adequate size to contain a minimum of 110% of the volume of the single largest container within the containment.

C. Contractor shall maintain a supply of containment products at the Project Area capable of controlling sheens and floating oil and/or tar, including, but not limited to, sorbent fabric that can be used to sweep surface water to remove sheen and oil, and oil-sorbent boom capable of isolating the spill or release. At a minimum, Contractor shall have at all times at least 1,000 linear feet of oil sorbent boom, 500 oil sorbent pads, and 300 pounds of speedy-dry sorbent at the Project Area. This supply shall be replenished upon usage at no additional cost to Owner.

D. Contractor shall provide and maintain at the Project Area at all times all appropriate equipment and materials necessary to address unexpected spill or discharges as described herein and in their EPP. This equipment and material shall be kept at the Project Area at all times during the Work and must be readily available to workers.

E. Contractor shall be responsible for the supply, setup, maintenance, and removal of all secondary containment systems.

F. In the event of a spill or release, Contractor shall immediately contain the release, absorb or otherwise collect spilled fluids, and remove/place the impacted materials in a separate staging area on an impermeable surface (e.g., polyethylene sheeting) compatible with the material spilled. The materials must be placed into separate containers or staging locations, covered (as necessary), labeled as a separate waste stream, tested for disposal requirements, and disposed of at an Owner-approved facility at no additional cost to Owner. Contractor shall take all necessary measures to contain/stop the release and apply sorbent materials.

G. Decontamination procedures may be required after cleanup to remove the spilled substance residue or to reduce it to an acceptable level as determined by Engineer. Decontamination shall be completed in accordance with Section 02 51 29 – Surface Cleaning and Decontamination. Complete cleanup may require removal of impacted soils, sediments, or liquids. Personnel decontamination shall include, as necessary, showers and cleansing or disposing of clothing and equipment. All impacted materials, including solvents, cloth, sediment, and wood that cannot be

decontaminated, must be properly containerized, labeled, and properly disposed of at no additional cost to Owner.

3.07 DUST MONITORING AND CONTROL

A. Contractor shall implement dust control measures as specified herein to adequately protect the public and employees of Contractor, Owner, and Engineer so as to not create hazardous or nuisance conditions. Implement these measures as required by Engineer-approved EPP and consistent with Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites, including implementing corrective actions to be completed in response to dust action level exceedances.

B. Contractor shall execute Work so as to minimize raising dust from construction operations.

C. In the event that it becomes necessary, in the opinion of Engineer or the CIH to provide additional measures to control the release of dust, Contractor shall implement such measures immediately, at no additional cost to Owner.

D. Contractor shall provide means to prevent airborne dust from dispersing into the atmosphere.

1. Means and methods shall include watering, misting, mulching, covering unprepared areas, calcium chloride, etc.

2. Contractor shall arrange for and maintain a reliable source of water for dust suppression.

E. Owner reserves the right to suspend Work at any time, if necessary, due to dust generation that causes a safety or an air quality problem or that may cause contamination of adjacent areas. Contractor shall not be entitled to any additional compensation for suspension of Work under such conditions.

3.08 ODOR AND ORGANIC VAPOR MONITORING AND CONTROL

A. Contractor shall implement odor and vapor control measures as specified herein to adequately protect the public and employees of Contractor, Owner, and Engineer so as to not create hazardous or nuisance conditions. Implement these measures as required by Engineer-approved EPP and consistent with Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites, including implementing corrective actions to be completed in response to VOCs and odor action level exceedances.

B. Real-time total organic vapor monitoring shall be performed by Contractor daily during excavation, dredging, sediment management, and other soil or sediment disturbing activities in accordance with Section 01 35 29 – Health, Safety, and

Emergency Response Procedures for Contaminated Sites and as requested by Engineer.

C. Engineer will conduct perimeter monitoring as described in Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites.

D. Based on Contractor's Work Zone and Work Zone Boundary, Engineer's perimeter monitoring results, or as directed by Engineer based on odors, Contractor shall implement measures to suppress organic vapor concentrations and/or odors. Acceptable measures include covering stockpiles with polyethylene sheeting, backfilling open excavations, and applying odor/organic vapor suppression foam.

E. Contractor shall be prepared and equipped to apply odor-suppressing foam during all Work activities in the event that nuisance odor reports are received by Owner from the surrounding abutters or the public.

F. As required, Contractor shall dedicate personnel to the application of odor controlling foam. If, in the opinion of Engineer, foam is not being applied adequately, all Contractor operations will cease at no additional cost to Owner until such time as Engineer is satisfied with the foaming operations.

G. Owner and/or Engineer reserve the right to suspend Work at any time in the event Contractor's operations result in organic vapors or objectionable odors that are deemed to cause a potential safety and/or air quality issue. Contractor shall not be entitled to any additional compensation for suspension of Work under such conditions.

H. Diesel operated equipment shall not be allowed to idle for more than 5 minutes in any 1-hour period unless to power auxiliary equipment, in an emergency situation, for maintenance activities, for heating/defrosting in cold weather, or for cooling purposes in hot weather for the health and safety of the operator.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 35 53 – Security Procedures

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Summary

D. Submittals

E. Contractor's Security Program Requirements

1.02 SCOPE

A. This section describes Contractor's (including Subcontractors, fabricators, manufacturers, and any other parties performing Work on the Site) minimum requirements for security measures at the Site.

1.03 RELATED SECTIONS

A. Section 01 31 00 – Project Management and Coordination

B. Section 01 33 00 – Submittal Procedures

1.04 SUMMARY

A. The Limits of Work include the approximately 500-foot stretch of the Little River between the Winter Street Bridge and the Little River conduit as shown on the Contract Drawings and the adjacent Upland Staging Area, which occupies 284 Winter Street, Haverhill, Massachusetts.

B. Contractor shall comply with National Grid security policies.

C. Contractor is responsible for security within the Limits of Work as described herein. This includes, but is not limited to, coordination with property owners, production of all required Contractor and subcontractor personnel personal identification information, security signage, maintaining and securing all enclosures, barriers and gates during working and non-working hours, maintaining a log registering all visitors, and performing security checks.

D. Contractor may use off-Site properties (properties outside the Limits of Work), but is responsible for all associated access agreements, fees, costs, security, permits, and delays incurred in the use of off-Site properties.

1.05 SUBMITTALS

A. Contractor and subcontractor(s) shall submit the following information to Owner for each worker who will be assigned to routinely work at the Site. This submittal is required for each worker at least 7 working days prior to conducting work at the Site and shall be submitted per Section 01 33 00 – Submittal Procedures:

1. Name of individual.

2. Name of employer.

3. Copy of government issued identification.

1.06 CONTRACTOR'S SECURITY PROGRAM REQUIREMENTS

A. Contractor shall implement a security program upon mobilization to the Site and maintain security program throughout the Work.

1. Protect Limits of Work from theft, vandalism, and unauthorized entry.

2. Should any unforeseen, potentially hazardous condition become evident during the performance of the Work, it shall be Contractor's responsibility to bring such to the attention of Engineer for resolution both verbally within 1 hour and in writing within 48 hours. In the interim, Contractor shall implement all necessary and prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

B. Contractor shall be responsible for all costs associated with providing the access restriction features (e.g., enclosures, barriers and gates), maintaining all features during construction and removal and disposal of temporary features at the conclusion of the Work.

C. Contractor's Site Entry Control Requirements:

1. Restrict entrance of persons and vehicles into Limits of Work areas. Contractor vehicles are only permitted within the Limits of Work for delivery of materials or vehicles actively engaged to support the work.

2. Allow entrance only to authorized persons with proper identification.

3. Maintain daily log of workers and visitors. The log shall be submitted to Engineer daily as part of the Daily Activity Report as defined in Section 01 31 00 – Project Management and Coordination.

4. Visitors within the Limits of Work are not allowed without the approval of Engineer or Owner. Visitors must not be left unescorted. Visitors are not

permitted to enter active Work areas without permission from Engineer or Owner.

5. At each property, secure (lock) fence gates during non-working hours and when not in active use during working hours. During active Work hours, gates are to remain closed at all times other than when needed for entry or exit.

D. Contractor shall be responsible for security within the Limits of Work. Contractor shall be solely responsible for the security and protection of their and the subcontractor(s) equipment, supplies, and materials at all times. Any vandalism, damage or theft shall be the sole responsibility of Contractor.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Signage

2.02 SIGNAGE

A. At a minimum, Contractor shall provide signage for the following items:

1. **Caution – Construction Area - Authorized Entry Only** – placed every 25 feet along the Temporary Fencing and Barricades. Signs shall be approximately 10 inches high by 14 inches wide.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Maintaining Security During Site Access/Use

3.02 MAINTAINING SECURITY DURING SITE ACCESS/USE

A. Temporary enclosures, barriers, and gates installed within Work areas of the various properties must be properly maintained by Contractor, and gates must remain closed and locked during non-working hours and when not in active use during working hours. During working hours, Contractor is responsible for controlling access to the Work areas for only authorized personnel, and gates shall remain closed at all times other than when needed for entry or exit.

B. For the property being accessed for performing the Work, Contractor shall be responsible for maintaining a registry (log) of personnel entering and exiting the Work area. The log shall be submitted to Engineer daily as part of the Daily Activity Report as defined in Section 01 31 00 – Project Management and Coordination.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 41 26 – Permits

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Submittals

D. Project Permit Posting and Records

E. Workmanship

1.02 SCOPE

A. This section describes the permits and other regulatory requirements applicable to the Project and enforceable during execution of the Contract.

1.03 RELATED SECTIONS

A. This section contains general information that applies to all Work performed under the Contract and is inherently part of each Specification section.

1.04 SUBMITTALS

A. Unless otherwise specified, Contractor shall submit copies of all applicable permits to Owner and Engineer at least 10 working days prior to start of relevant Work. Retain hard copies of all permits on Site.

B. Submit additional correspondence or addenda to Contractor-obtained permits to Owner and Engineer within 2 working days of receipt of addenda.

C. Contractor shall submit shop drawing for sign support system, samples, and graphic proof in accordance with MassDEP signage requirements.

1.05 PROJECT PERMIT POSTING AND RECORDS

A. Contractor shall furnish, install, and maintain project identification and regulatory signage, and remove signage upon completion of the Work.

B. Maintain on Site complete and accurate copies of all permits, addenda, and relevant correspondence from appropriate agencies.

1.06 WORKMANSHIP

A. All workmanship and materials shall conform to federal and state laws, local ordinances, utility company regulations, and applicable codes and other standards.

In case of conflict with these Contract Drawings and Specifications, such laws and regulations shall apply wherever they may require workmanship or materials other than required in the Contract Documents. In the event of conflict between standards, the more stringent standard as determined by Engineer shall apply.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Sign Materials

B. Graphics

C. Posts

2.02 SIGN MATERIALS

A. Panels for sign and application of graphics shall be a minimum of 1/4-inch Econo-Light as manufactured by FastSigns with baked-on enamel paint on an aluminum panel or an approved equal. Thickness of panels shall provide even, smooth surface without waves or buckles, while spanning mounting supports.

2.03 GRAPHICS

A. Graphics shall be flat printed graphics on pressure-sensitive vinyl or painted directly to the panels. Graphics shall be UV stable and shall not fade or peel for the scheduled duration of the Project.

2.04 POSTS

A. Posts and supporting members shall be pressure-treated wood or approved equivalent of sufficient size and quantity to properly support the sign. Hardware for mounting signs and fabricating posts and support members shall be galvanized steel.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Permits Obtained by Owner

B. Permits and Approvals Obtained by Contractor

C. Massachusetts Contingency Plan Compliance

D. Project Permit Compliance

E. MassDEP Signs

3.02 PERMITS OBTAINED BY OWNER

A. Owner has obtained or is in the process of obtaining certain permits and approvals necessary for the Work. Contractor shall perform all Work in compliance with these permits and approvals. Contractor shall be responsible for obtaining all other permits and approvals necessary for the execution of the Work in accordance with all applicable local, state, and federal regulations, laws, and requirements. The permits, and associated responses and requirements from the regulatory agencies, shall become part of the Contract Documents.

3.03 PERMITS AND APPROVALS OBTAINED BY CONTRACTOR

A. Contractor must obtain all other permits and approvals required to complete the Work in accordance with local, Commonwealth of Massachusetts, and federal regulations. These Contractor-obtained permits include, but are not limited to, the following:

1. Dig Safe.
2. Approval or permits for parking (City of Haverhill, if necessary)
3. Approval to use City/hydrant water (City of Haverhill, if necessary).
4. Electrical permit for installation of all electric utilities and connections (if necessary).
5. Plumbing permit for installation of all plumbing utilities and connections (if necessary).
6. Dumpster permit.
7. Welding permit (if necessary).
8. USEPA National Pollutant Discharge Elimination System (NPDES) General Permit MAG910000 for Discharges from Remediation Activities in the Commonwealth of Massachusetts (if necessary).

3.04 MASSACHUSETTS CONTINGENCY PLAN COMPLIANCE

A. Project Area: The Work is being conducted to fulfil the requirements of a Phase IV CRA Implementation of the Selected Remedial Alternative, in accordance with the MCP, under the oversight of a Licensed Site Professional (LSP). The Work will result in a Permanent Solution for the cleanup of the former Manufactured Gas Plant (MGP) Site, which is a Massachusetts Disposal Site assigned Release Tracking Number (RTN) 3-32792.

B. Owner will submit the Addendum to the Phase IV RIP describing Work at the Project Area under RTN 3-32792 to the MassDEP Bureau of Waste Site Cleanup to describe the Work prior to the start of construction.

C. Owner will provide copies of the MCP submittal listed above, and associated MassDEP responses and requirements, to Contractor, who shall comply with the Work descriptions and requirements therein. Contractor shall not proceed with any construction activities until the Addendum to the Phase IV RIP has been provided by the LSP. The MCP submittals, and any associated MassDEP responses and requirements, shall become part of the Contract Documents.

3.05 PROJECT PERMIT COMPLIANCE

A. Contractor shall comply with all terms and/or conditions of all Project permits and MCP submittals in the execution of the Work and pay any and all fines and/or penalties resulting from noncompliance with Project permit requirements or failure to obtain or maintain necessary local, Commonwealth of Massachusetts, or federal Project permits required for completion of the Work.

B. Contractor shall inform and update Engineer and Owner on permit status and regulatory compliance.

3.06 MASSDEP SIGNS

A. Erect MassDEP signs within the Project Area at a location with public visibility and adjacent to main entrances as approved by Engineer and Owner. If location is not found, signs shall be provided to Owner for posting.

B. Install signs with proper framing and supports. Use of structures (e.g., fences, walls) for installing signs will be considered but require Owner and Engineer approval.

C. Paint exposed and unfinished surfaces of supports, framing, and surface material using one coat of primer and one coat of exterior paint.

D. Lighting of signs is not permissible.

E. Maintain signs and supports in a neat and clean condition. Repair damages to structure, framing, sign, or graphics. The signs shall be properly maintained for the duration of the Project and replaced if damaged or if they become illegible in the opinion of Engineer, at no additional cost to Owner.

F. Remove signs, framing, supports, and foundations at completion of Project.

G. Restore disturbed areas to match existing conditions.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 45 00 – Quality Control

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Description

D. Submittals

E. References and Standards

1.02 SCOPE

A. This section describes Contractor's quality control (QC) requirements, duties, and responsibilities during execution of the Work. The intent of this section is to require Contractor to establish the necessary level of control that will provide sufficient information to ensure Contractor, Engineer, and Owner that these Specification requirements are being or have been met.

1.03 RELATED SECTIONS

A. Section 01 31 00 – Project Management and Coordination

B. Section 01 33 00 – Submittal Procedures

1.04 DESCRIPTION

A. Contractor shall establish, provide, and maintain a Construction Quality Control Plan (CQCP) as specified herein, detailing the methods and procedures that will be taken to ensure that all materials and completed construction elements conform to the Contract Drawings, Specifications, and other requirements. Although guidelines are established and certain minimum requirements are specified herein and elsewhere in the Specifications, Contractor shall ensure that construction and CQCP are accomplished in accordance with the stated purpose and the Specifications as described in this section.

B. Contractor shall be prepared to discuss and present Contractor's understanding of the CQCP requirements at the Pre-Construction Meeting, as discussed in Section 01 31 00 – Project Management and Coordination. No construction shall begin until the CQCP has been reviewed and approved by Engineer.

1.05 SUBMITTALS

A. Contractor shall submit a CQCP for review by Engineer in accordance with Section 01 33 00 – Submittal Procedures no later than 21 days from Notice to Proceed. The CQCP must be approved before any work may begin. The CQCP will be used to document inspections, monitoring, surveys, and other actions to be taken by Contractor to ensure that the Work complies with all Contract Documents and shall include the following elements, at a minimum:

1. Description of the QC organization, including an organizational chart showing the various QC team members, along with their designated responsibilities and lines of authority.

2. Acknowledgement that the QC staff will conduct inspections for all aspects of the Work specified, and shall report to the QC Supervisor, or someone of higher authority in Contractor's organization.

3. The name, qualifications, duties, responsibilities, and authorities of each person assigned a primary QC function.

4. Testing methods, schedules, and procedures used to report QC information to Engineer, including samples of the various reporting forms.

5. Description of the process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified, including indication of the types of corrective actions to be required to bring work in compliance with standards of workmanship established by the Specifications.

6. Contractor shall identify its on-Site QC Supervisor, who shall be responsible for overall QC management and have the authority to act in all QC matters for Contractor.

1.06 REFERENCES AND STANDARDS

A. Contractor shall provide products or workmanship specified by association, trade, or other consensus standards that comply with requirements of the standard, except when more rigid requirements are specified or required by applicable codes.

B. Contractor shall conform to reference standard by date of issue current on the date of the Contract Documents, except where a specific date is established by code.

C. Contractor shall obtain copies of standards where required by product specification sections.

D. Neither the contractual relationships, duties, and responsibilities of the parties in the Contract nor those of Owner shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

E. All pertinent laws, ordinances, rules, regulations, and codes shall govern construction activities within the Limits of Work.

F. Construction not governed by governmental regulations or the Specifications will be governed by the more stringent provisions of the latest published edition or statute adopted, at the time of Contract Documents signing, following applicable codes and standards:

1. Uniform Building Code

2. National Electrical Code

3. Uniform Plumbing Code

4. Uniform Fire Code

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Documentation

B. Corrective Action Requirements

C. Engineer's Quality Assurance Activities

D. Quality Assurance - Control of Installation

E. Non-Compliance

3.02 DOCUMENTATION

A. Contractor shall develop and maintain a database (physical or electronic) of QC records necessary to document the conduct and QC of the Work. QC records are those documents that have been reviewed and accepted by Contractor as complete, correct, and legible. QC records shall include documents such as the following:

1. Contract Drawings, Specifications, procedures used for construction, procurement documents, inspections, and test records.

2. Submittals.

3. Personnel and procedure qualification records.

4. Material, chemical, and physical property test results; certificates of compliance and shipment releases.

5. Non-compliance reports and corrective action.

B. All QC records shall be identified in the CQCP and maintained on Site in Contractor's files. Engineer shall be provided access to these files when requested. Upon the completion of Work at the Site, these files shall be turned over to Engineer and Owner.

C. Contractor shall prepare and maintain a Daily CQC Report of operations. The Daily CQC Report shall be attached to Contractor's Daily Activity Report and submitted in accordance with Section 01 33 00 – Submittal Procedures. The Daily CQC Report shall include the results of all inspections, surveys, and monitoring activities and shall be signed by Contractor's Field Superintendent or CQC Officer.

D. Contractor's CQC Plan shall include procedures for access and distribution control of the QC records. The following types of documents shall be on controlled distribution to ensure changes to them are accurately transmitted and received when applicable:

1. Manuals.

2. Instructions.

3. Procedures.

4. Specifications.

5. Contract Drawings.

6. Inspection and test plans.

7. Field change requests.

3.03 CORRECTIVE ACTION REQUIREMENTS

A. The CQCP shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of compliance with Project requirements (out of tolerance) and detail what action will be taken to bring the process into control.

3.04 ENGINEER'S QUALITY ASSURANCE ACTIVITIES

A. All items of material and equipment shall be subject to quality assurance verification by Engineer at the point of production, manufacture, or shipment to evaluate whether Contractor, producer, manufacturer, or shipper maintains an adequate QC system in conformance with the requirements detailed herein and the applicable Specification sections and Contract Drawings. In addition, all items of materials, equipment, and Work in place shall be subject to surveillance by Engineer at the Site for the same purpose.

B. To facilitate quality assurance verification by Engineer, Contractor shall allow Engineer access to the dredge area and equipment at the request of Engineer and while the Work is being performed.

C. Performance of quality assurance activities by Engineer does not relieve Contractor of performing QC inspections of either on- or off-Site Contractor's or Subcontractors' work.

3.05 QUALITY ASSURANCE – CONTROL OF INSTALLATION

A. Contractor shall monitor QC over Suppliers, manufacturers, products, services, Site conditions, and workmanship to produce work of specified quality.

B. Contractor shall comply with the manufacturer's instructions, including each step in a sequence. Should the manufacturer's instructions conflict with the Contract Documents, Contractor shall request clarification from Engineer before proceeding.

C. Contractor shall comply with specified standards as the minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

D. Contractor shall perform the Work by using persons qualified to produce required and specified quality.

E. Contractor shall verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

F. Contractor shall familiarize itself with pertinent codes and standards. In procuring all items used in the Work, Contractor shall verify the detailed requirements of the specifically named codes and standards, and verify that the items procured for use during the Work meet or exceed the specified requirements.

G. Engineer reserves the right to reject items incorporated into the Work that fail to meet the specified minimum requirements. Engineer further reserves the right, and without prejudice to other recourse Engineer may take, to accept non-

complying items subject to an adjustment in the Awarded Contract Price as approved by Engineer.

3.06 NON-COMPLIANCE

A. Engineer will notify Contractor of any non-compliance with any of the foregoing requirements. Contractor shall, after receipt of such notice, immediately take corrective action. Any notice, when delivered by Engineer, Owner, or its authorized representative to Contractor or its authorized representative at the Site of the Work, shall be considered sufficient notice.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 57 13 – Temporary Environmental Controls

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Applicable Regulations

D. Compliance with Testing and Materials Standards

E. Quality Assurance

F. Submittals

1.02 SCOPE

A. Contractor shall furnish all labor, materials, tools, supervision, transportation, and incidentals required to provide, install, maintain, repair, and replace all temporary environmental controls including:

1. Temporary erosion and sedimentation control measures required in the Upland Staging Area and Sediment Processing Area (SPA) to support the Work, including silt fence, straw bales, straw wattles, silt sacks, and stockpile covers.

2. Temporary sheen control measures in the Little River to support the in-river Work, including oil booms and oil sorbent pads. Turbidity controls are not required for conducting the work in the river as Contractor shall conduct in-river work “in the dry.”

B. Contractor shall provide, install, maintain, repair, and replace all temporary environmental controls as discussed herein, as shown on the Drawings, consistent will all permit applications and approvals, and as necessary to complete the Work to the satisfaction of Engineer and Owner. If Contractor provides an alternative approach to conducting this work other than “in the dry,” there may be additional permitting requirements including, but not limited to in-river turbidity controls.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 35 43 – Environmental Procedures

C. Section 01 41 26 – Permits

D. Section 01 53 00 – Temporary Construction

E. Section 02 61 00 – Removal and Disposal of Waste Materials

1.04 APPLICABLE REGULATIONS

A. Applicable state, federal, and local regulatory criteria include, but are not limited to, the following:

1. EPA—Office of Water, Storm Water Management for Construction Activities, September 1992.

2. Massachusetts Department of Environmental Protection. Massachusetts Stormwater Handbook, Volume 2 (2008).

B. Soil and sediment disturbance by excavation, dredging, grading, or filling will occur within the Limits of the Work. See Section 01 41 26 – Permits for information regarding Owner-obtained permits and regulatory requirements pertaining to temporary environmental controls. Contractor shall obtain any additional required permits prior to the start of Work and shall install temporary environmental controls to comply with the requirements of the permits and approvals, Drawings, and these Specifications.

1.05 QUALITY ASSURANCE

A. Temporary environmental control measures shall be implemented in accordance with the requirements and procedures outlined in these Specifications, the Drawings, state standards or guidelines for soil erosion and sediment control and sheen control, and all regulatory authorities having jurisdiction. Where conflicts between requirements exist, the more restrictive rules shall govern.

B. Contractor shall provide all temporary environmental control measures shown on the Drawings, or as directed by Owner, Engineer, for the duration of the contract. Temporary environmental control drawings are intended to be a guide to address the stages of Work shown. Additional measures not specified on the Drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to Owner.

C. Temporary environmental control measures shall at all times be satisfactory to Engineer. Engineer will inform Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 24 hours, Engineer may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by Contractor for additional compensation nor for an extension of time to complete the Work. Any complaints, fines, etc. relating to ineffective environmental control shall be the sole responsibility of Contractor.

D. Contractor shall inspect all temporary environmental control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the Limits of Work shall be the responsibility of Contractor until final stabilization is complete, and until any permanent environmental controls are established and in proper working condition.

E. Contractor shall protect adjacent properties and watercourses from erosion, sediment, and sheen damage throughout construction.

1.06 SUBMITTALS

A. Contractor shall submit all Temporary Environmental Controls (TEC) material specifications described herein and shown on the Drawings, including the name of the manufacturer/supplier for each product to be utilized. These material specifications shall be submitted to Engineer no later than 14 days prior to use and prior to delivery of any such material to the Site.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Silt Fence

B. Berms

C. Straw Bales

D. Straw Wattles

E. Silt Sacks

F. Stockpile Covers

G. Sorbent Booms and Sorbent Pads

2.02 SILT FENCE

A. Silt Fence fabric shall be inert to chemicals commonly found in soil and resistant to mildew, rot, insects, and rodent attack.

B. Silt Fence fabric and fence posts shall be factory-assembled. Posts shall be attached to the fence at a maximum of 5-foot centers.

C. Silt Fence fabric shall meet the following requirements:

PROPERTY	TEST METHOD	MIN VALUE
Grab Tensile, lb-min	ASTM D 4632	120 Warp/100 Fill
Grab Elongation, %	ASTM D 4632	40
Mullen Burst, psi	ASTM 3786	175
U.V. Resistance, %	ASTM D 4355	80
A.O.S., max sieve size	ASTM D 4751	30
Water Flow Rate, GPM/sq ft	ASTM D-4491	25

2.03 BERMS

A. Berms for enclosing stockpiles shall be Straw Bales, concrete blocks, and/or other product as approved by Engineer.

2.04 STRAW BALES

A. Straw Bales shall be baled within 12 months of use and the minimum dimension of any bale shall be 18 inches. Each bale shall be bound with a minimum of two strips of nylon bale twine or wire. Twine or wire shall be sufficiently strong to act as handles when placing in position by hand.

B. The bale shall have a minimum weight of 60 pounds and shall be composed entirely of vegetative matter.

2.05 STRAW WATTLES

A. Straw Wattles are to be 12-inch diameter and can range in lengths from 10 to 25 feet. The density of the wattles shall be no less than 3 pounds/linear foot.

B. The exterior shall be jute netting with an interior of 100% wheat straw.

2.06 SILT SACKS

A. Silt Sacks shall be manufactured from woven polypropylene geotextile and sewn by a double needle thread machine using a high strength nylon thread.

B. Silt Sacks shall have the following minimum properties:

PROPERTIES	TEST METHOD	UNITS	SPECIFIED VALUE
Grab Tensile	ASTM D4632	lbs	315
Grab Elongation	ASTM D4632	%	15
Puncture	ASTM D4833	lbs	140
Mullen Burst	ASTM D3786	psi	800
Trapezoid Tear	ASTM D4533	lbs	125 × 150
Permittivity	ASTM D4491	sec^{-1}	0.70

C. Silt Sacks shall consist of a Series I, Regular Flow Type C, Silt Sack manufactured by ACF Environmental of Richmond, Virginia or an Engineer-approved equivalent.

2.07 STOCKPILE COVERS

A. Stockpile covers are to be made of minimum 10-mil polyethylene sheeting

B. Weights used to secure the stockpile covers are to be 50-pound bags of sand (or approved equal).

C. Lines to secure the sandbags and stockpile covers shall be a minimum 3/8-inch polypropylene or manila braided rope.

2.08 SORBENT BOOMS AND PADS

A. Sorbent Booms shall be Parker Systems, Inc., PSI-SB5 Lights Oils Sorbent Booms or equivalent as approved by Engineer.

B. Sorbent Pads shall be Parker Systems, Inc., PSI-P10 15-inch by 19-inch Heavy Weight Oil Sorbent Pads or equivalent approved by Engineer.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Sediment and Erosion Control Barrier (Silt Fence) Installation

B. Sediment and Erosion Control Barrier (Straw Wattles) Installation

C. Sediment and Erosion Control Barrier (Straw Bales) Installation

D. Catch Basin Inlet Protection

E. Stockpile Covers

F. Provisions for Erosion and Sediment Control During Construction

G. Sorbent Booms and Pads

H. Removal of Temporary Environmental Controls

3.02 SEDIMENT AND EROSION CONTROL BARRIER (SILT FENCE) INSTALLATION

A. Silt Fence shall be installed as shown on the Drawings. Silt Fence material shall be embedded at least 4 inches beneath ground surface and shall extend upward at least 24 inches above the ground surface. Where two ends of a Silt Fence join, the ends shall be overlapped a minimum of 36 inches.

3.03 SEDIMENT AND EROSION CONTROL BARRIER (STRAW WATTLES) INSTALLATION

A. Straw Wattles shall be installed as shown on the Drawings. Wattles shall be placed in a row with the ends tightly adjoining and overlapping.

B. Straw Wattles shall be anchored in place by stakes driven through the wattle at 3 feet on center. The stakes shall be driven at least 8 inches into the ground.

3.04 SEDIMENT AND EROSION CONTROL BARRIER (STRAW BALES) INSTALLATION

A. Straw Bales shall be installed as shown on the Drawings. Bales shall be placed in a row with the ends tightly adjoining.

B. Straw Bales placed on pavement or concrete shall have burlap placed between the bale and the pavement or concrete.

C. Stakes are not required if bales are installed on asphalt or pavement surfaces. Straw Bales placed on soil shall be anchored in place by at least two stakes driven through the bale. The stakes shall be driven at least 18 inches into the ground.

3.05 CATCH BASIN INLET PROTECTION

A. Insert Silt Sack within the catch basin per manufacturer’s instruction.

B. Catch Basins shall have Straw Bales installed as shown on the Drawings. Bales shall be placed with the ends tightly adjoining.

C. Straw Bales placed on pavement or concrete shall have burlap placed between the bale and the pavement or concrete.

D. Stakes are not required if Straw Bales are installed on asphalt or concrete surfaces. Straw Bales placed on soil shall be anchored in place by at least two stakes driven through the bale. The stakes shall be driven at least 18 inches into the ground.

3.06 STOCKPILE COVERS

A. Stockpile covers shall be installed as shown on the Drawings. Edges of polyethylene sheeting shall be overlapped by a minimum of 12 inches and secured with sandbags (or approved equal) and rope so that a grid (horizontal and vertical) spacing for the ropes shall not exceed 10 feet on center.

B. Stockpiles shall have berms (Straw Bales) as shown on the Drawings. Stockpile berms are not required if the stockpile is within a larger containment cell such as the SPA.

3.07 PROVISIONS FOR EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

A. Contractor shall implement and maintain erosion and sedimentation control measures as specified herein, shown on the Contract Drawings, and as described in the Section 01 35 43 – Environmental Procedures to the satisfaction of Engineer and consistent with all permits and approvals. All observed deficiencies shall be corrected by Contractor within one day at no additional cost to Owner.

B. No earth disturbing activities, material deliveries, clearing or grubbing shall be allowed prior to the installation of the erosion and sediment control measures to the satisfaction of Engineer.

C. Contractor shall take sufficient precautions during construction to prevent the runoff of polluting substances such as silt, clay, wastes, fuels, and oils to surface waters. Storm water catch basins or drains shall be protected from materials runoff. Contractor shall install Silt Sacks within each catch basin in the vicinity of any work areas in accordance with the manufacturer’s recommendations, should catch basins be encountered during Work. Contractor shall use all BMPs necessary to protect these inlets from sediment and debris if encountered.

D. If non-contaminated storm water is accumulated it shall be handled as directed by Engineer per Section 01 53 00 – Temporary Construction and 02 61 00 – Removal and Disposal of Waste Materials.

E. Contractor shall maintain all erosion and sediment control features in the locations shown on the Contract Drawings at all times until completion of the Work or as otherwise approved by Engineer.

F. Contractor shall maintain construction entrances, exits, and traffic areas within the Limits of Work in a condition which shall prevent tracking or flowing of impacted media (soil, sediment, liquid). Tracking or flowing of impacted media (soil, sediment, liquid) onto public rights-of-way is not permitted. Contractor shall maintain construction entrances, exits, and traffic areas; repair or cleanout of any measures used to trap such media; or cleaning of other devices or surfaces. Impacted media spilled, dropped, washed, or tracked onto public rights-of-way

must be removed immediately at no additional cost to Owner and properly handled and disposed of by Contractor in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials. Periodic inspection and maintenance shall be provided as needed. Any release of oil or hazardous materials (as defined by the Massachusetts Contingency Plan; 310 CMR 40.0000) caused by Contractor are the full responsibility of Contractor.

G. Contractor shall remove and manage accumulated silt and debris from behind the face of any erosion control device or other BMPs as needed to maintain BMP effectiveness and properly handled and disposed of by Contractor in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials. Clogged or damaged BMPs shall be replaced immediately.

H. Contractor shall inspect erosion and sediment control measures daily and immediately after a rainfall of 0.5 inches or more. Contractor shall immediately repair any damaged or failed erosion and sediment control measures. Contractor shall document these inspections and maintenance/repair activities in their Daily Activity Reports as outlined in Section 01 33 00 – Submittal Procedures. Any erosion and sediment control materials impacted by Site contaminants shall be properly disposed by Contractor in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

I. Contractor shall not place stockpiled materials within the path of existing, newly created, or proposed areas that are or may be subjected to storm water flow.

J. Contractor shall protect all disturbed areas that are subject to potential erosion, either newly filled or excavated at no additional cost to Owner.

K. Contractor shall place additional erosion and sediment control measures as conditions warrant or as directed by Engineer or local or state environmental officials at no additional cost to Owner.

3.08 SORBENT BOOMS AND PADS

A. Contractor shall use sorbent booms and pads to sorb sheen from any available water within the river that may be present after dewatering and diverting river flow around the Work area.

B. Contractor shall maintain 300 feet of oil sorbent booms, and 100 oil sorbent pads as at all times for immediate use to address impacts (e.g., sheen and/or floating oil and/or tar) during dredging and cap placement operations, if needed. Contractor shall have a dedicated crew for deploying additional sorbent booms and pads, if required, to address sheen and/or floating oil and/or tar observed in the river at the direction of Engineer.

C. Contractor shall not begin work in the Little River until the contingency items listed above are on Site or approved by Engineer.

3.09 REMOVAL OF TEMPORARY ENVIRONMENTAL CONTROLS

A. Contractor shall ensure that surfaces disturbed to implement the Work are stabilized at the end of each construction season so that temporary erosion and sediment controls can be removed with the exception surfaces at the Upland Staging Area.

B. Contractor shall be responsible for the removal and disposal of all erosion and sediment controls, including but not limited to silt fences, straw wattles, straw bales, stockpile covers, within the Limits of Work at the completion of the project in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

C. Contractor shall be responsible for surface restoration and, where applicable, establishment of restored surfaces (e.g., asphalt, concrete, stone, sod, plantings, etc.) once the temporary erosion and sediment controls are removed.

D. Contractor shall remove all oil containment products at the completion of the work and dispose of in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 74 00 – Cleaning and Waste Management

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Description

1.02 SCOPE

A. Contractor shall provide materials, labor, equipment, and incidentals necessary to manage waste materials generated during execution of the Work.

1.03 RELATED SECTIONS

A. Section 02 61 00 – Removal and Disposal of Waste Materials

B. Section 35 20 30 – Dredged Material Management

1.04 DESCRIPTION

A. Contractor shall remove all debris and perform all cleaning required as a result of the performance of the Work.

B. Cleaning work shall be performed throughout the duration of the Project in a neat, safe, and organized manner. Contractor shall keep the Limits of Work in a neat and clean condition that is free of debris to the satisfaction of Engineer. All materials and debris accumulated in conjunction with completing this Work shall be legally recycled or disposed of at Owner-approved facility by Contractor consistent with these Specifications.

C. Furnish all labor, containers, transportation, and payment of fees associated with recycling, reuse, salvage, and disposal of construction materials. Contractor shall provide dumpsters for his own use. Dumpsters shall be of adequate size to handle all refuse and shall be emptied on a regular schedule or more often as needed. Contractor shall not have access to refuse or recycling containers provided by Owner.

D. Final clean-up of the Limits of Work shall be performed by Contractor to the satisfaction of Engineer at the completion of the Work.

E. Contractor shall conduct cleaning and disposal operations to comply with all state, federal, and local codes, ordinances, regulations, anti-pollution laws, and these Specifications.

F. Burning of waste material is not permitted.

G. Debris and dredged sediment generated during the Work shall be handled and disposed of in accordance with Section 35 20 30 – Dredged Material Management.

H. All other Waste Materials generated during the Work, including incidental construction water, shall be handled and disposed of in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Materials

2.02 MATERIALS

A. Contractor shall use only those cleaning materials that will not create hazards to health or property, will not damage surfaces, and in accordance with materials and methods recommended by manufacturers.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Cleaning During Construction

B. Final Cleaning

3.02 CLEANING DURING CONSTRUCTION

A. Execute periodic cleaning to keep the Limits of Work and adjacent areas free from accumulation of waste materials, rubbish, and windblown debris resulting from construction operations.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

C. Remove snow and ice from drives, walks, work surfaces, and all other paths of movement, which impedes access or drainage or present danger to workers, public, or property.

D. All packaging devices including cartons, crating, boxes, wrappings that have been used to enclose materials, devices, or equipment brought to the premises for use in the work of Contractor and identifiable in any proven way as to be such, shall be removed from the premises by Contractor.

E. Remove waste materials, debris, and rubbish from Site and legally dispose of at facilities pre-approved by Owner.

F. Debris or waste material from cutting, patching, or other construction procedures shall be removed by Contractor at the end of each day's work.

3.03 FINAL CLEANING

A. At final completion, Contractor shall clean all Work areas and remove from the Site all debris, unused construction materials, and waste material in compliance with these Specifications. Contractor shall then perform a general and final cleanup of the Site.

B. Prior to final completion, Engineer shall view all Work areas, to verify that the entire Limit of Work is clean. Contractor shall perform additional clean-up as necessary to satisfy Engineer at no additional cost to Owner.

END OF SECTION

DIVISION 01—GENERAL REQUIREMENTS
Section 01 78 00 – Project Record Documents

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Description

D. Submittals

1.02 SCOPE

A. This section details all required Record Documents for the Work and requirements for Contractor with respect to the Record Documents. Contractor shall keep accurate Record Documents for the Work, including additions, substitutions of material, and variations in Work.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 02 21 00 – Surveys

1.04 DESCRIPTION

A. Work includes keeping accurate Record Documents for the Work and all additions, substitutions of material, variations in Work, and any other additions or revisions to the Contract Documents in accordance with the General Conditions.

B. This section includes administrative and procedural requirements for Record Documents, including:

1. Record Drawings

2. Project Records

3. Contract Modifications and Addenda

1.05 SUBMITTALS

A. Record Drawings: Contractor shall prepare and submit a complete set of Record Drawings at the time of Substantial Completion.

1. Within 7 days from Notice to Proceed, Engineer will provide a set of Contract Drawings electronically for Contractor use in preparing Record Drawings.

2. Contractor shall record all variations to the Contract Drawings as described herein.

3. When Contractor considers Work to be Substantially Complete, Contractor shall submit Record Drawings, with all deviations from the Contract Drawings clearly marked, for Engineer review and comment.

   a) Record Drawings shall be prepared using the coordinate systems and scale shown on the original Contract Drawings.

   b) Record Drawings shall be provided to Engineer electronically in PDF and AutoCAD Civil 3D (2018) format or other program approved by Engineer.

   c) AutoCAD information shall be organized into separate electronic files that correspond to each sheet of the Contract Drawings. Each file shall be named with the sheet identification and clearly designated as a Record Drawing as described herein.

   d) Record Drawings shall be prepared under the direction of a registered Hydrographic Surveyor licensed to perform such Work in the Commonwealth of Massachusetts and shall be stamped and signed by the registered professional who directed the survey Work.

B. Project Records: Contractor shall provide Project Records as listed in Section 01 33 00 – Submittal Procedures Preliminary List of Submittals (Table A) and described in the Specification sections referenced in Table A.

C. Contract Modifications and Addenda: Contractor shall submit addenda and Contract modifications at the time of Substantial Completion.

D. In the event of a discrepancy between Section 01 33 00 – Submittals Procedures Preliminary List of Submittals (Table A) and the individual Specification sections, the submittal requirements of the individual Specification section shall apply.

E. Engineer may request Record Drawings and Project Records in addition to those listed in Section 01 33 00 – Submittal Procedures Preliminary Submittals List (Table A) when deemed necessary to adequately describe the Work covered in the respective sections. Contractor shall provide these additional Record Documents at no additional cost to Owner.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Maintenance of Record Documents

B. Recording

3.02 MAINTENANCE OF RECORD DOCUMENTS

A. Maintain at Site, one record copy of the following:

1. Contract Drawings.
2. Specifications.
3. Addenda.
4. Permits.
5. Health and Safety Plan and associated records for Contractor and Subcontractor personnel.
6. All Contract-required work plans and Submittals.
7. Reviewed shop drawings.
8. Change Orders.
9. Any other modifications to the Contract.
10. Engineer’s field change notices or written instructions.
11. Field test reports.
12. Disposal manifests.
13. Material delivery receipts and tickets.

B. Maintain all Record Documents in Contractor’s field office apart from documents used for construction.

C. Maintain all documents in clean, dry, and legible condition.

D. Do not use Record Documents for construction purposes.

E. Make all documents available at all times for inspection by Owner and Engineer.

3.03 RECORDING

A. Identify and date each Record Document; include the designation "RECORD DOCUMENT" in a prominent location.

B. Keep Record Documents current.

1. Make changes and modifications to Record Documents as they occur; do not wait until the end of Project.

2. Do not permanently conceal or cover any installed Project components until required information has been obtained and recorded.

C. Record Drawings: Contractor shall legibly markup Contract Drawings to record actual construction where construction varies from that shown originally. These may include, but are not limited to, the following:

1. Details not shown on original Contract Drawings.

2. Field changes of dimension and detail.

3. Use of alternate materials and equipment.

4. Changes made by field change notice or by Change Order.

5. Information required for inclusion on the Record Drawings is defined in Section 02 21 00 – Surveys.

D. See individual Specification sections for specific requirements for Record Documents of the Work in those sections.

END OF SECTION

DIVISION 02—EXISTING CONDITIONS
Section 02 21 00 – Surveys

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. References

D. Project Datums

E. Qualifications of Surveyors

F. Survey Reference Points

G. Topographic Survey Requirements

H. Submittals

1.02 SCOPE

A. Contractor shall furnish all labor, equipment, materials, and incidentals necessary to perform the survey Work described in the Specifications and shown on the Contract Drawings, including the following:

1. Pre-Construction Conditions Survey and Post-Construction Conditions Survey of both the upland and in-river portions of the Site within the Limits of Work.

2. Pre-Construction Upland Topographic Survey to confirm existing Site conditions, including utilities and Post-Construction Upland Topographic Survey to confirm upland areas disturbed during the completion of the work have been restored to pre-existing conditions.

3. Pre-, Interim-, and Post-Dredge Surveys, including project Record Drawings.

4. Pre, Interim, and Post-Cap Layer Placement Surveys, including project Record Drawings.

B. Contractor shall conduct in-river work under dry conditions which will require topographic survey methods to meet the work verification requirements of this specification. Contractor shall retain the services of a third-party topographic surveyor that meets the required qualifications within and to conduct the topographic surveys provided herein.

C. A third-party will conduct survey and monitoring of the existing retaining wall on the 284 Winter Street property and will provide data to Contractor. Contractor shall work collaboratively with the third-party and adjust their work procedures based on the data provided by this monitoring.

1.03 RELATED SECTIONS

A. Section 01 33 00 – Submittal Procedures

B. Section 01 78 00 – Project Record Documents

C. Section 32 30 00 – Site Restoration

D. Section 35 20 23 – Mechanical Dredging

E. Section 35 20 50 – Capping

1.04 REFERENCES

A. USACE, 2007. Engineering and Design – Control and Topographic Surveys. EM 1110-1-1005.

B. Geometric Geodetic Accuracy Standards and Specifications for Using GPS Relative Positioning Techniques, Federal Geodetic Control Committee, Version 5.0, May 1988 and corrected August 1, 1989.

1.05 PROJECT DATUMS

A. All topographic surveys shall be prepared using the Project datums listed in these Specifications and as shown on the Contract Drawings.

1. Horizontal Datum: Massachusetts State Plane, Mainland Zone, North American Datum of 1983 (NAD83) in U.S. Survey Feet.

2. Vertical Datum: North American Vertical Datum of 1988 (NAVD88) in Feet.

1.06 QUALIFICATIONS OF TOPOGRAPHIC SURVEYOR

A. Contractor shall select a third-party Topographic Surveyor licensed as a Professional Land Surveyor in the Commonwealth of Massachusetts whose qualifications are acceptable to Engineer. The Surveyor shall have actively engaged in land survey operations during the past 3 years and have a minimum of 5 years of experience in land surveying under license.

B. The qualifications of the Surveyor shall be submitted in the Survey Work Plan outlined herein. Engineer reserves the right to disallow the person(s) proposed by

Contractor for surveying. If, in the event Engineer disqualifies the person(s) to do the Work, Contractor shall select another surveyor and submit qualifications until a qualified person is approved. Use of alternative surveyors shall be at no cost to Owner.

1.07 SURVEY REFERENCE POINTS

A. Contractor shall install control point monuments prior to starting the Work and preserve and protect all control and reference points during construction.

1. Contractor shall not make changes or relocations of established control points without prior written notice to Engineer and after obtaining approval.

2. Contractor shall report to Engineer when any reference point is lost, destroyed, or requires relocation because of necessary changes in grades or locations.

3. Contractor shall replace project monuments or control points that may be lost or destroyed and establish replacements based on original horizontal and vertical controls at no additional cost to Owner.

1.08 SUBMITTALS

A. Pre-Construction

1. Survey Work Plan. Contractor shall submit a Survey Work Plan (as part of the Contractor's Work Plan [CWP]) to Engineer for review within 21 days of Notice to Proceed in accordance with Section 01 33 00 – Submittal Procedures. Work shall not commence until submittal is approved by Engineer. At a minimum, the Survey Work Plan shall include the following:

a) The name, address, and a summary of qualifications of the Surveyor(s) selected to perform the survey work and copies of licenses and certifications as required in Part 1.06.

b) A summary of all required surveying tasks and areas to be surveyed for both horizontal limits and elevations as necessary to perform and document the Work described in the Specifications and Contract Drawings.

c) Proposed location(s) for the installation of temporary survey monuments and control points to be used for survey operations and the anticipated location of the project base station.

d) A description of the proposed topographic survey methods, including equipment, procedures, calibration methods, calibration frequency, and estimated precision/accuracy of measurements.

e) Instrument specifications or cut sheets and calibration certificates (6 months current) and procedures for calibration during the full period of the Work.

f) A discussion of the planned methods and frequencies for interim progress surveys.

g) A description of record-keeping procedures during surveying.

h) A proposed survey deliverable format, including an example electronic file of survey surfaces for the Work in the format specified herein. Engineer will evaluate whether the file format is acceptable for use in determining compliance with the Specifications.

2. Pre-Construction Conditions Survey. Contractor shall submit Pre-Construction Conditions Survey documentation, including videos, photographs, figures, for the upland and in-river work areas at least 14 days, but no more than 30 days prior to the start of construction.

a) Contractor shall electronically submit the results of the Pre--Construction Conditions Survey to Engineer within 3 days after the survey is completed. Contractor work activities shall not be initiated until the Pre-Construction Conditions Survey is accepted by Engineer.

3. Pre-Construction Upland Topographic Survey to confirm existing Site conditions, including utilities. Contractor's selected Surveyor(s) shall conduct the Pre-Construction Upland Topographic Survey of the Site within the upland Limits of Work at least 14 days, but no more than 30 days prior to the start of construction.

4. Pre-Dredge Survey in the river. Contractor's select surveyor(s) shall conduct the initial topographic survey within the in-river Limits of Work at least 14 days, but no more than 30 days prior to the start of construction.

B. During Construction

1. Contractor shall submit topographic survey data for Pre-, Interim-, and Post-Dredge Surveys as described in Part 3 of this Specification.

2. Contractor shall submit topographic survey data for Pre-, Interim-, and Post-Cap Layer Placement Surveys as described in Part 3 of this Specification.

3. Contractor shall submit survey submittals that include survey data, processed survey contour maps, and processed survey data containing easting, northing, and elevation data (in the form of an .xyz or .csv file) with any request for progress payment or as requested by Engineer.

4. Contractor shall submit Interim- and Post-Dredge Surveys and Interim- and Post-Cap Layer Placement surveys and quantity calculations to verify the completion of dredging, each layer of cap placement, and overall construction. Contractor shall submit survey data to Engineer, as well as processed survey results containing easting, northing, and elevation data (in the form of an .xyz or .csv file) within 3 workdays of data collection. Contractor shall also prepare and submit contour maps and isopach comparisons in PDF and CAD format.

5. Contractor shall submit, upon request of Engineer, documentation of accuracy of survey work, survey logs, and field notes within 2 days of request.

C. Post-Construction

1. Survey Record Drawings. Contractor shall submit topographic maps and plans as part of the Survey Record Drawings to Engineer in accordance with Section 01 78 00 – Project Record Documents. The Survey Record Drawings shall be prepared and certified by Contractor's Surveyor(s). At a minimum, the Survey Record Drawing shall document the following:

a) Post-dredge conditions and elevations within the limits of dredging work.

b) Post-cap layer placement conditions and elevations for each cap layer within the limits of capping work.

c) Post-construction conditions and elevations following complete placement of the cap within the limits of capping work.

d) Post-construction upland topographic survey following the final restoration of all upland areas disturbed during the completion of the work including the Upland Staging Area and the Sediment Processing Area (SPA).

e) Post-construction conditions of the Upland Staging Area (including the SPA) and within the limits of in-river work.

2. Post-Construction Conditions Survey. Contractor shall submit Post-Construction Conditions Survey documentation as required in Part 3, including videos, photographs, and figures. The Post-Construction Conditions Survey shall consist of the same elements as the Pre-Construction Conditions Survey and shall note any discrepancies from the Pre-Construction Conditions Survey. Electronic copies of the Post-Construction Conditions Survey documentation shall be submitted in an electronic format acceptable to Engineer within 14 days of completing the survey.

3. Contractor shall submit to Engineer, at the completion of construction, all survey logs and field notes developed over the course of construction.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. General

B. Project Topographic Survey Requirements

C. Pre-Construction and Post-Construction Conditions Surveys

D. Pre-Construction and Post-Construction Topographic Surveys

E. Dredging Surveys

F. Capping Surveys

G. Survey Record Drawings and Reporting

3.02 GENERAL

A. Contractor is responsible for conducting all conditions surveys and topographic surveys required for layout and performance of the Work. All topographic surveys shall be performed by a Surveyor meeting the qualifications described in Part 1.06 of this Specification.

B. Contractor’s Topographic Surveyor shall make all necessary measurements of length, depth, and area necessary to calculate quantities of the Work performed consistent with the Specifications and as shown on the Contract Drawings. The results of these survey measurements and relevant backup calculations shall be provided to Engineer for review and approval.

C. Survey procedures, including, but not limited to, positioning modes, calibration, data reduction, adjustment, processing, and plotting shall conform to recognized industry standards.

D. Contractor's Surveyor(s) shall verify survey work using the manufacturer's calibration and field verification procedures and industry standards.

3.03 PROJECT TOPOGRAPHIC SURVEY REQUIREMENTS

A. Topographic surveys shall meet the following criteria, at a minimum:

1. Measure the target horizontal position to an accuracy of 0.1 foot and the target elevation to an accuracy of 0.1 foot.

2. Topographic data shall be collected at a level of detail and frequency sufficient to show grades at a 1-foot contour interval, with spot elevations to the nearest 0.1 foot shown at important features.

B. The survey limits for a given area shall extend a minimum of 20 feet (as feasible) beyond the perimeter of the area or unit being surveyed.

C. The spacing of topographic measurements shall consider the local conditions. Survey measurement spacing shall not exceed 5 feet. The spacing shall be determined as appropriate to collect adequate data to characterize the conditions and elevations of the area or unit being surveyed.

3.04 PRE- AND POST-CONSTRUCTION CONDITIONS SURVEYS

A. Contractor shall perform a Pre-Construction Conditions Survey before commencement of the Work and a Post-Construction Conditions Survey after completion of the Work as described herein.

1. Pre-Construction and Post-Construction Conditions Surveys shall document the condition of structures, roads, access ways, monitoring wells, catch basins, utilities, existing retaining walls, in-water features including the bridge upstream of the work area and the culvert downstream of the work areas (as shown on the Contract Drawings) and other relevant features in and adjacent to the work areas both in the upland and in the Little River.

2. Contractor shall conduct a Pre- and Post-Construction Conditions survey meeting the following requirements:

a) Inclusion of digital videos and photographs including an index of videos and photographs using a counter or other indexing technique.

b) Videos shall be labeled and narrated.

c) Photographs shall be numbered.

d) A key plan shall be provided to show the location and general direction of each photograph and video.

B. Documentation of the Pre- and Post-Construction Conditions Survey shall include a written description of the condition of key features for each structure in and adjacent to the work areas. The documentation shall note any evident structural faults and deficiencies, or recent repairs. Inspection documentation shall include a space for Engineer to initial, confirming the identified defects have been discussed.

3.05 PRE- AND POST-CONSTRUCTION UPLAND TOPOGRAPHIC SURVEY

A. Contractor shall conduct a Pre-Construction Upland Topographic Survey of the upland portion of the Site to confirm:

1. The location of existing Site features shown on the Contract Drawings, including but not limited to structures, roads, access ways, monitoring wells, catch basins, overhead utilities, and other relevant features in and adjacent to the Work Areas. Contractor shall survey the locations of aboveground utilities in, or immediately adjacent to, the work areas to confirm clearance with the Work. Existing utilities shall be clearly marked, defined, and protected if applicable. Engineer shall be notified immediately of any utility discrepancies.

2. The slope of the riverbank opposite of the 284 Winter Street Property

3. Working Points, and Control Points (horizontal control and vertical benchmarks) provided by Owner

4. Work is located as required by the Contract Documents.

B. Contractor shall conduct a Post-Construction Upland Topographic Survey of the upland portion of the Site to confirm that Contractor has met the requirements of Specification Section 32 30 00 – Site Restoration and has restored the Site to pre-existing conditions. Contractor shall survey the elements outlined in Paragraph 3.05A for comparison purposes to the Pre-Construction Upland Topographic Survey.

3.06 DREDGING SURVEYS

A. Contractor shall conduct the following topographic surveys in support of dredging operations:

1. Pre-Dredge Survey to be conducted following debris removal. Contractor shall provide Pre-Dredge Survey for Engineer review and approval before dredging operations can commence.

2. Interim-Dredge Surveys to measure dredging progress during construction. Contractor shall perform Interim-Dredge Surveys as needed to document and report the progress of dredging operations or as requested by Engineer.

3. Post-Dredge Survey to document final post-dredge conditions. Contractor shall perform Post-Dredge Survey within 3 workdays following the completion of dredging. Contractor shall verify dredging is compliant with the requirements specified in Section 35 20 23 – Mechanical Dredging.

B. Contractor shall use the same survey method and topographic survey measurement spacing for Pre-, Interim-, and Post-Dredge Surveys within a given area to facilitate survey comparison. Survey comparisons will be used to compute volume of material dredged.

C. Contractor shall submit the comparison between the Pre- and Post-Dredge Surveys to Engineer for final review and approval which shall be used as the basis for verification and acceptance of dredging by Engineer in accordance with Section 35 20 23 – Mechanical Dredging.

D. Contractor’s Surveyor(s) shall calculate the actual elevations (to the nearest 0.1 foot of elevation) and quantities (to the nearest cubic yard for volume) of material dredged and submit the quantity calculations to Engineer for approval. The quantity calculations shall be based on a comparison of the Pre- and Post-Dredge Surveys.

E. Engineer will verify that the post-dredge elevations achieve the minimum requirements specified in Section 35 20 23 – Mechanical Dredging.

F. If required dredging elevations have not been achieved, as determined by Engineer, Contractor shall re-dredge and re-survey the area as required. The re-surveying shall be conducted at no additional cost to Owner. In a case where design dredging elevations have been exceeded, Contractor may have to place additional clean material, if required by Engineer, and re-survey the area as required. The additional clean material placement and re-survey shall be conducted at no additional cost to Owner.

3.07 CAPPING SURVEYS

A. Contractor shall conduct the following topographic surveys for each cap layer in support capping operations:

1. Pre-Cap Layer Placement Survey prior to the start of capping work. Contractor shall conduct a Pre-Cap Layer Placement Survey covering the full extent of the limits of capping, and any adjacent areas that will be disturbed. Contractor's Post-Dredge Survey (Part 3.07.A) may serve as the Pre-Placement Survey for the first capping layer (CIL 1) if approved by Engineer. Contractor shall provide Pre-Cap Layer Placement Survey for Engineer review and approval before capping operations can commence.

2. Interim-Cap Layer Placement Surveys as needed to document and report the progress of capping operations or as requested by Engineer.

3. Post-Cap Layer Placement Survey for each layer of the caps layers. Contractor shall perform Post-Cap Layer Placement Surveys within three (3) workdays following the completion of a cap layer. Contractor shall verify placement of each cap layer is compliant with the requirements specified in Section 35 20 50 – Capping. Contractor shall submit the survey comparison to Engineer for review and approval. Post-Cap Layer Placement Surveys of each layer must be approved by Engineer prior to commencing placement of subsequent layers. The approved Post-Cap Layer Placement Survey of the preceding cap layer shall be the basis of comparison for the subsequent cap layer survey.

B. Contractor's Surveyor(s) shall calculate the actual thicknesses (to the nearest 0.1 foot of thickness), lateral extents (to the nearest square foot), and quantities (to the nearest cubic yard) of each placed cap layer and submit the quantity calculations to Engineer for approval.

C. Engineer will verify the cap layer thicknesses achieve the minimum requirements specified in Section 35 20 50 – Capping.

D. If required cap layer thicknesses and lateral extents have not been achieved or are in excess of the design thickness plus over placement allowance, as determined by Engineer, Contractor shall place or remove additional cap material and re-survey the area as required. The re-surveying shall be conducted at no additional cost to Owner.

3.08 SURVEY RECORD DRAWINGS AND REPORTING

A. Contractor shall maintain a complete, accurate log of all control and survey work as it progresses and provide all survey logs and field notes to Engineer upon request.

B. Contractor shall update Survey Record Drawings as a condition for approval of the Work and final payment requests per Section 01 78 00 – Project Record Documents.

C. Contractor shall submit, in tabular format, a summary of the final dredging volume, elevations, placed cap thicknesses and lateral extents achieved to Engineer. Engineer will verify all measurements and quantities.

D. Engineer will review the results of the surveys, including the provided quantities, within 7 workdays of the submittal and give subsequent release if Contractor has successfully fulfilled the requirements of the Work.

E. Contractor shall provide Engineer the following items for Survey Record Drawings and reporting:

1. AutoCAD Civil 3D (2018) format or compatible Digital Elevation Model (DEM) of the survey results. The DEM must contain adequate three-dimensional (3D) points and 3D break lines required to accurately model the digital surface to within the accuracy requirements stated herein. The DEM must also provide a two-dimensional polyline defining the limits of all surveyed areas.

2. Contractor's Surveyor shall provide raw, unedited, and processed survey data in comma-separated format (i.e., easting, northing, elevation) in the specified Project datums.

END OF SECTION

DIVISION 02—EXISTING CONDITIONS
Section 02 51 29 – Surface Cleaning and Decontamination

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Requirements

D. Submittals

1.02 SCOPE

A. Contractor shall provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for, or incidental to, cleaning and decontamination of all equipment and other surfaces that were used or were incidental to the Work.

B. Work will encounter manufactured gas plant (MGP)-related subsurface contamination, including residual coal tar and coal-tar related compounds as described in Section 01 11 00 – Summary of Work. Contractor shall conduct sufficient decontamination of equipment and materials so as to not transfer contamination from impacted areas to areas of the Site that are either uncontaminated or have already been dredged or capped as part of the Work, or off-Site areas.

C. All vehicles, trucks, and equipment entering or leaving the Limits of Work boundaries shall be properly decontaminated prior to their transport off Site.

1.03 RELATED SECTIONS

A. Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites

B. Section 01 35 43 – Environmental Procedures

C. Section 02 61 00 – Removal and Disposal of Waste Materials

1.04 REQUIREMENTS

A. Contractor shall perform all required decontamination activities consistent with the Engineer-approved Environmental Procedures Plan specified in Section 01 35 43 – Environmental Procedures.

B. Contractor shall provide and maintain the equipment required for decontamination and store and dispose of the resulting decontamination fluids in

accordance with Section 02 61 00 – Removal and Disposal of Waste Materials, these Specifications, and with all applicable local, state, and federal laws and permits.

1.05 SUBMITTALS

A. Decontamination Plan – As part of the Contractor's Work Plan, Contractor shall prepare and submit to Engineer within 21 days of the Notice to Proceed a Project-specific Decontamination Plan. The Decontamination Plan shall outline, at a minimum, the decontamination methods and equipment to be used for personnel, equipment, debris, and materials leaving the Site and the methods of storage, transport, and disposal for decontamination wastes. Contractor shall detail in the Decontamination Plan the procedures, equipment, and clearance criteria to be used for the decontamination of all process and storage equipment to be removed from the Site. Additionally, all equipment (catalog cut sheets shall be provided), and cleaning materials (including all Safety Data Sheets [SDSs] for proposed decontamination additives) shall be included in the Decontamination Plan.

PART 2 – MATERIALS

2.01 SECTION INCLUDES

A. Water

B. Decontamination Fluid Additives

2.02 WATER

A. Contractor shall obtain and use water for cleaning and decontamination activities associated with the Work.

2.03 DECONTAMINATION FLUID ADDITIVES

A. Contractor may use additives such as surfactants or water-borne abrasives to facilitate removal of hardened material from equipment subject to the approval of the Engineer. SDSs for all additives shall be submitted to Engineer prior to construction in accordance with Section 01 35 43 – Environmental Procedures. Contractor shall properly collect decontamination fluids used during the Project.

B. Cleaning agents shall not be added to fluids used for surface cleaning of equipment and surface without prior written approval from Engineer.

C. Contractor shall only use those cleaning additives or products and methods recommended by the manufacturer of the equipment or surface material to be cleaned.

D. Contractor shall use cleaning materials only on surfaces recommended by the cleaning material manufacturer.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Cleaning During Construction

B. Decontamination Requirements

C. Disposal of Decontamination Fluids

3.02 CLEANING DURING CONSTRUCTION

A. Prior to mobilization of any piece of equipment, Contractor must thoroughly clean that piece of equipment to prevent the spread of off-Site contaminants to the Site. Contractor shall provide evidence to cleaning to Engineer and shall make plant and equipment available for inspection by Engineer prior to mobilization.

B. Contractor shall execute periodic cleaning and surface decontamination to keep the Work areas and adjacent properties free from the accumulation of waste materials resulting from Work.

C. All personnel and equipment exiting the Exclusion Zone and Contamination Reduction Zone, as defined in Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites, or that have been in contact with impacted Site materials, shall require decontamination.

D. All debris such as, but not limited to, piles and timbers, concrete rubble, stone, brick, and metal encountered during the Work that will not be accepted by the sediment disposal facility shall require decontamination prior to offSite transportation and disposal to an Owner-approved facility.

E. All dredging, capping and process equipment, storage tanks, and miscellaneous equipment removed from the Site shall require decontamination prior to transport off the Site. All equipment shall be cleared of sediment, and MGP residuals and washed sufficiently to remove all visible MGP residuals.

3.03 DECONTAMINATION REQUIREMENTS

A. Equipment Decontamination

1. Equipment shall be decontaminated in place, in a manner that contains all decontamination water. Contractor shall ensure that any equipment, vehicles, or personnel that have been in contact with the Exclusion and/or

Contamination Reduction Zones are decontaminated properly before leaving these zones.

B. Debris

1. Debris that may be potentially recycled, must be fully cleaned and decontaminated prior to off-Site transport of the material.

2. No debris shall be transported off the Site until visible sediment or MGP residuals have been removed, as visually confirmed by Engineer.

3. Wash units for surface cleaning of debris shall be self-contained, portable, high-pressure hot water units.

4. Contractor should plan to prepare and submit wipe samples for analytical testing to confirm that debris decontamination is complete.

C. Personnel Decontamination

1. Personnel decontamination procedures shall be followed by Contractor as specified in the Health and Safety Plan required by Section 01 35 29 – Health, Safety, and Emergency Response Procedures for Contaminated Sites.

3.04 DISPOSAL OF DECONTAMINATION FLUIDS AND MATERIALS

A. Decontamination fluids generated from this activity shall be collected, contained, and disposed of by Contractor in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

B. Contractor is responsible for storing, separating, characterizing, handling, and transporting all decontamination waste materials in accordance with applicable regulations and requirements. All solid waste materials shall be disposed of at Owner-approved waste management facilities in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

END OF SECTION

DIVISION 02—EXISTING CONDITIONS
Section 02 61 00 – Removal and Disposal of Waste Materials

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Description

D. Submittals

E. References

1.02 SCOPE

A. Contractor shall provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for, or incidental to, transport of all dredged material, construction waters, and all other wastes generated incidental to the Work to Owner-approved facilities for disposal.

B. Contractor shall transport dredged material and applicable debris per Section 35 20 33 – Mechanical Dredging to the Clean Earth Thermal Desorption Facility in Loudon, New Hampshire. Contractor can select final disposal or recycling facilities for other waste streams in accordance with Owner-approved facility list.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions and Sequence

B. Section 01 20 00 – Price and Payment Procedures

C. Section 01 33 00 – Submittal Procedures

D. Section 01 35 43 – Environmental Procedures

1.04 DESCRIPTION

A. Contractor shall furnish all labor, equipment, materials, tools, supervision, transportation, and incidentals necessary to characterize, handle, manage, and transport all Waste Materials to an Owner-approved reuse, salvage, recycling, treatment, and/or disposal facility as specified herein and in accordance with all applicable laws and regulations. This includes, but is not limited to, all tipping fees, state, local, and federal taxes, and facility surcharges.

B. Contractor shall be paid for off-Site transportation and disposal of Waste Materials generated during the Work consistent with the payment items described in Section 01 20 00 – Price and Payment Procedures. These payment items

identify certain waste categories and estimated quantities for these categories are included on the Bid Form.

C. Contractor shall engage an Owner-approved, independent testing laboratory to perform all sampling and analytical testing of all Waste Materials as necessary for waste characterization, handling, transportation, and recycling/treatment/disposal at Owner-approved disposal facilities. The following laboratories are acceptable to Owner for analytical testing:

1. Alpha Analytical, contact: Elizabeth Porta (508-844-4124)

2. ESS Laboratory, contact: Sandra DeMedeiros (401-461-7181 x3055)

D. Engineer will be responsible for preparation of the final waste profiles, Bills of Lading (BOLs), manifests, and other shipping documents. Contractor shall assist Engineer as necessary in preparation of all required waste profiles, BOLs, manifests, and other shipping documents as required per Owner-approved facilities.

E. Owner will sign (or be responsible for obtaining appropriate signatures for) all necessary waste profiles and shipping documents as Generator.

F. Contractor shall contract directly with Owner-approved facilities to facilitate the off-Site transportation and reuse, salvage, recycling, treatment, and/or disposal of all Waste Materials generated during the Work.

G. All costs associated with the handling, transloading, transportation, and treatment/disposal of Waste Materials as defined herein and in Section 01 20 00 – Price and Payment Procedures (including all tipping fees, state, local, and federal taxes, and facility surcharges) shall be included in Contractor's Bid price.

1.05 SUBMITTALS

A. Pre-Construction

1. As part of the Contractor's Work Plan (CWP) and within 21 days of Notice to Proceed, Contractor shall prepare and submit to Engineer a Project-specific Waste Management Plan in accordance with Section 01 33 00 – Submittal Procedures. The Waste Management Plan shall outline, at a minimum, Contractor's methods for characterizing, tracking, handling, loading, transporting, and disposing of all Waste Materials generated during the Work as specified herein. Contractor shall not submit samples from the Site to a laboratory, or remove any generated material from the Site, until the Waste Management Plan has been approved by Engineer. If, following approval of the Waste Management Plan, Contractor desires or identifies a need to use any laboratory or facility not included in the Waste Management Plan, they shall submit all

the information as required by this section, and receive approval for same by Engineer, prior to such use.

2. The Waste Management Plan shall include, but not be limited to, the following:

   a) A detailed flow chart or schematic describing the means and methods for tracking, handling, loading, and off-Site transportation of all Waste Materials, including those specifically identified in this section and on the Bid Form and those considered incidental to the Work. Contractor shall provide a list of equipment to be used to complete the Work outlined in the flow chart or schematic.

   b) Estimated quantities of all Waste Materials expected to be generated.

   c) Designated areas for interim staging of Waste Materials in accordance with the access and use restrictions specified in Section 01 14 00 – Work Restrictions and Sequence.

   d) Name, address, and contact information for Owner-approved laboratories that will be utilized throughout the Project for the testing of samples.

   e) Contractor’s methods for characterizing, tracking, handling, loading, shipping, and disposing of all Waste Materials.

   f) Name(s) and address(es) of all Owner-approved recycling and treatment/disposal facilities that Contractor proposes to use. This information shall also be provided with Bid.

   g) Name, title, and telephone number of contact person for each disposal facility to be used.

   h) Lists matching each facility with the materials it will accept for this Project, and specifying whether the facility is a recycling, treatment, storage, or disposal facility.

   i) Estimated quantities of Waste Materials expected to be transported off Site to each facility-specific location.

   j) Written confirmation from the various facilities that they will accept the type and quantities of materials, the daily maximum and minimum quantities (cubic yards or tons per day), and the dates and times (including days of the week) they will accept materials from this Work.

k) A description of Contractor's procedures to manage and track materials and an example of Contractor's material tracking log.

l) Name, title, and telephone number of contact person for each transporter to be used.

m) For each transporter to be used, copies of licenses or up-to-date permits to operate and confirmation that they are permitted to transport materials to the respective facility.

B. During Construction

1. Contractor shall submit disposal truck logs to Engineer in accordance with Section 01 33 00 – Submittal Procedures. Logs shall include date, waste type, transporter, disposal facility identification and location, BOL or manifest number, vehicle number, driver, and approximate volume and weight of waste.

2. Disposal Receipts: Prior to submission of a progress payment for Work including material disposal, and within 5 days of transportation from the Site, Contractor shall document actual disposal of the waste at the designated facility by providing disposal receipts from the facility to Engineer in accordance with Section 01 33 00 – Submittal Procedures. Such certificates and receipts shall bear the printed name of the facility operator and shall specify the date of delivery, specify quantity and type of material delivered, weight tickets, and shall be signed by an on-Site representative of the facility operator. Payment may be withheld at the discretion of Engineer for the disposal of materials for which there are no signed disposal receipts.

3. Contractor shall submit a copy of analytical testing results from Owner-approved laboratory, including specific location for each sample identified on a plan, along with the date and time when samples were obtained and other pertinent information to Engineer in accordance with Section 01 33 00 – Submittal Procedures.

4. Contractor shall submit all paperwork associated with material transportation and disposal to Engineer in accordance with Section 01 33 00 – Submittal Procedures.

1.06 REFERENCES

A. Applicable references for the Work specified herein include, but are not limited to, the following:

1. MassDEP: 310 CMR 40.0000, "Massachusetts Contingency Plan."

2. MassDEP: 310 CMR 19.00, "Solid Waste Regulations."

3. MassDEP: 310 CMR 30.000, "Hazardous Waste Regulations."

4. MassDEP: Massachusetts General Law Chapter 21E Oil and Hazardous Material Release Prevention and Response Act.

5. Occupational Safety and Health Administration Standards and Regulations contained in Title 29, CFR, Parts 1910 and 1926, including amendments as stated in Federal Register, March 6, 1989, Final Rule, 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response."

6. Federal Resource Conservation and Recovery Act, as amended (USEPA Title 40 of CFR Parts 239 through 282, as applicable).

7. Posted weight limitations on roads and bridges.

PART 2 – MATERIALS

NOT USED

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Coordination

B. Characterization of Materials

C. Waste Materials Handling and Loading

D. Off-Site Transportation and Disposal Procedures

3.02 COORDINATION

A. Contractor shall notify Engineer prior to any sampling for waste characterization for off-Site treatment or disposal. Engineer will observe all sampling activities performed by Contractor. Any sampling performed without the knowledge of Engineer must be repeated by Contractor to the satisfaction of Engineer, at no additional expense to Owner.

B. Contractor shall coordinate the removal, processing, and off-Site transportation of all materials with Engineer.

3.03 CHARACTERIZATION OF MATERIALS

A. Contractor shall collect and prepare composite samples of waste prior to off-Site transport at the frequency of sampling required by the selected facility. Contractor

shall analyze the samples in accordance with the requirements of the selected facility using Owner–approved analytical laboratory.

3.04 WASTE MATERIALS HANDLING AND LOADING

A. Contractor shall perform the following tasks for the proper handling and loading of Waste Materials that shall be transported to the identified Owner-approved recycling or treatment/disposal facilities:

1. Contractor shall arrange and pay for all testing necessary to properly characterize wastes for disposal at the selected facility in accordance with facility requirements.

2. Waste Materials shall be transferred into temporary stockpiles or U.S. Department of Transportation-approved containers to be provided by waste transporter(s) or Contractor and staged for waste classification sampling.

   a) Stockpiled materials shall be managed consistent with Section 01 35 43 – Environmental Procedures.

   b) Containers shall be U.S. Department of Transportation shippable.

   c) Shipping containers shall be filled to within legal weight and height limits for shipping.

   d) Care should be taken not to overload containers. Debris shall be sized, as necessary, and placed in transport containers to achieve appropriate minimum dimensions.

   e) Waste Materials shall be contained to comply with Owner-approved disposal facility requirements.

3. Pending off-Site disposal, Waste Materials shall be temporarily staged in an area designated in Engineer-approved Waste Management Plan and in accordance with the access and use restrictions in Section 01 14 00 – Work Restrictions and Sequence and the requirements of this Specification.

4. Contractor shall manage all Waste Materials such that characterization and removal can be performed efficiently.

   a) Waste Materials shall be managed in accordance with applicable laws, regulations, and disposal facility requirements governing transportation and treatment/disposal.

b) Contractor shall employ environmental controls as specified in Section 01 35 43 – Environmental Procedures during all processes involving the generation, management, handling, temporary storage, and transportation of all Waste Materials.

c) Contractor shall treat and containerize all construction water, conduct required testing, and transport off Site for disposal.

d) Coordinate, assist Engineer, and manage the custody of necessary waste profiles, BOLs, hazardous waste manifests, and labels.

B. Pack and label materials for transportation following all U.S. Environmental Protection Agency, Massachusetts Department of Environmental Protection, U.S. Department of Transportation, and Massachusetts Department of Transportation regulations.

C. Care should be taken not to overload waste containers. Debris shall be sized, as necessary, and placed in transport containers to achieve appropriate minimum densities.

D. All debris and sediment stockpiles shall be covered above and below with sheeting and such that characterization and removal can be performed efficiently. Contractor shall be responsible for maintaining sheeting and covers on stockpiles or transport containers.

3.05 OFF-SITE TRANSPORTATION AND DISPOSAL PROCEDURES

A. Off-Site transportation and disposal of all Waste Materials generated as a result of the Work shall be in accordance with all applicable federal, state, and local regulations and the Waste Management Plan.

B. All characterization sampling of waste for disposal shall be performed by Contractor in accordance with all applicable federal, state, and local regulations and individual waste transporters and disposal facility requirements.

C. Contractor shall coordinate the schedule and transport of materials with Owner-approved facilities. Work delays due to scheduling or acceptance of the material at the disposal facilities for any reason will be at no additional cost to Owner.

D. Waste shall be transported in lined and covered U.S. Department of Transportation-approved containers to be provided by waste transporter(s) or drums to be provided by Contractor and staged for waste classification sampling. Containers shall meet all U.S. Department of Transportation shipping requirements. Shipping containers shall be filled to within legal weight and height limits for shipping. Waste shall be contained to comply with all approved disposal facility requirements. Contractor shall be responsible for temporarily staging waste in an area designated in the Engineer-approved Waste Management Plan.

E. Contractor shall coordinate, manage, and pay for (as a part of the Bid price) all waste handling activities, including transportation to the approved receiving facilities. Contractor shall be responsible for all tipping fees, taxes, and facility surcharges for all waste categories. Waste handling activities shall be conducted in accordance with the approved schedule so as not to delay Work.

F. Contractor shall schedule all waste shipments, in coordination with Engineer, and with Owner identified as Generator. Owner will sign documentation as Generator. Contractor shall provide waste manifests to Owner to sign (or be responsible for obtaining appropriate signatures) a minimum of 72 hours prior to shipment of waste, and Owner will in turn sign (or be responsible for obtaining appropriate signatures) manifests in a 3-day time period. Contractor shall assist Engineer in preparing BOLs, manifest, and other shipping papers.

1. Materials transported from the Limits of Work to an Owner-approved treatment/disposal facility shall be tracked under bill-of-lading or manifest as appropriate.

G. Any demurrage costs associated with transportation shall be borne by Contractor at no additional cost to Owner.

H. Contractor shall be responsible for transportation of all waste to Owner-approved disposal facilities unless otherwise noted in the Contract Documents. Contractor shall provide weight tickets for all waste disposal using commercially available scales with current calibration records. Portable scales will not be permitted for determination of pay quantities. Failure to properly weigh and record wastes transported for disposal will result in non-payment by Owner.

I. Contractor shall maintain a daily log of each truck’s weight and all waste shipped off Site.

J. Contractor shall coordinate the schedule and transport construction waste including, but not limited to, MRCS and contingency systems, general construction debris and waste, and construction water to the Contractor-selected, Owner-approved facility.

END OF SECTION

DIVISION 31—EARTHWORK
Section 31 05 13 – Aggregates

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Compliance with Testing and Materials Standards

D. Submittals

1.02 SCOPE

A. Contractor shall furnish all labor, materials, tools, supervision, and transportation required to procure and deliver to the Site the soils, aggregates, and products presented in this Specification for the installation of the engineered cap in the Little River per Section 35 20 50 – Capping.

B. Contractor shall furnish all labor, materials, tools, supervision, and transportation necessary to perform soil and aggregate testing and analysis to meet the testing requirements as specified herein.

1.03 RELATED SECTIONS

A. Section 02 61 00 – Removal and Disposal of Waste Materials

B. Section 35 20 50 – Capping

1.04 COMPLIANCE WITH TESTING AND MATERIALS STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. Latest version of the ASTM International (ASTM) standards:

a) ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

b) ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis

c) ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes

d) ASTM D2216 – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

e) ASTM C29 – Standard Test Methods for Bulk Density ("Unit Weight") and Voids in Aggregate.

2. Where reference is made to one of the above standards, the revision in effect at the time of the bid opening shall apply.

1.05 SUBMITTALS

A. Contractor shall perform chemical and physical properties testing as specified herein, and shall submit results confirming that the proposed materials meet the specified requirements, at least two weeks prior to delivery to the Site. Use of materials by Contractor prior to testing and approval or rejection shall be at Contractor's risk and at no additional cost to Owner.

B. For each material, no exceptions, specified in Part 2 of this Specification, Contractor shall submit the following prior to delivery of any materials to the Site:

1. The proposed material source or sources, including name, address, and contact information.

2. Certification letter from the borrow source owner and/or operator that the borrow material does not contain oil or hazardous material, as supported by test data to be provided with certification letter.

3. The results of testing as specified in Part 3 herein for all materials proposed from each source.

4. A 5-pound sample for inspection by Engineer.

C. Chemical characteristics of imported materials shall meet the requirements of 310 CMR 40.1600. Specifically, chemical concentrations of imported materials must be below the Reportable Concentrations of S1 (RCS1) soils, probable effects concentrations, or concentrations consistent with Local Conditions (as applicable). For polychlorinated biphenyls (PCBs) and pesticides, concentrations must be below detection limits, which must be at or below the S1 (RCS1) limits. Materials brought on Site by Contractor that do not meet these criteria will not be accepted and shall be legally disposed of off Site by Contractor at no cost to Owner. Any on-Site materials or Work adversely impacted by the presence of contaminated borrow materials shall be removed, replaced, or repaired by Contractor at no cost to Owner.

1. The testing suite shall at a minimum consist of the following:

a) Volatile organic compounds SW-846 Method 8260B;

b) Semivolatile organic compounds SW-846 Method 8270C;

c) MassDEP Extractable Petroleum Hydrocarbons (EPH), adjusted carbon ranges only;

d) Pesticides and PCBs SW-846 Method 8081A and 8082;

e) Priority Pollutant Metals 13 (Antimony, Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, Zinc) SW-846 Method 6010B and Methods 7470/7471.

2. For each type of off-Site material specified in Table A of Part 3 herein, results from one suite of the above tests with reporting limits equal to or less than RCS1 shall be submitted at least two weeks prior to delivery to the Site and thereafter for each 500 cubic yards of material imported to the Site.

3. All material testing shall be performed by an Owner-approved independent laboratory consistent with the requirements of this Specification.

D. Contractor shall document total amount and type of material imported to the Site. All import quantities shall be based on material weight slips.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Use of Materials

B. Materials

2.02 USE OF MATERIALS

A. The following summarizes a list of material to be used for engineered capping in the Little River.

1. Bedding Material

a) Locations of placement: over full cap area to generate a maximum 3H:1V surface on which to construct the cap, as shown on the Contract Drawings.

2. Chemical Isolation Layer (CIL) 1

a) Locations of placement: at the base of the retaining wall below the reactive core mat (RCM) and over full cap area as the first CIL 1 placed on the sediment surface.

b) CIL 1 shall be composed of an Organoclay/Sand mixture

3. CIL 2

a) Locations of placement: over full cap area as the second CIL (CIL 2) placed on top of CIL 1.

b) CIL 2 shall be composed of a Granular Activated Carbon (GAC)/Sand mixture

4. Filter Material

a) Locations of placement: over full cap area and placed on top of CIL 2 in the Multi-Layered Granular Cap and placed as shown on the Contract Drawings for the Wedge portion of the cap.

5. Armor Material

a) Locations of placement: over full cap area and placed on top of the Filter Material in the Multi-Layered Granular Cap and placed as shown on the Contract Drawings for the Wedge portion of the cap.

2.03 MATERIALS

A. Sand

1. "Sand" shall consist of clean inert, hard, durable grains of quartz or other durable rock, free from loam, clay, ice, snow, roots, sod, rubbish, surface coatings, or other deleterious materials. The allowable amount passing the No. 200 sieve as determined by ASTM D6913 shall not exceed 10% by weight, and the maximum particle size shall be 1/8 inch.

B. CIL 1

1. Organoclay/Sand mixture shall be free from ice and snow, roots, sod, rubbish, and other deleterious material.

a) It shall consist of 4% Organoclay by weight.

b) The Organoclay shall be CETCO PM-199, equivalent will not be accepted.

c) The Sand shall conform to the specification above for "Sand."

C. CIL 2

1. GAC/Sand mixture shall be free from ice and snow, roots, sod, rubbish, and other deleterious material.

a) It shall consist of 1-30% GAC by weight depending on the Cap Area where it is being placed as tabulated in Section 35 20 50 – Capping.

b) GAC shall be Calgon Filtrasorb 400, equivalent will not be accepted.

c) The Sand shall conform to the specification above for "Sand."

D. Bedding Material and Filter Material

1. Bedding Material and Filter Material shall be free of clay, loam, or other deleterious material. Bedding Material and Filter Material shall meet the following grain size distribution:

SIEVE SIZE	PERCENT FINER BY WEIGHT
3 inch	100
2.5 inch	90-100
2.0 inch	35-70
1.5 inch	0-15
0.75 inch	0-5

E. Armor Material

1. Armor Material shall be free of limestone, clay, loam, or other deleterious material. Armor Material shall conform to the MassDOT Specification M2.02.4 (Modified Rockfill).

F. Suitable Site Materials

1. Suitable Site Materials consists of soil generated during excavation and grading to achieve subgrade elevations specified on the Contract Drawings, and deemed acceptable for re-use as on-Site fill as determined by Engineer.

G. Unsuitable Site Materials

1. Unsuitable Site Materials consists of soil generated from on-Site sources that are classified by Engineer either as not meeting the requirements of Suitable Site Materials as specified herein, or are visually and olfactory impacted. Unsuitable Site Materials include organic soils such as peat and topsoil, subsoil, trash, frozen soil, ice or snow, stumps, debris, existing asphalt pavement, and material determined to be impacted by VOCs, coal tar and/or NAPL. Identification of Unsuitable Site Materials will be at the sole discretion of Engineer. Unsuitable Site Materials shall be managed, handled, temporarily stockpiled, loaded, transported and disposed of in

accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. General Material Requirements

B. Material Testing Requirements

C. Laboratory Testing Requirements

3.02 GENERAL MATERIAL REQUIREMENTS

A. Contractor shall provide the materials within this Specification free of chemical contamination and obtained from a source previously approved by Engineer, as described herein. Imported material shall be sampled and tested by Contractor and approved by Engineer prior to delivery to the Site. Any change in source during the Work requires approval of Owner or Engineer.

B. The final approval of a source for all material will be at the discretion of Engineer. Engineer will be responsible for the final approval of all materials recommended by Contractor and will provide approval or rejection of the suitability of all soil and aggregate materials.

3.03 MATERIAL TESTING REQUIREMENTS

A. Chemical Testing

MATERIAL	MASSDEP EPH; ADJUSTED CARBON RANGES	VOC (5035/ 8260B)	SVOC (8270C)	PP13 METALS (6010B/7470/ 7471)	PCBS (8082)	PESTICIDES (8081)
Sand	X	X	X	X	X	X
Organoclay						
GAC						
Bedding Material/ Filter Material	X	X	X	X	X	X
Armor Material						

B. Physical Testing

MATERIAL	GRAIN SIZE/ STONE SIZE ANALYSIS (D6913/C136)	MATERIAL CLASSIFICATION (D2487)	MOISTURE CONTENT (D2216)	WEIGHT PER UNIT VOLUME OF UNCOMPACTED MATERIALS (ASTM-C29)[1]
Sand	X	X		X
Organoclay				
GAC				
Bedding Material/ Filter Material	X	X	X	X
Armor Material	X	X		X

3.04 LABORATORY TESTING REQUIREMENTS

A. Employ and pay for services of an independent laboratory acceptable to Owner to perform specified testing and authorized to operate in the Commonwealth of Massachusetts.

B. The following laboratories are acceptable to Owner for analytical testing:

1. Alpha Analytical, contact: Elizabeth Porta, 508-844-4124

2. ESS Laboratory, contact: Sandra DeMedeiros, 401-461-7181 x3055

C. The following laboratories are acceptable to Owner for physical testing:

1. Thielsch Engineering, contact: Matthew Polsky, 401-467-6454

2. GeoTesting Express, contact: Shannon Piecuch, 978-893-1287

D. Retesting or reinspection required because of non-conformance to specified requirements shall be performed by same independent laboratory on instructions by Engineer. Payment for retesting or reinspection will be charged to Contractor by deducting testing charges from Contract Sum/Price.

E. Testing Agency/Laboratory Reports: After each test, promptly submit two copies of report to Engineer. When requested by Engineer, provide interpretation of test results. Include the following:

1. Date issued.

2. Project title and number.

3. Name of inspector.

[1] Or approved alternative

4. Date and time of sampling or inspection.

5. Identification of product and specifications section.

6. Location in Project.

7. Type of inspection or test.

8. Date of test.

9. Results of tests.

10. Conformance with Contract Documents

END OF SECTION

DIVISION 32—SITE IMPROVEMENT AND RESTORATION
Section 32 30 00 – Site Restoration

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

1.02 SCOPE

A. Contractor shall furnish all labor, equipment, supplies, and materials to perform operations in connection with final cleaning and restoration activities to be performed at the Site.

B. Restoration work is to be conducted at the Upland Staging Area, including the Sediment Processing Area (SPA), at any other areas impacted by construction of the project and as directed by Engineer.

C. Contractor is responsible for restoration activities as shown on the Contract Drawings or that have been disturbed by the Work.

1.03 RELATED SECTIONS

A. Section 01 74 00 – Cleaning and Waste Management

B. Section 02 61 00 – Removal and Disposal of Waste Materials

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. General

B. Protection of Restoration Work

C. Demobilization

3.02 GENERAL

A. Unless otherwise stated in this Specification, all restoration activities shall be performed to Pre-Construction conditions or as directed by Engineer.

B. Contractor shall clean the Site in accordance with Section 01 74 00 – Cleaning and Waste Management.

C. All trash and waste created or encountered during the Work shall be disposed of in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

D. Contractor shall remove all equipment and materials not otherwise allowed to leave in place as directed by Engineer at the end of construction. This includes, but is not limited to, the following:

1. Trailers, storage sheds, jersey barriers, temporary fencing, temporary signage, sanitary facilities, and temporary utilities.

2. Equipment used for dredging, dredged material handling, dewatering and water treatment, and equipment used for capping and cap material handling.

3. Excess cap materials such as amendments or aggregates.

3.03 PROTECTION OF RESTORATION WORK

A. In the event of damage to the Work specified herein or in other Specifications, Contractor shall immediately make all repairs and replacements necessary at a cost borne by Contractor alone.

3.04 DEMOBILIZATION.

A. Demobilization shall consist of removing all plants, equipment, materials, supplies, and other incidentals from the Site at the completion of the Work, including cleanup of all facilities and sites to Pre-Construction conditions. Engineer shall approve the completion of restoration activities prior to final mobilization by Contractor.

END OF SECTION

DIVISION 35—WATERWAYS AND MARINE CONSTRUCTION
Section 35 20 23 – Mechanical Dredging

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Submittals

D. Site and Subsurface Conditions

1.02 SCOPE

A. This section describes Contractor's (including Subcontractors and any other parties performing Work on the Site) minimum requirements for pre-dredging activities and mechanical dredging under the Contract. Pre-dredging activities include the following:

1. Removal of existing boom system
2. Pipe sealing at existing retaining wall
3. Visual debris survey and surficial debris removal
4. Evaluation of apparent coal tar coating and tar-impacted sediment in the Little River

B. Contractor shall provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for, or incidental to, pre-dredging activities and mechanical dredging as shown on the Contract Drawings.

C. Contractor shall conduct work operations within the Little River "in-the-dry," by means and methods selected by Contractor, and approved by Engineer, to mechanically dredge approximately 1,355 cubic yards (includes neat volume plus over dredge allowance) of sediment from the Little River and transport the dredged material to a Sediment Processing Area (SPA) for processing and treatment (refer to Section 35 20 30 – Dredged Material Management).

1.03 RELATED SECTIONS

A. Section 00 31 00 – Available Project Information

B. Section 01 14 00 – Work Restrictions and Sequence

C. Section 01 20 00 – Price and Payment Procedures

D. Section 01 33 00 – Submittal Procedures

E. Section 01 35 43 – Environmental Procedures

F. Section 01 41 26 – Permits

G. Section 01 57 13 – Temporary Environmental Controls

H. Section 02 21 00 – Surveys

I. Section 02 51 29 – Surface Cleaning and Decontamination

J. Section 02 61 00 – Removal and Disposal of Waste Materials

K. Section 35 20 30 – Dredged Material Management

1.04 SUBMITTALS

A. Pre-Construction

1. As part of the Contractor's Work Plan and within 21 days of Notice to Proceed, Contractor shall prepare and submit a Dredge Work Plan to Engineer in accordance with Section 01 33 00 – Submittal Procedures for review and approval. The Dredge Work Plan must be approved by Engineer prior to initiation of dredging operations and shall include, but not be limited to, the following:

a) Description of anticipated mechanical dredging equipment to be utilized, including manufacturer, number, type, and size of removal equipment and other support equipment used for dredging. If multiple pieces of equipment (excavators, containers, or other) are anticipated for dredging activities, the Dredge Work Plan shall include the specific area where each piece of equipment will be located and the volume of sediment that each piece of equipment is expected to remove from the Dredge Area. Daily dredge production rates and work sequence must be included in the Dredge Work Plan.

b) Description, dimensions, capacity, and drawings or photographs of the dredging bucket, or equivalent equipment, to be used for dredging. Include a description of the dredge bucket global positioning system (GPS) tracking and dredge cut visualization software to be utilized for removal.

c) Contractor's proposed approach for dredging and sequencing dredging to mitigate impacts to the existing stability of the vegetated slope on the western bank of the Little River, the retaining wall on the eastern side of the Little River, and the stability of the MBTA slope on the eastern bank of the river.

d) Contractor's proposed approach for deployment of equipment and personnel, including mobilization of equipment to the Site and daily deployment of personnel and equipment in accordance with Section 01 14 00 – Work Restrictions and Sequence.

e) Delineation of areas to be used by Contractor, including the areas for equipment and personnel access, dredged material transport, and dredged material processing at the SPA.

f) Detailed drawings and descriptions of the approach to completing the Work in accordance with Section 01 14 00 – Work Restrictions and Sequence.

g) Proposed plan for visual debris survey, removal, and handling of debris within the Dredge Area, including an approach for how debris that is encountered during dredging will be managed.

h) Proposed methods for avoiding or protecting utilities identified during utility locating procedures as specified in Section 01 14 00 – Work Restrictions and Sequence.

i) Proposed procedure for dredging within dredge tolerances as specified herein. Include methods to provide quality control during dredging with a description of location control equipment.

B. During Construction

1. Daily Activity Reports (DARs) shall be completed each working day by Contractor per Section 01 33 00 – Submittal Procedures. The DAR shall include, but not be limited to, the following information related to dredging activities:

a) Description of Work activities.

b) A description of the equipment used for dredging, locations of operation, hours of dredge time, total area dredged, volume dredged, actual daily production rate, and name of equipment operator.

c) Equipment performance, maintenance, and hours of downtime due to equipment breakdowns.

d) Cumulative area and volume dredged to.

e) Description and details of the daily quality control checks of all dredging equipment and GPS sensors.

f) Contractor shall provide daily surveys consistent with Section 02 21 00 – Surveys to show the progress of dredging.

g) Delays encountered and relevant details of the delay, such as the cause, resolution, and measures implemented to avoid similar delays in the future.

2. Progress and Final Surveys

a) Provide progress surveys to document dredge progress per Section 02 21 00 – Surveys

b) Provide final post-dredge verification survey for Engineer approval per Section 02 21 00 – Surveys before placing cap materials into the river.

1.05 SITE AND SUBSURFACE CONDITIONS

A. Available data from previously conducted Site investigations are described in Section 00 31 00 – Available Project Information.

B. Contractor shall field verify the locations of utilities within the Limits of Work, including, but not limited to, those shown on the Contract Drawings per Section 02 21 00 – Surveys. Contractor shall coordinate a utility locate service and coordinate utility identification and location with Engineer in accordance with Section 01 14 00 – Work Restrictions and Sequence.

C. Contractor shall field verify the lateral and vertical extent of any existing retaining walls located within or adjacent to the Dredge Area, including the retaining wall along the eastern bank of the Little River at the 284 Winter Street Property and provide conditions surveys in accordance with Section 02 21 00 – Surveys

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Hydraulic Cement Mortar

2.02 HYDRAULIC CEMENT MORTAR

A. Hydraulic cement mortar for use in sealing pipes along the existing retaining wall shall be SpecChem Spec Plug fast-setting hydraulic-cement mortar, or equivalent approved by Engineer.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. General Execution of the Work

B. Environmental Protection Requirements

C. Temporary Boom System Removal

D. Pipe Sealing

E. Debris Survey and Removal

F. Hardened Tar Deposit Removal

G. Dredging

H. Dredging Verification

I. Misplaced Material

J. Final Examination and Acceptance

3.02 GENERAL EXECUTION OF THE WORK

A. Contractor shall conduct all operations described herein in accordance with all applicable local, state, and federal permits per Section 01 41 26 – Permits.

B. Significant changes to operating procedures or equipment, such as proposed dredge production rates or changes to the duration of Work, must be reviewed and approved by Engineer.

C. Contractor shall identify and maintain necessary access to the Dredge Area for personnel and equipment necessary to complete the Work. Access location(s) shall be identified as part of Contractor's Bid, and Contractor shall secure permits, lease agreements, and approvals to access those location(s). Documentation shall be provided to Engineer and Owner for review.

D. Contractor shall protect existing retaining walls and structures from being undermined or destabilized during dredging operations. Contractor shall not perform any dredging within the offset areas indicated on the Contract Drawings.

E. Contractor shall provide lights for equipment during periods of restricted visibility.

F. Contractor shall inspect, certify, license, and number all equipment according to applicable regulations of applicable jurisdictional entities before placing them in service.

G. Contractor shall equip gasoline engines with backfire flame arrestor. The arrestor must be attached to the air intake with a flame-tight connection, or per manufacturer specifications. It must be kept clean and in serviceable condition.

H. Contractor shall store fuel in approved containers in approved areas in accordance with the project permits.

I. Contractor shall equip all equipment with adequate safety equipment to meet any hazards that may be encountered during normal operations.

J. A qualified person must inspect equipment before it is entered into service to make sure it is in safe operating condition. The qualified person must have a recognized degree, certificate, or license or professional standing, as well as extensive knowledge, training, and experience in solving problems related to the equipment planned for performing the Work. Inspections must be documented and submitted to Engineer and Owner.

K. A qualified person must directly supervise any mobilization, demobilization, or relocation of dredging equipment and other support equipment.

3.03 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. For all dredging work conducted in the dry, Contractor shall provide, maintain, and deploy sorbent booms and pads in accordance with Section 01 57 13 – Temporary Environmental Controls, and spill control and containment kits and other oil sorbent materials as required in Section 01 35 43 – Environmental Procedures.

B. Contractor shall clean any and all equipment that has become exposed to impacted material prior to using this equipment to conduct any other construction activities, in accordance with Section 02 51 29 – Surface Cleaning and Decontamination. Cleaning shall be conducted in a manner that has been pre-approved by Engineer, and all decontamination water shall be collected.

3.04 TEMPORARY BOOM SYSTEM REMOVAL

A. Contractor shall, prior to dredging, remove the existing boom system, handle the system in the SPA, and transport the system pieces off-site for disposal in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials. Contract Drawings of the existing boom system configuration are provided in available Site information in Appendix 2.

3.05 PIPE SEALING

A. A series of pipes daylight through the existing retaining wall at the 284 Winter Street property. The location and approximate diameter of the pipes are provided in available Site information in Appendix 2. Contractor shall, prior to dredging, field verify the location of pipes and fill pipes with hydraulic cement mortar or equivalent approved by Engineer. Contractor shall fill pipes with mortar per manufacturer's direction.

3.06 DEBRIS SURVEY AND REMOVAL

A. Debris refers to any solid materials identified within the Dredge Area. Solid materials may include, but are not limited to timber, granite blocks, concrete, brick, plastics, tires, wire/cable/chain, wood debris, and other miscellaneous materials as designated by Engineer and as defined by the selected disposal facility for dredged material. Existing stone walls and fallen walls along the western bank of the Little River, as shown on the Contract Drawings, will also require removal as debris.

B. Contractor shall perform a visual debris survey of the in-river Work areas to identify potential surficial obstructions and debris that would impact the performance of dredging to the required grades shown on the Contract Drawings. The Debris Survey shall cover the full extent of the planned dredging and capping areas and adequately evaluate the extent, size, and type of debris present and determine appropriate removal methods.

C. Contractor shall submit a written statement to Engineer verifying the visual debris survey results for acceptance by Engineer before Contractor proceeds with debris removal.

D. Contractor is responsible for evaluating the potential nature and extent of debris and condition of riverbanks and structural condition of infrastructure within and adjacent to the dredging Limits of Work, including the retaining wall located on the eastern side of the Little River. Contractor shall satisfy themselves regarding conditions of riverbanks and infrastructure and the nature and extent of materials present at the Site prior to beginning Work. Contractor shall immediately bring to the attention of Engineer any perceived issues regarding debris removal adjacent to banks or structures and provide a plan for addressing debris for Engineer review and approval.

E. Incidental debris may be encountered during dredging activities. Some of this debris material may not be suitable for disposal at the disposal facility selected for the dredged sediment. Disposal facilities may have specific size constraints regarding debris that differ from the definition of debris within this Specification. Contractor shall coordinate with the disposal facility(ies) to determine whether debris (and what size of debris) needs to be screened out of the dredged sediment

prior to transport and disposal. Contractor shall provide all necessary debris removal, screening, and transport and disposal.

F. Contractor shall note that Owner-approved disposal facilities may have additional material size and composition requirements. Contractor shall coordinate directly with the Contractor-selected and Owner-approved disposal facility regarding debris size and materials that may not be acceptable to the facility.

G. Contractor shall remove large debris or obstructions that may interfere with dredging operations prior to dredging in that area as necessary to complete the Work unless otherwise approved by Engineer. Contractor methods for removing obstructions, once identified, shall be approved by Engineer prior to commencing obstruction removal. No removal of large debris or obstructions shall occur outside the Limits of Work.

H. If the dredging equipment on the Site is not adequate to remove debris discovered during dredging, Contractor shall notify Engineer, and shall continue dredging activities in other areas. If an obstruction is encountered, Contractor shall promptly notify Engineer and a determination shall be made as to its disposition. Contractor shall remove all debris that will interfere with dredging operations, including full penetration or closing of the dredge bucket, and dispose of it properly.

3.07 EVALUATION OF APPARENT COAL TAR COATING AND TAR-IMPACTED SEDIMENT

A. Contractor shall, prior to dredging, field verify the location of apparent coal tar coating on the retaining wall and tar-impacted sediment within the Little River as shown on the Contract Drawings.

B. Engineer will review Contractor findings and evaluate each instance of apparent coal tar coating and tar-impacted sediment identified by Contractor. Engineer will determine the action and extent required for addressing each occurrence, which may include removal of staining off wall or dredging tar-impacted sediment.

C. Contractor shall manage apparent coal tar coating and tar-impacted sediment as directed by Engineer and in accordance with Section 35 20 30 – Dredged Material Management and transport off Site for disposal in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

3.08 DREDGING

A. Once surficial debris is removed from the Dredge Area, Contractor shall conduct a Pre-Dredge Topographic Survey per Section 02 21 00 – Surveys for Engineer review and approval. Engineer will compare the Pre-Dredge Topographic Survey with the existing conditions survey of the Dredge Area as shown in the Contract Drawings. The dredge design provided for this Project is based on meeting

prescribed dredge depths below the existing mudline (as opposed to dredging to a desired elevation across the area). Engineer will apply the dredge design to the Pre-Dredge Topographic Survey provided by Contractor, which will become the new Project dredge file for implementation. Because the design is a depth-based approach, the revised volume is anticipated to vary minimally, if any, from the design provided in the Contract Drawings.

B. Contractor shall perform dredging under dry conditions in the Little River, using mechanical dredging equipment and associated means and methods to meet the required dredge plan provided by Engineer (see Paragraph 3.08A). Actual equipment, means, and methods shall be determined by Contractor and approved by Engineer.

C. Contractor shall be responsible for constructing stable internal and external side slopes and, at a maximum, meet all internal and external side slope grades provided in the dredge plan (see Paragraph 3.08A). Contractor shall immediately notify Engineer of any dredge cuts that do not appear feasible.

D. The Payable Overdredge Allowance within the required limits of dredging is 6 inches (0.5 feet) unless otherwise shown on the Contract Drawings. Contractor shall minimize overdredge to the extent possible. No payment shall be made for the removal, management, or disposal of material beyond the lateral limits of dredging or beyond the vertical Payable Overdredge Allowance, unless directed by Engineer.

E. Engineer may direct Contractor to perform excess dredging beyond the Dredge Area limits as shown on the Contract Drawings or deeper than the provided dredge design plus Payable Overdredge Allowance (see Paragraph 3.08D) to remove additional visible oil and tar impacted material observed in the field. Measurement of excess dredging directed by Engineer shall be in accordance with Section 01 20 00 – Price and Payment Procedures.

F. If conditions within the river (e.g. sediment conditions, large rocks, or other debris) prevent Contractor from achieving the required grades and elevations shown on the Contract Drawings, Contractor shall notify Engineer. Contractor shall determine the extent of the area by visual observation. After the area is delineated by Contractor, Contractor shall provide a summary figure for review by Engineer to determine if dredging should continue to the design elevations at this location.

G. Contractor shall perform the dredging Work in a manner to maintain the stability of existing structures and slopes adjacent to the limits of the Work, insofar as structures or slopes may be jeopardized by dredging or associated Contractor operations. Contractor shall repair damage resulting from dredging operations or other Contractor construction activities in support of the Work to the original

condition prior to damage and repair to a condition approved by Engineer. Owner shall bear no costs associated with damage to such structures.

H. Contractor shall place mechanically dredged material from the Dredge Area into watertight intermodal containers and convey them via crane to the SPA for additional management per Section 35 20 30 – Dredged Material Management and eventual transport off Site for disposal per Section 02 61 00 – Removal and Disposal of Waste Materials. Contractor shall not stockpile dredged material within the Little River or outside of transport containers and approved stockpile areas.

I. Contractor shall repair any damages caused by non-compliance with the Work permitted in the Contract Drawings, Specifications, or permits at no additional cost to Owner.

3.09 DREDGING VERIFICATION

A. Contractor shall confirm through topographic surveys per Section 02 21 00 – Surveys that dredging has achieved the lateral and vertical extents shown on the Contract Drawings. Contractor shall dredge 100% of the Dredge Area to a depth at or below the required dredge elevation and at or above the Payable Overdredge Allowance, to the extent feasible as determined by Engineer.

B. If high spots remain above the required dredge elevations, Contractor shall remove such high spots at no additional cost to Owner and confirm final required dredge elevations have been achieved using subsequent survey activities.

C. Post-Dredge Survey elevations shall be surveyed and compared to Pre-Dredge Survey data as outlined in Section 02 21 00 – Surveys. While Contractor may choose to conduct its own measurements for the purposes of estimating quantities of sediments removed daily and verifying dredge cut lines, Contractor shall conduct all surveying for decisions regarding completion of dredging and payment per Section 02 21 00 – Surveys.

3.10 MISPLACED MATERIAL

A. Should Contractor, during the execution of the Work, lose, dump, or misplace any waste material, dredge, debris, machinery, equipment, or appliance, Contractor shall promptly recover and remove same to the satisfaction of Engineer at no additional cost to Owner. Contractor shall be solely responsible for any misplaced material.

3.11 FINAL EXAMINATION AND ACCEPTANCE

A. Upon examination and acceptance by Owner and Engineer, the dredging Work will be accepted as complete. Final payment shall be subject to deductions or

correction from Work that is non-compliant or otherwise completed in an unauthorized manner.

END OF SECTION

DIVISION 35—WATERWAYS AND MARINE CONSTRUCTION
Section 35 20 30 – Dredged Material Management

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Submittals

D. References

1.02 SCOPE

A. This Specification describes Contractor's (including Subcontractors, vendors, fabricators, and any other parties performing Work on the Site) minimum requirements for dredged material management under the Contract.

B. Contractor shall provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for, or incidental to the management of dredged material and debris as described herein.

C. Contractor shall, by means and methods selected by Contractor, and approved by Engineer, convey, dewater, process, treat (as required by permits and disposal facility requirements), approximately 1,355 cubic yards (in situ volume, including over dredge allowance) of dredged material from the Little River. The final off-Site transportation and disposal of the dredged material is covered under Section 02 61 00 – Removal and Disposal of Waste Materials. Specific equipment, processes, and services necessary to complete this Work shall be selected by Contractor and approved by Engineer.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions and Sequence

B. Section 01 33 00 – Submittal Procedures

C. Section 01 41 26 – Permits

D. Section 01 57 13 – Temporary Environmental Controls

E. Section 02 51 29 – Surface Cleaning and Decontamination

F. Section 02 61 00 – Removal and Disposal of Waste Materials

1.04 SUBMITTALS

A. Pre-Construction

1. As part of Contractor's Work Plan and within 21 days of Notice to Proceed, Contractor shall prepare and submit a Dredged Material Management and Processing Plan to Engineer in accordance with Section 01 33 00 – Submittal Procedures for review and approval. The Dredged Material Management and Processing Plan must be approved by Engineer prior to initiation of any dredging operations and shall include, but not be limited to, the following:

   a) The means and methods selected by Contractor to safely move loaded water-tight containers from the Little River Work Area to the Sediment Processing Area (SPA) and from the SPA to the trucks for off-Site transport and disposal. Contractor shall be required to specify the following with the submission of the Dredged Material Management and Processing Plan:

      1) A detailed flow chart describing the dredged material conveyance from Little River into the SPA, material management, dewatering, handling, and off-Site transport to final disposal destination. Contractor shall include equipment, containers, and personnel required to execute the flow chart.

      2) The make and model of the equipment to be used.

      3) Exact location of crane to be used to lift containers from the Little River into the SPA. Contractor shall provide a crane location and lift plan stamped by a Professional Engineer licensed in the Commonwealth of Massachusetts indicating that the surface where the equipment will be positioned, and crane operational parameters are suitable for such use.

      4) The maximum design load calculations based on the location/elevation of the equipment with respect to the Little River Work Area and the SPA

      5) The maximum reach radius of the equipment with respect to the Little River Work Area and the SPA.

   b) Contractor acknowledgement of the following requirements:

      1) Contractor shall maintain a 25-foot setback from the top of the retaining wall for the crane, truck loading and unloading areas, and for any other vibratory-producing activities as shown on the Contract Drawings.

2) Crane mats are required if a crane is being placed in the Upland Staging Area/SPA.

3) In the event Contractor places a crane in the upland, Contractor shall be required to sign a waiver of liability stating that they have investigated the Site (using ground penetrating radar [GPR] or the like) and are satisfied that no sink holes or deleterious ground conditions exist prior to setting up the crane.

c) A detailed flow chart describing the means and methods, including all equipment and personnel, for dredged material conveyance, management, handling, processing, treatment (as required by the permits), truck loading, and off-Site transport of dredged material.

d) Details related to Contractor's proposed dewatering means and methods. If required by disposal facilities, Contractor may elect to include the use of Calciment and/or Portland cement to stabilize and dewater dredged material at the SPA. If used, Contractor shall indicate the percent by weight of such materials to be added to satisfy disposal facility requirements, describe the mixing procedures to be used, and describe the measures for controlling/mitigating dust generation. Contractor must also include all calculations and assumptions associated with the selection of the stabilization agent(s), quantity of stabilization agent(s) to be used by weight, and mixing procedures.

e) Results of any supplemental dewatering testing/studies to support Contractor's proposed dewatering activities.

f) Describe the means and methods to securely cover dredged material stockpile(s) with sheeting material (e.g., polyethylene) to the satisfaction of Engineer, if stockpiling outside of roll-off containers is required within the SPA.

1.05 REFERENCES

A. Applicable references for the Work specified herein includes, but is not limited to, the following:

1. Applicable ASTM International (ASTM) Specifications and Methods

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. General Materials

2.02 GENERAL MATERIALS

A. Contractor shall determine, through testing conducted prior to the initiation of dredging activities, materials, doses, quantities, means and methods of mixing and application for the dewatering and stabilization of dredged material at the SPA to meet requirements set forth in the permits and disposal facility. Contractor shall elect to use one of the following:

1. Calciment

a) A combination of quick lime and cement as described at http://www.mintekresources.com/sediment-removal-page.php.

2. Portland cement

a) Portland cement shall meet the requirements of Type II Portland Cement per ASTM C 150 or Engineer-approved equivalent.

B. Materials selected for use by Contractor to stabilize and/or dewater dredged material shall be approved by Engineer. Contractor shall provide all relevant manufacturer's information to Engineer for review and approval. Contractor may elect to use a product other than that listed above and shall provide all relevant manufacturer's information to Engineer for review and approval.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. General Execution of the Work

B. Environmental Protection Requirements

C. Dredged Material Management

D. Final Transport and Disposal of Dredged Material

E. Water Management

3.02 GENERAL EXECUTION OF THE WORK

A. Contractor shall conduct all operations described herein in accordance with all applicable local, state, and federal permits per Section 01 41 26 – Permits.

B. Contractor shall complete all Work described herein per Section 01 14 00 – Work Restrictions and Sequence. Significant changes to operating procedures or equipment, such as proposed dredged material processing production rates or changes to the duration of Work, must be reviewed and approved by Engineer.

C. Contractor shall field-locate existing above ground and sub-surface utilities prior to construction of the SPA and shall protect all utilities during implementation of the Work. Contractor shall not perform any sediment processing, placement of roll-off containers, or stockpiling of materials within offset areas or exclusion areas indicated on the Contract Drawings.

D. Contractor shall provide lights for equipment and work areas during periods of restricted visibility.

3.03 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Contractor shall install , erosion, and sedimentation controls, as specified in Section 01 57 13 – Temporary Environmental Controls.

B. Contractor shall clean any and all equipment that has become exposed to dredged material in accordance with Section 02 51 29 – Surface Cleaning and Decontamination. Cleaning shall be conducted in a manner that has been pre-approved by Engineer and all decontamination water shall be collected.

3.04 DREDGED MATERIAL MANAGEMENT

A. Contractor shall provide all labor, equipment, and materials to handle, load, and convey dredged materials and debris from the Little River to the SPA for processing.

B. Contractor shall convey dredged material from the Little River to the SPA in water-tight roll-off containers and lift the containers via crane into the SPA for further management. Contractor shall submit pricing for this sequence of dredged material management as a base bid. Contractor may provide an alternate Bid for conveying dredged material via other methods that prevent the spillage of dredged material or water during conveyance. The alternate approach must be in compliance with the Contract Drawings, Specifications, and Permits. Additional environmental controls and permitting may be required with alternate approach.

C. Contractor shall follow best management practices related to filling and transporting the dredged material, including the following:

1. Filling the containers with dredged material to a safe transport level and with adequate freeboard of a minimum of 1 foot.

2. Covering containers when not actively being loaded and during conveyance.

3. Targeting periods of good weather (i.e., low wind and light to no rain) to transport the containers from the Little River to the SPA.

4. Inspecting containers daily for integrity and immediately repairing damaged containers. Additionally daily inspections of the area where containers are stored within the SPA.

D. Contractor shall dewater the dredged materials, if required to meet transport and disposal requirements, using means and methods selected by Contractor and approved by Engineer. If Contractor elects to use stabilization/solidification additives to meet transport and disposal requirements (refer to Part 2), all amendments must be approved by Engineer.

E. Contractor may stockpile dewatered/stabilized dredged material prior to final transport and disposal, if required, within the designated SPA. Stockpiled material shall be securely covered with impermeable material (e.g., polyethylene) to the satisfaction of Engineer at the end of each workday, and as warranted during precipitation events. Such covering activities shall be conducted as requested at no additional cost to Owner.

F. No wet dredged material shall be stockpiled by Contractor outside of water-tight containers.

3.05 FINAL TRANSPORT AND DISPOSAL OF DREDGED MATERIAL

A. Stockpiled dewatered dredged material shall be loaded onto trucks for final off-site transport and disposal in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

B. The decontamination of miscellaneous debris, if directed by Engineer due to contact with impacted material, removed prior to or during dredging activities and the subsequent segregation by material type, stockpiling, and off-Site transport of debris out of the SPA for disposal at Owner-approved disposal facility per Section 02 61 00 – Removal and Disposal of Waste Materials.

3.06 WATER MANAGEMENT

A. Contractor shall manage construction water from the dredged material dewatering process, stormwater runoff collected from the SPA, and water from other water-generating activities conducted on the SPA by collecting this water into fractionation tanks for treatment and disposal offsite in accordance with Section 02 61 00 – Removal and Disposal of Waste Materials.

END OF SECTION

DIVISION 35—WATERWAYS AND MARINE CONSTRUCTION
Section 35 20 50 – Capping

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Related Sections

C. Submittals

1.02 SCOPE

A. This Specification describes Contractor's (including Subcontractors and any other parties performing Work on the Site) minimum requirements for construction of an engineered cap (cap) in the Little River under the Contract.

B. Contractor shall provide all supervision, labor, tools, materials, equipment, services, and appurtenances necessary for, or incidental to capping as shown on the Contract Drawings.

C. Contractor shall, by means and methods selected by Contractor, and approved by Engineer, construct a Multi-Layered Granular Cap over the designated cap areas totaling approximately 20,200 square feet and in the configurations shown on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 01 14 00 – Work Restrictions and Sequence

B. Section 01 33 00 – Submittal Procedures

C. Section 01 35 43 – Environmental Procedures

D. Section 01 57 13 – Temporary Environmental Controls

E. Section 02 21 00 – Surveys

F. Section 02 51 29 – Surface Cleaning and Decontamination

G. Section 31 05 13 – Aggregates

H. Section 35 20 23 – Mechanical Dredging

1.04 SUBMITTALS

A. Pre-Construction

1. As part of Contractor's Work Plan and within 21 days of Notice to Proceed, Contractor shall prepare and submit a Capping Plan to Engineer in accordance with Section 01 33 00 – Submittal Procedures for review and approval. The Capping Plan must be approved by Engineer prior to initiation of any capping operations, including the importing of cap materials to the Site, and shall include, but not be limited to, the following:

   a) Description of anticipated equipment to be utilized, including manufacturer, number, type, and size of containers or other equipment used to convey capping material to the Little River from the upland stockpile/laydown areas.

   b) Identification of planned source(s) of all capping materials and written confirmation that the materials meet the required criteria per Part 2 of this Specification and Section 31 05 13 – Aggregates. Contractor shall provide a 5-gallon bucket sample of each aggregate material and a representative sample of any proposed geosynthetic materials to Engineer before bringing or importing the material to the Site.

   c) Contractor shall coordinate with and assist Engineer in collecting samples for independent testing of any materials upon Engineer's request.

   d) Details for cap aggregate material transport and stockpiling, which shall include, at a minimum, identification of on-Site material stockpiling areas, if required, the types of equipment and procedures to be used to transport material to the stockpiles and then from the stockpiles to the location of placement, and the equipment to be utilized during final material placement.

   e) Procedures, means, and methods for preparing chemical isolation layer (CIL) materials (comprising Sand and Granular Activated Carbon [GAC] mixture and Sand and Organoclay mixtures), and a description of how Contractor will ensure the final mixed ratio and homogeneity of the CIL material.

   f) At a minimum, Contractor shall provide Engineer the volume and weight of Sand and Organoclay or GAC being mixed. Contractor shall provide the documentation and allow for Engineer to visually inspect and perform independent testing on the CIL material, upon Engineer's request in accordance with this Specification.

   g) Procedures, means, and methods for placement of Multi-Layered Granular Cap materials, including means of marking the limits of

placement, sequencing of work, and coordination with Section 35 20 23 – Mechanical Dredging.

h) A description of procedures to be used by Contractor to verify specified lateral extents of cap placement, layer thickness, and final cap thickness per Section 02 21 00 – Surveys.

i) Details of how Contractor will monitor cap material placement performance for the duration of the Work, including methods of survey control and material volume and/or weight monitoring and the use of electronic bucket positioning and software specifications including, but not limited to, manufacturer, make, and model. The Capping Plan shall also specify how Contractor will document that capping requirements presented herein have been met.

B. During Construction

1. Daily Activity Reports (DARs) shall be completed each working day by Contractor per Section 01 33 00 – Submittal Procedures. The DAR will include, but not be limited to, the following information related to capping activities:

a) Description of Work activities.

b) A description of the equipment used for capping, including equipment used for conveyance of cap material from the upland to the Little River, locations of operation, hours of capping time, total area capped, volume of capping material placed, actual daily production rate, and name of equipment operator.

c) Contractor shall submit copies of the tared weight slips of cap material transport trucks to Engineer the same day of on-Site delivery.

d) Equipment maintenance and hours of downtime due to equipment malfunction or breakdowns and Work restrictions as specified in Section 01 14 00 – Work Restrictions and Sequence in accordance with Section 01 33 00 – Submittal Procedures.

e) Contractor shall submit a daily export of XYZ files in an AutoCAD Civil 3D (2018) format or compatible Digital Elevation Model of capped and surveyed areas to show capping progress for the day.

PART 2 – PRODUCTS

2.01 SECTION INCLUDES

A. Aggregate Cap Material

B. Geosynthetic and Geotextile Cap Materials

2.02 AGGREGATE CAP MATERIAL

A. Bedding Material shall be as specified in Section 31 05 13 – Aggregates.

B. CIL Materials

1. CIL 1 material shall consist of a Sand and Organoclay mix with 4% Organoclay by dry weight as shown in Table 1. The Sand and Organoclay product shall be as specified in Section 31 05 13 – Aggregates and will require manual mixing to meet the composition requirements of CIL 1.

2. CIL 2 material shall consist of a Sand and GAC mix ranging from 1% to 30% GAC by dry weight depending on the capping area and as summarized in Table 1. The Sand and GAC products shall be as specified in Section 31 05 13 – Aggregates and will require manual mixing to meet the composition requirements of CIL 2.

C. Filter Material shall be as specified in Section 31 05 13 – Aggregates.

D. Armor Material shall be as specified in Section 31 05 13 – Aggregates.

2.03 GEOSYNTHETIC AND GEOTEXTILE CAP MATERIALS

A. CETCO Reactive Core Mats (RCM)

1. CETCO RCM shall be CETCO RCM with PM-199 Organoclay as an active material or Engineer-approved equivalent.

PART 3 – EXECUTION

3.01 SECTION INCLUDES

A. Cap Areas and Components

B. General Execution of the Work

C. Environmental Protection Requirements

D. Engineered Cap Placement

E. Capping Verification

F. Misplaced Material

G. Final Examination and Acceptance

3.02 CAP AREAS AND COMPONENTS

A. Contractor shall install cap components within the three caping areas delineated on the Contract Drawings: Upstream Area, Midstream Area, and Downstream Area.

B. Contractor shall install the Multi-Layered Granular Cap (riverward of the Wedge) on the post-dredge sediment surface as shown on the Contract Drawings with the layers and components specified per Area in Table 1. Prior to installing the Multi-Layered Granular Cap, Bedding Material will be placed (as needed) to generate a maximum 3H:1V surface on which to construct the cap.

C. Contractor shall install the Wedge portion of the cap (adjacent to the existing wall) on the existing sediment surface as shown on the Contract Drawings including the two Chemical Isolation Layers per Cap Area as shown in Table 1 and the RCM, Filter Layer and Armor Layer placement as shown on the Wedge detail as shown on the Contract Drawings. CIL 1 will be used to create a 2H:1V surface at the toe of the retaining wall on which to place the RCM.

Table 1: Cap Components and Required Placement Thickness by Cap Area

Cap Area	Layer/Material[1]	CIL Composition	Minimum Required Placement Thickness	Overplacement Allowance
Upstream	CIL 1: Sand/Organoclay(OC) Mix	4% OC by wt	6 inches	3 inches
	CIL 2: Sand/GAC Mix	1% GAC by wt	6 inches	3 inches
	Filter Material		6 inches	3 inches
	Armor Material		12 inches	6 inches
Midstream	CIL 1: Sand/OC Mix	4% OC by wt	6 inches	3 inches
	CIL 2: Sand/GAC Mix	30% GAC by wt	12 inches	3 inches
	Filter Material		6 inches	3 inches
	Armor Material		12 inches	6 inches
Downstream	CIL 1: Sand/OC Mix	4% OC by wt	6 inches	3 inches
	CIL 2: Sand/GAC Mix	5% GAC by wt	6 inches	3 inches
	Filter Material		6 inches	3 inches
	Armor Material		12 inches	6 inches

Note:

1. Layers are listed from the sediment surface upwards. The Multi-Layered Granular Cap and the Wedge Cap require two CIL layers as listed above for the Area. In addition to Filter Layer and Armor Layer, the Wedge Cap includes RCM. See Contract Drawings for general cross section details.

3.03 GENERAL EXECUTION OF THE WORK

A. Contractor shall install the engineered cap under dry conditions in the Little River using the means and methods determined by Contractor and approved by Engineer.

B. Contractor shall complete all work described herein per Section 01 14 00 – Work Restrictions and Sequence. Significant changes to operating procedures or equipment, such as proposed capping production rates or changes to the duration of Work, must be reviewed and approved by Engineer.

C. Contractor shall identify and maintain necessary access to the Capping Area for personnel and equipment necessary to complete the Work. Access location(s) that vary from those used for dredging or other Work activities shall be identified as part of the Contractor's Bid, and Contractor shall secure permits, lease agreements, and approvals to access those location(s). Documentation shall be provided to Engineer and Owner for review.

D. Contractor shall install erosion and sedimentation controls, as specified in Section 01 57 13 – Temporary Environmental Controls.

E. Contractor shall not proceed with Capping Work until Engineer has approved Post-Dredge Survey per Section 02 21 00 – Surveys and has provided Contractor with documented notification that Capping Work may commence.

F. Contractor shall provide for secure transportation of cap materials to the Site, the storage of cap materials at the Site, and such materials shall be securely covered to the satisfaction of Owner or Engineer. Contractor shall provide temporary on-Site stockpiling and storage incorporating erosion control measures per Section 01 57 13 – Temporary Environmental Controls. Cap materials shall be segregated from any contaminated material (e.g., dewatered dredged material) in accordance with Section 01 35 43 – Environmental Procedures. Temporary stockpiling of the cap materials shall not be located in any dredged material processing areas. Contractor shall designate a clean storage area for the stockpiling of cap materials.

G. Contractor shall implement measures to prevent soils, aggregate, and geosynthetic materials from being misplaced in the upland or in the river during material delivery, storage, and loading and unloading. Contractor shall use spill plates and other approved equipment or controls to prevent the loss of materials when loading and offloading. All loss of materials shall be replaced, and areas affected by the lost material shall be restored at no additional cost to Owner.

H. Contractor shall protect all GAC and Organoclay materials, associated Sand, and GAC or Organoclay/Sand mixtures from weather and keep amendment materials dry at all times until final placement of the sand mixtures in the CIL. GAC and

Organoclay (and any other amendment materials) shall be suitably packaged during transportation and storage at the Site to isolate the material from the environment so as to maintain dryness and preserve its efficacy for the duration of storage. Contractor shall coordinate with Engineer to allow Engineer to conduct a visual inspection of GAC or Organoclay during unloading to identify if any packaging has been damaged. Material in damaged packaging shall be marked and further inspected for product integrity.

I. Contractor shall mix amendment (i.e., GAC or Organoclay)/Sand mixtures in equipment selected by Contractor, which may include a pug mill or concrete mixer truck. Mixing of amendments and sand using conventional earthmoving equipment shall not be allowed. Contractor shall present methods for creating amendment/Sand mixtures in the pre-construction Capping Plan submittal. Contractor shall coordinate with Engineer to allow quality assurance testing of the amendment/Sand mixtures. Engineer may elect to take samples of the mixture and submit samples for laboratory testing of mixture homogeneity. Contractor shall not place amendment/Sand mixtures material until authorized to do so by Engineer.

J. Contractor shall establish an accurate method of horizontal and vertical control before construction of the cap commences, and at a minimum, placement equipment shall be equipped with global positioning systems (GPS). The proposed method and maintenance of the horizontal control system is subject to approval of Engineer, and if, at any time, the method fails to provide accurate location for the capping operations, Engineer may suspend operations at no additional cost to Owner. Payment will not be made for any cap material that is placed outside of the designated lateral cap extents or in excess of the Overplacement Allowance, unless otherwise directed by Engineer. Contractor may be directed to remove misplaced material at no additional cost to Owner.

K. Contractor shall place RCM with a minimum 1-foot overlap between adjacent RCM panels.

L. If surplus, unacceptable, or hazardous materials are identified during cap installation, Contractor shall notify Engineer immediately.

M. Contractor shall review geotechnical properties of the existing sediment and implement measures, as needed, to avoid potential mixing of underlying sediment with cap materials and to limit cap placement-induced settlement/displacement of underlying or adjacent materials.

3.04 ENVIRONMENTAL PROTECTION REQUIREMENTS

A. For all capping Work, Contractor shall provide, maintain, and deploy sheen management in accordance with Section 01 57 13 – Temporary Environmental

Controls, and spill control and containment kits and other oil sorbent materials as required in Section 01 35 43 – Environmental Procedures.

B. Contractor shall clean any and all equipment that has become exposed to impacted material during dredging operations and is planned for use in capping operations per Section 02 51 29 – Surface Cleaning and Decontamination. Contractor shall conduct cleaning in a manner that has been pre-approved by Engineer, and all decontamination water shall be collected.

3.05 ENGINEERED CAP PLACEMENT

A. Contractor shall supply capping materials in accordance with Section 31 05 13 – Aggregates.

B. Contractor shall convey clean capping materials in roll-off boxes, or other appropriate containers, via crane from the upland staging area to the river and place capping materials with conventional mechanical bucket or other method proposed by Contractor in the Capping Plan and approved by Engineer.

C. Contractor shall place cap materials in accordance with the configurations and the thicknesses presented in Table 1 and shown on the Contract Drawings. Contractor may place additional material only if within Overplacement Allowances listed within this Specification.

3.06 CAPPING VERIFICATION

A. Contractor shall not commence cap placement activities until a Post-Dredge Survey is reviewed and approved by Engineer.

B. Contractor shall verify placement of each cap layer at required minimum thickness provided in Table 1 and in the configuration shown on the cross-sections provided on the Contract Drawings.

C. Contractor shall conduct Interim Cap Layer Placement Surveys per Section 02 21 00 – Surveys to provide progress updates for construction each layer.

D. Contractor shall verify the lateral and vertical extent of each cap layer placement by conducting a Post-Cap Layer Placement Survey (per Section 02 21 00 – Surveys) for Engineer approval of the Work. Contractor shall meet placement thickness requirements over 100% of the cap area. If the Post-Cap Layer Placement Survey shows deviations in the cap from the Contract Drawings and Specifications, Contractor shall conduct additional work, including but not limited to additional material placement, or excess material removal, to conform to the Contract Drawings and Specifications. Contractor shall conduct a secondary (and additional if required) Post-Cap Layer Placement Survey to verify the adequacy of the additional Work at no additional cost to Owner.

E. Contractor shall coordinate with Engineer to facilitate cap placement quality assurance testing. Engineer may require cap cores to verify placement thickness of the CIL and may use pans to verify placement thickness of Filter and Armor Material. At a minimum, Contractor shall assist Engineer in core collection for verification of adequate cap placement.

3.07 MISPLACED MATERIAL

A. Should Contractor, during the execution of the Work, lose, dump, or misplace any cap material, machinery, equipment, or appliance, Contractor shall promptly recover and remove same to the satisfaction of Engineer at no additional cost to Owner. Contractor shall be solely responsible for any misplaced cap material.

3.08 FINAL EXAMINATION AND ACCEPTANCE

A. Upon examination and acceptance by Owner and Engineer, the capping Work will be accepted as complete. Final payment shall be subject to deductions or correction from Work that is non-compliant or otherwise completed in an unauthorized manner.

END OF SECTION

Appendix D
Laboratory Reports

ANALYTICAL REPORT

Lab Number:	L2259175
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	11/16/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2259175-01	AQPW-10-101922	POREWATER	HAVERHILL, MA	10/19/22 10:53	10/21/22
L2259175-02	AQPW-09-101922	POREWATER	HAVERHILL, MA	10/19/22 11:37	10/21/22
L2259175-03	AQPW-08-101922	POREWATER	HAVERHILL, MA	10/19/22 12:30	10/21/22
L2259175-04	DUP1-101922	POREWATER	HAVERHILL, MA	10/19/22 00:00	10/21/22
L2259175-05	AQPW-07-101922	POREWATER	HAVERHILL, MA	10/19/22 15:35	10/21/22
L2259175-06	AQPW-06-101922	POREWATER	HAVERHILL, MA	10/19/22 14:00	10/21/22
L2259175-07	AQPW-05-101922	POREWATER	HAVERHILL, MA	10/19/22 16:20	10/21/22
L2259175-08	HAV-TB1	WATER	HAVERHILL, MA	10/16/22 18:15	10/21/22
L2259175-09	AQPW-04-102022	POREWATER	HAVERHILL, MA	10/20/22 11:02	10/21/22
L2259175-10	AQPW-03-102022	POREWATER	HAVERHILL, MA	10/20/22 11:50	10/21/22
L2259175-11	AQPW-02-102022	POREWATER	HAVERHILL, MA	10/20/22 15:52	10/21/22
L2259175-12	AQPW-01-102122	POREWATER	HAVERHILL, MA	10/21/22 09:00	10/21/22
L2259175-13	RB1-102122	WATER	HAVERHILL, MA	10/21/22 11:00	10/21/22
L2259175-14	AQHA-01-102122	SEDIMENT	HAVERHILL, MA	10/21/22 10:15	10/21/22
L2259175-15	DUP2-102122	SEDIMENT	HAVERHILL, MA	10/21/22 00:00	10/21/22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Volatile Organics

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2259175-01D, -02D, -03D, -04D, -05D, -06D, -07D, -09D, -10D, -11D, and -12D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2259175-14: The analysis of Volatile Organics by EPA Method 5035/8260 Low Level could not be performed due to the elevated concentrations of target compounds in the sample.

L2259175-15D2: The sample was re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

In reference to question H:

L2259175-08: Initial calibration utilized a quadratic fit for: bromomethane

L2259175-08: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0033)

Average Response Factor: 1,4-dioxane

Verification: carbon disulfide (193%)

L2259175-08: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

Case Narrative (continued)

L2259175-15D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: bromochloromethane (0.0896), trichloroethene (0.1863), bromodichloromethane (0.2758), 1,4-dioxane (0.0011), 1,1,2-trichloroethane (0.1918)
Average Response Factor: 1,4-dioxane
Verification: dichlorodifluoromethane (64%)
L2259175-15D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.
L2259175-07D and -10D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0016)
Average Response Factor: 1,4-dioxane
L2259175-07D and -10D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.
L2259175-01D, -02D, -03D, -04D, and -05D: Initial calibration utilized a quadratic fit for: bromomethane
L2259175-01D, -02D, -03D, -04D, and -05D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0033)
Average Response Factor: 1,4-dioxane
Verification: carbon disulfide (193%)
L2259175-01D, -02D, -03D, -04D, and -05D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.
L2259175-06D, -09D, -11D, and -12D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0016)

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Average Response Factor: 1,4-dioxane

L2259175-06D, -09D, -11D, and -12D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2259175-15D2: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: bromochloromethane (0.0896), trichloroethene (0.1863), bromodichloromethane (0.2758), 1,4-dioxane (0.0011), 1,1,2-trichloroethane (0.1918)

Average Response Factor: 1,4-dioxane

Verification: dichlorodifluoromethane (64%)

L2259175-15D2: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2259175-13: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0016)

Average Response Factor: 1,4-dioxane

L2259175-13: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2259175-14: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0033)

Average Response Factor: 1,4-dioxane

L2259175-14: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is

Case Narrative (continued)

included as an addendum to this report.
The WG1705574-3 LCS recovery, associated with L2259175-08, is above the individual acceptance criteria for 1,4-dioxane (136%), but within the overall method allowances. The results of the associated samples are reported; however, all positive detects for this compound is considered to have a potentially high bias.
The WG1705574-4 LCSD recoveries, associated with L2259175-08, are outside the acceptance criteria for individual target compounds, but within the overall method allowances. The results of the associated samples are reported; however, all results are considered to have a potentially high bias for bromomethane (140%), carbon disulfide (160%) and hexachlorobutadiene (140%) and a potentially low bias for dichlorodifluoromethane (58%).
The WG1705574-3/-4 LCS/LCSD RPD(s), associated with L2259175-08, are above the acceptance criteria for bromomethane (24%), dichlorodifluoromethane (52%), carbon disulfide (29%) and 1,4-dioxane (29%).
The WG1706907-3/-4 LCS/LCSD recoveries, associated with L2259175-15D, are below the individual acceptance criteria for acetone (69%/69%), carbon disulfide (69%-LCS) and 2-butanone (69%/68%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1706971-3 LCS recoveries, associated with L2259175-07D and -10D, are below the individual acceptance criteria for bromoform (68%) and 1,2-dibromo-3-chloropropane (67%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1706971-4 LCSD recoveries, associated with L2259175-07D and -10D, are below the individual acceptance criteria for bromoform (64%), 1,1,2,2-tetrachloroethane (69%), 1,2,3-trichloropropane (67%) and 1,2-dibromo-3-chloropropane (62%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1707170-3 LCS recoveries, associated with L2259175-06D, -09D, -11D, and -12D, are above the individual acceptance criteria for acetone (150%) and 1,4-dioxane (140%), but within the overall method allowances. The results of the associated samples are reported; however, all positive detects for these compounds are considered to have a potentially high bias.

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The WG1707170-3/-4 LCS/LCSD RPD(s), associated with L2259175-06D, -09D, -11D, and -12D, are above the acceptance criteria for chloroethane (30%), acetone (40%), 2-butanone (42%), 4-methyl-2-pentanone (21%), 2-hexanone (25%), tetrahydrofuran (31%) and 1,4-dioxane (57%).
The WG1707425-3 LCS recoveries, associated with L2259175-15D2, are below the individual acceptance criteria for acetone (65%), carbon disulfide (65%) and 2-butanone (64%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1707425-4 LCSD recoveries, associated with L2259175-15D2, are below the individual acceptance criteria for acetone (62%), carbon disulfide (65%), 2-butanone (64%), 2-hexanone (68%), and tetrahydrofuran (68%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1707538-3 LCS recoveries, associated with L2259175-13, are below the individual acceptance criteria for bromoform (69%) and 1,2-dibromo-3-chloropropane (67%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1708247-3 LCS recoveries, associated with L2259175-14, are below the individual acceptance criteria for chloromethane (67%), carbon disulfide (67%), 2-butanone (64%) and 2-hexanone (69%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1708247-4 LCSD recoveries, associated with L2259175-14, are below the individual acceptance criteria for chloromethane (69%), acetone (68%), 2-butanone (57%), 2-hexanone (66%) and tetrahydrofuran (68%), but within the overall method allowances. The results of the associated samples are reported; however, all results for these compounds are considered to have a potentially low bias.
The WG1707170-6/-7 MS/MSD recoveries, performed on L2259175-06, are outside the acceptance criteria for ethylbenzene (50%/60%),and naphthalene (0%/0%). The unacceptable percent recoveries are attributed to the elevated concentrations of target compounds present in the native sample.
The WG1707170-6/-7 MS/MSD recoveries, performed on L2259175-06, are outside the acceptance criteria

Case Narrative (continued)

for bromomethane (63%/63%); however, the associated LCS/LCSD recoveries are within overall method allowances. No further action was required.
The WG1708247-6 MS recoveries, performed on L2259175-14, are outside the acceptance criteria for several compounds; however, the associated LCS/LCSD recoveries are within overall method allowances. The results of the native sample are considered to have a potentially high bias for bromomethane (154%) and 1,1-dichloroethene (131%) and a potentially low bias for 1,2-dichlorobenzene (69%), 1,3-dichlorobenzene (61%), 1,4-dichlorobenzene (60%), n-butylbenzene (35%), sec-butylbenzene (46%), tert-butylbenzene (55%), o-chlorotoluene (61%), p-chlorotoluene (58%), hexachlorobutadiene (32%), isopropylbenzene (60%), p-isopropyltoluene (41%), naphthalene (29%), n-propylbenzene (50%), 1,2,4-trichlorobenzene (63%), 1,3,5-trimethylbenzene (52%) and 1,2,4-trimethylbenzene (38%).
The WG1708247-7 MSD recoveries, performed on L2259175-14, are outside the acceptance criteria for several compounds; however, the associated LCS/LCSD recoveries are within overall method allowances. The results of the native sample are considered to have a potentially high bias for bromomethane (144%) and a potentially low bias for 1,3-dichlorobenzene (63%), 1,4-dichlorobenzene (63%), n-butylbenzene (38%), sec-butylbenzene (49%), tert-butylbenzene (57%), o-chlorotoluene (62%), p-chlorotoluene (60%), hexachlorobutadiene (36%), isopropylbenzene (62%), p-isopropyltoluene (43%), naphthalene (31%), n-propylbenzene (53%), 1,2,4-trichlorobenzene (66%), 1,3,5-trimethylbenzene (54%) and 1,2,4-trimethylbenzene (41%).

Semivolatile Organics by SIM
In reference to question G:
One or more of the target analytes did not achieve the requested CAM reporting limits.
L2259175-01D, -02D, -03D, -04D, -05D, -06D, -07D, -09D, -10D, -11D, -12D. -14D and -15D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.
In reference to question H:
L2259175-01D, -02D, -03D, -04D, -05D, -06D, -07D, -09D, -10D, -11D, and -12D: The surrogate

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recoveries are below the acceptance criteria for 2-methylnaphthalene-d10 (0%), pyrene-d10 (0%) and benzo(b)fluoranthene-d12 (0%) due to the dilution required to quantitate the sample. Re-extraction was not required; therefore, the results of the original analysis are reported.

The WG1704210-2/-3 LCS/LCSD RPD(s), associated with L2259175-01D, -02D, -03D, -04D, -05D, -06D, -07D, -09D, -10D, -11D, -12D, and -13, are above the acceptance criteria for benzo(b)fluoranthene (41%), benzo(k)fluoranthene (39%) and indeno(1,2,3-cd)pyrene (21%).

The WG1704210-4D/-5D MS/MSD recoveries, performed on L2259175-06, are outside the acceptance criteria for multiple compounds. The unacceptable percent recoveries are attributed to the elevated concentrations of target compounds present in the native sample. In addition, the WG1704210-4D/-5D MS/MSD RPD, is outside the acceptance criteria for fluoranthene (39%).

WG1704210-4D and WG1704210-5D: The surrogate recoveries are below the acceptance criteria for 2-methylnaphthalene-d10 (0%), pyrene-d10 (0%) and benzo(b)fluoranthene-d12 (0%) due to the dilution required to quantitate the sample. Re-extraction was not required; therefore, the results of the original analysis are reported.

The WG1710501-4D/-5D MS/MSD recoveries/RPDs, performed on L2259175-14, are outside the acceptance criteria for multiple compounds. The unacceptable percent recoveries are attributed to the elevated concentrations of target compounds present in the native sample.

Non-MCP related Narratives

Total Organic Carbon

The WG1708881-4 MS recoveries (Rep1 - 135%) / (Rep2 - 140%) performed on L2259175-14, are outside the 75-125% acceptance criteria, possibly due to sample matrix. The associated SRM recoveries are within criteria, indicating the sample batch was in control, and all sample results were accepted.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative

Date: 11/16/22

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
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Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP Volatile Organics - Westborough Lab								
8260D	Batch QC	WG1705574-3	1,4-Dioxane	LCS	136	70-130	08	potential high bias
8260D	Batch QC	WG1705574-4	Bromomethane	LCSD	24	20	08	non-directional bias
8260D	Batch QC	WG1705574-4	Bromomethane	LCSD	140	70-130	08	potential high bias
8260D	Batch QC	WG1705574-4	Dichlorodifluoromethane	LCSD	52	20	08	non-directional bias
8260D	Batch QC	WG1705574-4	Dichlorodifluoromethane	LCSD	58	70-130	08	potential low bias
8260D	Batch QC	WG1705574-4	Carbon disulfide	LCSD	29	20	08	non-directional bias
8260D	Batch QC	WG1705574-4	Carbon disulfide	LCSD	160	70-130	08	potential high bias
8260D	Batch QC	WG1705574-4	Hexachlorobutadiene	LCSD	140	70-130	08	potential high bias
8260D	Batch QC	WG1705574-4	1,4-Dioxane	LCSD	29	20	08	non-directional bias
8260D	Batch QC	WG1706971-3	Bromoform	LCS	68	70-130	07,10	potential low bias
8260D	Batch QC	WG1706971-3	1,2-Dibromo-3-chloropropane	LCS	67	70-130	07,10	potential low bias
8260D	Batch QC	WG1706971-4	Bromoform	LCSD	64	70-130	07,10	potential low bias
8260D	Batch QC	WG1706971-4	1,1,2,2-Tetrachloroethane	LCSD	69	70-130	07,10	potential low bias
8260D	Batch QC	WG1706971-4	1,2,3-Trichloropropane	LCSD	67	70-130	07,10	potential low bias
8260D	Batch QC	WG1706971-4	1,2-Dibromo-3-chloropropane	LCSD	62	70-130	07,10	potential low bias
8260D	Batch QC	WG1707170-3	Acetone	LCS	150	70-130	06,09,11-12	potential high bias
8260D	Batch QC	WG1707170-3	1,4-Dioxane	LCS	140	70-130	06,09,11-12	potential high bias
8260D	Batch QC	WG1707170-4	Chloroethane	LCSD	30	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	Acetone	LCSD	40	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	Methyl ethyl ketone	LCSD	42	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	Methyl isobutyl ketone	LCSD	21	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	2-Hexanone	LCSD	25	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	Tetrahydrofuran	LCSD	31	20	06,09,11-12	non-directional bias
8260D	Batch QC	WG1707170-4	1,4-Dioxane	LCSD	57	20	06,09,11-12	non-directional bias
8260D	Batch QC (L2259175-06)	WG1707170-6	Ethylbenzene	MS	50	70-130	06,09,11-12	potential low bias
8260D	Batch QC (L2259175-06)	WG1707170-6	Bromomethane	MS	63	70-130	06,09,11-12	potential low bias
8260D	Batch QC (L2259175-06)	WG1707170-6	Naphthalene	MS	0	70-130	06,09,11-12	potential low bias
8260D	Batch QC (L2259175-06)	WG1707170-7	Ethylbenzene	MSD	60	70-130	06,09,11-12	potential low bias
8260D	Batch QC (L2259175-06)	WG1707170-7	Bromomethane	MSD	63	70-130	06,09,11-12	potential low bias

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Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8260D	Batch QC (L2259175-06)	WG1707170-7	Naphthalene	MSD	0	70-130	06,09,11-12	potential low bias
8260D	Batch QC	WG1707538-3	Bromoform	LCS	69	70-130	13	potential low bias
8260D	Batch QC	WG1707538-3	1,2-Dibromo-3-chloropropane	LCS	67	70-130	13	potential low bias
MCP Volatile Organics by EPA 5035 High - Westborough Lab								
8260D	Batch QC	WG1706907-3	Acetone	LCS	69	70-130	15	potential low bias
8260D	Batch QC	WG1706907-3	Carbon disulfide	LCS	69	70-130	15	potential low bias
8260D	Batch QC	WG1706907-3	Methyl ethyl ketone	LCS	69	70-130	15	potential low bias
8260D	Batch QC	WG1706907-4	Acetone	LCSD	69	70-130	15	potential low bias
8260D	Batch QC	WG1706907-4	Methyl ethyl ketone	LCSD	68	70-130	15	potential low bias
8260D	Batch QC	WG1707425-3	Acetone	LCS	65	70-130	15	potential low bias
8260D	Batch QC	WG1707425-3	Carbon disulfide	LCS	65	70-130	15	potential low bias
8260D	Batch QC	WG1707425-3	Methyl ethyl ketone	LCS	64	70-130	15	potential low bias
8260D	Batch QC	WG1707425-4	Acetone	LCSD	62	70-130	15	potential low bias
8260D	Batch QC	WG1707425-4	Carbon disulfide	LCSD	65	70-130	15	potential low bias
8260D	Batch QC	WG1707425-4	Methyl ethyl ketone	LCSD	64	70-130	15	potential low bias
8260D	Batch QC	WG1707425-4	2-Hexanone	LCSD	68	70-130	15	potential low bias
8260D	Batch QC	WG1707425-4	Tetrahydrofuran	LCSD	68	70-130	15	potential low bias
8260D	Batch QC	WG1708247-3	Chloromethane	LCS	67	70-130	14	potential low bias
8260D	Batch QC	WG1708247-3	Carbon disulfide	LCS	67	70-130	14	potential low bias
8260D	Batch QC	WG1708247-3	Methyl ethyl ketone	LCS	64	70-130	14	potential low bias
8260D	Batch QC	WG1708247-3	2-Hexanone	LCS	69	70-130	14	potential low bias
8260D	Batch QC	WG1708247-4	Chloromethane	LCSD	69	70-130	14	potential low bias
8260D	Batch QC	WG1708247-4	Acetone	LCSD	68	70-130	14	potential low bias
8260D	Batch QC	WG1708247-4	Methyl ethyl ketone	LCSD	57	70-130	14	potential low bias
8260D	Batch QC	WG1708247-4	2-Hexanone	LCSD	66	70-130	14	potential low bias
8260D	Batch QC	WG1708247-4	Tetrahydrofuran	LCSD	68	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	Bromomethane	MS	154	70-130	14	potential high bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,1-Dichloroethene	MS	131	70-130	14	potential high bias

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Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8260D	Batch QC (L2259175-14)	WG1708247-6	1,2-Dichlorobenzene	MS	69	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,3-Dichlorobenzene	MS	61	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,4-Dichlorobenzene	MS	60	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	n-Butylbenzene	MS	35	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	sec-Butylbenzene	MS	46	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	tert-Butylbenzene	MS	55	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	o-Chlorotoluene	MS	61	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	p-Chlorotoluene	MS	58	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	Hexachlorobutadiene	MS	32	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	Isopropylbenzene	MS	60	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	p-Isopropyltoluene	MS	41	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	Naphthalene	MS	29	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	n-Propylbenzene	MS	50	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,2,4-Trichlorobenzene	MS	63	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,3,5-Trimethylbenzene	MS	52	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-6	1,2,4-Trimethylbenzene	MS	38	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	Bromomethane	MSD	144	70-130	14	potential high bias
8260D	Batch QC (L2259175-14)	WG1708247-7	1,3-Dichlorobenzene	MSD	63	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	1,4-Dichlorobenzene	MSD	63	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	n-Butylbenzene	MSD	38	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	sec-Butylbenzene	MSD	49	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	tert-Butylbenzene	MSD	57	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	o-Chlorotoluene	MSD	62	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	p-Chlorotoluene	MSD	60	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	Hexachlorobutadiene	MSD	36	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	Isopropylbenzene	MSD	62	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	p-Isopropyltoluene	MSD	43	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	Naphthalene	MSD	31	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	n-Propylbenzene	MSD	53	70-130	14	potential low bias

QC OUTLIER SUMMARY REPORT

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Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8260D	Batch QC (L2259175-14)	WG1708247-7	1,2,4-Trichlorobenzene	MSD	66	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	1,3,5-Trimethylbenzene	MSD	54	70-130	14	potential low bias
8260D	Batch QC (L2259175-14)	WG1708247-7	1,2,4-Trimethylbenzene	MSD	41	70-130	14	potential low bias
MCP PAHs by GC/MS-SIM - Mansfield Lab								
8270E-SIM	AQPW-10-101922	L2259175-01 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-10-101922	L2259175-01 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-10-101922	L2259175-01 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-09-101922	L2259175-02 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-09-101922	L2259175-02 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-09-101922	L2259175-02 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-08-101922	L2259175-03 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-08-101922	L2259175-03 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-08-101922	L2259175-03 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	DUP1-101922	L2259175-04 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	DUP1-101922	L2259175-04 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	DUP1-101922	L2259175-04 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-07-101922	L2259175-05 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-07-101922	L2259175-05 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-07-101922	L2259175-05 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-06-101922	L2259175-06 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-06-101922	L2259175-06 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-06-101922	L2259175-06 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-05-101922	L2259175-07 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-05-101922	L2259175-07 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-05-101922	L2259175-07 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-04-102022	L2259175-09 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-04-102022	L2259175-09 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-04-102022	L2259175-09 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	AQPW-03-102022	L2259175-10 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-03-102022	L2259175-10 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-03-102022	L2259175-10 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-02-102022	L2259175-11 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-02-102022	L2259175-11 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-02-102022	L2259175-11 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-102122	L2259175-12 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-102122	L2259175-12 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-102122	L2259175-12 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC	WG1704210-3	Benzo(b)fluoranthene	LCSD	41	20	01-07,09-13	non-directional bias
8270E-SIM	Batch QC	WG1704210-3	Benzo(k)fluoranthene	LCSD	39	20	01-07,09-13	non-directional bias
8270E-SIM	Batch QC	WG1704210-3	Indeno(1,2,3-cd)Pyrene	LCSD	21	20	01-07,09-13	non-directional bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Naphthalene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	2-Methylnaphthalene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	2-Chloronaphthalene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Acenaphthylene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Acenaphthene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Fluorene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Phenanthrene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Anthracene	MS	1470	40-140	01-07,09-13	potential high bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Fluoranthene	MS	789	40-140	01-07,09-13	potential high bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Pyrene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benz(a)anthracene	MS	0	40-140	01-07,09-	potential low bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
							13	
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Chrysene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benzo(b)fluoranthene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benzo(k)fluoranthene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benzo(a)pyrene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Indeno(1,2,3-cd)Pyrene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Dibenz(a,h)anthracene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benzo(ghi)perylene	MS	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-06)	WG1704210-4 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Naphthalene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	2-Methylnaphthalene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	2-Chloronaphthalene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Acenaphthylene	MSD	712	40-140	01-07,09-13	potential high bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Acenaphthene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Fluorene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Phenanthrene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Anthracene	MSD	1620	40-140	01-07,09-13	potential high bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Fluoranthene	MSD	39	20	01-07,09-13	non-directional bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Fluoranthene	MSD	1180	40-140	01-07,09-13	potential high bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Pyrene	MSD	747	40-140	01-07,09-13	potential high bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benz(a)anthracene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Chrysene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benzo(b)fluoranthene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benzo(k)fluoranthene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benzo(a)pyrene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Indeno(1,2,3-cd)Pyrene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Dibenz(a,h)anthracene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benzo(ghi)perylene	MSD	0	40-140	01-07,09-13	potential low bias
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-06)	WG1704210-5 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Naphthalene	MS	3530	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	2-Methylnaphthalene	MS	1890	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Acenaphthylene	MS	695	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Acenaphthene	MS	2250	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Fluorene	MS	1470	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Phenanthrene	MS	4420	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Anthracene	MS	1180	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Fluoranthene	MS	1570	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Pyrene	MS	2050	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Benz(a)anthracene	MS	712	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Chrysene	MS	927	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Benzo(b)fluoranthene	MS	260	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Benzo(k)fluoranthene	MS	411	40-140	14-15	potential high bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Benzo(a)pyrene	MS	646	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Indeno(1,2,3-cd)Pyrene	MS	371	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-4 D	Benzo(ghi)perylene	MS	477	40-140	14-15	potential high bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Naphthalene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Naphthalene	MSD	43	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	2-Methylnaphthalene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	2-Methylnaphthalene	MSD	43	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Acenaphthylene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Acenaphthylene	MSD	43	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Acenaphthene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Acenaphthene	MSD	42	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Fluorene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Fluorene	MSD	42	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Phenanthrene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Phenanthrene	MSD	43	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Anthracene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Anthracene	MSD	44	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Fluoranthene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Fluoranthene	MSD	41	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Pyrene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Pyrene	MSD	44	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benz(a)anthracene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benz(a)anthracene	MSD	43	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Chrysene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Chrysene	MSD	46	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(b)fluoranthene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(b)fluoranthene	MSD	38	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(k)fluoranthene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(k)fluoranthene	MSD	52	30	14-15	non-directional bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(a)pyrene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(a)pyrene	MSD	46	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Indeno(1,2,3-cd)Pyrene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Indeno(1,2,3-cd)Pyrene	MSD	44	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Dibenz(a,h)anthracene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Dibenz(a,h)anthracene	MSD	46	30	14-15	non-directional bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(ghi)perylene	MSD	0	40-140	14-15	potential low bias
8270E-SIM	Batch QC (L2259175-14)	WG1710501-5 D	Benzo(ghi)perylene	MSD	49	30	14-15	non-directional bias
Total Organic Carbon - Mansfield Lab								
9060A	Batch QC (L2259175-14)	WG1708881-4	Total Organic Carbon (Rep1)	MS	135	75-125	14-15	potential high bias
9060A	Batch QC (L2259175-14)	WG1708881-4	Total Organic Carbon (Rep2)	MS	140	75-125	14-15	potential high bias

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D
Client ID: AQPW-10-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 10:53
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 14:36
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	200	68.	100
1,1-Dichloroethane	ND		ug/l	100	21.	100
Chloroform	ND		ug/l	100	22.	100
Carbon tetrachloride	ND		ug/l	100	13.	100
1,2-Dichloropropane	ND		ug/l	100	14.	100
Dibromochloromethane	ND		ug/l	100	15.	100
1,1,2-Trichloroethane	ND		ug/l	100	14.	100
Tetrachloroethene	ND		ug/l	100	18.	100
Chlorobenzene	ND		ug/l	100	18.	100
Trichlorofluoromethane	ND		ug/l	200	16.	100
1,2-Dichloroethane	ND		ug/l	100	13.	100
1,1,1-Trichloroethane	ND		ug/l	100	16.	100
Bromodichloromethane	ND		ug/l	100	19.	100
trans-1,3-Dichloropropene	ND		ug/l	40	16.	100
cis-1,3-Dichloropropene	ND		ug/l	40	14.	100
1,3-Dichloropropene, Total	ND		ug/l	40	14.	100
1,1-Dichloropropene	ND		ug/l	200	24.	100
Bromoform	ND		ug/l	200	25.	100
1,1,2,2-Tetrachloroethane	ND		ug/l	100	17.	100
Benzene	410		ug/l	50	16.	100
Toluene	34	J	ug/l	100	20.	100
Ethylbenzene	1600		ug/l	100	17.	100
Chloromethane	ND		ug/l	200	20.	100
Bromomethane	ND		ug/l	200	26.	100
Vinyl chloride	ND		ug/l	100	7.1	100
Chloroethane	ND		ug/l	200	13.	100
1,1-Dichloroethene	ND		ug/l	100	17.	100
trans-1,2-Dichloroethene	ND		ug/l	100	16.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D Date Collected: 10/19/22 10:53

Client ID: AQPW-10-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	100	18.	100
1,2-Dichlorobenzene	ND		ug/l	100	18.	100
1,3-Dichlorobenzene	ND		ug/l	100	19.	100
1,4-Dichlorobenzene	ND		ug/l	100	19.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	1300		ug/l	200	33.	100
o-Xylene	790		ug/l	100	39.	100
Xylenes, Total	2100		ug/l	100	33.	100
cis-1,2-Dichloroethene	ND		ug/l	100	19.	100
1,2-Dichloroethene, Total	ND		ug/l	100	16.	100
Dibromomethane	ND		ug/l	200	36.	100
1,2,3-Trichloropropane	ND		ug/l	200	18.	100
Styrene	ND		ug/l	100	36.	100
Dichlorodifluoromethane	ND		ug/l	200	24.	100
Acetone	ND		ug/l	500	150	100
Carbon disulfide	ND		ug/l	200	30.	100
Methyl ethyl ketone	ND		ug/l	500	190	100
Methyl isobutyl ketone	ND		ug/l	500	42.	100
2-Hexanone	ND		ug/l	500	52.	100
Bromochloromethane	ND		ug/l	200	15.	100
Tetrahydrofuran	ND		ug/l	200	52.	100
2,2-Dichloropropane	ND		ug/l	200	20.	100
1,2-Dibromoethane	ND		ug/l	200	19.	100
1,3-Dichloropropane	ND		ug/l	200	21.	100
1,1,1,2-Tetrachloroethane	ND		ug/l	100	16.	100
Bromobenzene	ND		ug/l	200	15.	100
n-Butylbenzene	ND		ug/l	200	19.	100
sec-Butylbenzene	ND		ug/l	200	18.	100
tert-Butylbenzene	ND		ug/l	200	20.	100
o-Chlorotoluene	ND		ug/l	200	22.	100
p-Chlorotoluene	ND		ug/l	200	18.	100
1,2-Dibromo-3-chloropropane	ND		ug/l	200	35.	100
Hexachlorobutadiene	ND		ug/l	60	22.	100
Isopropylbenzene	180	J	ug/l	200	19.	100
p-Isopropyltoluene	24	J	ug/l	200	19.	100
Naphthalene	9900		ug/l	200	22.	100
n-Propylbenzene	44	J	ug/l	200	17.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D Date Collected: 10/19/22 10:53

Client ID: AQPW-10-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	200	23.	100
1,2,4-Trichlorobenzene	ND		ug/l	200	22.	100
1,3,5-Trimethylbenzene	260		ug/l	200	22.	100
1,2,4-Trimethylbenzene	900		ug/l	200	19.	100
Diethyl ether	ND		ug/l	200	16.	100
Diisopropyl Ether	ND		ug/l	200	42.	100
Ethyl-Tert-Butyl-Ether	ND		ug/l	200	18.	100
Tertiary-Amyl Methyl Ether	ND		ug/l	200	28.	100
1,4-Dioxane	ND		ug/l	25000	6100	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	92		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 15:17
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	3300		ug/l	25	8.0	50
Toluene	40	J	ug/l	50	10.	50
Ethylbenzene	1500		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D Date Collected: 10/19/22 11:37

Client ID: AQPW-09-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	ND		ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	970		ug/l	100	17.	50
o-Xylene	730		ug/l	50	20.	50
Xylenes, Total	1700		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	120		ug/l	100	9.4	50
p-Isopropyltoluene	18	J	ug/l	100	9.4	50
Naphthalene	7300		ug/l	100	11.	50
n-Propylbenzene	30	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	200		ug/l	100	11.	50
1,2,4-Trimethylbenzene	660		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D
Client ID: AQPW-08-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 12:30
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 16:40
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	20	6.8	10
1,1-Dichloroethane	ND		ug/l	10	2.1	10
Chloroform	ND		ug/l	10	2.2	10
Carbon tetrachloride	ND		ug/l	10	1.3	10
1,2-Dichloropropane	ND		ug/l	10	1.4	10
Dibromochloromethane	ND		ug/l	10	1.5	10
1,1,2-Trichloroethane	ND		ug/l	10	1.4	10
Tetrachloroethene	ND		ug/l	10	1.8	10
Chlorobenzene	ND		ug/l	10	1.8	10
Trichlorofluoromethane	ND		ug/l	20	1.6	10
1,2-Dichloroethane	ND		ug/l	10	1.3	10
1,1,1-Trichloroethane	ND		ug/l	10	1.6	10
Bromodichloromethane	ND		ug/l	10	1.9	10
trans-1,3-Dichloropropene	ND		ug/l	4.0	1.6	10
cis-1,3-Dichloropropene	ND		ug/l	4.0	1.4	10
1,3-Dichloropropene, Total	ND		ug/l	4.0	1.4	10
1,1-Dichloropropene	ND		ug/l	20	2.4	10
Bromoform	ND		ug/l	20	2.5	10
1,1,2,2-Tetrachloroethane	ND		ug/l	10	1.7	10
Benzene	520		ug/l	5.0	1.6	10
Toluene	3.5	J	ug/l	10	2.0	10
Ethylbenzene	250		ug/l	10	1.7	10
Chloromethane	ND		ug/l	20	2.0	10
Bromomethane	ND		ug/l	20	2.6	10
Vinyl chloride	ND		ug/l	10	0.71	10
Chloroethane	ND		ug/l	20	1.3	10
1,1-Dichloroethene	ND		ug/l	10	1.7	10
trans-1,2-Dichloroethene	ND		ug/l	10	1.6	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D Date Collected: 10/19/22 12:30

Client ID: AQPW-08-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	10	1.8	10
1,2-Dichlorobenzene	ND		ug/l	10	1.8	10
1,3-Dichlorobenzene	ND		ug/l	10	1.9	10
1,4-Dichlorobenzene	ND		ug/l	10	1.9	10
Methyl tert butyl ether	ND		ug/l	20	1.7	10
p/m-Xylene	23		ug/l	20	3.3	10
o-Xylene	66		ug/l	10	3.9	10
Xylenes, Total	89		ug/l	10	3.3	10
cis-1,2-Dichloroethene	ND		ug/l	10	1.9	10
1,2-Dichloroethene, Total	ND		ug/l	10	1.6	10
Dibromomethane	ND		ug/l	20	3.6	10
1,2,3-Trichloropropane	ND		ug/l	20	1.8	10
Styrene	ND		ug/l	10	3.6	10
Dichlorodifluoromethane	ND		ug/l	20	2.4	10
Acetone	ND		ug/l	50	15.	10
Carbon disulfide	ND		ug/l	20	3.0	10
Methyl ethyl ketone	ND		ug/l	50	19.	10
Methyl isobutyl ketone	ND		ug/l	50	4.2	10
2-Hexanone	ND		ug/l	50	5.2	10
Bromochloromethane	ND		ug/l	20	1.5	10
Tetrahydrofuran	ND		ug/l	20	5.2	10
2,2-Dichloropropane	ND		ug/l	20	2.0	10
1,2-Dibromoethane	ND		ug/l	20	1.9	10
1,3-Dichloropropane	ND		ug/l	20	2.1	10
1,1,1,2-Tetrachloroethane	ND		ug/l	10	1.6	10
Bromobenzene	ND		ug/l	20	1.5	10
n-Butylbenzene	ND		ug/l	20	1.9	10
sec-Butylbenzene	ND		ug/l	20	1.8	10
tert-Butylbenzene	ND		ug/l	20	2.0	10
o-Chlorotoluene	ND		ug/l	20	2.2	10
p-Chlorotoluene	ND		ug/l	20	1.8	10
1,2-Dibromo-3-chloropropane	ND		ug/l	20	3.5	10
Hexachlorobutadiene	ND		ug/l	6.0	2.2	10
Isopropylbenzene	39		ug/l	20	1.9	10
p-Isopropyltoluene	3.8	J	ug/l	20	1.9	10
Naphthalene	1200		ug/l	20	2.2	10
n-Propylbenzene	15	J	ug/l	20	1.7	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D Date Collected: 10/19/22 12:30

Client ID: AQPW-08-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	20	2.3	10
1,2,4-Trichlorobenzene	ND		ug/l	20	2.2	10
1,3,5-Trimethylbenzene	24		ug/l	20	2.2	10
1,2,4-Trimethylbenzene	150		ug/l	20	1.9	10
Diethyl ether	ND		ug/l	20	1.6	10
Diisopropyl Ether	ND		ug/l	20	4.2	10
Ethyl-Tert-Butyl-Ether	ND		ug/l	20	1.8	10
Tertiary-Amyl Methyl Ether	ND		ug/l	20	2.8	10
1,4-Dioxane	ND		ug/l	2500	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 15:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	410		ug/l	25	8.0	50
Toluene	33	J	ug/l	50	10.	50
Ethylbenzene	1600		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D Date Collected: 10/19/22 00:00

Client ID: DUP1-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	ND		ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	1300		ug/l	100	17.	50
o-Xylene	820		ug/l	50	20.	50
Xylenes, Total	2100		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	170		ug/l	100	9.4	50
p-Isopropyltoluene	22	J	ug/l	100	9.4	50
Naphthalene	9400		ug/l	100	11.	50
n-Propylbenzene	43	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	240		ug/l	100	11.	50
1,2,4-Trimethylbenzene	860		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	10	3.4	5
1,1-Dichloroethane	ND		ug/l	5.0	1.0	5
Chloroform	ND		ug/l	5.0	1.1	5
Carbon tetrachloride	ND		ug/l	5.0	0.67	5
1,2-Dichloropropane	ND		ug/l	5.0	0.68	5
Dibromochloromethane	ND		ug/l	5.0	0.74	5
1,1,2-Trichloroethane	ND		ug/l	5.0	0.72	5
Tetrachloroethene	ND		ug/l	5.0	0.90	5
Chlorobenzene	ND		ug/l	5.0	0.89	5
Trichlorofluoromethane	ND		ug/l	10	0.80	5
1,2-Dichloroethane	ND		ug/l	5.0	0.66	5
1,1,1-Trichloroethane	ND		ug/l	5.0	0.79	5
Bromodichloromethane	ND		ug/l	5.0	0.96	5
trans-1,3-Dichloropropene	ND		ug/l	2.0	0.82	5
cis-1,3-Dichloropropene	ND		ug/l	2.0	0.72	5
1,3-Dichloropropene, Total	ND		ug/l	2.0	0.72	5
1,1-Dichloropropene	ND		ug/l	10	1.2	5
Bromoform	ND		ug/l	10	1.2	5
1,1,2,2-Tetrachloroethane	ND		ug/l	5.0	0.84	5
Benzene	3.5		ug/l	2.5	0.80	5
Toluene	ND		ug/l	5.0	1.0	5
Ethylbenzene	60		ug/l	5.0	0.84	5
Chloromethane	ND		ug/l	10	1.0	5
Bromomethane	ND		ug/l	10	1.3	5
Vinyl chloride	ND		ug/l	5.0	0.36	5
Chloroethane	ND		ug/l	10	0.67	5
1,1-Dichloroethene	ND		ug/l	5.0	0.84	5
trans-1,2-Dichloroethene	ND		ug/l	5.0	0.82	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D Date Collected: 10/19/22 15:35

Client ID: AQPW-07-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	5.0	0.88	5
1,2-Dichlorobenzene	ND		ug/l	5.0	0.92	5
1,3-Dichlorobenzene	ND		ug/l	5.0	0.93	5
1,4-Dichlorobenzene	ND		ug/l	5.0	0.94	5
Methyl tert butyl ether	ND		ug/l	10	0.83	5
p/m-Xylene	22		ug/l	10	1.7	5
o-Xylene	25		ug/l	5.0	2.0	5
Xylenes, Total	47		ug/l	5.0	1.7	5
cis-1,2-Dichloroethene	ND		ug/l	5.0	0.94	5
1,2-Dichloroethene, Total	ND		ug/l	5.0	0.82	5
Dibromomethane	ND		ug/l	10	1.8	5
1,2,3-Trichloropropane	ND		ug/l	10	0.88	5
Styrene	ND		ug/l	5.0	1.8	5
Dichlorodifluoromethane	ND		ug/l	10	1.2	5
Acetone	ND		ug/l	25	7.3	5
Carbon disulfide	ND		ug/l	10	1.5	5
Methyl ethyl ketone	ND		ug/l	25	9.7	5
Methyl isobutyl ketone	ND		ug/l	25	2.1	5
2-Hexanone	ND		ug/l	25	2.6	5
Bromochloromethane	ND		ug/l	10	0.76	5
Tetrahydrofuran	ND		ug/l	10	2.6	5
2,2-Dichloropropane	ND		ug/l	10	1.0	5
1,2-Dibromoethane	ND		ug/l	10	0.96	5
1,3-Dichloropropane	ND		ug/l	10	1.1	5
1,1,1,2-Tetrachloroethane	ND		ug/l	5.0	0.82	5
Bromobenzene	ND		ug/l	10	0.76	5
n-Butylbenzene	ND		ug/l	10	0.96	5
sec-Butylbenzene	ND		ug/l	10	0.90	5
tert-Butylbenzene	ND		ug/l	10	0.98	5
o-Chlorotoluene	ND		ug/l	10	1.1	5
p-Chlorotoluene	ND		ug/l	10	0.92	5
1,2-Dibromo-3-chloropropane	ND		ug/l	10	1.8	5
Hexachlorobutadiene	ND		ug/l	3.0	1.1	5
Isopropylbenzene	9.4	J	ug/l	10	0.94	5
p-Isopropyltoluene	2.1	J	ug/l	10	0.94	5
Naphthalene	570		ug/l	10	1.1	5
n-Propylbenzene	3.7	J	ug/l	10	0.86	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	10	1.2	5
1,2,4-Trichlorobenzene	ND		ug/l	10	1.1	5
1,3,5-Trimethylbenzene	16		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	53		ug/l	10	0.96	5
Diethyl ether	ND		ug/l	10	0.82	5
Diisopropyl Ether	ND		ug/l	10	2.1	5
Ethyl-Tert-Butyl-Ether	ND		ug/l	10	0.90	5
Tertiary-Amyl Methyl Ether	ND		ug/l	10	1.4	5
1,4-Dioxane	ND		ug/l	1200	300	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D
Client ID: AQPW-06-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 14:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:35
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	20	6.8	10
1,1-Dichloroethane	ND		ug/l	10	2.1	10
Chloroform	ND		ug/l	10	2.2	10
Carbon tetrachloride	ND		ug/l	10	1.3	10
1,2-Dichloropropane	ND		ug/l	10	1.4	10
Dibromochloromethane	ND		ug/l	10	1.5	10
1,1,2-Trichloroethane	ND		ug/l	10	1.4	10
Tetrachloroethene	ND		ug/l	10	1.8	10
Chlorobenzene	ND		ug/l	10	1.8	10
Trichlorofluoromethane	ND		ug/l	20	1.6	10
1,2-Dichloroethane	ND		ug/l	10	1.3	10
1,1,1-Trichloroethane	ND		ug/l	10	1.6	10
Bromodichloromethane	ND		ug/l	10	1.9	10
trans-1,3-Dichloropropene	ND		ug/l	4.0	1.6	10
cis-1,3-Dichloropropene	ND		ug/l	4.0	1.4	10
1,3-Dichloropropene, Total	ND		ug/l	4.0	1.4	10
1,1-Dichloropropene	ND		ug/l	20	2.4	10
Bromoform	ND		ug/l	20	2.5	10
1,1,2,2-Tetrachloroethane	ND		ug/l	10	1.7	10
Benzene	49		ug/l	5.0	1.6	10
Toluene	5.8	J	ug/l	10	2.0	10
Ethylbenzene	400		ug/l	10	1.7	10
Chloromethane	ND		ug/l	20	2.0	10
Bromomethane	ND		ug/l	20	2.6	10
Vinyl chloride	ND		ug/l	10	0.71	10
Chloroethane	ND		ug/l	20	1.3	10
1,1-Dichloroethene	ND		ug/l	10	1.7	10
trans-1,2-Dichloroethene	ND		ug/l	10	1.6	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D Date Collected: 10/19/22 14:00

Client ID: AQPW-06-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	10	1.8	10
1,2-Dichlorobenzene	ND		ug/l	10	1.8	10
1,3-Dichlorobenzene	ND		ug/l	10	1.9	10
1,4-Dichlorobenzene	ND		ug/l	10	1.9	10
Methyl tert butyl ether	ND		ug/l	20	1.7	10
p/m-Xylene	36		ug/l	20	3.3	10
o-Xylene	220		ug/l	10	3.9	10
Xylenes, Total	260		ug/l	10	3.3	10
cis-1,2-Dichloroethene	ND		ug/l	10	1.9	10
1,2-Dichloroethene, Total	ND		ug/l	10	1.6	10
Dibromomethane	ND		ug/l	20	3.6	10
1,2,3-Trichloropropane	ND		ug/l	20	1.8	10
Styrene	ND		ug/l	10	3.6	10
Dichlorodifluoromethane	ND		ug/l	20	2.4	10
Acetone	ND		ug/l	50	15.	10
Carbon disulfide	ND		ug/l	20	3.0	10
Methyl ethyl ketone	ND		ug/l	50	19.	10
Methyl isobutyl ketone	ND		ug/l	50	4.2	10
2-Hexanone	ND		ug/l	50	5.2	10
Bromochloromethane	ND		ug/l	20	1.5	10
Tetrahydrofuran	ND		ug/l	20	5.2	10
2,2-Dichloropropane	ND		ug/l	20	2.0	10
1,2-Dibromoethane	ND		ug/l	20	1.9	10
1,3-Dichloropropane	ND		ug/l	20	2.1	10
1,1,1,2-Tetrachloroethane	ND		ug/l	10	1.6	10
Bromobenzene	ND		ug/l	20	1.5	10
n-Butylbenzene	ND		ug/l	20	1.9	10
sec-Butylbenzene	ND		ug/l	20	1.8	10
tert-Butylbenzene	ND		ug/l	20	2.0	10
o-Chlorotoluene	ND		ug/l	20	2.2	10
p-Chlorotoluene	ND		ug/l	20	1.8	10
1,2-Dibromo-3-chloropropane	ND		ug/l	20	3.5	10
Hexachlorobutadiene	ND		ug/l	6.0	2.2	10
Isopropylbenzene	36		ug/l	20	1.9	10
p-Isopropyltoluene	3.9	J	ug/l	20	1.9	10
Naphthalene	1100		ug/l	20	2.2	10
n-Propylbenzene	13	J	ug/l	20	1.7	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D Date Collected: 10/19/22 14:00

Client ID: AQPW-06-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	20	2.3	10
1,2,4-Trichlorobenzene	ND		ug/l	20	2.2	10
1,3,5-Trimethylbenzene	16	J	ug/l	20	2.2	10
1,2,4-Trimethylbenzene	140		ug/l	20	1.9	10
Diethyl ether	ND		ug/l	20	1.6	10
Diisopropyl Ether	ND		ug/l	20	4.2	10
Ethyl-Tert-Butyl-Ether	ND		ug/l	20	1.8	10
Tertiary-Amyl Methyl Ether	ND		ug/l	20	2.8	10
1,4-Dioxane	ND		ug/l	2500	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 20:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	400	140	200
1,1-Dichloroethane	ND		ug/l	200	42.	200
Chloroform	ND		ug/l	200	44.	200
Carbon tetrachloride	ND		ug/l	200	27.	200
1,2-Dichloropropane	ND		ug/l	200	27.	200
Dibromochloromethane	ND		ug/l	200	30.	200
1,1,2-Trichloroethane	ND		ug/l	200	29.	200
Tetrachloroethene	ND		ug/l	200	36.	200
Chlorobenzene	ND		ug/l	200	36.	200
Trichlorofluoromethane	ND		ug/l	400	32.	200
1,2-Dichloroethane	ND		ug/l	200	26.	200
1,1,1-Trichloroethane	ND		ug/l	200	32.	200
Bromodichloromethane	ND		ug/l	200	38.	200
trans-1,3-Dichloropropene	ND		ug/l	80	33.	200
cis-1,3-Dichloropropene	ND		ug/l	80	29.	200
1,3-Dichloropropene, Total	ND		ug/l	80	29.	200
1,1-Dichloropropene	ND		ug/l	400	48.	200
Bromoform	ND		ug/l	400	50.	200
1,1,2,2-Tetrachloroethane	ND		ug/l	200	33.	200
Benzene	16000		ug/l	100	32.	200
Toluene	70	J	ug/l	200	41.	200
Ethylbenzene	1600		ug/l	200	33.	200
Chloromethane	ND		ug/l	400	40.	200
Bromomethane	ND		ug/l	400	51.	200
Vinyl chloride	ND		ug/l	200	14.	200
Chloroethane	ND		ug/l	400	27.	200
1,1-Dichloroethene	ND		ug/l	200	34.	200
trans-1,2-Dichloroethene	ND		ug/l	200	33.	200

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D Date Collected: 10/19/22 16:20

Client ID: AQPW-05-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	200	35.	200
1,2-Dichlorobenzene	ND		ug/l	200	37.	200
1,3-Dichlorobenzene	ND		ug/l	200	37.	200
1,4-Dichlorobenzene	ND		ug/l	200	37.	200
Methyl tert butyl ether	210	J	ug/l	400	33.	200
p/m-Xylene	590		ug/l	400	66.	200
o-Xylene	780		ug/l	200	78.	200
Xylenes, Total	1400		ug/l	200	66.	200
cis-1,2-Dichloroethene	ND		ug/l	200	37.	200
1,2-Dichloroethene, Total	ND		ug/l	200	33.	200
Dibromomethane	ND		ug/l	400	73.	200
1,2,3-Trichloropropane	ND		ug/l	400	35.	200
Styrene	ND		ug/l	200	72.	200
Dichlorodifluoromethane	ND		ug/l	400	49.	200
Acetone	ND		ug/l	1000	290	200
Carbon disulfide	ND		ug/l	400	60.	200
Methyl ethyl ketone	ND		ug/l	1000	390	200
Methyl isobutyl ketone	ND		ug/l	1000	83.	200
2-Hexanone	ND		ug/l	1000	100	200
Bromochloromethane	ND		ug/l	400	30.	200
Tetrahydrofuran	ND		ug/l	400	100	200
2,2-Dichloropropane	ND		ug/l	400	41.	200
1,2-Dibromoethane	ND		ug/l	400	39.	200
1,3-Dichloropropane	ND		ug/l	400	42.	200
1,1,1,2-Tetrachloroethane	ND		ug/l	200	33.	200
Bromobenzene	ND		ug/l	400	30.	200
n-Butylbenzene	ND		ug/l	400	38.	200
sec-Butylbenzene	ND		ug/l	400	36.	200
tert-Butylbenzene	ND		ug/l	400	39.	200
o-Chlorotoluene	ND		ug/l	400	43.	200
p-Chlorotoluene	ND		ug/l	400	37.	200
1,2-Dibromo-3-chloropropane	ND		ug/l	400	71.	200
Hexachlorobutadiene	ND		ug/l	120	43.	200
Isopropylbenzene	64	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	3500		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	400	47.	200
1,2,4-Trichlorobenzene	ND		ug/l	400	44.	200
1,3,5-Trimethylbenzene	63	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	230	J	ug/l	400	38.	200
Diethyl ether	ND		ug/l	400	33.	200
Diisopropyl Ether	ND		ug/l	400	85.	200
Ethyl-Tert-Butyl-Ether	ND		ug/l	400	36.	200
Tertiary-Amyl Methyl Ether	ND		ug/l	400	56.	200
1,4-Dioxane	ND		ug/l	50000	12000	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08
Client ID: HAV-TB1
Sample Location: HAVERHILL, MA

Date Collected: 10/16/22 18:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 10/28/22 19:20
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08 Date Collected: 10/16/22 18:15

Client ID: HAV-TB1 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08 Date Collected: 10/16/22 18:15

Client ID: HAV-TB1 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	105		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	117		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D
Client ID: AQPW-04-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:02
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	200	68.	100
1,1-Dichloroethane	ND		ug/l	100	21.	100
Chloroform	ND		ug/l	100	22.	100
Carbon tetrachloride	ND		ug/l	100	13.	100
1,2-Dichloropropane	ND		ug/l	100	14.	100
Dibromochloromethane	ND		ug/l	100	15.	100
1,1,2-Trichloroethane	ND		ug/l	100	14.	100
Tetrachloroethene	ND		ug/l	100	18.	100
Chlorobenzene	ND		ug/l	100	18.	100
Trichlorofluoromethane	ND		ug/l	200	16.	100
1,2-Dichloroethane	ND		ug/l	100	13.	100
1,1,1-Trichloroethane	ND		ug/l	100	16.	100
Bromodichloromethane	ND		ug/l	100	19.	100
trans-1,3-Dichloropropene	ND		ug/l	40	16.	100
cis-1,3-Dichloropropene	ND		ug/l	40	14.	100
1,3-Dichloropropene, Total	ND		ug/l	40	14.	100
1,1-Dichloropropene	ND		ug/l	200	24.	100
Bromoform	ND		ug/l	200	25.	100
1,1,2,2-Tetrachloroethane	ND		ug/l	100	17.	100
Benzene	14000		ug/l	50	16.	100
Toluene	130		ug/l	100	20.	100
Ethylbenzene	3500		ug/l	100	17.	100
Chloromethane	ND		ug/l	200	20.	100
Bromomethane	ND		ug/l	200	26.	100
Vinyl chloride	ND		ug/l	100	7.1	100
Chloroethane	ND		ug/l	200	13.	100
1,1-Dichloroethene	ND		ug/l	100	17.	100
trans-1,2-Dichloroethene	ND		ug/l	100	16.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D Date Collected: 10/20/22 11:02

Client ID: AQPW-04-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	100	18.	100
1,2-Dichlorobenzene	ND		ug/l	100	18.	100
1,3-Dichlorobenzene	ND		ug/l	100	19.	100
1,4-Dichlorobenzene	ND		ug/l	100	19.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	3400		ug/l	200	33.	100
o-Xylene	1900		ug/l	100	39.	100
Xylenes, Total	5300		ug/l	100	33.	100
cis-1,2-Dichloroethene	ND		ug/l	100	19.	100
1,2-Dichloroethene, Total	ND		ug/l	100	16.	100
Dibromomethane	ND		ug/l	200	36.	100
1,2,3-Trichloropropane	ND		ug/l	200	18.	100
Styrene	ND		ug/l	100	36.	100
Dichlorodifluoromethane	ND		ug/l	200	24.	100
Acetone	ND		ug/l	500	150	100
Carbon disulfide	ND		ug/l	200	30.	100
Methyl ethyl ketone	ND		ug/l	500	190	100
Methyl isobutyl ketone	ND		ug/l	500	42.	100
2-Hexanone	ND		ug/l	500	52.	100
Bromochloromethane	ND		ug/l	200	15.	100
Tetrahydrofuran	ND		ug/l	200	52.	100
2,2-Dichloropropane	ND		ug/l	200	20.	100
1,2-Dibromoethane	ND		ug/l	200	19.	100
1,3-Dichloropropane	ND		ug/l	200	21.	100
1,1,1,2-Tetrachloroethane	ND		ug/l	100	16.	100
Bromobenzene	ND		ug/l	200	15.	100
n-Butylbenzene	ND		ug/l	200	19.	100
sec-Butylbenzene	ND		ug/l	200	18.	100
tert-Butylbenzene	ND		ug/l	200	20.	100
o-Chlorotoluene	ND		ug/l	200	22.	100
p-Chlorotoluene	ND		ug/l	200	18.	100
1,2-Dibromo-3-chloropropane	ND		ug/l	200	35.	100
Hexachlorobutadiene	ND		ug/l	60	22.	100
Isopropylbenzene	110	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	6300		ug/l	200	22.	100
n-Propylbenzene	35	J	ug/l	200	17.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D Date Collected: 10/20/22 11:02

Client ID: AQPW-04-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	200	23.	100
1,2,4-Trichlorobenzene	ND		ug/l	200	22.	100
1,3,5-Trimethylbenzene	140	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	510		ug/l	200	19.	100
Diethyl ether	ND		ug/l	200	16.	100
Diisopropyl Ether	ND		ug/l	200	42.	100
Ethyl-Tert-Butyl-Ether	ND		ug/l	200	18.	100
Tertiary-Amyl Methyl Ether	ND		ug/l	200	28.	100
1,4-Dioxane	ND		ug/l	25000	6100	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D
Client ID: AQPW-03-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:50
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 21:44
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	42		ug/l	25	8.0	50
Toluene	28	J	ug/l	50	10.	50
Ethylbenzene	1200		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D Date Collected: 10/20/22 11:50

Client ID: AQPW-03-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	11	J	ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	500		ug/l	100	17.	50
o-Xylene	500		ug/l	50	20.	50
Xylenes, Total	1000		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	98	J	ug/l	100	9.4	50
p-Isopropyltoluene	13	J	ug/l	100	9.4	50
Naphthalene	4700		ug/l	100	11.	50
n-Propylbenzene	38	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D Date Collected: 10/20/22 11:50

Client ID: AQPW-03-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	89	J	ug/l	100	11.	50
1,2,4-Trimethylbenzene	330		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	107		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	93		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D
Client ID: AQPW-02-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 15:52
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 06:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	10	3.4	5
1,1-Dichloroethane	ND		ug/l	5.0	1.0	5
Chloroform	ND		ug/l	5.0	1.1	5
Carbon tetrachloride	ND		ug/l	5.0	0.67	5
1,2-Dichloropropane	ND		ug/l	5.0	0.68	5
Dibromochloromethane	ND		ug/l	5.0	0.74	5
1,1,2-Trichloroethane	ND		ug/l	5.0	0.72	5
Tetrachloroethene	ND		ug/l	5.0	0.90	5
Chlorobenzene	4.1	J	ug/l	5.0	0.89	5
Trichlorofluoromethane	ND		ug/l	10	0.80	5
1,2-Dichloroethane	ND		ug/l	5.0	0.66	5
1,1,1-Trichloroethane	ND		ug/l	5.0	0.79	5
Bromodichloromethane	ND		ug/l	5.0	0.96	5
trans-1,3-Dichloropropene	ND		ug/l	2.0	0.82	5
cis-1,3-Dichloropropene	ND		ug/l	2.0	0.72	5
1,3-Dichloropropene, Total	ND		ug/l	2.0	0.72	5
1,1-Dichloropropene	ND		ug/l	10	1.2	5
Bromoform	ND		ug/l	10	1.2	5
1,1,2,2-Tetrachloroethane	ND		ug/l	5.0	0.84	5
Benzene	30		ug/l	2.5	0.80	5
Toluene	1.3	J	ug/l	5.0	1.0	5
Ethylbenzene	80		ug/l	5.0	0.84	5
Chloromethane	ND		ug/l	10	1.0	5
Bromomethane	ND		ug/l	10	1.3	5
Vinyl chloride	ND		ug/l	5.0	0.36	5
Chloroethane	ND		ug/l	10	0.67	5
1,1-Dichloroethene	ND		ug/l	5.0	0.84	5
trans-1,2-Dichloroethene	ND		ug/l	5.0	0.82	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D Date Collected: 10/20/22 15:52
Client ID: AQPW-02-102022 Date Received: 10/21/22
Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	5.0	0.88	5
1,2-Dichlorobenzene	3.0	J	ug/l	5.0	0.92	5
1,3-Dichlorobenzene	ND		ug/l	5.0	0.93	5
1,4-Dichlorobenzene	ND		ug/l	5.0	0.94	5
Methyl tert butyl ether	10		ug/l	10	0.83	5
p/m-Xylene	10		ug/l	10	1.7	5
o-Xylene	27		ug/l	5.0	2.0	5
Xylenes, Total	37		ug/l	5.0	1.7	5
cis-1,2-Dichloroethene	ND		ug/l	5.0	0.94	5
1,2-Dichloroethene, Total	ND		ug/l	5.0	0.82	5
Dibromomethane	ND		ug/l	10	1.8	5
1,2,3-Trichloropropane	ND		ug/l	10	0.88	5
Styrene	ND		ug/l	5.0	1.8	5
Dichlorodifluoromethane	ND		ug/l	10	1.2	5
Acetone	11	J	ug/l	25	7.3	5
Carbon disulfide	ND		ug/l	10	1.5	5
Methyl ethyl ketone	ND		ug/l	25	9.7	5
Methyl isobutyl ketone	ND		ug/l	25	2.1	5
2-Hexanone	ND		ug/l	25	2.6	5
Bromochloromethane	ND		ug/l	10	0.76	5
Tetrahydrofuran	ND		ug/l	10	2.6	5
2,2-Dichloropropane	ND		ug/l	10	1.0	5
1,2-Dibromoethane	ND		ug/l	10	0.96	5
1,3-Dichloropropane	ND		ug/l	10	1.1	5
1,1,1,2-Tetrachloroethane	ND		ug/l	5.0	0.82	5
Bromobenzene	ND		ug/l	10	0.76	5
n-Butylbenzene	ND		ug/l	10	0.96	5
sec-Butylbenzene	ND		ug/l	10	0.90	5
tert-Butylbenzene	ND		ug/l	10	0.98	5
o-Chlorotoluene	ND		ug/l	10	1.1	5
p-Chlorotoluene	ND		ug/l	10	0.92	5
1,2-Dibromo-3-chloropropane	ND		ug/l	10	1.8	5
Hexachlorobutadiene	ND		ug/l	3.0	1.1	5
Isopropylbenzene	15		ug/l	10	0.94	5
p-Isopropyltoluene	5.5	J	ug/l	10	0.94	5
Naphthalene	620		ug/l	10	1.1	5
n-Propylbenzene	8.4	J	ug/l	10	0.86	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D Date Collected: 10/20/22 15:52

Client ID: AQPW-02-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	10	1.2	5
1,2,4-Trichlorobenzene	ND		ug/l	10	1.1	5
1,3,5-Trimethylbenzene	16		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	61		ug/l	10	0.96	5
Diethyl ether	ND		ug/l	10	0.82	5
Diisopropyl Ether	ND		ug/l	10	2.1	5
Ethyl-Tert-Butyl-Ether	ND		ug/l	10	0.90	5
Tertiary-Amyl Methyl Ether	ND		ug/l	10	1.4	5
1,4-Dioxane	ND		ug/l	1200	300	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 14:20
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	50	17.	25
1,1-Dichloroethane	ND		ug/l	25	5.2	25
Chloroform	ND		ug/l	25	5.6	25
Carbon tetrachloride	ND		ug/l	25	3.4	25
1,2-Dichloropropane	ND		ug/l	25	3.4	25
Dibromochloromethane	ND		ug/l	25	3.7	25
1,1,2-Trichloroethane	ND		ug/l	25	3.6	25
Tetrachloroethene	ND		ug/l	25	4.5	25
Chlorobenzene	ND		ug/l	25	4.4	25
Trichlorofluoromethane	ND		ug/l	50	4.0	25
1,2-Dichloroethane	ND		ug/l	25	3.3	25
1,1,1-Trichloroethane	ND		ug/l	25	4.0	25
Bromodichloromethane	ND		ug/l	25	4.8	25
trans-1,3-Dichloropropene	ND		ug/l	10	4.1	25
cis-1,3-Dichloropropene	ND		ug/l	10	3.6	25
1,3-Dichloropropene, Total	ND		ug/l	10	3.6	25
1,1-Dichloropropene	ND		ug/l	50	6.0	25
Bromoform	ND		ug/l	50	6.2	25
1,1,2,2-Tetrachloroethane	ND		ug/l	25	4.2	25
Benzene	30		ug/l	12	4.0	25
Toluene	29		ug/l	25	5.1	25
Ethylbenzene	910		ug/l	25	4.2	25
Chloromethane	ND		ug/l	50	5.0	25
Bromomethane	ND		ug/l	50	6.4	25
Vinyl chloride	ND		ug/l	25	1.8	25
Chloroethane	ND		ug/l	50	3.4	25
1,1-Dichloroethene	ND		ug/l	25	4.2	25
trans-1,2-Dichloroethene	ND		ug/l	25	4.1	25

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D Date Collected: 10/21/22 09:00

Client ID: AQPW-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	25	4.4	25
1,2-Dichlorobenzene	ND		ug/l	25	4.6	25
1,3-Dichlorobenzene	ND		ug/l	25	4.6	25
1,4-Dichlorobenzene	ND		ug/l	25	4.7	25
Methyl tert butyl ether	ND		ug/l	50	4.2	25
p/m-Xylene	320		ug/l	50	8.3	25
o-Xylene	300		ug/l	25	9.8	25
Xylenes, Total	620		ug/l	25	8.3	25
cis-1,2-Dichloroethene	ND		ug/l	25	4.7	25
1,2-Dichloroethene, Total	ND		ug/l	25	4.1	25
Dibromomethane	ND		ug/l	50	9.1	25
1,2,3-Trichloropropane	ND		ug/l	50	4.4	25
Styrene	ND		ug/l	25	9.0	25
Dichlorodifluoromethane	ND		ug/l	50	6.1	25
Acetone	ND		ug/l	120	36.	25
Carbon disulfide	ND		ug/l	50	7.5	25
Methyl ethyl ketone	ND		ug/l	120	48.	25
Methyl isobutyl ketone	ND		ug/l	120	10.	25
2-Hexanone	ND		ug/l	120	13.	25
Bromochloromethane	ND		ug/l	50	3.8	25
Tetrahydrofuran	ND		ug/l	50	13.	25
2,2-Dichloropropane	ND		ug/l	50	5.1	25
1,2-Dibromoethane	ND		ug/l	50	4.8	25
1,3-Dichloropropane	ND		ug/l	50	5.3	25
1,1,1,2-Tetrachloroethane	ND		ug/l	25	4.1	25
Bromobenzene	ND		ug/l	50	3.8	25
n-Butylbenzene	ND		ug/l	50	4.8	25
sec-Butylbenzene	ND		ug/l	50	4.5	25
tert-Butylbenzene	ND		ug/l	50	4.9	25
o-Chlorotoluene	ND		ug/l	50	5.4	25
p-Chlorotoluene	ND		ug/l	50	4.6	25
1,2-Dibromo-3-chloropropane	ND		ug/l	50	8.8	25
Hexachlorobutadiene	ND		ug/l	15	5.4	25
Isopropylbenzene	58		ug/l	50	4.7	25
p-Isopropyltoluene	7.8	J	ug/l	50	4.7	25
Naphthalene	2600		ug/l	50	5.4	25
n-Propylbenzene	17	J	ug/l	50	4.3	25

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	50	5.8	25
1,2,4-Trichlorobenzene	ND		ug/l	50	5.5	25
1,3,5-Trimethylbenzene	30	J	ug/l	50	5.4	25
1,2,4-Trimethylbenzene	170		ug/l	50	4.8	25
Diethyl ether	ND		ug/l	50	4.1	25
Diisopropyl Ether	ND		ug/l	50	11.	25
Ethyl-Tert-Butyl-Ether	ND		ug/l	50	4.5	25
Tertiary-Amyl Methyl Ether	ND		ug/l	50	7.0	25
1,4-Dioxane	ND		ug/l	6200	1500	25

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	92		70-130
Dibromofluoromethane	122		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13
Client ID: RB1-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 11:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:39
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13 Date Collected: 10/21/22 11:00

Client ID: RB1-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	2.2	J	ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13 Date Collected: 10/21/22 11:00

Client ID: RB1-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/03/22 17:15
Analyst: MKS
Percent Solids: 78%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	510	230	1
1,1-Dichloroethane	ND		ug/kg	100	15.	1
Chloroform	ND		ug/kg	150	14.	1
Carbon tetrachloride	ND		ug/kg	100	24.	1
1,2-Dichloropropane	ND		ug/kg	100	13.	1
Dibromochloromethane	ND		ug/kg	100	14.	1
1,1,2-Trichloroethane	ND		ug/kg	100	27.	1
Tetrachloroethene	ND		ug/kg	51	20.	1
Chlorobenzene	ND		ug/kg	51	13.	1
Trichlorofluoromethane	ND		ug/kg	410	71.	1
1,2-Dichloroethane	ND		ug/kg	100	26.	1
1,1,1-Trichloroethane	ND		ug/kg	51	17.	1
Bromodichloromethane	ND		ug/kg	51	11.	1
trans-1,3-Dichloropropene	ND		ug/kg	100	28.	1
cis-1,3-Dichloropropene	ND		ug/kg	51	16.	1
1,3-Dichloropropene, Total	ND		ug/kg	51	16.	1
1,1-Dichloropropene	ND		ug/kg	51	16.	1
Bromoform	ND		ug/kg	410	25.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	51	17.	1
Benzene	280		ug/kg	51	17.	1
Toluene	350		ug/kg	100	56.	1
Ethylbenzene	1300		ug/kg	100	14.	1
Chloromethane	ND		ug/kg	410	96.	1
Bromomethane	ND		ug/kg	200	60.	1
Vinyl chloride	ND		ug/kg	100	34.	1
Chloroethane	ND		ug/kg	200	46.	1
1,1-Dichloroethene	ND		ug/kg	100	24.	1
trans-1,2-Dichloroethene	ND		ug/kg	150	14.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 Date Collected: 10/21/22 10:15

Client ID: AQHA-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	ND		ug/kg	51	14.	1
1,2-Dichlorobenzene	ND		ug/kg	200	15.	1
1,3-Dichlorobenzene	ND		ug/kg	200	15.	1
1,4-Dichlorobenzene	ND		ug/kg	200	18.	1
Methyl tert butyl ether	ND		ug/kg	200	21.	1
p/m-Xylene	460		ug/kg	200	57.	1
o-Xylene	280		ug/kg	100	30.	1
Xylenes, Total	740		ug/kg	100	30.	1
cis-1,2-Dichloroethene	ND		ug/kg	100	18.	1
1,2-Dichloroethene, Total	ND		ug/kg	100	14.	1
Dibromomethane	ND		ug/kg	200	24.	1
1,2,3-Trichloropropane	ND		ug/kg	200	13.	1
Styrene	ND		ug/kg	100	20.	1
Dichlorodifluoromethane	ND		ug/kg	1000	94.	1
Acetone	ND		ug/kg	1000	490	1
Carbon disulfide	ND		ug/kg	1000	110	1
Methyl ethyl ketone	ND		ug/kg	1000	230	1
Methyl isobutyl ketone	ND		ug/kg	1000	130	1
2-Hexanone	ND		ug/kg	1000	120	1
Bromochloromethane	ND		ug/kg	200	21.	1
Tetrahydrofuran	ND		ug/kg	410	160	1
2,2-Dichloropropane	ND		ug/kg	200	21.	1
1,2-Dibromoethane	ND		ug/kg	100	29.	1
1,3-Dichloropropane	ND		ug/kg	200	17.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	51	14.	1
Bromobenzene	ND		ug/kg	200	15.	1
n-Butylbenzene	110		ug/kg	100	17.	1
sec-Butylbenzene	29	J	ug/kg	100	15.	1
tert-Butylbenzene	ND		ug/kg	200	12.	1
o-Chlorotoluene	ND		ug/kg	200	20.	1
p-Chlorotoluene	ND		ug/kg	200	11.	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	310	100	1
Hexachlorobutadiene	ND		ug/kg	410	17.	1
Isopropylbenzene	530		ug/kg	100	11.	1
p-Isopropyltoluene	290		ug/kg	100	11.	1
Naphthalene	29000		ug/kg	410	67.	1
n-Propylbenzene	320		ug/kg	100	18.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 Date Collected: 10/21/22 10:15

Client ID: AQHA-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	200	33.	1
1,2,4-Trichlorobenzene	ND		ug/kg	200	28.	1
1,3,5-Trimethylbenzene	990		ug/kg	200	20.	1
1,2,4-Trimethylbenzene	3400		ug/kg	200	34.	1
Diethyl ether	ND		ug/kg	200	35.	1
Diisopropyl Ether	ND		ug/kg	200	22.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	200	13.	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	200	18.	1
1,4-Dioxane	ND		ug/kg	8200	3600	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	114		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	96		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00
Client ID: DUP2-102122 Date Received: 10/21/22
Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/02/22 17:09
Analyst: NLK
Percent Solids: 77%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	2100	970	5
1,1-Dichloroethane	ND		ug/kg	420	61.	5
Chloroform	ND		ug/kg	630	59.	5
Carbon tetrachloride	ND		ug/kg	420	97.	5
1,2-Dichloropropane	ND		ug/kg	420	53.	5
Dibromochloromethane	ND		ug/kg	420	59.	5
1,1,2-Trichloroethane	ND		ug/kg	420	110	5
Tetrachloroethene	ND		ug/kg	210	83.	5
Chlorobenzene	ND		ug/kg	210	54.	5
Trichlorofluoromethane	ND		ug/kg	1700	290	5
1,2-Dichloroethane	ND		ug/kg	420	110	5
1,1,1-Trichloroethane	ND		ug/kg	210	70.	5
Bromodichloromethane	ND		ug/kg	210	46.	5
trans-1,3-Dichloropropene	ND		ug/kg	420	120	5
cis-1,3-Dichloropropene	ND		ug/kg	210	67.	5
1,3-Dichloropropene, Total	ND		ug/kg	210	67.	5
1,1-Dichloropropene	ND		ug/kg	210	67.	5
Bromoform	ND		ug/kg	1700	100	5
1,1,2,2-Tetrachloroethane	ND		ug/kg	210	70.	5
Benzene	160	J	ug/kg	210	70.	5
Toluene	270	J	ug/kg	420	230	5
Ethylbenzene	2100		ug/kg	420	60.	5
Chloromethane	ND		ug/kg	1700	390	5
Bromomethane	ND		ug/kg	840	240	5
Vinyl chloride	ND		ug/kg	420	140	5
Chloroethane	ND		ug/kg	840	190	5
1,1-Dichloroethene	ND		ug/kg	420	100	5
trans-1,2-Dichloroethene	ND		ug/kg	630	58.	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00

Client ID: DUP2-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	ND		ug/kg	210	58.	5
1,2-Dichlorobenzene	ND		ug/kg	840	61.	5
1,3-Dichlorobenzene	ND		ug/kg	840	62.	5
1,4-Dichlorobenzene	ND		ug/kg	840	72.	5
Methyl tert butyl ether	ND		ug/kg	840	85.	5
p/m-Xylene	420	J	ug/kg	840	240	5
o-Xylene	810		ug/kg	420	120	5
Xylenes, Total	1200	J	ug/kg	420	120	5
cis-1,2-Dichloroethene	ND		ug/kg	420	74.	5
1,2-Dichloroethene, Total	ND		ug/kg	420	58.	5
Dibromomethane	ND		ug/kg	840	100	5
1,2,3-Trichloropropane	ND		ug/kg	840	54.	5
Styrene	ND		ug/kg	420	83.	5
Dichlorodifluoromethane	ND		ug/kg	4200	390	5
Acetone	ND		ug/kg	4200	2000	5
Carbon disulfide	ND		ug/kg	4200	460	5
Methyl ethyl ketone	ND		ug/kg	4200	940	5
Methyl isobutyl ketone	ND		ug/kg	4200	540	5
2-Hexanone	ND		ug/kg	4200	500	5
Bromochloromethane	ND		ug/kg	840	87.	5
Tetrahydrofuran	ND		ug/kg	1700	670	5
2,2-Dichloropropane	ND		ug/kg	840	85.	5
1,2-Dibromoethane	ND		ug/kg	420	120	5
1,3-Dichloropropane	ND		ug/kg	840	70.	5
1,1,1,2-Tetrachloroethane	ND		ug/kg	210	56.	5
Bromobenzene	ND		ug/kg	840	61.	5
n-Butylbenzene	530		ug/kg	420	70.	5
sec-Butylbenzene	170	J	ug/kg	420	62.	5
tert-Butylbenzene	ND		ug/kg	840	50.	5
o-Chlorotoluene	ND		ug/kg	840	81.	5
p-Chlorotoluene	ND		ug/kg	840	46.	5
1,2-Dibromo-3-chloropropane	ND		ug/kg	1300	420	5
Hexachlorobutadiene	ND		ug/kg	1700	71.	5
Isopropylbenzene	3200		ug/kg	420	46.	5
p-Isopropyltoluene	1800		ug/kg	420	46.	5
Naphthalene	180000	E	ug/kg	1700	270	5
n-Propylbenzene	1700		ug/kg	420	72.	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00

Client ID: DUP2-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	840	140	5
1,2,4-Trichlorobenzene	ND		ug/kg	840	110	5
1,3,5-Trimethylbenzene	5800		ug/kg	840	82.	5
1,2,4-Trimethylbenzene	20000		ug/kg	840	140	5
Diethyl ether	ND		ug/kg	840	140	5
Diisopropyl Ether	ND		ug/kg	840	90.	5
Ethyl-Tert-Butyl-Ether	ND		ug/kg	840	54.	5
Tertiary-Amyl Methyl Ether	ND		ug/kg	840	74.	5
1,4-Dioxane	ND		ug/kg	34000	15000	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID:	L2259175-15	D	Date Collected:	10/21/22 00:00
Client ID:	DUP2-102122		Date Received:	10/21/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified

Sample Depth:

Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:35
Analyst: AJK
Percent Solids: 77%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Naphthalene	200000		ug/kg	6800	1100	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	88		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	88		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	87		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	122		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	104		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Methylene chloride	110		110		70-130	0		20
1,1-Dichloroethane	110		120		70-130	9		20
Chloroform	120		120		70-130	0		20
Carbon tetrachloride	120		120		70-130	0		20
1,2-Dichloropropane	100		110		70-130	10		20
Dibromochloromethane	100		110		70-130	10		20
1,1,2-Trichloroethane	98		100		70-130	2		20
Tetrachloroethene	120		120		70-130	0		20
Chlorobenzene	110		110		70-130	0		20
Trichlorofluoromethane	120		120		70-130	0		20
1,2-Dichloroethane	110		110		70-130	0		20
1,1,1-Trichloroethane	120		120		70-130	0		20
Bromodichloromethane	110		120		70-130	9		20
trans-1,3-Dichloropropene	110		110		70-130	0		20
cis-1,3-Dichloropropene	110		110		70-130	0		20
1,1-Dichloropropene	110		120		70-130	9		20
Bromoform	100		110		70-130	10		20
1,1,2,2-Tetrachloroethane	100		100		70-130	0		20
Benzene	110		110		70-130	0		20
Toluene	110		110		70-130	0		20
Ethylbenzene	120		120		70-130	0		20
Chloromethane	95		88		70-130	8		20
Bromomethane	110		**140**	Q	70-130	**24**	Q	20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Vinyl chloride	110		99		70-130	11		20
Chloroethane	120		120		70-130	0		20
1,1-Dichloroethene	120		120		70-130	0		20
trans-1,2-Dichloroethene	120		120		70-130	0		20
Trichloroethene	120		120		70-130	0		20
1,2-Dichlorobenzene	110		110		70-130	0		20
1,3-Dichlorobenzene	110		120		70-130	9		20
1,4-Dichlorobenzene	110		110		70-130	0		20
Methyl tert butyl ether	110		110		70-130	0		20
p/m-Xylene	115		120		70-130	4		20
o-Xylene	115		125		70-130	8		20
cis-1,2-Dichloroethene	120		120		70-130	0		20
Dibromomethane	100		120		70-130	18		20
1,2,3-Trichloropropane	100		98		70-130	2		20
Styrene	120		130		70-130	8		20
Dichlorodifluoromethane	99		**58**	Q	70-130	**52**	Q	20
Acetone	98		100		70-130	2		20
Carbon disulfide	120		**160**	Q	70-130	**29**	Q	20
Methyl ethyl ketone	95		94		70-130	1		20
Methyl isobutyl ketone	98		92		70-130	6		20
2-Hexanone	96		89		70-130	8		20
Bromochloromethane	120		120		70-130	0		20
Tetrahydrofuran	100		110		70-130	10		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
2,2-Dichloropropane	120		130		70-130	8		20
1,2-Dibromoethane	100		110		70-130	10		20
1,3-Dichloropropane	97		100		70-130	3		20
1,1,1,2-Tetrachloroethane	110		110		70-130	0		20
Bromobenzene	110		110		70-130	0		20
n-Butylbenzene	120		120		70-130	0		20
sec-Butylbenzene	110		120		70-130	9		20
tert-Butylbenzene	110		120		70-130	9		20
o-Chlorotoluene	110		110		70-130	0		20
p-Chlorotoluene	110		110		70-130	0		20
1,2-Dibromo-3-chloropropane	97		100		70-130	3		20
Hexachlorobutadiene	130		**140**	Q	70-130	7		20
Isopropylbenzene	110		110		70-130	0		20
p-Isopropyltoluene	120		120		70-130	0		20
Naphthalene	110		110		70-130	0		20
n-Propylbenzene	110		110		70-130	0		20
1,2,3-Trichlorobenzene	130		130		70-130	0		20
1,2,4-Trichlorobenzene	130		130		70-130	0		20
1,3,5-Trimethylbenzene	110		120		70-130	9		20
1,2,4-Trimethylbenzene	110		120		70-130	9		20
Diethyl ether	100		110		70-130	10		20
Diisopropyl Ether	98		99		70-130	1		20
Ethyl-Tert-Butyl-Ether	100		100		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Tertiary-Amyl Methyl Ether	110		100		70-130	10		20
1,4-Dioxane	**136**	Q	102		70-130	**29**	Q	20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	101		102		70-130
Toluene-d8	96		98		70-130
4-Bromofluorobenzene	94		96		70-130
Dibromofluoromethane	106		109		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Methylene chloride	89		89		70-130	0		20
1,1-Dichloroethane	100		101		70-130	1		20
Chloroform	86		86		70-130	0		20
Carbon tetrachloride	98		97		70-130	1		20
1,2-Dichloropropane	94		95		70-130	1		20
Dibromochloromethane	99		98		70-130	1		20
1,1,2-Trichloroethane	86		86		70-130	0		20
Tetrachloroethene	122		122		70-130	0		20
Chlorobenzene	104		104		70-130	0		20
Trichlorofluoromethane	96		98		70-130	2		20
1,2-Dichloroethane	84		83		70-130	1		20
1,1,1-Trichloroethane	97		97		70-130	0		20
Bromodichloromethane	83		84		70-130	1		20
trans-1,3-Dichloropropene	92		92		70-130	0		20
cis-1,3-Dichloropropene	92		91		70-130	1		20
1,1-Dichloropropene	102		102		70-130	0		20
Bromoform	94		95		70-130	1		20
1,1,2,2-Tetrachloroethane	79		80		70-130	1		20
Benzene	93		94		70-130	1		20
Toluene	101		101		70-130	0		20
Ethylbenzene	98		98		70-130	0		20
Chloromethane	99		100		70-130	1		20
Bromomethane	80		83		70-130	4		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Vinyl chloride	96		97		70-130	1		20
Chloroethane	88		89		70-130	1		20
1,1-Dichloroethene	114		114		70-130	0		20
trans-1,2-Dichloroethene	104		105		70-130	1		20
Trichloroethene	103		102		70-130	1		20
1,2-Dichlorobenzene	101		102		70-130	1		20
1,3-Dichlorobenzene	103		104		70-130	1		20
1,4-Dichlorobenzene	102		103		70-130	1		20
Methyl tert butyl ether	82		83		70-130	1		20
p/m-Xylene	108		107		70-130	1		20
o-Xylene	102		102		70-130	0		20
cis-1,2-Dichloroethene	96		97		70-130	1		20
Dibromomethane	84		84		70-130	0		20
1,2,3-Trichloropropane	78		81		70-130	4		20
Styrene	97		98		70-130	1		20
Dichlorodifluoromethane	86		86		70-130	0		20
Acetone	**69**	Q	**69**	Q	70-130	0		20
Carbon disulfide	**69**	Q	70		70-130	1		20
Methyl ethyl ketone	**69**	Q	**68**	Q	70-130	1		20
Methyl isobutyl ketone	93		91		70-130	2		20
2-Hexanone	74		72		70-130	3		20
Bromochloromethane	107		107		70-130	0		20
Tetrahydrofuran	76		74		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
2,2-Dichloropropane	101		101		70-130	0		20
1,2-Dibromoethane	96		95		70-130	1		20
1,3-Dichloropropane	87		87		70-130	0		20
1,1,1,2-Tetrachloroethane	103		103		70-130	0		20
Bromobenzene	102		104		70-130	2		20
n-Butylbenzene	95		96		70-130	1		20
sec-Butylbenzene	99		101		70-130	2		20
tert-Butylbenzene	104		106		70-130	2		20
o-Chlorotoluene	95		96		70-130	1		20
p-Chlorotoluene	96		97		70-130	1		20
1,2-Dibromo-3-chloropropane	94		95		70-130	1		20
Hexachlorobutadiene	116		119		70-130	3		20
Isopropylbenzene	97		98		70-130	1		20
p-Isopropyltoluene	105		106		70-130	1		20
Naphthalene	95		95		70-130	0		20
n-Propylbenzene	94		96		70-130	2		20
1,2,3-Trichlorobenzene	106		107		70-130	1		20
1,2,4-Trichlorobenzene	110		112		70-130	2		20
1,3,5-Trimethylbenzene	100		101		70-130	1		20
1,2,4-Trimethylbenzene	99		99		70-130	0		20
Diethyl ether	88		88		70-130	0		20
Diisopropyl Ether	94		95		70-130	1		20
Ethyl-Tert-Butyl-Ether	99		100		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Tertiary-Amyl Methyl Ether	87		87		70-130	0		20
1,4-Dioxane	116		115		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	88		87		70-130
Toluene-d8	101		100		70-130
4-Bromofluorobenzene	94		95		70-130
Dibromofluoromethane	104		103		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Methylene chloride	100		99		70-130	1		20
1,1-Dichloroethane	110		110		70-130	0		20
Chloroform	99		96		70-130	3		20
Carbon tetrachloride	100		87		70-130	14		20
1,2-Dichloropropane	100		99		70-130	1		20
Dibromochloromethane	79		80		70-130	1		20
1,1,2-Trichloroethane	82		80		70-130	2		20
Tetrachloroethene	87		84		70-130	4		20
Chlorobenzene	90		86		70-130	5		20
Trichlorofluoromethane	90		87		70-130	3		20
1,2-Dichloroethane	92		90		70-130	2		20
1,1,1-Trichloroethane	93		93		70-130	0		20
Bromodichloromethane	88		87		70-130	1		20
trans-1,3-Dichloropropene	80		77		70-130	4		20
cis-1,3-Dichloropropene	83		81		70-130	2		20
1,1-Dichloropropene	89		88		70-130	1		20
Bromoform	**68**	Q	**64**	Q	70-130	6		20
1,1,2,2-Tetrachloroethane	72		**69**	Q	70-130	4		20
Benzene	97		95		70-130	2		20
Toluene	95		92		70-130	3		20
Ethylbenzene	96		93		70-130	3		20
Chloromethane	120		110		70-130	9		20
Bromomethane	74		75		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Vinyl chloride	110		110		70-130	0		20
Chloroethane	100		100		70-130	0		20
1,1-Dichloroethene	97		97		70-130	0		20
trans-1,2-Dichloroethene	100		100		70-130	0		20
Trichloroethene	90		88		70-130	2		20
1,2-Dichlorobenzene	86		82		70-130	5		20
1,3-Dichlorobenzene	85		82		70-130	4		20
1,4-Dichlorobenzene	85		83		70-130	2		20
Methyl tert butyl ether	80		81		70-130	1		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		95		70-130	5		20
cis-1,2-Dichloroethene	100		99		70-130	1		20
Dibromomethane	85		85		70-130	0		20
1,2,3-Trichloropropane	70		**67**	Q	70-130	4		20
Styrene	95		90		70-130	5		20
Dichlorodifluoromethane	75		72		70-130	4		20
Acetone	100		110		70-130	10		20
Carbon disulfide	74		73		70-130	1		20
Methyl ethyl ketone	82		80		70-130	2		20
Methyl isobutyl ketone	85		87		70-130	2		20
2-Hexanone	86		86		70-130	0		20
Bromochloromethane	95		92		70-130	3		20
Tetrahydrofuran	99		97		70-130	2		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
2,2-Dichloropropane	90		90		70-130	0		20
1,2-Dibromoethane	83		80		70-130	4		20
1,3-Dichloropropane	88		85		70-130	3		20
1,1,1,2-Tetrachloroethane	80		76		70-130	5		20
Bromobenzene	81		76		70-130	6		20
n-Butylbenzene	86		83		70-130	4		20
sec-Butylbenzene	88		85		70-130	3		20
tert-Butylbenzene	88		85		70-130	3		20
o-Chlorotoluene	87		83		70-130	5		20
p-Chlorotoluene	87		84		70-130	4		20
1,2-Dibromo-3-chloropropane	**67**	Q	**62**	Q	70-130	8		20
Hexachlorobutadiene	77		74		70-130	4		20
Isopropylbenzene	85		82		70-130	4		20
p-Isopropyltoluene	88		85		70-130	3		20
Naphthalene	76		73		70-130	4		20
n-Propylbenzene	89		85		70-130	5		20
1,2,3-Trichlorobenzene	78		76		70-130	3		20
1,2,4-Trichlorobenzene	78		74		70-130	5		20
1,3,5-Trimethylbenzene	84		80		70-130	5		20
1,2,4-Trimethylbenzene	84		80		70-130	5		20
Diethyl ether	89		88		70-130	1		20
Diisopropyl Ether	100		100		70-130	0		20
Ethyl-Tert-Butyl-Ether	91		90		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Tertiary-Amyl Methyl Ether	77		75		70-130	3		20
1,4-Dioxane	102		102		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	103		104		70-130
Toluene-d8	104		104		70-130
4-Bromofluorobenzene	94		90		70-130
Dibromofluoromethane	106		106		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Methylene chloride	99		99		70-130	0		20
1,1-Dichloroethane	100		100		70-130	0		20
Chloroform	100		110		70-130	10		20
Carbon tetrachloride	110		110		70-130	0		20
1,2-Dichloropropane	98		97		70-130	1		20
Dibromochloromethane	100		100		70-130	0		20
1,1,2-Trichloroethane	95		97		70-130	2		20
Tetrachloroethene	110		110		70-130	0		20
Chlorobenzene	100		100		70-130	0		20
Trichlorofluoromethane	110		110		70-130	0		20
1,2-Dichloroethane	100		100		70-130	0		20
1,1,1-Trichloroethane	110		110		70-130	0		20
Bromodichloromethane	100		100		70-130	0		20
trans-1,3-Dichloropropene	100		100		70-130	0		20
cis-1,3-Dichloropropene	110		110		70-130	0		20
1,1-Dichloropropene	100		100		70-130	0		20
Bromoform	100		100		70-130	0		20
1,1,2,2-Tetrachloroethane	95		97		70-130	2		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	86		87		70-130	1		20
Bromomethane	110		110		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Vinyl chloride	96		99		70-130	3		20
Chloroethane	95		99		70-130	4		20
1,1-Dichloroethene	100		100		70-130	0		20
trans-1,2-Dichloroethene	100		100		70-130	0		20
Trichloroethene	110		110		70-130	0		20
1,2-Dichlorobenzene	100		100		70-130	0		20
1,3-Dichlorobenzene	110		100		70-130	10		20
1,4-Dichlorobenzene	100		100		70-130	0		20
Methyl tert butyl ether	100		100		70-130	0		20
p/m-Xylene	105		110		70-130	5		20
o-Xylene	105		110		70-130	5		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	100		110		70-130	10		20
1,2,3-Trichloropropane	92		90		70-130	2		20
Styrene	110		115		70-130	4		20
Dichlorodifluoromethane	85		87		70-130	2		20
Acetone	91		95		70-130	4		20
Carbon disulfide	100		100		70-130	0		20
Methyl ethyl ketone	92		91		70-130	1		20
Methyl isobutyl ketone	88		86		70-130	2		20
2-Hexanone	84		89		70-130	6		20
Bromochloromethane	110		110		70-130	0		20
Tetrahydrofuran	93		100		70-130	7		20

Lab Control Sample Analysis
Batch Quality Control

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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
2,2-Dichloropropane	110		110		70-130	0		20
1,2-Dibromoethane	100		100		70-130	0		20
1,3-Dichloropropane	94		93		70-130	1		20
1,1,1,2-Tetrachloroethane	100		100		70-130	0		20
Bromobenzene	100		100		70-130	0		20
n-Butylbenzene	110		100		70-130	10		20
sec-Butylbenzene	100		100		70-130	0		20
tert-Butylbenzene	100		100		70-130	0		20
o-Chlorotoluene	99		100		70-130	1		20
p-Chlorotoluene	100		98		70-130	2		20
1,2-Dibromo-3-chloropropane	95		96		70-130	1		20
Hexachlorobutadiene	120		110		70-130	9		20
Isopropylbenzene	100		100		70-130	0		20
p-Isopropyltoluene	110		110		70-130	0		20
Naphthalene	100		100		70-130	0		20
n-Propylbenzene	100		100		70-130	0		20
1,2,3-Trichlorobenzene	110		110		70-130	0		20
1,2,4-Trichlorobenzene	120		110		70-130	9		20
1,3,5-Trimethylbenzene	100		100		70-130	0		20
1,2,4-Trimethylbenzene	100		100		70-130	0		20
Diethyl ether	97		100		70-130	3		20
Diisopropyl Ether	91		91		70-130	0		20
Ethyl-Tert-Butyl-Ether	100		99		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Tertiary-Amyl Methyl Ether	100		100		70-130	0		20
1,4-Dioxane	108		112		70-130	4		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		98		70-130
Toluene-d8	95		99		70-130
4-Bromofluorobenzene	93		93		70-130
Dibromofluoromethane	99		102		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Methylene chloride	98		110		70-130	12		20
1,1-Dichloroethane	100		110		70-130	10		20
Chloroform	95		100		70-130	5		20
Carbon tetrachloride	88		94		70-130	7		20
1,2-Dichloropropane	100		100		70-130	0		20
Dibromochloromethane	88		85		70-130	3		20
1,1,2-Trichloroethane	90		87		70-130	3		20
Tetrachloroethene	100		100		70-130	0		20
Chlorobenzene	97		97		70-130	0		20
Trichlorofluoromethane	82		99		70-130	19		20
1,2-Dichloroethane	86		92		70-130	7		20
1,1,1-Trichloroethane	91		100		70-130	9		20
Bromodichloromethane	88		94		70-130	7		20
trans-1,3-Dichloropropene	88		84		70-130	5		20
cis-1,3-Dichloropropene	90		88		70-130	2		20
1,1-Dichloropropene	97		98		70-130	1		20
Bromoform	80		74		70-130	8		20
1,1,2,2-Tetrachloroethane	81		76		70-130	6		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	100		120		70-130	18		20
Bromomethane	83		98		70-130	17		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Vinyl chloride	120		120		70-130	0		20
Chloroethane	89		120		70-130	**30**	Q	20
1,1-Dichloroethene	98		110		70-130	12		20
trans-1,2-Dichloroethene	100		110		70-130	10		20
Trichloroethene	99		98		70-130	1		20
1,2-Dichlorobenzene	93		93		70-130	0		20
1,3-Dichlorobenzene	95		93		70-130	2		20
1,4-Dichlorobenzene	95		94		70-130	1		20
Methyl tert butyl ether	85		83		70-130	2		20
p/m-Xylene	105		110		70-130	5		20
o-Xylene	100		105		70-130	5		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	86		92		70-130	7		20
1,2,3-Trichloropropane	84		75		70-130	11		20
Styrene	100		100		70-130	0		20
Dichlorodifluoromethane	89		97		70-130	9		20
Acetone	**150**	Q	100		70-130	**40**	Q	20
Carbon disulfide	81		78		70-130	4		20
Methyl ethyl ketone	120		78		70-130	**42**	Q	20
Methyl isobutyl ketone	110		89		70-130	**21**	Q	20
2-Hexanone	100		78		70-130	**25**	Q	20
Bromochloromethane	93		100		70-130	7		20
Tetrahydrofuran	130		95		70-130	**31**	Q	20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
2,2-Dichloropropane	91		98		70-130	7		20
1,2-Dibromoethane	95		90		70-130	5		20
1,3-Dichloropropane	94		92		70-130	2		20
1,1,1,2-Tetrachloroethane	89		86		70-130	3		20
Bromobenzene	90		87		70-130	3		20
n-Butylbenzene	98		94		70-130	4		20
sec-Butylbenzene	97		98		70-130	1		20
tert-Butylbenzene	96		97		70-130	1		20
o-Chlorotoluene	93		92		70-130	1		20
p-Chlorotoluene	93		94		70-130	1		20
1,2-Dibromo-3-chloropropane	84		73		70-130	14		20
Hexachlorobutadiene	100		89		70-130	12		20
Isopropylbenzene	94		93		70-130	1		20
p-Isopropyltoluene	98		97		70-130	1		20
Naphthalene	93		81		70-130	14		20
n-Propylbenzene	96		96		70-130	0		20
1,2,3-Trichlorobenzene	99		84		70-130	16		20
1,2,4-Trichlorobenzene	97		83		70-130	16		20
1,3,5-Trimethylbenzene	93		91		70-130	2		20
1,2,4-Trimethylbenzene	93		89		70-130	4		20
Diethyl ether	86		91		70-130	6		20
Diisopropyl Ether	100		100		70-130	0		20
Ethyl-Tert-Butyl-Ether	97		94		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Tertiary-Amyl Methyl Ether	86		82		70-130	5		20
1,4-Dioxane	**140**	Q	78		70-130	**57**	Q	20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	91		96		70-130
Toluene-d8	102		103		70-130
4-Bromofluorobenzene	93		91		70-130
Dibromofluoromethane	95		103		70-130

Lab Control Sample Analysis
Batch Quality Control

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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Methylene chloride	84		84		70-130	0		20
1,1-Dichloroethane	94		94		70-130	0		20
Chloroform	81		81		70-130	0		20
Carbon tetrachloride	88		88		70-130	0		20
1,2-Dichloropropane	90		90		70-130	0		20
Dibromochloromethane	93		92		70-130	1		20
1,1,2-Trichloroethane	84		83		70-130	1		20
Tetrachloroethene	114		115		70-130	1		20
Chlorobenzene	99		98		70-130	1		20
Trichlorofluoromethane	87		90		70-130	3		20
1,2-Dichloroethane	78		78		70-130	0		20
1,1,1-Trichloroethane	88		89		70-130	1		20
Bromodichloromethane	79		79		70-130	0		20
trans-1,3-Dichloropropene	91		90		70-130	1		20
cis-1,3-Dichloropropene	88		88		70-130	0		20
1,1-Dichloropropene	96		96		70-130	0		20
Bromoform	90		89		70-130	1		20
1,1,2,2-Tetrachloroethane	80		78		70-130	3		20
Benzene	89		89		70-130	0		20
Toluene	97		96		70-130	1		20
Ethylbenzene	94		93		70-130	1		20
Chloromethane	88		88		70-130	0		20
Bromomethane	76		76		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Vinyl chloride	89		87		70-130	2		20
Chloroethane	81		82		70-130	1		20
1,1-Dichloroethene	107		106		70-130	1		20
trans-1,2-Dichloroethene	97		97		70-130	0		20
Trichloroethene	94		94		70-130	0		20
1,2-Dichlorobenzene	95		95		70-130	0		20
1,3-Dichlorobenzene	97		96		70-130	1		20
1,4-Dichlorobenzene	96		95		70-130	1		20
Methyl tert butyl ether	80		79		70-130	1		20
p/m-Xylene	102		101		70-130	1		20
o-Xylene	97		97		70-130	0		20
cis-1,2-Dichloroethene	90		89		70-130	1		20
Dibromomethane	80		79		70-130	1		20
1,2,3-Trichloropropane	77		79		70-130	3		20
Styrene	94		93		70-130	1		20
Dichlorodifluoromethane	79		78		70-130	1		20
Acetone	**65**	Q	**62**	Q	70-130	5		20
Carbon disulfide	**65**	Q	**65**	Q	70-130	0		20
Methyl ethyl ketone	**64**	Q	**64**	Q	70-130	0		20
Methyl isobutyl ketone	94		89		70-130	5		20
2-Hexanone	72		**68**	Q	70-130	6		20
Bromochloromethane	99		98		70-130	1		20
Tetrahydrofuran	71		**68**	Q	70-130	4		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
2,2-Dichloropropane	94		93		70-130	1		20
1,2-Dibromoethane	93		91		70-130	2		20
1,3-Dichloropropane	87		85		70-130	2		20
1,1,1,2-Tetrachloroethane	97		95		70-130	2		20
Bromobenzene	96		96		70-130	0		20
n-Butylbenzene	90		89		70-130	1		20
sec-Butylbenzene	94		94		70-130	0		20
tert-Butylbenzene	98		97		70-130	1		20
o-Chlorotoluene	91		91		70-130	0		20
p-Chlorotoluene	92		92		70-130	0		20
1,2-Dibromo-3-chloropropane	94		90		70-130	4		20
Hexachlorobutadiene	112		111		70-130	1		20
Isopropylbenzene	92		92		70-130	0		20
p-Isopropyltoluene	98		98		70-130	0		20
Naphthalene	91		88		70-130	3		20
n-Propylbenzene	90		90		70-130	0		20
1,2,3-Trichlorobenzene	102		100		70-130	2		20
1,2,4-Trichlorobenzene	105		103		70-130	2		20
1,3,5-Trimethylbenzene	95		94		70-130	1		20
1,2,4-Trimethylbenzene	94		94		70-130	0		20
Diethyl ether	86		85		70-130	1		20
Diisopropyl Ether	86		86		70-130	0		20
Ethyl-Tert-Butyl-Ether	94		93		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Tertiary-Amyl Methyl Ether	85		84		70-130	1		20
1,4-Dioxane	116		114		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	86		85		70-130
Toluene-d8	103		102		70-130
4-Bromofluorobenzene	97		97		70-130
Dibromofluoromethane	100		99		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Methylene chloride	110		110		70-130	0		20
1,1-Dichloroethane	120		110		70-130	9		20
Chloroform	100		100		70-130	0		20
Carbon tetrachloride	94		99		70-130	5		20
1,2-Dichloropropane	100		110		70-130	10		20
Dibromochloromethane	82		86		70-130	5		20
1,1,2-Trichloroethane	83		88		70-130	6		20
Tetrachloroethene	100		99		70-130	1		20
Chlorobenzene	99		97		70-130	2		20
Trichlorofluoromethane	99		99		70-130	0		20
1,2-Dichloroethane	90		93		70-130	3		20
1,1,1-Trichloroethane	100		100		70-130	0		20
Bromodichloromethane	89		94		70-130	5		20
trans-1,3-Dichloropropene	82		85		70-130	4		20
cis-1,3-Dichloropropene	85		91		70-130	7		20
1,1-Dichloropropene	96		98		70-130	2		20
Bromoform	**69**	Q	73		70-130	6		20
1,1,2,2-Tetrachloroethane	74		77		70-130	4		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	130		120		70-130	8		20
Bromomethane	87		81		70-130	7		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Vinyl chloride	130		130		70-130	0		20
Chloroethane	120		120		70-130	0		20
1,1-Dichloroethene	110		110		70-130	0		20
trans-1,2-Dichloroethene	110		110		70-130	0		20
Trichloroethene	97		98		70-130	1		20
1,2-Dichlorobenzene	95		94		70-130	1		20
1,3-Dichlorobenzene	97		94		70-130	3		20
1,4-Dichlorobenzene	97		95		70-130	2		20
Methyl tert butyl ether	75		83		70-130	10		20
p/m-Xylene	110		110		70-130	0		20
o-Xylene	110		110		70-130	0		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	90		92		70-130	2		20
1,2,3-Trichloropropane	72		76		70-130	5		20
Styrene	105		100		70-130	5		20
Dichlorodifluoromethane	96		97		70-130	1		20
Acetone	94		100		70-130	6		20
Carbon disulfide	83		79		70-130	5		20
Methyl ethyl ketone	71		82		70-130	14		20
Methyl isobutyl ketone	81		88		70-130	8		20
2-Hexanone	74		82		70-130	10		20
Bromochloromethane	100		100		70-130	0		20
Tetrahydrofuran	89		100		70-130	12		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
2,2-Dichloropropane	99		100		70-130	1		20
1,2-Dibromoethane	84		89		70-130	6		20
1,3-Dichloropropane	89		92		70-130	3		20
1,1,1,2-Tetrachloroethane	84		85		70-130	1		20
Bromobenzene	89		88		70-130	1		20
n-Butylbenzene	98		97		70-130	1		20
sec-Butylbenzene	100		99		70-130	1		20
tert-Butylbenzene	100		98		70-130	2		20
o-Chlorotoluene	96		94		70-130	2		20
p-Chlorotoluene	98		95		70-130	3		20
1,2-Dibromo-3-chloropropane	**67**	Q	70		70-130	4		20
Hexachlorobutadiene	92		89		70-130	3		20
Isopropylbenzene	97		95		70-130	2		20
p-Isopropyltoluene	100		98		70-130	2		20
Naphthalene	79		81		70-130	3		20
n-Propylbenzene	100		98		70-130	2		20
1,2,3-Trichlorobenzene	85		86		70-130	1		20
1,2,4-Trichlorobenzene	84		84		70-130	0		20
1,3,5-Trimethylbenzene	93		93		70-130	0		20
1,2,4-Trimethylbenzene	93		91		70-130	2		20
Diethyl ether	84		91		70-130	8		20
Diisopropyl Ether	100		110		70-130	10		20
Ethyl-Tert-Butyl-Ether	87		95		70-130	9		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Tertiary-Amyl Methyl Ether	75		82		70-130	9		20
1,4-Dioxane	116		124		70-130	7		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	94		98		70-130
Toluene-d8	104		101		70-130
4-Bromofluorobenzene	94		92		70-130
Dibromofluoromethane	101		104		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Methylene chloride	89		92		70-130	3		20
1,1-Dichloroethane	86		89		70-130	3		20
Chloroform	97		101		70-130	4		20
Carbon tetrachloride	96		100		70-130	4		20
1,2-Dichloropropane	85		86		70-130	1		20
Dibromochloromethane	99		101		70-130	2		20
1,1,2-Trichloroethane	90		92		70-130	2		20
Tetrachloroethene	103		107		70-130	4		20
Chlorobenzene	98		100		70-130	2		20
Trichlorofluoromethane	101		104		70-130	3		20
1,2-Dichloroethane	99		101		70-130	2		20
1,1,1-Trichloroethane	98		101		70-130	3		20
Bromodichloromethane	92		96		70-130	4		20
trans-1,3-Dichloropropene	94		97		70-130	3		20
cis-1,3-Dichloropropene	98		100		70-130	2		20
1,1-Dichloropropene	95		97		70-130	2		20
Bromoform	92		91		70-130	1		20
1,1,2,2-Tetrachloroethane	81		78		70-130	4		20
Benzene	93		96		70-130	3		20
Toluene	91		94		70-130	3		20
Ethylbenzene	93		97		70-130	4		20
Chloromethane	**67**	Q	**69**	Q	70-130	3		20
Bromomethane	119		120		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Vinyl chloride	78		81		70-130	4		20
Chloroethane	84		86		70-130	2		20
1,1-Dichloroethene	96		95		70-130	1		20
trans-1,2-Dichloroethene	88		92		70-130	4		20
Trichloroethene	92		96		70-130	4		20
1,2-Dichlorobenzene	96		96		70-130	0		20
1,3-Dichlorobenzene	94		96		70-130	2		20
1,4-Dichlorobenzene	94		95		70-130	1		20
Methyl tert butyl ether	96		95		70-130	1		20
p/m-Xylene	98		101		70-130	3		20
o-Xylene	96		99		70-130	3		20
cis-1,2-Dichloroethene	90		94		70-130	4		20
Dibromomethane	96		98		70-130	2		20
1,2,3-Trichloropropane	87		86		70-130	1		20
Styrene	96		99		70-130	3		20
Dichlorodifluoromethane	79		82		70-130	4		20
Acetone	73		**68**	Q	70-130	7		20
Carbon disulfide	**67**	Q	70		70-130	4		20
Methyl ethyl ketone	**64**	Q	**57**	Q	70-130	12		20
Methyl isobutyl ketone	74		71		70-130	4		20
2-Hexanone	**69**	Q	**66**	Q	70-130	4		20
Bromochloromethane	99		100		70-130	1		20
Tetrahydrofuran	70		**68**	Q	70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
2,2-Dichloropropane	89		92		70-130	3		20
1,2-Dibromoethane	96		97		70-130	1		20
1,3-Dichloropropane	95		96		70-130	1		20
1,1,1,2-Tetrachloroethane	101		104		70-130	3		20
Bromobenzene	94		94		70-130	0		20
n-Butylbenzene	90		93		70-130	3		20
sec-Butylbenzene	89		91		70-130	2		20
tert-Butylbenzene	88		89		70-130	1		20
o-Chlorotoluene	88		88		70-130	0		20
p-Chlorotoluene	91		92		70-130	1		20
1,2-Dibromo-3-chloropropane	80		81		70-130	1		20
Hexachlorobutadiene	100		100		70-130	0		20
Isopropylbenzene	88		89		70-130	1		20
p-Isopropyltoluene	90		92		70-130	2		20
Naphthalene	85		84		70-130	1		20
n-Propylbenzene	89		91		70-130	2		20
1,2,3-Trichlorobenzene	100		99		70-130	1		20
1,2,4-Trichlorobenzene	99		98		70-130	1		20
1,3,5-Trimethylbenzene	91		93		70-130	2		20
1,2,4-Trimethylbenzene	91		92		70-130	1		20
Diethyl ether	99		98		70-130	1		20
Diisopropyl Ether	78		80		70-130	3		20
Ethyl-Tert-Butyl-Ether	86		89		70-130	3		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Tertiary-Amyl Methyl Ether	92		93		70-130	1		20
1,4-Dioxane	84		84		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	103		106		70-130
Toluene-d8	100		101		70-130
4-Bromofluorobenzene	95		93		70-130
Dibromofluoromethane	99		98		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
Methylene chloride	ND	100	110	110		110	110		70-130	0		20
1,1-Dichloroethane	ND	100	110	110		110	110		70-130	0		20
Chloroform	ND	100	100	100		110	110		70-130	10		20
Carbon tetrachloride	ND	100	110	110		94	94		70-130	16		20
1,2-Dichloropropane	ND	100	100	100		100	100		70-130	0		20
Dibromochloromethane	ND	100	82	82		86	86		70-130	5		20
1,1,2-Trichloroethane	ND	100	83	83		86	86		70-130	4		20
Tetrachloroethene	ND	100	98	98		98	98		70-130	0		20
Chlorobenzene	ND	100	96	96		99	99		70-130	3		20
Trichlorofluoromethane	ND	100	96	96		96	96		70-130	0		20
1,2-Dichloroethane	ND	100	91	91		91	91		70-130	0		20
1,1,1-Trichloroethane	ND	100	99	99		100	100		70-130	1		20
Bromodichloromethane	ND	100	92	92		93	93		70-130	1		20
trans-1,3-Dichloropropene	ND	100	80	80		84	84		70-130	5		20
cis-1,3-Dichloropropene	ND	100	87	87		88	88		70-130	1		20
1,1-Dichloropropene	ND	100	95	95		96	96		70-130	1		20
Bromoform	ND	100	72	72		72	72		70-130	0		20
1,1,2,2-Tetrachloroethane	ND	100	74	74		75	75		70-130	1		20
Benzene	49	100	150	101		150	101		70-130	0		20
Toluene	5.8J	100	100	100		110	110		70-130	10		20
Ethylbenzene	400	100	450	**50**	Q	460	**60**	Q	70-130	2		20
Chloromethane	ND	100	120	120		110	110		70-130	9		20
Bromomethane	ND	100	63	**63**	Q	63	**63**	Q	70-130	0		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
Vinyl chloride	ND	100	120	120		120	120		70-130	0		20
Chloroethane	ND	100	120	120		120	120		70-130	0		20
1,1-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
trans-1,2-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
Trichloroethene	ND	100	97	97		96	96		70-130	1		20
1,2-Dichlorobenzene	ND	100	91	91		94	94		70-130	3		20
1,3-Dichlorobenzene	ND	100	93	93		95	95		70-130	2		20
1,4-Dichlorobenzene	ND	100	93	93		95	95		70-130	2		20
Methyl tert butyl ether	ND	100	79	79		81	81		70-130	3		20
p/m-Xylene	36	200	240	102		250	107		70-130	4		20
o-Xylene	220	200	400	90		420	100		70-130	5		20
cis-1,2-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
Dibromomethane	ND	100	93	93		93	93		70-130	0		20
1,2,3-Trichloropropane	ND	100	71	71		73	73		70-130	3		20
Styrene	ND	200	200	100		200	100		70-130	0		20
Dichlorodifluoromethane	ND	100	93	93		92	92		70-130	1		20
Acetone	ND	100	97	97		100	100		70-130	3		20
Carbon disulfide	ND	100	79	79		80	80		70-130	1		20
Methyl ethyl ketone	ND	100	72	72		76	76		70-130	5		20
Methyl isobutyl ketone	ND	100	80	80		84	84		70-130	5		20
2-Hexanone	ND	100	73	73		75	75		70-130	3		20
Bromochloromethane	ND	100	100	100		100	100		70-130	0		20
Tetrahydrofuran	ND	100	86	86		89	89		70-130	3		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
2,2-Dichloropropane	ND	100	98	98		98	98		70-130	0		20
1,2-Dibromoethane	ND	100	86	86		89	89		70-130	3		20
1,3-Dichloropropane	ND	100	87	87		90	90		70-130	3		20
1,1,1,2-Tetrachloroethane	ND	100	84	84		88	88		70-130	5		20
Bromobenzene	ND	100	84	84		87	87		70-130	4		20
n-Butylbenzene	ND	100	96	96		98	98		70-130	2		20
sec-Butylbenzene	ND	100	94	94		95	95		70-130	1		20
tert-Butylbenzene	ND	100	92	92		95	95		70-130	3		20
o-Chlorotoluene	ND	100	91	91		93	93		70-130	2		20
p-Chlorotoluene	ND	100	90	90		93	93		70-130	3		20
1,2-Dibromo-3-chloropropane	ND	100	70	70		71	71		70-130	1		20
Hexachlorobutadiene	ND	100	86	86		88	88		70-130	2		20
Isopropylbenzene	36	100	120	84		120	84		70-130	0		20
p-Isopropyltoluene	3.9J	100	100	100		100	100		70-130	0		20
Naphthalene	1100	100	1100	**0**	Q	1100	**0**	Q	70-130	0		20
n-Propylbenzene	13J	100	100	100		100	100		70-130	0		20
1,2,3-Trichlorobenzene	ND	100	88	88		90	90		70-130	2		20
1,2,4-Trichlorobenzene	ND	100	86	86		88	88		70-130	2		20
1,3,5-Trimethylbenzene	16J	100	100	100		110	110		70-130	10		20
1,2,4-Trimethylbenzene	140	100	220	80		220	80		70-130	0		20
Diethyl ether	ND	100	88	88		90	90		70-130	2		20
Diisopropyl Ether	ND	100	96	96		97	97		70-130	1		20
Ethyl-Tert-Butyl-Ether	ND	100	90	90		91	91		70-130	1		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 QC Batch ID: WG1707170-6 WG1707170-7 QC Sample: L2259175-06 Client ID: AQPW-06-101922												
Tertiary-Amyl Methyl Ether	ND	100	80	80		81	81		70-130	1		20
1,4-Dioxane	ND	5000	4400	88		4300	86		70-130	2		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		95		70-130
4-Bromofluorobenzene	88		89		70-130
Dibromofluoromethane	106		105		70-130
Toluene-d8	102		103		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Methylene chloride	ND	10000	12000	115		11000	114		70-130	1		30
1,1-Dichloroethane	ND	10000	11000	107		11000	107		70-130	0		30
Chloroform	ND	10000	12000	115		12000	115		70-130	0		30
Carbon tetrachloride	ND	10000	12000	119		12000	117		70-130	2		30
1,2-Dichloropropane	ND	10000	10000	100		10000	100		70-130	0		30
Dibromochloromethane	ND	10000	11000	110		11000	111		70-130	1		30
1,1,2-Trichloroethane	ND	10000	11000	106		11000	106		70-130	0		30
Tetrachloroethene	ND	10000	9300	93		9400	94		70-130	1		30
Chlorobenzene	ND	10000	8600	86		8800	88		70-130	2		30
Trichlorofluoromethane	ND	10000	10000	101		10000	100		70-130	1		30
1,2-Dichloroethane	ND	10000	12000	116		12000	115		70-130	1		30
1,1,1-Trichloroethane	ND	10000	12000	122		12000	122		70-130	0		30
Bromodichloromethane	ND	10000	11000	106		11000	106		70-130	0		30
trans-1,3-Dichloropropene	ND	10000	10000	103		10000	104		70-130	1		30
cis-1,3-Dichloropropene	ND	10000	11000	107		11000	107		70-130	0		30
1,1-Dichloropropene	ND	10000	11000	113		11000	113		70-130	0		30
Bromoform	ND	10000	10000	102		11000	106		70-130	4		30
1,1,2,2-Tetrachloroethane	ND	10000	9300	93		9600	96		70-130	3		30
Benzene	280	10000	11000	109		11000	108		70-130	1		30
Toluene	350	10000	9500	91		9600	93		70-130	1		30
Ethylbenzene	1300	10000	8400	71		8600	73		70-130	2		30
Chloromethane	ND	10000	8800	88		8900	89		70-130	1		30
Bromomethane	ND	10000	15000	**154**	Q	14000	**144**	Q	70-130	7		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Vinyl chloride	ND	10000	11000	112		11000	111		70-130	1		30
Chloroethane	ND	10000	9400	94		9300	93		70-130	0		30
1,1-Dichloroethene	ND	10000	13000	**131**	Q	13000	130		70-130	1		30
trans-1,2-Dichloroethene	ND	10000	11000	111		11000	107		70-130	4		30
Trichloroethene	ND	10000	9900	99		10000	100		70-130	0		30
1,2-Dichlorobenzene	ND	10000	6900	**69**	Q	7300	73		70-130	6		30
1,3-Dichlorobenzene	ND	10000	6100	**61**	Q	6300	**63**	Q	70-130	4		30
1,4-Dichlorobenzene	ND	10000	6000	**60**	Q	6300	**63**	Q	70-130	5		30
Methyl tert butyl ether	ND	10000	12000	122		12000	122		70-130	0		30
p/m-Xylene	460	20000	15000	74		15000	75		70-130	1		30
o-Xylene	280	20000	16000	77		16000	79		70-130	2		30
cis-1,2-Dichloroethene	ND	10000	11000	109		11000	109		70-130	0		30
Dibromomethane	ND	10000	11000	112		11000	112		70-130	0		30
1,2,3-Trichloropropane	ND	10000	9700	97		10000	100		70-130	3		30
Styrene	ND	20000	16000	78		16000	80		70-130	1		30
Dichlorodifluoromethane	ND	10000	12000	116		12000	116		70-130	0		30
Acetone	ND	10000	11000	105		10000	101		70-130	4		30
Carbon disulfide	ND	10000	8600	86		8500	85		70-130	1		30
Methyl ethyl ketone	ND	10000	7900	79		8000	80		70-130	2		30
Methyl isobutyl ketone	ND	10000	9500	95		9700	97		70-130	2		30
2-Hexanone	ND	10000	8800	88		8800	88		70-130	1		30
Bromochloromethane	ND	10000	12000	116		12000	115		70-130	1		30
Tetrahydrofuran	ND	10000	8600	86		8600	86		70-130	0		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
2,2-Dichloropropane	ND	10000	11000	112		11000	110		70-130	2		30
1,2-Dibromoethane	ND	10000	11000	111		11000	111		70-130	0		30
1,3-Dichloropropane	ND	10000	11000	110		11000	110		70-130	0		30
1,1,1,2-Tetrachloroethane	ND	10000	11000	105		11000	106		70-130	1		30
Bromobenzene	ND	10000	7800	78		8100	81		70-130	4		30
n-Butylbenzene	110	10000	3600	**35**	Q	3900	**38**	Q	70-130	6		30
sec-Butylbenzene	29J	10000	4700	**46**	Q	4900	**49**	Q	70-130	5		30
tert-Butylbenzene	ND	10000	5500	**55**	Q	5700	**57**	Q	70-130	4		30
o-Chlorotoluene	ND	10000	6100	**61**	Q	6200	**62**	Q	70-130	3		30
p-Chlorotoluene	ND	10000	5800	**58**	Q	6000	**60**	Q	70-130	5		30
1,2-Dibromo-3-chloropropane	ND	10000	9700	97		10000	100		70-130	3		30
Hexachlorobutadiene	ND	10000	3200	**32**	Q	3600	**36**	Q	70-130	11		30
Isopropylbenzene	530	10000	6500	**60**	Q	6800	**62**	Q	70-130	3		30
p-Isopropyltoluene	290	10000	4400	**41**	Q	4600	**43**	Q	70-130	6		30
Naphthalene	29000	10000	32000E	**29**	Q	32000E	**31**	Q	70-130	1		30
n-Propylbenzene	320	10000	5400	**50**	Q	5600	**53**	Q	70-130	5		30
1,2,3-Trichlorobenzene	ND	10000	7100	71		7500	75		70-130	5		30
1,2,4-Trichlorobenzene	ND	10000	6300	**63**	Q	6600	**66**	Q	70-130	6		30
1,3,5-Trimethylbenzene	990	10000	6200	**52**	Q	6400	**54**	Q	70-130	4		30
1,2,4-Trimethylbenzene	3400	10000	7300	**38**	Q	7500	**41**	Q	70-130	4		30
Diethyl ether	ND	10000	12000	120		12000	122		70-130	2		30
Diisopropyl Ether	ND	10000	9800	98		9800	98		70-130	0		30
Ethyl-Tert-Butyl-Ether	ND	10000	11000	111		11000	110		70-130	1		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14 Client ID: AQHA-01-102122												
Tertiary-Amyl Methyl Ether	ND	10000	12000	116		12000	116		70-130	0		30
1,4-Dioxane	ND	510000	520000	101		530000	104		70-130	3		30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		102		70-130
4-Bromofluorobenzene	97		99		70-130
Dibromofluoromethane	97		98		70-130
Toluene-d8	101		103		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D
Client ID: AQPW-10-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 10:53
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 12:32
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5920000		ng/l	20000	3540	2000
2-Methylnaphthalene	686000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	124000		ng/l	20000	3220	2000
Fluorene	35300		ng/l	20000	3460	2000
Phenanthrene	34300		ng/l	20000	3780	2000
Anthracene	6440	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	3130	J	ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 13:05
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3710000		ng/l	20000	3540	2000
2-Methylnaphthalene	322000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	138000		ng/l	20000	3220	2000
Fluorene	38300		ng/l	20000	3460	2000
Phenanthrene	33300		ng/l	20000	3780	2000
Anthracene	4230	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D
Client ID: AQPW-08-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 12:30
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 13:39
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	650000		ng/l	19000	3370	2000
2-Methylnaphthalene	45700		ng/l	19000	2020	2000
2-Chloronaphthalene	ND		ng/l	19000	4190	2000
Acenaphthylene	30700		ng/l	19000	3370	2000
Acenaphthene	119000		ng/l	19000	3070	2000
Fluorene	48100		ng/l	19000	3300	2000
Phenanthrene	49200		ng/l	19000	3600	2000
Anthracene	7390	J	ng/l	19000	3700	2000
Fluoranthene	ND		ng/l	19000	2840	2000
Pyrene	ND		ng/l	19000	2900	2000
Benz(a)anthracene	ND		ng/l	19000	3300	2000
Chrysene	ND		ng/l	19000	1780	2000
Benzo(b)fluoranthene	ND		ng/l	19000	2820	2000
Benzo(k)fluoranthene	ND		ng/l	19000	2230	2000
Benzo(a)pyrene	ND		ng/l	19000	1600	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	19000	1020	2000
Dibenz(a,h)anthracene	ND		ng/l	19000	1300	2000
Benzo(ghi)perylene	ND		ng/l	19000	2500	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 14:12
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5670000		ng/l	20000	3540	2000
2-Methylnaphthalene	665000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	131000		ng/l	20000	3220	2000
Fluorene	45100		ng/l	20000	3460	2000
Phenanthrene	36700		ng/l	20000	3780	2000
Anthracene	6240	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 14:46
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	369000		ng/l	20000	3540	2000
2-Methylnaphthalene	76100		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	4180	J	ng/l	20000	3540	2000
Acenaphthene	52400		ng/l	20000	3220	2000
Fluorene	35400		ng/l	20000	3460	2000
Phenanthrene	54300		ng/l	20000	3780	2000
Anthracene	6490	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D
Client ID: AQPW-06-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 14:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 15:20
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	1280000		ng/l	20000	3540	2000
2-Methylnaphthalene	94000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	69100		ng/l	20000	3220	2000
Fluorene	44300		ng/l	20000	3460	2000
Phenanthrene	67100		ng/l	20000	3780	2000
Anthracene	11100	J	ng/l	20000	3880	2000
Fluoranthene	5810	J	ng/l	20000	2980	2000
Pyrene	3980	J	ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 17:01
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2720000		ng/l	20000	3540	2000
2-Methylnaphthalene	162000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	3730	J	ng/l	20000	3540	2000
Acenaphthene	71000		ng/l	20000	3220	2000
Fluorene	22500		ng/l	20000	3460	2000
Phenanthrene	24500		ng/l	20000	3780	2000
Anthracene	ND		ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D
Client ID: AQPW-04-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:02
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 17:35
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5420000		ng/l	20000	3540	2000
2-Methylnaphthalene	553000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	79200		ng/l	20000	3220	2000
Fluorene	28000		ng/l	20000	3460	2000
Phenanthrene	25000		ng/l	20000	3780	2000
Anthracene	ND		ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D
Client ID: AQPW-03-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:50
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 18:09
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3630000		ng/l	19600	3470	2000
2-Methylnaphthalene	522000		ng/l	19600	2080	2000
2-Chloronaphthalene	ND		ng/l	19600	4310	2000
Acenaphthylene	ND		ng/l	19600	3470	2000
Acenaphthene	100000		ng/l	19600	3160	2000
Fluorene	27000		ng/l	19600	3390	2000
Phenanthrene	26100		ng/l	19600	3700	2000
Anthracene	ND		ng/l	19600	3800	2000
Fluoranthene	ND		ng/l	19600	2920	2000
Pyrene	ND		ng/l	19600	2980	2000
Benz(a)anthracene	ND		ng/l	19600	3390	2000
Chrysene	ND		ng/l	19600	1840	2000
Benzo(b)fluoranthene	ND		ng/l	19600	2900	2000
Benzo(k)fluoranthene	ND		ng/l	19600	2290	2000
Benzo(a)pyrene	ND		ng/l	19600	1650	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	19600	1040	2000
Dibenz(a,h)anthracene	ND		ng/l	19600	1340	2000
Benzo(ghi)perylene	ND		ng/l	19600	2570	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D
Client ID: AQPW-02-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 15:52
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 18:42
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	581000		ng/l	20400	3610	2000
2-Methylnaphthalene	204000		ng/l	20400	2160	2000
2-Chloronaphthalene	ND		ng/l	20400	4490	2000
Acenaphthylene	ND		ng/l	20400	3610	2000
Acenaphthene	61600		ng/l	20400	3280	2000
Fluorene	16600	J	ng/l	20400	3530	2000
Phenanthrene	20800		ng/l	20400	3860	2000
Anthracene	ND		ng/l	20400	3960	2000
Fluoranthene	ND		ng/l	20400	3040	2000
Pyrene	ND		ng/l	20400	3100	2000
Benz(a)anthracene	ND		ng/l	20400	3530	2000
Chrysene	ND		ng/l	20400	1910	2000
Benzo(b)fluoranthene	ND		ng/l	20400	3020	2000
Benzo(k)fluoranthene	ND		ng/l	20400	2390	2000
Benzo(a)pyrene	ND		ng/l	20400	1710	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20400	1090	2000
Dibenz(a,h)anthracene	ND		ng/l	20400	1400	2000
Benzo(ghi)perylene	ND		ng/l	20400	2670	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 19:16
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2480000		ng/l	20000	3540	2000
2-Methylnaphthalene	413000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	114000		ng/l	20000	3220	2000
Fluorene	52300		ng/l	20000	3460	2000
Phenanthrene	71300		ng/l	20000	3780	2000
Anthracene	9460	J	ng/l	20000	3880	2000
Fluoranthene	3870	J	ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13
Client ID: RB1-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 11:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 11/14/22 21:28
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	196		ng/l	10.0	1.77	1
2-Methylnaphthalene	99.3		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	15.9		ng/l	10.0	1.77	1
Acenaphthene	52.6		ng/l	10.0	1.61	1
Fluorene	47.5		ng/l	10.0	1.73	1
Phenanthrene	85.4		ng/l	10.0	1.89	1
Anthracene	25.7		ng/l	10.0	1.94	1
Fluoranthene	41.4		ng/l	10.0	1.49	1
Pyrene	42.0		ng/l	10.0	1.52	1
Benz(a)anthracene	26.0		ng/l	10.0	1.73	1
Chrysene	23.3		ng/l	10.0	0.936	1
Benzo(b)fluoranthene	19.8		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	14.4		ng/l	10.0	1.17	1
Benzo(a)pyrene	22.0		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	13.2		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	3.16	J	ng/l	10.0	0.685	1
Benzo(ghi)perylene	13.4		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	70		30-130
Pyrene-d10	70		30-130
Benzo(b)fluoranthene-d12	77		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 D
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 11/16/22 10:27
Analyst: GP
Percent Solids: 78%

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	87700		ug/kg	498	44.5	100
2-Methylnaphthalene	43000		ug/kg	498	61.7	100
2-Chloronaphthalene	74.3	J	ug/kg	498	39.0	100
Acenaphthylene	10100		ug/kg	498	33.3	100
Acenaphthene	51700		ug/kg	498	55.7	100
Fluorene	29800		ug/kg	498	33.2	100
Phenanthrene	99300		ug/kg	498	58.7	100
Anthracene	26700		ug/kg	498	61.7	100
Fluoranthene	38500		ug/kg	498	91.1	100
Pyrene	41200		ug/kg	498	50.8	100
Benz(a)anthracene	19800		ug/kg	498	133.	100
Chrysene	19600		ug/kg	498	43.8	100
Benzo(b)fluoranthene	8930		ug/kg	498	51.8	100
Benzo(k)fluoranthene	7820		ug/kg	498	51.3	100
Benzo(a)pyrene	15500		ug/kg	498	58.2	100
Indeno(1,2,3-cd)Pyrene	6960		ug/kg	498	142.	100
Dibenz(a,h)anthracene	2040		ug/kg	498	51.3	100
Benzo(ghi)perylene	8320		ug/kg	498	41.0	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		30-130
Pyrene-d10	68		30-130
Benzo(b)fluoranthene-d12	69		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D
Client ID: DUP2-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 11/16/22 09:54
Analyst: GP
Percent Solids: 77%

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	42900		ug/kg	242	21.7	50
2-Methylnaphthalene	19000		ug/kg	242	30.0	50
2-Chloronaphthalene	125	J	ug/kg	242	19.0	50
Acenaphthylene	713		ug/kg	242	16.2	50
Acenaphthene	13700		ug/kg	242	27.1	50
Fluorene	7010		ug/kg	242	16.2	50
Phenanthrene	20800		ug/kg	242	28.6	50
Anthracene	5210		ug/kg	242	30.0	50
Fluoranthene	6100		ug/kg	242	44.3	50
Pyrene	7180		ug/kg	242	24.7	50
Benz(a)anthracene	2510		ug/kg	242	64.7	50
Chrysene	2590		ug/kg	242	21.3	50
Benzo(b)fluoranthene	1260		ug/kg	242	25.2	50
Benzo(k)fluoranthene	935		ug/kg	242	25.0	50
Benzo(a)pyrene	1580		ug/kg	242	28.3	50
Indeno(1,2,3-cd)Pyrene	773		ug/kg	242	69.0	50
Dibenz(a,h)anthracene	263		ug/kg	242	25.0	50
Benzo(ghi)perylene	900		ug/kg	242	20.0	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	56		30-130
Pyrene-d10	65		30-130
Benzo(b)fluoranthene-d12	65		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/07/22 13:41
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-07,09-13 Batch: WG1704210-1					
Naphthalene	1.92	J	ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	2.07	J	ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	75		30-130
Pyrene-d10	83		30-130
Benzo(b)fluoranthene-d12	93		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/15/22 11:04
Analyst: GP

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 14-15 Batch: WG1710501-1					
Naphthalene	0.412	J	ug/kg	4.00	0.358
2-Methylnaphthalene	ND		ug/kg	4.00	0.496
2-Chloronaphthalene	ND		ug/kg	4.00	0.313
Acenaphthylene	ND		ug/kg	4.00	0.268
Acenaphthene	ND		ug/kg	4.00	0.448
Fluorene	ND		ug/kg	4.00	0.267
Phenanthrene	ND		ug/kg	4.00	0.472
Anthracene	ND		ug/kg	4.00	0.496
Fluoranthene	ND		ug/kg	4.00	0.732
Pyrene	ND		ug/kg	4.00	0.408
Benz(a)anthracene	ND		ug/kg	4.00	1.07
Chrysene	ND		ug/kg	4.00	0.352
Benzo(b)fluoranthene	ND		ug/kg	4.00	0.416
Benzo(k)fluoranthene	ND		ug/kg	4.00	0.412
Benzo(a)pyrene	ND		ug/kg	4.00	0.468
Indeno(1,2,3-cd)Pyrene	ND		ug/kg	4.00	1.14
Dibenz(a,h)anthracene	ND		ug/kg	4.00	0.412
Benzo(ghi)perylene	ND		ug/kg	4.00	0.330

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	45		30-130
Pyrene-d10	66		30-130
Benzo(b)fluoranthene-d12	77		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 Batch: WG1704210-2 WG1704210-3								
Naphthalene	66		72		40-140	9		20
2-Methylnaphthalene	63		67		40-140	6		20
2-Chloronaphthalene	73		79		40-140	8		20
Acenaphthylene	68		71		40-140	4		20
Acenaphthene	66		71		40-140	7		20
Fluorene	71		83		40-140	16		20
Phenanthrene	72		76		40-140	5		20
Anthracene	79		85		40-140	7		20
Fluoranthene	99		85		40-140	15		20
Pyrene	78		76		40-140	3		20
Benz(a)anthracene	85		87		40-140	2		20
Chrysene	85		87		40-140	2		20
Benzo(b)fluoranthene	80		121		40-140	**41**	Q	20
Benzo(k)fluoranthene	99		67		40-140	**39**	Q	20
Benzo(a)pyrene	82		86		40-140	5		20
Indeno(1,2,3-cd)Pyrene	81		100		40-140	**21**	Q	20
Dibenz(a,h)anthracene	84		95		40-140	12		20
Benzo(ghi)perylene	86		92		40-140	7		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 Batch: WG1704210-2 WG1704210-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	76		80		30-130
Pyrene-d10	84		85		30-130
Benzo(b)fluoranthene-d12	91		94		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 Batch: WG1710501-2 WG1710501-3								
Naphthalene	49		45		40-140	9		30
2-Methylnaphthalene	44		42		40-140	5		30
2-Chloronaphthalene	57		55		40-140	4		30
Acenaphthylene	51		49		40-140	4		30
Acenaphthene	53		52		40-140	2		30
Fluorene	54		58		40-140	7		30
Phenanthrene	57		61		40-140	7		30
Anthracene	57		63		40-140	10		30
Fluoranthene	56		62		40-140	10		30
Pyrene	50		56		40-140	11		30
Benz(a)anthracene	60		67		40-140	11		30
Chrysene	54		60		40-140	11		30
Benzo(b)fluoranthene	59		63		40-140	7		30
Benzo(k)fluoranthene	56		64		40-140	13		30
Benzo(a)pyrene	55		62		40-140	12		30
Indeno(1,2,3-cd)Pyrene	64		73		40-140	13		30
Dibenz(a,h)anthracene	64		70		40-140	9		30
Benzo(ghi)perylene	64		70		40-140	9		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 Batch: WG1710501-2 WG1710501-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	45		42		30-130
Pyrene-d10	53		61		30-130
Benzo(b)fluoranthene-d12	60		65		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 QC Batch ID: WG1704210-4 WG1704210-5 QC Sample: L2259175-06 Client ID: AQPW-06-101922												
Naphthalene	1280000	490	893000	**0**	Q	1030000	**0**	Q	40-140	14		20
2-Methylnaphthalene	94000	490	73200	**0**	Q	85600	**0**	Q	40-140	16		20
2-Chloronaphthalene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Acenaphthylene	ND	490	ND	**0**	Q	3490J	**712**	Q	40-140	NC		20
Acenaphthene	69100	490	47600	**0**	Q	51600	**0**	Q	40-140	8		20
Fluorene	44300	490	30100	**0**	Q	35900	**0**	Q	40-140	18		20
Phenanthrene	67100	490	50800	**0**	Q	60000	**0**	Q	40-140	17		20
Anthracene	11100J	490	7210J	**1470**	Q	7930J	**1620**	Q	40-140	10		20
Fluoranthene	5810J	490	3870J	**789**	Q	5760J	**1180**	Q	40-140	**39**	Q	20
Pyrene	3980J	490	ND	**0**	Q	3660J	**747**	Q	40-140	NC		20
Benz(a)anthracene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Chrysene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(b)fluoranthene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(k)fluoranthene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(a)pyrene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Indeno(1,2,3-cd)Pyrene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Dibenz(a,h)anthracene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(ghi)perylene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	**0**	Q	30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 QC Batch ID: WG1704210-4 WG1704210-5 QC Sample: L2259175-06 Client ID: AQPW-06-101922												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Pyrene-d10	**0**	Q	**0**	Q	30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab AQHA-01-102122	Associated sample(s): 14-15		QC Batch ID: WG1710501-4			WG1710501-5		QC Sample: L2259175-14		Client ID:		
Naphthalene	87700	604	109000E	**3530**	Q	70300	**0**	Q	40-140	**43**	Q	30
2-Methylnaphthalene	43000	604	54400	**1890**	Q	35300	**0**	Q	40-140	**43**	Q	30
2-Chloronaphthalene	74.3J	604	582	96		448J	76		40-140	26		30
Acenaphthylene	10100	604	14300	**695**	Q	9250	**0**	Q	40-140	**43**	Q	30
Acenaphthene	51700	604	65300	**2250**	Q	42600	**0**	Q	40-140	**42**	Q	30
Fluorene	29800	604	38700	**1470**	Q	25300	**0**	Q	40-140	**42**	Q	30
Phenanthrene	99300	604	126000E	**4420**	Q	81600	**0**	Q	40-140	**43**	Q	30
Anthracene	26700	604	33800	**1180**	Q	21500	**0**	Q	40-140	**44**	Q	30
Fluoranthene	38500	604	48000	**1570**	Q	31600	**0**	Q	40-140	**41**	Q	30
Pyrene	41200	604	53600	**2050**	Q	34300	**0**	Q	40-140	**44**	Q	30
Benz(a)anthracene	19800	604	24100	**712**	Q	15500	**0**	Q	40-140	**43**	Q	30
Chrysene	19600	604	25200	**927**	Q	15800	**0**	Q	40-140	**46**	Q	30
Benzo(b)fluoranthene	8930	604	10500	**260**	Q	7180	**0**	Q	40-140	**38**	Q	30
Benzo(k)fluoranthene	7820	604	10300	**411**	Q	6020	**0**	Q	40-140	**52**	Q	30
Benzo(a)pyrene	15500	604	19400	**646**	Q	12100	**0**	Q	40-140	**46**	Q	30
Indeno(1,2,3-cd)Pyrene	6960	604	9200	**371**	Q	5880	**0**	Q	40-140	**44**	Q	30
Dibenz(a,h)anthracene	2040	604	2810	127		1760	**0**	Q	40-140	**46**	Q	30
Benzo(ghi)perylene	8320	604	11200	**477**	Q	6790	**0**	Q	40-140	**49**	Q	30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	59		52		30-130
Benzo(b)fluoranthene-d12	66		55		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1710501-4 WG1710501-5 QC Sample: L2259175-14 Client ID: AQHA-01-102122												

Surrogate	MS % Recovery	Qualifier	MSD % Recovery	Qualifier	Acceptance Criteria
Pyrene-d10	71		56		30-130

INORGANICS
&
MISCELLANEOUS

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA
Sample Depth:
Matrix: Sediment

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	1.26		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	1.31		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	1.28		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	78.4		%	0.100	0.100	1	-	10/24/22 10:48	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15
Client ID: DUP2-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	1.58		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	1.54		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	1.56		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	77.0		%	0.100	0.100	1	-	10/24/22 10:48	121,2540G	AM

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab for sample(s): 14-15 Batch: WG1708881-1										
Total Organic Carbon (Rep1)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 Batch: WG1708881-2								
Total Organic Carbon (Rep1)	103		-		75-125	-		25
Total Organic Carbon (Rep2)	110		-		75-125	-		25
Total Organic Carbon (Average)	106		-		75-125	-		25

Matrix Spike Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1708881-4 WG1708881-5 QC Sample: L2259175-14 Client ID: AQHA-01-102122												
Total Organic Carbon (Rep1)	1.26	1.06	2.69	**135**	Q	2.14	101		75-125	23		25
Total Organic Carbon (Rep2)	1.31	0.876	2.54	**140**	Q	2.27	107		75-125	11		25

Lab Duplicate Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1708881-3 QC Sample: L2259175-14 Client ID: AQHA-01-102122						
Total Organic Carbon (Rep1)	1.26	1.54	%	20		25
Total Organic Carbon (Rep2)	1.31	1.31	%	0		25
Total Organic Carbon (Average)	1.28	1.42	%	10		25

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent
C	Absent
D	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-01A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-01E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-05A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-05E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-08A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-09A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-09E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-14A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14A1	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-14B1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14D1	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-14E1	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-15A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-15B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-15E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2259175
Project Number:	180327-08.01	**Report Date:**	11/16/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 10/21/22

ALPHA Job #: L2259175

ALPHA
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220
320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone:
Email: bgauley@anchorqea.com

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO
Filtration: ☒ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB	TPH	Sample Comments	TOTAL # BOTTLES
S9175-01	AQPW-10-101922	10/19/22	1053	X1	BJLG SA	X	X								5
-02	AQPW-09-101922		1137	X1		X	X								5
-03	AQPW-08-101922		1230	X1		X	X								5
-04	DUP1-101922		—	X1		X	X								5
-05	AQPW-07-101922		1535	X1		X	X								5
-06	AQPW-06-101922		1400	X1		X	X							MS/MSD	15
-07	AQPW-05-101922		1620	X1		X	X								5
-08	HAV-TB1	10/16/22	1815	X2		X	BJLG 10/21/22								3

Container Type	G	A
Preservative	B	A

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. L. Gauley	10/21/22 1342	[signature] AAL	10/21/22 13:42
[signature] AAL	10/21/22 17:00	[signature]	10/21/22 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 10/21/22

ALPHA Job #: L2259175

8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220

320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 978-792-5737
Email: bgauley@anchorqea.com

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	Sample Comments	Total # Bottles
59175-09	AQPW-04-102022	10/20/22	11:02	X1	SA	X	X		5
-10	AQPW-03-102022	10/20/22	11:50	X1	SA	X	X		5
-11	AQPW-02-102022	10/20/22	15:52	X1	SA	X	X		5
-12	AQPW-01-102122	10/21/22	0900	X1	BJLG/SA	X	X		5
-13	RB1-102122	10/21/22	11:00	X2	BJLG	X	X		5
-14	AQHA-01-102122	↓	1015	B	BJLG	X	X	MS/MSD	10
-15	DUP2-102122	↓	—	B	BJLG	X	X		5
Container Type						G	A		
Preservative						B	A		

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H= $Na_2S_2O_3$
I= Ascorbic Acid
J= NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. Lowry	10/21/22 1342	[illegible] AAL	10/21/22 13:42
[illegible] AAL	10/21/22 1700	[illegible]	10/21/22 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1705574-5	**Lab File ID**	: J221028B09
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 10/28/22 15:43

Client Sample No.	Lab Sample ID	Analysis Date
WG1705574-3LCS	WG1705574-3	10/28/22 13:12
WG1705574-4LCSD	WG1705574-4	10/28/22 14:16
HAV-TB1	L2259175-08	10/28/22 19:20

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1707020-5	**Lab File ID**	: J221101B08
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 11/01/22 08:24

Client Sample No.	Lab Sample ID	Analysis Date
WG1707020-3LCS	WG1707020-3	11/01/22 06:20
WG1707020-4LCSD	WG1707020-4	11/01/22 07:01
AQPW-10-101922	L2259175-01D	11/01/22 14:36
AQPW-09-101922	L2259175-02D	11/01/22 15:17
DUP1-101922	L2259175-04D	11/01/22 15:58
AQPW-08-101922	L2259175-03D	11/01/22 16:40
AQPW-07-101922	L2259175-05D	11/01/22 17:21

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1706907-5	**Lab File ID**	: V00221101A05
Instrument ID	: VOA100		
Matrix	: SOIL	**Analysis Date**	: 11/01/22 08:53

Client Sample No.	Lab Sample ID	Analysis Date
WG1706907-3LCS	WG1706907-3	11/01/22 07:35
WG1706907-4LCSD	WG1706907-4	11/01/22 08:01
DUP2-102122	L2259175-15D	11/01/22 17:35

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1706971-5	**Lab File ID**	: VQ221101N04
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 11/01/22 17:09

Client Sample No.	Lab Sample ID	Analysis Date
WG1706971-3LCS	WG1706971-3	11/01/22 16:23
WG1706971-4LCSD	WG1706971-4	11/01/22 16:46
AQPW-05-101922	L2259175-07D	11/01/22 20:58
AQPW-03-102022	L2259175-10D	11/01/22 21:44

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1707170-5	**Lab File ID**	: VQ221102A05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 11/02/22 05:12

Client Sample No.	Lab Sample ID	Analysis Date
WG1707170-3LCS	WG1707170-3	11/02/22 04:26
WG1707170-4LCSD	WG1707170-4	11/02/22 04:49
AQPW-06-101922	L2259175-06D	11/02/22 05:35
AQPW-04-102022	L2259175-09D	11/02/22 05:58
AQPW-02-102022	L2259175-11D	11/02/22 06:21
AQPW-06-101922MS	WG1707170-6	11/02/22 07:06
AQPW-06-101922MSD	WG1707170-7	11/02/22 07:29
AQPW-01-102122	L2259175-12D	11/02/22 14:20

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1707425-5	**Lab File ID**	: V00221102A05
Instrument ID	: VOA100		
Matrix	: SOIL	**Analysis Date**	: 11/02/22 08:56

Client Sample No.	Lab Sample ID	Analysis Date
WG1707425-3LCS	WG1707425-3	11/02/22 07:38
WG1707425-4LCSD	WG1707425-4	11/02/22 08:04
DUP2-102122	L2259175-15D2	11/02/22 17:09

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1707538-5	**Lab File ID**	: VQ221102P04
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 11/02/22 19:16

Client Sample No.	Lab Sample ID	Analysis Date
WG1707538-3LCS	WG1707538-3	11/02/22 18:08
WG1707538-4LCSD	WG1707538-4	11/02/22 18:31
RB1-102122	L2259175-13	11/02/22 19:39

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1708247-5	**Lab File ID**	: V29221103A05
Instrument ID	: VOA129		
Matrix	: SOIL	**Analysis Date**	: 11/03/22 08:49

Client Sample No.	Lab Sample ID	Analysis Date
WG1708247-3LCS	WG1708247-3	11/03/22 07:47
WG1708247-4LCSD	WG1708247-4	11/03/22 08:08
AQHA-01-102122	L2259175-14	11/03/22 17:15
AQHA-01-102122MS	WG1708247-6	11/03/22 17:35
AQHA-01-102122MSD	WG1708247-7	11/03/22 17:56

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 10/28/22 13:12
Lab File ID	: J221028B02	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1705574-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	79	0
Dichlorodifluoromethane	0.458	0.453	-	1.1	20	79	0
Chloromethane	0.48	0.456	-	5	20	78	0
Vinyl chloride	0.484	0.555	-	-14.7	20	85	0
Bromomethane	10	10.849	-	-8.5	20	103	0
Chloroethane	0.258	0.306	-	-18.6	20	89	0
Trichlorofluoromethane	0.653	0.79	-	-21*	20	90	0
Ethyl ether	0.222	0.235	-	-5.9	20	84	0
1,1-Dichloroethene	0.448	0.522	-	-16.5	20	87	0
Carbon disulfide	0.795	0.949	-	-19.4	20	91	0
Freon-113	0.463	0.565	-	-22*	20	90	0
Methylene chloride	0.509	0.56	-	-10	20	88	0
Acetone	0.115	0.112	-	2.6	20	83	0
trans-1,2-Dichloroethene	0.49	0.571	-	-16.5	20	90	0
Methyl acetate	0.298	0.303	-	-1.7	20	88	0
Methyl tert-butyl ether	1.136	1.242	-	-9.3	20	91	0
tert-Butyl alcohol	0.042	0.047	-	-11.9	20	95	0
Diisopropyl ether	1.331	1.312	-	1.4	20	84	0
1,1-Dichloroethane	0.876	0.987	-	-12.7	20	88	0
Halothane	0.378	0.444	-	-17.5	20	89	0
Acrylonitrile	0.139	0.152	-	-9.4	20	85	0
Ethyl tert-butyl ether	1.324	1.388	-	-4.8	20	87	0
Vinyl acetate	0.766	0.895	-	-16.8	20	111	0
cis-1,2-Dichloroethene	0.534	0.622	-	-16.5	20	89	0
2,2-Dichloropropane	0.7	0.85	-	-21.4*	20	96	0
Bromochloromethane	0.245	0.294	-	-20	20	90	0
Cyclohexane	0.834	0.937	-	-12.4	20	86	0
Chloroform	0.838	0.973	-	-16.1	20	91	0
Ethyl acetate	0.396	0.38	-	4	20	86	0
Carbon tetrachloride	0.604	0.751	-	-24.3*	20	93	0
Tetrahydrofuran	0.121	0.122	-	-0.8	20	91	0
Dibromofluoromethane	0.247	0.263	-	-6.5	20	77	0
1,1,1-Trichloroethane	0.688	0.841	-	-22.2*	20	95	0
2-Butanone	0.177	0.168	-	5.1	20	81	0
1,1-Dichloropropene	0.633	0.706	-	-11.5	20	89	0
Benzene	2.014	2.187	-	-8.6	20	87	0
tert-Amyl methyl ether	1.243	1.318	-	-6	20	88	-.01
1,2-Dichloroethane-d4	0.292	0.294	-	-0.7	20	80	0
1,2-Dichloroethane	0.588	0.638	-	-8.5	20	89	0
Methyl cyclohexane	0.774	0.936	-	-20.9*	20	95	-.01
Trichloroethene	0.484	0.557	-	-15.1	20	86	-.01
Dibromomethane	0.248	0.263	-	-6	20	85	0
1,2-Dichloropropane	0.489	0.507	-	-3.7	20	86	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 10/28/22 13:12
Lab File ID	: J221028B02	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1705574-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Bromodichloromethane	0.638	0.713	-	-11.8	20	91	0
1,4-Dioxane	0.00399	0.00546*	-	-36.8*	20	108	0
cis-1,3-Dichloropropene	0.758	0.839	-	-10.7	20	89	0
Chlorobenzene-d5	1	1	-	0	20	81	0
Toluene-d8	1.272	1.225	-	3.7	20	79	0
Toluene	1.577	1.751	-	-11	20	93	0
4-Methyl-2-pentanone	0.208	0.204	-	1.9	20	92	0
Tetrachloroethene	0.674	0.801	-	-18.8	20	95	0
trans-1,3-Dichloropropene	0.805	0.867	-	-7.7	20	91	0
Ethyl methacrylate	0.725	0.76	-	-4.8	20	88	0
1,1,2-Trichloroethane	0.424	0.417	-	1.7	20	86	0
Chlorodibromomethane	0.565	0.578	-	-2.3	20	89	0
1,3-Dichloropropane	0.898	0.868	-	3.3	20	87	0
1,2-Dibromoethane	0.512	0.518	-	-1.2	20	89	0
2-Hexanone	0.35	0.337	-	3.7	20	89	0
Chlorobenzene	1.716	1.882	-	-9.7	20	91	0
Ethylbenzene	2.802	3.26	-	-16.3	20	92	0
1,1,1,2-Tetrachloroethane	0.567	0.611	-	-7.8	20	90	0
p/m Xylene	1.14	1.338	-	-17.4	20	92	0
o Xylene	1.072	1.257	-	-17.3	20	93	0
Styrene	1.705	2.058	-	-20.7*	20	92	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	82	0
Bromoform	0.663	0.676	-	-2	20	91	0
Isopropylbenzene	5.062	5.5	-	-8.7	20	96	0
4-Bromofluorobenzene	0.88	0.83	-	5.7	20	82	0
Bromobenzene	1.296	1.422	-	-9.7	20	98	0
n-Propylbenzene	5.874	6.426	-	-9.4	20	95	0
1,4-Dichlorobutane	1.525	1.418	-	7	20	86	0
1,1,2,2-Tetrachloroethane	1.151	1.171	-	-1.7	20	93	0
4-Ethyltoluene	4.901	5.446	-	-11.1	20	94	0
2-Chlorotoluene	4.04	4.426	-	-9.6	20	95	0
1,3,5-Trimethylbenzene	4.127	4.616	-	-11.8	20	96	0
1,2,3-Trichloropropane	0.979	0.975	-	0.4	20	90	0
trans-1,4-Dichloro-2-buten	0.329	0.323	-	1.8	20	91	0
4-Chlorotoluene	3.742	4.037	-	-7.9	20	96	0
tert-Butylbenzene	3.485	3.936	-	-12.9	20	99	0
1,2,4-Trimethylbenzene	4.051	4.517	-	-11.5	20	95	0
sec-Butylbenzene	4.989	5.673	-	-13.7	20	98	0
p-Isopropyltoluene	4.203	4.842	-	-15.2	20	98	0
1,3-Dichlorobenzene	2.373	2.683	-	-13.1	20	97	0
1,4-Dichlorobenzene	2.405	2.691	-	-11.9	20	98	0
p-Diethylbenzene	2.463	2.87	-	-16.5	20	103	0
n-Butylbenzene	3.45	4.016	-	-16.4	20	102	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 10/28/22 13:12
Lab File ID	: J221028B02	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1705574-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichlorobenzene	2.226	2.467	-	-10.8	20	97	0
1,2,4,5-Tetramethylbenzene	3.461	3.931	-	-13.6	20	103	0
1,2-Dibromo-3-chloropropan	10	9.696	-	3	20	97	0
1,3,5-Trichlorobenzene	1.51	1.857	-	-23*	20	107	0
Hexachlorobutadiene	0.557	0.746	-	-33.9*	20	114	0
1,2,4-Trichlorobenzene	1.272	1.608	-	-26.4*	20	110	0
Naphthalene	3.649	4.135	-	-13.3	20	104	0
1,2,3-Trichlorobenzene	1.176	1.532	-	-30.3*	20	115	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/01/22 06:20
Lab File ID	: J221101B02	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1707020-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	88	0
Dichlorodifluoromethane	0.458	0.39	-	14.8	20	76	0
Chloromethane	0.48	0.415	-	13.5	20	79	0
Vinyl chloride	0.484	0.466	-	3.7	20	80	0
Bromomethane	10	10.789	-	-7.9	20	114	0
Chloroethane	0.258	0.246	-	4.7	20	80	0
Trichlorofluoromethane	0.653	0.718	-	-10	20	92	0
Ethyl ether	0.222	0.214	-	3.6	20	86	0
1,1-Dichloroethene	0.448	0.469	-	-4.7	20	88	0
Carbon disulfide	0.795	0.799	-	-0.5	20	86	0
Freon-113	0.463	0.504	-	-8.9	20	90	0
Acrolein	0.07	0.066	-	5.7	20	93	0
Methylene chloride	0.509	0.506	-	0.6	20	88	0
Acetone	0.115	0.104	-	9.6	20	86	0
trans-1,2-Dichloroethene	0.49	0.51	-	-4.1	20	90	0
Methyl acetate	0.298	0.271	-	9.1	20	88	0
Methyl tert-butyl ether	1.136	1.193	-	-5	20	97	0
tert-Butyl alcohol	0.042	0.044	-	-4.8	20	101	0
Diisopropyl ether	1.331	1.21	-	9.1	20	87	0
1,1-Dichloroethane	0.876	0.873	-	0.3	20	87	0
Halothane	0.378	0.412	-	-9	20	93	0
Acrylonitrile	0.139	0.13	-	6.5	20	80	0
Ethyl tert-butyl ether	1.324	1.353	-	-2.2	20	95	0
Vinyl acetate	0.766	0.865	-	-12.9	20	120	0
cis-1,2-Dichloroethene	0.534	0.562	-	-5.2	20	90	0
2,2-Dichloropropane	0.7	0.775	-	-10.7	20	97	0
Bromochloromethane	0.245	0.261	-	-6.5	20	89	0
Cyclohexane	0.834	0.847	-	-1.6	20	87	0
Chloroform	0.838	0.874	-	-4.3	20	91	0
Ethyl acetate	0.396	0.351	-	11.4	20	89	0
Carbon tetrachloride	0.604	0.668	-	-10.6	20	93	0
Tetrahydrofuran	0.121	0.113	-	6.6	20	95	0
Dibromofluoromethane	0.247	0.244	-	1.2	20	80	0
1,1,1-Trichloroethane	0.688	0.731	-	-6.3	20	93	0
2-Butanone	0.177	0.162	-	8.5	20	88	0
1,1-Dichloropropene	0.633	0.668	-	-5.5	20	95	0
Benzene	2.014	2.043	-	-1.4	20	91	0
tert-Amyl methyl ether	1.243	1.263	-	-1.6	20	94	0
1,2-Dichloroethane-d4	0.292	0.28	-	4.1	20	85	0
1,2-Dichloroethane	0.588	0.6	-	-2	20	94	0
Methyl cyclohexane	0.774	0.892	-	-15.2	20	101	0
Trichloroethene	0.484	0.516	-	-6.6	20	89	0
Dibromomethane	0.248	0.261	-	-5.2	20	94	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/01/22 06:20
Lab File ID	: J221101B02	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1707020-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.489	0.478	-	2.2	20	91	0
2-Chloroethyl vinyl ether	0.272	0.267	-	1.8	20	96	0
Bromodichloromethane	0.638	0.652	-	-2.2	20	93	0
1,4-Dioxane	0.00399	0.00428*	-	-7.3	20	95	0
cis-1,3-Dichloropropene	0.758	0.807	-	-6.5	20	95	0
Chlorobenzene-d5	1	1	-	0	20	91	0
Toluene-d8	1.272	1.209	-	5	20	87	0
Toluene	1.577	1.584	-	-0.4	20	94	0
4-Methyl-2-pentanone	0.208	0.182	-	12.5	20	92	0
Tetrachloroethene	0.674	0.747	-	-10.8	20	100	0
trans-1,3-Dichloropropene	0.805	0.848	-	-5.3	20	100	0
Ethyl methacrylate	0.725	0.683	-	5.8	20	89	0
1,1,2-Trichloroethane	0.424	0.401	-	5.4	20	93	0
Chlorodibromomethane	0.565	0.564	-	0.2	20	97	0
1,3-Dichloropropane	0.898	0.848	-	5.6	20	95	0
1,2-Dibromoethane	0.512	0.517	-	-1	20	99	0
2-Hexanone	0.35	0.292	-	16.6	20	87	0
Chlorobenzene	1.716	1.749	-	-1.9	20	95	0
Ethylbenzene	2.802	2.922	-	-4.3	20	93	0
1,1,1,2-Tetrachloroethane	0.567	0.569	-	-0.4	20	94	0
p/m Xylene	1.14	1.209	-	-6.1	20	94	0
o Xylene	1.072	1.144	-	-6.7	20	95	0
Styrene	1.705	1.895	-	-11.1	20	96	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	91	0
Bromoform	0.663	0.663	-	0	20	100	0
Isopropylbenzene	5.062	5.074	-	-0.2	20	99	0
4-Bromofluorobenzene	0.88	0.816	-	7.3	20	90	0
Bromobenzene	1.296	1.336	-	-3.1	20	103	0
n-Propylbenzene	5.874	5.934	-	-1	20	97	0
1,4-Dichlorobutane	1.525	1.349	-	11.5	20	91	0
1,1,2,2-Tetrachloroethane	1.151	1.096	-	4.8	20	97	0
4-Ethyltoluene	4.901	5.044	-	-2.9	20	97	0
2-Chlorotoluene	4.04	3.987	-	1.3	20	96	0
1,3,5-Trimethylbenzene	4.127	4.323	-	-4.7	20	100	0
1,2,3-Trichloropropane	0.979	0.896	-	8.5	20	93	0
trans-1,4-Dichloro-2-buten	0.329	0.288	-	12.5	20	91	0
4-Chlorotoluene	3.742	3.728	-	0.4	20	99	0
tert-Butylbenzene	3.485	3.567	-	-2.4	20	100	0
1,2,4-Trimethylbenzene	4.051	4.24	-	-4.7	20	100	0
sec-Butylbenzene	4.989	5.206	-	-4.3	20	100	0
p-Isopropyltoluene	4.203	4.54	-	-8	20	102	0
1,3-Dichlorobenzene	2.373	2.518	-	-6.1	20	102	0
1,4-Dichlorobenzene	2.405	2.441	-	-1.5	20	100	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Instrument ID	: JACK2	**Calibration Date**	: 11/01/22 06:20
Lab File ID	: J221101B02	**Init. Calib. Date(s)**	: 10/20/22 10/21/22
Sample No	: WG1707020-2	**Init. Calib. Times**	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	2.463	2.692	-	-9.3	20	108	0
n-Butylbenzene	3.45	3.68	-	-6.7	20	104	0
1,2-Dichlorobenzene	2.226	2.286	-	-2.7	20	101	0
1,2,4,5-Tetramethylbenzene	3.461	3.705	-	-7	20	108	0
1,2-Dibromo-3-chloropropan	10	9.533	-	4.7	20	106	0
1,3,5-Trichlorobenzene	1.51	1.748	-	-15.8	20	112	0
Hexachlorobutadiene	0.557	0.651	-	-16.9	20	111	0
1,2,4-Trichlorobenzene	1.272	1.468	-	-15.4	20	112	0
Naphthalene	3.649	3.725	-	-2.1	20	105	0
1,2,3-Trichlorobenzene	1.176	1.345	-	-14.4	20	112	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/01/22 07:09
Lab File ID	: V00221101A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1706907-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	109	0
Dichlorodifluoromethane	0.198	0.18	-	9.1	20	104	0
Chloromethane	0.196	0.205	-	-4.6	20	110	0
Vinyl chloride	0.209	0.215	-	-2.9	20	109	0
Bromomethane	0.135	0.112	-	17	20	98	0
Chloroethane	0.136	0.125	-	8.1	20	95	0
Trichlorofluoromethane	0.3	0.302	-	-0.7	20	114	0
Ethyl ether	0.112	0.102	-	8.9	20	97	0
1,1-Dichloroethene	0.182	0.218	-	-19.8	20	126	0
Carbon disulfide	0.574	0.419	-	27*	20	82	0
Freon-113	0.201	0.247	-	-22.9*	20	134	0
Acrolein	0.025	0.031	-	-24*	20	138	0
Methylene chloride	40	37.37	-	6.6	20	102	-.01
Acetone	40	28.7	-	28.3*	20	77	-.01
trans-1,2-Dichloroethene	0.223	0.243	-	-9	20	118	-.01
Methyl acetate	0.158	0.142	-	10.1	20	102	-.01
Methyl tert-butyl ether	0.611	0.518	-	15.2	20	92	0
tert-Butyl alcohol	0.02	0.02	-	0	20	110	-.01
Diisopropyl ether	0.816	0.8	-	2	20	104	-.01
1,1-Dichloroethane	0.387	0.406	-	-4.9	20	110	-.01
Halothane	0.173	0.203	-	-17.3	20	126	-.01
Acrylonitrile	0.062	0.063	-	-1.6	20	108	-.01
Ethyl tert-butyl ether	0.695	0.713	-	-2.6	20	109	-.01
Vinyl acetate	0.581	0.493	-	15.1	20	92	-.01
cis-1,2-Dichloroethene	0.256	0.255	-	0.4	20	107	0
2,2-Dichloropropane	0.316	0.333	-	-5.4	20	113	0
Bromochloromethane	0.112	0.126	-	-12.5	20	119	-.01
Cyclohexane	0.346	0.446	-	-28.9*	20	137	0
Chloroform	0.44	0.396	-	10	20	96	-.01
Ethyl acetate	0.24	0.197	-	17.9	20	91	-.01
Carbon tetrachloride	0.304	0.312	-	-2.6	20	112	0
Tetrahydrofuran	0.074	0.059	-	20.3*	20	88	-.02
Dibromofluoromethane	0.252	0.259	-	-2.8	20	113	0
1,1,1-Trichloroethane	0.327	0.33	-	-0.9	20	105	-.01
2-Butanone	0.114	0.082	-	28.1*	20	82	-.02
1,1-Dichloropropene	0.28	0.297	-	-6.1	20	110	-.01
Benzene	0.893	0.867	-	2.9	20	102	0
tert-Amyl methyl ether	0.657	0.588	-	10.5	20	95	0
1,2-Dichloroethane-d4	0.268	0.234	-	12.7	20	96	0
1,2-Dichloroethane	0.311	0.27	-	13.2	20	95	0
Methyl cyclohexane	0.384	0.423	-	-10.2	20	117	0
Trichloroethene	0.235	0.243	-	-3.4	20	108	-.01
Dibromomethane	0.145	0.126	-	13.1	20	93	-.01

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/01/22 07:09
Lab File ID	: V00221101A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1706907-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.233	0.225	-	3.4	20	104	-.01
2-Chloroethyl vinyl ether	0.122	0.099	-	18.9	20	84	-.01
Bromodichloromethane	0.332	0.286*	-	13.9	20	91	-.01
1,4-Dioxane	0.00162	0.00196*	-	-21*	20	125	0
cis-1,3-Dichloropropene	0.375	0.352	-	6.1	20	97	-.01
Chlorobenzene-d5	1	1	-	0	20	102	0
Toluene-d8	1.255	1.258	-	-0.2	20	102	-.01
Toluene	0.711	0.746	-	-4.9	20	105	0
4-Methyl-2-pentanone	0.089	0.085	-	4.5	20	92	-.02
Tetrachloroethene	0.285	0.365	-	-28.1*	20	123	0
trans-1,3-Dichloropropene	0.422	0.405	-	4	20	95	-.01
Ethyl methacrylate	0.355	0.306	-	13.8	20	83	-.01
1,1,2-Trichloroethane	0.213	0.188*	-	11.7	20	89	0
Chlorodibromomethane	0.295	0.302	-	-2.4	20	100	0
1,3-Dichloropropane	0.425	0.383	-	9.9	20	90	0
1,2-Dibromoethane	0.245	0.24	-	2	20	96	0
2-Hexanone	0.205	0.155	-	24.4*	20	75	-.01
Chlorobenzene	0.796	0.862	-	-8.3	20	106	0
Ethylbenzene	1.346	1.372	-	-1.9	20	100	0
1,1,1,2-Tetrachloroethane	0.285	0.304	-	-6.7	20	104	0
p/m Xylene	0.504	0.568	-	-12.7	20	108	0
o Xylene	0.493	0.526	-	-6.7	20	101	0
Styrene	0.842	0.861	-	-2.3	20	95	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	104	0
Bromoform	0.365	0.358	-	1.9	20	100	0
Isopropylbenzene	2.526	2.589	-	-2.5	20	103	0
4-Bromofluorobenzene	0.877	0.831	-	5.2	20	99	0
Bromobenzene	0.63	0.674	-	-7	20	109	0
n-Propylbenzene	2.996	2.986	-	0.3	20	100	0
1,4-Dichlorobutane	0.816	0.731	-	10.4	20	93	0
1,1,2,2-Tetrachloroethane	0.605	0.515	-	14.9	20	87	0
4-Ethyltoluene	2.459	2.599	-	-5.7	20	106	0
2-Chlorotoluene	1.773	1.778	-	-0.3	20	102	0
1,3,5-Trimethylbenzene	2.091	2.196	-	-5	20	106	0
1,2,3-Trichloropropane	0.488	0.406	-	16.8	20	89	-.01
trans-1,4-Dichloro-2-buten	0.19	0.167	-	12.1	20	90	0
4-Chlorotoluene	1.814	1.837	-	-1.3	20	102	0
tert-Butylbenzene	1.784	1.962	-	-10	20	110	0
1,2,4-Trimethylbenzene	2.074	2.139	-	-3.1	20	103	0
sec-Butylbenzene	2.721	2.843	-	-4.5	20	104	0
p-Isopropyltoluene	2.287	2.525	-	-10.4	20	110	0
1,3-Dichlorobenzene	1.229	1.322	-	-7.6	20	110	0
1,4-Dichlorobenzene	1.248	1.334	-	-6.9	20	110	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/01/22 07:09
Lab File ID	: V00221101A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1706907-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.363	1.545	-	-13.4	20	113	0
n-Butylbenzene	2.074	2.062	-	0.6	20	99	0
1,2-Dichlorobenzene	1.163	1.229	-	-5.7	20	108	0
1,2,4,5-Tetramethylbenzene	2.036	2.213	-	-8.7	20	109	0
1,2-Dibromo-3-chloropropan	0.097	0.094	-	3.1	20	100	0
1,3,5-Trichlorobenzene	0.857	1.014	-	-18.3	20	121	0
Hexachlorobutadiene	0.393	0.48	-	-22.1*	20	124	0
1,2,4-Trichlorobenzene	0.79	0.905	-	-14.6	20	118	0
Naphthalene	1.827	1.783	-	2.4	20	100	0
1,2,3-Trichlorobenzene	0.749	0.827	-	-10.4	20	115	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/01/22 16:23
Lab File ID	: VQ221101N02	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1706971-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	124	0
Dichlorodifluoromethane	0.258	0.193	-	25.2*	20	88	0
Chloromethane	0.281	0.332	-	-18.1	20	146	0
Vinyl chloride	0.232	0.262	-	-12.9	20	137	0
Bromomethane	0.127	0.094	-	26*	20	94	0
Chloroethane	0.142	0.149	-	-4.9	20	129	0
Trichlorofluoromethane	0.392	0.353	-	9.9	20	107	0
Ethyl ether	0.113	0.101	-	10.6	20	113	0
1,1-Dichloroethene	0.22	0.214	-	2.7	20	120	0
Carbon disulfide	0.529	0.391	-	26.1*	20	88	0
Methylene chloride	0.242	0.243	-	-0.4	20	126	0
Acetone	0.049	0.052	-	-6.1	20	122	0
trans-1,2-Dichloroethene	0.228	0.232	-	-1.8	20	124	0
Methyl tert-butyl ether	0.561	0.45	-	19.8	20	99	0
Diisopropyl ether	0.817	0.851	-	-4.2	20	132	0
1,1-Dichloroethane	0.479	0.522	-	-9	20	133	0
Ethyl tert-butyl ether	0.732	0.665	-	9.2	20	117	0
cis-1,2-Dichloroethene	0.258	0.262	-	-1.6	20	127	0
2,2-Dichloropropane	0.464	0.42	-	9.5	20	116	0
Bromochloromethane	0.118	0.112	-	5.1	20	113	0
Chloroform	0.446	0.443	-	0.7	20	123	0
Carbon tetrachloride	0.378	0.378	-	0	20	120	0
Tetrahydrofuran	0.066	0.065	-	1.5	20	122	0
Dibromofluoromethane	0.264	0.279	-	-5.7	20	132	0
1,1,1-Trichloroethane	0.41	0.383	-	6.6	20	115	0
2-Butanone	0.085	0.069	-	18.8	20	101	0
1,1-Dichloropropene	0.346	0.307	-	11.3	20	109	0
Benzene	0.956	0.926	-	3.1	20	117	0
tert-Amyl methyl ether	0.621	0.478	-	23*	20	101	0
1,2-Dichloroethane-d4	0.331	0.34	-	-2.7	20	129	0
1,2-Dichloroethane	0.351	0.321	-	8.5	20	115	0
Trichloroethene	0.246	0.221	-	10.2	20	109	0
Dibromomethane	10	8.541	-	14.6	20	103	0
1,2-Dichloropropane	0.254	0.258	-	-1.6	20	125	0
Bromodichloromethane	0.353	0.31	-	12.2	20	110	0
1,4-Dioxane	0.00147	0.0015*	-	-2	20	122	0
cis-1,3-Dichloropropene	0.419	0.347	-	17.2	20	102	0
Chlorobenzene-d5	1	1	-	0	20	119	0
Toluene-d8	1.326	1.376	-	-3.8	20	126	0
Toluene	0.794	0.757	-	4.7	20	115	0
4-Methyl-2-pentanone	0.079	0.067	-	15.2	20	105	0
Tetrachloroethene	0.329	0.287	-	12.8	20	107	0
trans-1,3-Dichloropropene	0.498	0.399	-	19.9	20	97	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/01/22 16:23
Lab File ID	: VQ221101N02	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1706971-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.205	0.167*	-	18.5	20	102	0
Chlorodibromomethane	0.313	0.248	-	20.8*	20	96	0
1,3-Dichloropropane	0.44	0.386	-	12.3	20	106	0
1,2-Dibromoethane	0.231	0.191*	-	17.3	20	100	0
2-Hexanone	0.16	0.138	-	13.7	20	106	0
Chlorobenzene	0.9	0.807	-	10.3	20	108	0
Ethylbenzene	1.57	1.507	-	4	20	112	0
1,1,1,2-Tetrachloroethane	0.334	0.266	-	20.4*	20	95	0
p/m Xylene	0.607	0.62	-	-2.1	20	117	0
o Xylene	0.578	0.579	-	-0.2	20	114	0
Styrene	0.978	0.924	-	5.5	20	109	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	134	0
Bromoform	0.359	0.245	-	31.8*	20	93	0
Isopropylbenzene	3.124	2.67	-	14.5	20	110	0
4-Bromofluorobenzene	1.005	0.945	-	6	20	125	0
Bromobenzene	0.752	0.609	-	19	20	109	0
n-Propylbenzene	3.707	3.305	-	10.8	20	114	0
1,1,2,2-Tetrachloroethane	0.573	0.411	-	28.3*	20	102	0
2-Chlorotoluene	2.595	2.259	-	12.9	20	113	0
1,3,5-Trimethylbenzene	2.747	2.307	-	16	20	110	0
1,2,3-Trichloropropane	0.496	0.35	-	29.4*	20	97	0
4-Chlorotoluene	2.344	2.04	-	13	20	114	0
tert-Butylbenzene	2.391	2.112	-	11.7	20	113	0
1,2,4-Trimethylbenzene	2.688	2.249	-	16.3	20	110	0
sec-Butylbenzene	3.438	3.036	-	11.7	20	111	0
p-Isopropyltoluene	3.085	2.715	-	12	20	113	0
1,3-Dichlorobenzene	1.489	1.267	-	14.9	20	114	0
1,4-Dichlorobenzene	1.469	1.252	-	14.8	20	112	0
n-Butylbenzene	2.654	2.279	-	14.1	20	111	0
1,2-Dichlorobenzene	1.377	1.182	-	14.2	20	113	0
1,2-Dibromo-3-chloropropan	0.101	0.067	-	33.7*	20	94	0
Hexachlorobutadiene	0.518	0.398	-	23.2*	20	103	0
1,2,4-Trichlorobenzene	1.039	0.813	-	21.8*	20	107	0
Naphthalene	2.112	1.596	-	24.4*	20	103	0
1,2,3-Trichlorobenzene	0.911	0.715	-	21.5*	20	107	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/02/22 04:26
Lab File ID	: VQ221102A03	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1707170-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	153	0
Dichlorodifluoromethane	0.258	0.231	-	10.5	20	130	0
Chloromethane	0.281	0.298	-	-6	20	161	.02
Vinyl chloride	0.232	0.268	-	-15.5	20	174	0
Bromomethane	0.127	0.105	-	17.3	20	129	0
Chloroethane	0.142	0.126	-	11.3	20	134	-.01
Trichlorofluoromethane	0.392	0.323	-	17.6	20	121	0
Ethyl ether	0.113	0.097	-	14.2	20	134	0
1,1-Dichloroethene	0.22	0.216	-	1.8	20	149	0
Carbon disulfide	0.529	0.431	-	18.5	20	120	0
Methylene chloride	0.242	0.237	-	2.1	20	152	0
Acetone	0.049	0.074	-	-51*	20	216	0
trans-1,2-Dichloroethene	0.228	0.238	-	-4.4	20	158	0
Methyl tert-butyl ether	0.561	0.48	-	14.4	20	130	0
Diisopropyl ether	0.817	0.846	-	-3.5	20	162	0
1,1-Dichloroethane	0.479	0.489	-	-2.1	20	154	0
Ethyl tert-butyl ether	0.732	0.714	-	2.5	20	154	0
cis-1,2-Dichloroethene	0.258	0.262	-	-1.6	20	156	0
2,2-Dichloropropane	0.464	0.421	-	9.3	20	144	0
Bromochloromethane	0.118	0.11	-	6.8	20	137	0
Chloroform	0.446	0.424	-	4.9	20	145	0
Carbon tetrachloride	0.378	0.333	-	11.9	20	131	0
Tetrahydrofuran	0.066	0.086	-	-30.3*	20	200	0
Dibromofluoromethane	0.264	0.252	-	4.5	20	147	0
1,1,1-Trichloroethane	0.41	0.374	-	8.8	20	138	-.01
2-Butanone	0.085	0.106	-	-24.7*	20	191	0
1,1-Dichloropropene	0.346	0.336	-	2.9	20	147	0
Benzene	0.956	0.977	-	-2.2	20	152	0
tert-Amyl methyl ether	0.621	0.537	-	13.5	20	140	0
1,2-Dichloroethane-d4	0.331	0.302	-	8.8	20	141	0
1,2-Dichloroethane	0.351	0.3	-	14.5	20	132	0
Trichloroethene	0.246	0.243	-	1.2	20	148	0
Dibromomethane	10	8.637	-	13.6	20	129	0
1,2-Dichloropropane	0.254	0.264	-	-3.9	20	158	0
Bromodichloromethane	0.353	0.312	-	11.6	20	136	0
1,4-Dioxane	0.00147	0.00208*	-	-41.5*	20	209	.01
cis-1,3-Dichloropropene	0.419	0.376	-	10.3	20	136	0
Chlorobenzene-d5	1	1	-	0	20	145	0
Toluene-d8	1.326	1.353	-	-2	20	151	0
Toluene	0.794	0.819	-	-3.1	20	152	0
4-Methyl-2-pentanone	0.079	0.087	-	-10.1	20	164	0
Tetrachloroethene	0.329	0.338	-	-2.7	20	154	0
trans-1,3-Dichloropropene	0.498	0.44	-	11.6	20	130	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/02/22 04:26
Lab File ID	: VQ221102A03	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1707170-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.205	0.184*	-	10.2	20	136	0
Chlorodibromomethane	0.313	0.274	-	12.5	20	129	0
1,3-Dichloropropane	0.44	0.414	-	5.9	20	138	0
1,2-Dibromoethane	0.231	0.219	-	5.2	20	140	0
2-Hexanone	0.16	0.164	-	-2.5	20	153	0
Chlorobenzene	0.9	0.871	-	3.2	20	142	0
Ethylbenzene	1.57	1.564	-	0.4	20	142	0
1,1,1,2-Tetrachloroethane	0.334	0.299	-	10.5	20	130	0
p/m Xylene	0.607	0.637	-	-4.9	20	147	0
o Xylene	0.578	0.587	-	-1.6	20	142	0
Styrene	0.978	0.954	-	2.5	20	137	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	156	0
Bromoform	0.359	0.287	-	20.1*	20	126	0
Isopropylbenzene	3.124	2.937	-	6	20	141	0
4-Bromofluorobenzene	1.005	0.93	-	7.5	20	143	0
Bromobenzene	0.752	0.674	-	10.4	20	140	0
n-Propylbenzene	3.707	3.57	-	3.7	20	144	0
1,1,2,2-Tetrachloroethane	0.573	0.466	-	18.7	20	135	0
2-Chlorotoluene	2.595	2.416	-	6.9	20	141	0
1,3,5-Trimethylbenzene	2.747	2.552	-	7.1	20	143	0
1,2,3-Trichloropropane	0.496	0.415	-	16.3	20	134	0
4-Chlorotoluene	2.344	2.189	-	6.6	20	143	0
tert-Butylbenzene	2.391	2.302	-	3.7	20	144	0
1,2,4-Trimethylbenzene	2.688	2.497	-	7.1	20	142	0
sec-Butylbenzene	3.438	3.338	-	2.9	20	143	0
p-Isopropyltoluene	3.085	3.025	-	1.9	20	147	0
1,3-Dichlorobenzene	1.489	1.409	-	5.4	20	148	0
1,4-Dichlorobenzene	1.469	1.398	-	4.8	20	146	0
n-Butylbenzene	2.654	2.6	-	2	20	148	0
1,2-Dichlorobenzene	1.377	1.28	-	7	20	143	0
1,2-Dibromo-3-chloropropan	0.101	0.085	-	15.8	20	139	0
Hexachlorobutadiene	0.518	0.541	-	-4.4	20	164	0
1,2,4-Trichlorobenzene	1.039	1.008	-	3	20	154	0
Naphthalene	2.112	1.965	-	7	20	148	0
1,2,3-Trichlorobenzene	0.911	0.9	-	1.2	20	157	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/02/22 07:12
Lab File ID	: V00221102A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1707425-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	115	0
Dichlorodifluoromethane	0.198	0.17	-	14.1	20	104	0
Chloromethane	0.196	0.195	-	0.5	20	110	0
Vinyl chloride	0.209	0.209	-	0	20	112	0
Bromomethane	0.135	0.114	-	15.6	20	105	0
Chloroethane	0.136	0.123	-	9.6	20	98	0
Trichlorofluoromethane	0.3	0.285	-	5	20	114	0
Ethyl ether	0.112	0.101	-	9.8	20	102	0
1,1-Dichloroethene	0.182	0.212	-	-16.5	20	129	0
Carbon disulfide	0.574	0.413	-	28*	20	85	0
Freon-113	0.201	0.237	-	-17.9	20	136	0
Acrolein	0.025	0.031	-	-24*	20	142	0
Methylene chloride	40	36.391	-	9	20	105	-.01
Acetone	40	27.415	-	31.5*	20	77	-.02
trans-1,2-Dichloroethene	0.223	0.234	-	-4.9	20	120	-.01
Methyl acetate	0.158	0.133	-	15.8	20	101	-.02
Methyl tert-butyl ether	0.611	0.517	-	15.4	20	96	0
tert-Butyl alcohol	0.02	0.021	-	-5	20	120	-.02
Diisopropyl ether	0.816	0.742	-	9.1	20	102	-.01
1,1-Dichloroethane	0.387	0.394	-	-1.8	20	113	-.01
Halothane	0.173	0.192	-	-11	20	125	-.01
Acrylonitrile	0.062	0.061	-	1.6	20	109	-.01
Ethyl tert-butyl ether	0.695	0.692	-	0.4	20	112	-.01
Vinyl acetate	0.581	0.458	-	21.2*	20	90	-.01
cis-1,2-Dichloroethene	0.256	0.249	-	2.7	20	110	0
2,2-Dichloropropane	0.316	0.323	-	-2.2	20	115	0
Bromochloromethane	0.112	0.119	-	-6.2	20	118	-.01
Cyclohexane	0.346	0.427	-	-23.4*	20	138	0
Chloroform	0.44	0.385	-	12.5	20	98	-.01
Ethyl acetate	0.24	0.188	-	21.7*	20	92	-.02
Carbon tetrachloride	0.304	0.292	-	3.9	20	110	0
Tetrahydrofuran	0.074	0.055	-	25.7*	20	87	-.03
Dibromofluoromethane	0.252	0.252	-	0	20	116	0
1,1,1-Trichloroethane	0.327	0.315	-	3.7	20	106	-.01
2-Butanone	0.114	0.078	-	31.6*	20	82	-.02
1,1-Dichloropropene	0.28	0.293	-	-4.6	20	114	-.01
Benzene	0.893	0.858	-	3.9	20	106	-.01
tert-Amyl methyl ether	0.657	0.589	-	10.4	20	101	0
1,2-Dichloroethane-d4	0.268	0.229	-	14.6	20	99	-.01
1,2-Dichloroethane	0.311	0.257	-	17.4	20	96	0
Methyl cyclohexane	0.384	0.415	-	-8.1	20	121	0
Trichloroethene	0.235	0.237	-	-0.9	20	111	-.01
Dibromomethane	0.145	0.122	-	15.9	20	95	-.01

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/02/22 07:12
Lab File ID	: V00221102A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1707425-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.233	0.223	-	4.3	20	109	0
2-Chloroethyl vinyl ether	0.122	0.1	-	18	20	90	-.01
Bromodichloromethane	0.332	0.279*	-	16	20	93	-.01
1,4-Dioxane	0.00162	0.00202*	-	-24.7*	20	135	0
cis-1,3-Dichloropropene	0.375	0.35	-	6.7	20	102	-.01
Chlorobenzene-d5	1	1	-	0	20	105	0
Toluene-d8	1.255	1.29	-	-2.8	20	108	-.01
Toluene	0.711	0.747	-	-5.1	20	108	-.01
4-Methyl-2-pentanone	0.089	0.087	-	2.2	20	97	-.02
Tetrachloroethene	0.285	0.354	-	-24.2*	20	123	0
trans-1,3-Dichloropropene	0.422	0.408	-	3.3	20	99	-.01
Ethyl methacrylate	0.355	0.317	-	10.7	20	89	-.01
1,1,2-Trichloroethane	0.213	0.19*	-	10.8	20	92	-.01
Chlorodibromomethane	0.295	0.291	-	1.4	20	100	-.01
1,3-Dichloropropane	0.425	0.389	-	8.5	20	94	0
1,2-Dibromoethane	0.245	0.24	-	2	20	99	0
2-Hexanone	0.205	0.155	-	24.4*	20	77	-.02
Chlorobenzene	0.796	0.842	-	-5.8	20	107	0
Ethylbenzene	1.346	1.359	-	-1	20	102	0
1,1,1,2-Tetrachloroethane	0.285	0.293	-	-2.8	20	103	0
p/m Xylene	0.504	0.556	-	-10.3	20	109	0
o Xylene	0.493	0.513	-	-4.1	20	102	0
Styrene	0.842	0.848	-	-0.7	20	97	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	108	0
Bromoform	0.365	0.351	-	3.8	20	102	0
Isopropylbenzene	2.526	2.517	-	0.4	20	104	0
4-Bromofluorobenzene	0.877	0.857	-	2.3	20	106	0
Bromobenzene	0.63	0.654	-	-3.8	20	111	0
n-Propylbenzene	2.996	2.921	-	2.5	20	102	0
1,4-Dichlorobutane	0.816	0.718	-	12	20	95	0
1,1,2,2-Tetrachloroethane	0.605	0.517	-	14.5	20	91	0
4-Ethyltoluene	2.459	2.524	-	-2.6	20	107	-.01
2-Chlorotoluene	1.773	1.738	-	2	20	103	0
1,3,5-Trimethylbenzene	2.091	2.132	-	-2	20	107	0
1,2,3-Trichloropropane	0.488	0.403	-	17.4	20	92	-.01
trans-1,4-Dichloro-2-buten	0.19	0.158	-	16.8	20	89	0
4-Chlorotoluene	1.814	1.793	-	1.2	20	104	0
tert-Butylbenzene	1.784	1.874	-	-5	20	110	0
1,2,4-Trimethylbenzene	2.074	2.088	-	-0.7	20	105	0
sec-Butylbenzene	2.721	2.748	-	-1	20	105	0
p-Isopropyltoluene	2.287	2.411	-	-5.4	20	109	0
1,3-Dichlorobenzene	1.229	1.267	-	-3.1	20	110	0
1,4-Dichlorobenzene	1.248	1.275	-	-2.2	20	110	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA100	Calibration Date	: 11/02/22 07:12
Lab File ID	: V00221102A01	Init. Calib. Date(s)	: 08/02/22 08/03/22
Sample No	: WG1707425-2	Init. Calib. Times	: 21:09 00:39
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.363	1.464	-	-7.4	20	111	0
n-Butylbenzene	2.074	1.991	-	4	20	100	0
1,2-Dichlorobenzene	1.163	1.17	-	-0.6	20	107	0
1,2,4,5-Tetramethylbenzene	2.036	2.132	-	-4.7	20	109	0
1,2-Dibromo-3-chloropropan	0.097	0.096	-	1	20	106	0
1,3,5-Trichlorobenzene	0.857	0.983	-	-14.7	20	122	0
Hexachlorobutadiene	0.393	0.469	-	-19.3	20	126	0
1,2,4-Trichlorobenzene	0.79	0.873	-	-10.5	20	119	0
Naphthalene	1.827	1.752	-	4.1	20	102	0
1,2,3-Trichlorobenzene	0.749	0.797	-	-6.4	20	115	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/02/22 18:08
Lab File ID	: VQ221102P01	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1707538-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	136	0
Dichlorodifluoromethane	0.258	0.248	-	3.9	20	124	0
Chloromethane	0.281	0.359	-	-27.8*	20	173	0
Vinyl chloride	0.232	0.299	-	-28.9*	20	172	0
Bromomethane	0.127	0.111	-	12.6	20	121	0
Chloroethane	0.142	0.169	-	-19	20	160	0
Trichlorofluoromethane	0.392	0.388	-	1	20	129	0
Ethyl ether	0.113	0.095	-	15.9	20	117	0
1,1-Dichloroethene	0.22	0.24	-	-9.1	20	147	0
Carbon disulfide	0.529	0.437	-	17.4	20	108	0
Methylene chloride	0.242	0.26	-	-7.4	20	148	0
Acetone	0.049	0.046	-	6.1	20	119	-.01
trans-1,2-Dichloroethene	0.228	0.257	-	-12.7	20	151	0
Methyl tert-butyl ether	0.561	0.422	-	24.8*	20	102	-.01
Diisopropyl ether	0.817	0.823	-	-0.7	20	140	-.01
1,1-Dichloroethane	0.479	0.553	-	-15.4	20	155	0
Ethyl tert-butyl ether	0.732	0.638	-	12.8	20	123	0
cis-1,2-Dichloroethene	0.258	0.273	-	-5.8	20	145	0
2,2-Dichloropropane	0.464	0.462	-	0.4	20	140	0
Bromochloromethane	0.118	0.12	-	-1.7	20	133	0
Chloroform	0.446	0.465	-	-4.3	20	142	0
Carbon tetrachloride	0.378	0.356	-	5.8	20	124	0
Tetrahydrofuran	0.066	0.058	-	12.1	20	120	0
Dibromofluoromethane	0.264	0.268	-	-1.5	20	139	0
1,1,1-Trichloroethane	0.41	0.411	-	-0.2	20	135	-.01
2-Butanone	0.085	0.06	-	29.4*	20	96	0
1,1-Dichloropropene	0.346	0.334	-	3.5	20	129	0
Benzene	0.956	1.005	-	-5.1	20	139	-.01
tert-Amyl methyl ether	0.621	0.467	-	24.8*	20	108	0
1,2-Dichloroethane-d4	0.331	0.311	-	6	20	129	0
1,2-Dichloroethane	0.351	0.317	-	9.7	20	124	0
Trichloroethene	0.246	0.238	-	3.3	20	129	0
Dibromomethane	10	8.993	-	10.1	20	119	0
1,2-Dichloropropane	0.254	0.267	-	-5.1	20	142	0
Bromodichloromethane	0.353	0.314	-	11	20	122	0
1,4-Dioxane	0.00147	0.0017*	-	-15.6	20	152	0
cis-1,3-Dichloropropene	0.419	0.357	-	14.8	20	115	-.01
Chlorobenzene-d5	1	1	-	0	20	129	0
Toluene-d8	1.326	1.375	-	-3.7	20	137	0
Toluene	0.794	0.841	-	-5.9	20	139	0
4-Methyl-2-pentanone	0.079	0.064	-	19	20	109	0
Tetrachloroethene	0.329	0.334	-	-1.5	20	135	0
trans-1,3-Dichloropropene	0.498	0.408	-	18.1	20	108	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 11/02/22 18:08
Lab File ID	: VQ221102P01	Init. Calib. Date(s)	: 09/15/22 09/15/22
Sample No	: WG1707538-2	Init. Calib. Times	: 06:04 08:44
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.205	0.171*	-	16.6	20	113	0
Chlorodibromomethane	0.313	0.255	-	18.5	20	107	0
1,3-Dichloropropane	0.44	0.392	-	10.9	20	117	0
1,2-Dibromoethane	0.231	0.195*	-	15.6	20	111	0
2-Hexanone	0.16	0.119	-	25.6*	20	99	0
Chlorobenzene	0.9	0.891	-	1	20	130	0
Ethylbenzene	1.57	1.637	-	-4.3	20	132	0
1,1,1,2-Tetrachloroethane	0.334	0.281	-	15.9	20	109	0
p/m Xylene	0.607	0.68	-	-12	20	140	0
o Xylene	0.578	0.635	-	-9.9	20	136	0
Styrene	0.978	1.007	-	-3	20	129	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	142	0
Bromoform	0.359	0.249	-	30.6*	20	100	0
Isopropylbenzene	3.124	3.025	-	3.2	20	132	0
4-Bromofluorobenzene	1.005	0.942	-	6.3	20	132	0
Bromobenzene	0.752	0.667	-	11.3	20	126	0
n-Propylbenzene	3.707	3.689	-	0.5	20	135	0
1,1,2,2-Tetrachloroethane	0.573	0.425	-	25.8*	20	112	0
2-Chlorotoluene	2.595	2.495	-	3.9	20	132	0
1,3,5-Trimethylbenzene	2.747	2.563	-	6.7	20	130	0
1,2,3-Trichloropropane	0.496	0.358	-	27.8*	20	105	0
4-Chlorotoluene	2.344	2.286	-	2.5	20	136	0
tert-Butylbenzene	2.391	2.396	-	-0.2	20	136	0
1,2,4-Trimethylbenzene	2.688	2.495	-	7.2	20	129	0
sec-Butylbenzene	3.438	3.455	-	-0.5	20	135	0
p-Isopropyltoluene	3.085	3.08	-	0.2	20	136	0
1,3-Dichlorobenzene	1.489	1.449	-	2.7	20	138	0
1,4-Dichlorobenzene	1.469	1.424	-	3.1	20	135	0
n-Butylbenzene	2.654	2.591	-	2.4	20	134	0
1,2-Dichlorobenzene	1.377	1.304	-	5.3	20	133	0
1,2-Dibromo-3-chloropropan	0.101	0.068	-	32.7*	20	101	0
Hexachlorobutadiene	0.518	0.479	-	7.5	20	132	0
1,2,4-Trichlorobenzene	1.039	0.872	-	16.1	20	122	0
Naphthalene	2.112	1.667	-	21.1*	20	114	0
1,2,3-Trichlorobenzene	0.911	0.777	-	14.7	20	124	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA129	Calibration Date	: 11/03/22 07:26
Lab File ID	: V29221103A01	Init. Calib. Date(s)	: 09/21/22 09/21/22
Sample No	: WG1708247-2	Init. Calib. Times	: 19:03 22:53
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	76	0
Dichlorodifluoromethane	0.266	0.23	-	13.5	20	72	0
Chloromethane	0.42	0.309	-	26.4*	20	62	0
Vinyl chloride	0.33	0.282	-	14.5	20	70	0
Bromomethane	0.175	0.226	-	-29.1*	20	119	0
Chloroethane	0.2	0.181	-	9.5	20	79	0
Trichlorofluoromethane	0.362	0.384	-	-6.1	20	85	0
Ethyl ether	0.119	0.117	-	1.7	20	82	0
1,1-Dichloroethene	0.224	0.226	-	-0.9	20	81	0
Carbon disulfide	0.684	0.485	-	29.1*	20	57	0
Freon-113	0.236	0.255	-	-8.1	20	83	0
Acrolein	0.047	0.037	-	21.3*	20	70	0
Methylene chloride	40	38.136	-	4.7	20	83	0
Acetone	40	28.598	-	28.5*	20	61	0
trans-1,2-Dichloroethene	0.278	0.268	-	3.6	20	78	0
Methyl acetate	0.232	0.165	-	28.9*	20	61	0
Methyl tert-butyl ether	0.668	0.653	-	2.2	20	77	0
tert-Butyl alcohol	0.043	0.033	-	23.3*	20	66	-.01
Diisopropyl ether	1.014	0.824	-	18.7	20	65	0
1,1-Dichloroethane	0.507	0.457	-	9.9	20	73	0
Halothane	0.21	0.213	-	-1.4	20	81	0
Acrylonitrile	40	29.144	-	27.1*	20	66	-.01
Ethyl tert-butyl ether	0.908	0.814	-	10.4	20	72	0
Vinyl acetate	0.661	0.537	-	18.8	20	66	0
cis-1,2-Dichloroethene	0.305	0.293	-	3.9	20	79	0
2,2-Dichloropropane	0.434	0.413	-	4.8	20	78	0
Bromochloromethane	0.155	0.155	-	0	20	83	0
Cyclohexane	0.546	0.442	-	19	20	66	0
Chloroform	0.487	0.49	-	-0.6	20	81	0
Ethyl acetate	0.337	0.239	-	29.1*	20	59	0
Carbon tetrachloride	0.368	0.375	-	-1.9	20	80	0
Tetrahydrofuran	0.123	0.084	-	31.7*	20	58	0
Dibromofluoromethane	0.257	0.257	-	0	20	77	0
1,1,1-Trichloroethane	0.407	0.42	-	-3.2	20	81	0
2-Butanone	0.175	0.111	-	36.6*	20	55	0
1,1-Dichloropropene	0.349	0.352	-	-0.9	20	76	0
Benzene	1.075	1.058	-	1.6	20	77	0
tert-Amyl methyl ether	0.781	0.731	-	6.4	20	75	0
1,2-Dichloroethane-d4	0.277	0.284	-	-2.5	20	82	0
1,2-Dichloroethane	0.363	0.372	-	-2.5	20	81	0
Methyl cyclohexane	0.496	0.475	-	4.2	20	75	0
Trichloroethene	0.305	0.291	-	4.6	20	80	0
Dibromomethane	0.174	0.171	-	1.7	20	81	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2259175
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA129	Calibration Date	: 11/03/22 07:26
Lab File ID	: V29221103A01	Init. Calib. Date(s)	: 09/21/22 09/21/22
Sample No	: WG1708247-2	Init. Calib. Times	: 19:03 22:53
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.312	0.273	-	12.5	20	71	0
2-Chloroethyl vinyl ether	0.193	0.161	-	16.6	20	66	0
Bromodichloromethane	0.399	0.382	-	4.3	20	80	0
1,4-Dioxane	0.00351	0.00308*	-	12.3	20	69	0
cis-1,3-Dichloropropene	0.453	0.45	-	0.7	20	76	0
Chlorobenzene-d5	1	1	-	0	20	77	0
Toluene-d8	1.259	1.272	-	-1	20	78	0
Toluene	0.889	0.851	-	4.3	20	78	0
4-Methyl-2-pentanone	0.151	0.109	-	27.8*	20	58	0
Tetrachloroethene	0.365	0.397	-	-8.8	20	85	0
trans-1,3-Dichloropropene	0.534	0.516	-	3.4	20	77	0
Ethyl methacrylate	0.476	0.401	-	15.8	20	71	0
1,1,2-Trichloroethane	0.265	0.249	-	6	20	79	0
Chlorodibromomethane	0.368	0.371	-	-0.8	20	80	0
1,3-Dichloropropane	0.517	0.503	-	2.7	20	78	0
1,2-Dibromoethane	0.313	0.308	-	1.6	20	79	0
2-Hexanone	0.307	0.209	-	31.9*	20	58	0
Chlorobenzene	0.983	0.998	-	-1.5	20	80	0
Ethylbenzene	1.671	1.634	-	2.2	20	79	0
1,1,1,2-Tetrachloroethane	0.35	0.364	-	-4	20	81	0
p/m Xylene	0.649	0.67	-	-3.2	20	81	0
o Xylene	0.631	0.633	-	-0.3	20	79	0
Styrene	1.056	1.057	-	-0.1	20	79	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	81	0
Bromoform	0.452	0.426	-	5.8	20	82	0
Isopropylbenzene	3.187	3.01	-	5.6	20	79	0
4-Bromofluorobenzene	0.9	0.852	-	5.3	20	77	0
Bromobenzene	0.821	0.815	-	0.7	20	86	0
n-Propylbenzene	3.761	3.618	-	3.8	20	80	0
1,4-Dichlorobutane	1.119	0.886	-	20.8*	20	69	0
1,1,2,2-Tetrachloroethane	0.805	0.679	-	15.7	20	77	0
4-Ethyltoluene	3.175	3.148	-	0.9	20	83	0
2-Chlorotoluene	2.265	2.087	-	7.9	20	78	0
1,3,5-Trimethylbenzene	2.793	2.748	-	1.6	20	83	0
1,2,3-Trichloropropane	0.623	0.566	-	9.1	20	81	0
trans-1,4-Dichloro-2-buten	0.278	0.219	-	21.2*	20	72	0
4-Chlorotoluene	2.344	2.291	-	2.3	20	83	0
tert-Butylbenzene	2.423	2.308	-	4.7	20	79	0
1,2,4-Trimethylbenzene	2.774	2.733	-	1.5	20	83	0
sec-Butylbenzene	3.527	3.416	-	3.1	20	80	0
p-Isopropyltoluene	3.141	3.109	-	1	20	82	0
1,3-Dichlorobenzene	1.609	1.622	-	-0.8	20	88	0
1,4-Dichlorobenzene	1.627	1.655	-	-1.7	20	88	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2259175
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Instrument ID	: VOA129	**Calibration Date**	: 11/03/22 07:26
Lab File ID	: V29221103A01	**Init. Calib. Date(s)**	: 09/21/22 09/21/22
Sample No	: WG1708247-2	**Init. Calib. Times**	: 19:03 22:53
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.922	1.857	-	3.4	20	82	0
n-Butylbenzene	2.698	2.689	-	0.3	20	82	0
1,2-Dichlorobenzene	1.519	1.542	-	-1.5	20	87	0
1,2,4,5-Tetramethylbenzene	2.884	2.856	-	1	20	82	0
1,2-Dibromo-3-chloropropan	0.158	0.131	-	17.1	20	75	0
1,3,5-Trichlorobenzene	1.185	1.308	-	-10.4	20	95	0
Hexachlorobutadiene	0.55	0.595	-	-8.2	20	91	0
1,2,4-Trichlorobenzene	1.102	1.186	-	-7.6	20	91	0
Naphthalene	2.872	2.572	-	10.4	20	78	0
1,2,3-Trichlorobenzene	1.033	1.086	-	-5.1	20	90	0

*** Value outside of QC limits.**

ANALYTICAL REPORT

Lab Number:	L2262370
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	12/09/22

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2262370-01	AQSS-22-1.5-2.0	SEDIMENT	HAVERHILL, MA	11/04/22 16:00	11/07/22
L2262370-02	AQSS-22-2.0-2.5	SEDIMENT	HAVERHILL, MA	11/04/22 16:05	11/07/22
L2262370-03	DUP1-110422	SEDIMENT	HAVERHILL, MA	11/04/22 00:00	11/07/22
L2262370-04	RINSE-110422	WATER	HAVERHILL, MA	11/04/22 16:26	11/07/22
L2262370-05	TRIP BLANK	WATER	HAVERHILL, MA	11/04/22 16:00	11/07/22

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L2262370: The sediment samples were frozen upon receipt in order to arrest the holding time.

MCP Related Narratives

Volatile Organics

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2262370-01, -01D: The sample was re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range. The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2262370-01, -02: The analysis of Volatile Organics by EPA Method 5035/8260 Low Level could not be performed due to the elevated concentrations of target compounds in the sample.

In reference to question H:

L2262370-01, -01D and -02: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: bromochloromethane (0.0808)

Verification: dichlorodifluoromethane (148%), ethyl ether (135%), carbon disulfide (151%)

L2262370-01, -01D and -02: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2262370-04 and -05: Initial calibration utilized a quadratic fit for: bromomethane

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

L2262370-04 and -05: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0033)
Average Response Factor: 1,4-dioxane
Verification: carbon disulfide (193%)
L2262370-04 and -05: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.
The WG1714879-3/-4 LCS/LCSD recoveries, associated with L2262370-01, are above the individual acceptance criteria for bromomethane (133%/137%), but within the overall method allowances. The results of the associated samples are reported; however, all positive detects for these compounds are considered to have a potentially high bias.

Semivolatile Organics by SIM
In reference to question G:
One or more of the target analytes did not achieve the requested CAM reporting limits.
L2262370-01D, -02D, -03D and WG1718985-4D and WG1718985-5D (MS/MSD): The samples have elevated detection limits due to the dilution required by the sample matrix.
The WG1718985-4D/-5D MS/MSD recoveries and RPDs, performed on L2262370-01, are outside the acceptance criteria for several compounds. The unacceptable percent recoveries are attributed to the elevated concentrations of target compounds present in the native sample. See the MS/MSD Summary Report for details.

Non-MCP Related Narratives
Total Organic Carbon
The WG1719298-4/-5 MS/MSD recoveries and RPDs (Rep1 - 47%), (Rep2 - 0%, 41% RPD) performed on L2262370-01, are outside the 75-125% acceptance criteria, possibly due to sample matrix. The associated

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

SRM recoveries are within criteria, indicating the sample batch was in control, and all sample results were accepted.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 12/09/22

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP Volatile Organics by EPA 5035 High - Westborough Lab								
8260D	Batch QC	WG1713088-3	Bromomethane	LCS	145	70-130	01-02	potential high bias
8260D	Batch QC	WG1713088-4	Bromomethane	LCSD	145	70-130	01-02	potential high bias
8260D	Batch QC	WG1714879-3	Bromomethane	LCS	133	70-130	01	potential high bias
8260D	Batch QC	WG1714879-4	Bromomethane	LCSD	137	70-130	01	potential high bias
MCP PAHs by GC/MS-SIM - Mansfield Lab								
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Naphthalene	MS	1070	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	2-Methylnaphthalene	MS	306	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Acenaphthylene	MS	303	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Acenaphthene	MS	338	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Fluorene	MS	356	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Phenanthrene	MS	2670	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Anthracene	MS	1160	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Fluoranthene	MS	3920	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Pyrene	MS	2670	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benz(a)anthracene	MS	1760	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Chrysene	MS	1500	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(b)fluoranthene	MS	1170	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(k)fluoranthene	MS	1230	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(a)pyrene	MS	1580	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Indeno(1,2,3-cd)Pyrene	MS	819	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Dibenz(a,h)anthracene	MS	278	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(ghi)perylene	MS	712	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Naphthalene	MSD	0	40-140	01-03	potential low bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	2-Methylnaphthalene	MSD	0	40-140	01-03	potential low bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Acenaphthylene	MSD	1090	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Acenaphthene	MSD	941	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluorene	MSD	1090	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Phenanthrene	MSD	35	30	01-03	non-directional bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Phenanthrene	MSD	15600	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Anthracene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Anthracene	MSD	6120	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluoranthene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluoranthene	MSD	24300	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Pyrene	MSD	46	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Pyrene	MSD	20100	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benz(a)anthracene	MSD	49	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benz(a)anthracene	MSD	13000	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Chrysene	MSD	45	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Chrysene	MSD	9830	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(b)fluoranthene	MSD	55	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(b)fluoranthene	MSD	9770	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(k)fluoranthene	MSD	5270	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(a)pyrene	MSD	46	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(a)pyrene	MSD	10900	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Indeno(1,2,3-cd)Pyrene	MSD	49	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Indeno(1,2,3-cd)Pyrene	MSD	6250	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Dibenz(a,h)anthracene	MSD	44	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Dibenz(a,h)anthracene	MSD	1460	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(ghi)perylene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(ghi)perylene	MSD	4670	40-140	01-03	potential high bias
Total Organic Carbon - Mansfield Lab								
9060A	Batch QC (L2262370-01)	WG1719298-4	Total Organic Carbon (Rep2)	MS	0	75-125	01-03	potential low bias
9060A	Batch QC (L2262370-01)	WG1719298-5	Total Organic Carbon (Rep1)	MSD	47	75-125	01-03	potential low bias
9060A	Batch QC (L2262370-01)	WG1719298-5	Total Organic Carbon (Rep2)	MSD	41	25	01-03	non-directional bias

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/18/22 17:04
Analyst: JIC
Percent Solids: 87%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	340	160	1
1,1-Dichloroethane	ND		ug/kg	69	10.	1
Chloroform	ND		ug/kg	100	9.7	1
Carbon tetrachloride	ND		ug/kg	69	16.	1
1,2-Dichloropropane	ND		ug/kg	69	8.6	1
Dibromochloromethane	ND		ug/kg	69	9.7	1
1,1,2-Trichloroethane	ND		ug/kg	69	18.	1
Tetrachloroethene	ND		ug/kg	34	14.	1
Chlorobenzene	ND		ug/kg	34	8.8	1
Trichlorofluoromethane	ND		ug/kg	280	48.	1
1,2-Dichloroethane	110		ug/kg	69	18.	1
1,1,1-Trichloroethane	ND		ug/kg	34	12.	1
Bromodichloromethane	ND		ug/kg	34	7.5	1
trans-1,3-Dichloropropene	ND		ug/kg	69	19.	1
cis-1,3-Dichloropropene	ND		ug/kg	34	11.	1
1,3-Dichloropropene, Total	ND		ug/kg	34	11.	1
1,1-Dichloropropene	ND		ug/kg	34	11.	1
Bromoform	ND		ug/kg	280	17.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	34	11.	1
Benzene	740		ug/kg	34	11.	1
Toluene	220		ug/kg	69	38.	1
Ethylbenzene	250		ug/kg	69	9.7	1
Chloromethane	ND		ug/kg	280	64.	1
Bromomethane	ND		ug/kg	140	40.	1
Vinyl chloride	ND		ug/kg	69	23.	1
Chloroethane	ND		ug/kg	140	31.	1
1,1-Dichloroethene	ND		ug/kg	69	16.	1
trans-1,2-Dichloroethene	ND		ug/kg	100	9.5	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 Date Collected: 11/04/22 16:00

Client ID: AQSS-22-1.5-2.0 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	300		ug/kg	34	9.5	1
1,2-Dichlorobenzene	ND		ug/kg	140	10.	1
1,3-Dichlorobenzene	ND		ug/kg	140	10.	1
1,4-Dichlorobenzene	19	J	ug/kg	140	12.	1
Methyl tert butyl ether	ND		ug/kg	140	14.	1
p/m-Xylene	210		ug/kg	140	39.	1
o-Xylene	120		ug/kg	69	20.	1
Xylenes, Total	330		ug/kg	69	20.	1
cis-1,2-Dichloroethene	110		ug/kg	69	12.	1
1,2-Dichloroethene, Total	110		ug/kg	69	9.5	1
Dibromomethane	ND		ug/kg	140	16.	1
1,2,3-Trichloropropane	ND		ug/kg	140	8.8	1
Styrene	24	J	ug/kg	69	14.	1
Dichlorodifluoromethane	ND		ug/kg	690	63.	1
Acetone	ND		ug/kg	690	330	1
Carbon disulfide	82	J	ug/kg	690	76.	1
Methyl ethyl ketone	ND		ug/kg	690	150	1
Methyl isobutyl ketone	ND		ug/kg	690	88.	1
2-Hexanone	ND		ug/kg	690	82.	1
Bromochloromethane	ND		ug/kg	140	14.	1
Tetrahydrofuran	ND		ug/kg	280	110	1
2,2-Dichloropropane	ND		ug/kg	140	14.	1
1,2-Dibromoethane	ND		ug/kg	69	19.	1
1,3-Dichloropropane	ND		ug/kg	140	12.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	34	9.1	1
Bromobenzene	ND		ug/kg	140	10.	1
n-Butylbenzene	18	J	ug/kg	69	12.	1
sec-Butylbenzene	ND		ug/kg	69	10.	1
tert-Butylbenzene	ND		ug/kg	140	8.2	1
o-Chlorotoluene	ND		ug/kg	140	13.	1
p-Chlorotoluene	ND		ug/kg	140	7.5	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	210	69.	1
Hexachlorobutadiene	ND		ug/kg	280	12.	1
Isopropylbenzene	50	J	ug/kg	69	7.5	1
p-Isopropyltoluene	14	J	ug/kg	69	7.5	1
Naphthalene	24000	E	ug/kg	280	45.	1
n-Propylbenzene	25	J	ug/kg	69	12.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 Date Collected: 11/04/22 16:00

Client ID: AQSS-22-1.5-2.0 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	140	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	140	19.	1
1,3,5-Trimethylbenzene	71	J	ug/kg	140	13.	1
1,2,4-Trimethylbenzene	200		ug/kg	140	23.	1
Diethyl ether	ND		ug/kg	140	24.	1
Diisopropyl Ether	ND		ug/kg	140	15.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	140	8.8	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	140	12.	1
1,4-Dioxane	ND		ug/kg	5500	2400	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-01	D	Date Collected:	11/04/22 16:00
Client ID:	AQSS-22-1.5-2.0		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified

Sample Depth:

Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/16/22 03:34
Analyst: NLK
Percent Solids: 87%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Naphthalene	21000		ug/kg	550	90.	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02
Client ID: AQSS-22-2.0-2.5
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:05
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:01
Analyst: NLK
Percent Solids: 89%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	370	170	1
1,1-Dichloroethane	ND		ug/kg	75	11.	1
Chloroform	ND		ug/kg	110	10.	1
Carbon tetrachloride	ND		ug/kg	75	17.	1
1,2-Dichloropropane	ND		ug/kg	75	9.3	1
Dibromochloromethane	ND		ug/kg	75	10.	1
1,1,2-Trichloroethane	ND		ug/kg	75	20.	1
Tetrachloroethene	ND		ug/kg	37	15.	1
Chlorobenzene	ND		ug/kg	37	9.5	1
Trichlorofluoromethane	ND		ug/kg	300	52.	1
1,2-Dichloroethane	ND		ug/kg	75	19.	1
1,1,1-Trichloroethane	ND		ug/kg	37	12.	1
Bromodichloromethane	ND		ug/kg	37	8.1	1
trans-1,3-Dichloropropene	ND		ug/kg	75	20.	1
cis-1,3-Dichloropropene	ND		ug/kg	37	12.	1
1,3-Dichloropropene, Total	ND		ug/kg	37	12.	1
1,1-Dichloropropene	ND		ug/kg	37	12.	1
Bromoform	ND		ug/kg	300	18.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	37	12.	1
Benzene	420		ug/kg	37	12.	1
Toluene	140		ug/kg	75	40.	1
Ethylbenzene	120		ug/kg	75	10.	1
Chloromethane	ND		ug/kg	300	70.	1
Bromomethane	ND		ug/kg	150	43.	1
Vinyl chloride	ND		ug/kg	75	25.	1
Chloroethane	ND		ug/kg	150	34.	1
1,1-Dichloroethene	ND		ug/kg	75	18.	1
trans-1,2-Dichloroethene	ND		ug/kg	110	10.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02 Date Collected: 11/04/22 16:05

Client ID: AQSS-22-2.0-2.5 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	180		ug/kg	37	10.	1
1,2-Dichlorobenzene	ND		ug/kg	150	11.	1
1,3-Dichlorobenzene	ND		ug/kg	150	11.	1
1,4-Dichlorobenzene	ND		ug/kg	150	13.	1
Methyl tert butyl ether	ND		ug/kg	150	15.	1
p/m-Xylene	120	J	ug/kg	150	42.	1
o-Xylene	49	J	ug/kg	75	22.	1
Xylenes, Total	170	J	ug/kg	75	22.	1
cis-1,2-Dichloroethene	46	J	ug/kg	75	13.	1
1,2-Dichloroethene, Total	46	J	ug/kg	75	10.	1
Dibromomethane	ND		ug/kg	150	18.	1
1,2,3-Trichloropropane	ND		ug/kg	150	9.5	1
Styrene	ND		ug/kg	75	15.	1
Dichlorodifluoromethane	ND		ug/kg	750	68.	1
Acetone	ND		ug/kg	750	360	1
Carbon disulfide	ND		ug/kg	750	82.	1
Methyl ethyl ketone	ND		ug/kg	750	160	1
Methyl isobutyl ketone	ND		ug/kg	750	96.	1
2-Hexanone	ND		ug/kg	750	88.	1
Bromochloromethane	ND		ug/kg	150	15.	1
Tetrahydrofuran	ND		ug/kg	300	120	1
2,2-Dichloropropane	ND		ug/kg	150	15.	1
1,2-Dibromoethane	ND		ug/kg	75	21.	1
1,3-Dichloropropane	ND		ug/kg	150	12.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	37	9.8	1
Bromobenzene	ND		ug/kg	150	11.	1
n-Butylbenzene	ND		ug/kg	75	12.	1
sec-Butylbenzene	ND		ug/kg	75	11.	1
tert-Butylbenzene	ND		ug/kg	150	8.8	1
o-Chlorotoluene	ND		ug/kg	150	14.	1
p-Chlorotoluene	ND		ug/kg	150	8.1	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	220	74.	1
Hexachlorobutadiene	ND		ug/kg	300	13.	1
Isopropylbenzene	ND		ug/kg	75	8.1	1
p-Isopropyltoluene	ND		ug/kg	75	8.1	1
Naphthalene	6900		ug/kg	300	48.	1
n-Propylbenzene	ND		ug/kg	75	13.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02 Date Collected: 11/04/22 16:05

Client ID: AQSS-22-2.0-2.5 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	150	24.	1
1,2,4-Trichlorobenzene	ND		ug/kg	150	20.	1
1,3,5-Trimethylbenzene	28	J	ug/kg	150	14.	1
1,2,4-Trimethylbenzene	75	J	ug/kg	150	25.	1
Diethyl ether	ND		ug/kg	150	25.	1
Diisopropyl Ether	ND		ug/kg	150	16.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	150	9.6	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	150	13.	1
1,4-Dioxane	ND		ug/kg	6000	2600	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	95		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04
Client ID: RINSE-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:26
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/16/22 06:40
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04 Date Collected: 11/04/22 16:26

Client ID: RINSE-110422 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04 Date Collected: 11/04/22 16:26

Client ID: RINSE-110422 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	111		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05
Client ID: TRIP BLANK
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/16/22 06:14
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05 Date Collected: 11/04/22 16:00

Client ID: TRIP BLANK Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05 Date Collected: 11/04/22 16:00

Client ID: TRIP BLANK Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	90		70-130
Dibromofluoromethane	114		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	30	J	ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	93		70-130
Dibromofluoromethane	109		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	98		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Methylene chloride	102		101		70-130	1		20
1,1-Dichloroethane	109		109		70-130	0		20
Chloroform	108		108		70-130	0		20
Carbon tetrachloride	115		112		70-130	3		20
1,2-Dichloropropane	106		105		70-130	1		20
Dibromochloromethane	95		94		70-130	1		20
1,1,2-Trichloroethane	103		102		70-130	1		20
Tetrachloroethene	109		107		70-130	2		20
Chlorobenzene	106		104		70-130	2		20
Trichlorofluoromethane	119		118		70-130	1		20
1,2-Dichloroethane	103		102		70-130	1		20
1,1,1-Trichloroethane	116		115		70-130	1		20
Bromodichloromethane	104		103		70-130	1		20
trans-1,3-Dichloropropene	101		100		70-130	1		20
cis-1,3-Dichloropropene	107		106		70-130	1		20
1,1-Dichloropropene	110		108		70-130	2		20
Bromoform	97		98		70-130	1		20
1,1,2,2-Tetrachloroethane	98		99		70-130	1		20
Benzene	110		109		70-130	1		20
Toluene	106		105		70-130	1		20
Ethylbenzene	106		104		70-130	2		20
Chloromethane	113		113		70-130	0		20
Bromomethane	**145**	Q	**145**	Q	70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Vinyl chloride	124		121		70-130	2		20
Chloroethane	107		107		70-130	0		20
1,1-Dichloroethene	115		114		70-130	1		20
trans-1,2-Dichloroethene	109		109		70-130	0		20
Trichloroethene	100		100		70-130	0		20
1,2-Dichlorobenzene	101		102		70-130	1		20
1,3-Dichlorobenzene	102		103		70-130	1		20
1,4-Dichlorobenzene	101		103		70-130	2		20
Methyl tert butyl ether	101		100		70-130	1		20
p/m-Xylene	108		106		70-130	2		20
o-Xylene	105		103		70-130	2		20
cis-1,2-Dichloroethene	107		107		70-130	0		20
Dibromomethane	104		105		70-130	1		20
1,2,3-Trichloropropane	98		99		70-130	1		20
Styrene	103		102		70-130	1		20
Dichlorodifluoromethane	118		116		70-130	2		20
Acetone	92		91		70-130	1		20
Carbon disulfide	101		100		70-130	1		20
Methyl ethyl ketone	93		92		70-130	1		20
Methyl isobutyl ketone	99		99		70-130	0		20
2-Hexanone	89		88		70-130	1		20
Bromochloromethane	108		107		70-130	1		20
Tetrahydrofuran	91		91		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
2,2-Dichloropropane	114		112		70-130	2		20
1,2-Dibromoethane	98		96		70-130	2		20
1,3-Dichloropropane	100		101		70-130	1		20
1,1,1,2-Tetrachloroethane	97		95		70-130	2		20
Bromobenzene	100		102		70-130	2		20
n-Butylbenzene	112		111		70-130	1		20
sec-Butylbenzene	110		110		70-130	0		20
tert-Butylbenzene	106		106		70-130	0		20
o-Chlorotoluene	99		101		70-130	2		20
p-Chlorotoluene	102		102		70-130	0		20
1,2-Dibromo-3-chloropropane	100		98		70-130	2		20
Hexachlorobutadiene	118		119		70-130	1		20
Isopropylbenzene	106		105		70-130	1		20
p-Isopropyltoluene	108		108		70-130	0		20
Naphthalene	94		95		70-130	1		20
n-Propylbenzene	105		106		70-130	1		20
1,2,3-Trichlorobenzene	105		106		70-130	1		20
1,2,4-Trichlorobenzene	108		109		70-130	1		20
1,3,5-Trimethylbenzene	105		105		70-130	0		20
1,2,4-Trimethylbenzene	102		103		70-130	1		20
Diethyl ether	107		108		70-130	1		20
Diisopropyl Ether	101		101		70-130	0		20
Ethyl-Tert-Butyl-Ether	102		102		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Tertiary-Amyl Methyl Ether	101		101		70-130	0		20
1,4-Dioxane	93		92		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	100		99		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	93		94		70-130
Dibromofluoromethane	98		96		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Methylene chloride	98		100		70-130	2		20
1,1-Dichloroethane	100		100		70-130	0		20
Chloroform	100		100		70-130	0		20
Carbon tetrachloride	110		110		70-130	0		20
1,2-Dichloropropane	100		100		70-130	0		20
Dibromochloromethane	110		110		70-130	0		20
1,1,2-Trichloroethane	100		110		70-130	10		20
Tetrachloroethene	120		120		70-130	0		20
Chlorobenzene	110		110		70-130	0		20
Trichlorofluoromethane	110		110		70-130	0		20
1,2-Dichloroethane	97		99		70-130	2		20
1,1,1-Trichloroethane	110		100		70-130	10		20
Bromodichloromethane	100		100		70-130	0		20
trans-1,3-Dichloropropene	110		110		70-130	0		20
cis-1,3-Dichloropropene	100		100		70-130	0		20
1,1-Dichloropropene	110		100		70-130	10		20
Bromoform	110		120		70-130	9		20
1,1,2,2-Tetrachloroethane	100		100		70-130	0		20
Benzene	110		100		70-130	10		20
Toluene	110		110		70-130	0		20
Ethylbenzene	110		110		70-130	0		20
Chloromethane	89		84		70-130	6		20
Bromomethane	130		130		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Vinyl chloride	98		98		70-130	0		20
Chloroethane	100		100		70-130	0		20
1,1-Dichloroethene	110		100		70-130	10		20
trans-1,2-Dichloroethene	110		100		70-130	10		20
Trichloroethene	110		110		70-130	0		20
1,2-Dichlorobenzene	110		110		70-130	0		20
1,3-Dichlorobenzene	110		110		70-130	0		20
1,4-Dichlorobenzene	110		110		70-130	0		20
Methyl tert butyl ether	97		98		70-130	1		20
p/m-Xylene	115		120		70-130	4		20
o-Xylene	110		115		70-130	4		20
cis-1,2-Dichloroethene	100		100		70-130	0		20
Dibromomethane	92		94		70-130	2		20
1,2,3-Trichloropropane	95		99		70-130	4		20
Styrene	115		120		70-130	4		20
Dichlorodifluoromethane	85		81		70-130	5		20
Acetone	92		91		70-130	1		20
Carbon disulfide	110		100		70-130	10		20
Methyl ethyl ketone	90		89		70-130	1		20
Methyl isobutyl ketone	92		94		70-130	2		20
2-Hexanone	89		87		70-130	2		20
Bromochloromethane	110		110		70-130	0		20
Tetrahydrofuran	91		89		70-130	2		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
2,2-Dichloropropane	110		110		70-130	0		20
1,2-Dibromoethane	110		110		70-130	0		20
1,3-Dichloropropane	100		100		70-130	0		20
1,1,1,2-Tetrachloroethane	110		110		70-130	0		20
Bromobenzene	100		110		70-130	10		20
n-Butylbenzene	120		120		70-130	0		20
sec-Butylbenzene	110		110		70-130	0		20
tert-Butylbenzene	110		110		70-130	0		20
o-Chlorotoluene	100		110		70-130	10		20
p-Chlorotoluene	100		100		70-130	0		20
1,2-Dibromo-3-chloropropane	94		96		70-130	2		20
Hexachlorobutadiene	120		130		70-130	8		20
Isopropylbenzene	110		110		70-130	0		20
p-Isopropyltoluene	120		120		70-130	0		20
Naphthalene	110		110		70-130	0		20
n-Propylbenzene	110		110		70-130	0		20
1,2,3-Trichlorobenzene	120		120		70-130	0		20
1,2,4-Trichlorobenzene	120		120		70-130	0		20
1,3,5-Trimethylbenzene	110		110		70-130	0		20
1,2,4-Trimethylbenzene	110		110		70-130	0		20
Diethyl ether	97		98		70-130	1		20
Diisopropyl Ether	95		94		70-130	1		20
Ethyl-Tert-Butyl-Ether	99		100		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Tertiary-Amyl Methyl Ether	98		99		70-130	1		20
1,4-Dioxane	122		124		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		94		70-130
Toluene-d8	97		98		70-130
4-Bromofluorobenzene	92		90		70-130
Dibromofluoromethane	101		97		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Methylene chloride	97		101		70-130	4		20
1,1-Dichloroethane	105		109		70-130	4		20
Chloroform	103		103		70-130	0		20
Carbon tetrachloride	109		113		70-130	4		20
1,2-Dichloropropane	103		106		70-130	3		20
Dibromochloromethane	90		93		70-130	3		20
1,1,2-Trichloroethane	97		99		70-130	2		20
Tetrachloroethene	101		102		70-130	1		20
Chlorobenzene	99		101		70-130	2		20
Trichlorofluoromethane	112		114		70-130	2		20
1,2-Dichloroethane	100		104		70-130	4		20
1,1,1-Trichloroethane	110		114		70-130	4		20
Bromodichloromethane	100		104		70-130	4		20
trans-1,3-Dichloropropene	97		98		70-130	1		20
cis-1,3-Dichloropropene	101		106		70-130	5		20
1,1-Dichloropropene	104		108		70-130	4		20
Bromoform	90		94		70-130	4		20
1,1,2,2-Tetrachloroethane	91		95		70-130	4		20
Benzene	104		108		70-130	4		20
Toluene	100		101		70-130	1		20
Ethylbenzene	100		102		70-130	2		20
Chloromethane	112		114		70-130	2		20
Bromomethane	**133**	Q	**137**	Q	70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Vinyl chloride	110		113		70-130	3		20
Chloroethane	101		105		70-130	4		20
1,1-Dichloroethene	109		110		70-130	1		20
trans-1,2-Dichloroethene	103		106		70-130	3		20
Trichloroethene	96		99		70-130	3		20
1,2-Dichlorobenzene	93		97		70-130	4		20
1,3-Dichlorobenzene	95		98		70-130	3		20
1,4-Dichlorobenzene	94		98		70-130	4		20
Methyl tert butyl ether	96		100		70-130	4		20
p/m-Xylene	101		103		70-130	2		20
o-Xylene	97		100		70-130	3		20
cis-1,2-Dichloroethene	100		104		70-130	4		20
Dibromomethane	99		104		70-130	5		20
1,2,3-Trichloropropane	91		98		70-130	7		20
Styrene	96		99		70-130	3		20
Dichlorodifluoromethane	111		114		70-130	3		20
Acetone	90		92		70-130	2		20
Carbon disulfide	96		99		70-130	3		20
Methyl ethyl ketone	90		94		70-130	4		20
Methyl isobutyl ketone	93		98		70-130	5		20
2-Hexanone	84		86		70-130	2		20
Bromochloromethane	100		105		70-130	5		20
Tetrahydrofuran	89		92		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
2,2-Dichloropropane	110		112		70-130	2		20
1,2-Dibromoethane	92		96		70-130	4		20
1,3-Dichloropropane	96		98		70-130	2		20
1,1,1,2-Tetrachloroethane	91		93		70-130	2		20
Bromobenzene	91		97		70-130	6		20
n-Butylbenzene	102		107		70-130	5		20
sec-Butylbenzene	101		105		70-130	4		20
tert-Butylbenzene	97		101		70-130	4		20
o-Chlorotoluene	94		97		70-130	3		20
p-Chlorotoluene	95		99		70-130	4		20
1,2-Dibromo-3-chloropropane	92		96		70-130	4		20
Hexachlorobutadiene	108		111		70-130	3		20
Isopropylbenzene	96		100		70-130	4		20
p-Isopropyltoluene	99		103		70-130	4		20
Naphthalene	85		87		70-130	2		20
n-Propylbenzene	98		101		70-130	3		20
1,2,3-Trichlorobenzene	95		96		70-130	1		20
1,2,4-Trichlorobenzene	99		102		70-130	3		20
1,3,5-Trimethylbenzene	97		101		70-130	4		20
1,2,4-Trimethylbenzene	95		99		70-130	4		20
Diethyl ether	101		104		70-130	3		20
Diisopropyl Ether	99		103		70-130	4		20
Ethyl-Tert-Butyl-Ether	99		102		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Tertiary-Amyl Methyl Ether	96		100		70-130	4		20
1,4-Dioxane	99		103		70-130	4		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	101		99		70-130
Toluene-d8	100		98		70-130
4-Bromofluorobenzene	94		94		70-130
Dibromofluoromethane	98		99		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 D
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 12/09/22 09:45
Analyst: GP
Percent Solids: 87%

Extraction Method: EPA 3570
Extraction Date: 12/03/22 11:59
Cleanup Method: EPA 3630
Cleanup Date: 12/08/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	30900		ug/kg	901	80.7	200
2-Methylnaphthalene	9480		ug/kg	901	112.	200
2-Chloronaphthalene	ND		ug/kg	901	70.6	200
Acenaphthylene	11400		ug/kg	901	60.4	200
Acenaphthene	10700		ug/kg	901	101.	200
Fluorene	21700		ug/kg	901	60.2	200
Phenanthrene	147000		ug/kg	901	106.	200
Anthracene	40900		ug/kg	901	112.	200
Fluoranthene	172000		ug/kg	901	165.	200
Pyrene	138000		ug/kg	901	91.9	200
Benz(a)anthracene	81700		ug/kg	901	241.	200
Chrysene	66800		ug/kg	901	79.2	200
Benzo(b)fluoranthene	53100		ug/kg	901	93.7	200
Benzo(k)fluoranthene	52300		ug/kg	901	92.8	200
Benzo(a)pyrene	72900		ug/kg	901	105.	200
Indeno(1,2,3-cd)Pyrene	40000		ug/kg	901	257.	200
Dibenz(a,h)anthracene	9440		ug/kg	901	92.8	200
Benzo(ghi)perylene	34400		ug/kg	901	74.3	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	87		30-130
Pyrene-d10	100		30-130
Benzo(b)fluoranthene-d12	102		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-02	D	Date Collected:	11/04/22 16:05
Client ID:	AQSS-22-2.0-2.5		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified
Sample Depth:				
Matrix:	Sediment		Extraction Method:	EPA 3570
Analytical Method:	141,8270E-SIM		Extraction Date:	12/03/22 11:59
Analytical Date:	12/09/22 11:21		Cleanup Method:	EPA 3630
Analyst:	GP		Cleanup Date:	12/08/22
Percent Solids:	89%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	6700		ug/kg	414	37.0	100
2-Methylnaphthalene	1960		ug/kg	414	51.3	100
2-Chloronaphthalene	ND		ug/kg	414	32.4	100
Acenaphthylene	3370		ug/kg	414	27.7	100
Acenaphthene	3240		ug/kg	414	46.4	100
Fluorene	7030		ug/kg	414	27.6	100
Phenanthrene	44800		ug/kg	414	48.8	100
Anthracene	14600		ug/kg	414	51.3	100
Fluoranthene	61900		ug/kg	414	75.8	100
Pyrene	48400		ug/kg	414	42.2	100
Benz(a)anthracene	27400		ug/kg	414	110.	100
Chrysene	22500		ug/kg	414	36.4	100
Benzo(b)fluoranthene	17900		ug/kg	414	43.0	100
Benzo(k)fluoranthene	17000		ug/kg	414	42.6	100
Benzo(a)pyrene	23900		ug/kg	414	48.4	100
Indeno(1,2,3-cd)Pyrene	13200		ug/kg	414	118.	100
Dibenz(a,h)anthracene	3170		ug/kg	414	42.6	100
Benzo(ghi)perylene	11300		ug/kg	414	34.1	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	93		30-130
Pyrene-d10	103		30-130
Benzo(b)fluoranthene-d12	104		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-03	D	Date Collected:	11/04/22 00:00
Client ID:	DUP1-110422		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified
Sample Depth:				
Matrix:	Sediment		Extraction Method:	EPA 3570
Analytical Method:	141,8270E-SIM		Extraction Date:	12/03/22 11:59
Analytical Date:	12/09/22 12:26		Cleanup Method:	EPA 3630
Analyst:	GP		Cleanup Date:	12/08/22
Percent Solids:	86%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	38300		ug/kg	1760	157.	400
2-Methylnaphthalene	12800		ug/kg	1760	218.	400
2-Chloronaphthalene	ND		ug/kg	1760	137.	400
Acenaphthylene	14800		ug/kg	1760	118.	400
Acenaphthene	15100		ug/kg	1760	196.	400
Fluorene	31400		ug/kg	1760	117.	400
Phenanthrene	209000		ug/kg	1760	207.	400
Anthracene	61100		ug/kg	1760	218.	400
Fluoranthene	230000		ug/kg	1760	321.	400
Pyrene	181000		ug/kg	1760	179.	400
Benz(a)anthracene	106000		ug/kg	1760	469.	400
Chrysene	87800		ug/kg	1760	154.	400
Benzo(b)fluoranthene	68600		ug/kg	1760	182.	400
Benzo(k)fluoranthene	67700		ug/kg	1760	181.	400
Benzo(a)pyrene	94700		ug/kg	1760	205.	400
Indeno(1,2,3-cd)Pyrene	53200		ug/kg	1760	500.	400
Dibenz(a,h)anthracene	12300		ug/kg	1760	181.	400
Benzo(ghi)perylene	43900		ug/kg	1760	145.	400

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	91		30-130
Pyrene-d10	99		30-130
Benzo(b)fluoranthene-d12	103		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04
Client ID: RINSE-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:26
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 11/17/22 10:56
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 11/11/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	49.3		ng/l	10.0	1.77	1
2-Methylnaphthalene	3.02	J	ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	4.04	J	ng/l	10.0	1.77	1
Acenaphthene	ND		ng/l	10.0	1.61	1
Fluorene	ND		ng/l	10.0	1.73	1
Phenanthrene	3.83	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	3.94	J	ng/l	10.0	1.49	1
Pyrene	3.56	J	ng/l	10.0	1.52	1
Benz(a)anthracene	2.00	J	ng/l	10.0	1.73	1
Chrysene	0.990	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17	1
Benzo(a)pyrene	ND		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	ND		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	68		30-130
Pyrene-d10	76		30-130
Benzo(b)fluoranthene-d12	92		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/15/22 12:43
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 11/11/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 04 Batch: WG1710943-1					
Naphthalene	2.15	J	ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	ND		ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	72		30-130
Pyrene-d10	78		30-130
Benzo(b)fluoranthene-d12	89		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 12/09/22 08:41
Analyst: GP

Extraction Method: EPA 3570
Extraction Date: 12/03/22 11:59
Cleanup Method: EPA 3630
Cleanup Date: 12/08/22

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-03 Batch: WG1718985-1					
Naphthalene	0.441	J	ug/kg	4.00	0.358
2-Methylnaphthalene	ND		ug/kg	4.00	0.496
2-Chloronaphthalene	ND		ug/kg	4.00	0.313
Acenaphthylene	ND		ug/kg	4.00	0.268
Acenaphthene	ND		ug/kg	4.00	0.448
Fluorene	ND		ug/kg	4.00	0.267
Phenanthrene	ND		ug/kg	4.00	0.472
Anthracene	ND		ug/kg	4.00	0.496
Fluoranthene	ND		ug/kg	4.00	0.732
Pyrene	ND		ug/kg	4.00	0.408
Benz(a)anthracene	ND		ug/kg	4.00	1.07
Chrysene	ND		ug/kg	4.00	0.352
Benzo(b)fluoranthene	ND		ug/kg	4.00	0.416
Benzo(k)fluoranthene	ND		ug/kg	4.00	0.412
Benzo(a)pyrene	ND		ug/kg	4.00	0.468
Indeno(1,2,3-cd)Pyrene	ND		ug/kg	4.00	1.14
Dibenz(a,h)anthracene	ND		ug/kg	4.00	0.412
Benzo(ghi)perylene	ND		ug/kg	4.00	0.330

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	77		30-130
Pyrene-d10	88		30-130
Benzo(b)fluoranthene-d12	100		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 04 Batch: WG1710943-2 WG1710943-3								
Naphthalene	77		76		40-140	1		20
2-Methylnaphthalene	77		76		40-140	1		20
2-Chloronaphthalene	76		70		40-140	8		20
Acenaphthylene	71		65		40-140	9		20
Acenaphthene	71		65		40-140	9		20
Fluorene	72		67		40-140	7		20
Phenanthrene	74		71		40-140	4		20
Anthracene	78		74		40-140	5		20
Fluoranthene	80		77		40-140	4		20
Pyrene	67		68		40-140	1		20
Benz(a)anthracene	79		83		40-140	5		20
Chrysene	74		77		40-140	4		20
Benzo(b)fluoranthene	77		81		40-140	5		20
Benzo(k)fluoranthene	75		79		40-140	5		20
Benzo(a)pyrene	72		78		40-140	8		20
Indeno(1,2,3-cd)Pyrene	82		82		40-140	0		20
Dibenz(a,h)anthracene	78		80		40-140	3		20
Benzo(ghi)perylene	80		84		40-140	5		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 04 Batch: WG1710943-2 WG1710943-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	91		89		30-130
Pyrene-d10	75		76		30-130
Benzo(b)fluoranthene-d12	82		86		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 Batch: WG1718985-2 WG1718985-3								
Naphthalene	87		80		40-140	8		30
2-Methylnaphthalene	82		75		40-140	9		30
2-Chloronaphthalene	85		78		40-140	9		30
Acenaphthylene	85		76		40-140	11		30
Acenaphthene	83		76		40-140	9		30
Fluorene	84		80		40-140	5		30
Phenanthrene	86		81		40-140	6		30
Anthracene	92		85		40-140	8		30
Fluoranthene	90		83		40-140	8		30
Pyrene	89		82		40-140	8		30
Benz(a)anthracene	99		92		40-140	7		30
Chrysene	91		83		40-140	9		30
Benzo(b)fluoranthene	102		94		40-140	8		30
Benzo(k)fluoranthene	96		90		40-140	6		30
Benzo(a)pyrene	100		92		40-140	8		30
Indeno(1,2,3-cd)Pyrene	104		97		40-140	7		30
Dibenz(a,h)anthracene	111		101		40-140	9		30
Benzo(ghi)perylene	105		98		40-140	7		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 Batch: WG1718985-2 WG1718985-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	83		77		30-130
Pyrene-d10	91		82		30-130
Benzo(b)fluoranthene-d12	97		90		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab AQSS-22-1.5-2.0	Associated sample(s): 01-03		QC Batch ID: WG1718985-4	WG1718985-5		QC Sample: L2262370-01			Client ID:			
Naphthalene	30900	562	36900	**1070**	Q	28800	**0**	Q	40-140	25		30
2-Methylnaphthalene	9480	562	11200	**306**	Q	9050	**0**	Q	40-140	21		30
2-Chloronaphthalene	ND	562	477J	85		461J	87		40-140	3		30
Acenaphthylene	11400	562	13100	**303**	Q	17200	**1090**	Q	40-140	27		30
Acenaphthene	10700	562	12600	**338**	Q	15700	**941**	Q	40-140	22		30
Fluorene	21700	562	23700	**356**	Q	27500	**1090**	Q	40-140	15		30
Phenanthrene	147000	562	162000	**2670**	Q	230000E	**15600**	Q	40-140	**35**	Q	30
Anthracene	40900	562	47400	**1160**	Q	73400	**6120**	Q	40-140	**43**	Q	30
Fluoranthene	172000	562	194000E	**3920**	Q	301000E	**24300**	Q	40-140	**43**	Q	30
Pyrene	138000	562	153000	**2670**	Q	245000E	**20100**	Q	40-140	**46**	Q	30
Benz(a)anthracene	81700	562	91600	**1760**	Q	151000	**13000**	Q	40-140	**49**	Q	30
Chrysene	66800	562	75200	**1500**	Q	119000	**9830**	Q	40-140	**45**	Q	30
Benzo(b)fluoranthene	53100	562	59700	**1170**	Q	105000	**9770**	Q	40-140	**55**	Q	30
Benzo(k)fluoranthene	52300	562	59200	**1230**	Q	80300	**5270**	Q	40-140	30		30
Benzo(a)pyrene	72900	562	81800	**1580**	Q	131000	**10900**	Q	40-140	**46**	Q	30
Indeno(1,2,3-cd)Pyrene	40000	562	44600	**819**	Q	73200	**6250**	Q	40-140	**49**	Q	30
Dibenz(a,h)anthracene	9440	562	11000	**278**	Q	17200	**1460**	Q	40-140	**44**	Q	30
Benzo(ghi)perylene	34400	562	38400	**712**	Q	59200	**4670**	Q	40-140	**43**	Q	30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	87		89		30-130
Benzo(b)fluoranthene-d12	97		102		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1718985-4 WG1718985-5 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Pyrene-d10	95		102		30-130

INORGANICS
&
MISCELLANEOUS

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	4.42		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.45		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.93		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	86.5		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02
Client ID: AQSS-22-2.0-2.5
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:05
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	3.18		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.98		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.58		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	88.8		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-03
Client ID: DUP1-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 00:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	4.15		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.27		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.71		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	86.0		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab for sample(s): 01-03 Batch: WG1719298-1										
Total Organic Carbon (Rep1)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 Batch: WG1719298-2								
Total Organic Carbon (Rep1)	98		-		75-125	-		25
Total Organic Carbon (Rep2)	100		-		75-125	-		25
Total Organic Carbon (Average)	99		-		75-125	-		25

Matrix Spike Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1719298-4 WG1719298-5 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0												
Total Organic Carbon (Rep1)	4.42	0.817	5.26	103		4.93	**47**	Q	75-125	6		25
Total Organic Carbon (Rep2)	3.45	1.08	3.15	**0**	Q	4.75	105		75-125	**41**	Q	25

Lab Duplicate Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1719298-3 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0						
Total Organic Carbon (Rep1)	4.42	3.62	%	20		25
Total Organic Carbon (Rep2)	3.45	3.98	%	14		25
Total Organic Carbon (Average)	3.93	3.80	%	3		25

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2262370-01A	Vial MeOH preserved	A	NA		2.7	Y	Absent		MCP-8260HLW-21(14)
L2262370-01B	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-01C	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-01D	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-01E	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-02A	Vial MeOH preserved	A	NA		2.7	Y	Absent		MCP-8260HLW-21(14)
L2262370-02B	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-02C	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-02D	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-02E	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-03A	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-03B	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-04A	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04B	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04C	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04D	Amber 1000ml unpreserved	A	7	7	2.7	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2262370-04E	Amber 1000ml unpreserved	A	7	7	2.7	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2262370-05A	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-05B	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-05C	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 11/7/22

ALPHA Job #: L2262370

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 818-422-4820
Email: bgauley@anchorqea.com

Additional Project Information:

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #:
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; TOC; TS

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB	TPH	TOC	TS	Sample Comments	TOTAL # BOTTLES
62370-01	AQSS-22-1.5-2.0	11/4/22	1600	SED	SAS	X	X							X	X	MS/MSD	5
02	AQSS-22-2.0-2.5		1605	SED	~~SAS~~ CC BJLG 11/6	X	X							X	X		5
03	DUP1-110422		—	SED	SAS		X							X	X		2
04	Rinse-110422		1626	Water	SAS	X	X										5
05	Trip Blank	10/16/22	1600	Water	BJLG	X											3
					Container Type	A	A							A	P		
					Preservative	B	A							A	A		

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J L Gauley	11/7/22 1225	[signature] Plum ARL	11/7/22 1225
[signature]	11/7/22 1632	[signature]	11/7/22 1632

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1713088-5	**Lab File ID**	: V11221115N05
Instrument ID	: VOA111		
Matrix	: SOIL	**Analysis Date**	: 11/15/22 20:53

Client Sample No.	Lab Sample ID	Analysis Date
WG1713088-3LCS	WG1713088-3	11/15/22 19:33
WG1713088-4LCSD	WG1713088-4	11/15/22 19:59
AQSS-22-1.5-2.0	L2262370-01D	11/16/22 03:34
AQSS-22-2.0-2.5	L2262370-02	11/16/22 04:01

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1713273-5	**Lab File ID**	: J221116A04
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 11/16/22 04:54

Client Sample No.	Lab Sample ID	Analysis Date
WG1713273-3LCS	WG1713273-3	11/16/22 03:34
WG1713273-4LCSD	WG1713273-4	11/16/22 04:00
TRIP BLANK	L2262370-05	11/16/22 06:14
RINSE-110422	L2262370-04	11/16/22 06:40

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1714879-5	**Lab File ID**	: V11221118A05
Instrument ID	: VOA111		
Matrix	: SOIL	**Analysis Date**	: 11/18/22 09:01

Client Sample No.	Lab Sample ID	Analysis Date
WG1714879-3LCS	WG1714879-3	11/18/22 07:41
WG1714879-4LCSD	WG1714879-4	11/18/22 08:08
AQSS-22-1.5-2.0	L2262370-01	11/18/22 17:04

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	80	0
Dichlorodifluoromethane	0.198	0.207	-	-4.5	20	80	0
Chloromethane	0.238	0.238	-	0	20	78	0
Vinyl chloride	0.308	0.331	-	-7.5	20	81	0
Bromomethane	0.211	0.271	-	-28.4*	20	103	0
Chloroethane	0.183	0.174	-	4.9	20	78	0
Trichlorofluoromethane	0.347	0.361	-	-4	20	81	0
Ethyl ether	0.108	0.112	-	-3.7	20	79	0
1,1-Dichloroethene	0.202	0.202	-	0	20	78	0
Carbon disulfide	0.487	0.421	-	13.6	20	76	0
Freon-113	0.21	0.227	-	-8.1	20	81	0
Acrolein	0.034	0.034	-	0	20	83	0
Methylene chloride	40	36.52	-	8.7	20	75	0
Acetone	40	36.527	-	8.7	20	73	0
trans-1,2-Dichloroethene	0.24	0.231	-	3.7	20	76	0
Methyl acetate	0.149	0.143	-	4	20	84	0
Methyl tert-butyl ether	0.629	0.612	-	2.7	20	78	0
tert-Butyl alcohol	0.025	0.026	-	-4	20	79	0
Diisopropyl ether	0.807	0.773	-	4.2	20	76	0
1,1-Dichloroethane	0.446	0.433	-	2.9	20	75	0
Halothane	0.167	0.169	-	-1.2	20	77	0
Acrylonitrile	0.065	0.063	-	3.1	20	78	0
Ethyl tert-butyl ether	0.82	0.797	-	2.8	20	77	0
Vinyl acetate	0.536	0.556	-	-3.7	20	84	0
cis-1,2-Dichloroethene	0.271	0.259	-	4.4	20	75	0
2,2-Dichloropropane	0.383	0.388	-	-1.3	20	80	0
Bromochloromethane	0.12	0.121	-	-0.8	20	76	0
Cyclohexane	0.398	0.393	-	1.3	20	78	0
Chloroform	0.472	0.445	-	5.7	20	73	0
Ethyl acetate	0.238	0.218	-	8.4	20	77	0
Carbon tetrachloride	0.322	0.321	-	0.3	20	77	0
Tetrahydrofuran	0.062	0.055	-	11.3	20	74	0
Dibromofluoromethane	0.262	0.252	-	3.8	20	78	0
1,1,1-Trichloroethane	0.357	0.36	-	-0.8	20	76	-.01
2-Butanone	0.1	0.094	-	6	20	76	0
1,1-Dichloropropene	40	38.199	-	4.5	20	77	0
Benzene	0.974	0.947	-	2.8	20	75	0
tert-Amyl methyl ether	0.762	0.735	-	3.5	20	77	0
1,2-Dichloroethane-d4	0.278	0.272	-	2.2	20	80	0
1,2-Dichloroethane	0.348	0.334	-	4	20	76	0
Methyl cyclohexane	0.413	0.416	-	-0.7	20	79	0
Trichloroethene	40	34.97	-	12.6	20	74	-.01
Dibromomethane	0.157	0.157	-	0	20	77	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.262	0.253	-	3.4	20	75	0
2-Chloroethyl vinyl ether	0.113	0.113	-	0	20	78	0
Bromodichloromethane	0.366	0.343	-	6.3	20	73	0
1,4-Dioxane	2000	1817.782	-	9.1	20	75	-.01
cis-1,3-Dichloropropene	0.426	0.421	-	1.2	20	75	0
Chlorobenzene-d5	1	1	-	0	20	81	0
Toluene-d8	1.321	1.318	-	0.2	20	81	0
Toluene	0.808	0.771	-	4.6	20	75	0
4-Methyl-2-pentanone	0.105	0.105	-	0	20	76	0
Tetrachloroethene	40	37.84	-	5.4	20	78	0
trans-1,3-Dichloropropene	0.536	0.516	-	3.7	20	76	0
Ethyl methacrylate	0.424	0.392	-	7.5	20	74	0
1,1,2-Trichloroethane	0.242	0.241	-	0.4	20	77	0
Chlorodibromomethane	40	35.593	-	11	20	73	0
1,3-Dichloropropane	0.503	0.485	-	3.6	20	76	0
1,2-Dibromoethane	40	37.725	-	5.7	20	76	0
2-Hexanone	0.218	0.195	-	10.6	20	75	0
Chlorobenzene	0.892	0.858	-	3.8	20	74	0
Ethylbenzene	1.58	1.499	-	5.1	20	75	0
1,1,1,2-Tetrachloroethane	40	35.511	-	11.2	20	73	0
p/m Xylene	0.593	0.577	-	2.7	20	75	0
o Xylene	0.572	0.542	-	5.2	20	74	0
Styrene	0.997	0.933	-	6.4	20	74	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	84	0
Bromoform	0.425	0.392	-	7.8	20	76	0
Isopropylbenzene	2.807	2.63	-	6.3	20	76	0
4-Bromofluorobenzene	0.9	0.835	-	7.2	20	77	0
Bromobenzene	0.723	0.675	-	6.6	20	76	0
n-Propylbenzene	3.495	3.304	-	5.5	20	76	0
1,4-Dichlorobutane	0.921	0.798	-	13.4	20	73	0
1,1,2,2-Tetrachloroethane	0.686	0.666	-	2.9	20	79	0
4-Ethyltoluene	2.782	2.616	-	6	20	76	0
2-Chlorotoluene	2.042	1.832	-	10.3	20	74	0
1,3,5-Trimethylbenzene	2.425	2.291	-	5.5	20	75	0
1,2,3-Trichloropropane	0.562	0.536	-	4.6	20	77	0
trans-1,4-Dichloro-2-buten	0.205	0.207	-	-1	20	79	0
4-Chlorotoluene	2.154	1.991	-	7.6	20	74	0
tert-Butylbenzene	1.981	1.882	-	5	20	76	0
1,2,4-Trimethylbenzene	2.442	2.28	-	6.6	20	76	0
sec-Butylbenzene	3.024	2.934	-	3	20	77	0
p-Isopropyltoluene	2.558	2.465	-	3.6	20	77	0
1,3-Dichlorobenzene	1.389	1.306	-	6	20	77	0
1,4-Dichlorobenzene	1.408	1.323	-	6	20	77	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.529	1.475	-	3.5	20	78	0
n-Butylbenzene	2.429	2.41	-	0.8	20	79	0
1,2-Dichlorobenzene	1.297	1.221	-	5.9	20	77	0
1,2,4,5-Tetramethylbenzene	2.378	2.17	-	8.7	20	75	0
1,2-Dibromo-3-chloropropan	0.1	0.097	-	3	20	78	0
1,3,5-Trichlorobenzene	0.998	1.003	-	-0.5	20	82	0
Hexachlorobutadiene	0.443	0.464	-	-4.7	20	81	0
1,2,4-Trichlorobenzene	0.864	0.876	-	-1.4	20	82	0
Naphthalene	1.767	1.622	-	8.2	20	75	0
1,2,3-Trichlorobenzene	0.739	0.728	-	1.5	20	78	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	94	0
Dichlorodifluoromethane	0.458	0.392	-	14.4	20	81	0
Chloromethane	0.48	0.425	-	11.5	20	86	0
Vinyl chloride	0.484	0.474	-	2.1	20	87	0
Bromomethane	10	13.078	-	-30.8*	20	149	0
Chloroethane	0.258	0.266	-	-3.1	20	92	0
Trichlorofluoromethane	0.653	0.726	-	-11.2	20	99	0
Ethyl ether	0.222	0.215	-	3.2	20	92	0
1,1-Dichloroethene	0.448	0.491	-	-9.6	20	98	0
Carbon disulfide	0.795	0.855	-	-7.5	20	98	0
Freon-113	0.463	0.528	-	-14	20	100	-.01
Acrolein	0.07	0.073	-	-4.3	20	109	0
Methylene chloride	0.509	0.5	-	1.8	20	93	0
Acetone	0.115	0.105	-	8.7	20	93	-.01
trans-1,2-Dichloroethene	0.49	0.531	-	-8.4	20	100	0
Methyl acetate	0.298	0.27	-	9.4	20	93	-.01
Methyl tert-butyl ether	1.136	1.1	-	3.2	20	96	-.01
tert-Butyl alcohol	0.042	0.047	-	-11.9	20	114	0
Diisopropyl ether	1.331	1.262	-	5.2	20	96	-.01
1,1-Dichloroethane	0.876	0.896	-	-2.3	20	95	0
Halothane	0.378	0.414	-	-9.5	20	99	0
Acrylonitrile	0.139	0.135	-	2.9	20	89	0
Ethyl tert-butyl ether	1.324	1.316	-	0.6	20	99	0
Vinyl acetate	0.766	0.848	-	-10.7	20	125	0
cis-1,2-Dichloroethene	0.534	0.565	-	-5.8	20	96	0
2,2-Dichloropropane	0.7	0.784	-	-12	20	105	-.01
Bromochloromethane	0.245	0.267	-	-9	20	97	-.01
Cyclohexane	0.834	0.859	-	-3	20	94	0
Chloroform	0.838	0.867	-	-3.5	20	96	-.01
Ethyl acetate	0.396	0.347	-	12.4	20	94	-.01
Carbon tetrachloride	0.604	0.682	-	-12.9	20	101	0
Tetrahydrofuran	0.121	0.111	-	8.3	20	99	0
Dibromofluoromethane	0.247	0.249	-	-0.8	20	87	0
1,1,1-Trichloroethane	0.688	0.73	-	-6.1	20	99	0
2-Butanone	0.177	0.16	-	9.6	20	92	0
1,1-Dichloropropene	0.633	0.681	-	-7.6	20	103	0
Benzene	2.014	2.135	-	-6	20	101	0
tert-Amyl methyl ether	1.243	1.222	-	1.7	20	97	0
1,2-Dichloroethane-d4	0.292	0.28	-	4.1	20	90	-.01
1,2-Dichloroethane	0.588	0.568	-	3.4	20	95	-.01
Methyl cyclohexane	0.774	0.902	-	-16.5	20	109	0
Trichloroethene	0.484	0.525	-	-8.5	20	96	0
Dibromomethane	0.248	0.229	-	7.7	20	88	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.489	0.488	-	0.2	20	99	0
2-Chloroethyl vinyl ether	0.272	0.25	-	8.1	20	96	0
Bromodichloromethane	0.638	0.639	-	-0.2	20	97	0
1,4-Dioxane	0.00399	0.00489*	-	-22.6*	20	115	-.01
cis-1,3-Dichloropropene	0.758	0.792	-	-4.5	20	100	0
Chlorobenzene-d5	1	1	-	0	20	89	-.01
Toluene-d8	1.272	1.228	-	3.5	20	87	-.01
Toluene	1.577	1.72	-	-9.1	20	100	-.01
4-Methyl-2-pentanone	0.208	0.19	-	8.7	20	95	0
Tetrachloroethene	0.674	0.812	-	-20.5*	20	106	0
trans-1,3-Dichloropropene	0.805	0.872	-	-8.3	20	100	0
Ethyl methacrylate	0.725	0.648	-	10.6	20	83	0
1,1,2-Trichloroethane	0.424	0.441	-	-4	20	100	-.01
Chlorodibromomethane	0.565	0.609	-	-7.8	20	103	0
1,3-Dichloropropane	0.898	0.908	-	-1.1	20	100	0
1,2-Dibromoethane	0.512	0.546	-	-6.6	20	103	0
2-Hexanone	0.35	0.311	-	11.1	20	90	0
Chlorobenzene	1.716	1.835	-	-6.9	20	97	0
Ethylbenzene	2.802	3.147	-	-12.3	20	98	0
1,1,1,2-Tetrachloroethane	0.567	0.62	-	-9.3	20	101	0
p/m Xylene	1.14	1.321	-	-15.9	20	100	0
o Xylene	1.072	1.203	-	-12.2	20	98	0
Styrene	1.705	1.996	-	-17.1	20	99	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	89	0
Bromoform	0.663	0.721	-	-8.7	20	105	0
Isopropylbenzene	5.062	5.415	-	-7	20	103	0
4-Bromofluorobenzene	0.88	0.806	-	8.4	20	86	0
Bromobenzene	1.296	1.371	-	-5.8	20	103	0
n-Propylbenzene	5.874	6.408	-	-9.1	20	102	0
1,4-Dichlorobutane	1.525	1.396	-	8.5	20	91	0
1,1,2,2-Tetrachloroethane	1.151	1.185	-	-3	20	102	0
4-Ethyltoluene	4.901	5.32	-	-8.5	20	100	0
2-Chlorotoluene	4.04	4.267	-	-5.6	20	100	0
1,3,5-Trimethylbenzene	4.127	4.621	-	-12	20	104	0
1,2,3-Trichloropropane	0.979	0.935	-	4.5	20	94	0
trans-1,4-Dichloro-2-buten	0.329	0.28	-	14.9	20	86	0
4-Chlorotoluene	3.742	3.882	-	-3.7	20	100	0
tert-Butylbenzene	3.485	3.854	-	-10.6	20	105	0
1,2,4-Trimethylbenzene	4.051	4.521	-	-11.6	20	103	0
sec-Butylbenzene	4.989	5.732	-	-14.9	20	108	0
p-Isopropyltoluene	4.203	5.032	-	-19.7	20	110	0
1,3-Dichlorobenzene	2.373	2.672	-	-12.6	20	105	0
1,4-Dichlorobenzene	2.405	2.66	-	-10.6	20	106	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	2.463	2.882	-	-17	20	112	0
n-Butylbenzene	3.45	4.044	-	-17.2	20	111	0
1,2-Dichlorobenzene	2.226	2.445	-	-9.8	20	105	0
1,2,4,5-Tetramethylbenzene	3.461	3.829	-	-10.6	20	109	0
1,2-Dibromo-3-chloropropan	10	9.432	-	5.7	20	102	0
1,3,5-Trichlorobenzene	1.51	1.831	-	-21.3*	20	114	0
Hexachlorobutadiene	0.557	0.695	-	-24.8*	20	115	0
1,2,4-Trichlorobenzene	1.272	1.537	-	-20.8*	20	114	0
Naphthalene	3.649	3.896	-	-6.8	20	106	0
1,2,3-Trichlorobenzene	1.176	1.427	-	-21.3*	20	116	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	85	0
Dichlorodifluoromethane	0.198	0.233	-	-17.7	20	96	0
Chloromethane	0.238	0.292	-	-22.7*	20	101	0
Vinyl chloride	0.308	0.367	-	-19.2	20	95	0
Bromomethane	0.211	0.299	-	-41.7*	20	121	0
Chloroethane	0.183	0.202	-	-10.4	20	96	0
Trichlorofluoromethane	0.347	0.41	-	-18.2	20	97	0
Ethyl ether	0.108	0.124	-	-14.8	20	94	0
1,1-Dichloroethene	0.202	0.229	-	-13.4	20	93	0
Carbon disulfide	0.487	0.493	-	-1.2	20	94	0
Freon-113	0.21	0.255	-	-21.4*	20	96	0
Acrolein	0.034	0.037	-	-8.8	20	97	0
Methylene chloride	40	42.825	-	-7.1	20	94	0
Acetone	40	41.26	-	-3.1	20	86	0
trans-1,2-Dichloroethene	0.24	0.263	-	-9.6	20	92	-.01
Methyl acetate	0.149	0.153	-	-2.7	20	95	0
Methyl tert-butyl ether	0.629	0.669	-	-6.4	20	90	-.01
tert-Butyl alcohol	0.025	0.026	-	-4	20	86	0
Diisopropyl ether	0.807	0.897	-	-11.2	20	93	0
1,1-Dichloroethane	0.446	0.514	-	-15.2	20	94	0
Halothane	0.167	0.19	-	-13.8	20	93	0
Acrylonitrile	0.065	0.069	-	-6.2	20	91	0
Ethyl tert-butyl ether	0.82	0.902	-	-10	20	92	0
Vinyl acetate	0.536	0.621	-	-15.9	20	100	0
cis-1,2-Dichloroethene	0.271	0.298	-	-10	20	92	0
2,2-Dichloropropane	0.383	0.451	-	-17.8	20	99	0
Bromochloromethane	0.12	0.134	-	-11.7	20	88	0
Cyclohexane	0.398	0.447	-	-12.3	20	94	0
Chloroform	0.472	0.511	-	-8.3	20	89	0
Ethyl acetate	0.238	0.231	-	2.9	20	87	0
Carbon tetrachloride	0.322	0.364	-	-13	20	93	0
Tetrahydrofuran	0.062	0.06	-	3.2	20	87	-.01
Dibromofluoromethane	0.262	0.256	-	2.3	20	84	0
1,1,1-Trichloroethane	0.357	0.414	-	-16	20	93	0
2-Butanone	0.1	0.099	-	1	20	85	0
1,1-Dichloropropene	40	43.215	-	-8	20	93	0
Benzene	0.974	1.093	-	-12.2	20	92	0
tert-Amyl methyl ether	0.762	0.805	-	-5.6	20	89	0
1,2-Dichloroethane-d4	0.278	0.278	-	0	20	87	0
1,2-Dichloroethane	0.348	0.386	-	-10.9	20	94	0
Methyl cyclohexane	0.413	0.456	-	-10.4	20	92	0
Trichloroethene	40	39.616	-	1	20	89	-.01
Dibromomethane	0.157	0.17	-	-8.3	20	89	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.262	0.291	-	-11.1	20	91	0
2-Chloroethyl vinyl ether	0.113	0.109	-	3.5	20	79	0
Bromodichloromethane	0.366	0.401	-	-9.6	20	91	0
1,4-Dioxane	2000	2091.481	-	-4.6	20	92	-.01
cis-1,3-Dichloropropene	0.426	0.477	-	-12	20	90	0
Chlorobenzene-d5	1	1	-	0	20	87	0
Toluene-d8	1.321	1.307	-	1.1	20	85	0
Toluene	0.808	0.862	-	-6.7	20	90	0
4-Methyl-2-pentanone	0.105	0.109	-	-3.8	20	85	0
Tetrachloroethene	40	42.346	-	-5.9	20	93	0
trans-1,3-Dichloropropene	0.536	0.57	-	-6.3	20	89	0
Ethyl methacrylate	0.424	0.414	-	2.4	20	83	0
1,1,2-Trichloroethane	0.242	0.258	-	-6.6	20	88	0
Chlorodibromomethane	40	39.54	-	1.2	20	87	0
1,3-Dichloropropane	0.503	0.535	-	-6.4	20	89	0
1,2-Dibromoethane	40	39.977	-	0.1	20	86	0
2-Hexanone	0.218	0.203	-	6.9	20	83	0
Chlorobenzene	0.892	0.961	-	-7.7	20	89	0
Ethylbenzene	1.58	1.681	-	-6.4	20	90	0
1,1,1,2-Tetrachloroethane	40	39.751	-	0.6	20	87	0
p/m Xylene	0.593	0.643	-	-8.4	20	89	0
o Xylene	0.572	0.603	-	-5.4	20	88	0
Styrene	0.997	1.049	-	-5.2	20	88	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	92	0
Bromoform	0.425	0.418	-	1.6	20	89	0
Isopropylbenzene	2.807	2.868	-	-2.2	20	90	0
4-Bromofluorobenzene	0.9	0.839	-	6.8	20	85	0
Bromobenzene	0.723	0.729	-	-0.8	20	90	0
n-Propylbenzene	3.495	3.621	-	-3.6	20	92	0
1,4-Dichlorobutane	0.921	0.887	-	3.7	20	89	0
1,1,2,2-Tetrachloroethane	0.686	0.7	-	-2	20	90	0
4-Ethyltoluene	2.782	2.868	-	-3.1	20	91	0
2-Chlorotoluene	2.042	2.094	-	-2.5	20	92	0
1,3,5-Trimethylbenzene	2.425	2.512	-	-3.6	20	90	0
1,2,3-Trichloropropane	0.562	0.571	-	-1.6	20	90	0
trans-1,4-Dichloro-2-buten	0.205	0.224	-	-9.3	20	94	0
4-Chlorotoluene	2.154	2.219	-	-3	20	91	0
tert-Butylbenzene	1.981	2.049	-	-3.4	20	90	0
1,2,4-Trimethylbenzene	2.442	2.513	-	-2.9	20	92	0
sec-Butylbenzene	3.024	3.208	-	-6.1	20	92	0
p-Isopropyltoluene	2.558	2.665	-	-4.2	20	91	0
1,3-Dichlorobenzene	1.389	1.437	-	-3.5	20	93	0
1,4-Dichlorobenzene	1.408	1.444	-	-2.6	20	93	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.529	1.604	-	-4.9	20	93	0
n-Butylbenzene	2.429	2.622	-	-7.9	20	94	0
1,2-Dichlorobenzene	1.297	1.323	-	-2	20	92	0
1,2,4,5-Tetramethylbenzene	2.378	2.359	-	0.8	20	89	0
1,2-Dibromo-3-chloropropan	0.1	0.099	-	1	20	88	0
1,3,5-Trichlorobenzene	0.998	1.07	-	-7.2	20	96	0
Hexachlorobutadiene	0.443	0.485	-	-9.5	20	93	0
1,2,4-Trichlorobenzene	0.864	0.921	-	-6.6	20	94	0
Naphthalene	1.767	1.581	-	10.5	20	80	0
1,2,3-Trichlorobenzene	0.739	0.753	-	-1.9	20	89	0

*** Value outside of QC limits.**

ANALYTICAL REPORT

Lab Number:	L2270115
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	HAVERHILL, MA
Project Number:	Not Specified
Report Date:	01/12/23

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Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2270115-01	AQSN-121222	SHEEN NET	HAVERHILL, MA	12/12/22 15:15	12/13/22

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Alkylated PAHs

L2270115-01D: The sample has elevated detection limits due to the dilution required by the sample matrix.

L2270115-01D: The surrogate recovery was outside the acceptance criteria for benzo(a)pyrene-d12 (49%); however, re-extraction could not be performed due to lack of additional sample. The results of the original analysis are reported; however, all associated compounds are considered to have a potential bias.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 01/12/23

ORGANICS

SEMIVOLATILES

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sheen Net
Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/09/23 12:27
Analyst: CNC
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
cis/trans-Decalin	81.1		ng Abs	10.0	1.66	2
C1-Decalins	848		ng Abs	10.0	1.66	2
C2-Decalins	3530		ng Abs	10.0	1.66	2
C3-Decalins	5980		ng Abs	10.0	1.66	2
C4-Decalins	22600		ng Abs	10.0	1.66	2
Naphthalene	1000		ng Abs	20.0	5.92	2
C1-Naphthalenes	7770		ng Abs	20.0	5.92	2
C2-Naphthalenes	37600		ng Abs	20.0	5.92	2
C3-Naphthalenes	38100		ng Abs	20.0	5.92	2
C4-Naphthalenes	16900		ng Abs	20.0	5.92	2
2-Methylnaphthalene	692		ng Abs	20.0	5.64	2
1-Methylnaphthalene	11700		ng Abs	20.0	3.04	2
Benzothiophene	53.1		ng Abs	20.0	4.40	2
C1-Benzo(b)thiophenes	817		ng Abs	20.0	4.40	2
C2-Benzo(b)thiophenes	1550		ng Abs	20.0	4.40	2
C3-Benzo(b)thiophenes	2390		ng Abs	20.0	4.40	2
C4-Benzo(b)thiophenes	981		ng Abs	20.0	4.40	2
Biphenyl	894		ng Abs	20.0	4.04	2
2,6-Dimethylnaphthalene	18200		ng Abs	20.0	4.26	2
Dibenzofuran	915		ng Abs	20.0	4.92	2
Acenaphthylene	1450		ng Abs	20.0	3.88	2
Acenaphthene	8320		ng Abs	20.0	5.48	2
2,3,5-Trimethylnaphthalene	2630		ng Abs	20.0	3.40	2
Fluorene	2970		ng Abs	20.0	6.32	2
C1-Fluorenes	4210		ng Abs	20.0	6.32	2
C2-Fluorenes	5510		ng Abs	20.0	6.32	2
C3-Fluorenes	2730		ng Abs	20.0	6.32	2
Dibenzothiophene	1130		ng Abs	20.0	2.74	2

Project Name: HAVERHILL, MA
Project Number: Not Specified
Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA
Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
4-Methyldibenzothiophene(4MDT)	1130		ng Abs	20.0	2.74	2
2/3-Methyldibenzothiophene(2MDT)	1540		ng Abs	20.0	2.74	2
1-Methyldibenzothiophene(1MDT)	228		ng Abs	20.0	2.74	2
C1-Dibenzothiophenes BS	3110		ng Abs	20.0	2.74	2
C2-Dibenzothiophenes	2360		ng Abs	20.0	2.74	2
C3-Dibenzothiophenes	1200		ng Abs	20.0	2.74	2
C4-Dibenzothiophenes	402		ng Abs	20.0	2.74	2
Phenanthrene	9000		ng Abs	20.0	5.16	2
3-Methylphenanthrene (3MP)	2490		ng Abs	20.0	5.16	2
2-Methylphenanthrene (2MP)	2790		ng Abs	20.0	5.16	2
2-Methylanthracene (2MA)	1010		ng Abs	20.0	5.16	2
9/4-Methylphenanthrene (9MP)	2580		ng Abs	20.0	5.16	2
C1-Phenanthrenes/Anthracenes	10500		ng Abs	20.0	5.16	2
C2-Phenanthrenes/Anthr BS	7090		ng Abs	20.0	5.16	2
C3-Phenanthrenes/Anthracenes	2760		ng Abs	20.0	5.16	2
C4-Phenanthrenes/Anthracenes	884		ng Abs	20.0	5.16	2
Retene	ND		ng Abs	20.0	5.16	2
Anthracene	2570		ng Abs	20.0	3.32	2
Carbazole	34.4		ng Abs	20.0	5.18	2
1-Methylphenanthrene	2280		ng Abs	20.0	4.22	2
Fluoranthene	3300		ng Abs	20.0	2.20	2
Benzo(b)fluorene	1060		ng Abs	20.0	3.16	2
7H-Benzo(c)fluorene	412		ng Abs	20.0	3.16	2
2-Methylpyrene[1]	914		ng Abs	20.0	3.00	2
4-Methylpyrene[1]	863		ng Abs	20.0	3.00	2
1-Methylpyrene[1]	1030		ng Abs	20.0	3.00	2
Pyrene	5710		ng Abs	20.0	3.00	2
C1-Fluoranthenes/Pyrenes	6640		ng Abs	20.0	3.00	2
C2-Fluoranthenes/Pyrenes	4230		ng Abs	20.0	3.00	2
C3-Fluoranthenes/Pyrenes	2070		ng Abs	20.0	3.00	2
C4-Fluoranthenes/Pyrenes	404		ng Abs	20.0	3.00	2
Naphthobenzothiophenes	1220		ng Abs	20.0	3.28	2
C1-Naphthobenzothiophenes	1370		ng Abs	20.0	3.28	2
C2-Naphthobenzothiophenes	629		ng Abs	20.0	3.28	2
C3-Naphthobenzothiophenes	342		ng Abs	20.0	3.28	2
C4-Naphthobenzothiophenes	178		ng Abs	20.0	3.28	2
Benz(a)anthracene	2960		ng Abs	20.0	2.60	2

Project Name: HAVERHILL, MA
Project Number: Not Specified
Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA
Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
Chrysene	2950		ng Abs	20.0	2.54	2
C1-Chrysenes	1960		ng Abs	20.0	2.54	2
C2-Chrysenes BS	1090		ng Abs	20.0	2.54	2
C3-Chrysenes	558		ng Abs	20.0	2.54	2
C4-Chrysenes	ND		ng Abs	20.0	2.54	2
Benzo(b)fluoranthene	635		ng Abs	20.0	2.46	2
Benzo(j)+(k)fluoranthene	669		ng Abs	20.0	2.82	2
Benzo(a)fluoranthene	355		ng Abs	20.0	2.82	2
Benzo(e)pyrene	636		ng Abs	20.0	3.24	2
Benzo(a)pyrene	1190		ng Abs	20.0	3.24	2
Perylene	144		ng Abs	20.0	5.02	2
Indeno(1,2,3-cd)pyrene	434		ng Abs	20.0	4.12	2
Dibenz(a,h)+(a,c)anthracene	170		ng Abs	20.0	2.72	2
Benzo(g,h,i)perylene	446		ng Abs	20.0	3.28	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Naphthalene-d8	59		50-130
Phenanthrene-d10	58		50-130
Benzo(a)pyrene-d12	**49**	Q	50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
cis/trans-Decalin	ND		ng Abs	5.00	0.830
C1-Decalins	ND		ng Abs	5.00	0.830
C2-Decalins	ND		ng Abs	5.00	0.830
C3-Decalins	ND		ng Abs	5.00	0.830
C4-Decalins	ND		ng Abs	5.00	0.830
Naphthalene	ND		ng Abs	10.0	2.96
C1-Naphthalenes	ND		ng Abs	10.0	2.96
C2-Naphthalenes	ND		ng Abs	10.0	2.96
C3-Naphthalenes	ND		ng Abs	10.0	2.96
C4-Naphthalenes	ND		ng Abs	10.0	2.96
2-Methylnaphthalene	ND		ng Abs	10.0	2.82
1-Methylnaphthalene	ND		ng Abs	10.0	1.52
Benzothiophene	ND		ng Abs	10.0	2.20
C1-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C2-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C3-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C4-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
Biphenyl	ND		ng Abs	10.0	2.02
2,6-Dimethylnaphthalene	ND		ng Abs	10.0	2.13
Dibenzofuran	ND		ng Abs	10.0	2.46
Acenaphthylene	ND		ng Abs	10.0	1.94
Acenaphthene	ND		ng Abs	10.0	2.74
2,3,5-Trimethylnaphthalene	ND		ng Abs	10.0	1.70
Fluorene	ND		ng Abs	10.0	3.16
C1-Fluorenes	ND		ng Abs	10.0	3.16
C2-Fluorenes	ND		ng Abs	10.0	3.16
C3-Fluorenes	ND		ng Abs	10.0	3.16
Dibenzothiophene	ND		ng Abs	10.0	1.37
4-Methyldibenzothiophene(4MDT)	ND		ng Abs	10.0	1.37

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
2/3-Methyldibenzothiophene(2MDT)	ND		ng Abs	10.0	1.37
1-Methyldibenzothiophene(1MDT)	ND		ng Abs	10.0	1.37
C1-Dibenzothiophenes BS	ND		ng Abs	10.0	1.37
C2-Dibenzothiophenes	ND		ng Abs	10.0	1.37
C3-Dibenzothiophenes	ND		ng Abs	10.0	1.37
C4-Dibenzothiophenes	ND		ng Abs	10.0	1.37
Phenanthrene	ND		ng Abs	10.0	2.58
3-Methylphenanthrene (3MP)	ND		ng Abs	10.0	2.58
2-Methylphenanthrene (2MP)	ND		ng Abs	10.0	2.58
2-Methylanthracene (2MA)	ND		ng Abs	10.0	2.58
9/4-Methylphenanthrene (9MP)	ND		ng Abs	10.0	2.58
C1-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
C2-Phenanthrenes/Anthr BS	ND		ng Abs	10.0	2.58
C3-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
C4-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
Retene	ND		ng Abs	10.0	2.58
Anthracene	ND		ng Abs	10.0	1.66
Carbazole	ND		ng Abs	10.0	2.59
1-Methylphenanthrene	ND		ng Abs	10.0	2.11
Fluoranthene	1.49	J	ng Abs	10.0	1.10
Benzo(b)fluorene	ND		ng Abs	10.0	1.58
7H-Benzo(c)fluorene	ND		ng Abs	10.0	1.58
2-Methylpyrene[1]	ND		ng Abs	10.0	1.50
4-Methylpyrene[1]	ND		ng Abs	10.0	1.50
1-Methylpyrene[1]	ND		ng Abs	10.0	1.50
Pyrene	1.96	J	ng Abs	10.0	1.50
C1-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
C2-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
C3-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
C4-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C1-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C2-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C3-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C4-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
Benz(a)anthracene	ND		ng Abs	10.0	1.30
Chrysene	ND		ng Abs	10.0	1.27
C1-Chrysenes	ND		ng Abs	10.0	1.27
C2-Chrysenes BS	ND		ng Abs	10.0	1.27
C3-Chrysenes	ND		ng Abs	10.0	1.27
C4-Chrysenes	ND		ng Abs	10.0	1.27
Benzo(b)fluoranthene	ND		ng Abs	10.0	1.23
Benzo(j)+(k)fluoranthene	ND		ng Abs	10.0	1.41
Benzo(a)fluoranthene	ND		ng Abs	10.0	1.41
Benzo(e)pyrene	ND		ng Abs	10.0	1.62
Benzo(a)pyrene	ND		ng Abs	10.0	1.62
Perylene	ND		ng Abs	10.0	2.51
Indeno(1,2,3-cd)pyrene	ND		ng Abs	10.0	2.06
Dibenz(a,h)+(a,c)anthracene	ND		ng Abs	10.0	1.36
Benzo(g,h,i)perylene	ND		ng Abs	10.0	1.64

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Naphthalene-d8	61		50-130
Phenanthrene-d10	119		50-130
Benzo(a)pyrene-d12	84		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PAHs - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								
Naphthalene	64		66		50-130	3		30
2-Methylnaphthalene	69		73		50-130	6		30
Acenaphthylene	67		69		50-130	3		30
Acenaphthene	73		76		50-130	4		30
Fluorene	73		77		50-130	5		30
Phenanthrene	76		79		50-130	4		30
Anthracene	83		87		50-130	5		30
Fluoranthene	117		103		50-130	13		30
Pyrene	101		81		50-130	22		30
Benz(a)anthracene	79		82		50-130	4		30
Chrysene	76		80		50-130	5		30
Benzo(b)fluoranthene	80		81		50-130	1		30
Benzo(j)+(k)fluoranthene	92		95		50-130	3		30
Benzo(a)pyrene	82		84		50-130	2		30
Indeno(1,2,3-cd)pyrene	96		96		50-130	0		30
Dibenz(a,h)+(a,c)anthracene	98		99		50-130	1		30
Benzo(g,h,i)perylene	93		94		50-130	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: HAVERHILL, MA

Project Number: Not Specified

Lab Number: L2270115

Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PAHs - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Naphthalene-d8	69		70		50-130
Phenanthrene-d10	87		89		50-130
Benzo(a)pyrene-d12	85		85		50-130

PETROLEUM HYDROCARBONS

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sheen Net
Analytical Method: 1,8015D(M)
Analytical Date: 01/10/23 01:37
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	ND		ug Abs	1.00	0.297	1
n-Decane (C10)	0.381	J	ug Abs	1.00	0.319	1
n-Undecane (C11)	0.594	J	ug Abs	1.00	0.299	1
n-Dodecane (C12)	1.30		ug Abs	1.00	0.218	1
n-Tridecane (C13)	5.32		ug Abs	1.00	0.274	1
2,6,10-Trimethyldodecane (1380)	19.3		ug Abs	1.00	0.150	1
n-Tetradecane (C14)	5.62		ug Abs	1.00	0.150	1
2,6,10-Trimethyltridecane (1470)	38.9		ug Abs	1.00	0.119	1
n-Pentadecane (C15)	ND		ug Abs	1.00	0.119	1
n-Hexadecane (C16)	10.5		ug Abs	1.00	0.151	1
Norpristane (1650)	34.5		ug Abs	1.00	0.330	1
n-Heptadecane (C17)	4.63		ug Abs	1.00	0.330	1
Pristane	57.2		ug Abs	1.00	0.214	1
n-Octadecane (C18)	ND		ug Abs	1.00	0.201	1
Phytane	23.2		ug Abs	1.00	0.126	1
n-Nonadecane (C19)	ND		ug Abs	1.00	0.257	1
n-Eicosane (C20)	ND		ug Abs	1.00	0.142	1
n-Heneicosane (C21)	ND		ug Abs	1.00	0.120	1
n-Docosane (C22)	0.548	J	ug Abs	1.00	0.104	1
n-Tricosane (C23)	1.76		ug Abs	1.00	0.127	1
n-Tetracosane (C24)	4.40		ug Abs	1.00	0.167	1
n-Pentacosane (C25)	7.23		ug Abs	1.00	0.529	1
n-Hexacosane (C26)	8.11		ug Abs	1.00	0.147	1
n-Heptacosane (C27)	7.95		ug Abs	1.00	0.120	1
n-Octacosane (C28)	7.11		ug Abs	1.00	0.214	1
n-Nonacosane (C29)	9.66		ug Abs	1.00	0.666	1
n-Triacontane (C30)	4.18		ug Abs	1.00	0.115	1
n-Hentriacontane (C31)	2.68		ug Abs	1.00	0.142	1

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	1.31		ug Abs	1.00	0.126	1
n-Tritriacontane (C33)	0.770	J	ug Abs	1.00	0.141	1
n-Tetratriacontane (C34)	0.507	J	ug Abs	1.00	0.159	1
n-Pentatriacontane (C35)	0.391	J	ug Abs	1.00	0.174	1
n-Hexatriacontane (C36)	0.264	J	ug Abs	1.00	0.199	1
n-Heptatriacontane (C37)	0.323	J	ug Abs	1.00	0.222	1
n-Octatriacontane (C38)	ND		ug Abs	1.00	0.233	1
n-Nonatriacontane (C39)	ND		ug Abs	1.00	0.325	1
n-Tetracontane (C40)	ND		ug Abs	1.00	0.325	1
Total Petroleum Hydrocarbons (C9-C44)	3770		ug Abs	33.0	7.26	1
Total Saturated Hydrocarbons	259	J	ug Abs	1.00	0.104	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	88		50-130
d50-Tetracosane	82		50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 01/09/23 19:37
Analyst: WR

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
n-Nonane (C9)	ND		ug Abs	1.00	0.297
n-Decane (C10)	ND		ug Abs	1.00	0.319
n-Undecane (C11)	ND		ug Abs	1.00	0.299
n-Dodecane (C12)	ND		ug Abs	1.00	0.218
n-Tridecane (C13)	ND		ug Abs	1.00	0.274
2,6,10-Trimethyldodecane (1380)	ND		ug Abs	1.00	0.150
n-Tetradecane (C14)	ND		ug Abs	1.00	0.150
2,6,10-Trimethyltridecane (1470)	ND		ug Abs	1.00	0.119
n-Pentadecane (C15)	ND		ug Abs	1.00	0.119
n-Hexadecane (C16)	ND		ug Abs	1.00	0.151
Norpristane (1650)	ND		ug Abs	1.00	0.330
n-Heptadecane (C17)	ND		ug Abs	1.00	0.330
Pristane	ND		ug Abs	1.00	0.214
n-Octadecane (C18)	ND		ug Abs	1.00	0.201
Phytane	ND		ug Abs	1.00	0.126
n-Nonadecane (C19)	ND		ug Abs	1.00	0.257
n-Eicosane (C20)	ND		ug Abs	1.00	0.142
n-Heneicosane (C21)	ND		ug Abs	1.00	0.120
n-Docosane (C22)	ND		ug Abs	1.00	0.104
n-Tricosane (C23)	ND		ug Abs	1.00	0.127
n-Tetracosane (C24)	ND		ug Abs	1.00	0.167
n-Pentacosane (C25)	ND		ug Abs	1.00	0.529
n-Hexacosane (C26)	ND		ug Abs	1.00	0.147
n-Heptacosane (C27)	ND		ug Abs	1.00	0.120
n-Octacosane (C28)	ND		ug Abs	1.00	0.214
n-Nonacosane (C29)	0.860	JC	ug Abs	1.00	0.666
n-Triacontane (C30)	ND		ug Abs	1.00	0.115
n-Hentriacontane (C31)	ND		ug Abs	1.00	0.142
n-Dotriacontane (C32)	ND		ug Abs	1.00	0.126

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 01/09/23 19:37
Analyst: WR

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
n-Tritriacontane (C33)	ND		ug Abs	1.00	0.141
n-Tetratriacontane (C34)	ND		ug Abs	1.00	0.159
n-Pentatriacontane (C35)	ND		ug Abs	1.00	0.174
n-Hexatriacontane (C36)	ND		ug Abs	1.00	0.199
n-Heptatriacontane (C37)	ND		ug Abs	1.00	0.222
n-Octatriacontane (C38)	ND		ug Abs	1.00	0.233
n-Nonatriacontane (C39)	ND		ug Abs	1.00	0.325
n-Tetracontane (C40)	ND		ug Abs	1.00	0.325
Total Petroleum Hydrocarbons (C9-C44)	ND		ug Abs	33.0	7.26
Total Saturated Hydrocarbons	0.860	J	ug Abs	1.00	0.104

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	92		50-130
d50-Tetracosane	88		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								
Nonane (C9)	74		75		50-130	1		30
n-Decane (C10)	83		84		50-130	1		30
n-Dodecane (C12)	89		90		50-130	1		30
n-Tetradecane (C14)	88		91		50-130	3		30
n-Hexadecane (C16)	95		98		50-130	3		30
n-Octadecane (C18)	100		104		50-130	4		30
n-Nonadecane (C19)	93		97		50-130	4		30
n-Eicosane (C20)	92		96		50-130	4		30
n-Docosane (C22)	93		98		50-130	5		30
n-Tetracosane (C24)	94		98		50-130	4		30
n-Hexacosane (C26)	93		96		50-130	3		30
n-Octacosane (C28)	96		99		50-130	3		30
n-Triacontane (C30)	92		94		50-130	2		30
n-Hexatriacontane (C36)	84		86		50-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	91		92		50-130
d50-Tetracosane	87		88		50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
B	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2270115-01A	Glass 120ml/4oz w/1:4 Acetone:Hexane	B	NA		3.3	Y	Absent		A2-SHC(14),A2-ALKPAH(14)

*Values in parentheses indicate holding time in days

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 12/13/22

ALPHA Job #: L2270115

Project Information

Project Name: Haverhill MA
Project Location: Haverhill, MA
Project #: 0
Project Manager: Billie-Jo Gauley
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 978-712-4475
Email: bgauley@anchorqea.com

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☐ Yes ☒ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ ☐ Criteria _____

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

Additional Project Information:
Alkylated PAH analysis including Fluoranthenes/pyrenes and naphthabenzothisphenes.

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Alkylated PAH - EPA Method 8270; TPH Fingerprint

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Alkylated PAH - EPA Method 8270	TPH Fingerprint	Sample Comments	TOTAL # BOTTLES
70115-01	AQSN-121222	12/12/22	1515	Sheen net	BJLG	X	X		1
					Container Type	A	A		
					Preservative	A	A		

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H = $Na_2S_2O_3$, I= Ascorbic Acid, J = NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. Gauley	12/13/22 1614	Eric Woods	12/13/22 1616
Eric Woods	12/13/22 1815	[illegible]	12/13/22 1815

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L2346465
Client:	Anchor QEA, LLC 6720 S Macadam Ave Suite 300 Portland, OR 97219
ATTN:	Masakazu Kenematsu
Phone:	(503) 972-5001
Project Name:	HAVERHILL: ISOTHERM STUDY
Project Number:	180327-08.01
Report Date:	08/17/23

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0825), DoD (L2474), FL (E87814), IL (200081), IN (C-MA-04), KY (KY98046), LA (85084), ME (MA00030), MD (350), MI (99110) , NJ (MA015), NY (11627), NC (685), OH (CL106), OR (MA-0262), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #525-23-107-88708), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01

Lab Number: L2346465
Report Date: 08/17/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2346465-01	HH-GAC1-KBT-1-080923	WATER	HAVERHILL, MA	08/09/23 05:50	08/10/23
L2346465-02	HH-GAC1-KBT-2-080923	WATER	HAVERHILL, MA	08/09/23 11:50	08/10/23
L2346465-03	HH-GAC1-IBT-1-080923	WATER	HAVERHILL, MA	08/09/23 12:00	08/10/23
L2346465-04	HH-GAC1-IBT-3-080923	WATER	HAVERHILL, MA	08/09/23 12:10	08/10/23
L2346465-05	HH-GAC2-IBT-1-080923	WATER	HAVERHILL, MA	08/09/23 12:20	08/10/23
L2346465-06	HH-GAC2-IBT-2-080923	WATER	HAVERHILL, MA	08/09/23 12:30	08/10/23
L2346465-07	HH-GAC2-IBT-3-080923	WATER	HAVERHILL, MA	08/09/23 12:40	08/10/23
L2346465-08	HH-PAC1-IBT-1-080923	WATER	HAVERHILL, MA	08/09/23 12:50	08/10/23
L2346465-09	HH-PAC1-IBT-2-080923	WATER	HAVERHILL, MA	08/09/23 13:00	08/10/23
L2346465-10	HH-PAC1-IBT-3-080923	WATER	HAVERHILL, MA	08/09/23 13:10	08/10/23
L2346465-11	HH-CTRL-1-080923	WATER	HAVERHILL, MA	08/09/23 13:20	08/10/23
L2346465-12	HH-INT-1-080923	WATER	HAVERHILL, MA	08/09/23 11:50	08/10/23

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Volatile Organics

In reference to question I:

All samples were analyzed for a subset of MCP compounds per client request.

In reference to question G:

L2346465-01D, -02D, -04D, -06D, -07D, -10D, -11D, and -12D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2346465-07D and -10D: Initial calibration utilized a quadratic fit for: NONE

In reference to question H:

L2346465-07D and -10D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0021)

Average Response Factor: 1,4-dioxane

Verification: dichlorodifluoromethane (136%)

L2346465-07D and -10D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2346465-04D: Initial calibration utilized a quadratic fit for: NONE

In reference to question H:

L2346465-04D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0022)

Average Response Factor: 1,4-dioxane

Verification: dichlorodifluoromethane (133%)

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

Case Narrative (continued)

L2346465-04D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2346465-01D, -02D, -03, -05, -06D, -08, -09D, -11D, and -12D: Initial calibration utilized a quadratic fit for: NONE

In reference to question H:

L2346465-01D, -02D, -03, -05, -06D, -08, -09D, -11D, and -12D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0021)

Average Response Factor: 1,4-dioxane

Verification: dichlorodifluoromethane (136%)

L2346465-01D, -02D, -03, -05, -06D, -08, -09D, -11D, and -12D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative

Date: 08/17/23

QC OUTLIER SUMMARY REPORT

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01

Lab Number: L2346465
Report Date: 08/17/23

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

VOLATILES

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-01 D
Client ID: HH-GAC1-KBT-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 05:50
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 08:33
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	210		ug/l	1.0	0.32	2
Toluene	23		ug/l	2.0	0.41	2
Ethylbenzene	6.4		ug/l	2.0	0.33	2
Methyl tert butyl ether	2.1	J	ug/l	4.0	0.33	2
p/m-Xylene	6.5		ug/l	4.0	0.66	2
o-Xylene	3.9		ug/l	2.0	0.78	2
Carbon disulfide	ND		ug/l	4.0	0.60	2
n-Butylbenzene	ND		ug/l	4.0	0.38	2
Isopropylbenzene	ND		ug/l	4.0	0.37	2
p-Isopropyltoluene	ND		ug/l	4.0	0.38	2
Naphthalene	ND		ug/l	4.0	0.43	2
n-Propylbenzene	ND		ug/l	4.0	0.35	2
1,3,5-Trimethylbenzene	ND		ug/l	4.0	0.43	2
1,2,4-Trimethylbenzene	ND		ug/l	4.0	0.38	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	89		70-130
4-Bromofluorobenzene	84		70-130
Dibromofluoromethane	116		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-02 D
Client ID: HH-GAC1-KBT-2-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 11:50
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 09:15
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	190		ug/l	1.0	0.32	2
Toluene	22		ug/l	2.0	0.41	2
Ethylbenzene	6.4		ug/l	2.0	0.33	2
Methyl tert butyl ether	1.9	J	ug/l	4.0	0.33	2
p/m-Xylene	6.7		ug/l	4.0	0.66	2
o-Xylene	3.8		ug/l	2.0	0.78	2
Carbon disulfide	ND		ug/l	4.0	0.60	2
n-Butylbenzene	ND		ug/l	4.0	0.38	2
Isopropylbenzene	ND		ug/l	4.0	0.37	2
p-Isopropyltoluene	ND		ug/l	4.0	0.38	2
Naphthalene	ND		ug/l	4.0	0.43	2
n-Propylbenzene	ND		ug/l	4.0	0.35	2
1,3,5-Trimethylbenzene	ND		ug/l	4.0	0.43	2
1,2,4-Trimethylbenzene	ND		ug/l	4.0	0.38	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	86		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	114		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-03
Client ID: HH-GAC1-IBT-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:00
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 07:10
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	12		ug/l	0.50	0.16	1
Toluene	1.6		ug/l	1.0	0.20	1
Ethylbenzene	0.56	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.53	J	ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	82		70-130
Dibromofluoromethane	120		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-04 D
Client ID: HH-GAC1-IBT-3-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:10
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/15/23 17:07
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	5700		ug/l	25	8.0	50
Toluene	680		ug/l	50	10.	50
Ethylbenzene	140		ug/l	50	8.4	50
Methyl tert butyl ether	14	J	ug/l	100	8.3	50
p/m-Xylene	180		ug/l	100	17.	50
o-Xylene	94		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	ND		ug/l	100	9.4	50
p-Isopropyltoluene	ND		ug/l	100	9.4	50
Naphthalene	ND		ug/l	100	11.	50
n-Propylbenzene	ND		ug/l	100	8.6	50
1,3,5-Trimethylbenzene	ND		ug/l	100	11.	50
1,2,4-Trimethylbenzene	ND		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	115		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-05
Client ID: HH-GAC2-IBT-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:20
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 07:52
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	26		ug/l	0.50	0.16	1
Toluene	3.9		ug/l	1.0	0.20	1
Ethylbenzene	1.6		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.26	J	ug/l	2.0	0.17	1
p/m-Xylene	1.6	J	ug/l	2.0	0.33	1
o-Xylene	0.98	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	88		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	116		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-06 D
Client ID: HH-GAC2-IBT-2-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:30
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 12:45
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	450		ug/l	2.5	0.80	5
Toluene	57		ug/l	5.0	1.0	5
Ethylbenzene	20		ug/l	5.0	0.84	5
Methyl tert butyl ether	4.1	J	ug/l	10	0.83	5
p/m-Xylene	21		ug/l	10	1.7	5
o-Xylene	12		ug/l	5.0	2.0	5
Carbon disulfide	ND		ug/l	10	1.5	5
n-Butylbenzene	ND		ug/l	10	0.96	5
Isopropylbenzene	ND		ug/l	10	0.94	5
p-Isopropyltoluene	ND		ug/l	10	0.94	5
Naphthalene	ND		ug/l	10	1.1	5
n-Propylbenzene	ND		ug/l	10	0.86	5
1,3,5-Trimethylbenzene	ND		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	ND		ug/l	10	0.96	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	88		70-130
4-Bromofluorobenzene	84		70-130
Dibromofluoromethane	115		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-07 D
Client ID: HH-GAC2-IBT-3-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:40
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/15/23 16:04
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9800		ug/l	50	16.	100
Toluene	1700		ug/l	100	20.	100
Ethylbenzene	460		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	610		ug/l	200	33.	100
o-Xylene	320		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	ND		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	94		70-130
Toluene-d8	85		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	112		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-08
Client ID: HH-PAC1-IBT-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 12:50
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 09:57
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	7.0		ug/l	0.50	0.16	1
Toluene	0.58	J	ug/l	1.0	0.20	1
Ethylbenzene	0.18	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	79		70-130
Dibromofluoromethane	114		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-09 D
Client ID: HH-PAC1-IBT-2-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 13:00
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 13:27
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	500		ug/l	2.5	0.80	5
Toluene	34		ug/l	5.0	1.0	5
Ethylbenzene	6.3		ug/l	5.0	0.84	5
Methyl tert butyl ether	3.2	J	ug/l	10	0.83	5
p/m-Xylene	7.0	J	ug/l	10	1.7	5
o-Xylene	3.6	J	ug/l	5.0	2.0	5
Carbon disulfide	ND		ug/l	10	1.5	5
n-Butylbenzene	ND		ug/l	10	0.96	5
Isopropylbenzene	ND		ug/l	10	0.94	5
p-Isopropyltoluene	ND		ug/l	10	0.94	5
Naphthalene	ND		ug/l	10	1.1	5
n-Propylbenzene	ND		ug/l	10	0.86	5
1,3,5-Trimethylbenzene	ND		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	ND		ug/l	10	0.96	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	80		70-130
Dibromofluoromethane	115		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-10 D
Client ID: HH-PAC1-IBT-3-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 13:10
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/15/23 16:46
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	14000		ug/l	50	16.	100
Toluene	3300		ug/l	100	20.	100
Ethylbenzene	790		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	1200		ug/l	200	33.	100
o-Xylene	580		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	ND		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	94		70-130
Toluene-d8	88		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	112		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-11 D
Client ID: HH-CTRL-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 13:20
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 11:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	25000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	22000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	42000		ug/l	400	66.	200
o-Xylene	22000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	73	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	6100		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	51	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	220	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	88		70-130
4-Bromofluorobenzene	81		70-130
Dibromofluoromethane	113		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

SAMPLE RESULTS

Lab ID: L2346465-12 D
Client ID: HH-INT-1-080923
Sample Location: HAVERHILL, MA

Date Collected: 08/09/23 11:50
Date Received: 08/10/23
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 08/16/23 12:03
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	27000		ug/l	100	32.	200
Toluene	21000		ug/l	200	41.	200
Ethylbenzene	22000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	44000		ug/l	400	66.	200
o-Xylene	23000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	79	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	6300		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	54	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	240	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	81		70-130
Dibromofluoromethane	113		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 08/15/23 07:40
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1816418-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	94		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	112		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 08/15/23 08:43
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04 Batch: WG1816422-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	87		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	117		70-130

Project Name: HAVERHILL: ISOTHERM STUDY **Lab Number:** L2346465

Project Number: 180327-08.01 **Report Date:** 08/17/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 08/16/23 06:28
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-03,05-06,08-09,11-12 Batch: WG1816826-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	89		70-130
4-Bromofluorobenzene	80		70-130
Dibromofluoromethane	120		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: HAVERHILL: ISOTHERM STUDY

Project Number: 180327-08.01

Lab Number: L2346465

Report Date: 08/17/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1816418-3 WG1816418-4								
Benzene	93		93		70-130	0		20
Toluene	88		87		70-130	1		20
Ethylbenzene	86		85		70-130	1		20
Methyl tert butyl ether	100		99		70-130	1		20
p/m-Xylene	90		90		70-130	0		20
o-Xylene	90		90		70-130	0		20
Carbon disulfide	92		98		70-130	6		20
n-Butylbenzene	88		87		70-130	1		20
Isopropylbenzene	90		90		70-130	0		20
p-Isopropyltoluene	96		96		70-130	0		20
Naphthalene	96		90		70-130	6		20
n-Propylbenzene	84		84		70-130	0		20
1,3,5-Trimethylbenzene	92		91		70-130	1		20
1,2,4-Trimethylbenzene	91		92		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	89		91		70-130
Toluene-d8	89		88		70-130
4-Bromofluorobenzene	87		89		70-130
Dibromofluoromethane	103		105		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01
Lab Number: L2346465
Report Date: 08/17/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04 Batch: WG1816422-3 WG1816422-4								
Benzene	94		99		70-130	5		20
Toluene	89		92		70-130	3		20
Ethylbenzene	88		90		70-130	2		20
Methyl tert butyl ether	100		100		70-130	0		20
p/m-Xylene	90		95		70-130	5		20
o-Xylene	95		95		70-130	0		20
Carbon disulfide	99		100		70-130	1		20
n-Butylbenzene	91		93		70-130	2		20
Isopropylbenzene	93		96		70-130	3		20
p-Isopropyltoluene	98		100		70-130	2		20
Naphthalene	94		94		70-130	0		20
n-Propylbenzene	89		92		70-130	3		20
1,3,5-Trimethylbenzene	94		96		70-130	2		20
1,2,4-Trimethylbenzene	94		96		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	93		94		70-130
Toluene-d8	91		88		70-130
4-Bromofluorobenzene	93		90		70-130
Dibromofluoromethane	105		106		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01
Lab Number: L2346465
Report Date: 08/17/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-03,05-06,08-09,11-12 Batch: WG1816826-3 WG1816826-4								
Benzene	90		88		70-130	2		20
Toluene	85		86		70-130	1		20
Ethylbenzene	82		83		70-130	1		20
Methyl tert butyl ether	95		96		70-130	1		20
p/m-Xylene	90		90		70-130	0		20
o-Xylene	90		90		70-130	0		20
Carbon disulfide	90		96		70-130	6		20
n-Butylbenzene	87		88		70-130	1		20
Isopropylbenzene	86		90		70-130	5		20
p-Isopropyltoluene	95		94		70-130	1		20
Naphthalene	93		89		70-130	4		20
n-Propylbenzene	81		84		70-130	4		20
1,3,5-Trimethylbenzene	90		90		70-130	0		20
1,2,4-Trimethylbenzene	90		90		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	94		97		70-130
Toluene-d8	89		88		70-130
4-Bromofluorobenzene	82		86		70-130
Dibromofluoromethane	105		109		70-130

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01

Lab Number: L2346465
Report Date: 08/17/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2346465-01A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-01B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-02A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-02B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-03A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-03B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-04A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-04B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-05A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-05B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-06A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-06B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-07A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-07B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-08A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-08B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-09A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-09B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-10A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-10B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-11A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-11B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)
L2346465-12A	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: HAVERHILL: ISOTHERM STUDY
Project Number: 180327-08.01

Lab Number: L2346465
Report Date: 08/17/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2346465-12B	Vial HCl preserved	A	NA		3.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	HAVERHILL: ISOTHERM STUDY	**Lab Number:**	L2346465
Project Number:	180327-08.01	**Report Date:**	08/17/23

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

8/10/23

L2346465

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date:	8/9/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave
Suite 300
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
1	HH-GAC1-KBT-1-080923	8/9/2023	5:50	Water	1	X	
2	HH-GAC1-KBT-2-080923	8/9/2023	11:50	Water	1	X	
3	HH-GAC1-IBT-1-080923	8/9/2023	12:00	Water	1	X	
4	HH-GAC1-IBT-3-080923	8/9/2023	12:10	Water	1	X	
5	HH-GAC2-IBT-1-080923	8/9/2023	12:20	Water	1	X	Expected high BTEX conc. (~10 mg/L)
6	HH-GAC2-IBT-2-080923	8/9/2023	12:30	Water	1	X	
7	HH-GAC2-IBT-3-080923	8/9/2023	12:40	Water	1	X	
8	HH-PAC-IBT-1-080923	8/9/2023	12:50	Water	1	X	Expected high BTEX conc. (~10 mg/L)
9	HH-PAC-IBT-2-080923	8/9/2023	13:00	Water	1	X	
10	HH-PAC-IBT-3-080923	8/9/2023	13:10	Water	1	X	
11	HH-CTRL-080923	8/9/2023	13:20	Water	1	X	Expected high BTEX conc. (~10 mg/L)
12	HH-INT-080923	8/8/2023	11:50	Water	1	X	Expected high BTEX conc. (~20-30 mg/L)
13							Expected high BTEX conc. (~20-30 mg/L)
14							
15							
16							
17							
18							
19							
20							

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a 5-day TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA	Received by: Fedex	
Signature/Print Name:	Date/Time: 8/9/2023 14:45	Signature/Print Name:	
Relinquished by: Fedex	Company:	Received by: AAL	8/10/23
Signature/Print Name:	Date/Time: 8/10/23 14:25	Signature/Print Name:	14:25

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Page 1 of 1

ORIGIN ID:BNOA (503) 972-5001
MASAKAZU KANEMATSU
ANCHOR QEA
6720 SW MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

SHIP DATE: 09AUG23
ACTWGT: 20.00 LB
CAD: 109495568/INET4640
DIMS: 23x13x13 IN

BILL SENDER

TO **LIZ PORTA**
ALPHA ANALYTICAL INC.
320 FORBES BLVD
ATTN: LIZ PORTA
MANSFIELD MA 02048
(508) 844-4124
INV:
PO: MASA KANEMATSU

REF: 180327-08.01 TASK 05
DEPT: SHIPPING WATER SAMPLES

583J4/C62B/9AE3

FedEx. Express

THU - 10 AUG 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **7730 0614 3097**

XE PYMA

02048
MA-US **BOS**

After printing this label:
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Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1816418-5	**Lab File ID**	: J230815A07
Instrument ID	: JACK1		
Matrix	: WATER	**Analysis Date**	: 08/15/23 07:40

Client Sample No.	Lab Sample ID	Analysis Date
WG1816418-3LCS	WG1816418-3	08/15/23 05:35
WG1816418-4LCSD	WG1816418-4	08/15/23 06:16
HH-GAC2-IBT-3-080923	L2346465-07D	08/15/23 16:04
HH-PAC1-IBT-3-080923	L2346465-10D	08/15/23 16:46

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1816422-5	**Lab File ID**	: J230815A10
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 08/15/23 08:43

Client Sample No.	Lab Sample ID	Analysis Date
WG1816422-3LCS	WG1816422-3	08/15/23 06:38
WG1816422-4LCSD	WG1816422-4	08/15/23 07:20
HH-GAC1-IBT-3-080923	L2346465-04D	08/15/23 17:07

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1816826-5	**Lab File ID**	: J230816A07
Instrument ID	: JACK1		
Matrix	: WATER	**Analysis Date**	: 08/16/23 06:28

Client Sample No.	Lab Sample ID	Analysis Date
WG1816826-3LCS	WG1816826-3	08/16/23 04:22
WG1816826-4LCSD	WG1816826-4	08/16/23 05:04
HH-GAC1-IBT-1-080923	L2346465-03	08/16/23 07:10
HH-GAC2-IBT-1-080923	L2346465-05	08/16/23 07:52
HH-GAC1-KBT-1-080923	L2346465-01D	08/16/23 08:33
HH-GAC1-KBT-2-080923	L2346465-02D	08/16/23 09:15
HH-PAC1-IBT-1-080923	L2346465-08	08/16/23 09:57
HH-CTRL-1-080923	L2346465-11D	08/16/23 11:21
HH-INT-1-080923	L2346465-12D	08/16/23 12:03
HH-GAC2-IBT-2-080923	L2346465-06D	08/16/23 12:45
HH-PAC1-IBT-2-080923	L2346465-09D	08/16/23 13:27

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK1	Calibration Date	: 08/15/23 05:35
Lab File ID	: J230815A01	Init. Calib. Date(s)	: 06/03/23 06/03/23
Sample No	: WG1816418-2	Init. Calib. Times	: 17:41 23:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	82	0
Dichlorodifluoromethane	0.367	0.399	-	-8.7	20	79	0
Chloromethane	0.43	0.446	-	-3.7	20	78	0
Vinyl chloride	0.376	0.38	-	-1.1	20	72	0
Bromomethane	0.226	0.168	-	25.7*	20	60	0
Chloroethane	0.23	0.198	-	13.9	20	64	0
Trichlorofluoromethane	0.57	0.549	-	3.7	20	70	0
Ethyl ether	0.144	0.142	-	1.4	20	81	0
1,1-Dichloroethene	0.339	0.347	-	-2.4	20	76	0
Carbon disulfide	0.967	0.892	-	7.8	20	68	0
Freon-113	0.356	0.386	-	-8.4	20	82	0
Acrolein	0.043	0.046	-	-7	20	87	0
Methylene chloride	0.363	0.358	-	1.4	20	78	0
Acetone	0.085	0.094	-	-10.6	20	91	0
trans-1,2-Dichloroethene	0.367	0.373	-	-1.6	20	78	0
Methyl acetate	0.199	0.222	-	-11.6	20	92	0
Methyl tert-butyl ether	0.743	0.744	-	-0.1	20	83	0
tert-Butyl alcohol	0.023	0.021	-	8.7	20	75	0
Diisopropyl ether	1.134	1.148	-	-1.2	20	83	0
1,1-Dichloroethane	0.663	0.62	-	6.5	20	70	0
Halothane	0.293	0.328	-	-11.9	20	86	0
Acrylonitrile	0.09	0.094	-	-4.4	20	83	0
Ethyl tert-butyl ether	0.95	0.89	-	6.3	20	79	0
Vinyl acetate	0.75	0.643	-	14.3	20	73	0
cis-1,2-Dichloroethene	0.397	0.416	-	-4.8	20	80	0
2,2-Dichloropropane	0.554	0.539	-	2.7	20	76	0
Bromochloromethane	0.189	0.213	-	-12.7	20	88	0
Cyclohexane	0.62	0.63	-	-1.6	20	78	0
Chloroform	0.647	0.621	-	4	20	76	0
Ethyl acetate	0.289	0.273	-	5.5	20	83	0
Carbon tetrachloride	10	9.443	-	5.6	20	74	0
Tetrahydrofuran	0.096	0.086	-	10.4	20	77	0
Dibromofluoromethane	0.312	0.321	-	-2.9	20	82	0
1,1,1-Trichloroethane	0.563	0.564	-	-0.2	20	77	0
2-Butanone	0.119	0.122	-	-2.5	20	90	0
1,1-Dichloropropene	0.451	0.427	-	5.3	20	75	0
Benzene	1.369	1.277	-	6.7	20	76	0
tert-Amyl methyl ether	0.839	0.695	-	17.2	20	68	0
1,2-Dichloroethane-d4	0.342	0.306	-	10.5	20	74	0
1,2-Dichloroethane	0.434	0.448	-	-3.2	20	81	0
Methyl cyclohexane	0.605	0.571	-	5.6	20	75	0
Trichloroethene	0.37	0.377	-	-1.9	20	82	0
Dibromomethane	0.208	0.2	-	3.8	20	77	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK1	Calibration Date	: 08/15/23 05:35
Lab File ID	: J230815A01	Init. Calib. Date(s)	: 06/03/23 06/03/23
Sample No	: WG1816418-2	Init. Calib. Times	: 17:41 23:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.352	0.311	-	11.6	20	69	0
2-Chloroethyl vinyl ether	0.168	0.152	-	9.5	20	71	0
Bromodichloromethane	0.512	0.476	-	7	20	74	0
1,4-Dioxane	0.00204	0.00192*	-	5.9	20	72	0
cis-1,3-Dichloropropene	0.53	0.479	-	9.6	20	73	0
Chlorobenzene-d5	1	1	-	0	20	91	0
Toluene-d8	1.175	1.042	-	11.3	20	79	0
Toluene	0.918	0.804	-	12.4	20	78	0
4-Methyl-2-pentanone	0.106	0.076	-	28.3*	20	64	0
Tetrachloroethene	0.449	0.472	-	-5.1	20	92	0
trans-1,3-Dichloropropene	0.514	0.421	-	18.1	20	74	0
Ethyl methacrylate	0.401	0.256	-	36.2*	20	54	0
1,1,2-Trichloroethane	0.236	0.198*	-	16.1	20	80	0
Chlorodibromomethane	0.373	0.334	-	10.5	20	84	0
1,3-Dichloropropane	0.46	0.37	-	19.6	20	74	0
1,2-Dibromoethane	0.3	0.28	-	6.7	20	88	0
2-Hexanone	0.229	0.177	-	22.7*	20	70	0
Chlorobenzene	1.078	1.016	-	5.8	20	84	0
Ethylbenzene	1.846	1.586	-	14.1	20	74	0
1,1,1,2-Tetrachloroethane	0.368	0.345	-	6.3	20	87	0
p/m Xylene	0.785	0.705	-	10.2	20	79	0
o Xylene	0.764	0.684	-	10.5	20	79	0
Styrene	1.238	1.144	-	7.6	20	81	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	92	0
Bromoform	0.414	0.334	-	19.3	20	77	0
Isopropylbenzene	3.217	2.886	-	10.3	20	80	0
4-Bromofluorobenzene	0.801	0.699	-	12.7	20	79	0
Bromobenzene	0.8	0.751	-	6.1	20	85	0
n-Propylbenzene	3.737	3.129	-	16.3	20	73	0
1,4-Dichlorobutane	0.786	0.686	-	12.7	20	78	0
1,1,2,2-Tetrachloroethane	0.584	0.481	-	17.6	20	72	0
4-Ethyltoluene	3.154	2.872	-	8.9	20	80	0
2-Chlorotoluene	2.503	2.071	-	17.3	20	73	0
1,3,5-Trimethylbenzene	2.676	2.448	-	8.5	20	81	0
1,2,3-Trichloropropane	0.474	0.367	-	22.6*	20	71	0
trans-1,4-Dichloro-2-buten	0.188	0.146	-	22.3*	20	71	0
4-Chlorotoluene	2.283	1.882	-	17.6	20	74	0
tert-Butylbenzene	2.375	2.213	-	6.8	20	82	0
1,2,4-Trimethylbenzene	2.632	2.389	-	9.2	20	80	0
sec-Butylbenzene	3.451	3.197	-	7.4	20	80	0
p-Isopropyltoluene	3.043	2.932	-	3.6	20	83	0
1,3-Dichlorobenzene	1.569	1.501	-	4.3	20	85	0
1,4-Dichlorobenzene	1.539	1.457	-	5.3	20	84	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK1	Calibration Date	: 08/15/23 05:35
Lab File ID	: J230815A01	Init. Calib. Date(s)	: 06/03/23 06/03/23
Sample No	: WG1816418-2	Init. Calib. Times	: 17:41 23:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.824	1.766	-	3.2	20	83	0
n-Butylbenzene	2.544	2.25	-	11.6	20	75	0
1,2-Dichlorobenzene	1.451	1.394	-	3.9	20	85	0
1,2,4,5-Tetramethylbenzene	2.576	2.409	-	6.5	20	83	0
1,2-Dibromo-3-chloropropan	0.117	0.101	-	13.7	20	80	0
1,3,5-Trichlorobenzene	1.088	1.134	-	-4.2	20	91	0
Hexachlorobutadiene	0.484	0.483	-	0.2	20	88	0
1,2,4-Trichlorobenzene	0.93	0.946	-	-1.7	20	89	0
Naphthalene	2.159	2.062	-	4.5	20	84	0
1,2,3-Trichlorobenzene	0.832	0.84	-	-1	20	88	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 08/15/23 06:38
Lab File ID	: J230815A04	Init. Calib. Date(s)	: 06/03/23 06/04/23
Sample No	: WG1816422-2	Init. Calib. Times	: 18:02 00:19
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	78	0
Dichlorodifluoromethane	0.331	0.392	-	-18.4	20	88	0
Chloromethane	0.388	0.463	-	-19.3	20	89	0
Vinyl chloride	0.338	0.383	-	-13.3	20	80	0
Bromomethane	0.221	0.218	-	1.4	20	81	0
Chloroethane	0.22	0.202	-	8.2	20	68	0
Trichlorofluoromethane	0.53	0.516	-	2.6	20	72	0
Ethyl ether	0.136	0.148	-	-8.8	20	80	0
1,1-Dichloroethene	0.31	0.329	-	-6.1	20	81	0
Carbon disulfide	0.902	0.89	-	1.3	20	72	0
Freon-113	0.327	0.379	-	-15.9	20	84	0
Acrolein	0.04	0.045	-	-12.5	20	85	0
Methylene chloride	0.332	0.353	-	-6.3	20	82	0
Acetone	10	12.973	-	-29.7*	20	93	0
trans-1,2-Dichloroethene	0.338	0.372	-	-10.1	20	84	0
Methyl acetate	0.2	0.242	-	-21*	20	95	0
Methyl tert-butyl ether	0.769	0.776	-	-0.9	20	80	0
tert-Butyl alcohol	0.027	0.026	-	3.7	20	70	0
Diisopropyl ether	1.107	1.149	-	-3.8	20	80	0
1,1-Dichloroethane	0.623	0.637	-	-2.2	20	76	0
Halothane	0.273	0.324	-	-18.7	20	90	0
Acrylonitrile	0.089	0.101	-	-13.5	20	88	0
Ethyl tert-butyl ether	0.95	0.9	-	5.3	20	75	0
Vinyl acetate	0.756	0.644	-	14.8	20	68	0
cis-1,2-Dichloroethene	0.374	0.41	-	-9.6	20	84	0
2,2-Dichloropropane	0.516	0.527	-	-2.1	20	77	0
Bromochloromethane	0.172	0.209	-	-21.5*	20	91	0
Cyclohexane	0.572	0.643	-	-12.4	20	82	0
Chloroform	0.616	0.614	-	0.3	20	77	0
Ethyl acetate	0.302	0.297	-	1.7	20	78	0
Carbon tetrachloride	0.488	0.507	-	-3.9	20	76	0
Tetrahydrofuran	0.102	0.108	-	-5.9	20	84	0
Dibromofluoromethane	0.301	0.316	-	-5	20	82	0
1,1,1-Trichloroethane	0.541	0.566	-	-4.6	20	79	0
2-Butanone	0.129	0.127	-	1.6	20	79	0
1,1-Dichloropropene	0.443	0.433	-	2.3	20	76	0
Benzene	1.336	1.257	-	5.9	20	73	0
tert-Amyl methyl ether	0.84	0.718	-	14.5	20	66	0
1,2-Dichloroethane-d4	0.337	0.313	-	7.1	20	73	0
1,2-Dichloroethane	0.42	0.45	-	-7.1	20	83	0
Methyl cyclohexane	0.567	0.565	-	0.4	20	77	0
Trichloroethene	0.352	0.371	-	-5.4	20	77	0
Dibromomethane	0.199	0.198	-	0.5	20	78	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 08/15/23 06:38
Lab File ID	: J230815A04	Init. Calib. Date(s)	: 06/03/23 06/04/23
Sample No	: WG1816422-2	Init. Calib. Times	: 18:02 00:19
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.345	0.323	-	6.4	20	70	0
2-Chloroethyl vinyl ether	0.177	0.154	-	13	20	63	0
Bromodichloromethane	0.475	0.462	-	2.7	20	74	0
1,4-Dioxane	0.00217	0.00253*	-	-16.6	20	82	0
cis-1,3-Dichloropropene	0.531	0.488	-	8.1	20	71	0
Chlorobenzene-d5	1	1	-	0	20	92	0
Toluene-d8	1.174	1.063	-	9.5	20	82	0
Toluene	0.891	0.793	-	11	20	81	0
4-Methyl-2-pentanone	0.11	0.086	-	21.8*	20	74	0
Tetrachloroethene	0.44	0.441	-	-0.2	20	88	0
trans-1,3-Dichloropropene	0.537	0.415	-	22.7*	20	69	0
Ethyl methacrylate	0.401	0.283	-	29.4*	20	64	0
1,1,2-Trichloroethane	0.244	0.201	-	17.6	20	76	0
Chlorodibromomethane	0.384	0.326	-	15.1	20	79	0
1,3-Dichloropropane	0.484	0.382	-	21.1*	20	72	0
1,2-Dibromoethane	0.315	0.285	-	9.5	20	83	0
2-Hexanone	0.246	0.199	-	19.1	20	76	0
Chlorobenzene	1.041	0.983	-	5.6	20	86	0
Ethylbenzene	1.769	1.549	-	12.4	20	78	0
1,1,1,2-Tetrachloroethane	0.366	0.329	-	10.1	20	82	0
p/m Xylene	0.75	0.693	-	7.6	20	83	0
o Xylene	0.726	0.678	-	6.6	20	83	0
Styrene	1.183	1.128	-	4.6	20	84	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	92	0
Bromoform	0.429	0.33	-	23.1*	20	70	0
Isopropylbenzene	3.095	2.892	-	6.6	20	83	0
4-Bromofluorobenzene	0.802	0.747	-	6.9	20	86	0
Bromobenzene	0.769	0.727	-	5.5	20	86	0
n-Propylbenzene	3.574	3.178	-	11.1	20	78	0
1,4-Dichlorobutane	0.809	0.743	-	8.2	20	82	0
1,1,2,2-Tetrachloroethane	0.599	0.517	-	13.7	20	75	0
4-Ethyltoluene	3.035	2.839	-	6.5	20	83	0
2-Chlorotoluene	2.42	2.109	-	12.9	20	78	0
1,3,5-Trimethylbenzene	2.575	2.415	-	6.2	20	83	0
1,2,3-Trichloropropane	0.482	0.385	-	20.1*	20	70	0
trans-1,4-Dichloro-2-buten	0.2	0.146	-	27*	20	68	0
4-Chlorotoluene	2.205	1.918	-	13	20	78	0
tert-Butylbenzene	2.282	2.184	-	4.3	20	83	0
1,2,4-Trimethylbenzene	2.52	2.358	-	6.4	20	82	0
sec-Butylbenzene	3.303	3.212	-	2.8	20	85	0
p-Isopropyltoluene	2.918	2.87	-	1.6	20	85	0
1,3-Dichlorobenzene	1.491	1.466	-	1.7	20	88	0
1,4-Dichlorobenzene	1.493	1.425	-	4.6	20	86	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 08/15/23 06:38
Lab File ID	: J230815A04	Init. Calib. Date(s)	: 06/03/23 06/04/23
Sample No	: WG1816422-2	Init. Calib. Times	: 18:02 00:19
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.737	1.694	-	2.5	20	85	0
n-Butylbenzene	2.428	2.21	-	9	20	78	0
1,2-Dichlorobenzene	1.397	1.371	-	1.9	20	87	0
1,2,4,5-Tetramethylbenzene	2.565	2.386	-	7	20	81	0
1,2-Dibromo-3-chloropropan	0.119	0.107	-	10.1	20	79	0
1,3,5-Trichlorobenzene	1.045	1.06	-	-1.4	20	88	0
Hexachlorobutadiene	0.454	0.439	-	3.3	20	85	0
1,2,4-Trichlorobenzene	0.9	0.891	-	1	20	86	0
Naphthalene	2.262	2.123	-	6.1	20	80	0
1,2,3-Trichlorobenzene	0.826	0.819	-	0.8	20	85	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK1	Calibration Date	: 08/16/23 04:22
Lab File ID	: J230816A01	Init. Calib. Date(s)	: 06/03/23 06/03/23
Sample No	: WG1816826-2	Init. Calib. Times	: 17:41 23:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	77	0
Dichlorodifluoromethane	0.367	0.4	-	-9	20	75	0
Chloromethane	0.43	0.427	-	0.7	20	70	0
Vinyl chloride	0.376	0.367	-	2.4	20	66	0
Bromomethane	0.226	0.191	-	15.5	20	64	0
Chloroethane	0.23	0.188	-	18.3	20	57	0
Trichlorofluoromethane	0.57	0.567	-	0.5	20	68	0
Ethyl ether	0.144	0.135	-	6.2	20	72	0
1,1-Dichloroethene	0.339	0.346	-	-2.1	20	71	0
Carbon disulfide	0.967	0.872	-	9.8	20	63	0
Methylene chloride	0.363	0.341	-	6.1	20	70	0
Acetone	0.085	0.087	-	-2.4	20	79	0
trans-1,2-Dichloroethene	0.367	0.367	-	0	20	73	0
Methyl tert-butyl ether	0.743	0.706	-	5	20	75	0
Diisopropyl ether	1.134	1.039	-	8.4	20	70	0
1,1-Dichloroethane	0.663	0.598	-	9.8	20	64	0
Ethyl tert-butyl ether	0.95	0.825	-	13.2	20	69	0
cis-1,2-Dichloroethene	0.397	0.396	-	0.3	20	72	0
2,2-Dichloropropane	0.554	0.534	-	3.6	20	71	0
Bromochloromethane	0.189	0.215	-	-13.8	20	84	0
Chloroform	0.647	0.604	-	6.6	20	69	0
Carbon tetrachloride	10	9.849	-	1.5	20	72	0
Tetrahydrofuran	0.096	0.081	-	15.6	20	68	0
Dibromofluoromethane	0.312	0.327	-	-4.8	20	79	0
1,1,1-Trichloroethane	0.563	0.579	-	-2.8	20	74	0
2-Butanone	0.119	0.111	-	6.7	20	77	0
1,1-Dichloropropene	0.451	0.415	-	8	20	69	0
Benzene	1.369	1.229	-	10.2	20	69	0
tert-Amyl methyl ether	0.839	0.654	-	22.1*	20	60	0
1,2-Dichloroethane-d4	0.342	0.321	-	6.1	20	73	0
1,2-Dichloroethane	0.434	0.439	-	-1.2	20	75	0
Trichloroethene	0.37	0.373	-	-0.8	20	77	0
Dibromomethane	0.208	0.19	-	8.7	20	69	0
1,2-Dichloropropane	0.352	0.292	-	17	20	61	0
Bromodichloromethane	0.512	0.457	-	10.7	20	67	0
1,4-Dioxane	0.00204	0.00205*	-	-0.5	20	73	0
cis-1,3-Dichloropropene	0.53	0.448	-	15.5	20	64	0
Chlorobenzene-d5	1	1	-	0	20	86	0
Toluene-d8	1.175	1.041	-	11.4	20	75	0
Toluene	0.918	0.778	-	15.3	20	71	0
4-Methyl-2-pentanone	0.106	0.071	-	33*	20	56	0
Tetrachloroethene	0.449	0.481	-	-7.1	20	89	0
trans-1,3-Dichloropropene	0.514	0.395	-	23.2*	20	66	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2346465
Project Name	: HAVERHILL: ISOTHERM STUDY	Project Number	: 180327-08.01
Instrument ID	: JACK1	Calibration Date	: 08/16/23 04:22
Lab File ID	: J230816A01	Init. Calib. Date(s)	: 06/03/23 06/03/23
Sample No	: WG1816826-2	Init. Calib. Times	: 17:41 23:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.236	0.187*	-	20.8*	20	72	0
Chlorodibromomethane	0.373	0.321	-	13.9	20	77	0
1,3-Dichloropropane	0.46	0.354	-	23*	20	68	0
1,2-Dibromoethane	0.3	0.275	-	8.3	20	82	0
2-Hexanone	0.229	0.154	-	32.8*	20	58	0
Chlorobenzene	1.078	0.999	-	7.3	20	78	0
Ethylbenzene	1.846	1.52	-	17.7	20	68	0
1,1,1,2-Tetrachloroethane	0.368	0.345	-	6.3	20	83	0
p/m Xylene	0.785	0.694	-	11.6	20	74	0
o Xylene	0.764	0.671	-	12.2	20	73	0
Styrene	1.238	1.118	-	9.7	20	75	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	88	0
Bromoform	0.414	0.324	-	21.7*	20	72	0
Isopropylbenzene	3.217	2.782	-	13.5	20	74	0
4-Bromofluorobenzene	0.801	0.659	-	17.7	20	71	0
Bromobenzene	0.8	0.759	-	5.1	20	83	0
n-Propylbenzene	3.737	3.033	-	18.8	20	68	0
1,1,2,2-Tetrachloroethane	0.584	0.447	-	23.5*	20	65	0
2-Chlorotoluene	2.503	1.999	-	20.1*	20	68	0
1,3,5-Trimethylbenzene	2.676	2.4	-	10.3	20	76	0
1,2,3-Trichloropropane	0.474	0.342	-	27.8*	20	64	0
4-Chlorotoluene	2.283	1.801	-	21.1*	20	68	0
tert-Butylbenzene	2.375	2.152	-	9.4	20	76	0
1,2,4-Trimethylbenzene	2.632	2.364	-	10.2	20	76	0
sec-Butylbenzene	3.451	3.184	-	7.7	20	77	0
p-Isopropyltoluene	3.043	2.905	-	4.5	20	79	0
1,3-Dichlorobenzene	1.569	1.514	-	3.5	20	83	0
1,4-Dichlorobenzene	1.539	1.451	-	5.7	20	80	0
n-Butylbenzene	2.544	2.208	-	13.2	20	71	0
1,2-Dichlorobenzene	1.451	1.384	-	4.6	20	81	0
1,2-Dibromo-3-chloropropan	0.117	0.101	-	13.7	20	77	0
Hexachlorobutadiene	0.484	0.493	-	-1.9	20	86	0
1,2,4-Trichlorobenzene	0.93	0.916	-	1.5	20	83	0
Naphthalene	2.159	2.002	-	7.3	20	78	0
1,2,3-Trichlorobenzene	0.832	0.853	-	-2.5	20	86	0

* Value outside of QC limits.

ANALYTICAL REPORT

Lab Number:	L2349844
Client:	Anchor QEA, LLC 6720 S Macadam Ave Suite 300 Portland, OR 97219
ATTN:	Masakazu Kenematsu
Phone:	(503) 972-5001
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	09/12/23

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2349844
Report Date: 09/12/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2349844-01	HH-FS400-INT-20230822	GROUNDWATER	HAVERHILL, MA	08/22/23 07:00	08/28/23
L2349844-02	HH-FS400-INT-20230824	GROUNDWATER	HAVERHILL, MA	08/24/23 06:00	08/28/23
L2349844-03	HH-FS400-KNBT-1	GROUNDWATER	HAVERHILL, MA	08/24/23 08:00	08/28/23
L2349844-04	HH-FS400-KNBT-2	GROUNDWATER	HAVERHILL, MA	08/24/23 10:00	08/28/23
L2349844-05	HH-FS400-KNBT-3	GROUNDWATER	HAVERHILL, MA	08/24/23 14:00	08/28/23
L2349844-06	HH-TRIP-BLANK-20230822	GROUNDWATER	HAVERHILL, MA	08/22/23 07:30	08/28/23

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	NO
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

In reference to question A:

The samples were received via Express Ship in a cooler with ice; however, the ice was melted and the samples were above the required temperature range. Per client authorization of the exceedance, all requested analyses were performed.

Volatile Organics

MCP Related Narratives

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2349844-01D, -02D, -03D, -04D, and -05D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2349844-01D: Initial calibration utilized a quadratic fit for: stryene

In reference to question H:

L2349844-01D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.195), 1,4-dioxane (0.0015), 1,1,2-trichloroethane (0.1521), 1,2-dibromoethane (0.174)

Average Response Factor: 1,4-dioxane, 1,1,2-trichloroethane

Verification: dichlorodifluoromethane (133%)

L2349844-01D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

Case Narrative (continued)

high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2349844-02D, -03D, -04D, -05D, and -06: Initial calibration utilized a quadratic fit for: NONE

L2349844-02D, -03D, -04D, -05D, and -06: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.1792), bromodichloromethane (0.2584), 1,2-dibromoethane (0.1662), bromochloromethane (0.0878), 1,1,2-trichloroethane (0.1433), chlorodibromomethane (0.1803), 1,4-dioxane (0.0014), chloroform (0.2883), cis-1,2-dichloroethene (0.1826)

Average Response Factor: 1,2-dibromoethane, bromodichloromethane, 1,1,2-trichloroethane, 1,4-dioxane, bromochloromethane

Verification: NONE

L2349844-02D, -03D, -04D, -05D, and -06: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 09/12/23

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2349844

Report Date: 09/12/23

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-01 D
Client ID: HH-FS400-INT-20230822
Sample Location: HAVERHILL, MA

Date Collected: 08/22/23 07:00
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 16:29
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	36000		ug/l	120	40.	250
Toluene	32000		ug/l	250	51.	250
Ethylbenzene	32000		ug/l	250	42.	250
Methyl tert butyl ether	ND		ug/l	500	42.	250
p/m-Xylene	66000		ug/l	500	83.	250
o-Xylene	31000		ug/l	250	98.	250
Carbon disulfide	ND		ug/l	500	75.	250
n-Butylbenzene	ND		ug/l	500	48.	250
Isopropylbenzene	91	J	ug/l	500	47.	250
p-Isopropyltoluene	ND		ug/l	500	47.	250
Naphthalene	6100		ug/l	500	54.	250
n-Propylbenzene	ND		ug/l	500	43.	250
1,3,5-Trimethylbenzene	ND		ug/l	500	54.	250
1,2,4-Trimethylbenzene	230	J	ug/l	500	48.	250

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	109		70-130
Dibromofluoromethane	95		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-02 D
Client ID: HH-FS400-INT-20230824
Sample Location: HAVERHILL, MA

Date Collected: 08/24/23 06:00
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 15:36
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	23000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	21000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	43000		ug/l	400	66.	200
o-Xylene	23000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	67	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	4600		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	44	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	180	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	82		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-03 D
Client ID: HH-FS400-KNBT-1
Sample Location: HAVERHILL, MA

Date Collected: 08/24/23 08:00
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 15:59
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	12000		ug/l	50	16.	100
Toluene	10000		ug/l	100	20.	100
Ethylbenzene	11000		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	22000		ug/l	200	33.	100
o-Xylene	12000		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	21	J	ug/l	200	19.	100
Isopropylbenzene	40	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	2700		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	27	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	110	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	104		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-04 D
Client ID: HH-FS400-KNBT-2
Sample Location: HAVERHILL, MA

Date Collected: 08/24/23 10:00
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 16:21
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9700		ug/l	50	16.	100
Toluene	7100		ug/l	100	20.	100
Ethylbenzene	7800		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	16000		ug/l	200	33.	100
o-Xylene	8700		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	31	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	1900		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	80	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	92		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	82		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-05 D
Client ID: HH-FS400-KNBT-3
Sample Location: HAVERHILL, MA

Date Collected: 08/24/23 14:00
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 16:44
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	8500		ug/l	50	16.	100
Toluene	5800		ug/l	100	20.	100
Ethylbenzene	6300		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	13000		ug/l	200	33.	100
o-Xylene	7200		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	25	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	1500		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	65	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

SAMPLE RESULTS

Lab ID: L2349844-06
Client ID: HH-TRIP-BLANK-20230822
Sample Location: HAVERHILL, MA

Date Collected: 08/22/23 07:30
Date Received: 08/28/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/01/23 15:13
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	0.35	J	ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	115		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/01/23 09:02
Analyst: PID

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01 Batch: WG1823507-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	104		70-130
4-Bromofluorobenzene	110		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2349844

Project Number: 180327-08.01 **Report Date:** 09/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/01/23 13:19
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 02-06 Batch: WG1823621-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	0.22	J	ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	114		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2349844
Report Date: 09/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01 Batch: WG1823507-3 WG1823507-4								
Benzene	99		100		70-130	1		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Methyl tert butyl ether	86		94		70-130	9		20
p/m-Xylene	95		95		70-130	0		20
o-Xylene	95		95		70-130	0		20
Carbon disulfide	94		98		70-130	4		20
n-Butylbenzene	110		110		70-130	0		20
Isopropylbenzene	110		100		70-130	10		20
p-Isopropyltoluene	100		100		70-130	0		20
Naphthalene	92		96		70-130	4		20
n-Propylbenzene	110		100		70-130	10		20
1,3,5-Trimethylbenzene	100		100		70-130	0		20
1,2,4-Trimethylbenzene	110		100		70-130	10		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		96		70-130
Toluene-d8	107		106		70-130
4-Bromofluorobenzene	107		103		70-130
Dibromofluoromethane	96		96		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2349844
Report Date: 09/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 02-06 Batch: WG1823621-3 WG1823621-4								
Benzene	99		95		70-130	4		20
Toluene	96		93		70-130	3		20
Ethylbenzene	96		92		70-130	4		20
Methyl tert butyl ether	99		95		70-130	4		20
p/m-Xylene	105		100		70-130	5		20
o-Xylene	100		100		70-130	0		20
Carbon disulfide	110		100		70-130	10		20
n-Butylbenzene	78		74		70-130	5		20
Isopropylbenzene	86		83		70-130	4		20
p-Isopropyltoluene	87		85		70-130	2		20
Naphthalene	91		87		70-130	4		20
n-Propylbenzene	85		82		70-130	4		20
1,3,5-Trimethylbenzene	86		83		70-130	4		20
1,2,4-Trimethylbenzene	87		84		70-130	4		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	99		95		70-130
Toluene-d8	98		99		70-130
4-Bromofluorobenzene	79		81		70-130
Dibromofluoromethane	109		107		70-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2349844
Report Date: 09/12/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2349844-01A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-01B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-02A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-02B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-03A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-03B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-04A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-04B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-05A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-05B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-06A	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)
L2349844-06B	Vial HCl preserved	A	NA		21.3	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
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Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2349844
Project Number:	180327-08.01	**Report Date:**	09/12/23

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

8/28/23

L2349844

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date:	8/24/2023
Project Name:	Haverhill, Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave
Suite 300

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
1	HH-FS400-INT-20230822	8/22/2023	7:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
2	HH-FS400-INT-20230824	8/24/2023	6:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
3	HH-FS400-KNBT-1	8/24/2023	8:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
4	HH-FS400-KNBT-2	8/24/2023	10:00	Water	1	X	Expected high BTEX conc. (0.01-2 mg/L)
5	HH-FS400-KNBT-3	8/24/2023	14:00	Water	1	X	Expected high BTEX conc. (0.01-2 mg/L)
6	HH-Trip-Blank-20230822	8/22/2023	7[illegible]:30	Water	1	X	Expected to be ND for VOCs
7							
8							
9							
10							
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Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA	Received by: Fedex	
Signature/Print Name:	Date/Time: 8/24/2023 15:00	Signature/Print Name:	
Relinquished by:	Company: Fedex	Received by: 8/28/23 09:33	Alpha
Signature/Print Name:	Date/Time:	Signature/Print Name:	Dylan Snook

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original.

Page 1 of 1

ORIGIN ID:BNOA (503) 972-5001
MASAKAZU KANEMATSU
ANCHOR QEA
6720 SW MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

SHIP DATE: 24AUG23
ACTWGT: 20.00 LB
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TO **LIZ PORTA**
ALPHA ANALYTICAL INC.
320 FORBES BLVD
ATTN: LIZ PORTA
MANSFIELD MA 02048
(508) 844-4124
INV:
PO: MASA KANEMATSU

REF: 180327-08.01 TASK 05
DEPT: SHIPPING WATER SAMPLES

593J5/7584/9AE3

FedEx Express

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Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2349844
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1823507-5	**Lab File ID**	: V08230901A05
Instrument ID	: VOA108		
Matrix	: LIQUID	**Analysis Date**	: 09/01/23 09:02

Client Sample No.	Lab Sample ID	Analysis Date
WG1823507-3LCS	WG1823507-3	09/01/23 07:32
WG1823507-4LCSD	WG1823507-4	09/01/23 07:54
HH-FS400-INT-20230822	L2349844-01D	09/01/23 16:29

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2349844
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1823621-5	**Lab File ID**	: VQ230901A06
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 09/01/23 13:19

Client Sample No.	Lab Sample ID	Analysis Date
WG1823621-3LCS	WG1823621-3	09/01/23 11:25
WG1823621-4LCSD	WG1823621-4	09/01/23 11:48
HH-TRIP-BLANK-20230822	L2349844-06	09/01/23 15:13
HH-FS400-INT-20230824	L2349844-02D	09/01/23 15:36
HH-FS400-KNBT-1	L2349844-03D	09/01/23 15:59
HH-FS400-KNBT-2	L2349844-04D	09/01/23 16:21
HH-FS400-KNBT-3	L2349844-05D	09/01/23 16:44

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2349844
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA108	Calibration Date	: 09/01/23 07:32
Lab File ID	: V08230901A01	Init. Calib. Date(s)	: 08/23/23 08/23/23
Sample No	: WG1823507-2	Init. Calib. Times	: 18:22 22:05
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	102	0
Dichlorodifluoromethane	0.145	0.124	-	14.5	20	84	0
Chloromethane	0.178	0.184	-	-3.4	20	102	0
Vinyl chloride	0.304	0.326	-	-7.2	20	100	0
Bromomethane	0.287	0.31	-	-8	20	117	0
Chloroethane	0.332	0.325	-	2.1	20	99	0
Trichlorofluoromethane	0.615	0.586	-	4.7	20	94	0
Ethyl ether	0.214	0.193	-	9.8	20	90	0
1,1-Dichloroethene	0.201	0.194	-	3.5	20	100	0
Carbon disulfide	0.648	0.61	-	5.9	20	100	0
Freon-113	0.206	0.208	-	-1	20	101	0
Acrolein	0.022	0.02	-	9.1	20	99	0
Methylene chloride	0.237	0.227	-	4.2	20	100	0
Acetone	0.042	0.037	-	11.9	20	91	0
trans-1,2-Dichloroethene	0.248	0.234	-	5.6	20	100	0
Methyl acetate	0.105	0.097	-	7.6	20	99	0
Methyl tert-butyl ether	0.582	0.504	-	13.4	20	92	0
tert-Butyl alcohol	0.014	0.012	-	14.3	20	89	0
Diisopropyl ether	0.698	0.654	-	6.3	20	102	0
1,1-Dichloroethane	0.424	0.426	-	-0.5	20	104	0
Halothane	0.194	0.19	-	2.1	20	102	0
Acrylonitrile	0.046	0.045	-	2.2	20	95	0
Ethyl tert-butyl ether	0.691	0.622	-	10	20	98	0
Vinyl acetate	0.288	0.351	-	-21.9*	20	151	0
cis-1,2-Dichloroethene	0.286	0.274	-	4.2	20	100	0
2,2-Dichloropropane	0.353	0.371	-	-5.1	20	110	0
Bromochloromethane	0.139	0.125	-	10.1	20	96	0
Cyclohexane	0.347	0.337	-	2.9	20	101	0
Chloroform	0.455	0.45	-	1.1	20	102	0
Ethyl acetate	0.15	0.133	-	11.3	20	95	0
Carbon tetrachloride	0.342	0.337	-	1.5	20	98	0
Tetrahydrofuran	0.041	0.039	-	4.9	20	102	0
Dibromofluoromethane	0.318	0.307	-	3.5	20	100	0
1,1,1-Trichloroethane	0.393	0.382	-	2.8	20	98	0
2-Butanone	0.063	0.055	-	12.7	20	87	0
1,1-Dichloropropene	0.321	0.311	-	3.1	20	99	0
Benzene	0.962	0.952	-	1	20	103	0
tert-Amyl methyl ether	0.641	0.555	-	13.4	20	93	0
1,2-Dichloroethane-d4	0.313	0.3	-	4.2	20	100	0
1,2-Dichloroethane	0.314	0.294	-	6.4	20	98	0
Methyl cyclohexane	0.42	0.382	-	9	20	99	0
Trichloroethene	0.3	0.263	-	12.3	20	90	0
Dibromomethane	0.15	0.139	-	7.3	20	97	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2349844
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA108	Calibration Date	: 09/01/23 07:32
Lab File ID	: V08230901A01	Init. Calib. Date(s)	: 08/23/23 08/23/23
Sample No	: WG1823507-2	Init. Calib. Times	: 18:22 22:05
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.245	0.238	-	2.9	20	102	0
Bromodichloromethane	0.36	0.344	-	4.4	20	100	0
1,4-Dioxane	0.0016	0.00143*	-	10.6	20	92	0
cis-1,3-Dichloropropene	0.394	0.379	-	3.8	20	101	0
Chlorobenzene-d5	1	1	-	0	20	94	0
Toluene-d8	1.166	1.244	-	-6.7	20	98	0
Toluene	0.663	0.681	-	-2.7	20	99	0
4-Methyl-2-pentanone	0.055	0.051	-	7.3	20	88	0
Tetrachloroethene	0.299	0.301	-	-0.7	20	97	0
trans-1,3-Dichloropropene	0.35	0.354	-	-1.1	20	99	0
Ethyl methacrylate	0.23	0.208	-	9.6	20	92	0
1,1,2-Trichloroethane	0.174	0.176*	-	-1.1	20	98	0
Chlorodibromomethane	0.267	0.261	-	2.2	20	94	0
1,3-Dichloropropane	0.336	0.339	-	-0.9	20	96	0
1,2-Dibromoethane	0.206	0.206	-	0	20	95	0
2-Hexanone	0.096	0.087	-	9.4	20	86	0
Chlorobenzene	0.789	0.796	-	-0.9	20	99	0
Ethylbenzene	1.313	1.322	-	-0.7	20	99	0
1,1,1,2-Tetrachloroethane	0.296	0.298	-	-0.7	20	99	0
p/m Xylene	0.555	0.531	-	4.3	20	99	0
o Xylene	0.553	0.521	-	5.8	20	98	0
Styrene	20	17.216	-	13.9	20	99	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	91	0
Bromoform	0.32	0.285	-	10.9	20	92	0
Isopropylbenzene	2.222	2.407	-	-8.3	20	99	0
4-Bromofluorobenzene	0.706	0.753	-	-6.7	20	94	0
Bromobenzene	0.581	0.604	-	-4	20	96	0
n-Propylbenzene	2.647	2.867	-	-8.3	20	100	0
1,4-Dichlorobutane	0.52	0.532	-	-2.3	20	96	0
1,1,2,2-Tetrachloroethane	0.385	0.451	-	-17.1	20	109	0
4-Ethyltoluene	2.222	2.409	-	-8.4	20	100	0
2-Chlorotoluene	1.525	1.703	-	-11.7	20	103	0
1,3,5-Trimethylbenzene	1.975	2.086	-	-5.6	20	99	0
1,2,3-Trichloropropane	0.328	0.339	-	-3.4	20	97	0
trans-1,4-Dichloro-2-buten	0.103	0.111	-	-7.8	20	102	0
4-Chlorotoluene	1.589	1.726	-	-8.6	20	100	0
tert-Butylbenzene	1.655	1.762	-	-6.5	20	97	0
1,2,4-Trimethylbenzene	1.917	2.042	-	-6.5	20	99	0
sec-Butylbenzene	2.468	2.657	-	-7.7	20	98	0
p-Isopropyltoluene	2.169	2.273	-	-4.8	20	98	0
1,3-Dichlorobenzene	1.184	1.232	-	-4.1	20	98	0
1,4-Dichlorobenzene	1.2	1.229	-	-2.4	20	98	0
p-Diethylbenzene	1.324	1.367	-	-3.2	20	99	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2349844
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA108	Calibration Date	: 09/01/23 07:32
Lab File ID	: V08230901A01	Init. Calib. Date(s)	: 08/23/23 08/23/23
Sample No	: WG1823507-2	Init. Calib. Times	: 18:22 22:05
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
n-Butylbenzene	1.866	2.048	-	-9.8	20	100	0
1,2-Dichlorobenzene	1.093	1.131	-	-3.5	20	95	0
1,2,4,5-Tetramethylbenzene	2.054	2.001	-	2.6	20	94	0
1,2-Dibromo-3-chloropropan	0.065	0.062	-	4.6	20	87	0
1,3,5-Trichlorobenzene	0.882	0.875	-	0.8	20	95	0
Hexachlorobutadiene	0.349	0.35	-	-0.3	20	94	0
1,2,4-Trichlorobenzene	0.744	0.713	-	4.2	20	93	0
Naphthalene	1.331	1.222	-	8.2	20	87	0
1,2,3-Trichlorobenzene	0.644	0.606	-	5.9	20	91	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2349844
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/01/23 11:25
Lab File ID	: VQ230901A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1823621-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	54	0
Dichlorodifluoromethane	0.249	0.192	-	22.9*	20	39	0
Chloromethane	0.253	0.223	-	11.9	20	45	0
Vinyl chloride	0.242	0.234	-	3.3	20	50	0
Bromomethane	0.09	0.118	-	-31.1*	20	66	0
Chloroethane	0.127	0.137	-	-7.9	20	54	0
Trichlorofluoromethane	0.248	0.256	-	-3.2	20	51	0
Ethyl ether	0.102	0.109	-	-6.9	20	55	0
1,1-Dichloroethene	0.16	0.188	-	-17.5	20	58	0
Carbon disulfide	0.476	0.529	-	-11.1	20	56	0
Methylene chloride	0.194	0.205	-	-5.7	20	58	0
Acetone	10	9.463	-	5.4	20	49	0
trans-1,2-Dichloroethene	0.17	0.206	-	-21.2*	20	61	0
Methyl tert-butyl ether	0.515	0.511	-	0.8	20	52	0
Diisopropyl ether	0.653	0.586	-	10.3	20	47	0
1,1-Dichloroethane	0.387	0.385	-	0.5	20	50	0
Ethyl tert-butyl ether	0.639	0.538	-	15.8	20	44	0
cis-1,2-Dichloroethene	0.221	0.235	-	-6.3	20	54	0
2,2-Dichloropropane	0.328	0.278	-	15.2	20	44	0
Bromochloromethane	0.098	0.11	-	-12.2	20	57	0
Chloroform	0.346	0.341	-	1.4	20	50	0
Carbon tetrachloride	0.257	0.254	-	1.2	20	50	0
Tetrahydrofuran	10	9.035	-	9.6	20	52	0
Dibromofluoromethane	0.264	0.287	-	-8.7	20	59	0
1,1,1-Trichloroethane	0.302	0.294	-	2.6	20	50	0
2-Butanone	0.063	0.057	-	9.5	20	51	0
1,1-Dichloropropene	0.284	0.269	-	5.3	20	48	0
Benzene	0.837	0.827	-	1.2	20	51	0
tert-Amyl methyl ether	0.56	0.478	-	14.6	20	46	0
1,2-Dichloroethane-d4	0.306	0.302	-	1.3	20	54	0
1,2-Dichloroethane	0.265	0.227	-	14.3	20	45	0
Trichloroethene	0.223	0.21	-	5.8	20	49	0
Dibromomethane	0.114	0.11	-	3.5	20	51	0
1,2-Dichloropropane	0.219	0.208	-	5	20	49	0
Bromodichloromethane	0.278	0.256*	-	7.9	20	48	0
1,4-Dioxane	0.00129	0.00139*	-	-7.8	20	55	0
cis-1,3-Dichloropropene	0.346	0.312	-	9.8	20	47	0
Chlorobenzene-d5	1	1	-	0	20	57	0
Toluene-d8	1.298	1.278	-	1.5	20	57	0
Toluene	0.592	0.57	-	3.7	20	52	0
4-Methyl-2-pentanone	0.067	0.053	-	20.9*	20	46	0
Tetrachloroethene	0.237	0.258	-	-8.9	20	59	0
trans-1,3-Dichloropropene	0.357	0.296*	-	17.1	20	47	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2349844
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/01/23 11:25
Lab File ID	: VQ230901A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1823621-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.165	0.155*	-	6.1	20	52	0
Chlorodibromomethane	0.22	0.215	-	2.3	20	54	0
1,3-Dichloropropane	0.345	0.32	-	7.2	20	51	0
1,2-Dibromoethane	0.188	0.179*	-	4.8	20	54	0
2-Hexanone	0.104	0.085	-	18.3	20	47	0
Chlorobenzene	0.633	0.658	-	-3.9	20	56	0
Ethylbenzene	1.108	1.064	-	4	20	51	0
1,1,1,2-Tetrachloroethane	0.23	0.228	-	0.9	20	54	0
p/m Xylene	0.427	0.44	-	-3	20	54	0
o Xylene	0.416	0.427	-	-2.6	20	54	0
Styrene	0.688	0.734	-	-6.7	20	54	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	66	0
Bromoform	0.239	0.226	-	5.4	20	60	0
Isopropylbenzene	1.913	1.64	-	14.3	20	52	0
4-Bromofluorobenzene	0.923	0.731	-	20.8*	20	52	0
Bromobenzene	0.475	0.481	-	-1.3	20	62	0
n-Propylbenzene	2.25	1.915	-	14.9	20	50	0
1,1,2,2-Tetrachloroethane	0.412	0.361	-	12.4	20	54	0
2-Chlorotoluene	1.617	1.387	-	14.2	20	52	0
1,3,5-Trimethylbenzene	1.655	1.424	-	14	20	51	0
1,2,3-Trichloropropane	0.335	0.281	-	16.1	20	52	0
4-Chlorotoluene	1.476	1.258	-	14.8	20	51	0
tert-Butylbenzene	1.348	1.19	-	11.7	20	53	0
1,2,4-Trimethylbenzene	1.631	1.423	-	12.8	20	52	0
sec-Butylbenzene	1.923	1.673	-	13	20	52	0
p-Isopropyltoluene	1.68	1.465	-	12.8	20	52	0
1,3-Dichlorobenzene	0.9	0.917	-	-1.9	20	61	0
1,4-Dichlorobenzene	0.911	0.939	-	-3.1	20	62	0
n-Butylbenzene	10	7.812	-	21.9*	20	50	0
1,2-Dichlorobenzene	0.86	0.869	-	-1	20	60	0
1,2-Dibromo-3-chloropropan	0.065	0.058	-	10.8	20	57	0
Hexachlorobutadiene	10	9.473	-	5.3	20	66	0
1,2,4-Trichlorobenzene	10	9.329	-	6.7	20	61	0
Naphthalene	1.365	1.239	-	9.2	20	55	0
1,2,3-Trichlorobenzene	0.569	0.572	-	-0.5	20	62	0

* Value outside of QC limits.

ANALYTICAL REPORT

Lab Number:	L2350059
Client:	Anchor QEA, LLC 6720 S Macadam Ave Suite 300 Portland, OR 97219
ATTN:	Masakazu Kenematsu
Phone:	(503) 972-5001
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	09/13/23

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350059
Report Date: 09/13/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2350059-01	HH-FS400-KNBT-4	GROUNDWATER	HAVERHILL, MA	08/24/23 18:00	08/29/23
L2350059-02	HH-FS400-KNBT-5	GROUNDWATER	HAVERHILL, MA	08/25/23 06:00	08/29/23
L2350059-03	HH-FS400-KNBT-6	GROUNDWATER	HAVERHILL, MA	08/26/23 06:00	08/29/23
L2350059-04	HH-FS400-KNBT-7	GROUNDWATER	HAVERHILL, MA	08/27/23 06:00	08/29/23
L2350059-05	HH-FS400-IBT-2	GROUNDWATER	HAVERHILL, MA	08/25/23 15:30	08/29/23
L2350059-06	HH-FS400-IBT-3	GROUNDWATER	HAVERHILL, MA	08/25/23 15:35	08/29/23
L2350059-07	HH-FS400-IBT-4	GROUNDWATER	HAVERHILL, MA	08/25/23 15:40	08/29/23
L2350059-08	HH-FS400-IBT-5	GROUNDWATER	HAVERHILL, MA	08/25/23 15:45	08/29/23
L2350059-09	HH-FS400-IBT-6	GROUNDWATER	HAVERHILL, MA	08/25/23 15:50	08/29/23
L2350059-10	HH-FS400-IBT-7	GROUNDWATER	HAVERHILL, MA	08/25/23 15:55	08/29/23
L2350059-11	HH-FS400-IBT-8	GROUNDWATER	HAVERHILL, MA	08/25/23 16:00	08/29/23
L2350059-12	HH-FS400-IBT-9	GROUNDWATER	HAVERHILL, MA	08/25/23 16:05	08/29/23
L2350059-13	HH-FS400-IBT-10	GROUNDWATER	HAVERHILL, MA	08/25/23 16:10	08/29/23
L2350059-14	HH-FS400-IBT-11	GROUNDWATER	HAVERHILL, MA	08/25/23 16:15	08/29/23
L2350059-15	HH-FS400-IBT-12	GROUNDWATER	HAVERHILL, MA	08/25/23 16:20	08/29/23
L2350059-16	HH-FS400-IBT-13	GROUNDWATER	HAVERHILL, MA	08/25/23 16:25	08/29/23
L2350059-17	HH-FS400-IBT-14	GROUNDWATER	HAVERHILL, MA	08/25/23 16:30	08/29/23
L2350059-18	HH-FS400-IBT-15	GROUNDWATER	HAVERHILL, MA	08/25/23 16:35	08/29/23
L2350059-19	HH-FS400-IBT-16	GROUNDWATER	HAVERHILL, MA	08/25/23 16:40	08/29/23
L2350059-20	HH-FS400-IBT-17	GROUNDWATER	HAVERHILL, MA	08/25/23 16:45	08/29/23
L2350059-21	HH-FS400-IBT-18	GROUNDWATER	HAVERHILL, MA	08/25/23 16:50	08/29/23
L2350059-22	HH-FS400-CTRL	GROUNDWATER	HAVERHILL, MA	08/25/23 16:55	08/29/23
L2350059-23	HH-FS400-MB	GROUNDWATER	HAVERHILL, MA	08/25/23 17:00	08/29/23
L2350059-24	HH-FS400-IBT-19	GROUNDWATER	HAVERHILL, MA	08/27/23 06:10	08/29/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2350059-25	HH-FS400-CTRL-2	GROUNDWATER	HAVERHILL, MA	08/27/23 06:20	08/29/23
L2350059-26	HH-WPX-INT-20230828	GROUNDWATER	HAVERHILL, MA	08/28/23 06:00	08/29/23
L2350059-27	HH-WPX-KNBT-1	GROUNDWATER	HAVERHILL, MA	08/28/23 08:00	08/29/23
L2350059-28	HH-WPX-KNBT-2	GROUNDWATER	HAVERHILL, MA	08/28/23 10:00	08/29/23
L2350059-29	HH-WPX-KNBT-3	GROUNDWATER	HAVERHILL, MA	08/28/23 14:00	08/29/23
L2350059-30	HH-TRIP-BLANK-20230828	GROUNDWATER	HAVERHILL, MA	08/28/23 14:30	08/29/23

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Volatile Organics

MCP Related Narratives

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2350059-01D, -02D, -03D, -04D, -11D, -12D, -13D, -14D, -15D, -16D, -17D, -19D, -20D, -21D, -22D, -24D, -25D, -26D, -27D, -28D, and -29D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2350059-02, -04, and -11: The sample was re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

L2350059-02D, -04D, -05, -06, -07, -08, -09, -10, and -11D: The analysis was performed utilizing a compromised vial. The initial vial had suspected carryover, so the second vial that was initially used for screening was used for the sample analysis.

L2350059-08: Headspace was noted in the sample container utilized for analysis.

L2350059-01D, -02, -03D, -04, -11, and -12D: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene

In reference to question H:

L2350059-01D, -02, -03D, -04, -11, and -12D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromchloromethane

Case Narrative (continued)

(0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
L2350059-01D, -02, -03D, -04, -11, and -12D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350059-13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, -21D, -22D, -23, -24D, -25D, -26D, -27D, -28D, and -29D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.1792), bromodichloromethane (0.2584), 1,2-dibromoethane (0.1662), bromochloromethane (0.0878), 1,1,2-trichloroethane (0.1433), chlorodibromomethane (0.1803), 1,4-dioxane (0.0014), chloroform (0.2883), cis-dichloroethene (0.1826)
L2350059-13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, -21D, -22D, -23, -24D, -25D, -26D, -27D, -28D, and -29D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350059-06, -10, and -30: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.1792), bromodichloromethane (0.2584), 1,2-dibromoethane (0.1662), bromochloromethane (0.0878), 1,1,2-trichloroethane (0.1433), chlorodibromomethane (0.1803), 1,4-dioxane (0.0014), chloroform (0.2883), cis-dichloroethene (0.1826)
Average Response Factor: 1,2-dibromoethane, bromodichloromethane, 1,1,2-trichloroethane, 1,4-dioxane, bromochloromethane

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
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Case Narrative (continued)

L2350059-06, -10, and -30: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350059-05, -07, -08, and -09: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene
L2350059-05, -07, -08, and -09: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromchloromethane (0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
L2350059-05, -07, -08, and -09: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350059-02D, -04D, and -11D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0032)
Average Response Factor: 1,4-dioxane
Verification: dichlorodifluoromethane (160%), chloromethane (135%), vinyl chloride(133%), bromomethane (139%), trichlorofluoromethane (131%)
L2350059-02D, -04D, and -11D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
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Case Narrative (continued)

continuing calibration standard is included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 09/13/23

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2350059

Report Date: 09/13/23

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-01 D
Client ID: HH-FS400-KNBT-4
Sample Location: HAVERHILL, MA

Date Collected: 08/24/23 18:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 17:46
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	8500		ug/l	25	8.0	50
Toluene	4000		ug/l	50	10.	50
Ethylbenzene	4000		ug/l	50	8.4	50
Methyl tert butyl ether	17	J	ug/l	100	8.3	50
p/m-Xylene	6900		ug/l	100	17.	50
o-Xylene	3800		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	30	J	ug/l	100	9.4	50
p-Isopropyltoluene	ND		ug/l	100	9.4	50
Naphthalene	850		ug/l	100	11.	50
n-Propylbenzene	ND		ug/l	100	8.6	50
1,3,5-Trimethylbenzene	ND		ug/l	100	11.	50
1,2,4-Trimethylbenzene	34	J	ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	105		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	109		70-130
Dibromofluoromethane	96		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-02
Client ID: HH-FS400-KNBT-5
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 15:10
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	1500	E	ug/l	0.50	0.16	1
Toluene	1300	E	ug/l	1.0	0.20	1
Ethylbenzene	740	E	ug/l	1.0	0.17	1
Methyl tert butyl ether	19		ug/l	2.0	0.17	1
p/m-Xylene	1700	E	ug/l	2.0	0.33	1
o-Xylene	1400	E	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	0.32	J	ug/l	2.0	0.19	1
Isopropylbenzene	9.1		ug/l	2.0	0.19	1
p-Isopropyltoluene	0.78	J	ug/l	2.0	0.19	1
Naphthalene	320	E	ug/l	2.0	0.22	1
n-Propylbenzene	0.64	J	ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	6.4		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	25		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	105		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	112		70-130
Dibromofluoromethane	85		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-02 D
Client ID: HH-FS400-KNBT-5
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 14:45
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	8700		ug/l	25	8.0	50
Toluene	2400		ug/l	50	10.	50
Ethylbenzene	1600		ug/l	50	8.4	50
p/m-Xylene	2900		ug/l	100	17.	50
o-Xylene	1700		ug/l	50	20.	50
Naphthalene	220		ug/l	100	11.	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-03 D
Client ID: HH-FS400-KNBT-6
Sample Location: HAVERHILL, MA

Date Collected: 08/26/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 18:12
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	8000		ug/l	50	16.	100
Toluene	1500		ug/l	100	20.	100
Ethylbenzene	400		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	550		ug/l	200	33.	100
o-Xylene	330		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	34	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	120	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	110		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-04
Client ID: HH-FS400-KNBT-7
Sample Location: HAVERHILL, MA

Date Collected: 08/27/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 15:36
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	1400	E	ug/l	0.50	0.16	1
Toluene	1000	E	ug/l	1.0	0.20	1
Ethylbenzene	410	E	ug/l	1.0	0.17	1
Methyl tert butyl ether	21		ug/l	2.0	0.17	1
p/m-Xylene	580	E	ug/l	2.0	0.33	1
o-Xylene	340		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	0.84	J	ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	9.8		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	0.59	J	ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	114		70-130
Dibromofluoromethane	86		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-04 D
Client ID: HH-FS400-KNBT-7
Sample Location: HAVERHILL, MA

Date Collected: 08/27/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 14:02
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9200		ug/l	25	8.0	50
Toluene	1500		ug/l	50	10.	50
Ethylbenzene	390		ug/l	50	8.4	50
p/m-Xylene	520		ug/l	100	17.	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-05
Client ID: HH-FS400-IBT-2
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:30
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 13:30
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	2.6		ug/l	0.50	0.16	1
Toluene	0.33	J	ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.72	J	ug/l	2.0	0.33	1
o-Xylene	0.69	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	112		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-06
Client ID: HH-FS400-IBT-3
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:35
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 14:14
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	4.4		ug/l	0.50	0.16	1
Toluene	0.54	J	ug/l	1.0	0.20	1
Ethylbenzene	0.18	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-07
Client ID: HH-FS400-IBT-4
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:40
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 13:05
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	10		ug/l	0.50	0.16	1
Toluene	2.6		ug/l	1.0	0.20	1
Ethylbenzene	2.1		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	2.5		ug/l	2.0	0.33	1
o-Xylene	1.6		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	102		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-08
Client ID: HH-FS400-IBT-5
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:45
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 12:39
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	15		ug/l	0.50	0.16	1
Toluene	1.8		ug/l	1.0	0.20	1
Ethylbenzene	0.78	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	1.4	J	ug/l	2.0	0.33	1
o-Xylene	1.1		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.2	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-09
Client ID: HH-FS400-IBT-6
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:50
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 12:14
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	39		ug/l	0.50	0.16	1
Toluene	3.8		ug/l	1.0	0.20	1
Ethylbenzene	0.99	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	0.38	J	ug/l	2.0	0.17	1
p/m-Xylene	1.4	J	ug/l	2.0	0.33	1
o-Xylene	1.1		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	108		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-10
Client ID: HH-FS400-IBT-7
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 15:55
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 14:37
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	58		ug/l	0.50	0.16	1
Toluene	6.2		ug/l	1.0	0.20	1
Ethylbenzene	1.5		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.64	J	ug/l	2.0	0.17	1
p/m-Xylene	1.4	J	ug/l	2.0	0.33	1
o-Xylene	0.90	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	102		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-11
Client ID: HH-FS400-IBT-8
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 19:04
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	210	E	ug/l	0.50	0.16	1
Toluene	20		ug/l	1.0	0.20	1
Ethylbenzene	5.0		ug/l	1.0	0.17	1
Methyl tert butyl ether	1.7	J	ug/l	2.0	0.17	1
p/m-Xylene	4.8		ug/l	2.0	0.33	1
o-Xylene	3.0		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	110		70-130
Dibromofluoromethane	96		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID:	L2350059-11	D	Date Collected:	08/25/23 16:00
Client ID:	HH-FS400-IBT-8		Date Received:	08/29/23
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified

Sample Depth:

Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 13:19
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	210		ug/l	1.2	0.40	2.5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-12 D
Client ID: HH-FS400-IBT-9
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:05
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 18:38
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	320		ug/l	1.2	0.40	2.5
Toluene	29		ug/l	2.5	0.51	2.5
Ethylbenzene	6.7		ug/l	2.5	0.42	2.5
Methyl tert butyl ether	2.3	J	ug/l	5.0	0.42	2.5
p/m-Xylene	7.0		ug/l	5.0	0.83	2.5
o-Xylene	4.6		ug/l	2.5	0.98	2.5
Carbon disulfide	ND		ug/l	5.0	0.75	2.5
n-Butylbenzene	ND		ug/l	5.0	0.48	2.5
Isopropylbenzene	ND		ug/l	5.0	0.47	2.5
p-Isopropyltoluene	ND		ug/l	5.0	0.47	2.5
Naphthalene	2.8	J	ug/l	5.0	0.54	2.5
n-Propylbenzene	ND		ug/l	5.0	0.43	2.5
1,3,5-Trimethylbenzene	ND		ug/l	5.0	0.54	2.5
1,2,4-Trimethylbenzene	ND		ug/l	5.0	0.48	2.5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	109		70-130
Dibromofluoromethane	94		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-13 D
Client ID: HH-FS400-IBT-10
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:10
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 12:28
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	600		ug/l	2.5	0.80	5
Toluene	55		ug/l	5.0	1.0	5
Ethylbenzene	12		ug/l	5.0	0.84	5
Methyl tert butyl ether	4.0	J	ug/l	10	0.83	5
p/m-Xylene	13		ug/l	10	1.7	5
o-Xylene	7.4		ug/l	5.0	2.0	5
Carbon disulfide	ND		ug/l	10	1.5	5
n-Butylbenzene	1.2	J	ug/l	10	0.96	5
Isopropylbenzene	ND		ug/l	10	0.94	5
p-Isopropyltoluene	ND		ug/l	10	0.94	5
Naphthalene	ND		ug/l	10	1.1	5
n-Propylbenzene	ND		ug/l	10	0.86	5
1,3,5-Trimethylbenzene	ND		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	ND		ug/l	10	0.96	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-14 D
Client ID: HH-FS400-IBT-11
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:15
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 12:51
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	960		ug/l	5.0	1.6	10
Toluene	90		ug/l	10	2.0	10
Ethylbenzene	20		ug/l	10	1.7	10
Methyl tert butyl ether	5.4	J	ug/l	20	1.7	10
p/m-Xylene	21		ug/l	20	3.3	10
o-Xylene	11		ug/l	10	3.9	10
Carbon disulfide	ND		ug/l	20	3.0	10
n-Butylbenzene	2.3	J	ug/l	20	1.9	10
Isopropylbenzene	ND		ug/l	20	1.9	10
p-Isopropyltoluene	ND		ug/l	20	1.9	10
Naphthalene	ND		ug/l	20	2.2	10
n-Propylbenzene	ND		ug/l	20	1.7	10
1,3,5-Trimethylbenzene	ND		ug/l	20	2.2	10
1,2,4-Trimethylbenzene	ND		ug/l	20	1.9	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-15 D
Client ID: HH-FS400-IBT-12
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:20
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 13:14
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	1700		ug/l	10	3.2	20
Toluene	160		ug/l	20	4.1	20
Ethylbenzene	34		ug/l	20	3.3	20
Methyl tert butyl ether	8.3	J	ug/l	40	3.3	20
p/m-Xylene	38	J	ug/l	40	6.6	20
o-Xylene	21		ug/l	20	7.8	20
Carbon disulfide	ND		ug/l	40	6.0	20
n-Butylbenzene	ND		ug/l	40	3.8	20
Isopropylbenzene	ND		ug/l	40	3.7	20
p-Isopropyltoluene	ND		ug/l	40	3.8	20
Naphthalene	ND		ug/l	40	4.3	20
n-Propylbenzene	ND		ug/l	40	3.5	20
1,3,5-Trimethylbenzene	ND		ug/l	40	4.3	20
1,2,4-Trimethylbenzene	ND		ug/l	40	3.8	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-16 D
Client ID: HH-FS400-IBT-13
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:25
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 13:37
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	2800		ug/l	10	3.2	20
Toluene	290		ug/l	20	4.1	20
Ethylbenzene	59		ug/l	20	3.3	20
Methyl tert butyl ether	11	J	ug/l	40	3.3	20
p/m-Xylene	69		ug/l	40	6.6	20
o-Xylene	37		ug/l	20	7.8	20
Carbon disulfide	ND		ug/l	40	6.0	20
n-Butylbenzene	4.3	J	ug/l	40	3.8	20
Isopropylbenzene	ND		ug/l	40	3.7	20
p-Isopropyltoluene	ND		ug/l	40	3.8	20
Naphthalene	ND		ug/l	40	4.3	20
n-Propylbenzene	ND		ug/l	40	3.5	20
1,3,5-Trimethylbenzene	ND		ug/l	40	4.3	20
1,2,4-Trimethylbenzene	ND		ug/l	40	3.8	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-17 D
Client ID: HH-FS400-IBT-14
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:30
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 14:00
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	5100		ug/l	25	8.0	50
Toluene	620		ug/l	50	10.	50
Ethylbenzene	120		ug/l	50	8.4	50
Methyl tert butyl ether	14	J	ug/l	100	8.3	50
p/m-Xylene	150		ug/l	100	17.	50
o-Xylene	81		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	11	J	ug/l	100	9.6	50
Isopropylbenzene	ND		ug/l	100	9.4	50
p-Isopropyltoluene	ND		ug/l	100	9.4	50
Naphthalene	ND		ug/l	100	11.	50
n-Propylbenzene	ND		ug/l	100	8.6	50
1,3,5-Trimethylbenzene	ND		ug/l	100	11.	50
1,2,4-Trimethylbenzene	ND		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-18 D
Client ID: HH-FS400-IBT-15
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:35
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 14:23
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9500		ug/l	50	16.	100
Toluene	1600		ug/l	100	20.	100
Ethylbenzene	350		ug/l	100	17.	100
Methyl tert butyl ether	17	J	ug/l	200	17.	100
p/m-Xylene	480		ug/l	200	33.	100
o-Xylene	250		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	21	J	ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	ND		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	87		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-19 D
Client ID: HH-FS400-IBT-16
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:40
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 15:09
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18000		ug/l	100	32.	200
Toluene	7700		ug/l	200	41.	200
Ethylbenzene	2700		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	4100		ug/l	400	66.	200
o-Xylene	2100		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	54	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-20 D
Client ID: HH-FS400-IBT-17
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:45
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 15:33
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	22000		ug/l	100	32.	200
Toluene	14000		ug/l	200	41.	200
Ethylbenzene	8300		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	14000		ug/l	400	66.	200
o-Xylene	7200		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	240	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-21 D
Client ID: HH-FS400-IBT-18
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:50
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 15:56
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	22000		ug/l	100	32.	200
Toluene	17000		ug/l	200	41.	200
Ethylbenzene	14000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	25000		ug/l	400	66.	200
o-Xylene	13000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	940		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	43	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-22 D
Client ID: HH-FS400-CTRL
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 16:55
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 16:19
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	23000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	20000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	40000		ug/l	400	66.	200
o-Xylene	21000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	58	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	5300		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	160	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	84		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-23
Client ID: HH-FS400-MB
Sample Location: HAVERHILL, MA

Date Collected: 08/25/23 17:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 14:46
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	4.2		ug/l	0.50	0.16	1
Toluene	5.9		ug/l	1.0	0.20	1
Ethylbenzene	6.5		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	14		ug/l	2.0	0.33	1
o-Xylene	4.3		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.25	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	85		70-130
Dibromofluoromethane	111		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-24 D
Client ID: HH-FS400-IBT-19
Sample Location: HAVERHILL, MA

Date Collected: 08/27/23 06:10
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 16:42
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	20000		ug/l	100	32.	200
Toluene	18000		ug/l	200	41.	200
Ethylbenzene	19000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	38000		ug/l	400	66.	200
o-Xylene	20000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	64	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	5400		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	43	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	180	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-25 D
Client ID: HH-FS400-CTRL-2
Sample Location: HAVERHILL, MA

Date Collected: 08/27/23 06:20
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 17:05
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18000		ug/l	100	32.	200
Toluene	16000		ug/l	200	41.	200
Ethylbenzene	15000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	29000		ug/l	400	66.	200
o-Xylene	16000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	45	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	3300		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	120	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	84		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-26 D
Client ID: HH-WPX-INT-20230828
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 06:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 17:28
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	27000		ug/l	100	32.	200
Toluene	23000		ug/l	200	41.	200
Ethylbenzene	23000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	47000		ug/l	400	66.	200
o-Xylene	25000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	74	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	6100		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	47	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	200	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	82		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-27 D
Client ID: HH-WPX-KNBT-1
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 08:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 17:51
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	14000		ug/l	50	16.	100
Toluene	3500		ug/l	100	20.	100
Ethylbenzene	990		ug/l	100	17.	100
Methyl tert butyl ether	21	J	ug/l	200	17.	100
p/m-Xylene	1500		ug/l	200	33.	100
o-Xylene	770		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	60	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	104		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-28 D
Client ID: HH-WPX-KNBT-2
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 10:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 18:14
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	12000		ug/l	50	16.	100
Toluene	2800		ug/l	100	20.	100
Ethylbenzene	700		ug/l	100	17.	100
Methyl tert butyl ether	19	J	ug/l	200	17.	100
p/m-Xylene	1000		ug/l	200	33.	100
o-Xylene	530		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	24	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-29 D
Client ID: HH-WPX-KNBT-3
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 14:00
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/05/23 18:37
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	11000		ug/l	50	16.	100
Toluene	2700		ug/l	100	20.	100
Ethylbenzene	650		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	940		ug/l	200	33.	100
o-Xylene	500		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	ND		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	87		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

SAMPLE RESULTS

Lab ID: L2350059-30
Client ID: HH-TRIP-BLANK-20230828
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 14:30
Date Received: 08/29/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/07/23 13:50
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	93		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	104		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/05/23 10:36
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-04,11-12 Batch: WG1824636-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	1.1	J	ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	108		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/05/23 12:05
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13-29 Batch: WG1824667-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	0.32	J	ug/l	2.0	0.30
n-Butylbenzene	0.23	J	ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	109		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/07/23 11:08
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,10,30 Batch: WG1825105-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	0.21	J	ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	90		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/07/23 11:49
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 05,07-09 Batch: WG1825267-5					
Benzene	0.26	J	ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	0.61	J	ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	1.1	J	ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	102		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350059

Project Number: 180327-08.01 **Report Date:** 09/13/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/07/23 12:37
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 02,04,11 Batch: WG1825326-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	109		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350059
Report Date: 09/13/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-04,11-12 Batch: WG1824636-3 WG1824636-4								
Benzene	100		99		70-130	1		20
Toluene	100		99		70-130	1		20
Ethylbenzene	110		100		70-130	10		20
Methyl tert butyl ether	89		92		70-130	3		20
p/m-Xylene	95		90		70-130	5		20
o-Xylene	95		90		70-130	5		20
Carbon disulfide	100		99		70-130	1		20
n-Butylbenzene	100		98		70-130	2		20
Isopropylbenzene	100		99		70-130	1		20
p-Isopropyltoluene	100		98		70-130	2		20
Naphthalene	82		84		70-130	2		20
n-Propylbenzene	110		110		70-130	0		20
1,3,5-Trimethylbenzene	100		100		70-130	0		20
1,2,4-Trimethylbenzene	100		100		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	91		91		70-130
Toluene-d8	106		103		70-130
4-Bromofluorobenzene	107		107		70-130
Dibromofluoromethane	94		94		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350059
Report Date: 09/13/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13-29 Batch: WG1824667-3 WG1824667-4								
Benzene	94		100		70-130	6		20
Toluene	94		100		70-130	6		20
Ethylbenzene	91		99		70-130	8		20
Methyl tert butyl ether	87		96		70-130	10		20
p/m-Xylene	95		105		70-130	10		20
o-Xylene	95		105		70-130	10		20
Carbon disulfide	110		110		70-130	0		20
n-Butylbenzene	76		84		70-130	10		20
Isopropylbenzene	81		93		70-130	14		20
p-Isopropyltoluene	84		94		70-130	11		20
Naphthalene	84		95		70-130	12		20
n-Propylbenzene	81		92		70-130	13		20
1,3,5-Trimethylbenzene	81		93		70-130	14		20
1,2,4-Trimethylbenzene	81		93		70-130	14		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	97		97		70-130
Toluene-d8	99		100		70-130
4-Bromofluorobenzene	83		85		70-130
Dibromofluoromethane	105		104		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350059
Report Date: 09/13/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,10,30 Batch: WG1825105-3 WG1825105-4								
Benzene	96		91		70-130	5		20
Toluene	100		94		70-130	6		20
Ethylbenzene	97		91		70-130	6		20
Methyl tert butyl ether	84		85		70-130	1		20
p/m-Xylene	105		95		70-130	10		20
o-Xylene	100		95		70-130	5		20
Carbon disulfide	110		97		70-130	13		20
n-Butylbenzene	85		78		70-130	9		20
Isopropylbenzene	92		85		70-130	8		20
p-Isopropyltoluene	95		87		70-130	9		20
Naphthalene	83		84		70-130	1		20
n-Propylbenzene	92		84		70-130	9		20
1,3,5-Trimethylbenzene	92		85		70-130	8		20
1,2,4-Trimethylbenzene	92		86		70-130	7		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	88		86		70-130
Toluene-d8	100		98		70-130
4-Bromofluorobenzene	86		84		70-130
Dibromofluoromethane	100		100		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350059
Report Date: 09/13/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 05,07-09 Batch: WG1825267-3 WG1825267-4								
Benzene	120		110		70-130	9		20
Toluene	100		99		70-130	1		20
Ethylbenzene	100		100		70-130	0		20
Methyl tert butyl ether	98		100		70-130	2		20
p/m-Xylene	95		95		70-130	0		20
o-Xylene	95		90		70-130	5		20
Carbon disulfide	110		110		70-130	0		20
n-Butylbenzene	95		95		70-130	0		20
Isopropylbenzene	96		95		70-130	1		20
p-Isopropyltoluene	95		94		70-130	1		20
Naphthalene	87		90		70-130	3		20
n-Propylbenzene	100		100		70-130	0		20
1,3,5-Trimethylbenzene	98		97		70-130	1		20
1,2,4-Trimethylbenzene	96		97		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	94		94		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	105		104		70-130
Dibromofluoromethane	98		99		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350059
Report Date: 09/13/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 02,04,11 Batch: WG1825326-3 WG1825326-4								
Benzene	100		100		70-130	0		20
Toluene	100		97		70-130	3		20
Ethylbenzene	100		97		70-130	3		20
Methyl tert butyl ether	97		97		70-130	0		20
p/m-Xylene	100		95		70-130	5		20
o-Xylene	100		95		70-130	5		20
Carbon disulfide	110		98		70-130	12		20
n-Butylbenzene	100		94		70-130	6		20
Isopropylbenzene	96		90		70-130	6		20
p-Isopropyltoluene	96		91		70-130	5		20
Naphthalene	83		84		70-130	1		20
n-Propylbenzene	100		94		70-130	6		20
1,3,5-Trimethylbenzene	98		94		70-130	4		20
1,2,4-Trimethylbenzene	96		94		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	106		105		70-130
Toluene-d8	101		100		70-130
4-Bromofluorobenzene	91		94		70-130
Dibromofluoromethane	108		106		70-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350059
Report Date: 09/13/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2350059-01A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-01B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-02A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-02B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-03A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-03B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-04A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-04B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-05A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-05B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-06A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-06B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-07A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-07B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-08A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-08B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-09A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-09B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-10A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-10B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-11A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-11B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-12A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350059
Report Date: 09/13/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2350059-12B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-13A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-13B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-14A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-14B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-15A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-15B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-16A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-16B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-17A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-17B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-18A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-18B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-19A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-19B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-20A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-20B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-21A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-21B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-22A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-22B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-23A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-23B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-24A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-24B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-25A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-25B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-26A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350059
Report Date: 09/13/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2350059-26B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-27A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-27B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-28A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-28B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-29A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-29B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-30A	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)
L2350059-30B	Vial HCl preserved	A	NA		3.7	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350059
Project Number:	180327-08.01	**Report Date:**	09/13/23

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial_No:09132314:38

L2350059

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019

Date:	8/28/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave
Suite 300

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
1	HH-FS400-KNBT-4	8/24/2023	18:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
2	HH-FS400-KNBT-5	8/25/2023	6:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
3	HH-FS400-KNBT-6	8/26/2023	6:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
4	HH-FS400-KNBT-7	8/27/2023	6:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
5	HH-FS400-IBT-2	8/25/2023	15:30	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
6	HH-FS400-IBT-3	8/25/2023	15:35	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
7	HH-FS400-IBT-4	8/25/2023	15:40	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
8	HH-FS400-IBT-5	8/25/2023	15:45	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
9	HH-FS400-IBT-6	8/25/2023	15:50	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
10	HH-FS400-IBT-7	8/25/2023	15:55	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
11	HH-FS400-IBT-8	8/25/2023	16:00	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
12	HH-FS400-IBT-9	8/25/2023	16:05	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
13	HH-FS400-IBT-10	8/25/2023	16:10	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
14	HH-FS400-IBT-11	8/25/2023	16:15	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
15	HH-FS400-IBT-12	8/25/2023	16:20	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
16	HH-FS400-IBT-13	8/25/2023	16:25	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
17	HH-FS400-IBT-14	8/25/2023	16:30	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
18	HH-FS400-IBT-15	8/25/2023	16:35	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
19	HH-FS400-IBT-16	8/25/2023	16:40	Water	1	X	Expected high BTEX conc. (10-20 mg/L)
20	HH-FS400-IBT-17	8/25/2023	16:45	Water	1	X	Expected high BTEX conc. (10-20 mg/L)

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA
Signature/Print Name:	Date/Time: 8/28/2023 14:45
Relinquished by: Fedex	Company:
Signature/Print Name:	Date/Time:

Received by: Fedex	
Signature/Print Name:	
Received by:	
Signature/Print Name: AAL	8/29/23 10:18

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Page 1 of 1

AAL 8/29/23 17:00 Fedex AAL 8/29/23 2050

Fedex AAL 8/29/23 2135 8/29/23 2135

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	8/28/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave
Suite 300

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
21	HH-FS400-IBT-18	8/25/2023	16:50	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
22	HH-FS400-CTRL	8/25/2023	16:55	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
23	HH-FS400-MB	8/25/2023	17:00	Water	1	X	Expected to be ND for VOCs
24	HH-FS400-IBT-19	8/27/2023	6:10	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
25	HH-FS400-CTRL-2	8/27/2023	6:20	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
26	HH-WPX-INT-20230828	8/28/2023	6:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
27	HH-WPX-KNBT-1	8/28/2023	8:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
28	HH-WPX-KNBT-2	8/28/2023	10:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
29	HH-WPX-KNBT-3	8/28/2023	14:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
30	HH-Trip-Blank-20230828	8/28/2023	14:30	Water	1	X	Expected to be ND for VOCs
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA	Received by: FedEx	
Signature/Print Name:	Date/Time: 8/28/2023 14:45	Signature/Print Name:	
Relinquished by: FedEx	Company:	Received by:	
Signature/Print Name:	Date/Time:	Signature/Print Name: AAL 8/29/23 10:18	

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Page 1 of 1

UNC - AL 8/29/23 17:00
R Mendoza ASL 8/29/23 2135

R Mendoza ASL 8/29/23 2050
8/29/23 2135

ORIGIN ID:BNOA (503) 972-5001
MASAKAZU KANEMATSU
ANCHOR QEA
6720 SW MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

SHIP DATE: 28AUG23
ACTWGT: 30.00 LB
CAD: 109495568/INET4640
DIMS: 23x13x13 IN

BILL SENDER

TO **LIZ PORTA**
ALPHA ANALYTICAL INC.
320 FORBES BLVD
ATTN: LIZ PORTA
MANSFIELD MA 02048
(508) 844-4124
INV:
PO: MASA KANEMATSU

REF: 180327-08.01 TASK 05
DEPT: SHIPPING WATER SAMPLES

583J5/7984/GAE3

FedEx Express

TUE - 29 AUG 10:30A
PRIORITY OVERNIGHT

TRK# 0201 **7732 3268 3899**

XE PYMA

02048
MA-US **BOS**

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Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1824636-5	**Lab File ID**	: V16230905A05
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/05/23 10:36

Client Sample No.	Lab Sample ID	Analysis Date
WG1824636-3LCS	WG1824636-3	09/05/23 09:00
WG1824636-4LCSD	WG1824636-4	09/05/23 09:24
HH-FS400-KNBT-5	L2350059-02	09/05/23 15:10
HH-FS400-KNBT-7	L2350059-04	09/05/23 15:36
HH-FS400-KNBT-4	L2350059-01D	09/05/23 17:46
HH-FS400-KNBT-6	L2350059-03D	09/05/23 18:12
HH-FS400-IBT-9	L2350059-12D	09/05/23 18:38
HH-FS400-IBT-8	L2350059-11	09/05/23 19:04

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1824667-5	**Lab File ID**	: VQ230905B05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 09/05/23 12:05

Client Sample No.	Lab Sample ID	Analysis Date
WG1824667-3LCS	WG1824667-3	09/05/23 10:33
WG1824667-4LCSD	WG1824667-4	09/05/23 10:56
HH-FS400-IBT-10	L2350059-13D	09/05/23 12:28
HH-FS400-IBT-11	L2350059-14D	09/05/23 12:51
HH-FS400-IBT-12	L2350059-15D	09/05/23 13:14
HH-FS400-IBT-13	L2350059-16D	09/05/23 13:37
HH-FS400-IBT-14	L2350059-17D	09/05/23 14:00
HH-FS400-IBT-15	L2350059-18D	09/05/23 14:23
HH-FS400-MB	L2350059-23	09/05/23 14:46
HH-FS400-IBT-16	L2350059-19D	09/05/23 15:09
HH-FS400-IBT-17	L2350059-20D	09/05/23 15:33
HH-FS400-IBT-18	L2350059-21D	09/05/23 15:56
HH-FS400-CTRL	L2350059-22D	09/05/23 16:19
HH-FS400-IBT-19	L2350059-24D	09/05/23 16:42
HH-FS400-CTRL-2	L2350059-25D	09/05/23 17:05
HH-WPX-INT-20230828	L2350059-26D	09/05/23 17:28
HH-WPX-KNBT-1	L2350059-27D	09/05/23 17:51
HH-WPX-KNBT-2	L2350059-28D	09/05/23 18:14
HH-WPX-KNBT-3	L2350059-29D	09/05/23 18:37

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1825105-5	**Lab File ID**	: VQ230907A05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 09/07/23 11:08

Client Sample No.	Lab Sample ID	Analysis Date
WG1825105-3LCS	WG1825105-3	09/07/23 09:36
WG1825105-4LCSD	WG1825105-4	09/07/23 09:59
HH-TRIP-BLANK-20230828	L2350059-30	09/07/23 13:50
HH-FS400-IBT-3	L2350059-06	09/07/23 14:14
HH-FS400-IBT-7	L2350059-10	09/07/23 14:37

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1825267-5	**Lab File ID**	: V16230907A05
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/07/23 11:49

Client Sample No.	Lab Sample ID	Analysis Date
WG1825267-3LCS	WG1825267-3	09/07/23 10:11
WG1825267-4LCSD	WG1825267-4	09/07/23 10:35
HH-FS400-IBT-6	L2350059-09	09/07/23 12:14
HH-FS400-IBT-5	L2350059-08	09/07/23 12:39
HH-FS400-IBT-4	L2350059-07	09/07/23 13:05
HH-FS400-IBT-2	L2350059-05	09/07/23 13:30

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1825326-5	**Lab File ID**	: J230907A10
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 09/07/23 12:37

Client Sample No.	Lab Sample ID	Analysis Date
WG1825326-3LCS	WG1825326-3	09/07/23 10:29
WG1825326-4LCSD	WG1825326-4	09/07/23 11:11
HH-FS400-IBT-8	L2350059-11D	09/07/23 13:19
HH-FS400-KNBT-7	L2350059-04D	09/07/23 14:02
HH-FS400-KNBT-5	L2350059-02D	09/07/23 14:45

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/05/23 09:00
Lab File ID	: V16230905A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1824636-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	134	0
Dichlorodifluoromethane	0.307	0.316	-	-2.9	20	130	0
Chloromethane	0.269	0.304	-	-13	20	145	0
Vinyl chloride	0.374	0.303	-	19	20	101	0
Bromomethane	0.235	0.158	-	32.8*	20	95	0
Chloroethane	0.227	0.165	-	27.3*	20	90	0
Trichlorofluoromethane	0.335	0.324	-	3.3	20	125	0
Ethyl ether	0.087	0.08	-	8	20	128	0
1,1-Dichloroethene	0.186	0.184	-	1.1	20	131	0
Carbon disulfide	0.626	0.662	-	-5.8	20	138	0
Methylene chloride	0.213	0.217	-	-1.9	20	134	0
Acetone	10	10.133	-	-1.3	20	138	0
trans-1,2-Dichloroethene	0.201	0.196	-	2.5	20	132	0
Methyl tert-butyl ether	0.413	0.367	-	11.1	20	130	0
Diisopropyl ether	0.546	0.563	-	-3.1	20	144	0
1,1-Dichloroethane	0.414	0.429	-	-3.6	20	138	0
Ethyl tert-butyl ether	0.583	0.544	-	6.7	20	142	0
cis-1,2-Dichloroethene	0.22	0.213	-	3.2	20	133	0
2,2-Dichloropropane	0.303	0.323	-	-6.6	20	152	0
Bromochloromethane	0.096	0.09*	-	6.3	20	123	0
Chloroform	0.4	0.375	-	6.3	20	133	0
Carbon tetrachloride	0.298	0.302	-	-1.3	20	134	0
Tetrahydrofuran	10	9.302	-	7	20	126	0
Dibromofluoromethane	0.334	0.315	-	5.7	20	130	0
1,1,1-Trichloroethane	0.34	0.338	-	0.6	20	135	0
2-Butanone	10	8.72	-	12.8	20	136	0
1,1-Dichloropropene	0.288	0.278	-	3.5	20	131	0
Benzene	0.798	0.812	-	-1.8	20	135	0
tert-Amyl methyl ether	10	9.063	-	9.4	20	133	0
1,2-Dichloroethane-d4	0.41	0.373	-	9	20	132	0
1,2-Dichloroethane	0.289	0.276	-	4.5	20	131	0
Trichloroethene	0.248	0.222	-	10.5	20	123	0
Dibromomethane	0.126	0.111	-	11.9	20	123	0
1,2-Dichloropropane	0.226	0.23	-	-1.8	20	135	0
Bromodichloromethane	0.287	0.274*	-	4.5	20	132	0
1,4-Dioxane	0.00075	0.00063*	-	16	20	122	0
cis-1,3-Dichloropropene	10	9.003	-	10	20	135	0
Chlorobenzene-d5	1	1	-	0	20	128	0
Toluene-d8	1.289	1.36	-	-5.5	20	132	0
Toluene	0.574	0.601	-	-4.7	20	134	0
4-Methyl-2-pentanone	0.053	0.043	-	18.9	20	119	0
Tetrachloroethene	0.252	0.264	-	-4.8	20	133	0
trans-1,3-Dichloropropene	0.304	0.307	-	-1	20	131	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/05/23 09:00
Lab File ID	: V16230905A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1824636-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.158	0.151*	-	4.4	20	121	0
Chlorodibromomethane	0.219	0.209	-	4.6	20	126	0
1,3-Dichloropropane	0.316	0.305	-	3.5	20	124	0
1,2-Dibromoethane	0.177	0.166*	-	6.2	20	123	0
2-Hexanone	10	7.293	-	27.1*	20	105	0
Chlorobenzene	0.607	0.61	-	-0.5	20	130	0
Ethylbenzene	1.057	1.124	-	-6.3	20	135	0
1,1,1,2-Tetrachloroethane	0.226	0.225	-	0.4	20	131	0
p/m Xylene	20	19.392	-	3	20	133	0
o Xylene	20	18.932	-	5.3	20	130	0
Styrene	20	18.605	-	7	20	128	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	121	0
Bromoform	0.255	0.219	-	14.1	20	114	0
Isopropylbenzene	10	10.169	-	-1.7	20	133	0
4-Bromofluorobenzene	0.819	0.877	-	-7.1	20	130	0
Bromobenzene	0.424	0.43	-	-1.4	20	127	0
n-Propylbenzene	2.226	2.492	-	-11.9	20	132	0
1,1,2,2-Tetrachloroethane	0.393	0.371	-	5.6	20	120	0
2-Chlorotoluene	1.539	1.691	-	-9.9	20	132	0
1,3,5-Trimethylbenzene	1.624	1.696	-	-4.4	20	133	0
1,2,3-Trichloropropane	0.317	0.287	-	9.5	20	115	0
4-Chlorotoluene	1.332	1.461	-	-9.7	20	132	0
tert-Butylbenzene	1.324	1.359	-	-2.6	20	131	0
1,2,4-Trimethylbenzene	1.547	1.6	-	-3.4	20	130	0
sec-Butylbenzene	10	10.249	-	-2.5	20	141	0
p-Isopropyltoluene	10	10.073	-	-0.7	20	144	0
1,3-Dichlorobenzene	0.846	0.889	-	-5.1	20	127	0
1,4-Dichlorobenzene	0.85	0.853	-	-0.4	20	122	0
n-Butylbenzene	10	10.14	-	-1.4	20	129	0
1,2-Dichlorobenzene	0.762	0.76	-	0.3	20	121	0
1,2-Dibromo-3-chloropropan	0.054	0.043	-	20.4*	20	107	0
Hexachlorobutadiene	0.218	0.237	-	-8.7	20	138	0
1,2,4-Trichlorobenzene	10	9.114	-	8.9	20	129	0
Naphthalene	10	8.199	-	18	20	110	0
1,2,3-Trichlorobenzene	0.412	0.414	-	-0.5	20	122	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/05/23 10:33
Lab File ID	: VQ230905B01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1824667-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	58	0
Dichlorodifluoromethane	0.249	0.224	-	10	20	49	0
Chloromethane	0.253	0.234	-	7.5	20	50	0
Vinyl chloride	0.242	0.234	-	3.3	20	53	0
Bromomethane	0.09	0.117	-	-30*	20	70	0
Chloroethane	0.127	0.128	-	-0.8	20	54	-.01
Trichlorofluoromethane	0.248	0.245	-	1.2	20	52	0
Ethyl ether	0.102	0.092	-	9.8	20	49	0
1,1-Dichloroethene	0.16	0.177	-	-10.6	20	58	0
Carbon disulfide	0.476	0.513	-	-7.8	20	58	0
Freon-113	0.168	0.181	-	-7.7	20	56	0
Iodomethane	0.225	0.129	-	42.7*	20	34	0
Acrolein	10	12.394	-	-23.9*	20	72	0
Methylene chloride	0.194	0.186	-	4.1	20	56	0
Acetone	10	9.089	-	9.1	20	50	0
trans-1,2-Dichloroethene	0.17	0.188	-	-10.6	20	59	0
Methyl acetate	0.107	0.093	-	13.1	20	53	0
Methyl tert-butyl ether	0.515	0.45	-	12.6	20	49	0
tert-Butyl alcohol	0.012	0.012	-	0	20	63	0
Diisopropyl ether	0.653	0.585	-	10.4	20	49	0
1,1-Dichloroethane	0.387	0.353	-	8.8	20	49	0
Halothane	0.153	0.155	-	-1.3	20	54	0
Acrylonitrile	0.051	0.049	-	3.9	20	55	0
Ethyl tert-butyl ether	0.639	0.554	-	13.3	20	49	0
Vinyl acetate	0.329	0.303	-	7.9	20	61	0
cis-1,2-Dichloroethene	0.221	0.218	-	1.4	20	54	0
2,2-Dichloropropane	0.328	0.282	-	14	20	47	0
Bromochloromethane	0.098	0.1	-	-2	20	56	0
Cyclohexane	0.378	0.343	-	9.3	20	49	0
Chloroform	0.346	0.317	-	8.4	20	50	0
Ethyl acetate	0.142	0.126	-	11.3	20	54	0
Carbon tetrachloride	0.257	0.242	-	5.8	20	50	-.01
Tetrahydrofuran	10	8.494	-	15.1	20	52	0
Dibromofluoromethane	0.264	0.277	-	-4.9	20	60	0
1,1,1-Trichloroethane	0.302	0.279	-	7.6	20	50	0
2-Butanone	0.063	0.053	-	15.9	20	51	0
1,1-Dichloropropene	0.284	0.269	-	5.3	20	51	0
Benzene	0.837	0.785	-	6.2	20	51	0
tert-Amyl methyl ether	0.56	0.488	-	12.9	20	49	0
1,2-Dichloroethane-d4	0.306	0.297	-	2.9	20	56	0
1,2-Dichloroethane	0.265	0.217	-	18.1	20	46	0
Methyl cyclohexane	0.361	0.33	-	8.6	20	51	0
Trichloroethene	0.223	0.203	-	9	20	51	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/05/23 10:33
Lab File ID	: VQ230905B01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1824667-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Dibromomethane	0.114	0.104	-	8.8	20	52	0
1,2-Dichloropropane	0.219	0.194	-	11.4	20	48	0
2-Chloroethyl vinyl ether	0.122	0.094	-	23*	20	44	0
Bromodichloromethane	0.278	0.237*	-	14.7	20	47	0
1,4-Dioxane	0.00129	0.0013*	-	-0.8	20	55	0
cis-1,3-Dichloropropene	0.346	0.306	-	11.6	20	49	0
Chlorobenzene-d5	1	1	-	0	20	59	0
Toluene-d8	1.298	1.284	-	1.1	20	59	0
Toluene	0.592	0.554	-	6.4	20	52	0
4-Methyl-2-pentanone	0.067	0.053	-	20.9*	20	47	0
Tetrachloroethene	0.237	0.257	-	-8.4	20	61	0
trans-1,3-Dichloropropene	0.357	0.298*	-	16.5	20	48	0
Ethyl methacrylate	0.262	0.191	-	27.1*	20	41	0
1,1,2-Trichloroethane	0.165	0.146*	-	11.5	20	50	0
Chlorodibromomethane	0.22	0.201	-	8.6	20	52	0
1,3-Dichloropropane	0.345	0.302	-	12.5	20	50	0
1,2-Dibromoethane	0.188	0.175*	-	6.9	20	54	0
2-Hexanone	0.104	0.083	-	20.2*	20	47	0
Chlorobenzene	0.633	0.604	-	4.6	20	53	0
Ethylbenzene	1.108	1.011	-	8.8	20	50	0
1,1,1,2-Tetrachloroethane	0.23	0.211	-	8.3	20	51	0
p/m Xylene	0.427	0.412	-	3.5	20	52	0
o Xylene	0.416	0.392	-	5.8	20	51	0
Styrene	0.688	0.661	-	3.9	20	50	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	67	0
Bromoform	0.239	0.213	-	10.9	20	58	0
Isopropylbenzene	1.913	1.548	-	19.1	20	50	0
4-Bromofluorobenzene	0.923	0.766	-	17	20	56	0
Bromobenzene	0.475	0.429	-	9.7	20	56	0
n-Propylbenzene	2.25	1.828	-	18.8	20	49	0
1,4-Dichlorobutane	0.601	0.396	-	34.1*	20	42	0
1,1,2,2-Tetrachloroethane	0.412	0.32	-	22.3*	20	49	0
4-Ethyltoluene	1.914	1.592	-	16.8	20	51	0
2-Chlorotoluene	1.617	1.275	-	21.2*	20	49	0
1,3,5-Trimethylbenzene	1.655	1.339	-	19.1	20	49	0
1,2,3-Trichloropropane	0.335	0.255	-	23.9*	20	48	0
trans-1,4-Dichloro-2-buten	0.131	0.08	-	38.9*	20	39	0
4-Chlorotoluene	1.476	1.179	-	20.1*	20	49	0
tert-Butylbenzene	1.348	1.119	-	17	20	51	0
1,2,4-Trimethylbenzene	1.631	1.318	-	19.2	20	49	0
sec-Butylbenzene	1.923	1.59	-	17.3	20	50	0
p-Isopropyltoluene	1.68	1.409	-	16.1	20	51	0
1,3-Dichlorobenzene	0.9	0.825	-	8.3	20	56	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/05/23 10:33
Lab File ID	: VQ230905B01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1824667-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,4-Dichlorobenzene	0.911	0.834	-	8.5	20	56	0
p-Diethylbenzene	1.069	0.858	-	19.7	20	52	0
n-Butylbenzene	10	7.573	-	24.3*	20	49	0
1,2-Dichlorobenzene	0.86	0.776	-	9.8	20	55	0
1,2,4,5-Tetramethylbenzene	1.63	1.325	-	18.7	20	50	0
1,2-Dibromo-3-chloropropan	0.065	0.054	-	16.9	20	54	0
1,3,5-Trichlorobenzene	10	8.869	-	11.3	20	60	0
Hexachlorobutadiene	10	9.354	-	6.5	20	66	0
1,2,4-Trichlorobenzene	10	8.655	-	13.5	20	58	0
Naphthalene	1.365	1.144	-	16.2	20	52	0
1,2,3-Trichlorobenzene	0.569	0.528	-	7.2	20	58	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/07/23 09:36
Lab File ID	: VQ230907A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1825105-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	64	0
Dichlorodifluoromethane	0.249	0.217	-	12.9	20	52	0
Chloromethane	0.253	0.227	-	10.3	20	54	0
Vinyl chloride	0.242	0.231	-	4.5	20	58	0
Bromomethane	0.09	0.143	-	-58.9*	20	95	0
Chloroethane	0.127	0.132	-	-3.9	20	62	-.01
Trichlorofluoromethane	0.248	0.258	-	-4	20	61	0
Ethyl ether	0.102	0.09	-	11.8	20	54	0
1,1-Dichloroethene	0.16	0.178	-	-11.2	20	65	0
Carbon disulfide	0.476	0.517	-	-8.6	20	65	0
Methylene chloride	0.194	0.19	-	2.1	20	64	0
Acetone	10	8.192	-	18.1	20	51	0
trans-1,2-Dichloroethene	0.17	0.19	-	-11.8	20	67	0
Methyl tert-butyl ether	0.515	0.432	-	16.1	20	52	0
Diisopropyl ether	0.653	0.599	-	8.3	20	57	0
1,1-Dichloroethane	0.387	0.364	-	5.9	20	56	0
Ethyl tert-butyl ether	0.639	0.543	-	15	20	53	0
cis-1,2-Dichloroethene	0.221	0.216	-	2.3	20	59	0
2,2-Dichloropropane	0.328	0.296	-	9.8	20	55	0
Bromochloromethane	0.098	0.101	-	-3.1	20	62	0
Chloroform	0.346	0.326	-	5.8	20	57	0
Carbon tetrachloride	0.257	0.254	-	1.2	20	59	0
Tetrahydrofuran	10	7.224	-	27.8*	20	49	0
Dibromofluoromethane	0.264	0.263	-	0.4	20	64	0
1,1,1-Trichloroethane	0.302	0.288	-	4.6	20	58	0
2-Butanone	0.063	0.045	-	28.6*	20	48	0
1,1-Dichloropropene	0.284	0.263	-	7.4	20	55	0
Benzene	0.837	0.803	-	4.1	20	59	0
tert-Amyl methyl ether	0.56	0.466	-	16.8	20	53	0
1,2-Dichloroethane-d4	0.306	0.268	-	12.4	20	57	0
1,2-Dichloroethane	0.265	0.215	-	18.9	20	50	0
Trichloroethene	0.223	0.228	-	-2.2	20	64	0
Dibromomethane	0.114	0.099	-	13.2	20	55	0
1,2-Dichloropropane	0.219	0.198	-	9.6	20	55	0
Bromodichloromethane	0.278	0.242*	-	12.9	20	54	0
1,4-Dioxane	0.00129	0.00127*	-	1.6	20	60	0
cis-1,3-Dichloropropene	0.346	0.302	-	12.7	20	54	0
Chlorobenzene-d5	1	1	-	0	20	62	0
Toluene-d8	1.298	1.295	-	0.2	20	62	0
Toluene	0.592	0.596	-	-0.7	20	58	0
4-Methyl-2-pentanone	0.067	0.05	-	25.4*	20	46	0
Tetrachloroethene	0.237	0.277	-	-16.9	20	69	0
trans-1,3-Dichloropropene	0.357	0.306	-	14.3	20	52	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/07/23 09:36
Lab File ID	: VQ230907A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1825105-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.165	0.151*	-	8.5	20	55	0
Chlorodibromomethane	0.22	0.213	-	3.2	20	58	0
1,3-Dichloropropane	0.345	0.315	-	8.7	20	54	0
1,2-Dibromoethane	0.188	0.176*	-	6.4	20	57	0
2-Hexanone	0.104	0.075	-	27.9*	20	45	0
Chlorobenzene	0.633	0.649	-	-2.5	20	59	0
Ethylbenzene	1.108	1.08	-	2.5	20	56	0
1,1,1,2-Tetrachloroethane	0.23	0.234	-	-1.7	20	59	0
p/m Xylene	0.427	0.443	-	-3.7	20	59	0
o Xylene	0.416	0.424	-	-1.9	20	57	0
Styrene	0.688	0.707	-	-2.8	20	56	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	67	0
Bromoform	0.239	0.229	-	4.2	20	62	0
Isopropylbenzene	1.913	1.756	-	8.2	20	56	0
4-Bromofluorobenzene	0.923	0.794	-	14	20	58	0
Bromobenzene	0.475	0.481	-	-1.3	20	63	0
n-Propylbenzene	2.25	2.063	-	8.3	20	55	0
1,1,2,2-Tetrachloroethane	0.412	0.335	-	18.7	20	51	0
2-Chlorotoluene	1.617	1.445	-	10.6	20	55	0
1,3,5-Trimethylbenzene	1.655	1.53	-	7.6	20	56	0
1,2,3-Trichloropropane	0.335	0.263	-	21.5*	20	50	0
4-Chlorotoluene	1.476	1.321	-	10.5	20	55	0
tert-Butylbenzene	1.348	1.28	-	5	20	58	0
1,2,4-Trimethylbenzene	1.631	1.5	-	8	20	56	0
sec-Butylbenzene	1.923	1.84	-	4.3	20	58	0
p-Isopropyltoluene	1.68	1.601	-	4.7	20	57	0
1,3-Dichlorobenzene	0.9	0.931	-	-3.4	20	63	0
1,4-Dichlorobenzene	0.911	0.934	-	-2.5	20	62	0
n-Butylbenzene	10	8.482	-	15.2	20	55	0
1,2-Dichlorobenzene	0.86	0.869	-	-1	20	61	0
1,2-Dibromo-3-chloropropan	0.065	0.055	-	15.4	20	55	0
Hexachlorobutadiene	10	10.466	-	-4.7	20	74	0
1,2,4-Trichlorobenzene	10	9.452	-	5.5	20	63	0
Naphthalene	1.365	1.129	-	17.3	20	51	0
1,2,3-Trichlorobenzene	0.569	0.561	-	1.4	20	62	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/07/23 10:11
Lab File ID	: V16230907A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1825267-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	115	0
Dichlorodifluoromethane	0.307	0.324	-	-5.5	20	115	0
Chloromethane	0.269	0.308	-	-14.5	20	127	.01
Vinyl chloride	0.374	0.306	-	18.2	20	88	0
Bromomethane	0.235	0.176	-	25.1*	20	91	0
Chloroethane	0.227	0.164	-	27.8*	20	77	-.01
Trichlorofluoromethane	0.335	0.374	-	-11.6	20	124	0
Ethyl ether	0.087	0.085	-	2.3	20	117	0
1,1-Dichloroethene	0.186	0.197	-	-5.9	20	121	0
Carbon disulfide	0.626	0.7	-	-11.8	20	126	0
Freon-113	0.219	0.237	-	-8.2	20	122	0
Iodomethane	0.245	0.158	-	35.5*	20	79	0
Acrolein	0.023	0.026	-	-13	20	144	0
Methylene chloride	0.213	0.238	-	-11.7	20	126	0
Acetone	10	12.479	-	-24.8*	20	145	0
trans-1,2-Dichloroethene	0.201	0.21	-	-4.5	20	122	0
Methyl acetate	0.086	0.092	-	-7	20	139	0
Methyl tert-butyl ether	0.413	0.406	-	1.7	20	124	0
tert-Butyl alcohol	0.00872	0.01161	-	-33.1*	20	162	0
Diisopropyl ether	0.546	0.586	-	-7.3	20	129	0
1,1-Dichloroethane	0.414	0.456	-	-10.1	20	126	0
Halothane	0.157	0.17	-	-8.3	20	121	0
Acrylonitrile	10	10.336	-	-3.4	20	122	0
Ethyl tert-butyl ether	0.583	0.572	-	1.9	20	129	0
Vinyl acetate	10	10.704	-	-7	20	150	0
cis-1,2-Dichloroethene	0.22	0.227	-	-3.2	20	121	0
2,2-Dichloropropane	0.303	0.331	-	-9.2	20	134	0
Bromochloromethane	0.096	0.1	-	-4.2	20	118	0
Cyclohexane	0.406	0.427	-	-5.2	20	125	0
Chloroform	0.4	0.394	-	1.5	20	120	0
Ethyl acetate	0.119	0.118	-	0.8	20	123	0
Carbon tetrachloride	0.298	0.329	-	-10.4	20	126	0
Tetrahydrofuran	10	8.173	-	18.3	20	95	0
Dibromofluoromethane	0.334	0.326	-	2.4	20	116	0
1,1,1-Trichloroethane	0.34	0.364	-	-7.1	20	125	0
2-Butanone	10	10.224	-	-2.2	20	138	0
1,1-Dichloropropene	0.288	0.305	-	-5.9	20	123	0
Benzene	0.798	0.98	-	-22.8*	20	140	0
tert-Amyl methyl ether	10	9.755	-	2.4	20	125	0
1,2-Dichloroethane-d4	0.41	0.384	-	6.3	20	117	0
1,2-Dichloroethane	0.289	0.308	-	-6.6	20	126	0
Methyl cyclohexane	0.418	0.424	-	-1.4	20	122	0
Trichloroethene	0.248	0.256	-	-3.2	20	123	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/07/23 10:11
Lab File ID	: V16230907A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1825267-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Dibromomethane	0.126	0.126	-	0	20	121	0
1,2-Dichloropropane	0.226	0.246	-	-8.8	20	124	0
2-Chloroethyl vinyl ether	10	8.702	-	13	20	121	0
Bromodichloromethane	0.287	0.293*	-	-2.1	20	122	0
1,4-Dioxane	0.00075	0.00102*	-	-36*	20	170	0
cis-1,3-Dichloropropene	10	9.728	-	2.7	20	125	0
Chlorobenzene-d5	1	1	-	0	20	121	0
Toluene-d8	1.289	1.275	-	1.1	20	116	0
Toluene	0.574	0.592	-	-3.1	20	124	0
4-Methyl-2-pentanone	0.053	0.048	-	9.4	20	124	0
Tetrachloroethene	0.252	0.266	-	-5.6	20	126	0
trans-1,3-Dichloropropene	0.304	0.305	-	-0.3	20	123	0
Ethyl methacrylate	10	8.708	-	12.9	20	120	0
1,1,2-Trichloroethane	0.158	0.157*	-	0.6	20	118	0
Chlorodibromomethane	0.219	0.216	-	1.4	20	123	0
1,3-Dichloropropane	0.316	0.313	-	0.9	20	120	0
1,2-Dibromoethane	0.177	0.173*	-	2.3	20	120	0
2-Hexanone	10	8.457	-	15.4	20	118	0
Chlorobenzene	0.607	0.616	-	-1.5	20	124	0
Ethylbenzene	1.057	1.081	-	-2.3	20	123	0
1,1,1,2-Tetrachloroethane	0.226	0.229	-	-1.3	20	126	0
p/m Xylene	20	18.934	-	5.3	20	122	0
o Xylene	20	18.655	-	6.7	20	121	0
Styrene	20	18.462	-	7.7	20	119	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	118	0
Bromoform	0.255	0.231	-	9.4	20	118	0
Isopropylbenzene	10	9.646	-	3.5	20	123	0
4-Bromofluorobenzene	0.819	0.859	-	-4.9	20	125	0
Bromobenzene	0.424	0.427	-	-0.7	20	124	0
n-Propylbenzene	2.226	2.338	-	-5	20	122	0
1,4-Dichlorobutane	0.495	0.485	-	2	20	122	0
1,1,2,2-Tetrachloroethane	0.393	0.369	-	6.1	20	117	0
4-Ethyltoluene	1.896	1.855	-	2.2	20	121	0
2-Chlorotoluene	1.539	1.598	-	-3.8	20	122	0
1,3,5-Trimethylbenzene	1.624	1.586	-	2.3	20	122	0
1,2,3-Trichloropropane	0.317	0.29	-	8.5	20	114	0
trans-1,4-Dichloro-2-buten	0.112	0.098	-	12.5	20	115	0
4-Chlorotoluene	1.332	1.356	-	-1.8	20	121	0
tert-Butylbenzene	1.324	1.301	-	1.7	20	123	0
1,2,4-Trimethylbenzene	1.547	1.487	-	3.9	20	118	0
sec-Butylbenzene	10	9.977	-	0.2	20	135	0
p-Isopropyltoluene	10	9.479	-	5.2	20	132	0
1,3-Dichlorobenzene	0.846	0.848	-	-0.2	20	118	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350059
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Instrument ID	: VOA116	**Calibration Date**	: 09/07/23 10:11
Lab File ID	: V16230907A01	**Init. Calib. Date(s)**	: 08/25/23 08/25/23
Sample No	: WG1825267-2	**Init. Calib. Times**	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,4-Dichlorobenzene	0.85	0.839	-	1.3	20	118	0
p-Diethylbenzene	10	9.35	-	6.5	20	121	0
n-Butylbenzene	10	9.549	-	4.5	20	119	0
1,2-Dichlorobenzene	0.762	0.752	-	1.3	20	118	0
1,2,4,5-Tetramethylbenzene	10	8.737	-	12.6	20	120	0
1,2-Dibromo-3-chloropropan	0.054	0.045	-	16.7	20	110	0
1,3,5-Trichlorobenzene	0.584	0.612	-	-4.8	20	125	0
Hexachlorobutadiene	0.218	0.234	-	-7.3	20	133	0
1,2,4-Trichlorobenzene	10	9.323	-	6.8	20	129	0
Naphthalene	10	8.679	-	13.2	20	115	0
1,2,3-Trichlorobenzene	0.412	0.43	-	-4.4	20	125	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 09/07/23 10:29
Lab File ID	: J230907A04	Init. Calib. Date(s)	: 08/23/23 08/23/23
Sample No	: WG1825326-2	Init. Calib. Times	: 07:04 12:00
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	59	0
Dichlorodifluoromethane	0.292	0.218	-	25.3*	20	43	0
Chloromethane	0.322	0.238	-	26.1*	20	42	0
Vinyl chloride	0.351	0.477	-	-35.9*	20	76	0
Bromomethane	0.275	0.158	-	42.5*	20	34	0
Chloroethane	0.242	0.427	-	-76.4*	20	100	0
Trichlorofluoromethane	0.534	0.648	-	-21.3*	20	68	0
Ethyl ether	0.18	0.178	-	1.1	20	57	0
1,1-Dichloroethene	0.341	0.381	-	-11.7	20	65	0
Carbon disulfide	0.921	1.013	-	-10	20	60	0
Methylene chloride	0.395	0.413	-	-4.6	20	62	0
Acetone	10	9.99	-	0.1	20	62	0
trans-1,2-Dichloroethene	0.383	0.417	-	-8.9	20	61	0
Methyl tert-butyl ether	1.044	1.011	-	3.2	20	57	0
Diisopropyl ether	1.058	0.985	-	6.9	20	54	0
1,1-Dichloroethane	0.687	0.762	-	-10.9	20	61	0
Ethyl tert-butyl ether	1.057	0.962	-	9	20	55	0
cis-1,2-Dichloroethene	0.435	0.469	-	-7.8	20	61	0
2,2-Dichloropropane	0.643	0.689	-	-7.2	20	61	0
Bromochloromethane	0.206	0.204	-	1	20	56	0
Chloroform	0.731	0.79	-	-8.1	20	60	0
Carbon tetrachloride	0.58	0.626	-	-7.9	20	63	0
Tetrahydrofuran	0.114	0.099	-	13.2	20	52	0
Dibromofluoromethane	0.312	0.336	-	-7.7	20	63	0
1,1,1-Trichloroethane	0.659	0.707	-	-7.3	20	62	0
2-Butanone	0.13	0.123	-	5.4	20	54	0
1,1-Dichloropropene	0.523	0.563	-	-7.6	20	63	0
Benzene	1.55	1.619	-	-4.5	20	62	0
tert-Amyl methyl ether	1.024	0.954	-	6.8	20	55	0
1,2-Dichloroethane-d4	0.365	0.386	-	-5.8	20	61	0
1,2-Dichloroethane	0.504	0.547	-	-8.5	20	60	0
Trichloroethene	0.435	0.449	-	-3.2	20	60	0
Dibromomethane	0.248	0.258	-	-4	20	60	0
1,2-Dichloropropane	0.372	0.375	-	-0.8	20	59	0
Bromodichloromethane	0.545	0.575	-	-5.5	20	58	0
1,4-Dioxane	0.00344	0.00401*	-	-16.6	20	63	0
cis-1,3-Dichloropropene	0.619	0.595	-	3.9	20	55	0
Chlorobenzene-d5	1	1	-	0	20	61	0
Toluene-d8	1.174	1.18	-	-0.5	20	61	0
Toluene	0.997	1.005	-	-0.8	20	62	0
4-Methyl-2-pentanone	0.12	0.101	-	15.8	20	52	0
Tetrachloroethene	0.467	0.433	-	7.3	20	59	0
trans-1,3-Dichloropropene	0.61	0.53	-	13.1	20	55	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350059
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 09/07/23 10:29
Lab File ID	: J230907A04	Init. Calib. Date(s)	: 08/23/23 08/23/23
Sample No	: WG1825326-2	Init. Calib. Times	: 07:04 12:00
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.283	0.267	-	5.7	20	61	0
Chlorodibromomethane	0.423	0.367	-	13.2	20	56	0
1,3-Dichloropropane	0.551	0.521	-	5.4	20	60	0
1,2-Dibromoethane	0.356	0.312	-	12.4	20	56	0
2-Hexanone	0.244	0.192	-	21.3*	20	50	0
Chlorobenzene	1.122	1.096	-	2.3	20	60	0
Ethylbenzene	1.996	2.031	-	-1.8	20	61	0
1,1,1,2-Tetrachloroethane	0.41	0.366	-	10.7	20	56	0
p/m Xylene	0.809	0.813	-	-0.5	20	61	0
o Xylene	0.789	0.778	-	1.4	20	59	0
Styrene	1.295	1.324	-	-2.2	20	61	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	65	0
Bromoform	0.477	0.356	-	25.4*	20	51	0
Isopropylbenzene	3.44	3.289	-	4.4	20	62	0
4-Bromofluorobenzene	0.811	0.742	-	8.5	20	59	0
Bromobenzene	0.828	0.732	-	11.6	20	58	0
n-Propylbenzene	3.973	3.99	-	-0.4	20	63	0
1,1,2,2-Tetrachloroethane	0.685	0.658	-	3.9	20	64	0
2-Chlorotoluene	2.681	2.617	-	2.4	20	63	0
1,3,5-Trimethylbenzene	2.898	2.847	-	1.8	20	62	0
1,2,3-Trichloropropane	0.578	0.52	-	10	20	59	0
4-Chlorotoluene	2.446	2.335	-	4.5	20	61	0
tert-Butylbenzene	2.48	2.286	-	7.8	20	59	0
1,2,4-Trimethylbenzene	2.856	2.747	-	3.8	20	61	0
sec-Butylbenzene	3.69	3.705	-	-0.4	20	64	0
p-Isopropyltoluene	3.202	3.081	-	3.8	20	62	0
1,3-Dichlorobenzene	1.609	1.497	-	7	20	60	0
1,4-Dichlorobenzene	1.603	1.514	-	5.6	20	61	0
n-Butylbenzene	2.748	2.879	-	-4.8	20	66	0
1,2-Dichlorobenzene	1.511	1.392	-	7.9	20	59	0
1,2-Dibromo-3-chloropropan	0.141	0.108	-	23.4*	20	51	0
Hexachlorobutadiene	0.524	0.433	-	17.4	20	55	0
1,2,4-Trichlorobenzene	1.021	0.892	-	12.6	20	56	0
Naphthalene	2.617	2.164	-	17.3	20	54	0
1,2,3-Trichlorobenzene	0.95	0.79	-	16.8	20	54	0

*** Value outside of QC limits.**

ANALYTICAL REPORT

Lab Number:	L2350948
Client:	Anchor QEA, LLC 6720 S Macadam Ave Suite 300 Portland, OR 97219
ATTN:	Masakazu Kenematsu
Phone:	(503) 972-5001
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	09/15/23

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350948
Report Date: 09/15/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2350948-01	HH-WPX-KNBT-4	GROUNDWATER	HAVERHILL, MA	08/28/23 18:00	09/01/23
L2350948-02	HH-WPX-KNBT-5	GROUNDWATER	HAVERHILL, MA	08/29/23 06:00	09/01/23
L2350948-03	HH-WPX-KNBT-6	GROUNDWATER	HAVERHILL, MA	08/30/23 06:00	09/01/23
L2350948-04	HH-WPX-KNBT-7	GROUNDWATER	HAVERHILL, MA	08/31/23 06:00	09/01/23
L2350948-05	HH-WPX-IBT-1	GROUNDWATER	HAVERHILL, MA	08/31/23 07:00	09/01/23
L2350948-06	HH-WPX-IBT-2	GROUNDWATER	HAVERHILL, MA	08/31/23 07:10	09/01/23
L2350948-07	HH-WPX-IBT-3	GROUNDWATER	HAVERHILL, MA	08/31/23 07:20	09/01/23
L2350948-08	HH-WPX-IBT-4	GROUNDWATER	HAVERHILL, MA	08/31/23 07:30	09/01/23
L2350948-09	HH-WPX-IBT-5	GROUNDWATER	HAVERHILL, MA	08/31/23 07:40	09/01/23
L2350948-10	HH-WPX-IBT-6	GROUNDWATER	HAVERHILL, MA	08/31/23 07:50	09/01/23
L2350948-11	HH-WPX-IBT-7	GROUNDWATER	HAVERHILL, MA	08/31/23 08:00	09/01/23
L2350948-12	HH-WPX-IBT-8	GROUNDWATER	HAVERHILL, MA	08/31/23 08:10	09/01/23
L2350948-13	HH-WPX-IBT-9	GROUNDWATER	HAVERHILL, MA	08/31/23 08:20	09/01/23
L2350948-14	HH-WPX-IBT-10	GROUNDWATER	HAVERHILL, MA	08/31/23 08:30	09/01/23
L2350948-15	HH-WPX-IBT-11	GROUNDWATER	HAVERHILL, MA	08/31/23 08:40	09/01/23
L2350948-16	HH-WPX-IBT-12	GROUNDWATER	HAVERHILL, MA	08/31/23 08:50	09/01/23
L2350948-17	HH-WPX-IBT-13	GROUNDWATER	HAVERHILL, MA	08/31/23 09:00	09/01/23
L2350948-18	HH-WPX-IBT-14	GROUNDWATER	HAVERHILL, MA	08/31/23 09:10	09/01/23
L2350948-19	HH-WPX-IBT-15	GROUNDWATER	HAVERHILL, MA	08/31/23 09:20	09/01/23
L2350948-20	HH-WPX-IBT-16	GROUNDWATER	HAVERHILL, MA	08/31/23 09:30	09/01/23
L2350948-21	HH-WPX-IBT-17	GROUNDWATER	HAVERHILL, MA	08/31/23 09:40	09/01/23
L2350948-22	HH-WPX-IBT-18	GROUNDWATER	HAVERHILL, MA	08/31/23 09:50	09/01/23
L2350948-23	HH-WPX-CTRL	GROUNDWATER	HAVERHILL, MA	08/31/23 10:00	09/01/23
L2350948-24	HH-WPX-MB	GROUNDWATER	HAVERHILL, MA	08/31/23 10:10	09/01/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2350948-25	HH-WPX-TRIP-BLANK	GROUNDWATER	HAVERHILL, MA	08/31/23 15:20	09/01/23

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	NO
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

The samples were received at the laboratory above the required temperature range. The samples were transported via Express Ship in a cooler with ice. All requested analyses were performed.

MCP Related Narratives

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

Volatile Organics

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2350948-01D, -02D, -03D, -04D, -12D, -13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, and -21D:

The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2350948-22D and -23D: The sample has elevated detection limits due to the dilution required by the sample matrix (foam).

In reference to question H:

L2350948-10, -11, -22D, -23D, and -25: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.1792), bromodichloromethane (0.2584), 1,2-dibromoethane (0.1662), bromochloromethane (0.0878), 1,1,2-trichloroethane (0.1433), chlorodibromomethane (0.1803), 1,4-dioxane (0.0014), chloroform (0.2883), cis-dichloroethene (0.1826)

Average Response Factor: 1,2-dibromoethane, bromodichloromethane, 1,1,2-trichloroethane, 1,4-dioxane,

Case Narrative (continued)

bromochloromethane
Verification: NONE
L2350948-10, -11, -22D, -23D, and -25: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350948-04D, -05, -06, -07, -08, -09, -12D, -13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, and -21D: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene
L2350948-04D, -05, -06, -07, -08, -09, -12D, -13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, and -21D: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromochloromethane (0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
Verification: NONE
L2350948-04D, -05, -06, -07, -08, -09, -12D, -13D, -14D, -15D, -16D, -17D, -18D, -19D, -20D, and -21D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350948-01D, -02D, and -03D: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene
L2350948-01D, -02D, and -03D: Initial Calibration did not meet:

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

Case Narrative (continued)

Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromochloromethane (0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
Verification: NONE
L2350948-01D, -02D, and -03D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2350948-24: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,2-dichloropropane (0.1792), bromodichloromethane (0.2584), 1,2-dibromoethane (0.1662), bromochloromethane (0.0878), 1,1,2-trichloroethane (0.1433), chlorodibromomethane (0.1803), 1,4-dioxane (0.0014), chloroform (0.2883), cis-1,2-dichloroethene (0.1826)
Average Response Factor: 1,2-dibromoethane, bromodichloromethane, 1,1,2-trichloroethane, 1,4-dioxane, bromochloromethane
Verification: NONE
L2350948-24: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 09/15/23

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2350948

Report Date: 09/15/23

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-01 D
Client ID: HH-WPX-KNBT-4
Sample Location: HAVERHILL, MA

Date Collected: 08/28/23 18:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/08/23 17:06
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18000		ug/l	100	32.	200
Toluene	3900		ug/l	200	41.	200
Ethylbenzene	860		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	1200		ug/l	400	66.	200
o-Xylene	620		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	220	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-02 D
Client ID: HH-WPX-KNBT-5
Sample Location: HAVERHILL, MA

Date Collected: 08/29/23 06:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/08/23 17:31
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	19000		ug/l	50	16.	100
Toluene	4200		ug/l	100	20.	100
Ethylbenzene	950		ug/l	100	17.	100
Methyl tert butyl ether	22	J	ug/l	200	17.	100
p/m-Xylene	1200		ug/l	200	33.	100
o-Xylene	610		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	110	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	109		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-03 D
Client ID: HH-WPX-KNBT-6
Sample Location: HAVERHILL, MA

Date Collected: 08/30/23 06:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/08/23 17:55
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	20000		ug/l	120	40.	250
Toluene	4300		ug/l	250	51.	250
Ethylbenzene	950		ug/l	250	42.	250
Methyl tert butyl ether	ND		ug/l	500	42.	250
p/m-Xylene	1300		ug/l	500	83.	250
o-Xylene	710		ug/l	250	98.	250
Carbon disulfide	ND		ug/l	500	75.	250
n-Butylbenzene	ND		ug/l	500	48.	250
Isopropylbenzene	ND		ug/l	500	47.	250
p-Isopropyltoluene	ND		ug/l	500	47.	250
Naphthalene	270	J	ug/l	500	54.	250
n-Propylbenzene	ND		ug/l	500	43.	250
1,3,5-Trimethylbenzene	ND		ug/l	500	54.	250
1,2,4-Trimethylbenzene	ND		ug/l	500	48.	250

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	108		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-04 D
Client ID: HH-WPX-KNBT-7
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 06:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 19:34
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	17000		ug/l	50	16.	100
Toluene	3600		ug/l	100	20.	100
Ethylbenzene	830		ug/l	100	17.	100
Methyl tert butyl ether	19	J	ug/l	200	17.	100
p/m-Xylene	1100		ug/l	200	33.	100
o-Xylene	560		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	34	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	110	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	96		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-05
Client ID: HH-WPX-IBT-1
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 17:33
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	5.9		ug/l	0.50	0.16	1
Toluene	0.32	J	ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.70	J	ug/l	2.0	0.33	1
o-Xylene	0.66	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	108		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-06
Client ID: HH-WPX-IBT-2
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:10
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 17:57
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9.3		ug/l	0.50	0.16	1
Toluene	0.50	J	ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.75	J	ug/l	2.0	0.33	1
o-Xylene	0.68	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-07
Client ID: HH-WPX-IBT-3
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:20
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 18:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	19		ug/l	0.50	0.16	1
Toluene	1.0		ug/l	1.0	0.20	1
Ethylbenzene	0.23	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.83	J	ug/l	2.0	0.33	1
o-Xylene	0.71	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	107		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-08
Client ID: HH-WPX-IBT-4
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:30
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 18:46
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	48		ug/l	0.50	0.16	1
Toluene	2.2		ug/l	1.0	0.20	1
Ethylbenzene	0.41	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	0.32	J	ug/l	2.0	0.17	1
p/m-Xylene	0.95	J	ug/l	2.0	0.33	1
o-Xylene	0.80	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	102		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-09
Client ID: HH-WPX-IBT-5
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:40
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 19:10
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	86		ug/l	0.50	0.16	1
Toluene	3.8		ug/l	1.0	0.20	1
Ethylbenzene	0.61	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	0.49	J	ug/l	2.0	0.17	1
p/m-Xylene	1.1	J	ug/l	2.0	0.33	1
o-Xylene	0.87	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	102		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-10
Client ID: HH-WPX-IBT-6
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 07:50
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 18:15
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	94		ug/l	0.50	0.16	1
Toluene	5.4		ug/l	1.0	0.20	1
Ethylbenzene	0.98	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	0.57	J	ug/l	2.0	0.17	1
p/m-Xylene	1.0	J	ug/l	2.0	0.33	1
o-Xylene	0.58	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	87		70-130
Dibromofluoromethane	102		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-11
Client ID: HH-WPX-IBT-7
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 18:38
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	140		ug/l	0.50	0.16	1
Toluene	7.8		ug/l	1.0	0.20	1
Ethylbenzene	1.2		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.93	J	ug/l	2.0	0.17	1
p/m-Xylene	1.2	J	ug/l	2.0	0.33	1
o-Xylene	0.68	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-12 D
Client ID: HH-WPX-IBT-8
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:10
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 19:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	260		ug/l	1.0	0.32	2
Toluene	13		ug/l	2.0	0.41	2
Ethylbenzene	2.0		ug/l	2.0	0.33	2
Methyl tert butyl ether	1.5	J	ug/l	4.0	0.33	2
p/m-Xylene	2.7	J	ug/l	4.0	0.66	2
o-Xylene	2.1		ug/l	2.0	0.78	2
Carbon disulfide	ND		ug/l	4.0	0.60	2
n-Butylbenzene	ND		ug/l	4.0	0.38	2
Isopropylbenzene	ND		ug/l	4.0	0.37	2
p-Isopropyltoluene	ND		ug/l	4.0	0.38	2
Naphthalene	ND		ug/l	4.0	0.43	2
n-Propylbenzene	ND		ug/l	4.0	0.35	2
1,3,5-Trimethylbenzene	ND		ug/l	4.0	0.43	2
1,2,4-Trimethylbenzene	ND		ug/l	4.0	0.38	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-13 D
Client ID: HH-WPX-IBT-9
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:20
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 20:22
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	420		ug/l	1.2	0.40	2.5
Toluene	22		ug/l	2.5	0.51	2.5
Ethylbenzene	3.6		ug/l	2.5	0.42	2.5
Methyl tert butyl ether	2.4	J	ug/l	5.0	0.42	2.5
p/m-Xylene	4.3	J	ug/l	5.0	0.83	2.5
o-Xylene	3.1		ug/l	2.5	0.98	2.5
Carbon disulfide	ND		ug/l	5.0	0.75	2.5
n-Butylbenzene	ND		ug/l	5.0	0.48	2.5
Isopropylbenzene	ND		ug/l	5.0	0.47	2.5
p-Isopropyltoluene	ND		ug/l	5.0	0.47	2.5
Naphthalene	ND		ug/l	5.0	0.54	2.5
n-Propylbenzene	ND		ug/l	5.0	0.43	2.5
1,3,5-Trimethylbenzene	ND		ug/l	5.0	0.54	2.5
1,2,4-Trimethylbenzene	ND		ug/l	5.0	0.48	2.5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-14 D
Client ID: HH-WPX-IBT-10
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:30
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 20:46
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	660		ug/l	2.0	0.64	4
Toluene	38		ug/l	4.0	0.81	4
Ethylbenzene	5.8		ug/l	4.0	0.67	4
Methyl tert butyl ether	3.2	J	ug/l	8.0	0.66	4
p/m-Xylene	7.1	J	ug/l	8.0	1.3	4
o-Xylene	4.9		ug/l	4.0	1.6	4
Carbon disulfide	ND		ug/l	8.0	1.2	4
n-Butylbenzene	ND		ug/l	8.0	0.77	4
Isopropylbenzene	ND		ug/l	8.0	0.75	4
p-Isopropyltoluene	ND		ug/l	8.0	0.75	4
Naphthalene	ND		ug/l	8.0	0.86	4
n-Propylbenzene	ND		ug/l	8.0	0.69	4
1,3,5-Trimethylbenzene	ND		ug/l	8.0	0.87	4
1,2,4-Trimethylbenzene	ND		ug/l	8.0	0.76	4

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	97		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-15 D
Client ID: HH-WPX-IBT-11
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:40
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 21:10
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	1400		ug/l	5.0	1.6	10
Toluene	93		ug/l	10	2.0	10
Ethylbenzene	14		ug/l	10	1.7	10
Methyl tert butyl ether	6.1	J	ug/l	20	1.7	10
p/m-Xylene	18	J	ug/l	20	3.3	10
o-Xylene	12		ug/l	10	3.9	10
Carbon disulfide	ND		ug/l	20	3.0	10
n-Butylbenzene	ND		ug/l	20	1.9	10
Isopropylbenzene	ND		ug/l	20	1.9	10
p-Isopropyltoluene	ND		ug/l	20	1.9	10
Naphthalene	ND		ug/l	20	2.2	10
n-Propylbenzene	ND		ug/l	20	1.7	10
1,3,5-Trimethylbenzene	ND		ug/l	20	2.2	10
1,2,4-Trimethylbenzene	ND		ug/l	20	1.9	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-16 D
Client ID: HH-WPX-IBT-12
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 08:50
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 21:34
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	6000		ug/l	25	8.0	50
Toluene	610		ug/l	50	10.	50
Ethylbenzene	100		ug/l	50	8.4	50
Methyl tert butyl ether	15	J	ug/l	100	8.3	50
p/m-Xylene	130		ug/l	100	17.	50
o-Xylene	81		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	ND		ug/l	100	9.4	50
p-Isopropyltoluene	ND		ug/l	100	9.4	50
Naphthalene	ND		ug/l	100	11.	50
n-Propylbenzene	ND		ug/l	100	8.6	50
1,3,5-Trimethylbenzene	ND		ug/l	100	11.	50
1,2,4-Trimethylbenzene	ND		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	92		70-130
4-Bromofluorobenzene	105		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-17 D
Client ID: HH-WPX-IBT-13
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 21:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	15000		ug/l	50	16.	100
Toluene	3100		ug/l	100	20.	100
Ethylbenzene	710		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	940		ug/l	200	33.	100
o-Xylene	500		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	110	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	90		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-18 D
Client ID: HH-WPX-IBT-14
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:10
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 22:22
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18000		ug/l	100	32.	200
Toluene	5400		ug/l	200	41.	200
Ethylbenzene	1600		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	2200		ug/l	400	66.	200
o-Xylene	1100		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	230	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	90		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-19 D
Client ID: HH-WPX-IBT-15
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:20
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 22:46
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	22000		ug/l	100	32.	200
Toluene	9800		ug/l	200	41.	200
Ethylbenzene	4000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	5800		ug/l	400	66.	200
o-Xylene	3000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	ND		ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	280	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	90		70-130
4-Bromofluorobenzene	110		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-20 D
Client ID: HH-WPX-IBT-16
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:30
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 23:10
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	26000		ug/l	100	32.	200
Toluene	15000		ug/l	200	41.	200
Ethylbenzene	9300		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	14000		ug/l	400	66.	200
o-Xylene	7300		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	79	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	440		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-21 D
Client ID: HH-WPX-IBT-17
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:40
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 23:34
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	28000		ug/l	100	32.	200
Toluene	19000		ug/l	200	41.	200
Ethylbenzene	16000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	27000		ug/l	400	66.	200
o-Xylene	14000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	93	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	1200		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-22 D
Client ID: HH-WPX-IBT-18
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 09:50
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 19:01
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	23000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	19000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	38000		ug/l	400	66.	200
o-Xylene	20000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	51	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	2800		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	110	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	88		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-23 D
Client ID: HH-WPX-CTRL
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 10:00
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 19:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	20000		ug/l	100	32.	200
Toluene	18000		ug/l	200	41.	200
Ethylbenzene	18000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	37000		ug/l	400	66.	200
o-Xylene	20000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	59	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	5600		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	170	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	87		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-24
Client ID: HH-WPX-MB
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 10:10
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/13/23 08:37
Analyst: TMS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	2.7		ug/l	0.50	0.16	1
Toluene	4.1		ug/l	1.0	0.20	1
Ethylbenzene	3.4		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	7.4		ug/l	2.0	0.33	1
o-Xylene	2.1		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	83		70-130
Dibromofluoromethane	111		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

SAMPLE RESULTS

Lab ID: L2350948-25
Client ID: HH-WPX-TRIP-BLANK
Sample Location: HAVERHILL, MA

Date Collected: 08/31/23 15:20
Date Received: 09/01/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/10/23 17:52
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	87		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	86		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/10/23 17:29
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 10-11,22-23,25 Batch: WG1826275-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	87		70-130
Dibromofluoromethane	104		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/10/23 16:20
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-09,12-21 Batch: WG1826320-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	1.0	J	ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	91		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/08/23 09:35
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-03 Batch: WG1826346-5					
Benzene	0.19	J	ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	0.61	J	ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	1.1	J	ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	104		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2350948

Project Number: 180327-08.01 **Report Date:** 09/15/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/13/23 04:50
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 24 Batch: WG1827155-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	90		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	82		70-130
Dibromofluoromethane	112		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350948
Report Date: 09/15/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 10-11,22-23,25 Batch: WG1826275-3 WG1826275-4								
Benzene	110		100		70-130	10		20
Toluene	110		110		70-130	0		20
Ethylbenzene	110		110		70-130	0		20
Methyl tert butyl ether	92		96		70-130	4		20
p/m-Xylene	115		115		70-130	0		20
o-Xylene	115		115		70-130	0		20
Carbon disulfide	110		110		70-130	0		20
n-Butylbenzene	89		88		70-130	1		20
Isopropylbenzene	97		99		70-130	2		20
p-Isopropyltoluene	100		100		70-130	0		20
Naphthalene	88		93		70-130	6		20
n-Propylbenzene	97		97		70-130	0		20
1,3,5-Trimethylbenzene	99		99		70-130	0		20
1,2,4-Trimethylbenzene	98		99		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	84		82		70-130
Toluene-d8	98		98		70-130
4-Bromofluorobenzene	83		84		70-130
Dibromofluoromethane	100		99		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350948
Report Date: 09/15/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-09,12-21 Batch: WG1826320-3 WG1826320-4								
Benzene	120		110		70-130	9		20
Toluene	100		97		70-130	3		20
Ethylbenzene	100		98		70-130	2		20
Methyl tert butyl ether	100		110		70-130	10		20
p/m-Xylene	95		90		70-130	5		20
o-Xylene	90		90		70-130	0		20
Carbon disulfide	110		110		70-130	0		20
n-Butylbenzene	89		88		70-130	1		20
Isopropylbenzene	90		89		70-130	1		20
p-Isopropyltoluene	90		91		70-130	1		20
Naphthalene	80		85		70-130	6		20
n-Propylbenzene	98		96		70-130	2		20
1,3,5-Trimethylbenzene	93		93		70-130	0		20
1,2,4-Trimethylbenzene	92		91		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	92		91		70-130
Toluene-d8	96		95		70-130
4-Bromofluorobenzene	102		102		70-130
Dibromofluoromethane	102		101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350948
Report Date: 09/15/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-03 Batch: WG1826346-3 WG1826346-4								
Benzene	120		110		70-130	9		20
Toluene	100		97		70-130	3		20
Ethylbenzene	100		98		70-130	2		20
Methyl tert butyl ether	100		100		70-130	0		20
p/m-Xylene	95		90		70-130	5		20
o-Xylene	95		90		70-130	5		20
Carbon disulfide	110		100		70-130	10		20
n-Butylbenzene	95		90		70-130	5		20
Isopropylbenzene	97		92		70-130	5		20
p-Isopropyltoluene	96		93		70-130	3		20
Naphthalene	86		86		70-130	0		20
n-Propylbenzene	100		100		70-130	0		20
1,3,5-Trimethylbenzene	98		96		70-130	2		20
1,2,4-Trimethylbenzene	99		94		70-130	5		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	93		91		70-130
Toluene-d8	97		97		70-130
4-Bromofluorobenzene	104		106		70-130
Dibromofluoromethane	98		99		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2350948
Report Date: 09/15/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 24 Batch: WG1827155-3 WG1827155-4								
Benzene	96		94		70-130	2		20
Toluene	97		98		70-130	1		20
Ethylbenzene	93		93		70-130	0		20
Methyl tert butyl ether	81		87		70-130	7		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		100		70-130	0		20
Carbon disulfide	110		100		70-130	10		20
n-Butylbenzene	79		76		70-130	4		20
Isopropylbenzene	85		84		70-130	1		20
p-Isopropyltoluene	90		87		70-130	3		20
Naphthalene	72		78		70-130	8		20
n-Propylbenzene	84		82		70-130	2		20
1,3,5-Trimethylbenzene	87		85		70-130	2		20
1,2,4-Trimethylbenzene	86		85		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	84		88		70-130
Toluene-d8	97		98		70-130
4-Bromofluorobenzene	78		79		70-130
Dibromofluoromethane	105		104		70-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350948
Report Date: 09/15/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2350948-01A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-01B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-02A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-02B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-03A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-03B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-04A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-04B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-05A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-05B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-06A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-06B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-07A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-07B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-08A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-08B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-09A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-09B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-10A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-10B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-11A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-11B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-12A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2350948
Report Date: 09/15/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2350948-12B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-13A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-13B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-14A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-14B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-15A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-15B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-16A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-16B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-17A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-17B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-18A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-18B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-19A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-19B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-20A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-20B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-21A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-21B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-22A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-22B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-23A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-23B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-24A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-24B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-25A	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)
L2350948-25B	Vial HCl preserved	A	NA		10.1	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2350948
Project Number:	180327-08.01	**Report Date:**	09/15/23

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

L2350948

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	8/31/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave Suite 300
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
1	HH-WPX-KNBT-4	8/28/2023	18:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
2	HH-WPX-KNBT-5	8/29/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
3	HH-WPX-KNBT-6	8/30/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
4	HH-WPX-KNBT-7	8/31/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
5	HH-WPX-IBT-1	8/31/2023	7:00	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
6	HH-WPX-IBT-2	8/31/2023	7:10	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
7	HH-WPX-IBT-3	8/31/2023	7:20	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
8	HH-WPX-IBT-4	8/31/2023	7:30	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
9	HH-WPX-IBT-5	8/31/2023	7:40	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
10	HH-WPX-IBT-6	8/31/2023	7:50	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
11	HH-WPX-IBT-7	8/31/2023	8:00	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
12	HH-WPX-IBT-8	8/31/2023	8:10	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
13	HH-WPX-IBT-9	8/31/2023	8:20	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
14	HH-WPX-IBT-10	8/31/2023	8:30	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
15	HH-WPX-IBT-11	8/31/2023	8:40	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
16	HH-WPX-IBT-12	8/31/2023	8:50	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
17	HH-WPX-IBT-13	8/31/2023	9:00	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
18	HH-WPX-IBT-14	8/31/2023	9:10	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
19	HH-WPX-IBT-15	8/31/2023	9:20	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
20	HH-WPX-IBT-16	8/31/2023	9:30	Water	1	X	Expected high BTEX conc. (1-10 mg/L)

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA
Signature/Print Name:	Date/Time: 8/31/2023 15:30
Relinquished by: FEDEX	Company:
Signature/Print Name:	Date/Time: 9/1/23 1016

Received by: FEDEX	
Signature/Print Name:	
Received by: Kendal Armstrong	
Signature/Print Name:	9/1/23 1016

Distribution: A copy will be made for the laboratory and client. The Project file will retain the original

9/1/23 1016
9/1/23 1220
9/1/23 1145
9/1/23 1230

L2350948

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	8/31/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave Suite 300
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	VOCs (by MCP-8260-21)	Comments/Preservation
21	HH-WPX-IBT-17	8/31/2023	9:40	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
22	HH-WPX-IBT-18	8/31/2023	9:50	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
23	HH-WPX-CTRL	8/31/2023	10:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
24	HH-WPX-MB	8/31/2023	10:10	Water	1	X	Expected to be ND for VOCs
25	HH-WPX-Trip-Blank	8/31/2023	15:20	Water	1	X	Expected to be ND for VOCs
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Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: Masa Kanematsu	Company: Anchor QEA	Received by: FEDEX	
Signature/Print Name:	Date/Time: 8/31/2023 15:30	Signature/Print Name:	
Relinquished by: FEDEX	Company:	Received by: Kendal Armstrong	
Signature/Print Name:	Date/Time: 9/1/23 1016	Signature/Print Name:	9/1/23 1016

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9/1/23 11:45

9/1/23 1230

9/1/23 11:45

Page 1 of 2

ORIGIN ID:BNOA (503) 972-5001
MASAKAZU KANEMATSU
ANCHOR QEA
6720 SW MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

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(508) 844-4124
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PO: MASA KANEMATSU

REF: 180327-08.01 TASK 05

DEPT: SHIPPING WATER SAMPLES

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Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350948
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1826346-5	**Lab File ID**	: V16230908A05
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/08/23 09:35

Client Sample No.	Lab Sample ID	Analysis Date
WG1826346-3LCS	WG1826346-3	09/08/23 08:22
WG1826346-4LCSD	WG1826346-4	09/08/23 08:46
HH-WPX-KNBT-4	L2350948-01D	09/08/23 17:06
HH-WPX-KNBT-5	L2350948-02D	09/08/23 17:31
HH-WPX-KNBT-6	L2350948-03D	09/08/23 17:55

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350948
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1826320-5	**Lab File ID**	: V16230910A06
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/10/23 16:20

Client Sample No.	Lab Sample ID	Analysis Date
WG1826320-3LCS	WG1826320-3	09/10/23 13:47
WG1826320-4LCSD	WG1826320-4	09/10/23 14:11
HH-WPX-IBT-1	L2350948-05	09/10/23 17:33
HH-WPX-IBT-2	L2350948-06	09/10/23 17:57
HH-WPX-IBT-3	L2350948-07	09/10/23 18:21
HH-WPX-IBT-4	L2350948-08	09/10/23 18:46
HH-WPX-IBT-5	L2350948-09	09/10/23 19:10
HH-WPX-KNBT-7	L2350948-04D	09/10/23 19:34
HH-WPX-IBT-8	L2350948-12D	09/10/23 19:58
HH-WPX-IBT-9	L2350948-13D	09/10/23 20:22
HH-WPX-IBT-10	L2350948-14D	09/10/23 20:46
HH-WPX-IBT-11	L2350948-15D	09/10/23 21:10
HH-WPX-IBT-12	L2350948-16D	09/10/23 21:34
HH-WPX-IBT-13	L2350948-17D	09/10/23 21:58
HH-WPX-IBT-14	L2350948-18D	09/10/23 22:22
HH-WPX-IBT-15	L2350948-19D	09/10/23 22:46
HH-WPX-IBT-16	L2350948-20D	09/10/23 23:10
HH-WPX-IBT-17	L2350948-21D	09/10/23 23:34

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350948
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1826275-5	**Lab File ID**	: VQ230910A05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 09/10/23 17:29

Client Sample No.	Lab Sample ID	Analysis Date
WG1826275-3LCS	WG1826275-3	09/10/23 15:58
WG1826275-4LCSD	WG1826275-4	09/10/23 16:20
HH-WPX-TRIP-BLANK	L2350948-25	09/10/23 17:52
HH-WPX-IBT-6	L2350948-10	09/10/23 18:15
HH-WPX-IBT-7	L2350948-11	09/10/23 18:38
HH-WPX-IBT-18	L2350948-22D	09/10/23 19:01
HH-WPX-CTRL	L2350948-23D	09/10/23 19:24

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2350948
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1827155-5	**Lab File ID**	: VQ230913A05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 09/13/23 04:50

Client Sample No.	Lab Sample ID	Analysis Date
WG1827155-3LCS	WG1827155-3	09/13/23 03:20
WG1827155-4LCSD	WG1827155-4	09/13/23 04:05
HH-WPX-MB	L2350948-24	09/13/23 08:37

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/08/23 08:22
Lab File ID	: V16230908A02	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1826346-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	119	0
Dichlorodifluoromethane	0.307	0.299	-	2.6	20	109	0
Chloromethane	0.269	0.299	-	-11.2	20	127	.01
Vinyl chloride	0.374	0.286	-	23.5*	20	85	0
Bromomethane	0.235	0.213	-	9.4	20	114	0
Chloroethane	0.227	0.157	-	30.8*	20	77	0
Trichlorofluoromethane	0.335	0.344	-	-2.7	20	119	0
Ethyl ether	0.087	0.089	-	-2.3	20	128	0
1,1-Dichloroethene	0.186	0.204	-	-9.7	20	129	0
Carbon disulfide	0.626	0.714	-	-14.1	20	133	0
Methylene chloride	0.213	0.229	-	-7.5	20	126	0
Acetone	10	13.481	-	-34.8*	20	162	0
trans-1,2-Dichloroethene	0.201	0.22	-	-9.5	20	132	0
Methyl tert-butyl ether	0.413	0.424	-	-2.7	20	134	0
Diisopropyl ether	0.546	0.612	-	-12.1	20	140	0
1,1-Dichloroethane	0.414	0.473	-	-14.3	20	135	0
Ethyl tert-butyl ether	0.583	0.598	-	-2.6	20	139	0
cis-1,2-Dichloroethene	0.22	0.239	-	-8.6	20	132	0
2,2-Dichloropropane	0.303	0.348	-	-14.9	20	146	0
Bromochloromethane	0.096	0.107	-	-11.5	20	129	0
Chloroform	0.4	0.454	-	-13.5	20	143	0
Carbon tetrachloride	0.298	0.322	-	-8.1	20	127	0
Tetrahydrofuran	10	9.872	-	1.3	20	119	0
Dibromofluoromethane	0.334	0.328	-	1.8	20	120	0
1,1,1-Trichloroethane	0.34	0.38	-	-11.8	20	135	0
2-Butanone	10	11.024	-	-10.2	20	155	0
1,1-Dichloropropene	0.288	0.315	-	-9.4	20	132	0
Benzene	0.798	0.919	-	-15.2	20	136	0
tert-Amyl methyl ether	10	10.135	-	-1.3	20	134	0
1,2-Dichloroethane-d4	0.41	0.38	-	7.3	20	119	0
1,2-Dichloroethane	0.289	0.317	-	-9.7	20	134	0
Trichloroethene	0.248	0.253	-	-2	20	125	0
Dibromomethane	0.126	0.128	-	-1.6	20	127	0
1,2-Dichloropropane	0.226	0.255	-	-12.8	20	133	0
Bromodichloromethane	0.287	0.299*	-	-4.2	20	129	0
1,4-Dioxane	0.00075	0.00119*	-	-58.7*	20	205	0
cis-1,3-Dichloropropene	10	10.98	-	-9.8	20	147	0
Chlorobenzene-d5	1	1	-	0	20	131	0
Toluene-d8	1.289	1.248	-	3.2	20	123	0
Toluene	0.574	0.583	-	-1.6	20	132	0
4-Methyl-2-pentanone	0.053	0.047	-	11.3	20	133	0
Tetrachloroethene	0.252	0.267	-	-6	20	137	0
trans-1,3-Dichloropropene	0.304	0.298*	-	2	20	129	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/08/23 08:22
Lab File ID	: V16230908A02	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1826346-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.158	0.153*	-	3.2	20	125	0
Chlorodibromomethane	0.219	0.215	-	1.8	20	132	0
1,3-Dichloropropane	0.316	0.309	-	2.2	20	128	0
1,2-Dibromoethane	0.177	0.174*	-	1.7	20	131	0
2-Hexanone	10	9.027	-	9.7	20	138	0
Chlorobenzene	0.607	0.62	-	-2.1	20	135	0
Ethylbenzene	1.057	1.098	-	-3.9	20	135	0
1,1,1,2-Tetrachloroethane	0.226	0.227	-	-0.4	20	135	0
p/m Xylene	20	19.192	-	4	20	134	0
o Xylene	20	19.054	-	4.7	20	134	0
Styrene	20	18.589	-	7.1	20	130	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	128	0
Bromoform	0.255	0.228	-	10.6	20	126	0
Isopropylbenzene	10	9.673	-	3.3	20	134	0
4-Bromofluorobenzene	0.819	0.852	-	-4	20	134	0
Bromobenzene	0.424	0.414	-	2.4	20	130	0
n-Propylbenzene	2.226	2.323	-	-4.4	20	131	0
1,1,2,2-Tetrachloroethane	0.393	0.374	-	4.8	20	128	0
2-Chlorotoluene	1.539	1.609	-	-4.5	20	133	0
1,3,5-Trimethylbenzene	1.624	1.597	-	1.7	20	133	0
1,2,3-Trichloropropane	0.317	0.292	-	7.9	20	124	0
4-Chlorotoluene	1.332	1.389	-	-4.3	20	134	0
tert-Butylbenzene	1.324	1.301	-	1.7	20	133	0
1,2,4-Trimethylbenzene	1.547	1.526	-	1.4	20	131	0
sec-Butylbenzene	10	9.838	-	1.6	20	144	0
p-Isopropyltoluene	10	9.635	-	3.7	20	146	0
1,3-Dichlorobenzene	0.846	0.847	-	-0.1	20	128	0
1,4-Dichlorobenzene	0.85	0.836	-	1.6	20	127	0
n-Butylbenzene	10	9.516	-	4.8	20	128	0
1,2-Dichlorobenzene	0.762	0.744	-	2.4	20	126	0
1,2-Dibromo-3-chloropropan	0.054	0.047	-	13	20	124	0
Hexachlorobutadiene	0.218	0.226	-	-3.7	20	139	0
1,2,4-Trichlorobenzene	10	9.189	-	8.1	20	138	0
Naphthalene	10	8.57	-	14.3	20	123	0
1,2,3-Trichlorobenzene	0.412	0.424	-	-2.9	20	133	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/10/23 13:47
Lab File ID	: V16230910A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1826320-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	116	0
Dichlorodifluoromethane	0.307	0.29	-	5.5	20	104	0
Chloromethane	0.269	0.304	-	-13	20	126	.01
Vinyl chloride	0.374	0.254	-	32.1*	20	74	0
Bromomethane	0.235	0.149	-	36.6*	20	78	0
Chloroethane	0.227	0.14	-	38.3*	20	67	-.01
Trichlorofluoromethane	0.335	0.35	-	-4.5	20	118	0
Ethyl ether	0.087	0.092	-	-5.7	20	129	0
1,1-Dichloroethene	0.186	0.202	-	-8.6	20	125	0
Carbon disulfide	0.626	0.703	-	-12.3	20	128	0
Methylene chloride	0.213	0.247	-	-16	20	132	0
Acetone	10	11.958	-	-19.6	20	141	0
trans-1,2-Dichloroethene	0.201	0.217	-	-8	20	127	0
Methyl tert-butyl ether	0.413	0.425	-	-2.9	20	131	0
Diisopropyl ether	0.546	0.611	-	-11.9	20	136	0
1,1-Dichloroethane	0.414	0.465	-	-12.3	20	130	0
Ethyl tert-butyl ether	0.583	0.585	-	-0.3	20	133	0
cis-1,2-Dichloroethene	0.22	0.237	-	-7.7	20	128	0
2,2-Dichloropropane	0.303	0.353	-	-16.5	20	144	0
Bromochloromethane	0.096	0.107	-	-11.5	20	127	0
Chloroform	0.4	0.418	-	-4.5	20	129	0
Carbon tetrachloride	0.298	0.323	-	-8.4	20	124	0
Tetrahydrofuran	10	9.388	-	6.1	20	111	0
Dibromofluoromethane	0.334	0.34	-	-1.8	20	122	0
1,1,1-Trichloroethane	0.34	0.369	-	-8.5	20	128	0
2-Butanone	10	9.547	-	4.5	20	130	0
1,1-Dichloropropene	0.288	0.315	-	-9.4	20	129	0
Benzene	0.798	0.938	-	-17.5	20	136	0
tert-Amyl methyl ether	10	9.167	-	8.3	20	117	0
1,2-Dichloroethane-d4	0.41	0.377	-	8	20	116	0
1,2-Dichloroethane	0.289	0.305	-	-5.5	20	126	0
Trichloroethene	0.248	0.253	-	-2	20	122	0
Dibromomethane	0.126	0.129	-	-2.4	20	125	0
1,2-Dichloropropane	0.226	0.259	-	-14.6	20	133	0
Bromodichloromethane	0.287	0.305	-	-6.3	20	128	0
1,4-Dioxane	0.00075	0.00102*	-	-36*	20	171	0
cis-1,3-Dichloropropene	10	10.181	-	-1.8	20	133	0
Chlorobenzene-d5	1	1	-	0	20	132	0
Toluene-d8	1.289	1.237	-	4	20	123	0
Toluene	0.574	0.577	-	-0.5	20	132	0
4-Methyl-2-pentanone	0.053	0.045	-	15.1	20	129	0
Tetrachloroethene	0.252	0.262	-	-4	20	136	0
trans-1,3-Dichloropropene	0.304	0.291*	-	4.3	20	127	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/10/23 13:47
Lab File ID	: V16230910A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1826320-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.158	0.151*	-	4.4	20	124	0
Chlorodibromomethane	0.219	0.21	-	4.1	20	130	0
1,3-Dichloropropane	0.316	0.304	-	3.8	20	127	0
1,2-Dibromoethane	0.177	0.17*	-	4	20	129	0
2-Hexanone	10	7.764	-	22.4*	20	116	0
Chlorobenzene	0.607	0.608	-	-0.2	20	133	0
Ethylbenzene	1.057	1.053	-	0.4	20	130	0
1,1,1,2-Tetrachloroethane	0.226	0.223	-	1.3	20	134	0
p/m Xylene	20	18.696	-	6.5	20	132	0
o Xylene	20	18.533	-	7.3	20	131	0
Styrene	20	18.231	-	8.8	20	128	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	133	0
Bromoform	0.255	0.218	-	14.5	20	125	0
Isopropylbenzene	10	8.959	-	10.4	20	129	0
4-Bromofluorobenzene	0.819	0.839	-	-2.4	20	137	0
Bromobenzene	0.424	0.402	-	5.2	20	132	0
n-Propylbenzene	2.226	2.189	-	1.7	20	129	0
1,1,2,2-Tetrachloroethane	0.393	0.35	-	10.9	20	125	0
2-Chlorotoluene	1.539	1.496	-	2.8	20	129	0
1,3,5-Trimethylbenzene	1.624	1.51	-	7	20	131	0
1,2,3-Trichloropropane	0.317	0.268	-	15.5	20	118	0
4-Chlorotoluene	1.332	1.299	-	2.5	20	130	0
tert-Butylbenzene	1.324	1.216	-	8.2	20	129	0
1,2,4-Trimethylbenzene	1.547	1.42	-	8.2	20	127	0
sec-Butylbenzene	10	9.167	-	8.3	20	139	0
p-Isopropyltoluene	10	8.992	-	10.1	20	141	0
1,3-Dichlorobenzene	0.846	0.814	-	3.8	20	128	0
1,4-Dichlorobenzene	0.85	0.804	-	5.4	20	128	0
n-Butylbenzene	10	8.944	-	10.6	20	125	0
1,2-Dichlorobenzene	0.762	0.719	-	5.6	20	127	0
1,2-Dibromo-3-chloropropan	0.054	0.043	-	20.4*	20	119	0
Hexachlorobutadiene	0.218	0.22	-	-0.9	20	142	0
1,2,4-Trichlorobenzene	10	8.745	-	12.6	20	136	0
Naphthalene	10	7.993	-	20.1*	20	118	0
1,2,3-Trichlorobenzene	0.412	0.405	-	1.7	20	133	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/10/23 15:58
Lab File ID	: VQ230910A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1826275-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	58	0
Dichlorodifluoromethane	0.249	0.217	-	12.9	20	48	0
Chloromethane	0.253	0.241	-	4.7	20	52	0
Vinyl chloride	0.242	0.249	-	-2.9	20	57	0
Bromomethane	0.09	0.161	-	-78.9*	20	97	0
Chloroethane	0.127	0.139	-	-9.4	20	59	0
Trichlorofluoromethane	0.248	0.272	-	-9.7	20	58	0
Ethyl ether	0.102	0.093	-	8.8	20	51	0
1,1-Dichloroethene	0.16	0.188	-	-17.5	20	63	0
Carbon disulfide	0.476	0.535	-	-12.4	20	61	0
Methylene chloride	0.194	0.213	-	-9.8	20	65	0
Acetone	10	8.751	-	12.5	20	49	0
trans-1,2-Dichloroethene	0.17	0.212	-	-24.7*	20	68	0
Methyl tert-butyl ether	0.515	0.472	-	8.3	20	52	0
Diisopropyl ether	0.653	0.653	-	0	20	56	0
1,1-Dichloroethane	0.387	0.403	-	-4.1	20	57	0
Ethyl tert-butyl ether	0.639	0.591	-	7.5	20	53	0
cis-1,2-Dichloroethene	0.221	0.245	-	-10.9	20	61	0
2,2-Dichloropropane	0.328	0.306	-	6.7	20	52	0
Bromochloromethane	0.098	0.112	-	-14.3	20	63	0
Chloroform	0.346	0.36	-	-4	20	57	0
Carbon tetrachloride	0.257	0.288	-	-12.1	20	61	0
Tetrahydrofuran	10	7.59	-	24.1*	20	47	0
Dibromofluoromethane	0.264	0.264	-	0	20	58	0
1,1,1-Trichloroethane	0.302	0.321	-	-6.3	20	58	0
2-Butanone	0.063	0.047	-	25.4*	20	46	0
1,1-Dichloropropene	0.284	0.287	-	-1.1	20	55	0
Benzene	0.837	0.896	-	-7	20	59	0
tert-Amyl methyl ether	0.56	0.511	-	8.8	20	53	0
1,2-Dichloroethane-d4	0.306	0.256	-	16.3	20	49	0
1,2-Dichloroethane	0.265	0.236	-	10.9	20	50	0
Trichloroethene	0.223	0.232	-	-4	20	59	0
Dibromomethane	0.114	0.108	-	5.3	20	54	0
1,2-Dichloropropane	0.219	0.219	-	0	20	55	0
Bromodichloromethane	0.278	0.271*	-	2.5	20	55	0
1,4-Dioxane	0.00129	0.00134*	-	-3.9	20	58	0
cis-1,3-Dichloropropene	0.346	0.334	-	3.5	20	54	0
Chlorobenzene-d5	1	1	-	0	20	57	0
Toluene-d8	1.298	1.274	-	1.8	20	57	0
Toluene	0.592	0.657	-	-11	20	60	0
4-Methyl-2-pentanone	0.067	0.053	-	20.9*	20	45	0
Tetrachloroethene	0.237	0.3	-	-26.6*	20	69	0
trans-1,3-Dichloropropene	0.357	0.33	-	7.6	20	52	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/10/23 15:58
Lab File ID	: VQ230910A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1826275-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.165	0.161*	-	2.4	20	54	0
Chlorodibromomethane	0.22	0.232	-	-5.5	20	59	0
1,3-Dichloropropane	0.345	0.333	-	3.5	20	54	0
1,2-Dibromoethane	0.188	0.187*	-	0.5	20	56	0
2-Hexanone	0.104	0.079	-	24*	20	43	0
Chlorobenzene	0.633	0.714	-	-12.8	20	60	0
Ethylbenzene	1.108	1.178	-	-6.3	20	56	0
1,1,1,2-Tetrachloroethane	0.23	0.257	-	-11.7	20	61	0
p/m Xylene	0.427	0.487	-	-14.1	20	60	0
o Xylene	0.416	0.471	-	-13.2	20	59	0
Styrene	0.688	0.782	-	-13.7	20	58	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	63	0
Bromoform	0.239	0.24	-	-0.4	20	61	0
Isopropylbenzene	1.913	1.864	-	2.6	20	57	0
4-Bromofluorobenzene	0.923	0.767	-	16.9	20	53	0
Bromobenzene	0.475	0.528	-	-11.2	20	65	0
n-Propylbenzene	2.25	2.183	-	3	20	55	0
1,1,2,2-Tetrachloroethane	0.412	0.345	-	16.3	20	50	0
2-Chlorotoluene	1.617	1.539	-	4.8	20	55	0
1,3,5-Trimethylbenzene	1.655	1.64	-	0.9	20	57	0
1,2,3-Trichloropropane	0.335	0.276	-	17.6	20	49	0
4-Chlorotoluene	1.476	1.403	-	4.9	20	55	0
tert-Butylbenzene	1.348	1.357	-	-0.7	20	58	0
1,2,4-Trimethylbenzene	1.631	1.602	-	1.8	20	56	0
sec-Butylbenzene	1.923	1.94	-	-0.9	20	58	0
p-Isopropyltoluene	1.68	1.689	-	-0.5	20	57	0
1,3-Dichlorobenzene	0.9	0.998	-	-10.9	20	64	0
1,4-Dichlorobenzene	0.911	1.012	-	-11.1	20	64	0
n-Butylbenzene	10	8.924	-	10.8	20	55	0
1,2-Dichlorobenzene	0.86	0.93	-	-8.1	20	62	0
1,2-Dibromo-3-chloropropan	0.065	0.056	-	13.8	20	53	0
Hexachlorobutadiene	10	11.05	-	-10.5	20	74	0
1,2,4-Trichlorobenzene	10	9.95	-	0.5	20	63	0
Naphthalene	1.365	1.196	-	12.4	20	52	0
1,2,3-Trichlorobenzene	0.569	0.601	-	-5.6	20	63	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/13/23 03:20
Lab File ID	: VQ230913A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1827155-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	58	0
Dichlorodifluoromethane	0.249	0.213	-	14.5	20	46	0
Chloromethane	0.253	0.215	-	15	20	46	-.01
Vinyl chloride	0.242	0.224	-	7.4	20	51	0
Bromomethane	0.09	0.113	-	-25.6*	20	68	0
Chloroethane	0.127	0.135	-	-6.3	20	57	0
Trichlorofluoromethane	0.248	0.273	-	-10.1	20	58	0
Ethyl ether	0.102	0.087	-	14.7	20	47	0
1,1-Dichloroethene	0.16	0.185	-	-15.6	20	61	0
Carbon disulfide	0.476	0.53	-	-11.3	20	60	0
Methylene chloride	0.194	0.197	-	-1.5	20	60	0
Acetone	10	7.923	-	20.8*	20	44	0
trans-1,2-Dichloroethene	0.17	0.199	-	-17.1	20	63	0
Methyl tert-butyl ether	0.515	0.418	-	18.8	20	46	0
Diisopropyl ether	0.653	0.539	-	17.5	20	46	0
1,1-Dichloroethane	0.387	0.358	-	7.5	20	50	0
Ethyl tert-butyl ether	0.639	0.49	-	23.3*	20	43	0
cis-1,2-Dichloroethene	0.221	0.218	-	1.4	20	54	0
2,2-Dichloropropane	0.328	0.295	-	10.1	20	49	0
Bromochloromethane	0.098	0.105	-	-7.1	20	58	0
Chloroform	0.346	0.332	-	4	20	52	0
Carbon tetrachloride	0.257	0.261	-	-1.6	20	55	0
Tetrahydrofuran	10	5.836	-	41.6*	20	36	0
Dibromofluoromethane	0.264	0.277	-	-4.9	20	61	0
1,1,1-Trichloroethane	0.302	0.292	-	3.3	20	53	0
2-Butanone	0.063	0.039	-	38.1*	20	37	0
1,1-Dichloropropene	0.284	0.253	-	10.9	20	48	0
Benzene	0.837	0.801	-	4.3	20	53	0
tert-Amyl methyl ether	0.56	0.426	-	23.9*	20	43	0
1,2-Dichloroethane-d4	0.306	0.258	-	15.7	20	49	0
1,2-Dichloroethane	0.265	0.216	-	18.5	20	45	0
Trichloroethene	0.223	0.211	-	5.4	20	53	0
Dibromomethane	0.114	0.1	-	12.3	20	50	0
1,2-Dichloropropane	0.219	0.188	-	14.2	20	47	0
Bromodichloromethane	0.278	0.248*	-	10.8	20	50	0
1,4-Dioxane	0.00129	0.00115*	-	10.9	20	49	0
cis-1,3-Dichloropropene	0.346	0.293*	-	15.3	20	47	0
Chlorobenzene-d5	1	1	-	0	20	58	0
Toluene-d8	1.298	1.259	-	3	20	57	0
Toluene	0.592	0.576	-	2.7	20	53	0
4-Methyl-2-pentanone	0.067	0.038	-	43.3*	20	33	0
Tetrachloroethene	0.237	0.282	-	-19	20	66	0
trans-1,3-Dichloropropene	0.357	0.284*	-	20.4*	20	45	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2350948
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 09/13/23 03:20
Lab File ID	: VQ230913A01	Init. Calib. Date(s)	: 08/10/23 08/10/23
Sample No	: WG1827155-2	Init. Calib. Times	: 06:53 09:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,1,2-Trichloroethane	0.165	0.142*	-	13.9	20	48	0
Chlorodibromomethane	0.22	0.21	-	4.5	20	54	0
1,3-Dichloropropane	0.345	0.289	-	16.2	20	47	0
1,2-Dibromoethane	0.188	0.165*	-	12.2	20	50	0
2-Hexanone	0.104	0.059	-	43.3*	20	33	0
Chlorobenzene	0.633	0.64	-	-1.1	20	55	0
Ethylbenzene	1.108	1.033	-	6.8	20	50	0
1,1,1,2-Tetrachloroethane	0.23	0.232	-	-0.9	20	55	0
p/m Xylene	0.427	0.44	-	-3	20	55	0
o Xylene	0.416	0.42	-	-1	20	53	0
Styrene	0.688	0.7	-	-1.7	20	52	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	65	0
Bromoform	0.239	0.214	-	10.5	20	57	0
Isopropylbenzene	1.913	1.624	-	15.1	20	51	0
4-Bromofluorobenzene	0.923	0.724	-	21.6*	20	52	0
Bromobenzene	0.475	0.476	-	-0.2	20	61	0
n-Propylbenzene	2.25	1.886	-	16.2	20	49	0
1,1,2,2-Tetrachloroethane	0.412	0.296	-	28.2*	20	44	0
2-Chlorotoluene	1.617	1.366	-	15.5	20	51	0
1,3,5-Trimethylbenzene	1.655	1.435	-	13.3	20	51	0
1,2,3-Trichloropropane	0.335	0.226	-	32.5*	20	42	0
4-Chlorotoluene	1.476	1.229	-	16.7	20	50	0
tert-Butylbenzene	1.348	1.189	-	11.8	20	53	0
1,2,4-Trimethylbenzene	1.631	1.404	-	13.9	20	51	0
sec-Butylbenzene	1.923	1.685	-	12.4	20	52	0
p-Isopropyltoluene	1.68	1.51	-	10.1	20	53	0
1,3-Dichlorobenzene	0.9	0.921	-	-2.3	20	61	0
1,4-Dichlorobenzene	0.911	0.931	-	-2.2	20	61	0
n-Butylbenzene	10	7.873	-	21.3*	20	50	0
1,2-Dichlorobenzene	0.86	0.853	-	0.8	20	59	0
1,2-Dibromo-3-chloropropan	0.065	0.047	-	27.7*	20	46	0
Hexachlorobutadiene	10	10.931	-	-9.3	20	76	0
1,2,4-Trichlorobenzene	10	8.963	-	10.4	20	59	0
Naphthalene	1.365	0.986	-	27.8*	20	44	0
1,2,3-Trichlorobenzene	0.569	0.545	-	4.2	20	59	0

* Value outside of QC limits.

ANALYTICAL REPORT

Lab Number:	L2353444
Client:	Anchor QEA, LLC 6720 S Macadam Ave Suite 300 Portland, OR 97219
ATTN:	Masakazu Kenematsu
Phone:	(503) 972-5001
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	09/22/23

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2353444
Report Date: 09/22/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2353444-01	HH-DSRA8X40-INT-20230908	GROUNDWATER	HAVERHILL, MA	09/08/23 06:00	09/13/23
L2353444-02	HH-DSRA8X40-KNBT-1	GROUNDWATER	HAVERHILL, MA	09/08/23 08:00	09/13/23
L2353444-03	HH-DSRA8X40-KNBT-2	GROUNDWATER	HAVERHILL, MA	09/08/23 10:00	09/13/23
L2353444-04	HH-DSRA8X40-KNBT-3	GROUNDWATER	HAVERHILL, MA	09/08/23 14:00	09/13/23
L2353444-05	HH-DSRA8X40-KNBT-4	GROUNDWATER	HAVERHILL, MA	09/08/23 18:00	09/13/23
L2353444-06	HH-DSRA8X40-KNBT-5	GROUNDWATER	HAVERHILL, MA	09/09/23 06:00	09/13/23
L2353444-07	HH-DSRA8X40-KNBT-6	GROUNDWATER	HAVERHILL, MA	09/10/23 06:00	09/13/23
L2353444-08	HH-DSRA8X40-KNBT-7	GROUNDWATER	HAVERHILL, MA	09/11/23 06:00	09/13/23
L2353444-09	HH-DSRA8X40-IBT-1	GROUNDWATER	HAVERHILL, MA	09/11/23 15:00	09/13/23
L2353444-10	HH-DSRA8X40-IBT-2	GROUNDWATER	HAVERHILL, MA	09/11/23 15:10	09/13/23
L2353444-11	HH-DSRA8X40-IBT-3	GROUNDWATER	HAVERHILL, MA	09/11/23 15:20	09/13/23
L2353444-12	HH-DSRA8X40-IBT-4	GROUNDWATER	HAVERHILL, MA	09/11/23 15:30	09/13/23
L2353444-13	HH-DSRA8X40-IBT-5	GROUNDWATER	HAVERHILL, MA	09/11/23 15:40	09/13/23
L2353444-14	HH-DSRA8X40-IBT-6	GROUNDWATER	HAVERHILL, MA	09/11/23 15:50	09/13/23
L2353444-15	HH-DSRA8X40-IBT-7	GROUNDWATER	HAVERHILL, MA	09/11/23 16:00	09/13/23
L2353444-16	HH-DSRA8X40-IBT-8	GROUNDWATER	HAVERHILL, MA	09/11/23 16:10	09/13/23
L2353444-17	HH-DSRA8X40-IBT-9	GROUNDWATER	HAVERHILL, MA	09/11/23 16:20	09/13/23
L2353444-18	HH-DSRA8X40-IBT-10	GROUNDWATER	HAVERHILL, MA	09/11/23 16:30	09/13/23
L2353444-19	HH-DSRA8X40-IBT-11	GROUNDWATER	HAVERHILL, MA	09/11/23 16:40	09/13/23
L2353444-20	HH-DSRA8X40-IBT-12	GROUNDWATER	HAVERHILL, MA	09/11/23 16:50	09/13/23
L2353444-21	HH-DSRA8X40-IBT-13	GROUNDWATER	HAVERHILL, MA	09/11/23 17:00	09/13/23
L2353444-22	HH-DSRA8X40-IBT-14	GROUNDWATER	HAVERHILL, MA	09/11/23 17:10	09/13/23
L2353444-23	HH-DSRA8X40-IBT-15	GROUNDWATER	HAVERHILL, MA	09/11/23 17:20	09/13/23
L2353444-24	HH-DSRA8X40-IBT-16	GROUNDWATER	HAVERHILL, MA	09/11/23 17:30	09/13/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2353444-25	HH-DSRA8X40-IBT-17	GROUNDWATER	HAVERHILL, MA	09/11/23 17:40	09/13/23
L2353444-26	HH-DSRA8X40-IBT-18	GROUNDWATER	HAVERHILL, MA	09/11/23 17:50	09/13/23
L2353444-27	HH-DSRA8X40-CTRL	GROUNDWATER	HAVERHILL, MA	09/11/23 18:00	09/13/23
L2353444-28	HH-DSRA8X40-MB	GROUNDWATER	HAVERHILL, MA	09/11/23 18:10	09/13/23
L2353444-29	HH-DSRA8X40-TRIP-BLANK	GROUNDWATER	HAVERHILL, MA	09/11/23 18:20	09/13/23

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
Project Number:	180327-08.01	**Report Date:**	09/22/23

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
Project Number:	180327-08.01	**Report Date:**	09/22/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
Project Number:	180327-08.01	**Report Date:**	09/22/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Volatile Organics

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2353444-01D, -02D, -03D, -04D, -05D, -06D, -07D, -08D, -17D, -18D, -19D, -20D, -21D, -22D, -23D, -24D, -24D2, -25D, -26D/-26D2, and -27D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2353444-02D, -20D, -24D, and -26D: The sample was re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.

L2353444-02D, -07D, -19D, -24D2, and -26D2: The analysis was performed utilizing a compromised vial. The two vials received were utilized for screening and the initial anlaysis, subsequent analyses at dilution utilized volume remaining in one of the two vials.

L2353444-02D2, -07D, -19D, -20D, -21D, -22D, -23D, -24D, -25D, -26D, -27D, and -28: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene

In reference to question H:

L2353444-02D2, -07D, -19D, -20D, -21D, -22D, -23D, -24D, -25D, -26D, -27D, and -28: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromochloromethane

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
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Case Narrative (continued)

(0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
Verification: NONE
L2353444-02D2, -07D, -19D, -20D, -21D, -22D, -23D, -24D, -25D, -26D, -27D, and -28: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2353444-01D, -02D, -03D, -04D, -05D, -06D, -08D, -09, -10, -11, -12, -13, -14, -15, -16, -17D, -18D, and -29: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene
In reference to question H:
L2353444-01D, -02D, -03D, -04D, -05D, -06D, -08D, -09, -10, -11, -12, -13, -14, -15, -16, -17D, -18D, and -29: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromochloromethane (0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)
Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane
Verification: NONE
L2353444-01D, -02D, -03D, -04D, -05D, -06D, -08D, -09, -10, -11, -12, -13, -14, -15, -16, -17D, -18D, and -29: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
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Case Narrative (continued)

high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2353444-20D2, -24D2, and -26D2: Initial calibration utilized a quadratic fit for: vinyl acetate, cis-1,3-dichloropropene

In reference to question H:

L2353444-20D2, -24D2, and -26D2: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.198), bromochloromethane (0.0873), 1,2-dichloropropane (0.1953), bromodichloromethane (0.2896), 1,4-dioxane (0.0006), trans-1,3-dichloropropene (0.2652), 1,1,2-trichloroethane (0.1465), 1,2-dibromoethane (0.1742), 1,2,3-trichlorobenzene (0.3154)

Average Response Factor: bromochloromethane, bromodichloromethane, 1,4-dioxane, 1,1,2-trichloroethane, 1,2-dibromoethane

Verification: NONE

L2353444-20D2, -24D2, and -26D2: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative

Date: 09/22/23

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2353444

Report Date: 09/22/23

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-01 D
Client ID: HH-DSRA8X40-INT-20230908
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 06:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 07:33
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	34000		ug/l	200	64.	400
Toluene	30000		ug/l	400	81.	400
Ethylbenzene	29000		ug/l	400	67.	400
Methyl tert butyl ether	ND		ug/l	800	66.	400
p/m-Xylene	56000		ug/l	800	130	400
o-Xylene	28000		ug/l	400	160	400
Carbon disulfide	ND		ug/l	800	120	400
n-Butylbenzene	ND		ug/l	800	77.	400
Isopropylbenzene	210	J	ug/l	800	75.	400
p-Isopropyltoluene	ND		ug/l	800	75.	400
Naphthalene	6000		ug/l	800	86.	400
n-Propylbenzene	ND		ug/l	800	69.	400
1,3,5-Trimethylbenzene	ND		ug/l	800	87.	400
1,2,4-Trimethylbenzene	200	J	ug/l	800	76.	400

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	90		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-02 D2
Client ID: HH-DSRA8X40-KNBT-1
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 08:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 17:01
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	17000		ug/l	120	40.	250

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-02 D
Client ID: HH-DSRA8X40-KNBT-1
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 08:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 07:57
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	20000	E	ug/l	50	16.	100
Toluene	15000		ug/l	100	20.	100
Ethylbenzene	14000		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	26000		ug/l	200	33.	100
o-Xylene	14000		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	72	J	ug/l	200	19.	100
p-Isopropyltoluene	43	J	ug/l	200	19.	100
Naphthalene	3000		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	28	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	110	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	105		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-03 D
Client ID: HH-DSRA8X40-KNBT-2
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 10:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 08:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18000		ug/l	50	16.	100
Toluene	12000		ug/l	100	20.	100
Ethylbenzene	10000		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	18000		ug/l	200	33.	100
o-Xylene	10000		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	62	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	2000		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	75	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	105		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-04 D
Client ID: HH-DSRA8X40-KNBT-3
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 14:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 08:45
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	17000		ug/l	100	32.	200
Toluene	7600		ug/l	200	41.	200
Ethylbenzene	4800		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	8200		ug/l	400	66.	200
o-Xylene	4500		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	80	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	640		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	81		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	109		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-05 D
Client ID: HH-DSRA8X40-KNBT-4
Sample Location: HAVERHILL, MA

Date Collected: 09/08/23 18:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 09:09
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	17000		ug/l	100	32.	200
Toluene	6200		ug/l	200	41.	200
Ethylbenzene	2800		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	4400		ug/l	400	66.	200
o-Xylene	2400		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	74	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	340	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-06 D
Client ID: HH-DSRA8X40-KNBT-5
Sample Location: HAVERHILL, MA

Date Collected: 09/09/23 06:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 09:33
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	13000		ug/l	50	16.	100
Toluene	3300		ug/l	100	20.	100
Ethylbenzene	940		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	1400		ug/l	200	33.	100
o-Xylene	750		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	120	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-07 D
Client ID: HH-DSRA8X40-KNBT-6
Sample Location: HAVERHILL, MA

Date Collected: 09/10/23 06:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 20:59
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	13000		ug/l	50	16.	100
Toluene	3200		ug/l	100	20.	100
Ethylbenzene	810		ug/l	100	17.	100
Methyl tert butyl ether	18	J	ug/l	200	17.	100
p/m-Xylene	1200		ug/l	200	33.	100
o-Xylene	630		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	35	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	130	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-08 D
Client ID: HH-DSRA8X40-KNBT-7
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 06:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 10:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	14000		ug/l	50	16.	100
Toluene	3200		ug/l	100	20.	100
Ethylbenzene	770		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	1100		ug/l	200	33.	100
o-Xylene	590		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	120	J	ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-09
Client ID: HH-DSRA8X40-IBT-1
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 05:09
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	7.2		ug/l	0.50	0.16	1
Toluene	1.2		ug/l	1.0	0.20	1
Ethylbenzene	0.57	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	1.3	J	ug/l	2.0	0.33	1
o-Xylene	0.98	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.2	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	95		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-10
Client ID: HH-DSRA8X40-IBT-2
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:10
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 04:22
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9.8		ug/l	0.50	0.16	1
Toluene	1.5		ug/l	1.0	0.20	1
Ethylbenzene	0.57	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	1.2	J	ug/l	2.0	0.33	1
o-Xylene	0.95	J	ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	87		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	94		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-11
Client ID: HH-DSRA8X40-IBT-3
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:20
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 05:33
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	18		ug/l	0.50	0.16	1
Toluene	2.5		ug/l	1.0	0.20	1
Ethylbenzene	0.84	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	1.4	J	ug/l	2.0	0.33	1
o-Xylene	1.1		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.2	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	93		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-12
Client ID: HH-DSRA8X40-IBT-4
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:30
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 05:57
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	30		ug/l	0.50	0.16	1
Toluene	4.1		ug/l	1.0	0.20	1
Ethylbenzene	1.3		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.27	J	ug/l	2.0	0.17	1
p/m-Xylene	1.7	J	ug/l	2.0	0.33	1
o-Xylene	1.3		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	91		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-13
Client ID: HH-DSRA8X40-IBT-5
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:40
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 04:46
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	47		ug/l	0.50	0.16	1
Toluene	6.2		ug/l	1.0	0.20	1
Ethylbenzene	2.0		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.42	J	ug/l	2.0	0.17	1
p/m-Xylene	2.5		ug/l	2.0	0.33	1
o-Xylene	1.7		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.2	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	90		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-14
Client ID: HH-DSRA8X40-IBT-6
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 15:50
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 06:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	80		ug/l	0.50	0.16	1
Toluene	10		ug/l	1.0	0.20	1
Ethylbenzene	3.1		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.68	J	ug/l	2.0	0.17	1
p/m-Xylene	3.4		ug/l	2.0	0.33	1
o-Xylene	2.3		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	85		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	90		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-15
Client ID: HH-DSRA8X40-IBT-7
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 06:45
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	100		ug/l	0.50	0.16	1
Toluene	13		ug/l	1.0	0.20	1
Ethylbenzene	3.6		ug/l	1.0	0.17	1
Methyl tert butyl ether	0.84	J	ug/l	2.0	0.17	1
p/m-Xylene	4.0		ug/l	2.0	0.33	1
o-Xylene	2.5		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	92		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-16
Client ID: HH-DSRA8X40-IBT-8
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:10
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 07:09
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	140		ug/l	0.50	0.16	1
Toluene	18		ug/l	1.0	0.20	1
Ethylbenzene	5.2		ug/l	1.0	0.17	1
Methyl tert butyl ether	1.2	J	ug/l	2.0	0.17	1
p/m-Xylene	5.4		ug/l	2.0	0.33	1
o-Xylene	3.4		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-17 D
Client ID: HH-DSRA8X40-IBT-9
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:20
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 11:32
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	290		ug/l	1.2	0.40	2.5
Toluene	33		ug/l	2.5	0.51	2.5
Ethylbenzene	8.6		ug/l	2.5	0.42	2.5
Methyl tert butyl ether	2.2	J	ug/l	5.0	0.42	2.5
p/m-Xylene	9.4		ug/l	5.0	0.83	2.5
o-Xylene	6.2		ug/l	2.5	0.98	2.5
Carbon disulfide	ND		ug/l	5.0	0.75	2.5
n-Butylbenzene	ND		ug/l	5.0	0.48	2.5
Isopropylbenzene	ND		ug/l	5.0	0.47	2.5
p-Isopropyltoluene	ND		ug/l	5.0	0.47	2.5
Naphthalene	ND		ug/l	5.0	0.54	2.5
n-Propylbenzene	ND		ug/l	5.0	0.43	2.5
1,3,5-Trimethylbenzene	ND		ug/l	5.0	0.54	2.5
1,2,4-Trimethylbenzene	ND		ug/l	5.0	0.48	2.5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	104		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-18 D
Client ID: HH-DSRA8X40-IBT-10
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:30
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 10:44
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	440		ug/l	2.5	0.80	5
Toluene	51		ug/l	5.0	1.0	5
Ethylbenzene	13		ug/l	5.0	0.84	5
Methyl tert butyl ether	3.1	J	ug/l	10	0.83	5
p/m-Xylene	15		ug/l	10	1.7	5
o-Xylene	10		ug/l	5.0	2.0	5
Carbon disulfide	ND		ug/l	10	1.5	5
n-Butylbenzene	ND		ug/l	10	0.96	5
Isopropylbenzene	ND		ug/l	10	0.94	5
p-Isopropyltoluene	ND		ug/l	10	0.94	5
Naphthalene	5.4	J	ug/l	10	1.1	5
n-Propylbenzene	ND		ug/l	10	0.86	5
1,3,5-Trimethylbenzene	ND		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	ND		ug/l	10	0.96	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-19 D
Client ID: HH-DSRA8X40-IBT-11
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:40
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 21:23
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	770		ug/l	2.5	0.80	5
Toluene	89		ug/l	5.0	1.0	5
Ethylbenzene	22		ug/l	5.0	0.84	5
Methyl tert butyl ether	5.3	J	ug/l	10	0.83	5
p/m-Xylene	25		ug/l	10	1.7	5
o-Xylene	15		ug/l	5.0	2.0	5
Carbon disulfide	ND		ug/l	10	1.5	5
n-Butylbenzene	ND		ug/l	10	0.96	5
Isopropylbenzene	ND		ug/l	10	0.94	5
p-Isopropyltoluene	ND		ug/l	10	0.94	5
Naphthalene	5.6	J	ug/l	10	1.1	5
n-Propylbenzene	ND		ug/l	10	0.86	5
1,3,5-Trimethylbenzene	ND		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	ND		ug/l	10	0.96	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	81		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-20 D2
Client ID: HH-DSRA8X40-IBT-12
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:50
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/22/23 06:18
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	4400		ug/l	25	8.0	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	105		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-20 D
Client ID: HH-DSRA8X40-IBT-12
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 16:50
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 17:49
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	3000	E	ug/l	2.0	0.64	4
Toluene	560		ug/l	4.0	0.81	4
Ethylbenzene	130		ug/l	4.0	0.67	4
Methyl tert butyl ether	13		ug/l	8.0	0.66	4
p/m-Xylene	150		ug/l	8.0	1.3	4
o-Xylene	84		ug/l	4.0	1.6	4
Carbon disulfide	ND		ug/l	8.0	1.2	4
n-Butylbenzene	ND		ug/l	8.0	0.77	4
Isopropylbenzene	1.5	J	ug/l	8.0	0.75	4
p-Isopropyltoluene	ND		ug/l	8.0	0.75	4
Naphthalene	5.2	J	ug/l	8.0	0.86	4
n-Propylbenzene	ND		ug/l	8.0	0.69	4
1,3,5-Trimethylbenzene	ND		ug/l	8.0	0.87	4
1,2,4-Trimethylbenzene	ND		ug/l	8.0	0.76	4

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	81		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	110		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-21 D
Client ID: HH-DSRA8X40-IBT-13
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 18:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	13000		ug/l	50	16.	100
Toluene	3100		ug/l	100	20.	100
Ethylbenzene	700		ug/l	100	17.	100
Methyl tert butyl ether	19	J	ug/l	200	17.	100
p/m-Xylene	990		ug/l	200	33.	100
o-Xylene	530		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	ND		ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	ND		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	ND		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-22 D
Client ID: HH-DSRA8X40-IBT-14
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:10
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 18:36
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	17000		ug/l	100	32.	200
Toluene	6100		ug/l	200	41.	200
Ethylbenzene	1800		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	2800		ug/l	400	66.	200
o-Xylene	1500		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	70	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	250	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	83		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-23 D
Client ID: HH-DSRA8X40-IBT-15
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:20
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 19:00
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	21000		ug/l	100	32.	200
Toluene	11000		ug/l	200	41.	200
Ethylbenzene	4300		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	6600		ug/l	400	66.	200
o-Xylene	3400		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	73	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	300	J	ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	ND		ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-24 D2
Client ID: HH-DSRA8X40-IBT-16
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:30
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/22/23 05:30
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	29000		ug/l	100	32.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	89		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-24 D
Client ID: HH-DSRA8X40-IBT-16
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:30
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 19:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	24000	E	ug/l	50	16.	100
Toluene	17000		ug/l	100	20.	100
Ethylbenzene	9900		ug/l	100	17.	100
Methyl tert butyl ether	19	J	ug/l	200	17.	100
p/m-Xylene	16000		ug/l	200	33.	100
o-Xylene	8400		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	49	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	520		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	ND		ug/l	200	22.	100
1,2,4-Trimethylbenzene	23	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-25 D
Client ID: HH-DSRA8X40-IBT-17
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:40
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 19:47
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	24000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	16000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	27000		ug/l	400	66.	200
o-Xylene	14000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	97	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	1600		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	59	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	108		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-26 D2
Client ID: HH-DSRA8X40-IBT-18
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:50
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/22/23 05:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	33000		ug/l	100	32.	200
Toluene	29000		ug/l	200	41.	200
Ethylbenzene	25000		ug/l	200	33.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	81		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	107		70-130
Dibromofluoromethane	87		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-26 D
Client ID: HH-DSRA8X40-IBT-18
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 17:50
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 20:11
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	27000	E	ug/l	50	16.	100
Toluene	24000	E	ug/l	100	20.	100
Ethylbenzene	21000	E	ug/l	100	17.	100
Methyl tert butyl ether	20	J	ug/l	200	17.	100
p/m-Xylene	37000		ug/l	200	33.	100
o-Xylene	20000		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	87	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	4300		ug/l	200	22.	100
n-Propylbenzene	ND		ug/l	200	17.	100
1,3,5-Trimethylbenzene	35	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	140	J	ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	81		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	88		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-27 D
Client ID: HH-DSRA8X40-CTRL
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 18:00
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 20:35
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	22000		ug/l	100	32.	200
Toluene	20000		ug/l	200	41.	200
Ethylbenzene	19000		ug/l	200	33.	200
Methyl tert butyl ether	ND		ug/l	400	33.	200
p/m-Xylene	37000		ug/l	400	66.	200
o-Xylene	20000		ug/l	200	78.	200
Carbon disulfide	ND		ug/l	400	60.	200
n-Butylbenzene	ND		ug/l	400	38.	200
Isopropylbenzene	120	J	ug/l	400	37.	200
p-Isopropyltoluene	86	J	ug/l	400	38.	200
Naphthalene	6300		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200
1,3,5-Trimethylbenzene	ND		ug/l	400	43.	200
1,2,4-Trimethylbenzene	150	J	ug/l	400	38.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	82		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	86		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-28
Client ID: HH-DSRA8X40-MB
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 18:10
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 17:25
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	0.72	J	ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	1.1	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	84		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	93		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

SAMPLE RESULTS

Lab ID: L2353444-29
Client ID: HH-DSRA8X40-TRIP-BLANK
Sample Location: HAVERHILL, MA

Date Collected: 09/11/23 18:20
Date Received: 09/13/23
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 09/21/23 03:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	87		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	102		70-130
Dibromofluoromethane	94		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/21/23 16:38
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 02,07,19-28 Batch: WG1830585-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	94		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/21/23 03:34
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-06,08-18,29 Batch: WG1830586-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	1.0	J	ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	88		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	102		70-130
Dibromofluoromethane	95		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2353444

Project Number: 180327-08.01 **Report Date:** 09/22/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 09/22/23 04:43
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 20,24,26 Batch: WG1830726-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	86		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	91		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2353444
Report Date: 09/22/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 02,07,19-28 Batch: WG1830585-3 WG1830585-4								
Benzene	98		96		70-130	2		20
Toluene	97		97		70-130	0		20
Ethylbenzene	98		97		70-130	1		20
Methyl tert butyl ether	94		97		70-130	3		20
p/m-Xylene	90		95		70-130	5		20
o-Xylene	90		90		70-130	0		20
Carbon disulfide	96		93		70-130	3		20
n-Butylbenzene	85		86		70-130	1		20
Isopropylbenzene	90		91		70-130	1		20
p-Isopropyltoluene	82		92		70-130	11		20
Naphthalene	91		93		70-130	2		20
n-Propylbenzene	94		95		70-130	1		20
1,3,5-Trimethylbenzene	91		91		70-130	0		20
1,2,4-Trimethylbenzene	91		92		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	76		76		70-130
Toluene-d8	97		97		70-130
4-Bromofluorobenzene	100		102		70-130
Dibromofluoromethane	89		90		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2353444
Report Date: 09/22/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-06,08-18,29 Batch: WG1830586-3 WG1830586-4								
Benzene	100		95		70-130	5		20
Toluene	100		97		70-130	3		20
Ethylbenzene	100		97		70-130	3		20
Methyl tert butyl ether	100		100		70-130	0		20
p/m-Xylene	95		95		70-130	0		20
o-Xylene	95		90		70-130	5		20
Carbon disulfide	99		91		70-130	8		20
n-Butylbenzene	91		86		70-130	6		20
Isopropylbenzene	95		90		70-130	5		20
p-Isopropyltoluene	96		90		70-130	6		20
Naphthalene	99		96		70-130	3		20
n-Propylbenzene	99		94		70-130	5		20
1,3,5-Trimethylbenzene	96		91		70-130	5		20
1,2,4-Trimethylbenzene	97		92		70-130	5		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	76		75		70-130
Toluene-d8	97		97		70-130
4-Bromofluorobenzene	102		101		70-130
Dibromofluoromethane	90		88		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2353444
Report Date: 09/22/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 20,24,26 Batch: WG1830726-3 WG1830726-4								
Benzene	110		110		70-130	0		20
Toluene	110		110		70-130	0		20
Ethylbenzene	110		110		70-130	0		20
Methyl tert butyl ether	110		110		70-130	0		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		100		70-130	0		20
Carbon disulfide	100		100		70-130	0		20
n-Butylbenzene	92		91		70-130	1		20
Isopropylbenzene	100		100		70-130	0		20
p-Isopropyltoluene	89		99		70-130	11		20
Naphthalene	100		110		70-130	10		20
n-Propylbenzene	100		100		70-130	0		20
1,3,5-Trimethylbenzene	100		100		70-130	0		20
1,2,4-Trimethylbenzene	100		100		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	74		75		70-130
Toluene-d8	98		96		70-130
4-Bromofluorobenzene	102		103		70-130
Dibromofluoromethane	89		89		70-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2353444
Report Date: 09/22/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Present/Intact

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2353444-01A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-01B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-02A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-02B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-03A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-03B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-04A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-04B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-05A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-05B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-06A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-06B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-07A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-07B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-08A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-08B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-09A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-09B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-10A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-10B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-11A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-11B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-12A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2353444
Report Date: 09/22/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2353444-12B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-13A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-13B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-14A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-14B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-15A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-15B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-16A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-16B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-17A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-17B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-18A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-18B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-19A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-19B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-20A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-20B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-21A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-21B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-22A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-22B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-23A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-23B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-24A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-24B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-25A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-25B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-26A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2353444
Report Date: 09/22/23

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2353444-26B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-27A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-27B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-28A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-28B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-29A	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)
L2353444-29B	Vial HCl preserved	A	NA		2.4	Y	Present/Intact		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
Project Number:	180327-08.01	**Report Date:**	09/22/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

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Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2353444
Project Number:	180327-08.01	**Report Date:**	09/22/23

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

L2353444

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	9/12/2023
Project Name:	Haverhill Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA

Masa Kanematsu
6720 S Macadam Ave Suite 300
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
1	HH-DSRA8X40-INT-20230908	9/8/2023	6:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
2	HH-DSRA8X40-KNBT-1	9/8/2023	8:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
3	HH-DSRA8X40-KNBT-2	9/8/2023	10:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
4	HH-DSRA8X40-KNBT-3	9/8/2023	14:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
5	HH-DSRA8X40-KNBT-4	9/8/2023	18:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
6	HH-DSRA8X40-KNBT-5	9/9/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
7	HH-DSRA8X40-KNBT-6	9/10/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
8	HH-DSRA8X40-KNBT-7	9/11/2023	6:00	Water	1	X	Expected high BTEX conc. (0.1-10 mg/L)
9	HH-DSRA8X40-IBT-1	9/11/2023	15:00	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
10	HH-DSRA8X40-IBT-2	9/11/2023	15:10	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
11	HH-DSRA8X40-IBT-3	9/11/2023	15:20	Water	1	X	Expected high BTEX conc. (0.001-0.01 mg/L)
12	HH-DSRA8X40-IBT-4	9/11/2023	15:30	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
13	HH-DSRA8X40-IBT-5	9/11/2023	15:40	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
14	HH-DSRA8X40-IBT-6	9/11/2023	15:50	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
15	HH-DSRA8X40-IBT-7	9/11/2023	16:00	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
16	HH-DSRA8X40-IBT-8	9/11/2023	16:10	Water	1	X	Expected high BTEX conc. (0.01-0.1 mg/L)
17	HH-DSRA8X40-IBT-9	9/11/2023	16:20	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
18	HH-DSRA8X40-IBT-10	9/11/2023	16:30	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
19	HH-DSRA8X40-IBT-11	9/11/2023	16:40	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)
20	HH-DSRA8X40-IBT-12	9/11/2023	16:50	Water	1	X	Expected high BTEX conc. (0.1-1 mg/L)

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: ~~Masa Kanematsu~~ SUHANT ARASOLDUR Company: Anchor QEA	Received by: Fedex
Signature/Print Name: AS Date/Time: 9/12/2023 15:00	Signature/Print Name:
Relinquished by: H. Rui AAL 9.13.23 Company: Fedex	Received by: Alpha Analytical
Signature/Print Name: 1730 Date/Time:	Signature/Print Name: 9/13/23 14:15

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H. Rui AAL 9.13.23 1600

9/13/23 1730

9/13/23

L2353444

Chain of Custody Record & Laboratory Analysis Request

Laboratory Number: 503-972-5019	
Date:	9/12/2023
Project Name:	Haverhill: Isotherm Study
Project Number:	180327-08.01 Task 05
Project Manager:	Masa Kanematsu, mkanematsu@anchorqea.com
Phone Number:	530-400-5375
Shipment Method:	FedEx Overnight Shipment

ANCHOR QEA
Masa Kanematsu
6720 S Macadam Ave Suite 300
Portland OR 97219

Line	Field Sample ID	Collection Date	Collection Time	Matrix	No. of Containers	Parameters: VOCs (by MCP-8260-21)	Comments/Preservation
21	HH-DSRA8X40-IBT-13	9/11/2023	17:00	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
22	HH-DSRA8X40-IBT-14	9/11/2023	17:10	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
23	HH-DSRA8X40-IBT-15	9/11/2023	17:20	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
24	HH-DSRA8X40-IBT-16	9/11/2023	17:30	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
25	HH-DSRA8X40-IBT-17	9/11/2023	17:40	Water	1	X	Expected high BTEX conc. (1-10 mg/L)
26	HH-DSRA8X40-IBT-18	9/11/2023	17:50	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
27	HH-DSRA8X40-CTRL	9/11/2023	18:00	Water	1	X	Expected high BTEX conc. (20-30 mg/L)
28	HH-DSRA8X40-MB	9/11/2023	18:10	Water	1	X	Expected to be ND for VOCs
29	HH-DSRA8X40-Trip-Blank	9/11/2023	18:20	Water	1	X	Expected to be ND for VOCs
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							

Notes: Each sample has 2 of 40 mL VOA vials provided from Alpha (the third vials are not available due to limited sample volumes). All water samples were preserved with HCl (sampled in pre-preserved VOA vials) and filtered by 0.45 um PTFE membrane with stainless-steel filter holder and gas-tight syringe. **Please analyze on a standard TAT.**

Relinquished by: ~~Masa Kanematsu~~ SUMANT AVASARALA Company: Anchor QEA	Received by:
Signature/Print Name: AZ Date/Time: 9/12/2023 15:00	Signature/Print Name:
Relinquished by: N. Rule AAL 9.13.23 Company:	Received by: N. Rule AAL 9.13.23 1600
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ANCHOR QEA
6720 SW MACADAM AVE.
SUITE 300
PORTLAND, OR 97219
UNITED STATES US

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(508) 844-4124 REF: 180327-08.01 TASK 05
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PO: MASA KANEMATSU DEPT: SHIPPING WATER SAMPLES

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Project HAVER HILL

Container # 1 of 1

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2353444
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1830586-5	**Lab File ID**	: V16230921A04
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/21/23 03:34

Client Sample No.	Lab Sample ID	Analysis Date
WG1830586-3LCS	WG1830586-3	09/21/23 02:22
WG1830586-4LCSD	WG1830586-4	09/21/23 02:46
HH-DSRA8X40-TRIP-BLANK	L2353444-29	09/21/23 03:58
HH-DSRA8X40-IBT-2	L2353444-10	09/21/23 04:22
HH-DSRA8X40-IBT-5	L2353444-13	09/21/23 04:46
HH-DSRA8X40-IBT-1	L2353444-09	09/21/23 05:09
HH-DSRA8X40-IBT-3	L2353444-11	09/21/23 05:33
HH-DSRA8X40-IBT-4	L2353444-12	09/21/23 05:57
HH-DSRA8X40-IBT-6	L2353444-14	09/21/23 06:21
HH-DSRA8X40-IBT-7	L2353444-15	09/21/23 06:45
HH-DSRA8X40-IBT-8	L2353444-16	09/21/23 07:09
HH-DSRA8X40-INT-20230908	L2353444-01D	09/21/23 07:33
HH-DSRA8X40-KNBT-1	L2353444-02D	09/21/23 07:57
HH-DSRA8X40-KNBT-2	L2353444-03D	09/21/23 08:21
HH-DSRA8X40-KNBT-3	L2353444-04D	09/21/23 08:45
HH-DSRA8X40-KNBT-4	L2353444-05D	09/21/23 09:09
HH-DSRA8X40-KNBT-5	L2353444-06D	09/21/23 09:33
HH-DSRA8X40-KNBT-7	L2353444-08D	09/21/23 10:21
HH-DSRA8X40-IBT-10	L2353444-18D	09/21/23 10:44
HH-DSRA8X40-IBT-9	L2353444-17D	09/21/23 11:32

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2353444
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1830585-5	**Lab File ID**	: V16230921N05
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/21/23 16:38

Client Sample No.	Lab Sample ID	Analysis Date
WG1830585-3LCS	WG1830585-3	09/21/23 15:03
WG1830585-4LCSD	WG1830585-4	09/21/23 15:26
HH-DSRA8X40-KNBT-1	L2353444-02D2	09/21/23 17:01
HH-DSRA8X40-MB	L2353444-28	09/21/23 17:25
HH-DSRA8X40-IBT-12	L2353444-20D	09/21/23 17:49
HH-DSRA8X40-IBT-13	L2353444-21D	09/21/23 18:12
HH-DSRA8X40-IBT-14	L2353444-22D	09/21/23 18:36
HH-DSRA8X40-IBT-15	L2353444-23D	09/21/23 19:00
HH-DSRA8X40-IBT-16	L2353444-24D	09/21/23 19:24
HH-DSRA8X40-IBT-17	L2353444-25D	09/21/23 19:47
HH-DSRA8X40-IBT-18	L2353444-26D	09/21/23 20:11
HH-DSRA8X40-CTRL	L2353444-27D	09/21/23 20:35
HH-DSRA8X40-KNBT-6	L2353444-07D	09/21/23 20:59
HH-DSRA8X40-IBT-11	L2353444-19D	09/21/23 21:23

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2353444
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1830726-5	**Lab File ID**	: V16230922A04
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 09/22/23 04:43

Client Sample No.	Lab Sample ID	Analysis Date
WG1830726-3LCS	WG1830726-3	09/22/23 03:31
WG1830726-4LCSD	WG1830726-4	09/22/23 03:55
HH-DSRA8X40-IBT-16	L2353444-24D2	09/22/23 05:30
HH-DSRA8X40-IBT-18	L2353444-26D2	09/22/23 05:54
HH-DSRA8X40-IBT-12	L2353444-20D2	09/22/23 06:18

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2353444
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/21/23 02:22
Lab File ID	: V16230921A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1830586-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	120	0
Carbon disulfide	0.626	0.618	-	1.3	20	116	0
Methyl tert-butyl ether	0.413	0.434	-	-5.1	20	139	0
Dibromofluoromethane	0.334	0.299	-	10.5	20	111	0
Benzene	0.798	0.806	-	-1	20	121	0
1,2-Dichloroethane-d4	0.41	0.311	-	24.1*	20	99	0
Chlorobenzene-d5	1	1	-	0	20	122	0
Toluene-d8	1.289	1.247	-	3.3	20	115	0
Toluene	0.574	0.588	-	-2.4	20	124	0
Chlorobenzene	0.607	0.642	-	-5.8	20	130	0
Ethylbenzene	1.057	1.088	-	-2.9	20	124	0
p/m Xylene	20	19.418	-	2.9	20	127	0
o Xylene	20	19.306	-	3.5	20	126	0
Styrene	20	19.344	-	3.3	20	126	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	122	0
Isopropylbenzene	10	9.526	-	4.7	20	125	0
4-Bromofluorobenzene	0.819	0.837	-	-2.2	20	125	0
Bromobenzene	0.424	0.463	-	-9.2	20	138	0
n-Propylbenzene	2.226	2.207	-	0.9	20	118	0
2-Chlorotoluene	1.539	1.53	-	0.6	20	120	0
1,3,5-Trimethylbenzene	1.624	1.563	-	3.8	20	123	0
4-Chlorotoluene	1.332	1.371	-	-2.9	20	125	0
tert-Butylbenzene	1.324	1.298	-	2	20	126	0
1,2,4-Trimethylbenzene	1.547	1.502	-	2.9	20	123	0
sec-Butylbenzene	10	9.526	-	4.7	20	132	0
p-Isopropyltoluene	10	9.55	-	4.5	20	137	0
1,3-Dichlorobenzene	0.846	0.912	-	-7.8	20	131	0
1,4-Dichlorobenzene	0.85	0.905	-	-6.5	20	131	0
n-Butylbenzene	10	9.117	-	8.8	20	116	0
1,2-Dichlorobenzene	0.762	0.819	-	-7.5	20	132	0
Hexachlorobutadiene	0.218	0.249	-	-14.2	20	146	0
1,2,4-Trichlorobenzene	10	10.317	-	-3.2	20	147	0
Naphthalene	10	9.876	-	1.2	20	137	0
1,2,3-Trichlorobenzene	0.412	0.487	-	-18.2	20	145	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2353444
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/21/23 15:03
Lab File ID	: V16230921N01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1830585-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	121	0
Carbon disulfide	0.626	0.602	-	3.8	20	114	0
Methyl tert-butyl ether	0.413	0.39	-	5.6	20	125	0
Dibromofluoromethane	0.334	0.297	-	11.1	20	111	0
Benzene	0.798	0.781	-	2.1	20	118	0
1,2-Dichloroethane-d4	0.41	0.312	-	23.9*	20	100	0
Chlorobenzene-d5	1	1	-	0	20	123	0
Toluene-d8	1.289	1.252	-	2.9	20	117	0
Toluene	0.574	0.558	-	2.8	20	119	0
Chlorobenzene	0.607	0.608	-	-0.2	20	125	0
Ethylbenzene	1.057	1.038	-	1.8	20	120	0
p/m Xylene	20	18.487	-	7.6	20	122	0
o Xylene	20	18.264	-	8.7	20	121	0
Styrene	20	18.329	-	8.4	20	121	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	124	0
Isopropylbenzene	10	8.998	-	10	20	120	0
4-Bromofluorobenzene	0.819	0.821	-	-0.2	20	125	0
Bromobenzene	0.424	0.427	-	-0.7	20	130	0
n-Propylbenzene	2.226	2.097	-	5.8	20	114	0
2-Chlorotoluene	1.539	1.446	-	6	20	116	0
1,3,5-Trimethylbenzene	1.624	1.477	-	9.1	20	118	0
4-Chlorotoluene	1.332	1.284	-	3.6	20	119	0
tert-Butylbenzene	1.324	1.205	-	9	20	119	0
1,2,4-Trimethylbenzene	1.547	1.404	-	9.2	20	117	0
sec-Butylbenzene	10	8.959	-	10.4	20	126	0
p-Isopropyltoluene	10	8.189	-	18.1	20	119	0
1,3-Dichlorobenzene	0.846	0.846	-	0	20	124	0
1,4-Dichlorobenzene	0.85	0.837	-	1.5	20	123	0
n-Butylbenzene	10	8.51	-	14.9	20	110	0
1,2-Dichlorobenzene	0.762	0.754	-	1	20	124	0
Hexachlorobutadiene	0.218	0.222	-	-1.8	20	133	0
1,2,4-Trichlorobenzene	10	9.438	-	5.6	20	137	0
Naphthalene	10	9.097	-	9	20	127	0
1,2,3-Trichlorobenzene	0.412	0.439	-	-6.6	20	133	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2353444
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 09/22/23 03:31
Lab File ID	: V16230922A01	Init. Calib. Date(s)	: 08/25/23 08/25/23
Sample No	: WG1830726-2	Init. Calib. Times	: 04:13 07:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	109	0
Carbon disulfide	0.626	0.638	-	-1.9	20	108	0
Methyl tert-butyl ether	0.413	0.44	-	-6.5	20	127	0
Dibromofluoromethane	0.334	0.298	-	10.8	20	100	0
Benzene	0.798	0.863	-	-8.1	20	117	0
1,2-Dichloroethane-d4	0.41	0.304	-	25.9*	20	87	0
Chlorobenzene-d5	1	1	-	0	20	109	0
Toluene-d8	1.289	1.262	-	2.1	20	104	0
Toluene	0.574	0.626	-	-9.1	20	119	0
Chlorobenzene	0.607	0.672	-	-10.7	20	123	0
Ethylbenzene	1.057	1.148	-	-8.6	20	118	0
p/m Xylene	20	20.447	-	-2.2	20	120	0
o Xylene	20	20.119	-	-0.6	20	118	0
Styrene	20	19.978	-	0.1	20	117	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	108	0
Isopropylbenzene	10	10.126	-	-1.3	20	118	0
4-Bromofluorobenzene	0.819	0.838	-	-2.3	20	111	0
Bromobenzene	0.424	0.479	-	-13	20	127	0
n-Propylbenzene	2.226	2.334	-	-4.9	20	111	0
2-Chlorotoluene	1.539	1.606	-	-4.4	20	112	0
1,3,5-Trimethylbenzene	1.624	1.643	-	-1.2	20	115	0
4-Chlorotoluene	1.332	1.408	-	-5.7	20	114	0
tert-Butylbenzene	1.324	1.348	-	-1.8	20	116	0
1,2,4-Trimethylbenzene	1.547	1.573	-	-1.7	20	114	0
sec-Butylbenzene	10	9.717	-	2.8	20	119	0
p-Isopropyltoluene	10	8.897	-	11	20	113	0
1,3-Dichlorobenzene	0.846	0.943	-	-11.5	20	120	0
1,4-Dichlorobenzene	0.85	0.937	-	-10.2	20	120	0
n-Butylbenzene	10	9.253	-	7.5	20	105	0
1,2-Dichlorobenzene	0.762	0.841	-	-10.4	20	120	0
Hexachlorobutadiene	0.218	0.233	-	-6.9	20	121	0
1,2,4-Trichlorobenzene	10	10.687	-	-6.9	20	135	0
Naphthalene	10	10.326	-	-3.3	20	128	0
1,2,3-Trichlorobenzene	0.412	0.502	-	-21.8*	20	133	0

* Value outside of QC limits.

Appendix E
Design Memorandums

E-1: Preliminary Chemical Isolation Layer Design Analysis

E-2: Erosion-Protection Evaluation

E-3: Ebullition-Facilitated NAPL Flux Calculation

Appendix E-1
Preliminary Chemical Isolation Layer Design Analysis

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Preliminary Chemical Isolation Layer Design Analysis

Prepared for Boston Gas Company d/b/a National Grid

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Preliminary Chemical Isolation Layer Design Analysis

Prepared for
National Grid
170 Data Drive
Waltham, Massachusetts 02451

Prepared by
Anchor QEA
9 Water Street, First Floor
Amesbury, Massachusetts 01913

Project Number: 180327-08.01
https://anchorqea-my.sharepoint.com/personal/bgauley_anchorqea_com/Documents/Haverhill/Phase_IV_Report/Appendix A - Anchor QEA Preliminary Ph IV/Appendix E - Design Memoranda/Appendix E-1 Cap Eval/App E-1_Prelim CIL Design Analysis.docx

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Figure 4 Upstream Segment: Model-Predicted TPAH16 Concentration in the Top 15 cm of a Cap with a 15 cm Chemical Isolation Layer Containing 1% GAC by Weight 17

Figure 5 Midstream Segment: Model-Predicted Benzene Concentration in the Top 15 cm of a Cap with a 182 cm Chemical Isolation Layer Containing 17% GAC by Weight 18

Figure 6 Downstream Segment: Model-Predicted TPAH16 Concentration in the Top 15 cm of a Cap with a 15 cm Chemical Isolation Layer Containing 5% GAC by Weight 20

ATTACHMENTS

Attachment 1 Haverhill Site-Specific Activated Carbon Adsorption Isotherm Study for BTEX

Attachment 2 Hydraulic Conditions in Sediment

Attachment 3 Figures of Cap Model Results

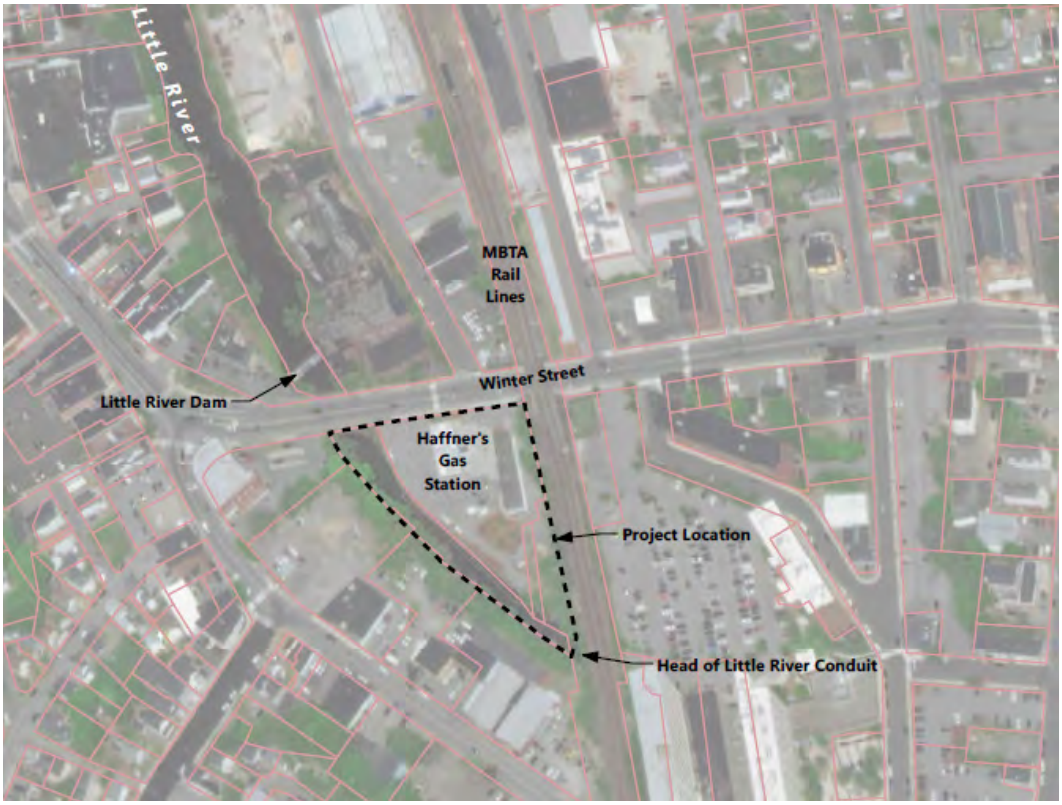
ABBREVIATIONS

µg/L	microgram per liter
BTEX	benzene, toluene, ethylbenzene, and xylenes
cm	centimeter
cm/day	centimeter per day
cm/hr	centimeter per hour
cm/s	centimeter per second
cm/yr	centimeter per year
cm^2/s	square centimeter per second
cm^2/yr	square centimeter per year
COC	constituent of concern
CSO	combined sewer outfall
f_{OC}	fraction organic carbon
ft/ft	foot per foot
GAC	granular activated carbon
g/cm^3	gram per cubic centimeter
hr	hour
K_d	equilibrium partition coefficient
K_{OC}	organic carbon partition coefficient
L/kg	liter per kilogram
mg/kg	milligram per kilogram
MGP	manufactured gas plant
NAPL	nonaqueous phase liquid
PAH	polycyclic aromatic hydrocarbon
PEC	probable effects concentration
Phase III RAP	*Phase III Remedial Action Plan*
Phase IV RIP	*Phase IV Remedy Implementation Plan*
Site	284 Winter Street in Haverhill, Massachusetts
TOC	total organic carbon
TPAH	total polycyclic aromatic hydrocarbons (16 priority pollutants)
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
yr^{-1}	per year

1 Introduction

This appendix to the *Phase IV Remedy Implementation Plan* (Phase IV RIP) describes design evaluations of a cap chemical isolation layer for the former manufactured gas plant (MGP) at 284 Winter Street and adjacent portion of the Little River in Haverhill, Massachusetts (Site). The former MGP was located on property that abuts the east side of the Little River that is currently owned by HEG 284 Winter Street LLC and operated as a Haffner's gas station and car wash (Figure 1). The Site comprises an upland portion and an in-river portion; this appendix applies to the sediments in the in-river portion (hereinafter "Site" refers to the in-river portion unless otherwise stated).

Figure 1
Site Map



Nonaqueous phase liquid (NAPL) is present in the sediments and within the upland portion of the Site, and elevated polycyclic aromatic hydrocarbons (PAH) and volatile organic compounds (VOC) concentrations have been detected in Site groundwater and sediment porewater. The Phase II risk assessment for the Site identified PAHs as having the potential to pose a risk to aquatic receptors in sediments (see Section 7 of Appendix C of *Phase II Comprehensive Site Assessment – 284 Winter Street Haverhill, Massachusetts RTNs 3-32792 and 3-32875* [GZA 2022]). An evaluation of the Site

groundwater and sediment data indicates that VOCs—particularly BTEX compounds (benzene, toluene, ethylbenzene, and xylenes)—are also present at concentrations that are of concern. Potential non-MGP sources of VOCs include current gas station operations, historical spills, storm water drainage from Winter Street and other nearby paved areas, and combined sewer outfalls (CSOs). The CSOs discharge in the northern portion of the Site.

This appendix describes chemical transport modeling conducted to evaluate the design of an engineered cap to address flux of dissolved-phase constituents of concern (COCs), including PAHs and BTEX from Site sediment. A design evaluation of the use of an absorption layer to address NAPL is presented in Section 5.5 of the Phase IV RIP. Together, the dissolved phase chemical isolation layer and the NAPL absorption layer would provide overall protection of aquatic receptors from Site COCs.

The modeling analyses described herein were performed in accordance with guidance on cap design set forth by the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (Palermo et al. 1998) and the Interstate Technology and Regulatory Council (ITRC 2014, 2023). The primary goal of this modeling was to simulate the transport of dissolved-phase PAHs and BTEX within an engineered cap to identify a chemical isolation layer design configuration (i.e., thickness and composition, including whether sorptive amendments would be included and, if so, the amounts) that would provide long-term effectiveness in limiting concentrations at the cap surface to which benthic organisms can be exposed.

2 Approach

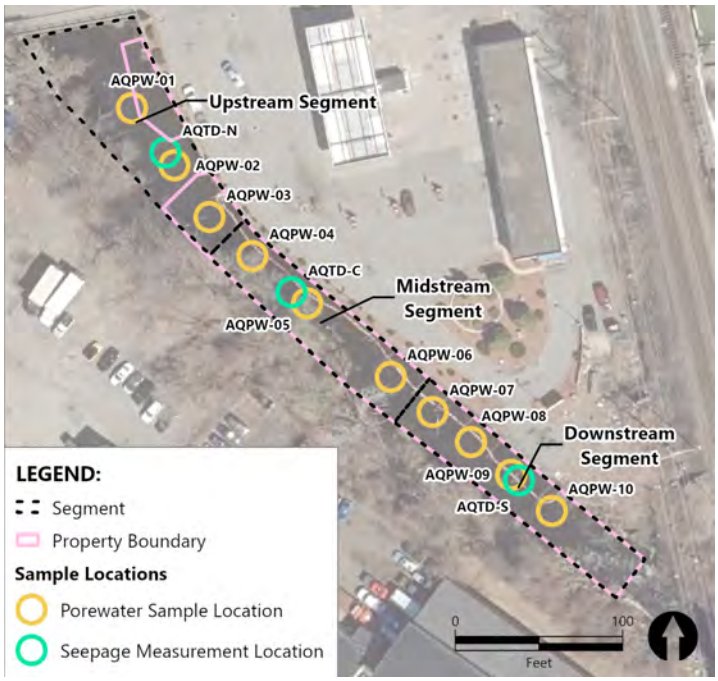
2.1 Model Framework

The widely used 1D model of chemical transport within sediment caps, CapSim (version 4.2; Reible 2023), was used for this evaluation. This model simulates the time variable fate and transport of chemicals (dissolved and sorbed phases, including partitioning between these phases) under the processes of advection, diffusion/dispersion, biodegradation, bioturbation/bioirrigation, and exchange with the overlying surface water within a sediment cap. Details on the model structure and underlying theory and equations are provided in Lampert and Reible (2009), Go et al. (2009), and Shen et al. (2018). CapSim and its predecessors have been used to support the evaluation and design of sediment caps at numerous domestic and international sites, including Gloucester Harbor in Massachusetts (Anchor QEA and GZA 2015).

2.2 Dissolved-Phase Chemical Isolation Layer Evaluation Segments

For the purposes of evaluating the cap dissolved-phase chemical isolation layer design, the Site was divided into three segments based on observed differences in porewater COC concentrations and groundwater seepage rates (see Sections 3.2 and 3.3, respectively, for details). The segments were designated as Upstream, Midstream, and Downstream (Figure 2). The chemical isolation layer design was evaluated separately for each segment.

Figure 2
Site Segments for Cap Modeling Evaluation



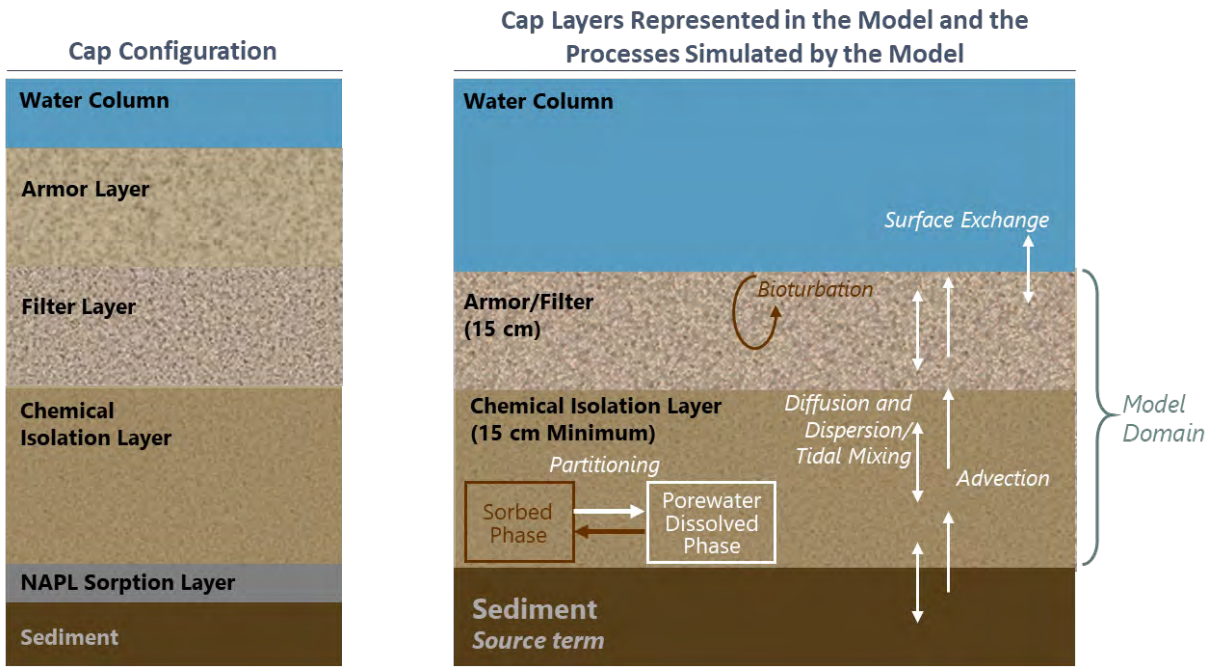
2.3 Model Domain and Layers

The model was configured to represent the presence of a multilayer cap placed atop the sediment surface. The cap design consisted of the following four basic layers, listed from top to bottom: 1) armor layer to resist erosive forces; 2) filter layer to prevent intermixing of the armor and chemical isolation layers; 3) chemical isolation layer to address dissolved-phase contaminant transport; and 4) NAPL-absorption layer. The design evaluation for the NAPL-absorption layer is presented in Section 5.5 of the Phase IV RIP. The design evaluations for the armor and filter layers are presented in Appendix A of the *Phase III Remedial Action Plan* (Phase III RAP).

Figure 3 is a schematic showing the cap layers represented in the model and the processes simulated by the model. The NAPL-absorption layer and a portion of the armor and filter layers were excluded from the model domain for the following reasons:

1. The NAPL-absorption layer is allocated to the function of addressing the potential for transport of NAPL from the underlying sediment, so the potential for sorption of dissolved-phase chemicals by that layer in the absence of any NAPL transport was conservatively excluded from this model evaluation.
2. Based on the preliminary design evaluation in Appendix A of the Phase III RAP, the minimum armor and filter layer thicknesses are 23 centimeters (cm; 9 inches) and 15 cm (6 inches), respectively. Upon placement, the armor layer is not likely to provide much attenuation; however, over time, it is expected that the interstitial spaces of the armor stone would fill in from depositing sediment. The timing of that is uncertain; therefore, conservatively, only a portion of the filter, armor, and future deposited sediment that will fill in the interstices were represented. To represent these layers in the model, only 15 cm of the total 38 cm were included in the model domain to simulate the portion of the cap material above the chemical isolation layer. It is within this armor/filter layer where bioturbation was simulated with the model (Figure 3).

Figure 3
Cap Configurations and Processes Simulated



Note: Not to scale

2.4 Design Target Concentrations and Compliance Depth

At the Site, compliance with remedial endpoints was evaluated in the cap surface. The cap surface is defined as the vertical average concentration over the top 15 cm (6 inches) of the cap model domain, to maintain consistency with the sediment depth interval evaluated for the Phase II risk assessment (Section 7 of Appendix C of *Phase II Comprehensive Site Assessment* [GZA 2022]). Model-predicted concentrations at the cap surface over time were compared to design targets (i.e., numerical COC concentration thresholds) to evaluate protectiveness of candidate cap configurations. For the purposes of this evaluation, long-term cap effectiveness was based on maintaining model-predicted concentrations in the top 15 cm of the cap below the design target for a minimum of 100 years. Design target concentrations were selected for each COC, as discussed in the following paragraphs.

The probable effects concentration (PEC) for total PAH 16 (TPAH16) of 22.8 milligrams per kilogram (mg/kg) is a consensus-based sediment-quality guideline for freshwater sediments (MacDonald et al. 2000) that has been used at other sites (e.g., MVVA et al. 2022) as the point of comparison to evaluate the long-term effectiveness of an engineered cap. However, it is anticipated that the dam just upstream of the Site will be removed at some point in the near future (Fuss and O'Neill 2021).

Average sediment concentrations upstream of the dam (i.e., local conditions[1]) are 29.9 mg/kg TPAH16 (see Section 5.2.1 of the *Phase II Comprehensive Site Assessment* [GZA 2022]), which is greater than the TPAH16 PEC (22.8 mg/kg). Removal of the dam will allow sediments with these assumed local conditions concentrations to deposit on top of the cap. Therefore, for the purposes of this evaluation, long-term cap effectiveness for TPAH16 was based on maintaining model-predicted concentrations in the top 15 cm of the cap below the local conditions-based TPAH16 concentration of 29.9 mg/kg for a 100-year simulation period. Use of a local conditions-based target concentration is common practice, particularly at sites where site-specific targets were not developed.

BTEX compounds do not have similar consensus-based sediment PEC values, and local conditions concentrations of BTEX in sediment upstream of the dam have not been measured. PEC-equivalent concentrations (considered to be those concentrations above which adverse effects may be likely) for BTEX compounds were established based on a review of relevant guidance. Because Massachusetts does not have guidance values for BTEX compounds in sediment, New York State Class C freshwater sediment guidance values, which were conservative screening values derived through equilibrium partitioning calculations (NYSDEC 2014), were selected as the target criteria for the Site.

The TPAH16 and BTEX design target concentrations are presented in Table 1.

Table 1
Target Concentrations in Site Sediment

COC	Target Criteria (mg/kg)
TPAH16	29.9
Benzene	1.9
Toluene	4.5
Ethylbenzene	3.7
Total xylenes	5.2

Note:
Total xylenes is the sum of *m,p*-xylene and *o*-xylene.

[1] Local conditions, as defined by the Massachusetts Department of Environmental Protection's Guidance for Disposal Site Risk Characterization, Section 9.4, "are concentrations of OHM that are higher than background levels, but nevertheless ubiquitous throughout the vicinity of the Site and are attributable to sources other than the site in question" (MassDEP 1995).

3 Model Inputs

The model uses several input parameters that describe chemical-specific properties, cap material properties, and chemical mass transfer rates. These parameters are based on Site-specific data, information from the literature, and experience with cap design at similar sites. The model input parameters, the values used for this modeling assessment, and the source(s) from which they were derived are provided in Table 2. More details describing certain key model inputs are provided in Sections 3.1 through 3.3.

Table 2
Input Parameter Values for the Chemical Isolation Cap Model

Model Input Parameter	Value	Data Source
Chemical-Specific Properties		
Porewater COC concentrations (µg/L)	See Table 3	Site-specific porewater data. See Section 3.1 for more details.
Partitioning onto sand or gravel cap materials (L/kg)	See Table 4	Literature -based K_{OC} values from USEPA (2003). See Section 3.2.1 for more details.
Partitioning of PAHs onto granular activated carbon (GAC) included as a cap amendment (L/kg)	See Table 5	Ten times the literature based K_{OC} values from USEPA (2003) for PAHs. See Section 3.2.2 for more details.
Partitioning of BTEX onto granular activated carbon (specifically, Freundlich isotherm parameters K_f [µg/kg/(µg/L)$^{1/n}$] and 1/n)	See Table 5	Site-specific sorption isotherm study results for BTEX with Filtrasorb 400 GAC. See Section 3.2.2 for more details.
Molecular diffusivity (cm^2/s)	PAHs: 5.0×10^{-6} to 8.6×10^{-6} BTEX: 9.8×10^{-6} to 1.2×10^{-5}	Calculated based on the molecular weight of the chemical compound (i.e., individual PAHs and BTEX) using the correlation identified from Schwarzenbach et al. (1993). The model calculates an effective diffusion coefficient using the chemical-specific input value for the molecular diffusivity multiplied by a tortuosity factor that is a function of the material porosity (Lampert and Reible 2009).
Chemical biodegradation rate (yr^{-1})	0	Assumed no degradation, which is conservative for PAHs and BTEX given they have been shown to degrade in sediments under certain conditions.
Chemical Isolation Layer Properties		
Thickness (cm)	Variable	Design parameter; started with a chemical isolation layer thickness of 15 cm and increased as necessary to maintain COC concentrations in the top 6 inches of the cap less than the target concentrations.
Dry bulk density (g/cm^3)	Variable	Sand: 1.6 g/cm^3, calculated based on typical particle density of 2.6 g/cm^3 and porosity of 0.4 for sand (see next row). GAC: 0.54 g/cm^3, based on the Filtrasorb 400 data sheet (Calgon Carbon 2015). The dry bulk density of the chemical isolation layer depends on the relative amounts of sand and GAC and is calculated in CapSim using the user-specified weight percent of each.

Model Input Parameter	Value	Data Source
Total porosity	Variable	Based on typical value of 0.4 for sand (e.g., Domenico and Schwartz 1990) and a typical value of 0.6 for GAC (default value from CapSim 4.2). The porosity of the chemical isolation layer depends on the relative amounts of sand and GAC and is calculated in CapSim using the user-specified weight percent of each.
Fraction organic carbon of sand (f_{OC}; %)	0.1	A lower-bound estimate typically used to represent quarry sand in which sorption to mineral fractions can also occur (Karickhoff 1984; USEPA 2000).
Sand content (wt %)	Variable	Design parameter; started with 100% sand and decreased as necessary to include sufficient GAC to maintain COC concentrations in the top 15 cm of the cap less than the target concentration.
GAC content (wt %)	Variable	Design parameter; started with no GAC and increased as necessary to maintain COC concentrations in the top 15 cm of the cap less than the target concentration.
Armor/Filter Layer		
Thickness (cm)	15	Conservatively simulated only 15 cm of granular material to represent a portion of the armor layer, filter layer, and future deposited sediment that will infill the interstices.
Dry bulk density (g/cm^3)	1.7	Calculated based on typical particle density of 2.6 g/cm^3 and porosity of 0.35 (see next row).
Total porosity	0.35	Typical value for gravel consistent with filter and/or armor stone that is infilled from deposition (e.g., Domenico and Schwartz 1990).
f_{OC} (%)	1.0 in top 10 cm 0.1 in bottom 5 cm	A value of 1% in the top 10 cm (bioturbation zone) was selected based on experience from other sites and the assumption that, over time, the f_{OC} at the cap surface will increase toward levels of the sediment expected to deposit on the cap after dam removal. In the armor/filter layer below the bioturbation zone, a nominal f_{OC} of 0.1% was assumed.
Mass Transport Properties		
Boundary layer mass transfer coefficient (cm/hr)	0.3	Midpoint of range of values compiled from laboratory and field measurements reported in the literature (e.g., Thibodeaux et al. 2001) and values calibrated as part of models of sediment/water exchange at other sites (e.g., USEPA 2006).

Model Input Parameter	Value	Data Source
Groundwater seepage rate (cm/yr)	Upstream Segment: 88 Midstream Segment: 1,300 Downstream Segment: 130	Based on Site-specific data collected to characterize current hydraulic conditions. See Section 3.3 for more details.
Tortuosity factor for molecular diffusion	Millington and Quirk	Model uses an empirical relationship with porosity to calculate a tortuosity factor that is multiplied by the chemical-specific molecular diffusion coefficient to result in an effective diffusion coefficient associated with porous media flow. The Millington and Quirk (1961) relationship was used because it is applicable to granular (sand and gravel) materials.
Net sedimentation rate (cm/yr)	0	Although it is likely that some deposition of sediment from upstream will occur following removal of the dam, conservatively no net sedimentation was assumed in the model. That is, the model domain thickness was held constant.
Dispersion length (cm)	6.4	Dispersion length was calculated from the relationship developed by Neuman (1990), which relates dispersion length to domain length, and considerations presented in Cherry (2023). An order-of-magnitude domain length of 2 meters was used in this calculation.
Bioturbation depth (cm)	10	Recommended value for cap design in freshwater systems based on literature (e.g., Clarke et al. 2001; USEPA 2015).
Porewater biodiffusion coefficient (cm^2/yr)	100	Parameter represents bioturbation rate applied to dissolved phase; typical value for freshwater systems (e.g., Thibodeaux and Mackay 2011).
Particle biodiffusion coefficient (cm^2/yr)	1	Parameter represents bioturbation rate applied to particulate phase; typical value for freshwater systems (e.g., Thibodeaux and Mackay 2011).
Consolidation thickness (cm) and time (years) to reach 90% consolidation for underlying sediment	None	For the purpose of the Phase IV RIP, the effects of consolidation of sediment beneath the cap, which can result in an additional upward flux of porewater, were excluded. It was assumed that dredging to accommodate the cap would occur prior to capping, so consolidation, if any, would be nominal.

3.1 Porewater Concentrations

The COC concentrations of the porewater in sediment beneath the cap define the source term in the cap model. Because NAPL is present in the sediments and within the upland portion of the Site and elevated COC concentrations have been detected in Site groundwater, the modeling was conducted with the assumption that the upland and river sediment beneath the cap would represent an infinite source of COCs (i.e., COC concentrations in porewater beneath the cap held constant over time in the model).[2]

Porewater was sampled at 10 locations at the Site during the 2022 Field Investigation sampling program (see Section 2.2 of the Phase IV RIP for details). NAPL observed in many of the sediment samples collected at the Site has the potential to be entrained in porewater samples collected via pumping and influence measured concentrations. To prevent the 2022 Field Investigation porewater samples from being unduly affected by NAPL entrainment, each dissolved phase porewater sample was pumped through an inert, porous ceramic water filter (capillary barrier) to collect a porewater sample representative of the dissolved phase COCs, excluding NAPL (Anchor QEA 2022).

A review of the porewater data indicates spatial patterns in Site PAH and BTEX concentrations. PAH concentrations are generally similar among the three segments, though the highest total PAH concentration was measured in the Downstream segment. Large differences in BTEX concentrations were observed among the three segments. The highest BTEX concentrations were measured in the Midstream segment. The maximum reported concentration of each individual PAH and BTEX compound in each segment was used to define the porewater source term in the model. Porewater concentrations used in the model are listed in Table 3.

Table 3
Porewater COC Concentrations Used in the Model by Segment

COC	Upstream (µg/L)	Midstream (µg/L)	Downstream (µg/L)
Acenaphthene	110	79	140
Acenaphthylene	20	3.7	31
Anthracene	9.5	11	7.4
Benzo(a)anthracene	20	20	20
Benzo(a)pyrene	20	20	20
Benzo(b)fluoranthene	20	20	20
Benzo(k)fluoranthene	20	20	20
Benzo(g,h,i)perylene	20	20	3.1

[2] Upland remedies are presently being evaluated, and if the source of COCs is partially or fully addressed (to the extent practicable), the characteristics of the model source term (infinite vs. finite) and the associated COC porewater concentrations may be revisited.

COC	Upstream (µg/L)	Midstream (µg/L)	Downstream (µg/L)
Dibenzo(a,h)anthracene	20	20	20
Indeno(1,2,3-c,d)pyrene	20	20	20
Chrysene	20	20	20
Fluoranthene	3.9	5.8	20
Fluorene	52	44	48
Naphthalene	3,600	5,400	5,900
Phenanthrene	71	67	54
Pyrene	20	4.0	20
TPAH16	4,100	5,800	6,400
Benzene	42	16,000	3,300
Toluene	29	130	40
Ethylbenzene	1,200	3,500	1,600
Total xylenes	1,000	5,300	2,100

Notes:
Values are rounded to two significant figures.
The porewater TPAH16 concentration is calculated based on the maximum individual PAH concentrations for each cap segment and is shown for reference only. The individual PAH compounds that compose TPAH16 are simulated separately, and the TPAH16 concentration is calculated as the sum of the model results of the individual compounds.
Total xylenes is simulated as the sum of *m,p*-xylene and *o*-xylene.

3.2 Partition Coefficients

3.2.1 Partitioning onto Sand or Gravel Cap Materials

Linear partitioning of chemicals between the dissolved and sorbed phases (i.e., between porewater and unamended cap material) is described in the model by the chemical-specific equilibrium partition coefficient (K_d). The partition coefficient is calculated in the model based on the customary $K_d = f_{OC}*K_{OC}$ approach (e.g., Karickhoff 1984), where K_{OC} is the compound's organic carbon partition coefficient and f_{OC} is the organic carbon fraction of the solid phase (e.g., unamended cap material). Because of a lack of Site-specific data, partition coefficients were set to the literature-based K_{OC} values from USEPA (2003) for PAHs and USEPA (2018) for BTEX (Table 4), which is a customary approach for this type of analysis.

Table 4
Partition Coefficients Used in the Model for Unamended Sand or Gravel Cap Material

Chemical Name	Log K_{OC} (log L/kg)
Acenaphthene	3.9
Acenaphthylene	3.2
Anthracene	4.5

Chemical Name	Log K_{OC} (log L/kg)
Benzo(a)anthracene	5.6
Benzo(a)pyrene	6.0
Benzo(b)fluoranthene	6.2
Benzo(k)fluoranthene	6.2
Benzo(g,h,i)perylene	6.4
Dibenzo(a,h)anthracene	6.6
Indeno(1,2,3-c,d)pyrene	6.6
Chrysene	5.6
Fluoranthene	5.0
Fluorene	4.1
Naphthalene	3.3
Phenanthrene	4.5
Pyrene	4.8
Benzene	2.2
Toluene	2.4
Ethylbenzene	2.6
Total xylenes	2.6

3.2.2 Partitioning onto GAC

3.2.2.1 PAHs

Sorption of PAHs onto GAC has been well studied and documented in the literature and has been shown to be at least 10 to 100 times more sorbent than natural organic matter (e.g., Jonker and Koelmans 2002; Hale and Werner 2010). Thus, the literature-based log K_{OC} values in Table 4 were multiplied by 10 to represent sorption of PAHs onto GAC in this modeling evaluation (Table 5).

3.2.2.2 BTEX

BTEX compounds have a relatively high mobility, and partitioning values for GAC in the literature vary greatly. Therefore, a Site-specific isotherm study was performed to provide information on Site-specific partitioning of BTEX compounds onto GAC. Attachment 1 of this appendix presents the Site-specific isotherm study for three different activated carbons, which were selected for this study based on their reported effectiveness, availability, and cost. Of the three activated carbons tested, Filtrasorb 400 showed the highest adsorption capacity across the range of aqueous-phase equilibrium concentrations, and the sorption data from the testing were well-described by a Freundlich isotherm (which is consistent with existing literature). The Site-specific Filtrasorb 400 Freundlich isotherm values were, therefore, used as inputs for the cap model to represent partitioning onto GAC for BTEX (Table 5).

Table 5
Parameters Used in the Model to Represent Sorption of PAHs and BTEX onto GAC

Chemical Name	Linear Isotherm Log K_{AC} (log L/kg)	Freundlich Isotherm		
		K_f (mg/kg/(mg/L)$^{1/n}$)	K_f (µg/kg/(µg/L)$^{1/n}$) (units required by CapSim)	1/n (unitless)
Acenaphthene	4.9	—	—	—
Acenaphthylene	4.2	—	—	—
Anthracene	5.5	—	—	—
Benzo(a)anthracene	6.6	—	—	—
Benzo(a)pyrene	7.0	—	—	—
Benzo(b)fluoranthene	7.2	—	—	—
Benzo(k)fluoranthene	7.2	—	—	—
Benzo(g,h,i)perylene	7.4	—	—	—
Dibenzo(a,h)anthracene	7.6	—	—	—
Indeno(1,2,3-c,d)pyrene	7.6	—	—	—
Chrysene	6.6	—	—	—
Fluoranthene	6.0	—	—	—
Fluorene	5.1	—	—	—
Naphthalene	4.3	—	—	—
Phenanthrene	5.5	—	—	—
Pyrene	5.8	—	—	—
Benzene	—	18	960,000	0.42
Toluene	—	33	2,600,000	0.37
Ethylbenzene	—	52	6,100,000	0.31
Total xylenes	—	55	7,400,000	0.29

Notes:
Total xylenes is simulated as the total of *m,p*-xylene and *o*-xylene.
The Filtrasorb 400 isotherm for *o*-xylene had a lower adsorption capacity than that of *m,p*-xylene and was, therefore, conservatively selected to represent sorption of total xylenes to GAC in the model.
Values are rounded to two significant figures.
—: not applicable

3.3 Groundwater Seepage Rates

To support the capping evaluations, data were collected and evaluated to characterize current hydraulic conditions in Site sediment. Attachment 2 presents a detailed summary of the sampling and analysis conducted to characterize seepage rates in the three Site segments. The following field activities were conducted to characterize hydraulic conditions in the Site sediment:

- Continuous recording of hydraulic head at pairs of piezometers installed in the sediment to calculate vertical hydraulic gradient (i_v). Vertical hydraulic gradient data were measured at three locations along the river between November 3, 2022, and July 21, 2023.

- Vertical hydraulic conductivity (K_v) measurements were conducted in the field on November 4, 2022, by gravity drainage tests. Cores collected for these tests were co-located with the paired piezometers.

The product of these two parameters is the groundwater seepage rate expressed as a Darcy flux, with units of length per unit time, as shown in Equation 1.

Equation 1

$$q = K_v \cdot i_v$$

where:

q	=	seepage rate (L/T)
K_v	=	vertical hydraulic conductivity (L/T)
i_v	=	vertical hydraulic gradient (L/L)

Long-term average seepage rates over the course of the 9-month piezometer deployment were calculated for each segment and are summarized in Table 6.

Table 6
Summary of Seepage Rate Values

Segment	K_v (cm/s)	i_v (feet/feet)	Seepage Rate (cm/s)	Seepage Rate (cm/yr)
Upstream	2.8E-05	0.10	2.8E-06	88
Midstream	6.1E-04	0.066	4.1E-05	1,300
Downstream	2.1E-04	0.019	4.2E-06	130

Note:
Values are rounded to two significant figures.

4 Model Results

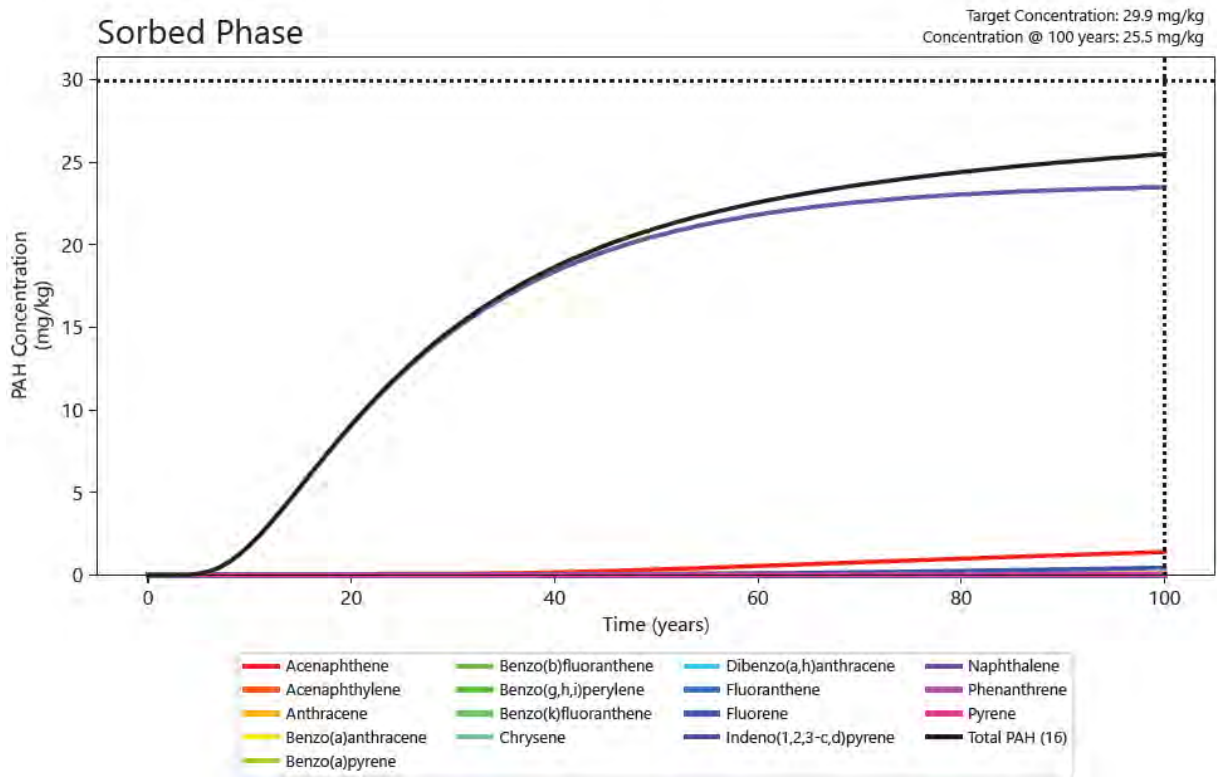
The model was used to simulate the transport of PAH and BTEX compounds within a cap and assess the ability of candidate cap configurations to maintain COC concentrations in the top 15 cm of the cap at values less than the target concentrations for more than 100 years. Because of differences in chemical properties (i.e., mobility), the individual PAH compounds that compose TPAH16 were simulated separately, and the TPAH16 concentration was calculated based on the sum of the model-predicted concentrations for each individual compound. Model performance was evaluated by comparing model-predicted solid phase TPAH16 and BTEX concentrations from the top 15 cm of the cap (expressed as a vertical average) to the corresponding target concentrations (see Section 2.4 and Table 1).

The three Site segments were simulated separately because of the spatial differences in porewater concentrations and seepage rates discussed in Sections 3.2 and 3.3, respectively. For each segment, the model was initially set up to represent a cap with a 6-inch-thick chemical isolation layer composed of sand only. The model was then run iteratively to identify the chemical isolation layer thickness and GAC content needed to meet the target COC concentrations throughout the 100-year simulation. The GAC content was increased in 1% increments, and cap thickness was increased in half-foot increments during these iterative simulations.

4.1 Upstream Segment

For the Upstream segment, model results indicated that a chemical isolation layer composed of 6 inches of sand with 1% GAC by weight would be sufficient to maintain TPAH16 and BTEX concentrations at values less than the respective targets for more than 100 years. Because of the relatively lower groundwater seepage rate and BTEX concentrations in this segment, TPAH16 is the driving chemical. Figure 4 shows that the model-predicted TPAH16 concentrations in the top 15 cm of the cap remain below the target value throughout the 100-year simulation. Attachment 3 includes a full set of figures showing TPAH16 and BTEX model-predicted concentrations with depth at different times during the 100-year simulation (Figures 1 through 5) and over time in the top 15 cm of the cap (Figures 6 through 10).

Figure 4
Upstream Segment: Model-Predicted TPAH16 Concentration in the Top 15 cm of a Cap with a 15 cm Chemical Isolation Layer Containing 1% GAC by Weight



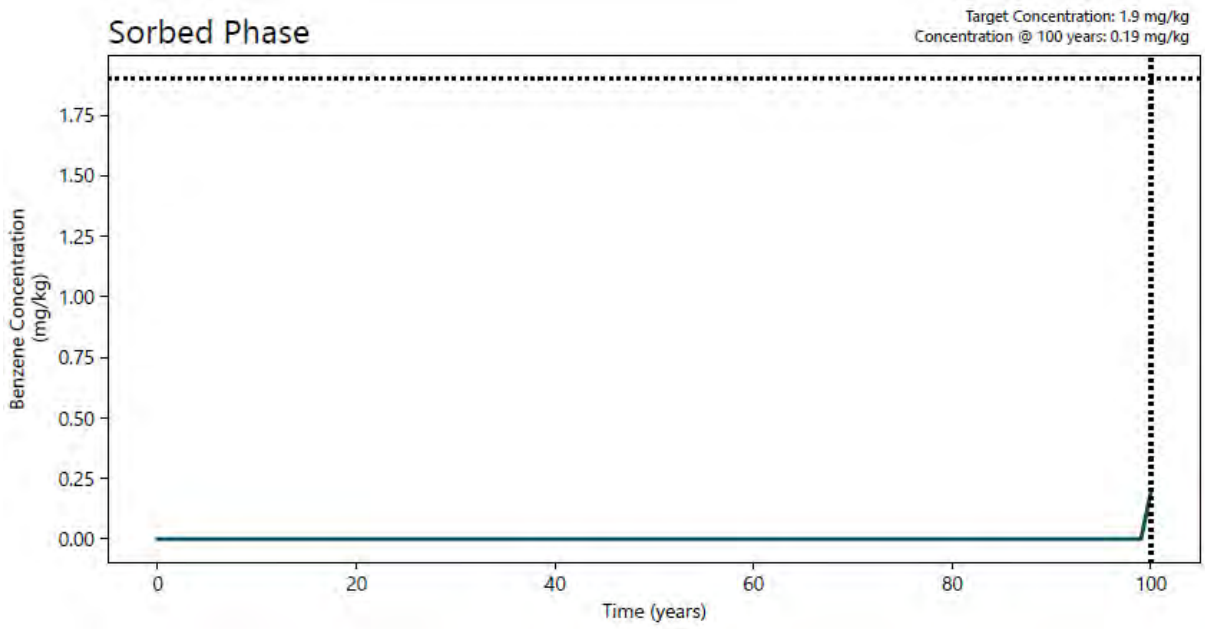
Notes:
The vertical dotted line at 100 years represents the length of time the cap was simulated.
The horizontal dotted line at 29 mg/kg represents the target concentration.

4.2 Midstream Segment

For the Midstream segment, which has the highest observed BTEX concentrations and groundwater seepage rate (by far), model results indicated that 6 inches of sand alone would not be sufficient to meet design targets. Benzene is a mobile chemical with a log K_{OC} of 2.2 L/kg (USEPA 2018) and is the contaminant that drives cap design in this segment. A 6-inch chemical isolation layer with a moderate GAC dose of 5% by weight was also found to be insufficient for meeting the design targets (predicted TPAH concentrations exceeded the target within 10 years, and benzene exceeded the target within 2 years). As shown in Figure 5, the iterative model evaluations indicated that a 6-foot-thick chemical isolation layer containing 17% GAC by weight would be needed to meet the design target for benzene for more than 100 years. A cap with a minimum 6-foot-thick chemical isolation layer is not constructable due to Site constraints. Attachment 3 includes a full set of figures showing model-predicted TPAH16 and BTEX concentrations with depth at different times during the 100-year simulation (Figures 11 through 15) and over time in the top 15 cm of the cap (Figures 16 through 20).

These cap modeling evaluations indicate that capping may not be a feasible remedial technology in the Midstream segment under the current conditions. If cap constructability allows, it may be possible to decrease the thickness of the cap by increasing the GAC content in the chemical isolation layer. But even if 100% GAC were used, the chemical isolation layer would still need to be a minimum of 2.5 feet thick to meet the design target for benzene. This thickness is considered impractical, because the removal depth for this cap necessary to maintain the current riverbed elevations could not be achieved without consideration of the structural stability of the retaining wall along the eastern side of the river. Alternatively, it may be possible to construct a cap on grade in the vicinity of the retaining wall if approved during the environmental permitting process. Regardless, a 2.5-foot-thick layer of 100% GAC is likely cost prohibitive.

Figure 5
Midstream Segment: Model-Predicted Benzene Concentration in the Top 15 cm of a Cap with a 182 cm Chemical Isolation Layer Containing 17% GAC by Weight



Notes:
The vertical dotted line at 100 years represents the length of time that the cap was simulated.
The horizontal dotted line at 1.9 mg/kg represents the target concentration.

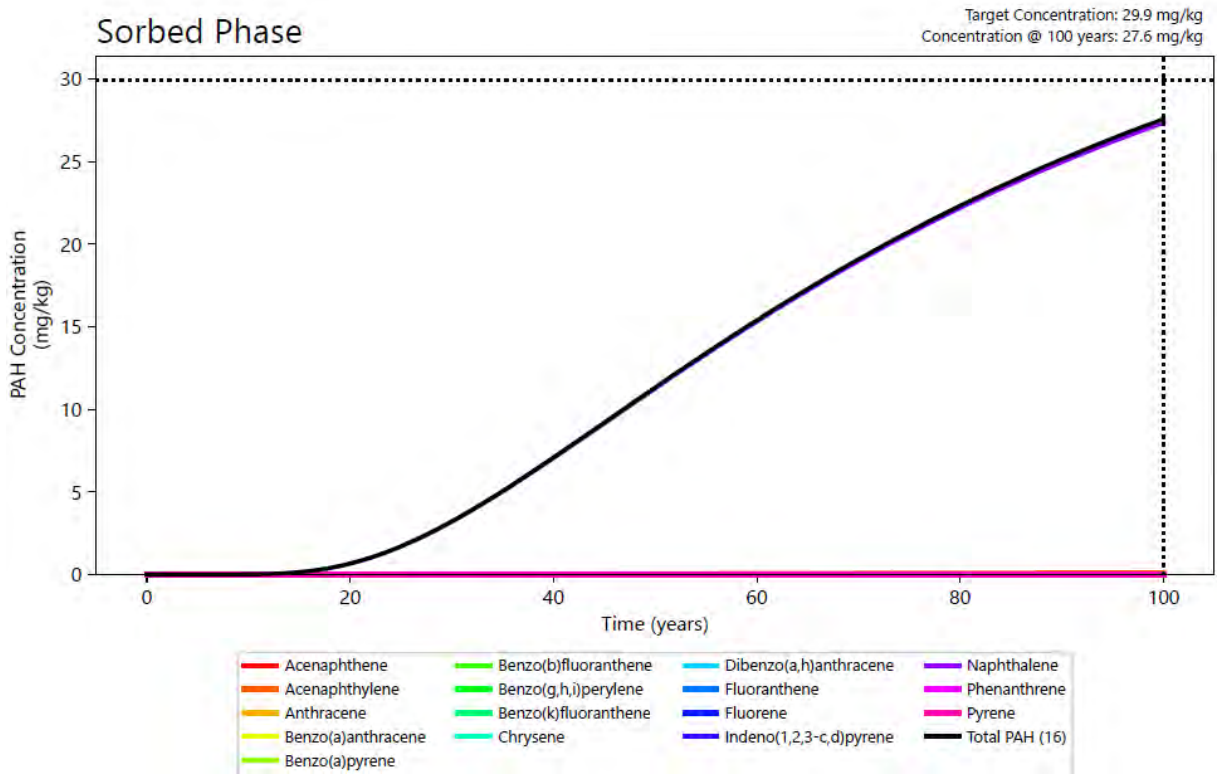
Alternatively, if upland source control were successfully implemented such that the porewater concentrations beneath the cap were reduced substantially within a relatively short timeframe, a thinner cap may be feasible to meet design targets without compromising the integrity of the wall. Upland remedies are being evaluated to address the source of BTEX in soil and groundwater (to the extent practicable). Therefore, the current BTEX porewater concentrations that are used as the source term in the cap model may not be representative of future Site conditions—depending on the

outcome of these ongoing evaluations. Thus, a sensitivity analysis was conducted to evaluate the maximum BTEX concentrations that could be managed by a cap that was designed to address TPAH16. Iterative modeling evaluations showed that a 30 cm chemical isolation layer containing 30% GAC by weight would be needed to address the maximum TPAH16 concentrations measured in porewater for more than 100 years in the Midstream segment. This cap configuration is predicted to be sufficient to meet the design targets for toluene and ethylbenzene at the current maximum porewater concentrations of 130 and 3,500 µg/L, respectively. However, future reductions in benzene and xylene porewater concentrations would need to occur for this cap configuration to meet the design targets for those COCs. The maximum benzene porewater concentration that this cap could manage for a period of 100 years is predicted to be 2,500 µg/L (this is an 84% reduction in benzene concentrations compared to the current maximum benzene porewater concentration of 16,000 µg/L in the Midstream segment). The maximum xylene porewater concentration that this cap configuration could address for a period of more than 100 years is 4,500 µg/L (this is a 15% reduction in xylene concentration compared to the current maximum xylene porewater concentration of 5,300 µg/L in the Midstream segment).

4.3 Downstream Segment

For the Downstream segment, model results indicated a chemical isolation layer consisting of 6 inches of sand amended with 5% GAC by weight would be needed to meet the design targets. TPAH16 drives cap design in this segment, and Figure 6 shows the TPAH16 model results for this cap configuration in this segment. Attachment 3 includes a full set of figures showing model-predicted TPAH16 and BTEX concentrations with depth at different times during the 100-year simulation (Figures 21 through 25) and over time in the top 15 cm of the cap (Figures 26 through 30).

Figure 6
Downstream Segment: Model-Predicted TPAH16 Concentration in the Top 15 cm of a Cap with a 15 cm Chemical Isolation Layer Containing 5% GAC by Weight



Notes:
The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The horizontal dotted line at 1.9 mg/kg represents the target concentration.

5 Summary and Next Steps

Numerical modeling was conducted to assess the design of engineered caps to address dissolved-phase PAH and BTEX flux from Site sediment by evaluating the long-term performance of a cap's chemical isolation layer. The cap modeling evaluations presented in this appendix indicate that capping may not be a feasible remedial technology in the Midstream segment of the Site under current conditions because the Midstream segment would need a minimum of 2.5 feet of 100% GAC (or 6 feet of 17% GAC) to meet design targets, which is impracticable due to the need to maintain the current riverbed elevations to avoid potentially destabilizing the adjacent retaining wall. As described in Section 4.2, if the ongoing source of BTEX from the upland portion of the Site were remediated prior to capping (i.e., need to demonstrate that benzene concentrations are reduced by at least 84%), these evaluations could be revisited to assess those changed conditions. For the Upstream and Downstream segments, a 6-inch chemical isolation layer with 1% and 5% GAC by weight, respectively, would meet the design targets.

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Attachment 1
Haverhill Site-Specific Activated Carbon Adsorption Isotherm Study for BTEX

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Haverhill Site-Specific Activated Carbon Adsorption Isotherm Study for BTEX

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Project Number: 180327-08.01
https://anchorqea-my.sharepoint.com/personal/bgauley_anchorqea_com/Documents/Haverhill/Phase_IV_Report/Appendix A - Anchor QEA Preliminary Ph IV/Appendix E - Design Memoranda/Appendix E-1 Cap Eval/App E-1_Attachment 1.docx

1 Introduction

This attachment to Appendix E-1 of the *Phase IV Remedy Implementation Plan* presents site-specific activated carbon adsorption isotherms for benzene, toluene, ethylbenzene, and xylenes (BTEX) for the former manufactured gas plant (MGP) at 284 Winter Street in Haverhill, Massachusetts (Site). Groundwater was collected from the Site and used for batch testing to develop Site-specific BTEX adsorption isotherm parameters for three different activated carbons for potential application in a sediment cap at the Site to sequester BTEX in porewater. The Freundlich isotherm parameters presented in this attachment were used to represent BTEX sorption to granular activated carbon (GAC) in the evaluation of the cap chemical isolation layer design presented in Appendix E-1. The Site-specific BTEX adsorption capacities in the multisolute system determined in this study account for competitive sorption with all Site chemicals, and not just those evaluated in this study, thereby providing performance data needed to accurately simulate sorption of BTEX onto GAC in the cap model used for Site cap design.

2 Materials and Methods

2.1 Activated Carbons

The following three activated carbons were selected for this study based on experience from other projects and a Site-specific discussion with a representative from Calgon Carbon Corporation, from which the products were obtained:

- **Granular Activated Carbon (GAC) No. 1: Filtrasorb 400,** a GAC made from select grades of bituminous coal. Effective size: 0.55–0.75 millimeter [mm], larger than #12 mesh [1.68 mm]: 0.5%, less than #40 mesh (0.40 mm): 4%
- **GAC No. 2: DSR A 8×40**, a GAC made from coal, 0.5%, less than #40 mesh [0.40 mm]: 5%
- **Powdered Activated Carbon (PAC): WPX**, a powdered activated carbon made from coal, less than #325 mesh [0.045 mm], 60%–80%

The two GACs (approximately 80 grams) were transferred into 1-liter (L) glass beakers and washed with high-performance liquid chromatography (HPLC)-grade water several times to remove undesirable fine particles, as recommended by Randtke and Snoeyink (1983). This step was continued until the floating fine particles were completely removed. The washed GACs and the PAC were then dried in an oven at 110°C to a constant weight to remove residual water and potential volatile organic compounds (VOCs) and cooled in a desiccator prior to use.

2.2 Site Groundwater

Approximately 7 gallons of groundwater was collected on July 24, 2023, from groundwater monitoring well B208-MW in the upland area of the Site. Prior to sampling, three volumes of water were removed from the well. Then, the groundwater sample was collected in 1 L narrow-mouth amber glass bottles with zero headspace to minimize potential loss of BTEX from the groundwater and immediately shipped on ice in coolers to the Anchor QEA Environmental Geochemistry Laboratory (EGL) in Portland, Oregon.

2.3 NAPL Exclusion and BTEX Spiking

The Site groundwater is known to contain a small amount of nonaqueous phase liquid (NAPL), which can complicate determining the activated carbon adsorption isotherms for BTEX. In the laboratory prior to the adsorption batch testing, NAPL was filtered and excluded from the groundwater using a porous ceramic tube (Part No. 0652X04-B01M1 from Soilmoisture Equipment Corporation of Goleta, California) connected to a polytetrafluoroethylene (PTFE) tubing and a peristaltic pump. A ceramic porous tube acts as a capillary barrier that excludes NAPL from water samples because of small pore sizes (i.e., a few micrometers) and the non-wetting behavior of NAPL (Gefell et al. 2018).

After NAPL exclusion using the porous ceramic filter, the filtered groundwater was spiked with a stock solution of BTEX to elevate their concentrations in the groundwater. This was necessary to produce adsorption isotherms that cover a wide range of BTEX concentrations. The amount of stock solution of BTEX added to the groundwater sample was determined by reviewing VOC concentrations from a groundwater sample that was collected on June 7, 2022, from the same monitoring well. Table 1 shows the VOC concentrations from this sample. HPLC-grade (>99.9% purity) benzene, toluene, ethylbenzene, and xylenes (i.e., *m*-xylene, *p*-xylene, and *o*-xylene) were obtained from Sigma Aldrich of St. Louis, Missouri, for use in this study. The physical and chemical characteristics of BTEX are summarized in Table 2. The same volume of each of the compounds was first mixed in 2-milliliter (mL) amber glass vials, and the mixed solvent was spiked into the groundwater to elevate BTEX concentrations to target concentrations of approximately 36 mg/L, which is much lower than the aqueous solubilities of BTEX compounds (Table 2). After spiking the BTEX stock solution, the 1-L amber glass bottles were immediately sealed and stirred under dark conditions for more than 48 hours using magnetic stirrers to completely dissolve BTEX in the groundwater.

Table 1
Volatile Organic Compounds in the Groundwater Sample Collected at B208-MW on June 7, 2022

Analyte	Result (µg/L)	Qualifier
1,2,4-Trimethylbenzene	410	
1,3,5-Trimethylbenzene (Mesitylene)	100	
Benzene	5,720	
Carbon Disulfide	1.1	U
Cymene	10.8	U
Ethylbenzene	2,070	
Isopropylbenzene (Cumene)	84.2	U
m,p-xylene	1,420	
Naphthalene	7,450	
N-Butylbenzene	7.2	U
N-Propylbenzene	23.8	U
o-xylene (1,2-Dimethylbenzene)	1,070	
Tert-Butyl Methyl Ether	6.6	U
Toluene	250	
Xylenes, Total	2,490	

Notes:
The water sample was analyzed by Alpha Analytical using EPA Method 8260B/5030B.
U: The analyte was non-detected in the sample.

Table 2
Physical and Chemical Properties of BTEX[1]

Chemical	Chemical Formula	Molecular Weight (g/mol)	Aqueous Solubility (mg/L)	Vapor Pressure at 20°C (mm Hg)	Octanol-Water Partition Coefficient (log K_{OW})[2]
Benzene	C_6H_6	78.1	1,700	95.2	2.17
Toluene	C_7H_8	92.2	515	28.4	2.69
Ethylbenzene	C_8H_{10}	106	534.8	9.5	3.20
m-xylene	C_8H_{10}	106	152	6.6	3.30
p-xylene	C_8H_{10}	106	175[3]	—	3.27
o-xylene	C_8H_{10}	106	130	—	3.16

Notes:

1. Cited from Njobuenwu et al. (2005)
2. Cited from Schwarzembach et al. (2003)
3. Cited from OSTP (1997) and Clark and MacLeod (1977)

Hg: mercury

3 Batch Tests

3.1 Adsorption Kinetics Batch Tests

Adsorption kinetic batch tests were performed for the three activated carbons to evaluate the rates of BTEX uptake from the ceramic-filtered, BTEX-spiked Site groundwater. The adsorption kinetics batch tests were set up in 4-ounce Boston amber glass bottles with PTFE-lined polypropylene caps. The same mass of each activated carbon (i.e., 100 milligrams [mg]) was transferred into the different glass bottles, and the ceramic-filtered, BTEX-spiked Site groundwater was filled in the glass bottles without headspace. The glass bottles were immediately sealed with the PTFE-lined caps and agitated on rotary shakers at 70 revolutions per minute (rpm). Test solutions were sampled from the glass bottles after 2, 4, 8, 12, 24, 48, and 72 hours of agitation. Gas-tight glass syringes and stainless-steel syringe holders with 0.45-µm PTFE membranes were used to exclude fine activated carbon particles. Then, the filtered solution samples were collected in sulfuric acid (H_2SO_4) preserved 40-milliliter [mL] amber glass vials without headspace and shipped on ice in a cooler to Alpha Analytical in Mansfield, Massachusetts. VOCs in the solution samples were analyzed by U.S. Environmental Protection Agency (EPA) Method 8260B/5030B.

The results of the kinetic batch tests are presented in Figure 1. All the kinetic batch tests with the three activated carbons appear to have reached equilibrium within 3 days or less, as indicated by leveling of the BTEX concentrations (Figure 1). For all three activated carbons, benzene reached equilibrium within approximately 24 hours. WPX showed the highest BTEX removal rates because of the finer particle size of its PAC.

3.2 Adsorption Isotherm Batch Tests

The activated carbon adsorption batch tests were performed in the 4-ounce Boston amber glass bottles with PTFE-lined polypropylene caps. The activated carbons were added to individual test bottles in varying amounts (approximately 0.08 to 4.0 g) to achieve different liquid/solid (L/S) ratios. The glass bottles were filled with ceramic-filtered and spiked groundwater without headspace to minimize volatilization, immediately sealed with the PTFE-lined caps, and agitated on a rotary shaker at 70 rpm. Test solutions were sampled after 72 hours of agitation, which was confirmed to be sufficient for achieving adsorption equilibrium based on the kinetics batch test results. Test solutions were filtered, shipped, and analyzed in the same manner as the adsorption kinetics batch tests.

Figures 2 through 6 show adsorption isotherm batch test results for each of the activated carbons with solid-phase equilibrium concentrations of BTEX as a function of aqueous-phase equilibrium concentrations of BTEX. The adsorption isotherm data were fit to the Freundlich isotherm equation (Equation 1), and the Freundlich isotherm parameters for each of the activated carbons tested are summarized in Table 3.

Equation 1

$$q_e = \mathrm{K}_f (C_e)^{1/\mathrm{n}}$$

where:

q_e	=	equilibrium concentration of BTEX on solid (mg/kg)
K_f	=	Freundlich constant related to adsorption capacity ([mg/g]/[mg/L]$^{1/n}$)
C_e	=	equilibrium concentration of BTEX in solution (mg/L)
$1/\mathrm{n}$	=	Freundlich exponent related to adsorption intensity (-)

Table 3
Site-Specific BTEX Freundlich Isotherm Parameters for the Activated Carbon Tested

Media	Type	Analyte	K_f*	1/n†	R†,‡
Filtrasorb 400	GAC	Benzene	17.5	0.42	0.99
		Toluene	32.9	0.37	0.91
		Ethylbenzene	52.0	0.31	0.96
		m,p-xylene	99.6	0.29	0.69
		o-xylene	55.0	0.29	0.96
DSR A 8×40	GAC	Benzene	10.8	0.38	0.99
		Toluene	16.1	0.31	0.98
		Ethylbenzene	25.3	0.28	0.96
		m,p-xylene	55.3	0.24	0.95
		o-xylene	33.6	0.31	0.99
WXP	PAC	Benzene	7.20	0.30	0.98
		Toluene	21.0	0.38	0.97
		Ethylbenzene	33.5	0.36	0.96
		m,p-xylene	58.7	0.35	0.98
		o-xylene	35.9	0.36	0.98

Notes:
* The Freundlich constant related to adsorption capacity ([mg/g]/[mg/L]$^{1/n}$)
† Freundlich exponent related to adsorption intensity (-)
‡ R-squared value

Among the activated carbons tested (Figures 2 through 6), Filtrasorb 400 showed the highest adsorption capacity (i.e., highest K_f values) for all BTEX compounds across the range of aqueous-phase equilibrium concentrations. The adsorption isotherm batch test results for all BTEX compounds are also plotted for Filtrasorb 400 in Figure 7. The adsorption uptake capacity increases

in the order of benzene, toluene, ethylbenzene, and xylene, which is correlated with their hydrophobicity (i.e., respective log K_{OW} values in Table 2).

For comparison, the benzene adsorption isotherms determined for the three tested activated carbons are plotted together with other benzene adsorption isotherms in the literature (Figure 8). The benzene adsorption uptake capacities of the activated carbons tested in this study are less than those in most of the literature studies. This is probably because the benzene adsorption isotherms in the literature were determined in single-solute systems. The benzene adsorption isotherms in this study were determined in the presence of other VOCs (e.g., toluene, ethylbenzene, xylene, naphthalene, and other polycyclic aromatic hydrocarbons) and natural dissolved organic matter, which are known to compete with adsorption of target organic compounds on activated carbons (Randtke and Snoeyink 1983). As discussed previously, the Site-specific BTEX adsorption capacities in the multisolute system determined in this study account for competitive sorption with all Site chemicals (as well as dissolved organic matter) and not just those evaluated in this study, thereby providing performance data needed to accurately simulate sorption of BTEX onto GAC in the cap model used for cap design.

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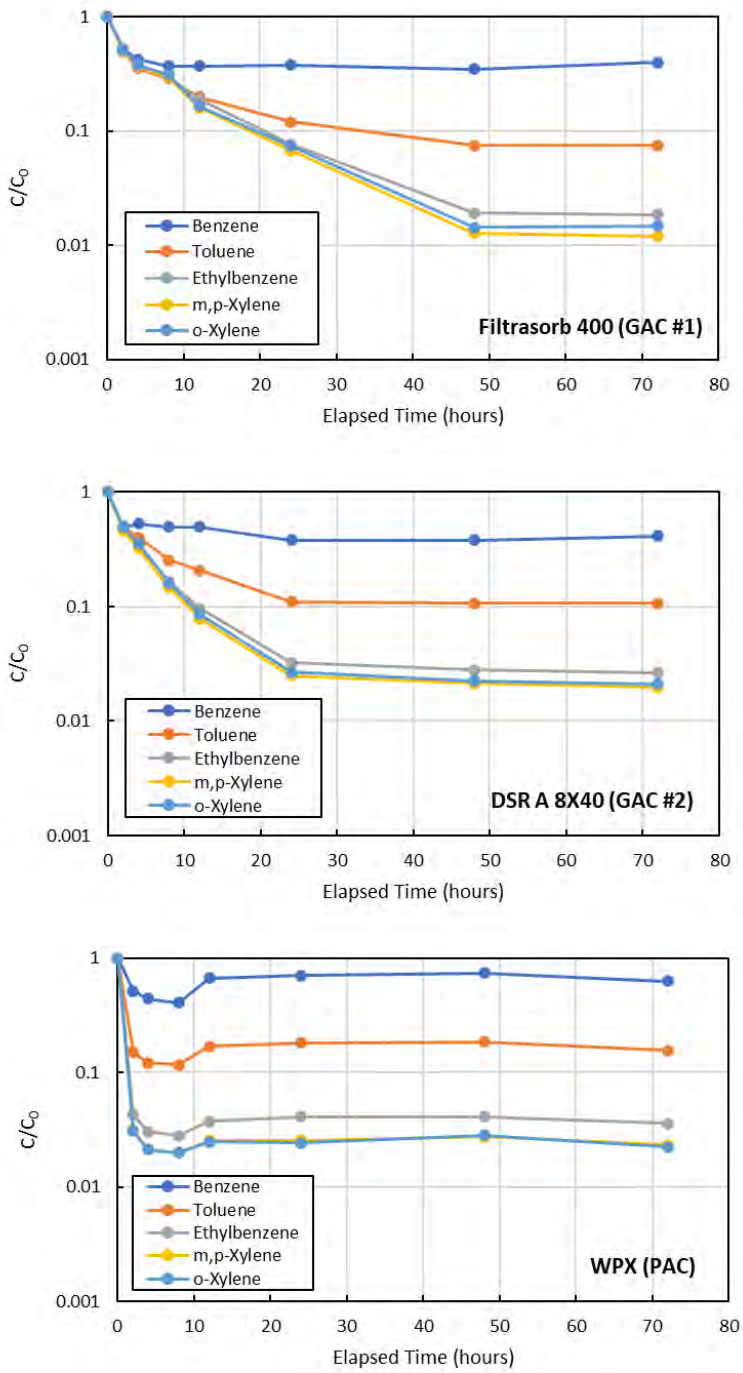
Figures

Figure 1
Adsorption Kinetics Batch Test Results



Note:
The test solutions were shipped in two separate shipments to the analytical laboratory to meet the holding time for BTEX analysis, which likely resulted in the shift at 8 to 12 hours elapsed time for WPX (PAC).

Figure 2
Adsorption Isotherm Batch Test Results for Benzene

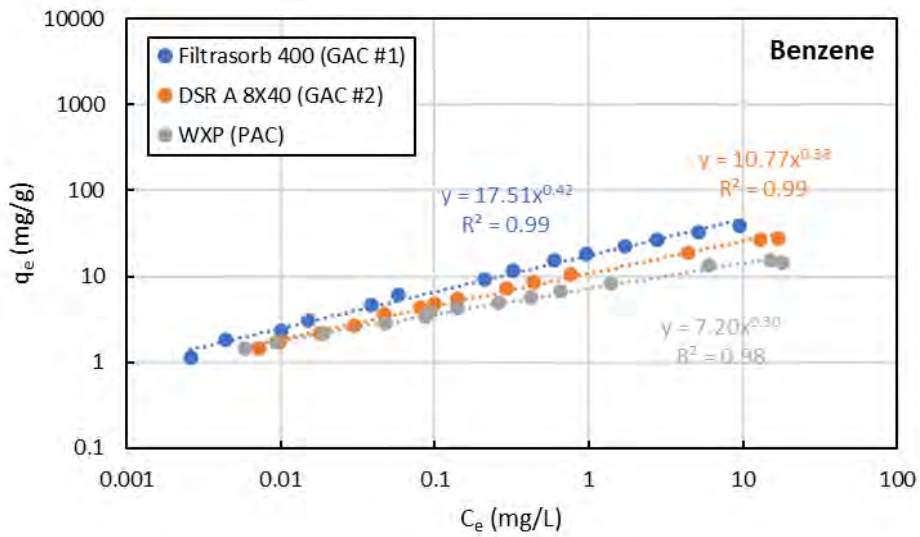


Figure 3
Adsorption Isotherm Batch Test Results for Toluene

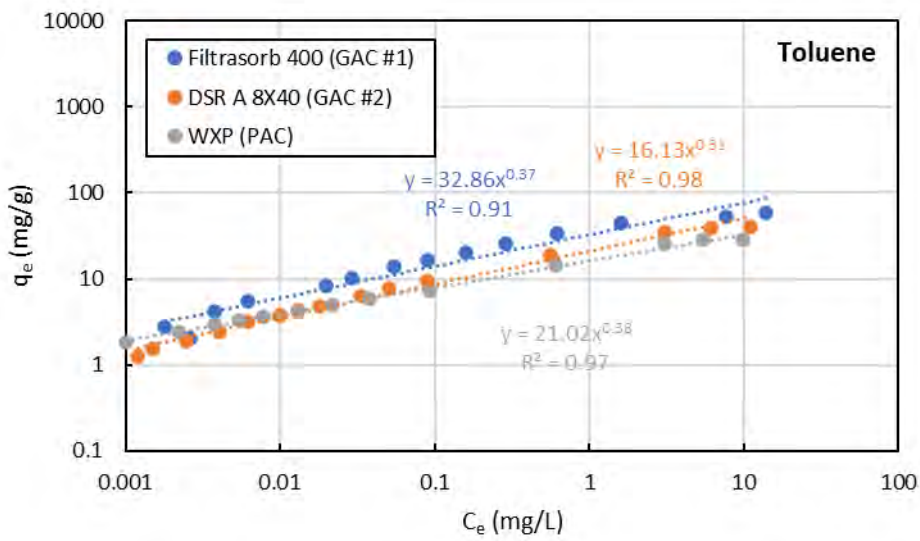


Figure 4
Adsorption Isotherm Batch Test Results for Ethylbenzene

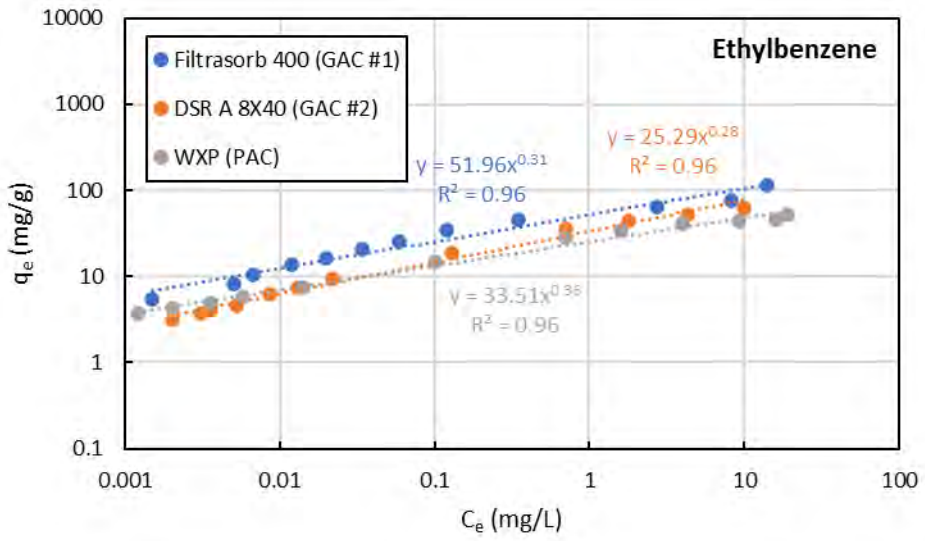


Figure 5
Adsorption Isotherm Batch Test Results for *m,p*-xylene

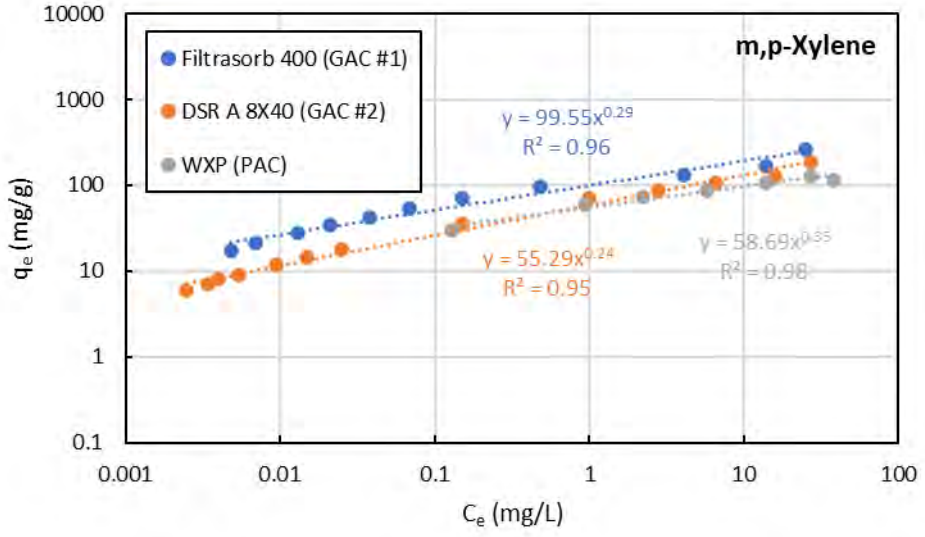


Figure 6
Adsorption Isotherm Batch Test Results for *o*-xylene

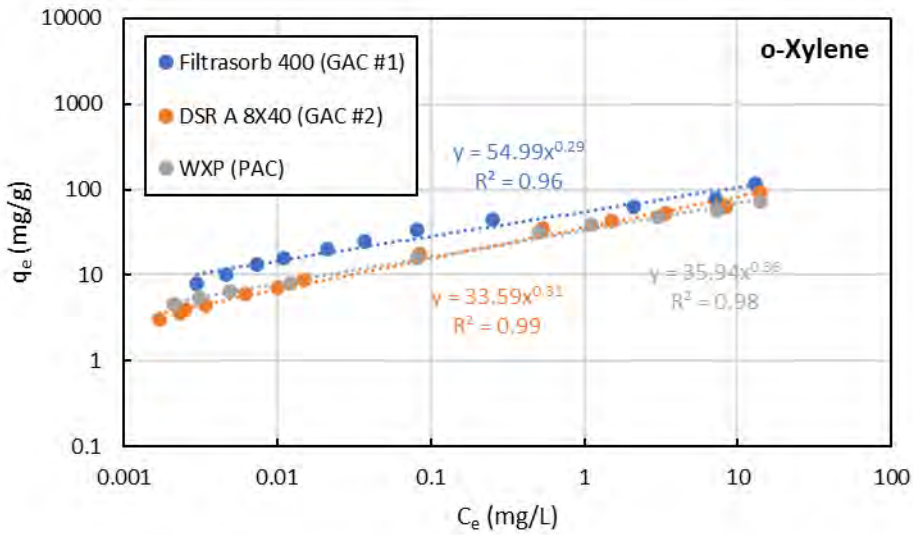


Figure 7
Adsorption Isotherm Batch Test Results of all BTEX Compounds for Filtrasorb 400

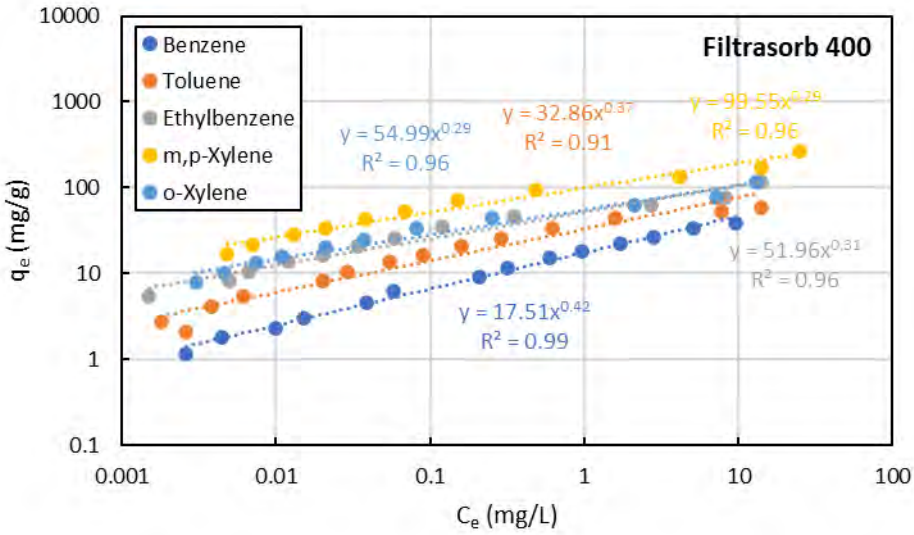
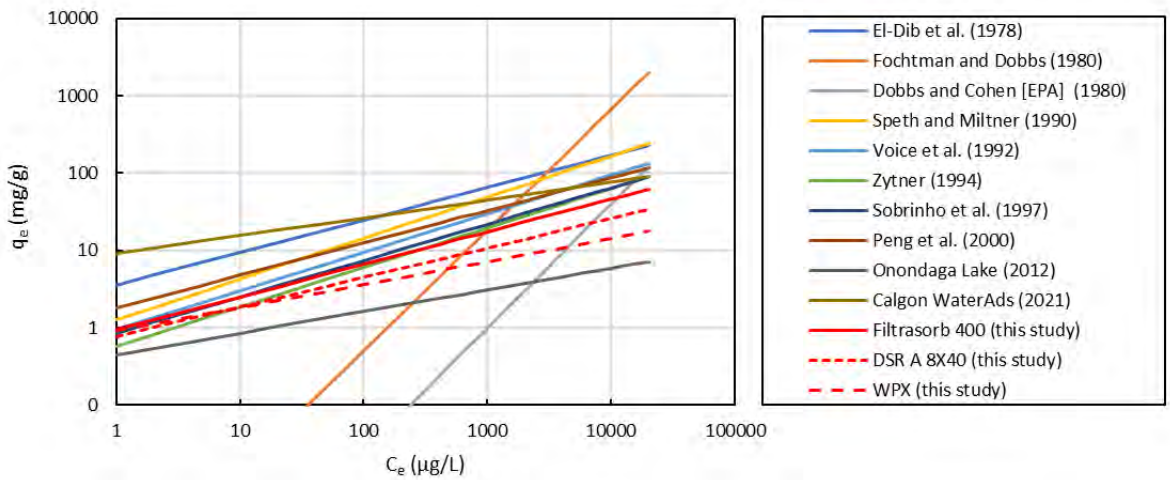


Figure 8
Comparison of Benzene Adsorption Isotherms Between This Study and Published Literature



Attachment 2
Hydraulic Conditions in Sediment

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Hydraulic Conditions in Sediment

Prepared for
National Grid
170 Data Drive
Waltham, Massachusetts 02451

Prepared by
Anchor QEA
9 Water Street, First Floor
Amesbury, Massachusetts 01913

Project Number: 180327-08.01
https://anchorqea-my.sharepoint.com/personal/bgauley_anchorqea_com/Documents/Haverhill/Phase_IV_Report/Appendix A - Anchor QEA Preliminary Ph IV/Appendix E - Design Memoranda/Appendix E-1 Cap Eval/App E-1_Attachment 2.docx

1 Introduction

This attachment to Appendix E-1 of the *Phase IV Remedy Implementation Plan* presents data and calculations used to characterize the hydraulic conditions in the sediment of the Little River adjacent to the former manufactured gas plant (MGP) at 284 Winter Street in Haverhill, Massachusetts (the Site) in support of the Phase IV Remedy Implementation Plan. The following field activities were conducted to characterize hydraulic conditions in the sediment:

- Continuous recording of hydraulic head at pairs of piezometers installed in the sediment to calculate vertical hydraulic gradient
- Vertical hydraulic conductivity measurements obtained by gravity drainage tests

The product of these two parameters is the groundwater seepage rate expressed as a Darcy flux, with units of length per unit time. Seepage rates, along with porewater quality data help to characterize the dissolved-phase chemical mass flux for developing a remedial design.

Vertical hydraulic gradient data were measured using pairs of piezometers installed at three locations along the river on November 3, 2022. Each pair included a shallow piezometer screened approximately at the mudline and a deep piezometer screened several feet below the mudline. Because these long temporal datasets captured short-term and seasonal fluctuations, they are useful for calculating long-term average vertical hydraulic gradients under a wide range of temporal conditions.

Annex A presents the vertical hydraulic gradient (i_v) dataset graphically, including continuous hydrographs of river level changes, pressure (equivalent to water level) recorded at the shallow and deep piezometers, hydraulic gradient-induced head difference, and the calculated vertical hydraulic gradient for the three piezometer pairs.

Annex B presents data collected during vertical hydraulic conductivity (K_v) testing and the calculated K_v values for individual sediment samples.

This appendix discusses the i_v and K_v data collection and evaluation, and it presents the estimated seepage rates calculated from those data.

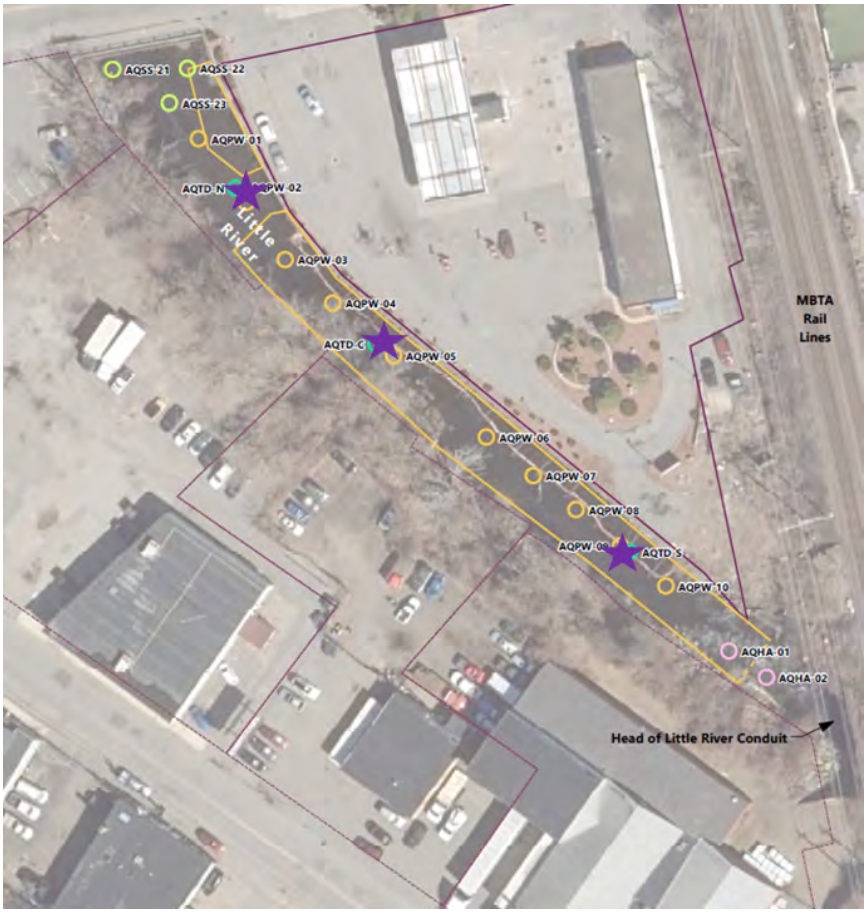
2 Vertical Hydraulic Gradient Evaluation

2.1 Vertical Hydraulic Gradient Data Collection

As noted in the introduction, vertical hydraulic gradients in sediment beneath the river near the former MGP were measured from November 3, 2022, through July 21, 2023, using piezometer pairs installed at three locations in the riverbed of the Site. The piezometer locations were designated as follows: AQTD-S, AQTD-C, and AQTD-N.

The three locations are shown with purple stars in Figure 1. Pressure transducers were placed in the piezometers to measure hydraulic heads at the mudline and at the depth of the deep piezometer. Preliminary data were downloaded from the transducers by Anchor QEA field staff on December 12, 2022, and the transducers were retrieved on October 4, 2023. Although the transducers were retrieved in October 2023, the data storage was exceeded on July 21, 2023; no data were recorded between July 21 and October 4, 2023. This work was conducted in accordance with Standard Operating Procedure (SOP) 010 – Hydraulic Data Collection (Anchor QEA 2022).

Figure 1
Location of Porewater, Seepage Measurement, and Sediment Core Locations



Each riverbed piezometer pair was constructed using 2-inch (inner diameter) Schedule 40 PVC materials and included one "shallow" piezometer between 1.7 feet long and one "deep" piezometer approximately 8.5 feet long. Deep piezometers were installed manually with 1-foot-long screens vertically centered approximately 4 to 5 feet below the sediment surface. Shallow piezometers were tightly zip-tied to the deep piezometers. Each piezometer had a 0.010-inch slotted screen at the bottom and so was hydraulically connected to the surrounding sediment. The top of each piezometer was capped with a water-tight, pressure-fit well cap; the cap was removed as required to calibrate the transducer and to retrieve the transducer for downloading data.

Table 1 presents the screen depth and corresponding elevation for each riverbed piezometer as measured on November 3, 2022. Precise elevations for the piezometers are not known (not surveyed), so an arbitrary elevation of 100 feet was selected as the datum from which to calculate water elevations.

Table 1
Riverbed Piezometer Installation Depths and Relative Evaluations

Piezometer		Top of Piezometer Elevation Based on Arbitrary Datum (feet)	Depth to Top of Screen Below Mudline (feet)	Depth to Bottom of Screen Below Mudline (feet)
AQTD-S	Deep	100.00	4.05	5.05
AQTD-S	Shallow	98.21	-0.96	0.04
AQTD-C	Deep	100.00	4.30	5.30
AQTD-C	Shallow	99.01	-1.14	-0.14
AQTD-N	Deep	100.00	3.96	4.96
AQTD-N	Shallow	98.44	-0.89	0.11

Self-contained pressure transducers with internal dataloggers were programmed to record pressure data every 5 minutes. Each transducer was connected to a tether and lowered to the bottom of the piezometer. The tether length allowed the transducer to rest on the bottom of each piezometer to maintain the same vertical position of the transducer during data collection. During the transducer deployment period, each piezometer was tightly capped to allow the transducers to record the pressure surrounding the piezometer screen. The data measured during the recording period were used to calculate the vertical hydraulic gradient in the sediment. These data and the results are discussed further in the next section.

2.2 Vertical Hydraulic Gradient Calculation

Vertical hydraulic gradient values were calculated for each pair of transducer measurements, which were collected every 5 minutes throughout the recording period at each location. Pressure data collected by the transducers were converted to water elevations (relative to the arbitrary datum of 100 feet) and used to calculate the hydraulic head difference between piezometers. The hydraulic head difference (dH) was divided by the vertical separation distance (dZ) to calculate vertical hydraulic gradient, as shown by Equation 1.

Equation 1

$$i_v = dH/dZ$$

where:

i_v = vertical hydraulic gradient (calculated every 5 minutes as feet per foot)

dH = hydraulic head difference between piezometers (expressed as equivalent feet of water)

dZ = vertical separation distance between piezometer screen midpoints (feet)

Pressure readings recorded by the transducers were converted to relative elevation data by first setting an arbitrary datum (100 feet) at the top of the deep piezometer casing. The difference in height between the tops of the paired piezometers was measured in the field and used to calculate a top-of-casing elevation for the shallow piezometer relative to the deep piezometer.

The transducer elevation in each piezometer was determined from synchronized depth to water (DTW) measurements and pressure readings recorded by the transducer, using Equation 2.

Equation 2

$$E_t = E_{toe} - DTW - P$$

where:

E_t	=	elevation of transducer (feet)
E_{toe}	=	top of casing elevation (feet)
DTW	=	depth to water below top of casing (feet)
P	=	pressure reading by transducer at the time of depth to water measurement (expressed in equivalent height of water in feet)

Manual DTW data were measured at the beginning and end of the first data collection period, on November 3, 2022, and December 12, 2022, respectively. The average transducer elevation from these two measurements was used to calculate water elevations for this recording period. DTW was also measured after data downloading and transducer re-deployment on December 12, 2022; that measurement was used to calculate the transducer elevation for the second data collection period, December 12, 2022, to July 21, 2023 (when the transducer dataloggers reached their storage capacity). The data from the second data collection period were downloaded on October 4, 2023.

The hydraulic head at each piezometer during each data collection period was calculated using Equation 3.

Equation 3

$$H = E_t + P$$

where:

H	=	hydraulic head (feet)
E_t	=	transducer elevation (feet)
P	=	pressure reading by transducer (expressed as equivalent height of water in feet)

2.3 Results

Hydrographs of the hydraulic data are summarized in Annex A, Figures A-1 through A-3, which show the water level data and resulting vertical hydraulic gradients measured every 5 minutes throughout the full data collection period at the three data collection locations, as follows:

- **Relative River Level Data:** The top panel of each figure of Annex A shows the relative changes in river level during the transducer data collection period. These data were recorded by the shallow piezometers as they were installed with screened intervals that extend into the water column, which provided a direct hydraulic connection to the river. This dataset is provided for reference and included on all three figures to compare relative changes in the river level and those recorded at the piezometers.
- **Water Level Above Transducer:** The second panel in the figures of Annex A shows the water level above the transducers in each piezometer pair. These charts show that both transducers in each pair recorded similar pressure changes throughout the data recording period, which confirms that they were hydraulically connected via the sediment column. Also, the general magnitudes of water-level changes measured in the piezometers closely matched those of the river.
- **Hydraulic Head Difference:** The third panel in the figures in Annex A shows the hydraulic head difference between the two piezometers. For locations AQTD-S and AQTD-C, this panel also compares values for corrected vs. uncorrected data (as explained below). This panel also shows the data for location AQTD-S that were excluded from the average vertical hydraulic gradient calculation because of a discontinuous gap in values that occurred on March 23, 2023.
- **Vertical Hydraulic Gradient:** The fourth panel in the figures of Annex A shows the continuous i_v values as calculated using Equation 1. For locations AQTD-S and AQTD-C, this panel also compares values for corrected vs. uncorrected data (as explained below). This panel also shows the data for location AQTD-S that were excluded from the average vertical

hydraulic gradient calculation because of a discontinuous gap in values that occurred on March 23, 2023.

Arithmetic average vertical hydraulic gradient values for the entire recording period are presented in Tables 2a and 2b. For the downstream location (AQTD-S), values after 2:30 p.m. on March 23, 2023, were excluded from the i_v calculation because of a sudden, unexplained shift in head measurements. As shown in Figure A-1, a correction factor was included because of a discontinuous drop in elevations that occurred in the data after the station was serviced on December 12, 2022. The correction factor applied after this time did not explain the second shift in values from March 23, 2023, onward, so the later data were excluded from the vertical hydraulic gradient calculation.

For the central location (AQTD-C), values collected after the station was serviced, on December 12, 2022, also had to be adjusted with a correction factor because of the gap in reported data. These data were continuous until the end of the recording period, on July 21, 2023. The upstream location (AQTD-N) required no correction factor to reported data over the entire duration of recording. The average vertical gradient and vertical groundwater flux values reported in Tables 2a and 2b represent values adjusted with correction factors for AQTD-S and AQTD-C.

Table 2a
Arithmetic Average Vertical Hydraulic Gradients – AQTD-S

Parameter	Data Recording Period	Unit	AQTD-S
Vertical Hydraulic Conductivity, K_v	NA	cm/sec	2.2E-04
Average Vertical Gradient, i_v	November 3 to December 12, 2022	feet per foot	0.018
	December 12, 2022, to March 23, 2023	feet per foot	0.020
	March 23 to July 21, 2023	feet per foot	0.065
	Entire Recording Period (Excluding March 23 to July 21, 2023)	feet per foot	0.019
Vertical Groundwater Flux, $K_v * i_v$	November 3 to December 12, 2022	cm/day	0.34
	December 12, 2022, to March 23, 2023	cm/day	0.36
	March 23 to July 21, 2023	cm/day	1.2*
	Entire Recording Period (Excluding March 23 to July 21, 2023)	cm/day	0.36

Notes:
*Data collected during this period were excluded from the average vertical hydraulic gradient calculation due to a discontinuous shift in the data from March 23, 2023, onward.
cm/day: centimeter per day
cm/sec: centimeter per second
NA: Vertical hydraulic conductivity measurements were conducted in the field on November 4, 2022.

Table 2b
Arithmetic Average Vertical Hydraulic Gradients – AQTD-C and AQTD-N

Parameter	Data Recording Period	Unit	AQTD-C	AQTD-N
Vertical Hydraulic Conductivity, K_v	NA	cm/sec	6.1E-04	2.8E-05
Average Vertical Gradient, i_v	November 3 to December 12, 2022	feet per foot	0.054	0.090
	December 12, 2022, to July 21, 2023	feet per foot	0.068	0.10
	Entire Recording Period	feet per foot	0.066	0.10
Vertical Groundwater Flux, $K_v * i_v$	November 3 to December 12, 2022	cm/day	2.8	0.21
	December 12, 2022, to July 21, 2023	cm/day	3.6	0.24
	Entire Recording Period	cm/day	3.5	0.24

Following the data download on December 12, 2022, the transducers were placed again in the piezometers and the caps were secured on the piezometers. Additional hydraulic data continued to be recorded at all three locations until the data loggers reached their data storage capacity, on July 21, 2023. Final estimates are presented in Table 3, which shows the average vertical hydraulic gradients spanning the full data collection period from November 3, 2022, through July 21, 2023 (except for AQTD-S, for which data collected from March 23 to July 21, 2023, were excluded because of the unexplained shift). All three piezometer pairs indicated predominantly positive vertical gradients beneath the river, which indicates upward seepage into the river.

Table 3
Vertical Hydraulic Gradient Averages by Location

Piezometer	Average Vertical Gradient - i_v (feet per foot)
AQTD-S	0.019
AQTD-C	0.066
AQTD-N	0.10

3 Vertical Hydraulic Conductivity Evaluation

3.1 Vertical Hydraulic Conductivity Data Collection

Vertical hydraulic conductivity (K_v) data were measured using collocated sediment cores collected in the field in accordance with SOP 010 – Hydraulic Data Collection (Anchor QEA 2022).

Vertical hydraulic conductivity measurements were conducted in the field on November 4, 2022. Sediment samples were collected in rigid plastic liners from the mudline to refusal. Up to six attempts were made at each core location. For each core interval, K_v was measured empirically during a period of porewater drainage from the inside of the core liner. A summary of sediment core recovery is shown in Table 4.

Table 4
Summary of Sediment Core Recovery

Location ID	Recovered Sample Length (feet)
AQTD-S	2.78
AQTD-C	2.04
AQTD-N	3.06

The cores collected for K_v testing did not achieve the targeted recovery of approximately 5 feet, which represents the full vertical interval between the mudline and the screen of the deeper piezometer. But the logs for the cores with the greatest recovery (4.6 to 5.9 feet) were reviewed: AQSS-7D, AQSS-11D, AQSS-18, AQSS-19, and AQSS-20. Those core logs describe similar grain size in the top 2 to 3 feet as in the bottom 2 to 3 feet, predominantly sand and gravel with little or no fine-grained material. Therefore, it is assumed that the hydraulic conductivity values obtained from the recovered K_v test cores represent the K_v for the top 5 feet of sediment.

After each sediment core sample was collected, the core liner was capped, maintained in a vertical position, and the outside was wiped with a disposable towel to remove excess water. The core liner was then secured in place vertically to allow field staff to collect K_v data. The bottom cap on the liner was replaced with a perforated cap lined with a fine filter material (steel wool), and the core was allowed to drain freely under the force of gravity. Water that drained from the core liner was collected in a measuring cup and then carefully transferred into a graduated cylinder for measurement of volume.

The volume of water that drained from the samples during these tests ranged from 12 to 335 milliliters over periods between 126 to 199 minutes. The hydraulic gradient was maintained relatively

constant by the force of gravity and the limited volume of flow. The following data were measured and recorded during the drainage period:

- **dH:** Total height of water above the bottom of liner, including saturated core material and water column above sediment (by visual inspection from outside of liner). These data were measured and recorded at the beginning and end of the period of flow rate data collection (Q). Additional water-level and time-of-measurement data were collected periodically along with incremental flow measurements
- **dL:** Length of test sample in liner (by visual inspection from outside of liner)
- **Q:** Flow rate of water by free gravity drainage from bottom of core, including the following:
  - Start time (expressed as hours, minutes, and seconds [HH:MM:SS])
  - Volume of water collected between start time and stop time
  - Stop time (expressed as HH:MM:SS)

These data were tabulated and used to calculate K_v for each test interval. The data and the results are summarized in tables and figures in Annex B.

3.2 Vertical Hydraulic Conductivity Data Evaluation

For each test, the K_v of the tested sediment sample was calculated as follows using a form of Darcy's Law:

Equation 4

$$K_v = Q/(A\ i_v)$$

where:

K_v	=	vertical hydraulic conductivity of test sample (in cm/s)
Q	=	average flow rate during period of approximately constant flow (in cm^3/s)
A	=	circular area of the bottom of the cylindrical core sample (in $cm^{2)}$
i_v	=	vertical hydraulic gradient through the test sample (feet per foot)

The vertical hydraulic gradient during the test was calculated as shown in Equation 5.

Equation 5

$$i_v = dH/dL$$

where:

dH	=	head change between the top and the bottom of the saturated sediment sample, which is equal to the height of the water level in the liner (measured from the bottom of the liner in cm)
dL	=	vertical length of the sediment sample (in cm)

Each dataset was plotted as cumulative flow volume versus time. The data showed stable drainage rates, as indicated by a linear data trend with constant slope (see charts in Annex B). The calculated steady-state flow rate was used to calculate K_v.

Hydraulic gradients decreased by between 0% and 13% during the tests, with larger changes observed in samples that drained larger volumes of water. The average i_v value was used in calculating K_v, so the maximum error in the gradient value (between the maximum or minimum i_v value and the average i_v value) was 7%. The calculated K_v value is proportional to i_v, so the maximum error in K_v that could occur because of i_v changes is 7%. Given that K_v values for geologic materials range by several orders of magnitude, this error is considered negligible, supporting the use of the steady-state flow relationship in Equation 4.

3.3 Vertical Hydraulic Conductivity Results

The calculated K_v values are shown in Table 5.

Table 5
Calculated Vertical Hydraulic Conductivity Values

Piezometer ID	K_v (cm/sec)
AQTD-S	2.1E-04
AQTD-C	6.1E-04
AQTD-N	2.8E-05

Given that K_v values for geologic materials range by several orders of magnitude, these results are reasonably consistent. These K_v values match expectations based on the descriptions of the sediment samples, which typically consisted of fine to coarse sand with traces of silt and fine gravel.

4 Seepage Rates

Based on the i_v and K_v results discussed in the preceding sections, the seepage rate (equal to Darcy flux, porewater specific discharge, or groundwater specific discharge) within the sediment was calculated using Equation 6.

Equation 6

$$q = K_v \, i_v$$

where:

q	=	seepage rate (feet/second)
K_v	=	representative, bulk vertical hydraulic conductivity between shallow and deep piezometers (feet/second)
i_v	=	average vertical hydraulic gradient measured using shallow and deep piezometers (feet per foot)

The resulting seepage rates are listed in Table 6.

Table 6
Summary of Seepage Rate Values

Piezometer ID	K_v (cm/sec)	i_v (feet per foot)	Seepage Rate (cm/sec)	Seepage Rate (cm/day)
AQTD-S	2.1E-04	0.019	4.2E-06	0.36
AQTD-C	6.1E-04	0.066	4.1E-05	3.5
AQTD-N	2.8E-05	0.10	2.8E-06	0.24

These seepage rates will be used with the porewater sample analytical results to calculate dissolved phase chemical mass fluxes for use in cap design modeling. Tables 2a and 2b present a more detailed summary with seepage rate estimates for individual data recording periods, which provide a range of seepage rates for each location. The results show relatively small temporal variations in calculated seepage rates over the different recording periods (except for data collected at location AQTD-S between March 23 and July 21, 2023).

An evaluation of groundwater seepage rates was conducted as part of the Phase III Remedial Action Plan (RAP; See Appendix B – Preliminary Chemical Isolation Layer Design Analysis included in Appendix C; GZA 2022). Groundwater seepage rates had not been measured directly at that time, so rates were estimated using available hydrogeological information from the Little River and the adjacent upland. A groundwater seepage rate of 0.9 cm/day was calculated for the eastern half of

the riverbed; a significantly higher rate was calculated from groundwater well data on the western side of the river. Due to the limited groundwater data available from the western side of the river, there was uncertainty around this value. Thus, a groundwater seepage rate of 1 cm/day was used for the preliminary cap model evaluation.

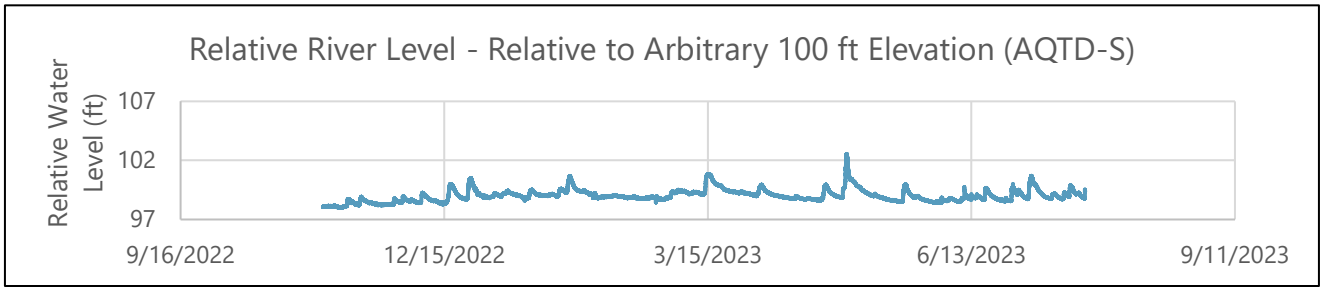
Only one seepage rate was calculated to support the preliminary cap model evaluation in the Phase III RAP due to the limited available data. Although this rate is higher than the upstream and downstream seepages rates calculated from the 2022/2023 data collected from the Little River, it is less than the average of the three measurements (i.e., 1.4 cm/day).

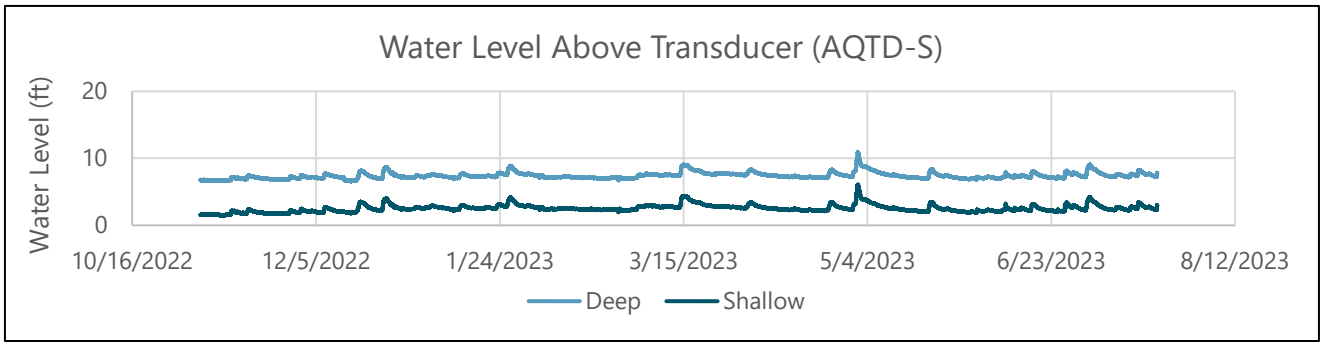
5 References

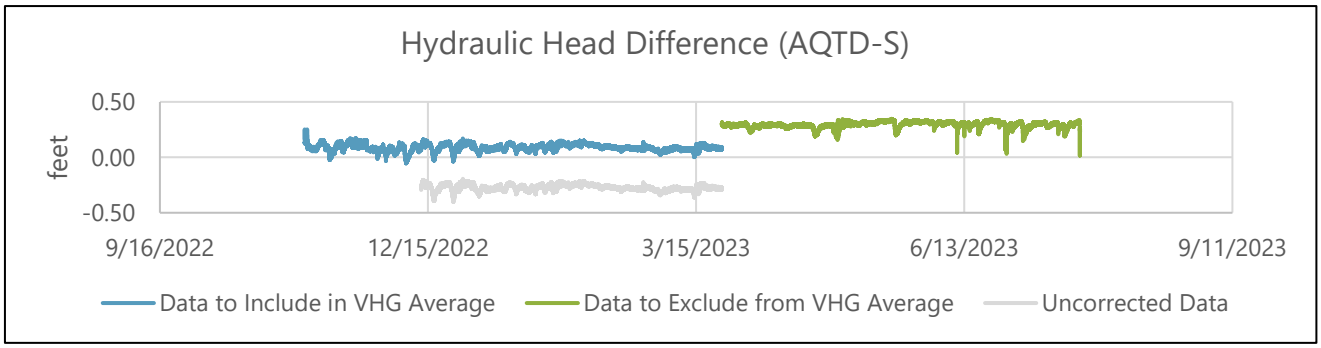
Anchor QEA (Anchor QEA), 2022. Memorandum to: Jesse Edmands, National Grid, and Charles Lindberg, LSP, GZA GeoEnvironmental. Regarding: Field Investigation Work Plan. Former Haverhill MGP Site – 284 Winter Street, Haverhill, Massachusetts. October 14, 2022.

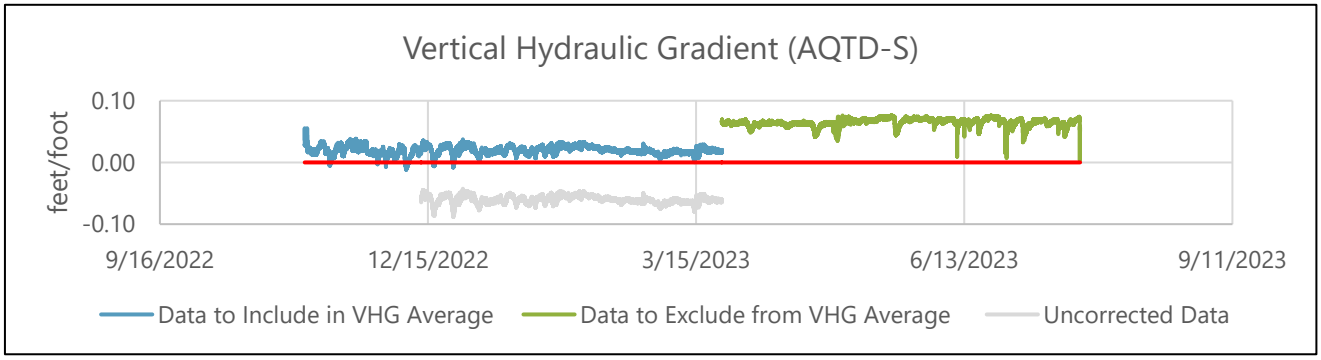
GZA (GZA GeoEnvironmental, Inc.), 2022. *Phase III Remedial Action Plan – 284 Winter Street Haverhill, Massachusetts RTNs 3-32792 and 3-32875.* Prepared on behalf of Boston Gas Company d/b/a National Grid. July 2022.

Annex A
Vertical Hydraulic Gradient Hydrographs



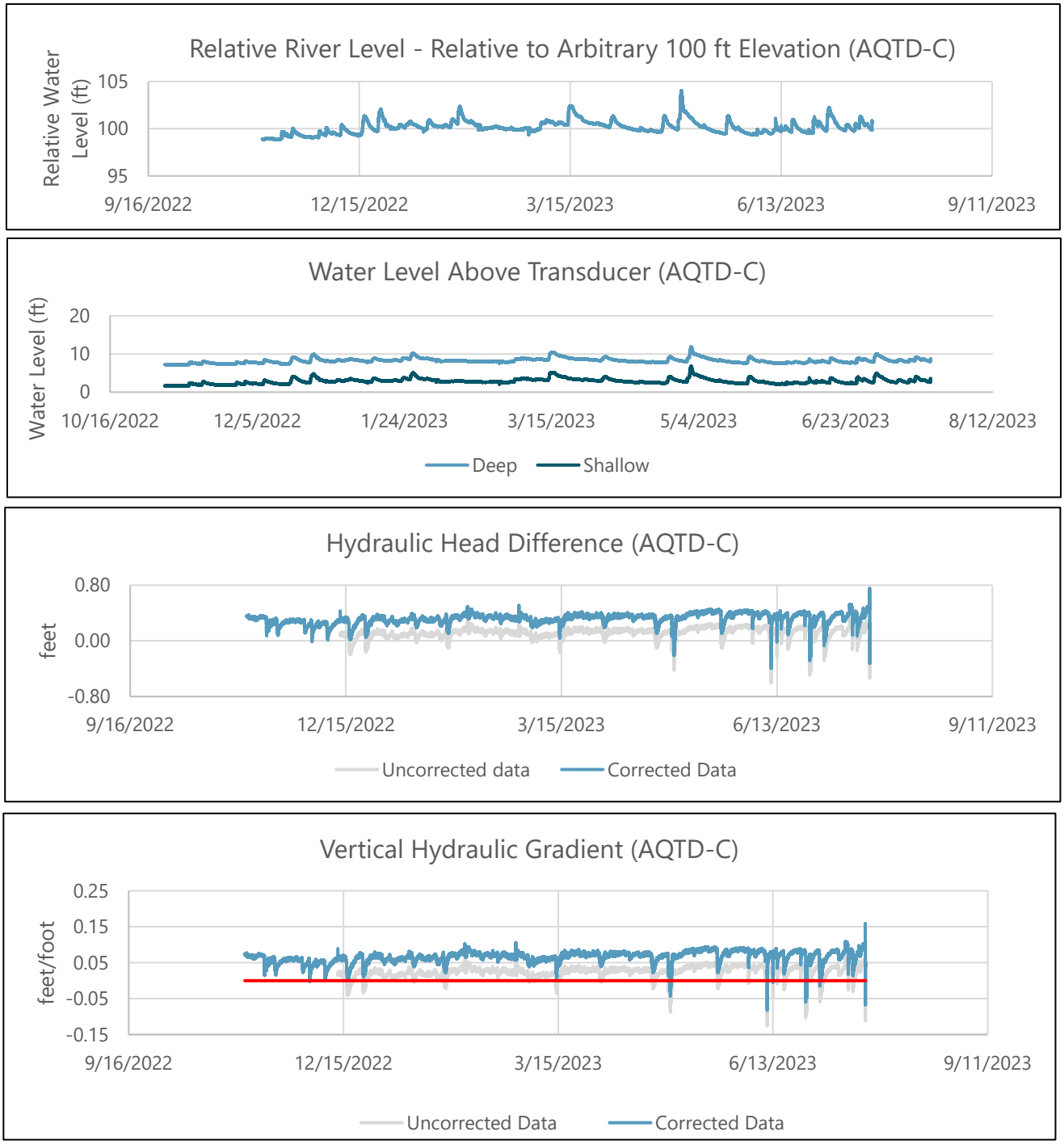






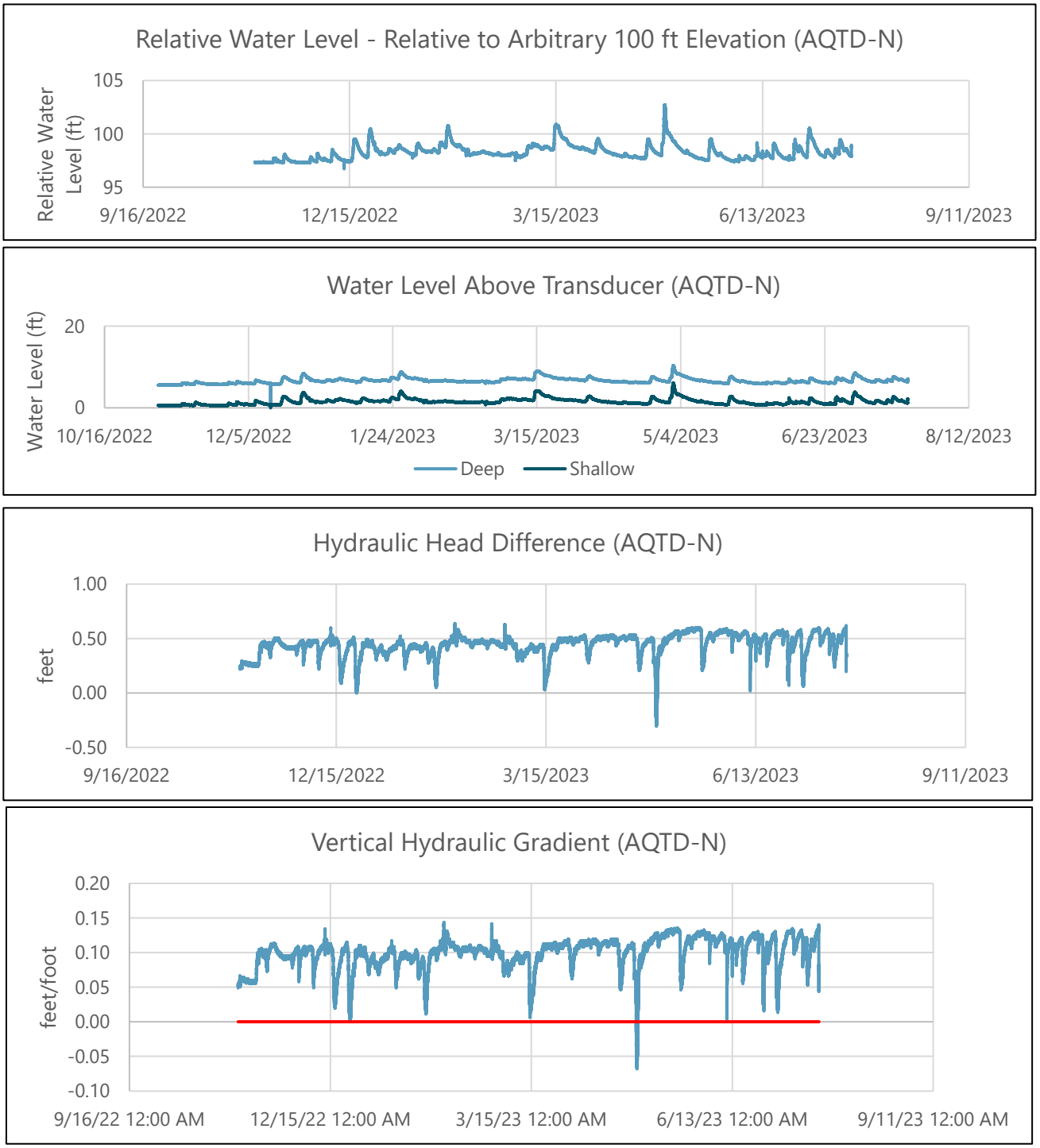
Notes:
Continuous water-level measurements corrected for barometric pressure.
Gradient-induced head difference plotted in the third panel from the top is the difference in water level elevations between the shallow and deep piezometers during the gradient measurement periods.
A positive vertical gradient indicates upward flow, and a negative vertical gradient indicates downward flow.
Data shown in the Relative River Level plot are based on transducer data from the shallow piezometer.
Due to a discontinuous drop in elevations, a correction factor was applied to all data collected after December 12, 2022.
Data collected after March 23, 2023, were excluded from the VHG calculation due to a discontinuous gap in elevations not resolved by the application of a correction factor.
The horizontal red line in the last panel represents a VHG of zero.

Figure A-1
Hydrographs of Measured Water Levels and Hydraulic Conditions at AQTD-S



Notes:
Continuous water-level measurements corrected for barometric pressure.
Gradient-induced head difference plotted in the third panel from the top is the difference in water level elevations between the shallow and deep piezometers during the gradient measurement periods.
A positive vertical gradient indicates upward flow, and a negative vertical gradient indicates downward flow.
Data shown in the Relative River Level plot are based on transducer data from the shallow piezometer.
Due to a discontinuous drop in elevations, a correction factor was applied to all data collected after December 12, 2022.
The horizontal red line in the last panel represents a VHG of zero.

Figure A-2
Hydrographs of Measured Water Levels and Hydraulic Conditions at AQTD-C



Notes:
Continuous water-level measurements corrected for barometric pressure.
Gradient-induced head difference plotted in the third panel from the top is the difference in water level elevations between the shallow and deep piezometers during the gradient measurement periods.
A positive vertical gradient indicates upward flow, and a negative vertical gradient indicates downward flow.
Data shown in the Relative River Level plot are based on transducer data from the shallow piezometer.
The horizontal red line in the last panel represents a VHG of zero.

Figure A-3
Hydrographs of Measured Water Levels and Hydraulic Conditions at AQTD-N

Annex B
Vertical Hydraulic Conductivity Measurements

Date: 11/04/2022

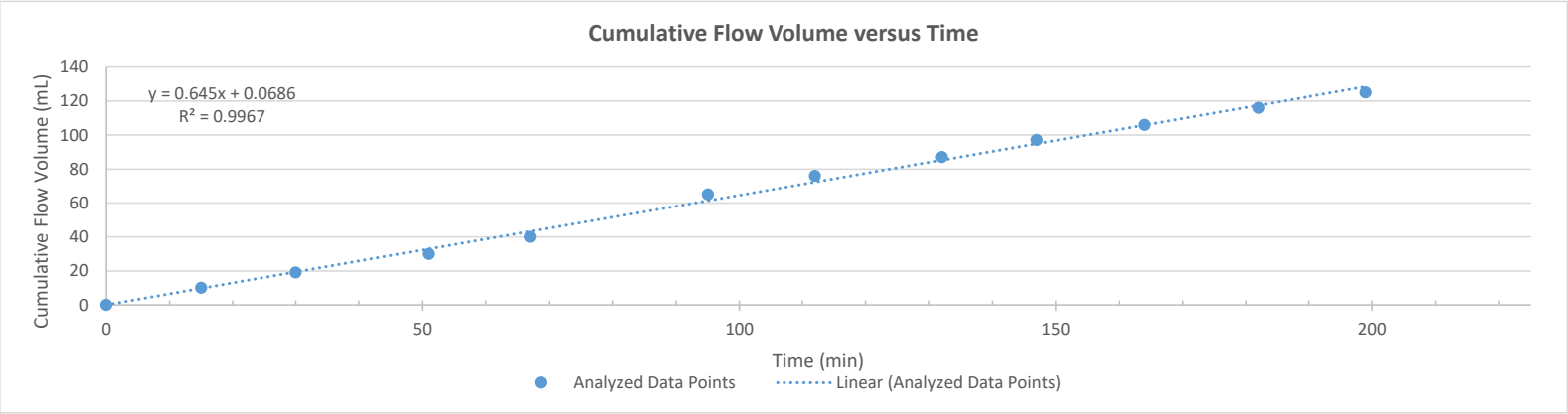
Calculation of Vertical Hydraulic Conductivity by Gravity Drainage

Boring ID: AQTD-S (0-3')

Sampling Interval Depth	**0-3**	**feet**
Test Core Tube Length	**4.93**	**feet**
Test Sample Length	**2.78**	**feet**
Core Diameter	**2.75**	**inches**
Core Diameter	**6.99**	**cm**
Flow Area (A)	**38.3**	**cm^2**

Kv Calculation (cm/sec)
Kv = Q / (AI)
2.1E-04

Time					**Water Level**			**Flow Volume (mL)**	
Incremental			**Cumulative**						
Time (HH:MM:SS)	**Time Elapsed (HH:MM:SS)**	**Seconds**	**Seconds**	**Minutes**	**From Bottom (Feet)**	**From Top (Feet)**	**Hydraulic Gradient**	**Incremental**	**Cumulative**
11/4/22 12:00	0:00:00	0	0	0	3.73	1.20	1.34	0	0
11/4/22 12:15	0:15:00	900	900	15	3.71	1.22	1.33	10	10
11/4/22 12:30	0:15:00	900	1800	30	3.71	1.22	1.33	9	19
11/4/22 12:51	0:21:00	1260	3060	51	3.69	1.24	1.33	11	30
11/4/22 13:07	0:16:00	960	4020	67	3.69	1.24	1.33	10	40
11/4/22 13:35	0:28:00	1680	5700	95	3.68	1.25	1.32	25	65
11/4/22 13:52	0:17:00	1020	6720	112	3.67	1.26	1.32	11	76
11/4/22 14:12	0:20:00	1200	7920	132	3.66	1.27	1.32	11	87
11/4/22 14:27	0:15:00	900	8820	147	3.65	1.28	1.31	10	97
11/4/22 14:44	0:17:00	1020	9840	164	3.64	1.29	1.31	9	106
11/4/22 15:02	0:18:00	1080	10920	182	3.63	1.30	1.31	10	116
11/4/22 15:19	0:17:00	1020	11940	199	3.62	1.31	1.30	9	125
Best-Fit Line		Final Time	10920		Average Hydraulic Gradient (I):		**1.32**	Final Volume	125
Best-Fit Line Y Intercept:			0.0686		Best-Fit Flow Rate (Q, mL/sec):		0.0108		



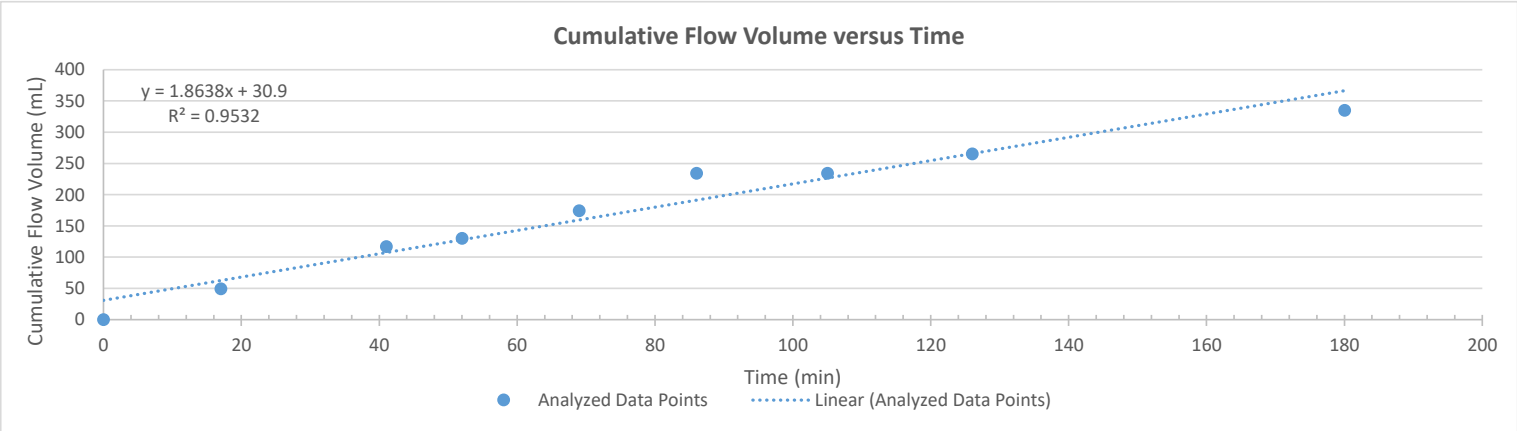
Note: Test and calculation methods described in Gefell, M.J., M. LaRue, and K. Russell, 2019. "Vertical Hydraulic Conductivity Measurement by Gravity Drainage." *Groundwater* 57(4):511–516.

Date: 11/04/2022 | **Calculation of Vertical Hydraulic Conductivity by Gravity Drainage** | **Boring ID: AQTD-C (0-3')**

Sampling Interval Depth	**0-3**	**feet**
Test Core Tube Length	**4.65**	**feet**
Test Sample Length	**2.04**	**feet**
Core Diameter	**2.75**	**inches**
Core Diameter	**6.99**	**cm**
Flow Area (A)	**38.3**	**cm^2**

Kv Calculation (cm/sec)
Kv = Q / (AI)
6.1E-04

Time					**Water Level**			**Flow Volume (mL)**	
Incremental			**Cumulative**						
Time (HH:MM:SS)	**Time Elapsed (HH:MM:SS)**	**Seconds**	**Seconds**	**Minutes**	**From Bottom (Feet)**	**From Top (Feet)**	**Hydraulic Gradient**	**Incremental**	**Cumulative**
11/4/22 12:00	0:00:00	0	0	0	2.91	1.74	1.43	0	0
11/4/22 12:17	0:17:00	1020	1020	17	2.85	1.80	1.40	49	49
11/4/22 12:41	0:24:00	1440	2460	41	2.79	1.86	1.37	68	117
11/4/22 12:52	0:11:00	660	3120	52	2.76	1.89	1.35	13	130
11/4/22 13:09	0:17:00	1020	4140	69	2.73	1.92	1.34	44	174
11/4/22 13:26	0:17:00	1020	5160	86	2.67	1.98	1.31	60	234
11/4/22 13:45	0:19:00	1140	6300	105	2.65	2.00	1.30		234
11/4/22 14:06	0:21:00	1260	7560	126	2.63	2.02	1.29	31	265
11/4/22 15:00	0:54:00	3240	10800	180	2.56	2.09	1.25	70	335
Best-Fit Line		Final Time	10800		Average Hydraulic Gradient (I):		**1.34**	Final Volume	335
Best-Fit Line Y Intercept:			30.9		Best-Fit Flow Rate (Q, mL/sec):		0.0311		



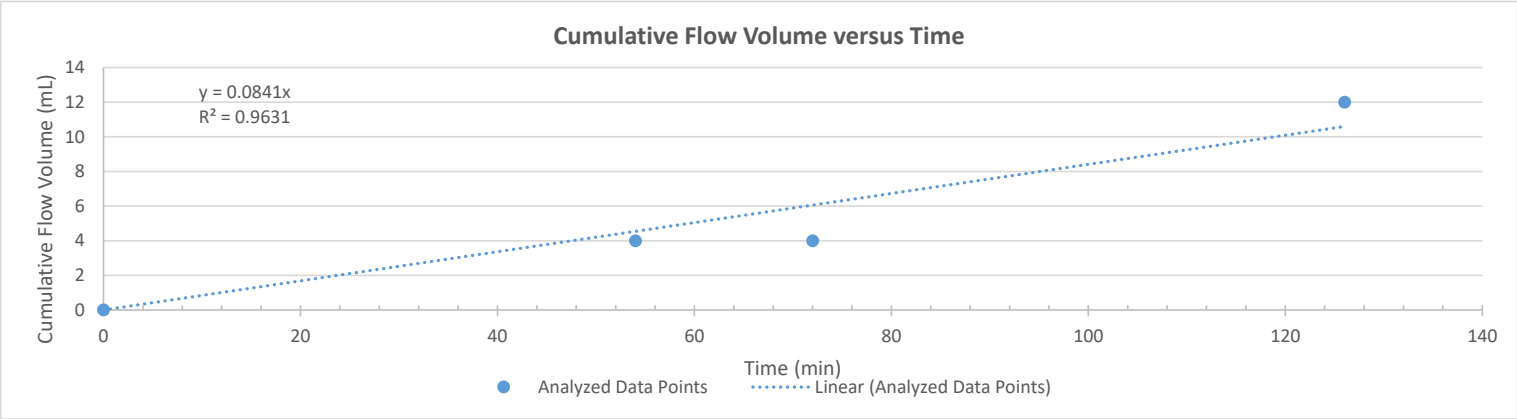
Note: Test and calculation methods described in Gefell, M.J., M. LaRue, and K. Russell, 2019. "Vertical Hydraulic Conductivity Measurement by Gravity Drainage." *Groundwater* 57(4):511–516.

Date: 11/04/2022 | **Calculation of Vertical Hydraulic Conductivity by Gravity Drainage** | **Boring ID: AQTD-N (0-3')**

Sampling Interval Depth	**0-3**	**feet**
Test Core Tube Length	**4.91**	**feet**
Test Sample Length	**3.06**	**feet**
Core Diameter	**2.75**	**inches**
Core Diameter	**6.99**	**cm**
Flow Area (A)	**38.3**	**cm^2**

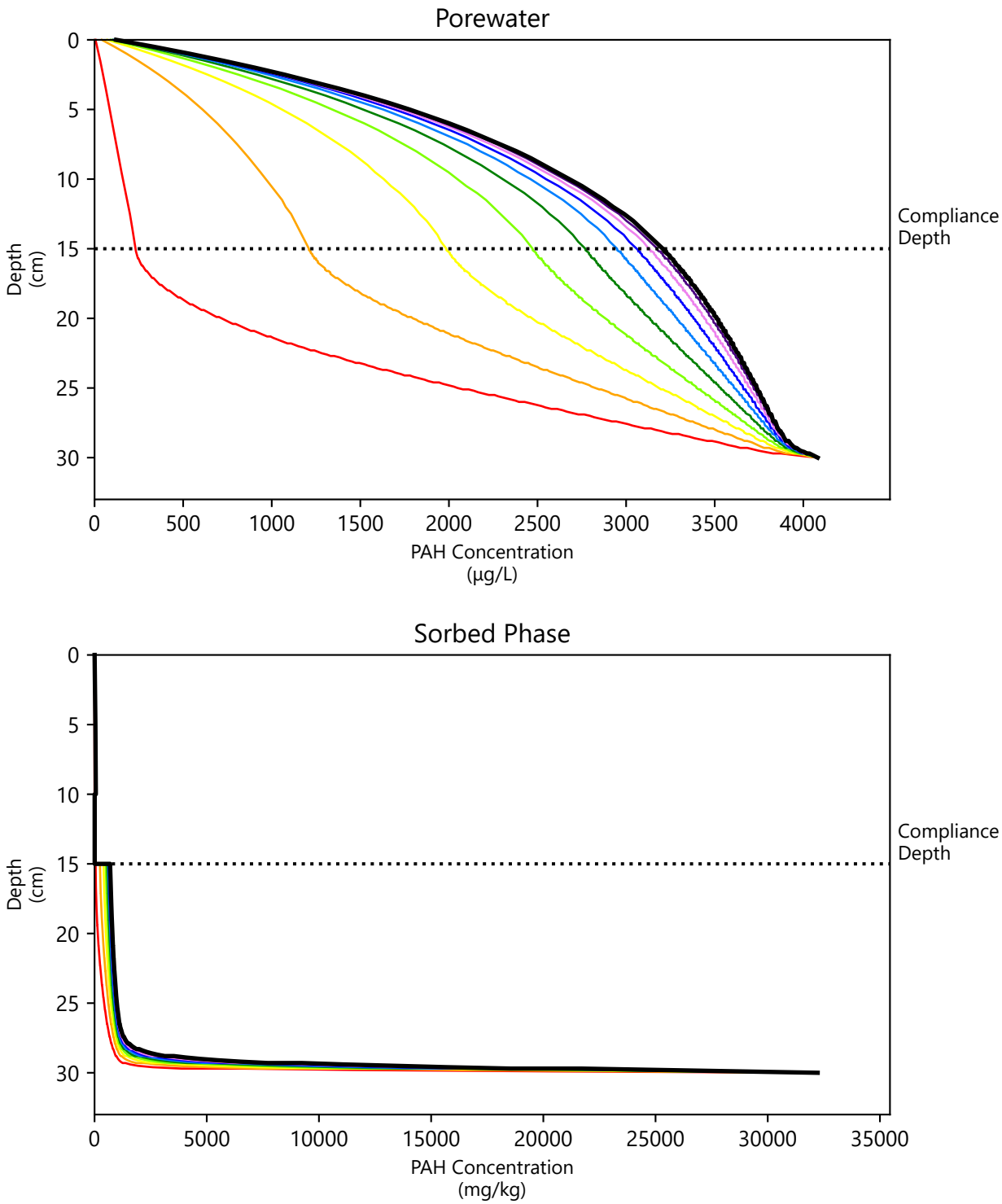
Kv Calculation (cm/sec)
Kv = Q / (AI)
2.8E-05

Time					**Water Level**			**Flow Volume (mL)**	
Incremental			**Cumulative**						
Time (HH:MM:SS)	**Time Elapsed (HH:MM:SS)**	**Seconds**	**Seconds**	**Minutes**	**From Bottom (Feet)**	**From Top (Feet)**	**Hydraulic Gradient**	**Incremental**	**Cumulative**
11/4/22 12:00	0:00:00	0	0	0	4.05	0.86	1.32	0	0
11/4/22 12:54	0:54:00	3240	3240	54	4.05	0.86	1.32	4	4
11/4/22 13:12	0:18:00	1080	4320	72	4.05	0.86	1.32	0	4
11/4/22 14:06	0:54:00	3240	7560	126	4.04	0.87	1.32	8	12
Best-Fit Line		Final Time	7560		Average Hydraulic Gradient (I):		**1.32**	Final Volume	12
Best-Fit Line Y Intercept:			0		Best-Fit Flow Rate (Q, mL/sec):		0.00140		



Note: Test and calculation methods described in Gefell, M.J., M. LaRue, and K. Russell, 2019. "Vertical Hydraulic Conductivity Measurement by Gravity Drainage." *Groundwater* 57(4):511–516.

Attachment 3
Figures of Cap Model Results



Source: output_2401-13_Total PAH (16).csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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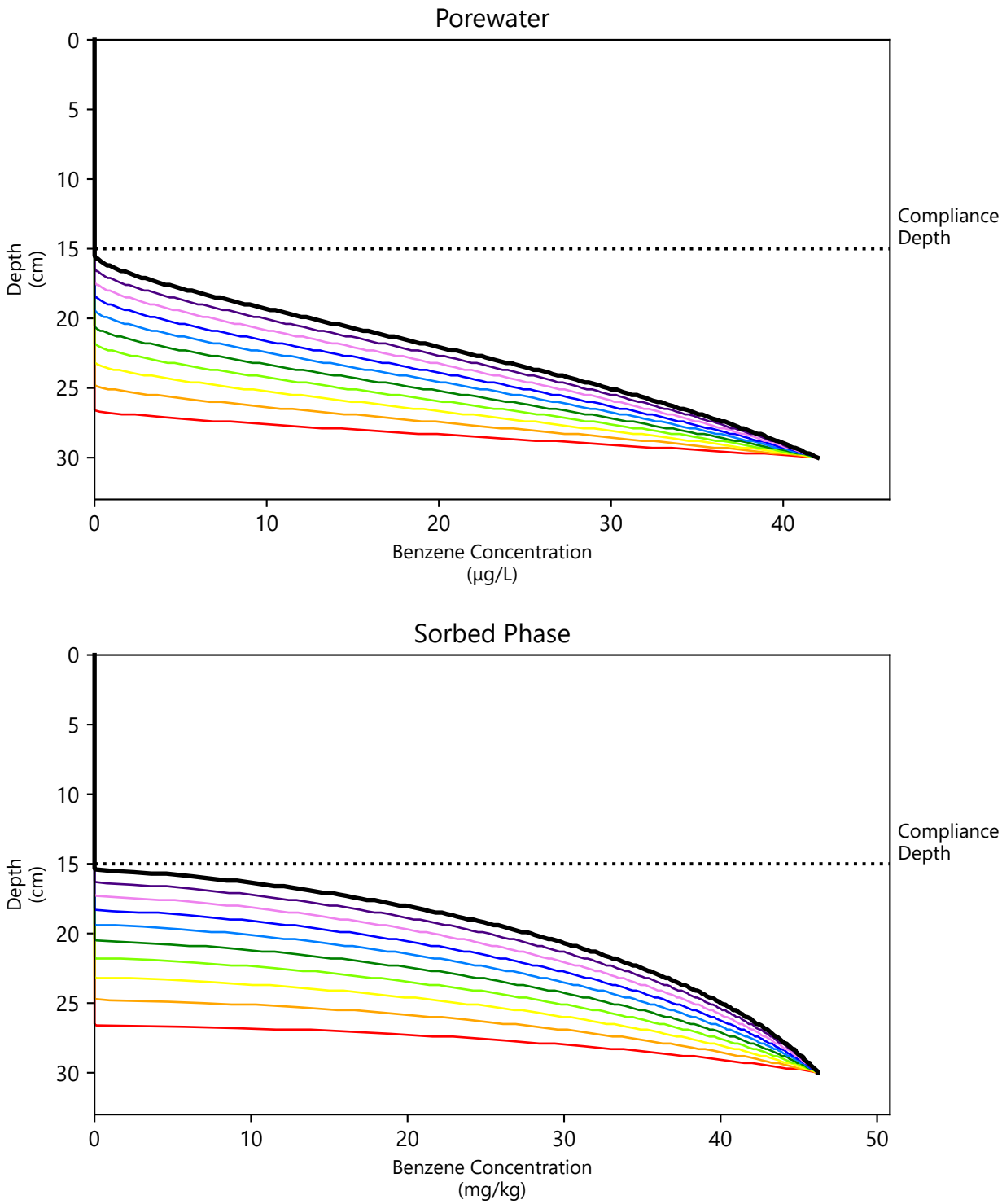
Figure 1
Depth Profile of Total PAH (16) Concentrations in the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-13_Benzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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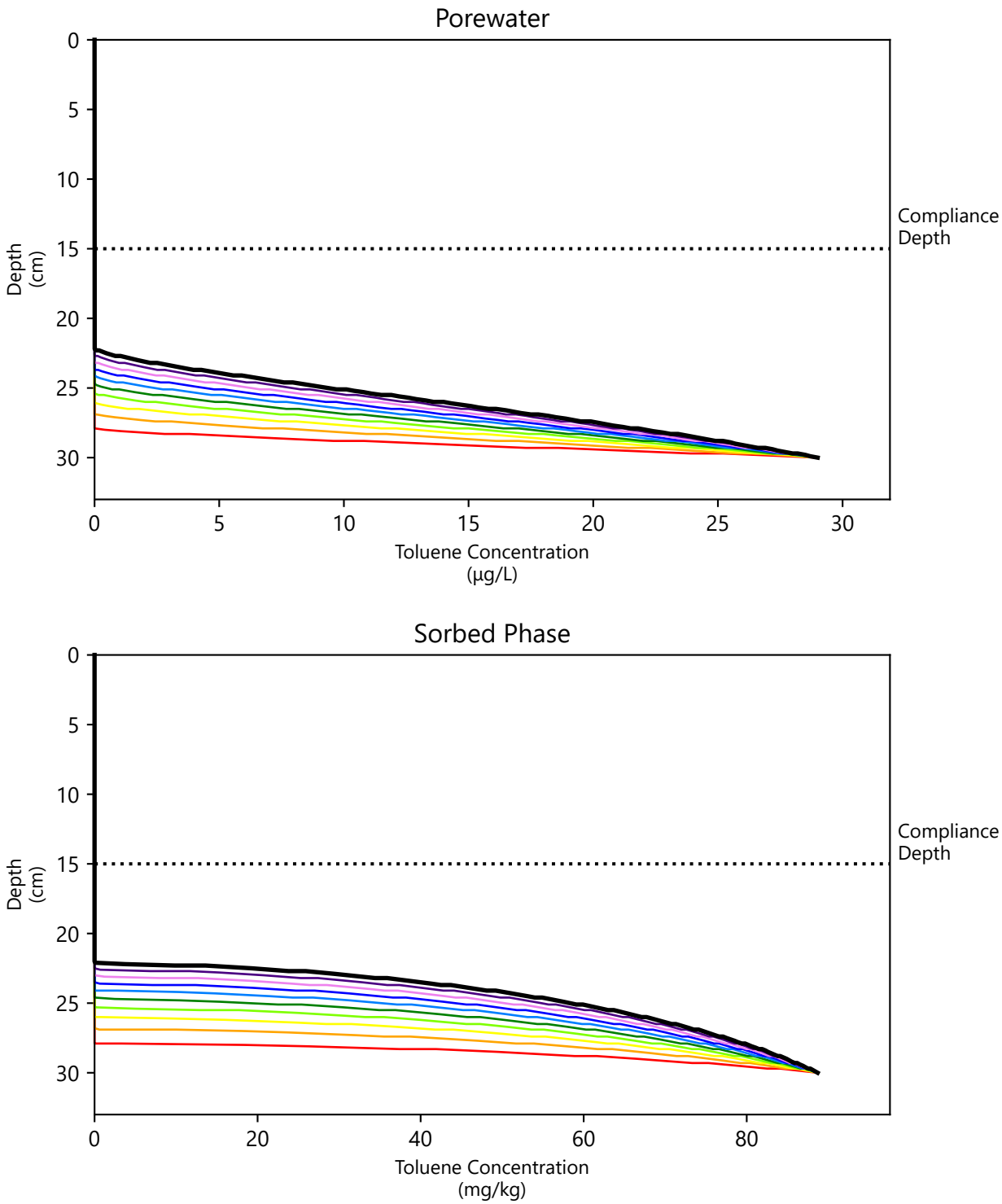
Figure 2
Depth Profile of Benzene Concentrations in the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-13_Toluene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

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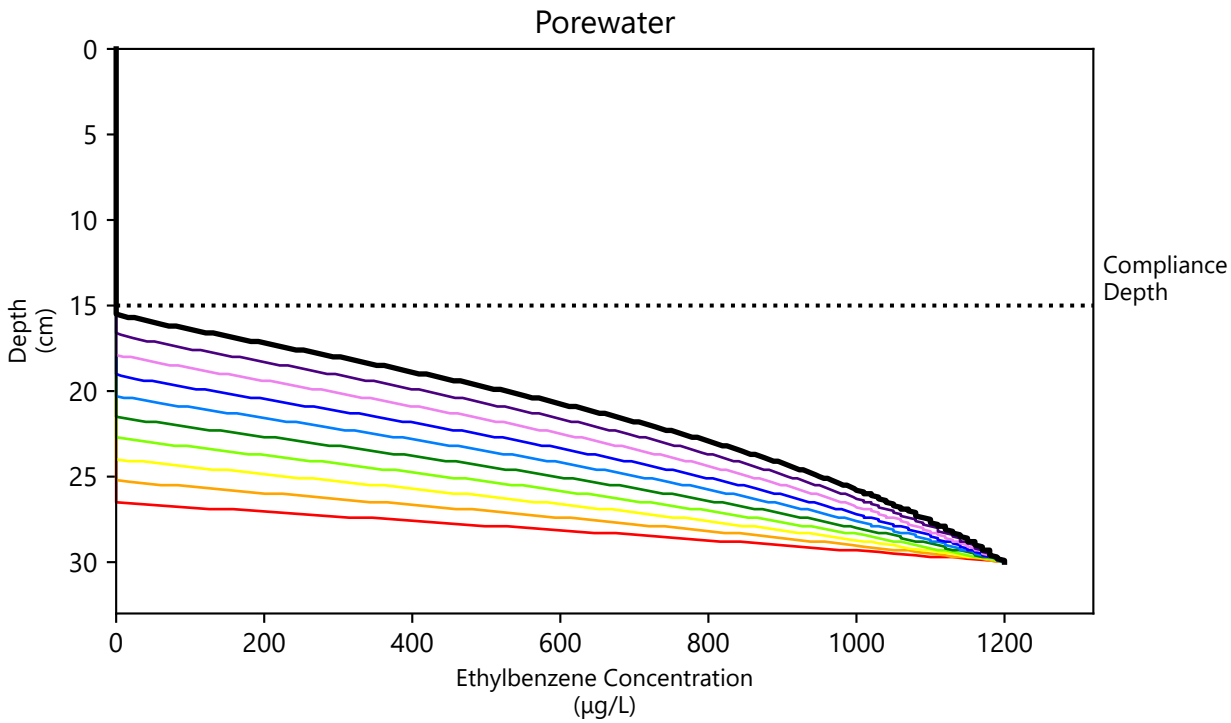
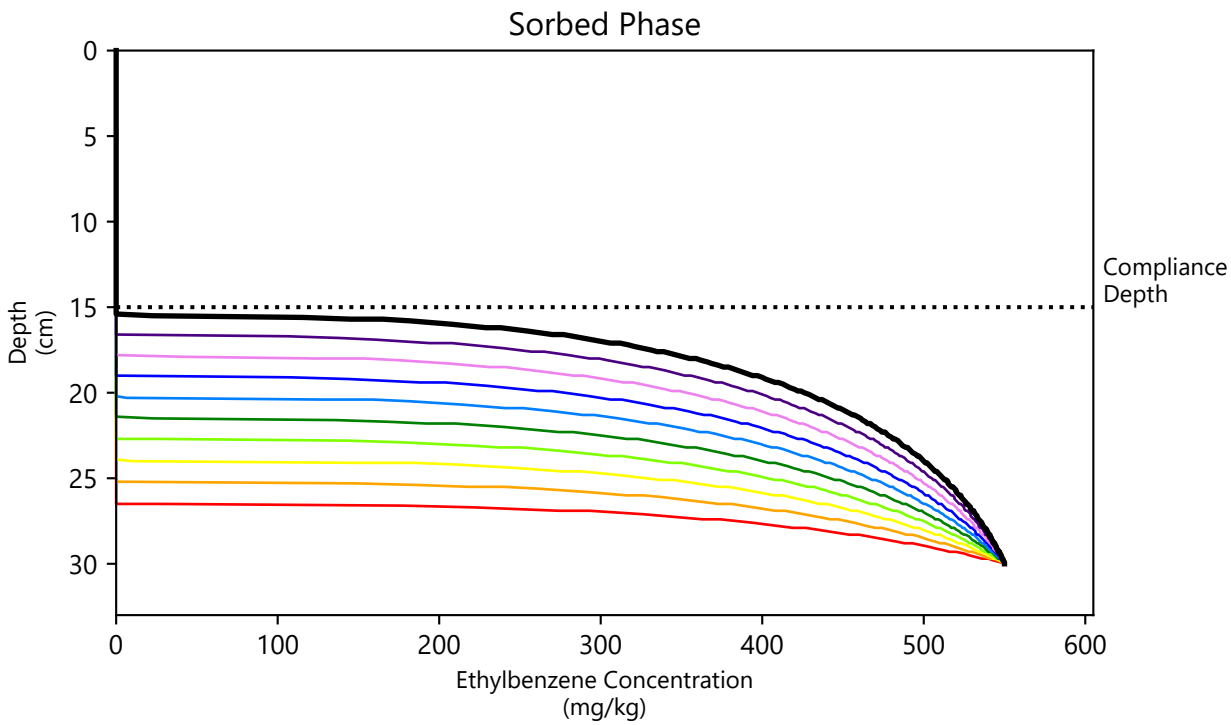
Figure 3
Depth Profile of Toluene Concentrations in the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site





Source: output_2401-13_Ethylbenzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

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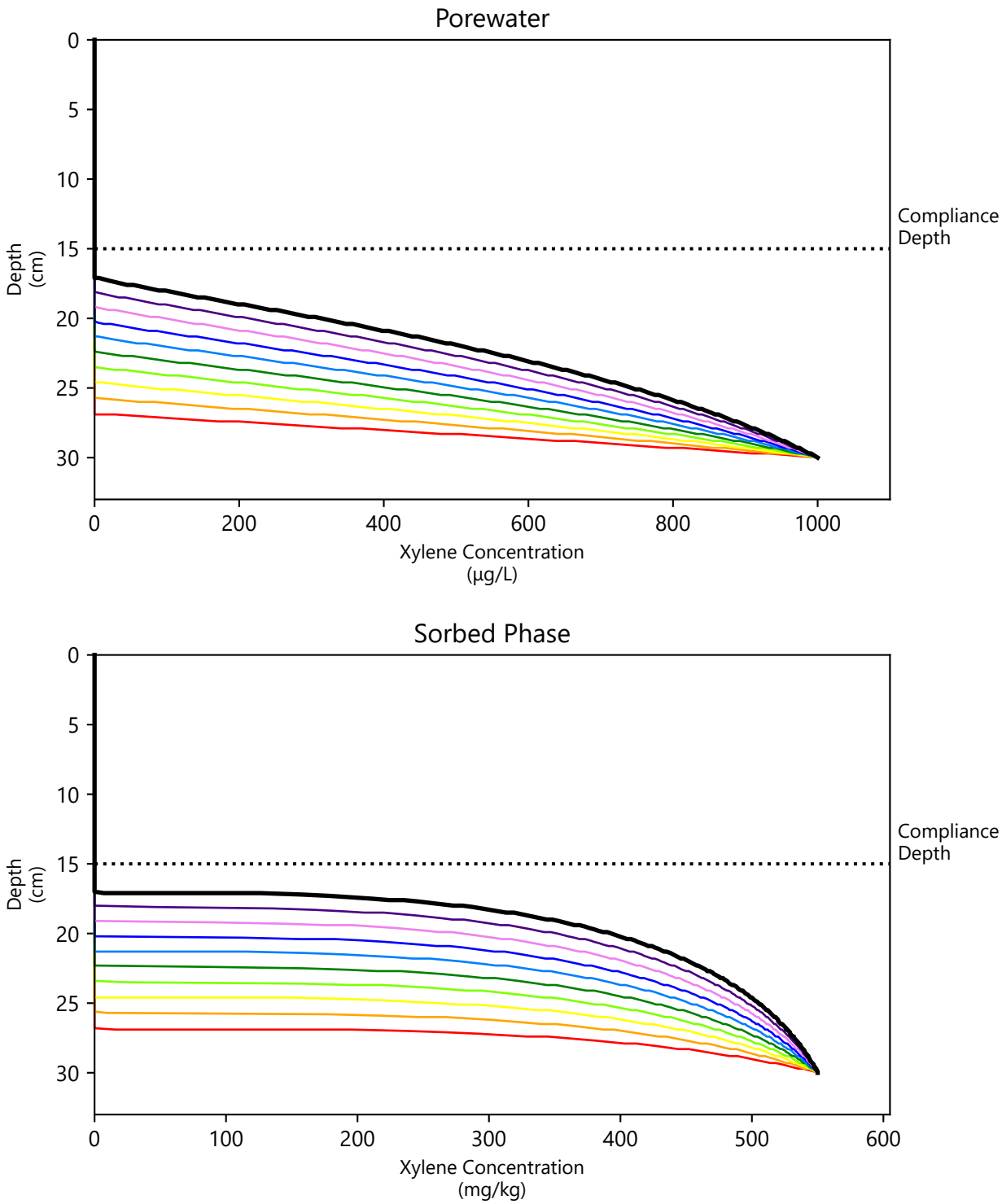
Figure 4
Depth Profile of Ethylbenzene Concentrations in the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-13_Xylene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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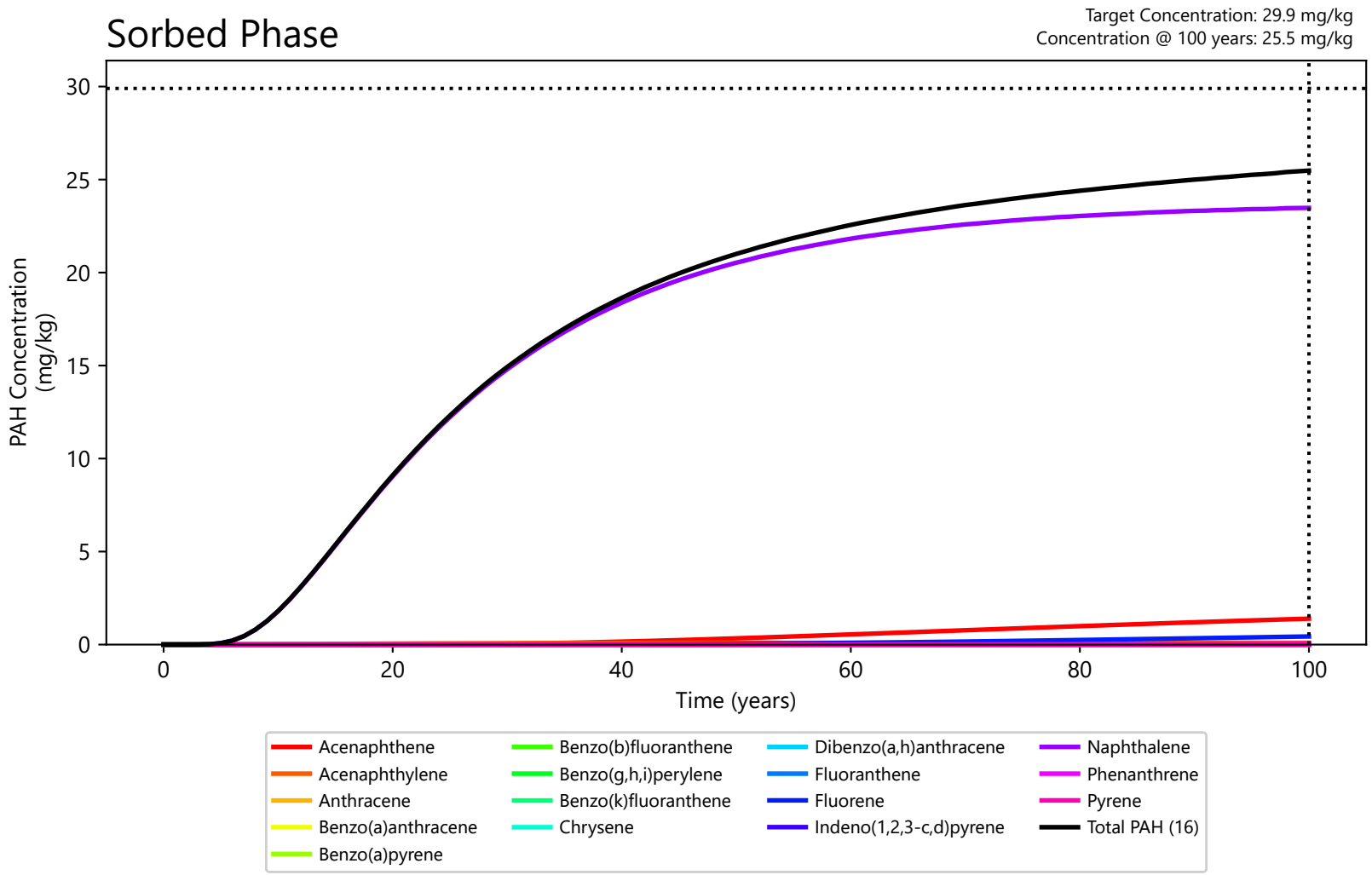
Figure 5
Depth Profile of Xylene Concentrations in the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-13_Total PAH (16).csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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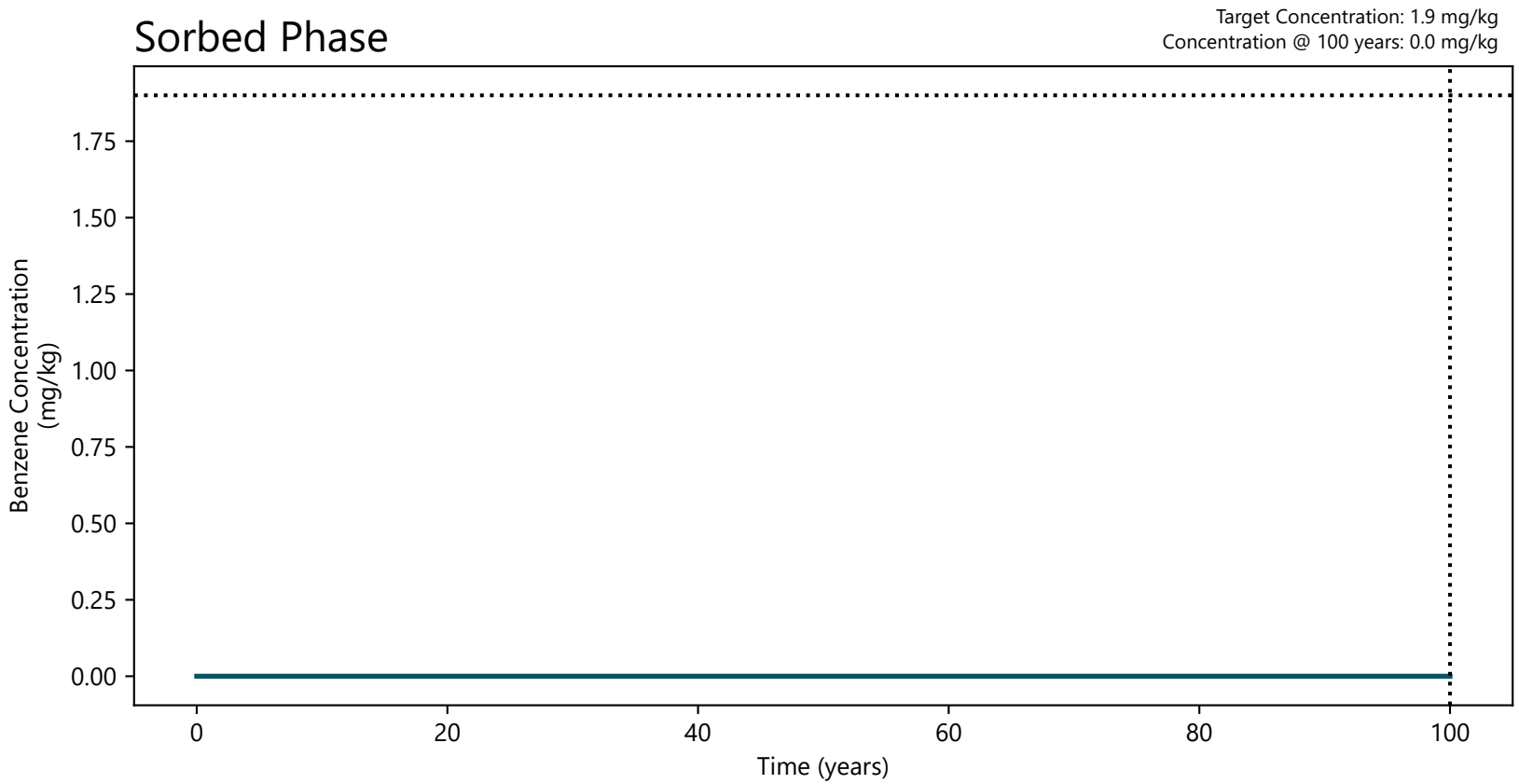
Figure 6
Vertically Averaged PAH Concentrations in the top 15 cm of the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-13_Benzene.csv

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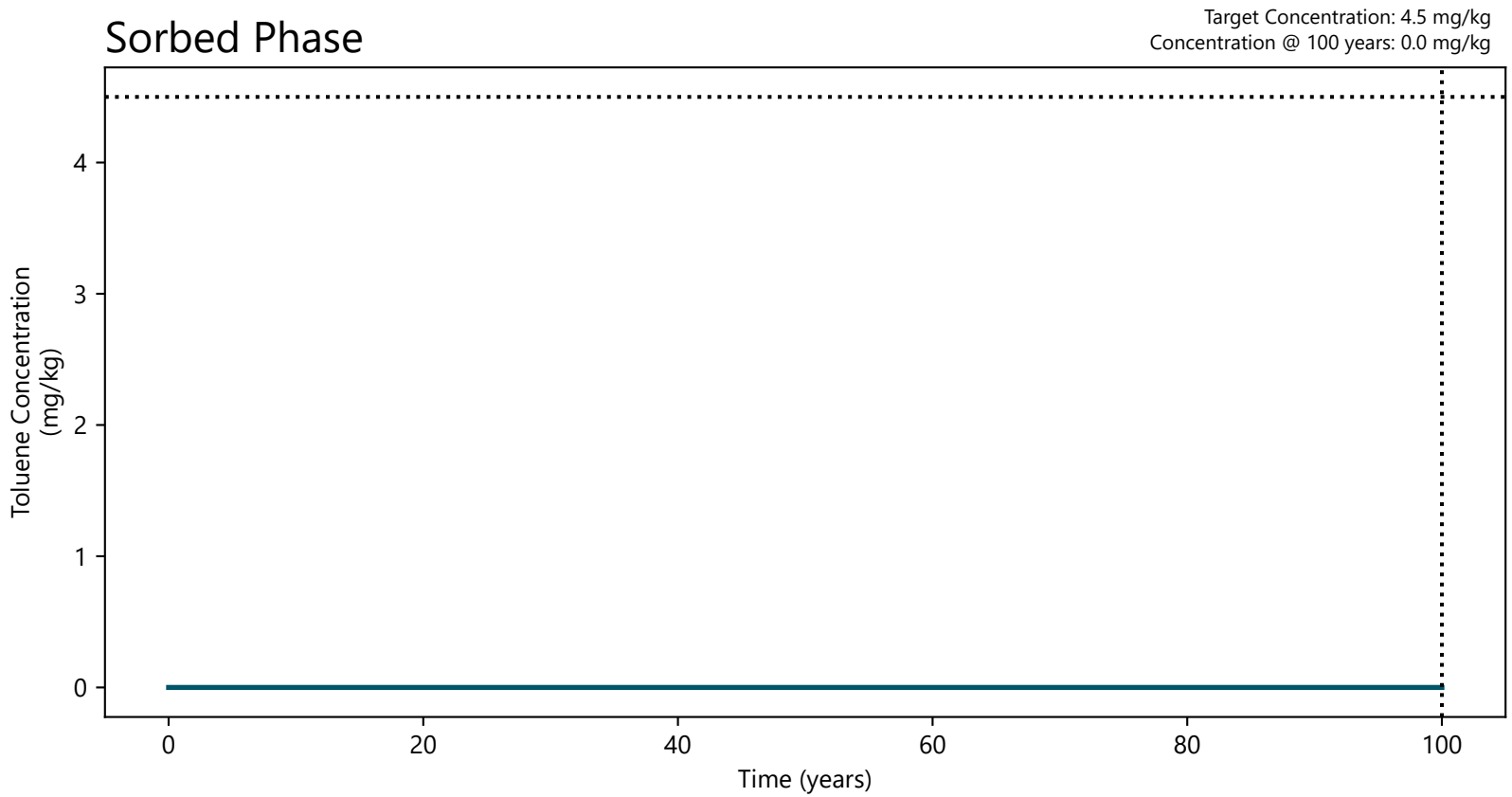
Figure 7
Vertically Averaged Benzene Concentration in the top 15 cm of the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-13_Toluene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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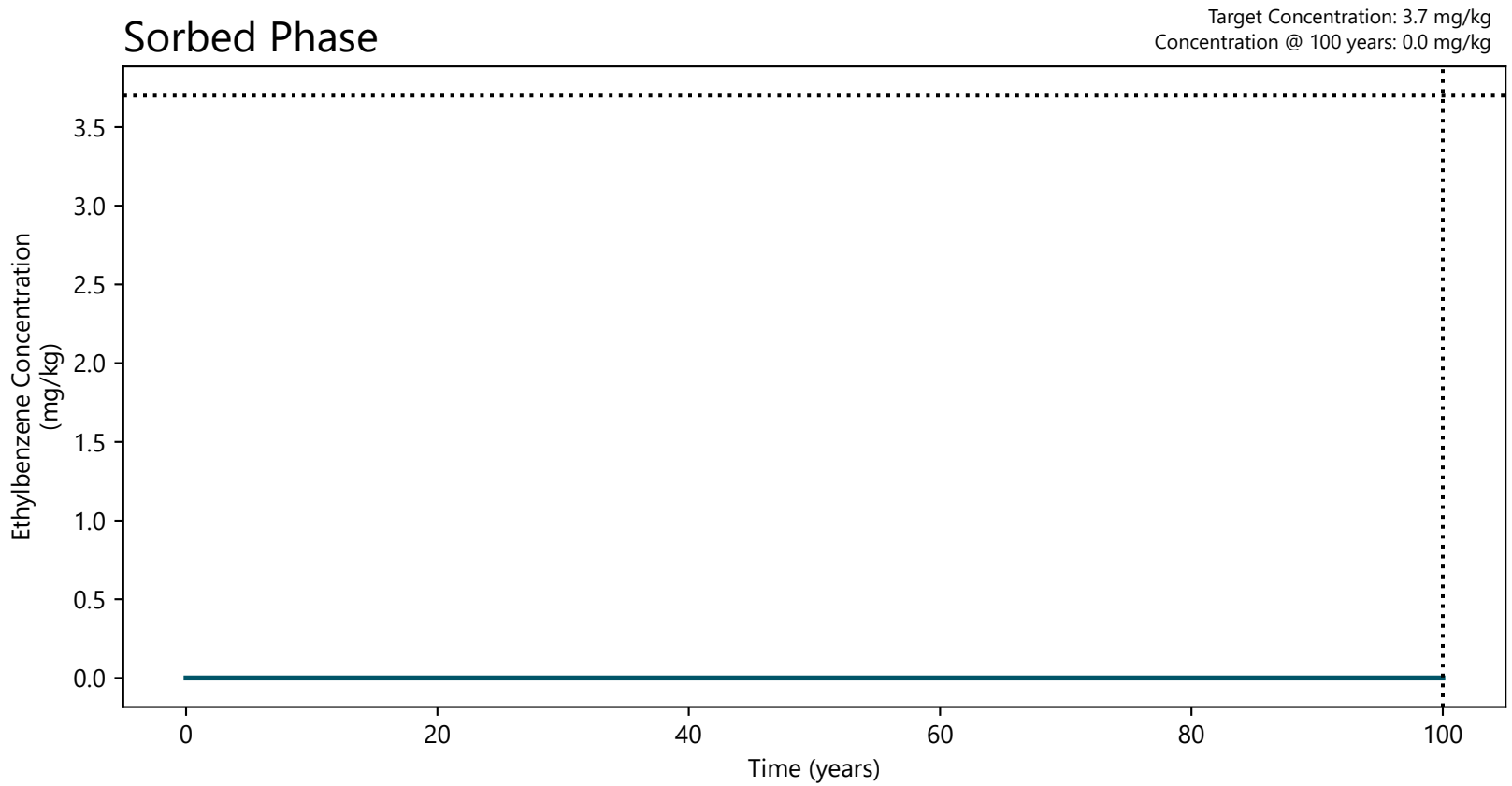
Figure 8
Vertically Averaged Toluene Concentration in the top 15 cm of the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC
Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-13_Ethylbenzene.csv

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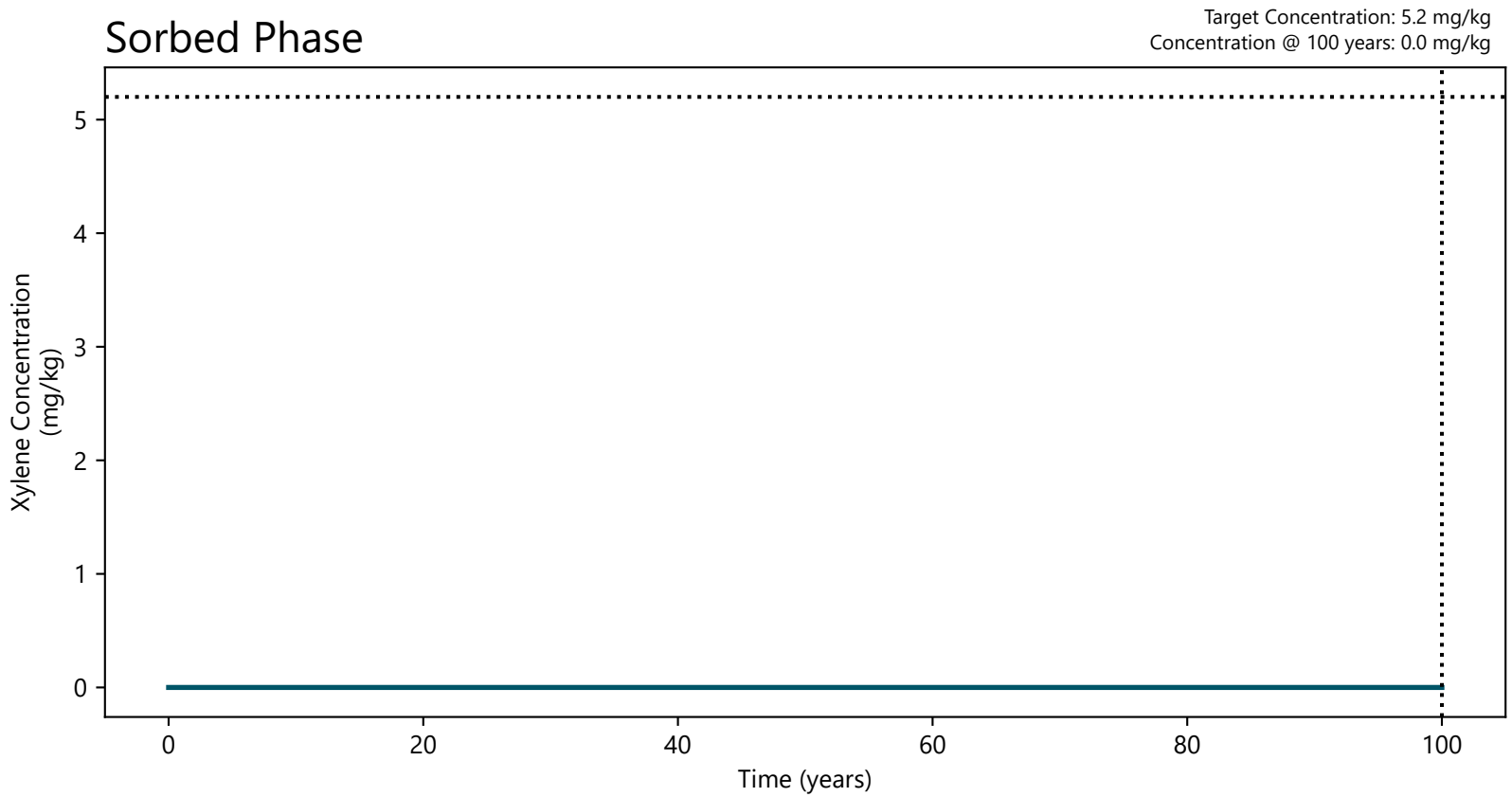
Figure 9
Vertically Averaged Ethylbenzene Concentration in the top 15 cm of the Cap: Upstream Segment 0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-13_Xylene.csv

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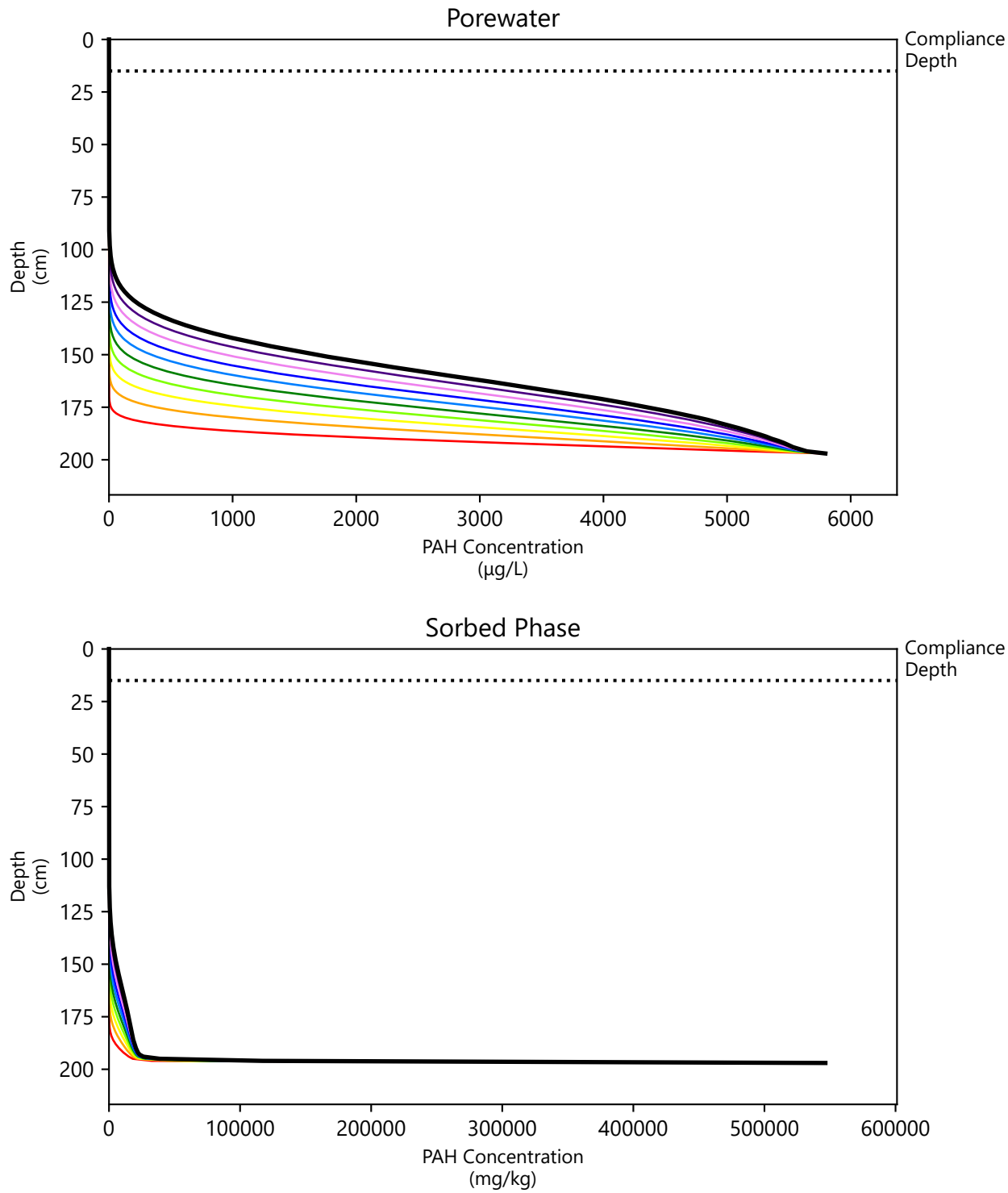
Figure 10
Vertically Averaged Xylene Concentration in the top 15 cm of the Cap: Upstream Segment
0.5 foot CIL with 1% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-03_Total PAH (16).csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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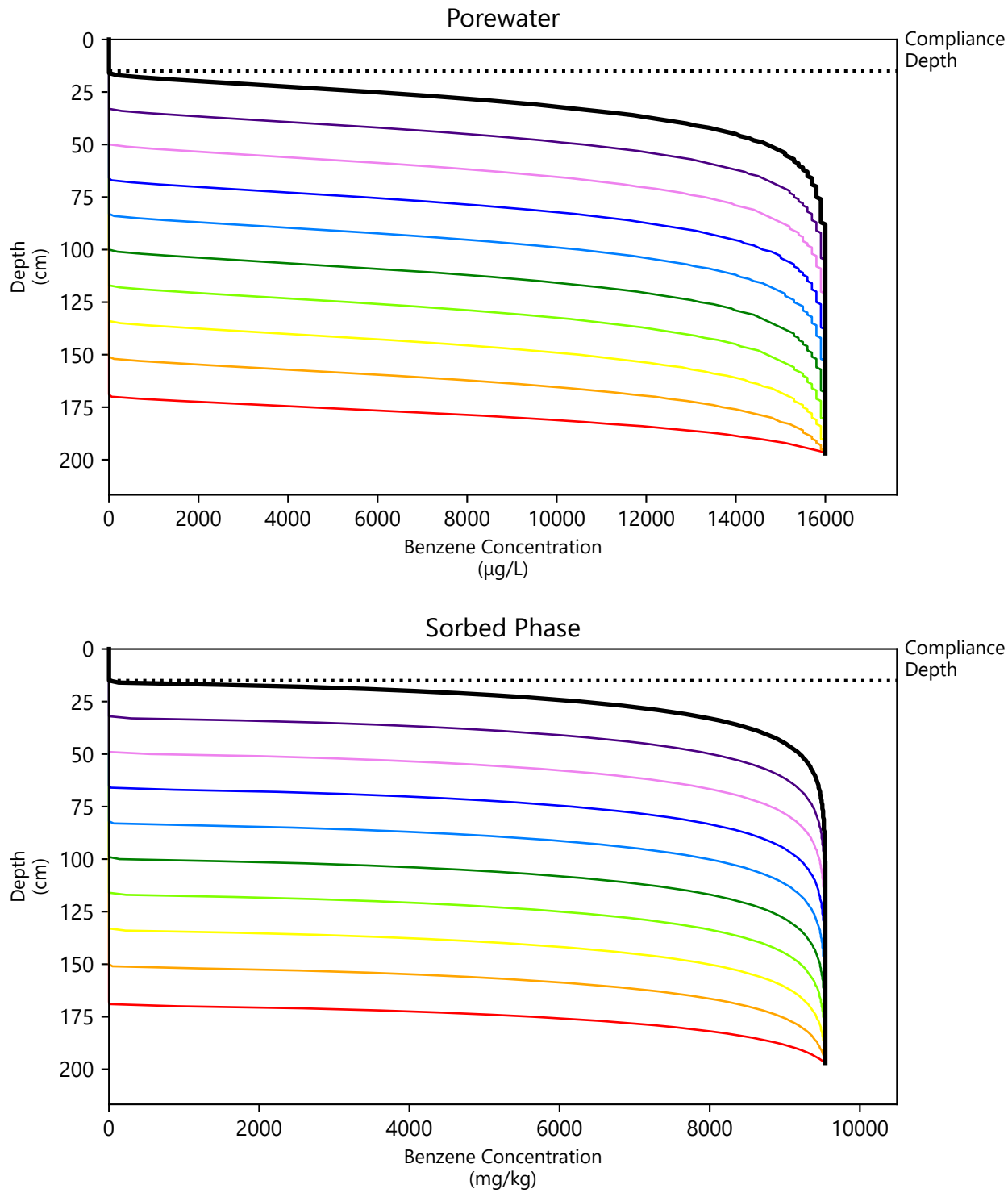
Figure 11
Depth Profile of Total PAH (16) Concentrationss in the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-03_Benzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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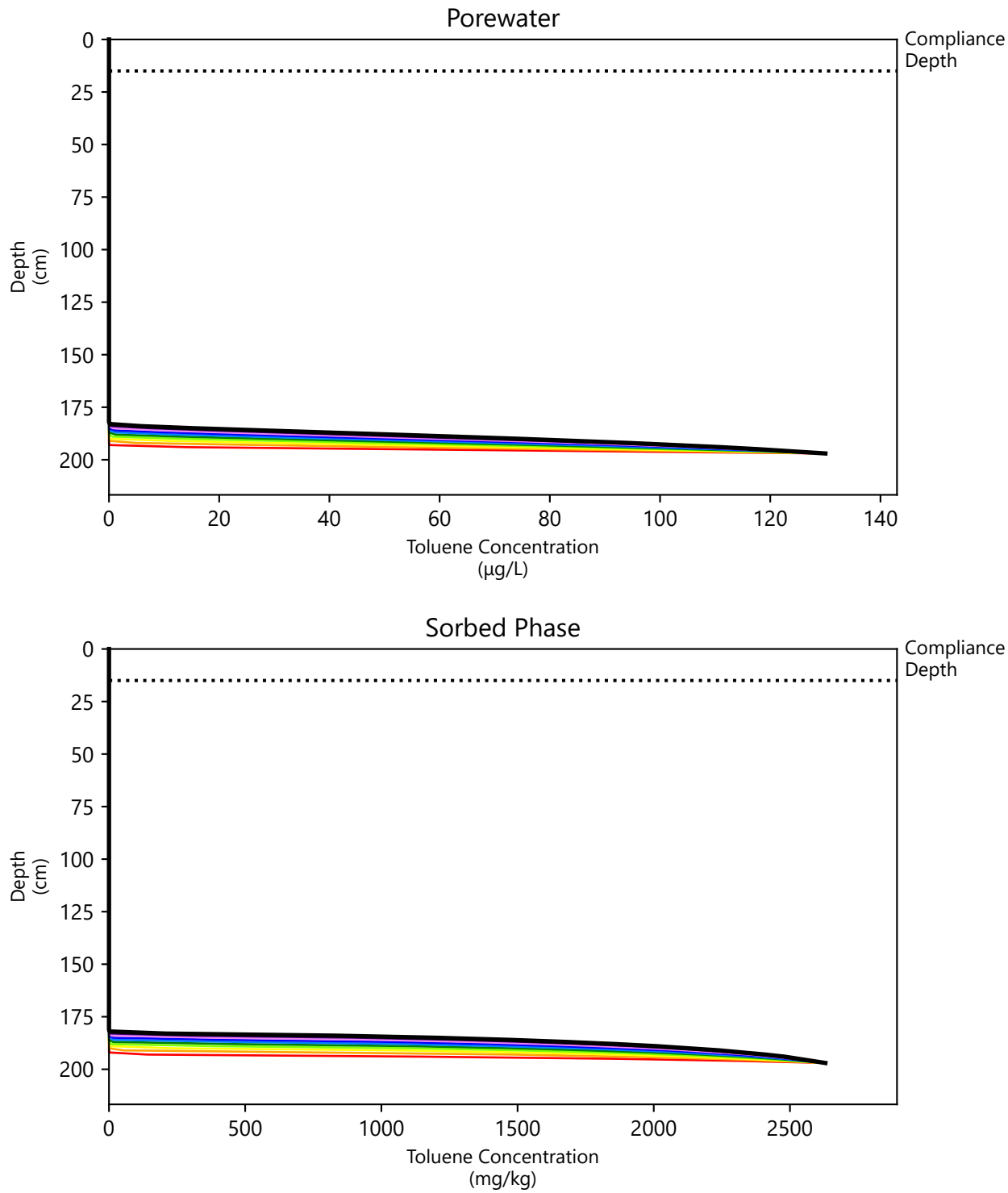
Figure 12
Depth Profile of Benzene Concentrations in the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-03_Toluene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
\\wcl-fs1\beverly\Projects\National_Grid\Haverhill\Phase4\Design\Cap Design\Cap_Modeling\CapSim_4pt2\Python\CapSim_Plots_Batch_version4pt2_for_Report.py

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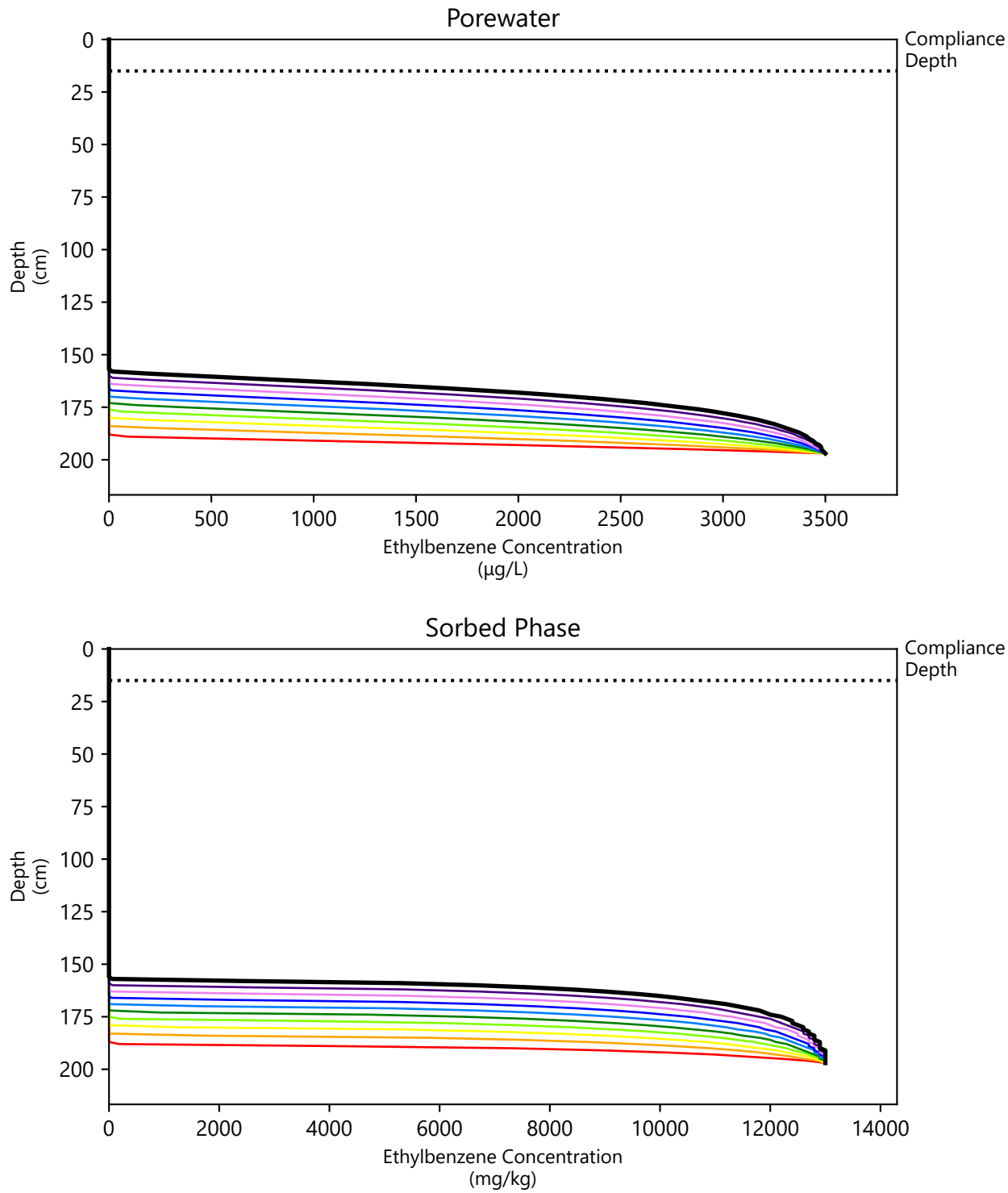
Figure 13
Depth Profile of Toluene Concentrations in the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-03_Ethylbenzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

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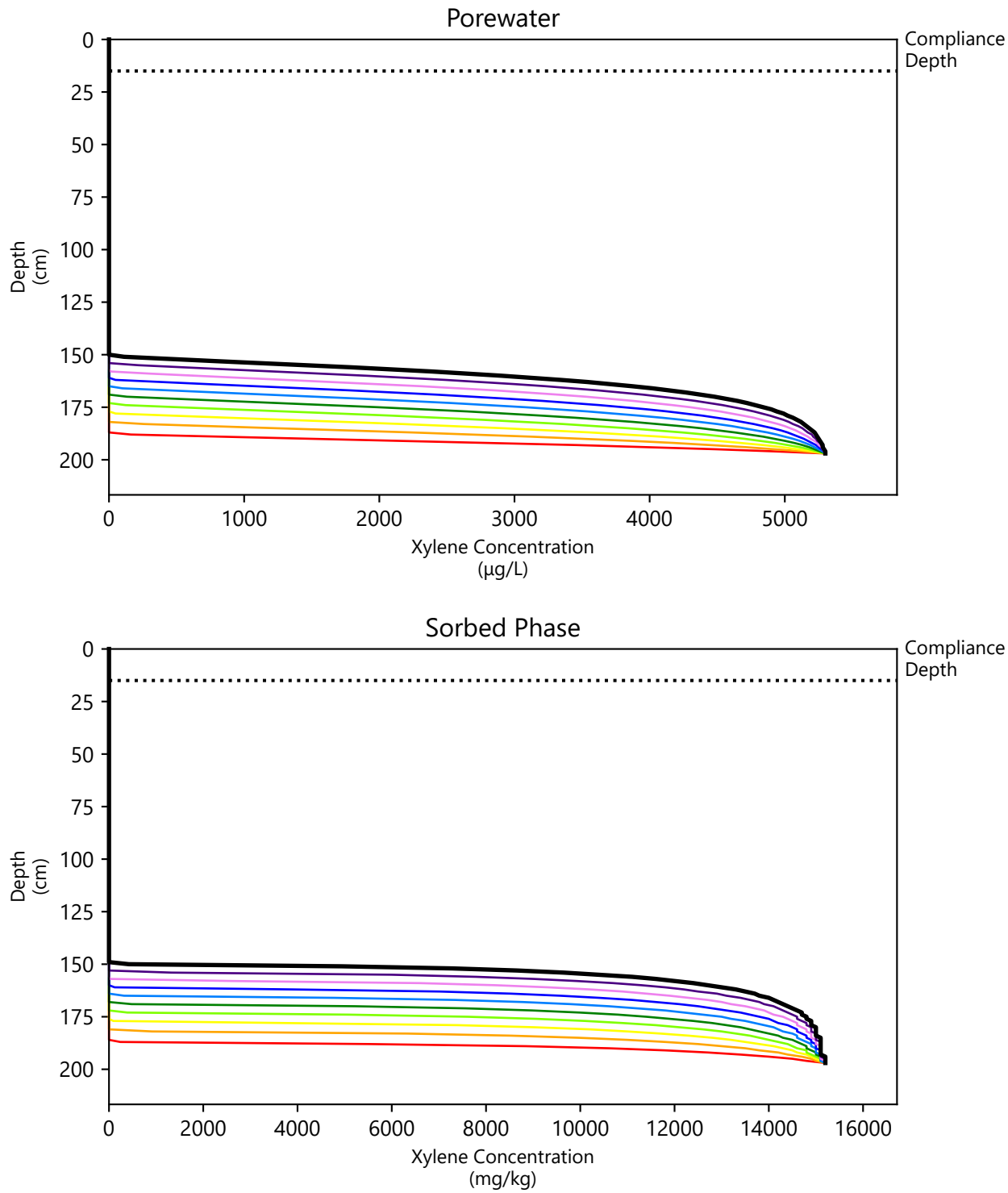
\\wcl-fs1\beverly\Projects\National_Grid\Haverhill\Phase4\Design\Cap Design\Cap_Modeling\CapSim_4pt2\Python\CapSim_Plots_Batch_version4pt2_for_Report.py

ANCHOR QEA

Figure 14
Depth Profile of Ethylbenzene Concentrations in the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-03_Xylene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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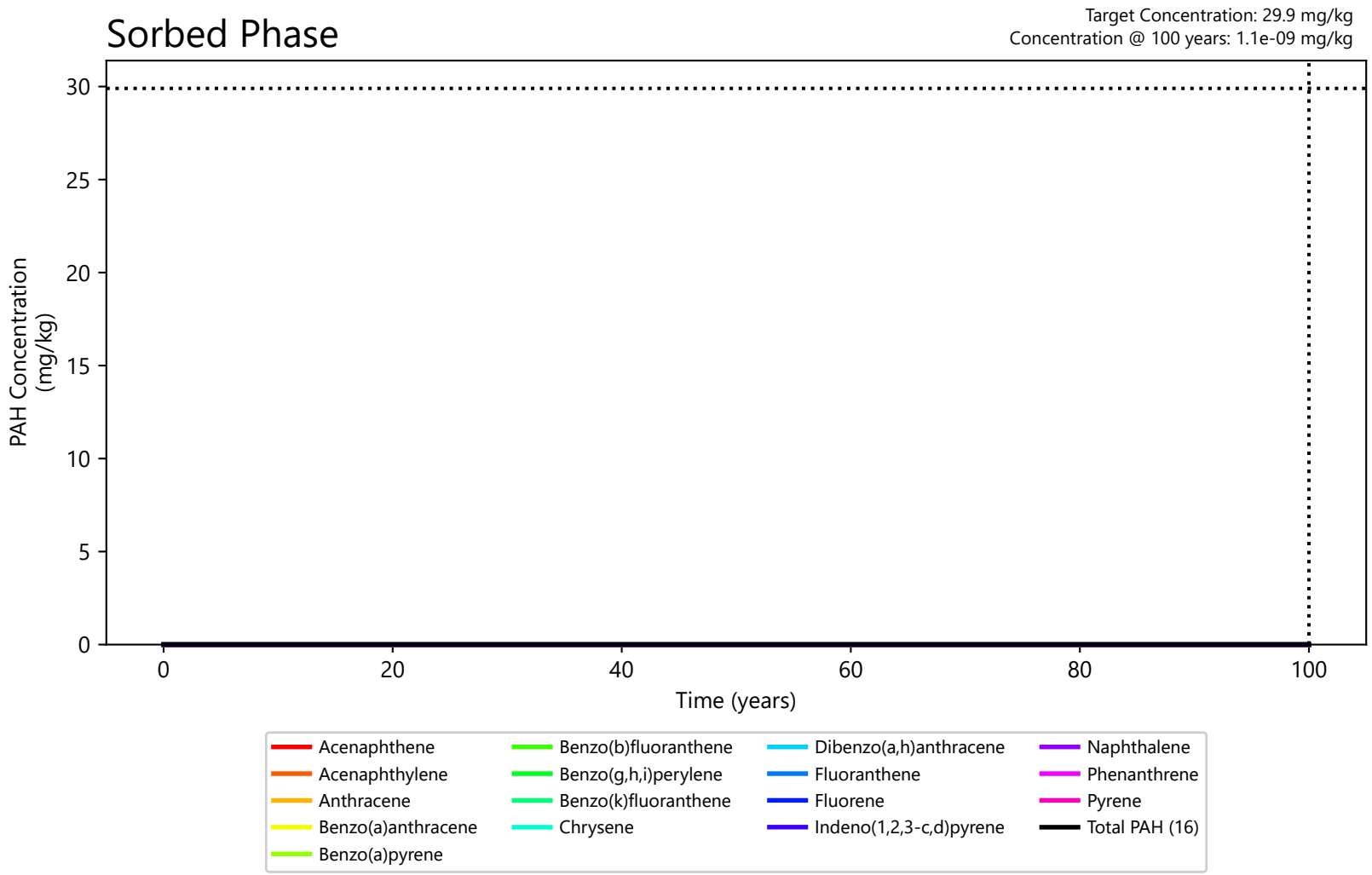
Figure 15
Depth Profile of Xylene Concentrations in the Cap: Midstream Segment
6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-03_Total PAH (16).csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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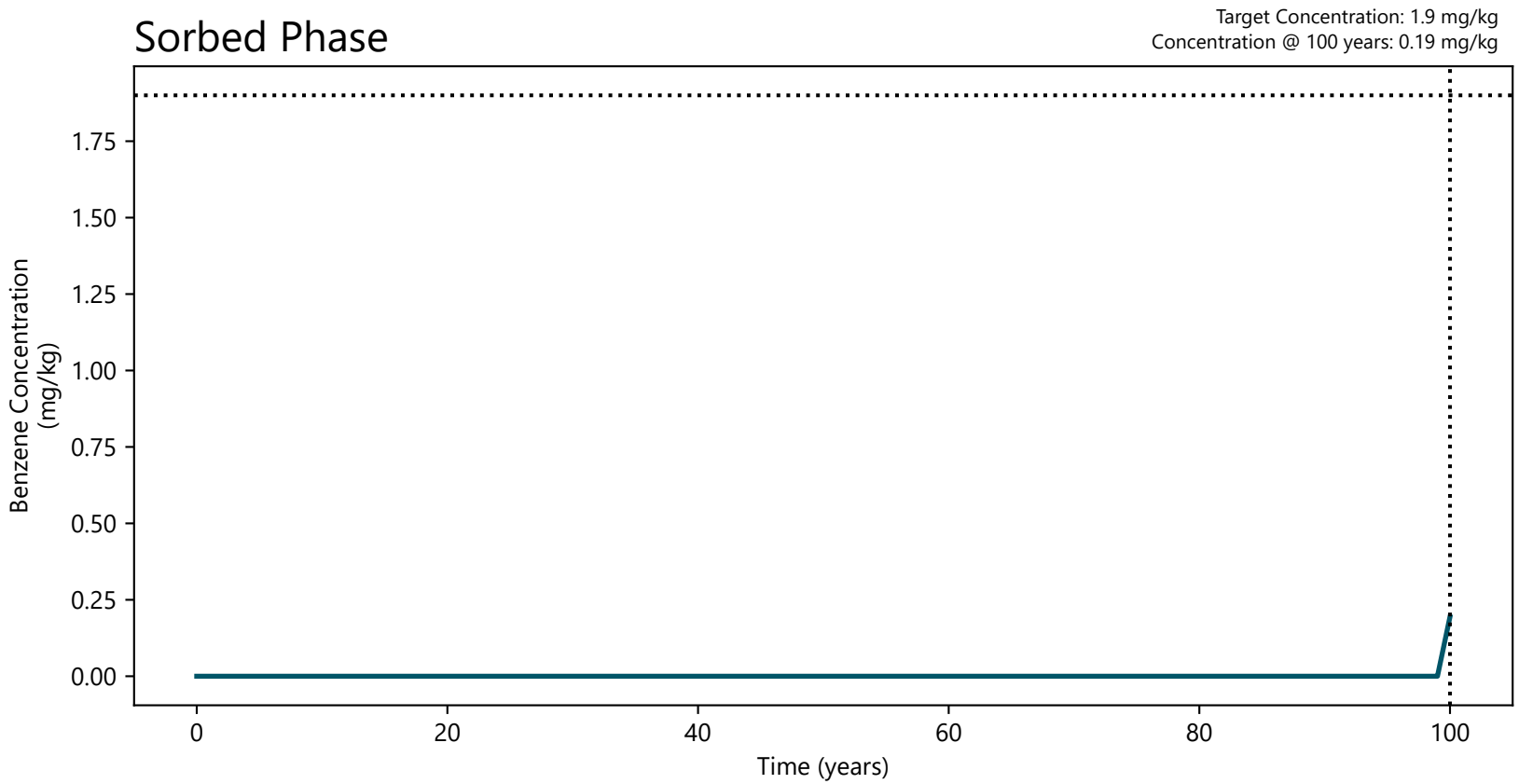
ANCHOR QEA

Figure 16
Vertically Averaged PAH Concentrations in the top 15 cm of the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-03_Benzene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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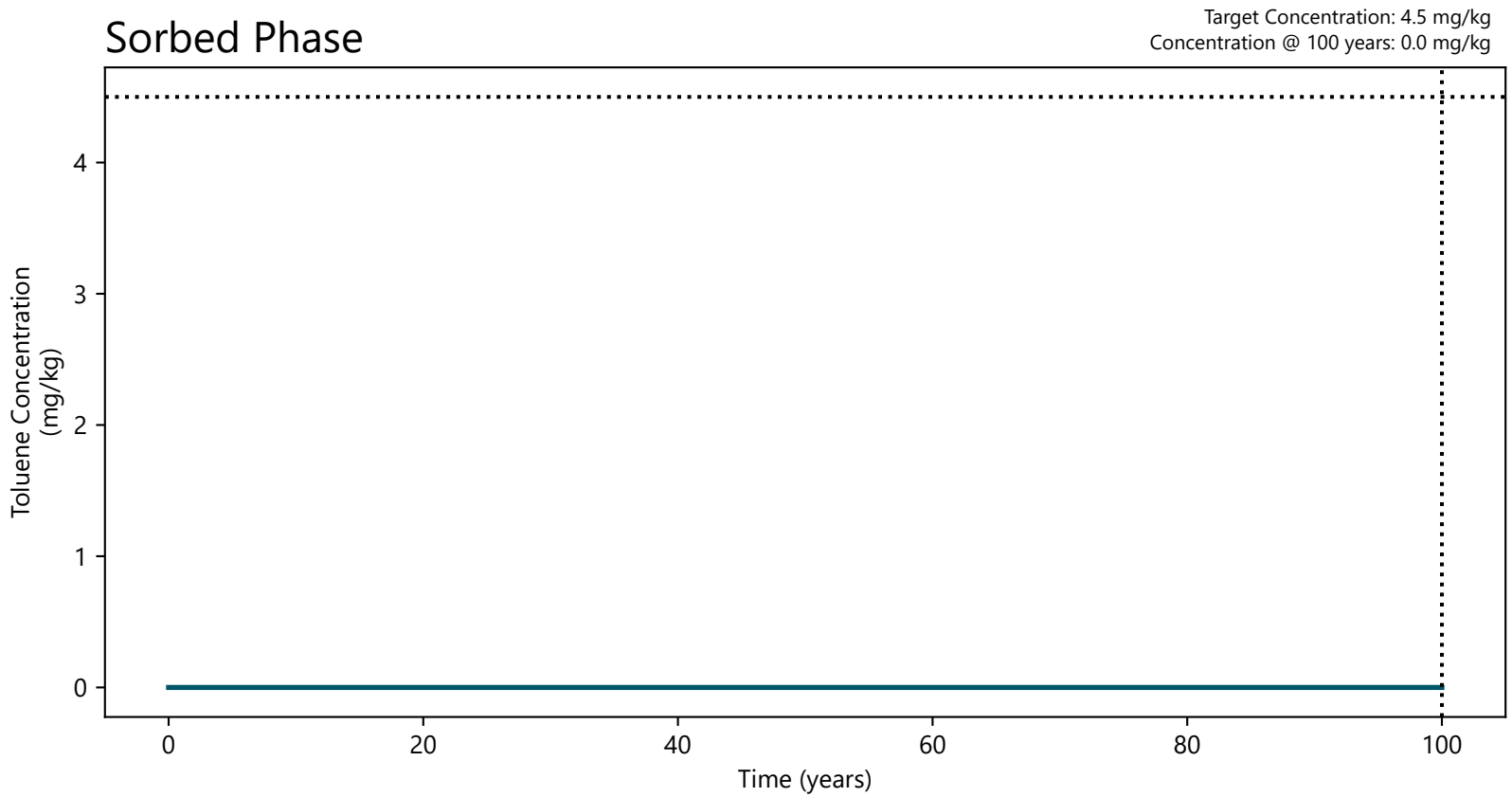
Figure 17
Vertically Averaged Benzene Concentration in the top 15 cm of the Cap: Midstream Segment
6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-03_Toluene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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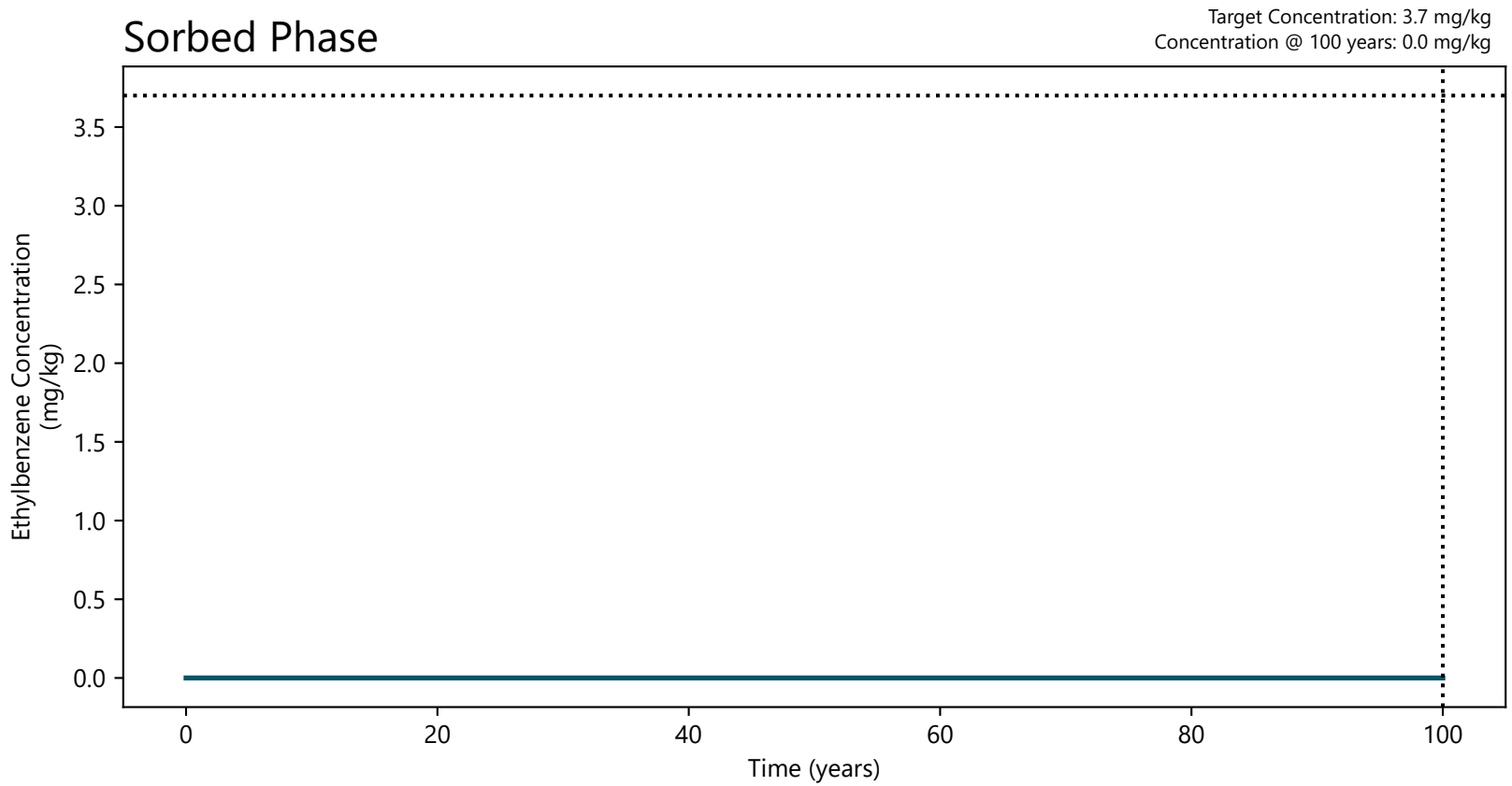
Figure 18
Vertically Averaged Toluene Concentration in the top 15 cm of the Cap: Midstream Segment
6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-03_Ethylbenzene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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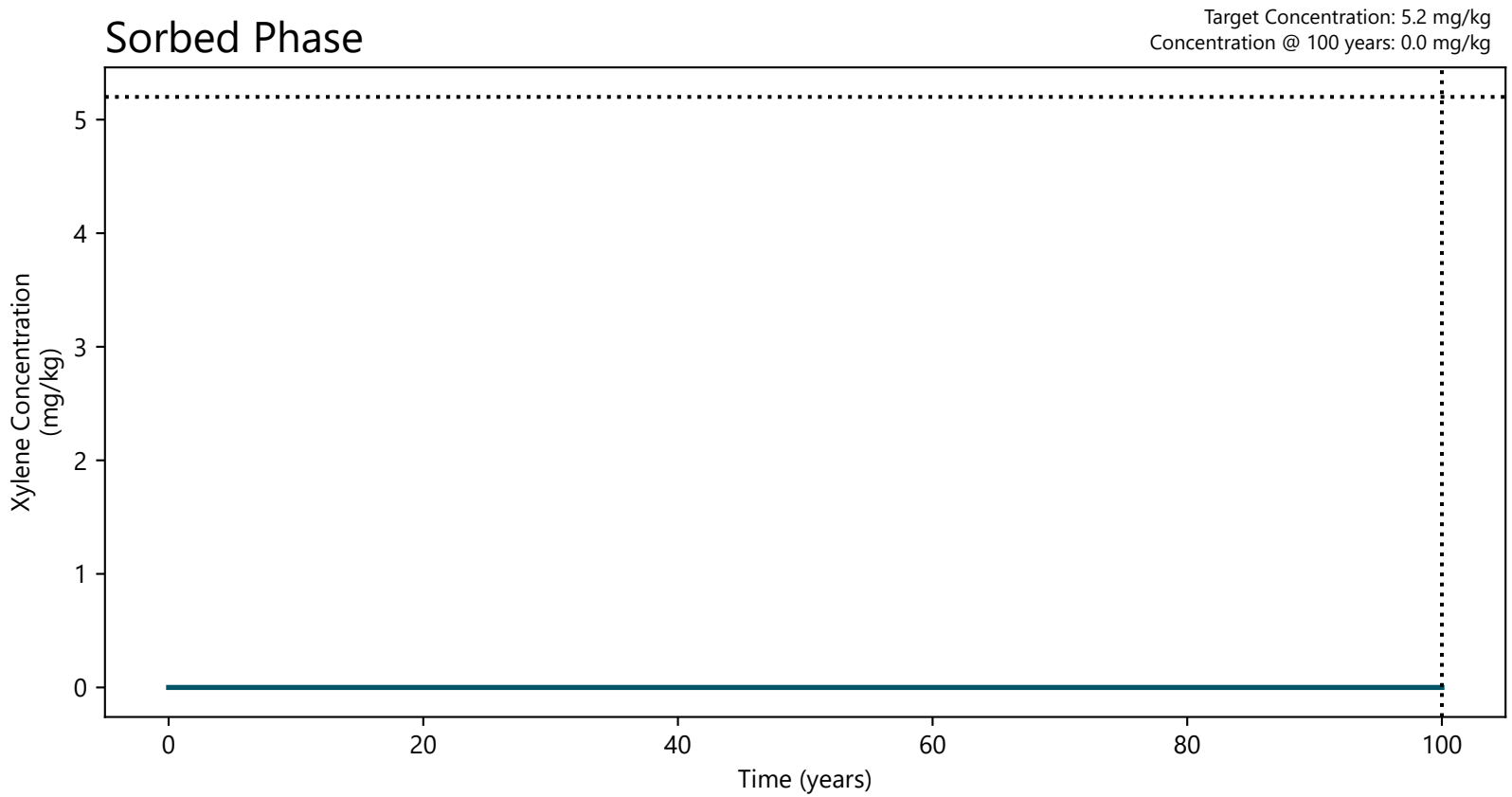
Figure 19
Vertically Averaged Ethylbenzene Concentration in the top 15 cm of the Cap: Midstream Segment 6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-03_Xylene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
\\wcl-fs1\beverly\Projects\National_Grid\Haverhill\Phase4\Design\Cap Design\Cap_Modeling\CapSim_4pt2\Python\CapSim_Plots_Batch_version4pt2_for_Report.py

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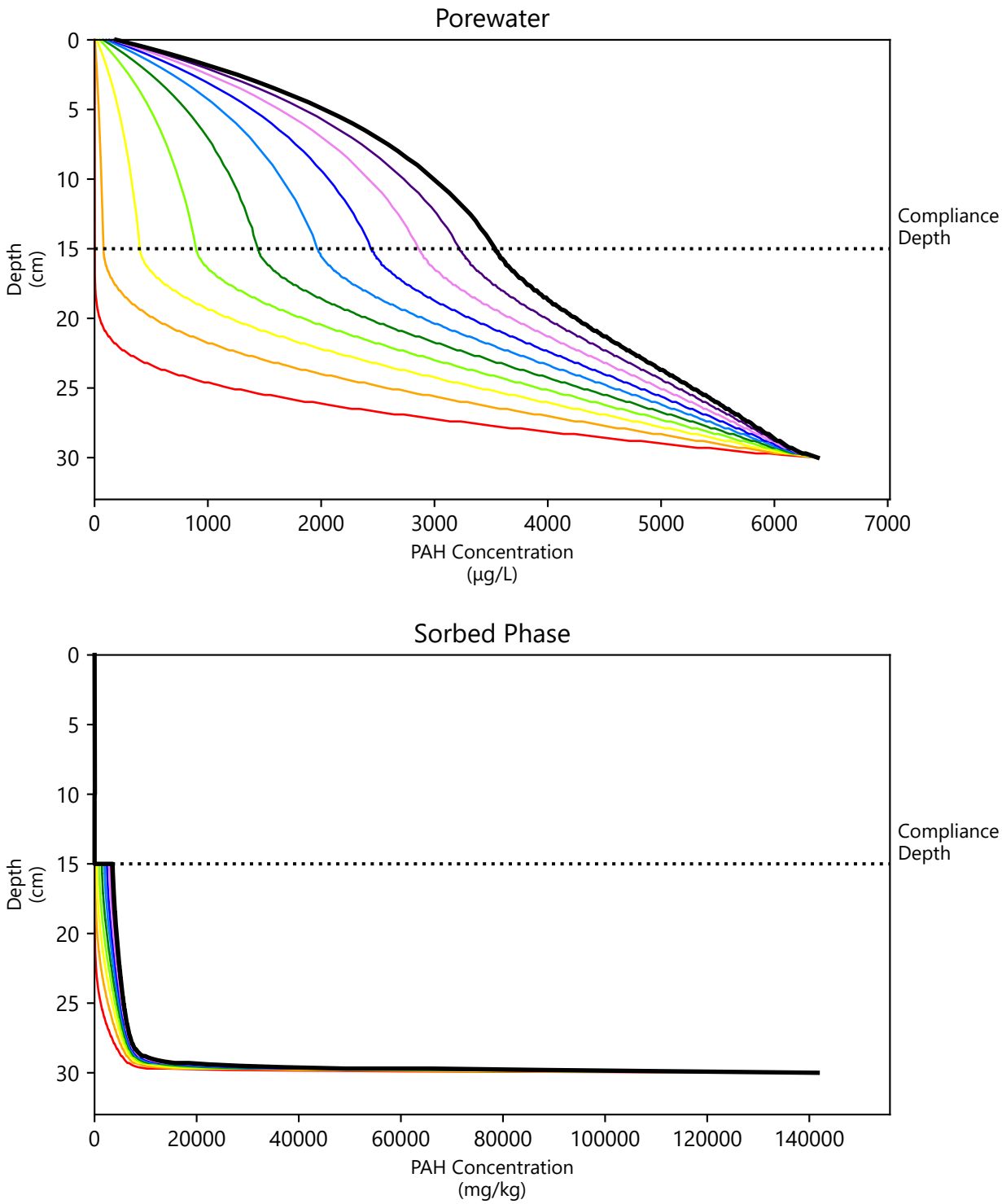
Figure 20
Vertically Averaged Xylene Concentration in the top 15 cm of the Cap: Midstream Segment
6 foot CIL with 17% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-16_Total PAH (16).csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
\\wcl-fs1\beverly\Projects\National_Grid\Haverhill\Phase4\Design\Cap Design\Cap_Modeling\CapSim_4pt2\Python\CapSim_Plots_Batch_version4pt2_for_Report.py

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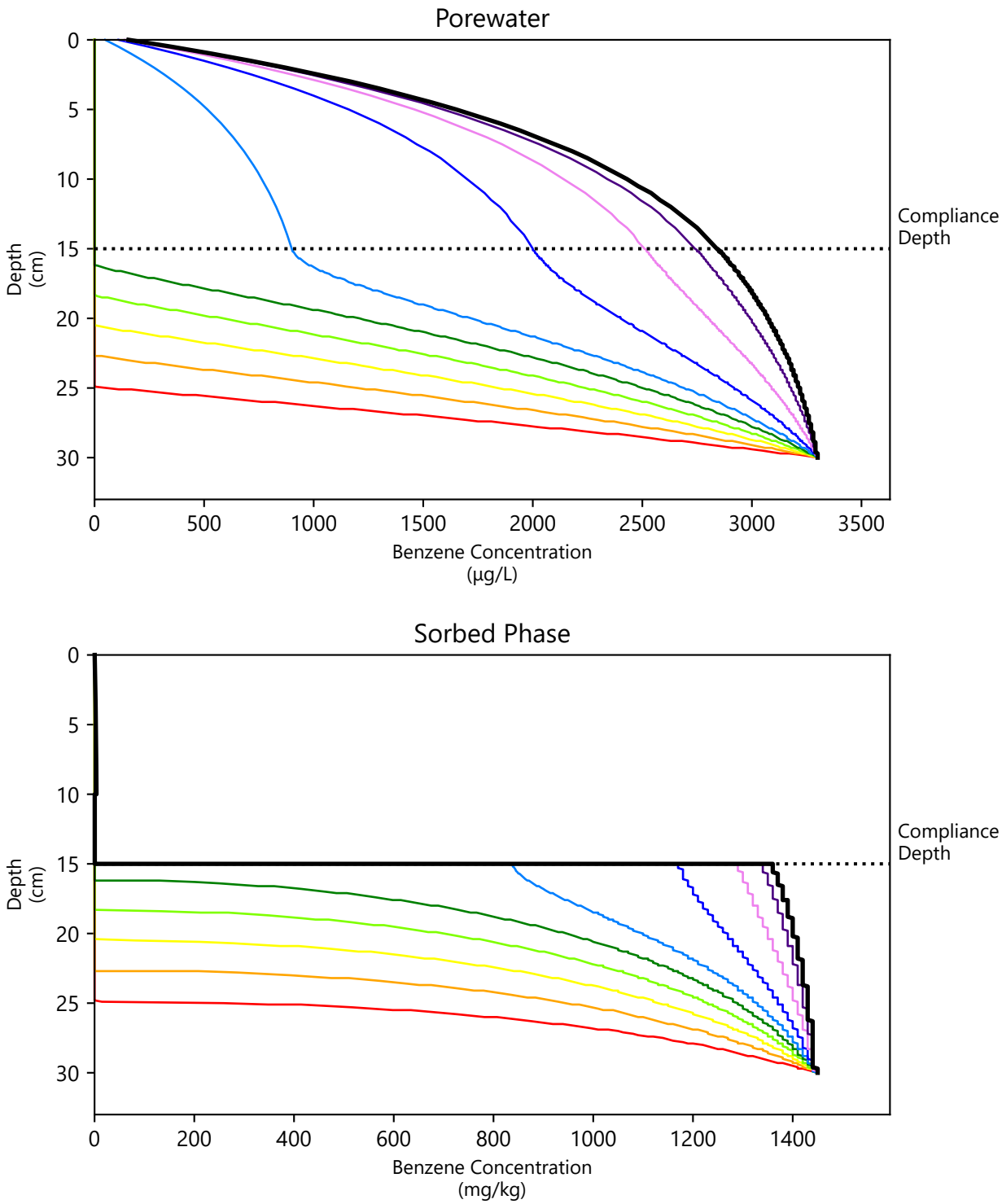
Figure 21
Depth Profile of Total PAH (16) Concentrationss in the Cap: Downstream Segment 0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-16_Benzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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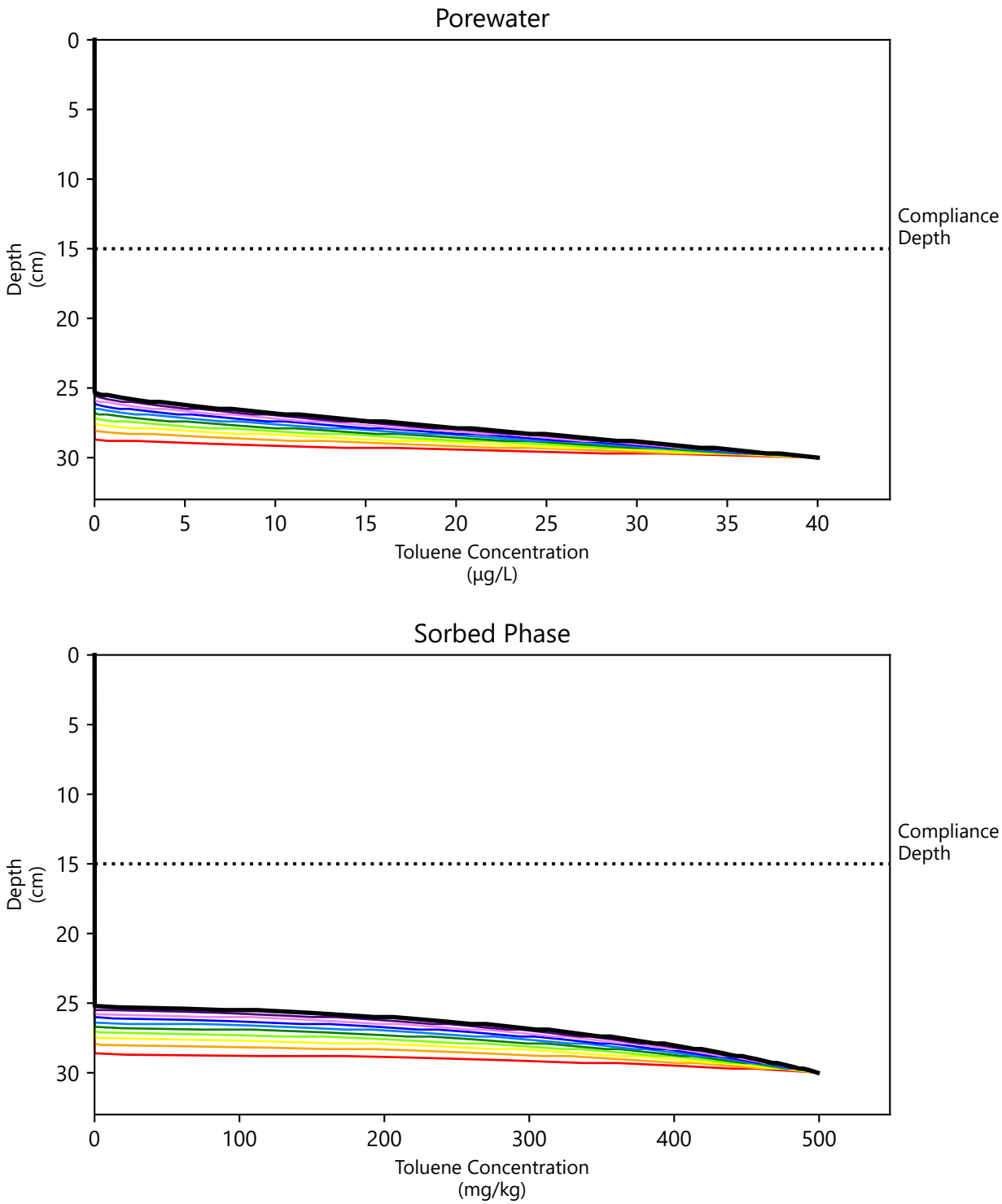
Figure 22
Depth Profile of Benzene Concentrations in the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-16_Toluene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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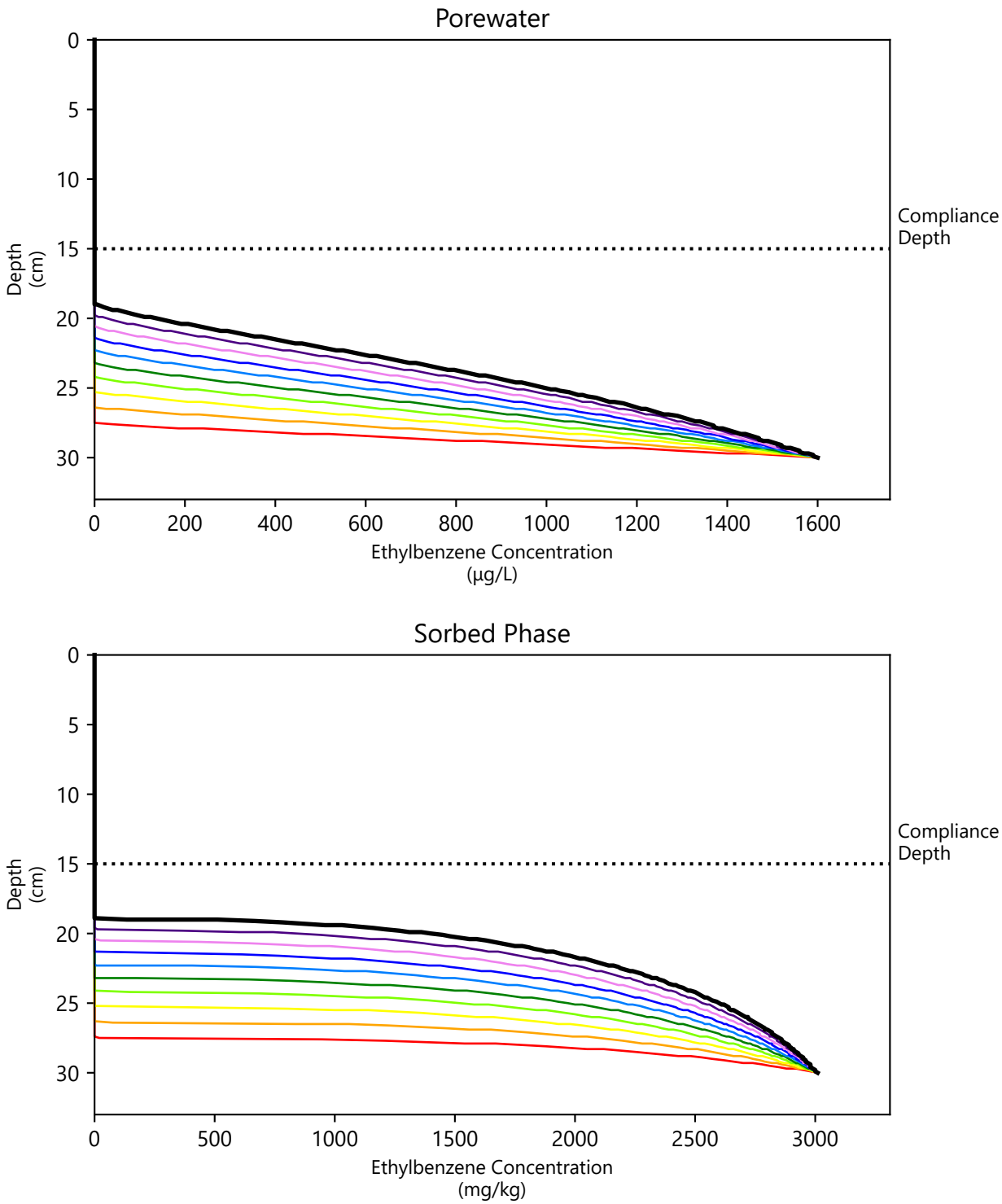
Figure 23
Depth Profile of Toluene Concentrations in the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC



Source: output_2401-16_Ethylbenzene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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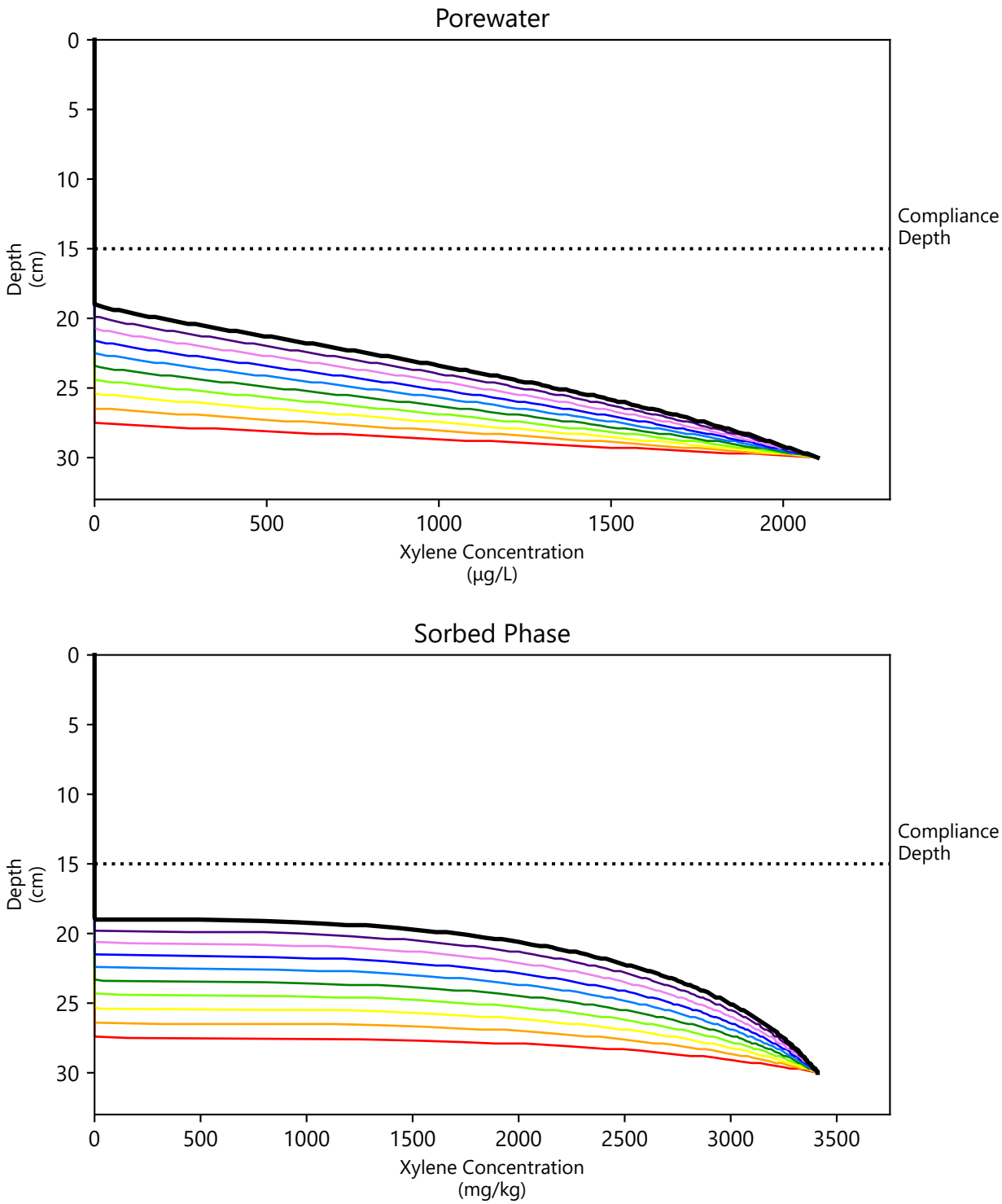
Figure 24
Depth Profile of Ethylbenzene Concentrations in the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Source: output_2401-16_Xylene.csv
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon

10 Years, 20 Years, 30 Years, 40 Years, 50 Years, 60 Years, 70 Years, 80 Years, 90 Years, 100 Years

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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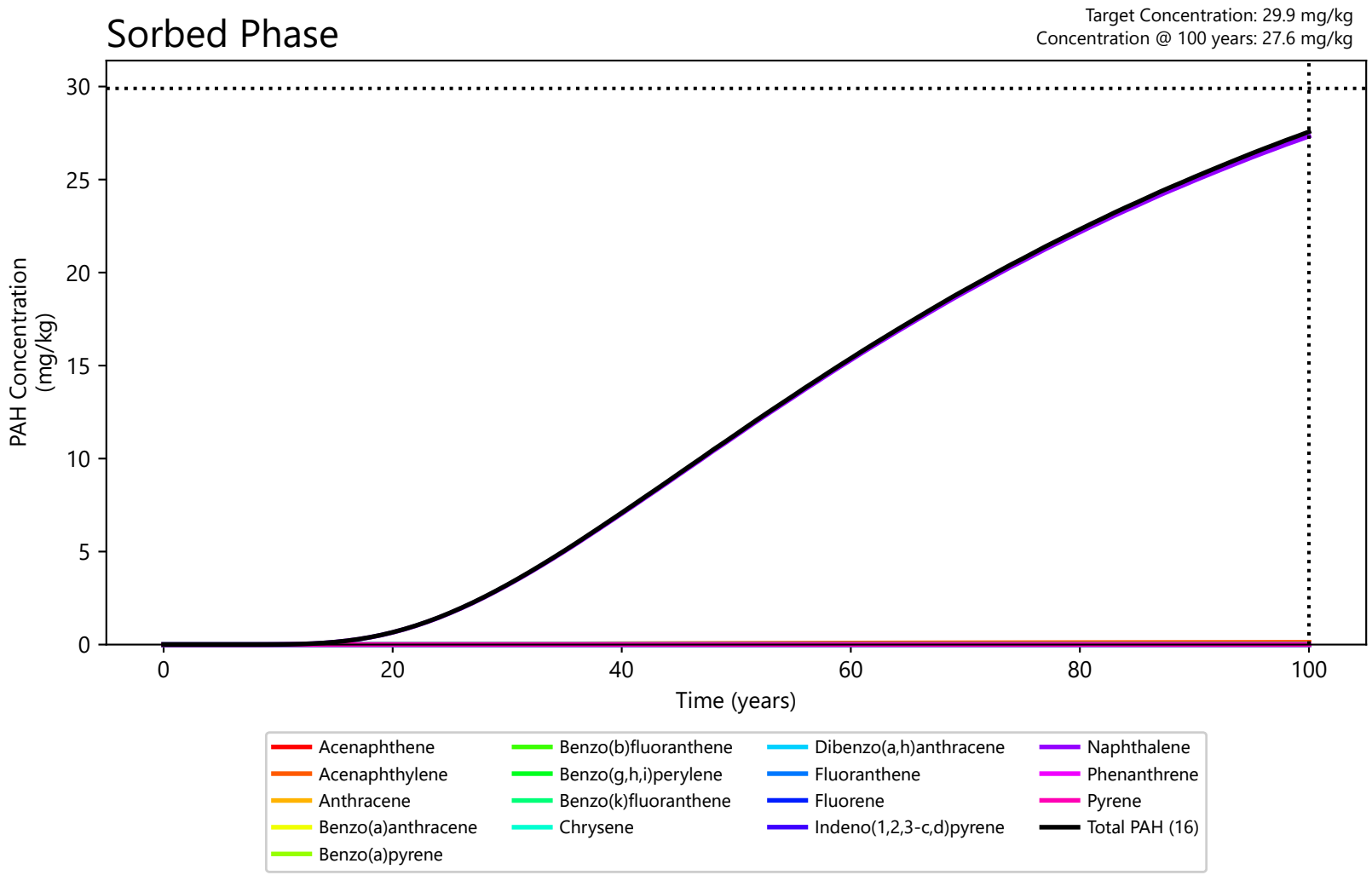
Figure 25
Depth Profile of Xylene Concentrations in the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-16_Total PAH (16).csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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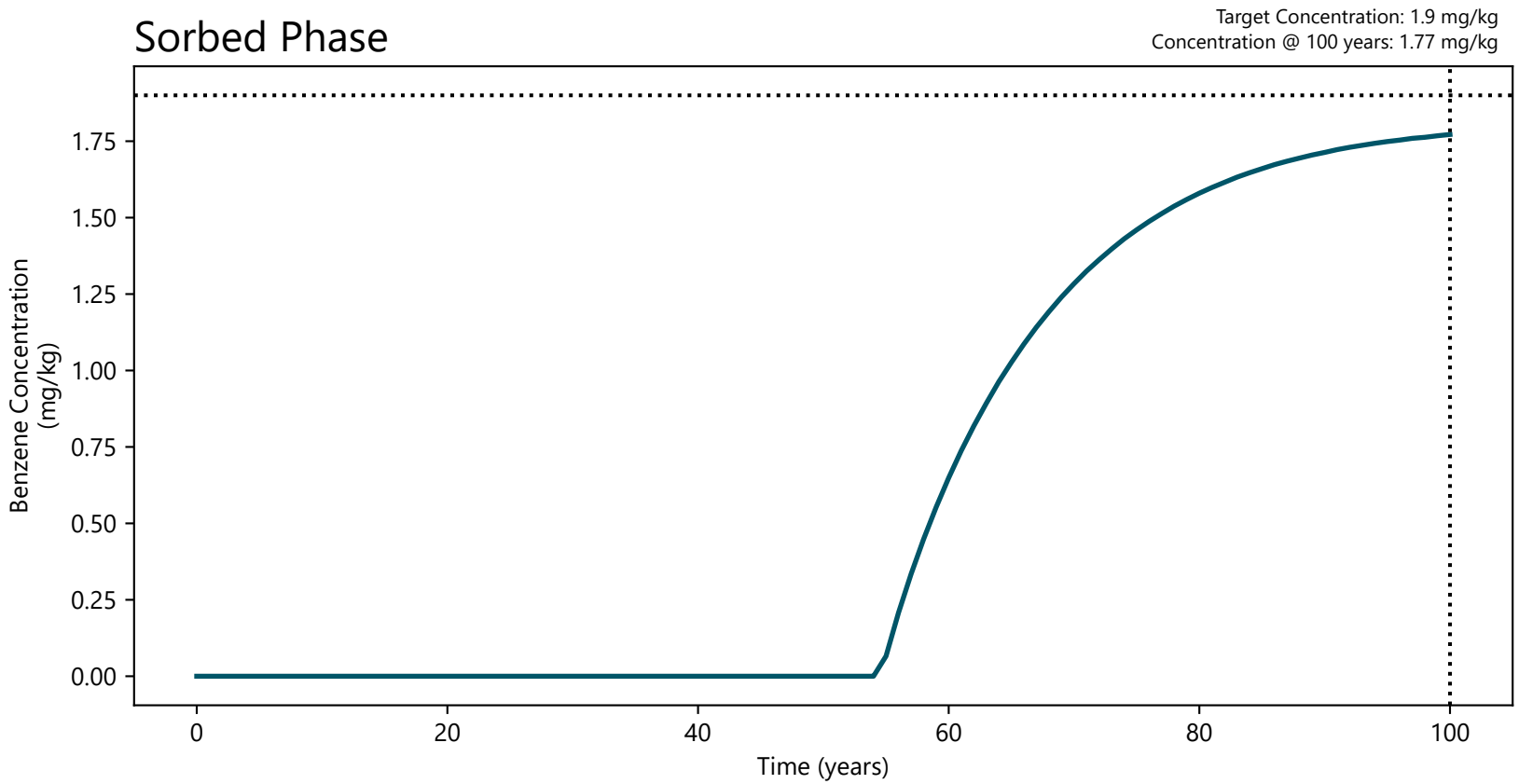
Figure 26
Vertically Averaged PAH Concentrations in the top 15 cm of the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-16_Benzene.csv

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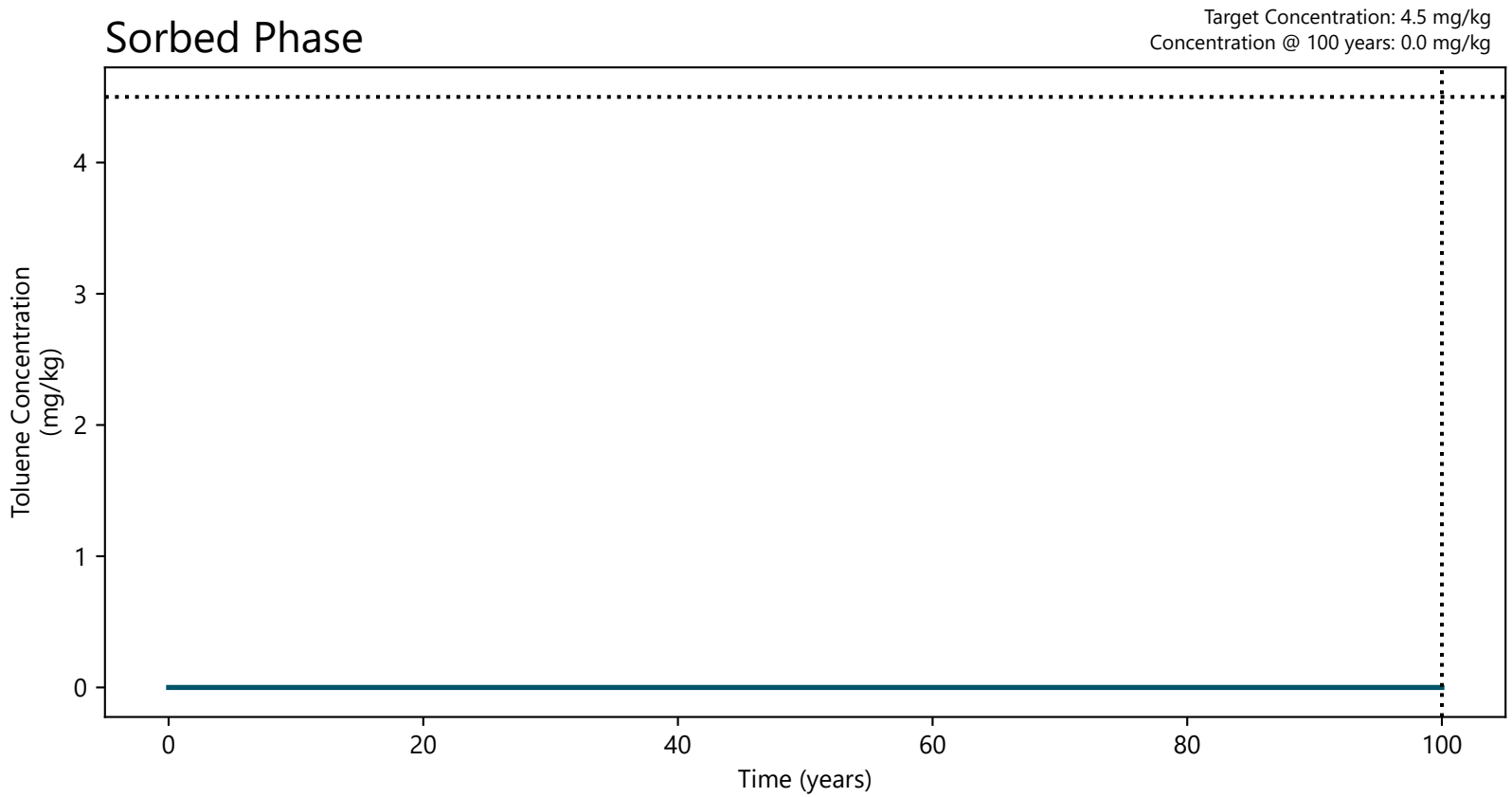
Figure 27
Vertically Averaged Benzene Concentration in the top 15 cm of the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-16_Toluene.csv

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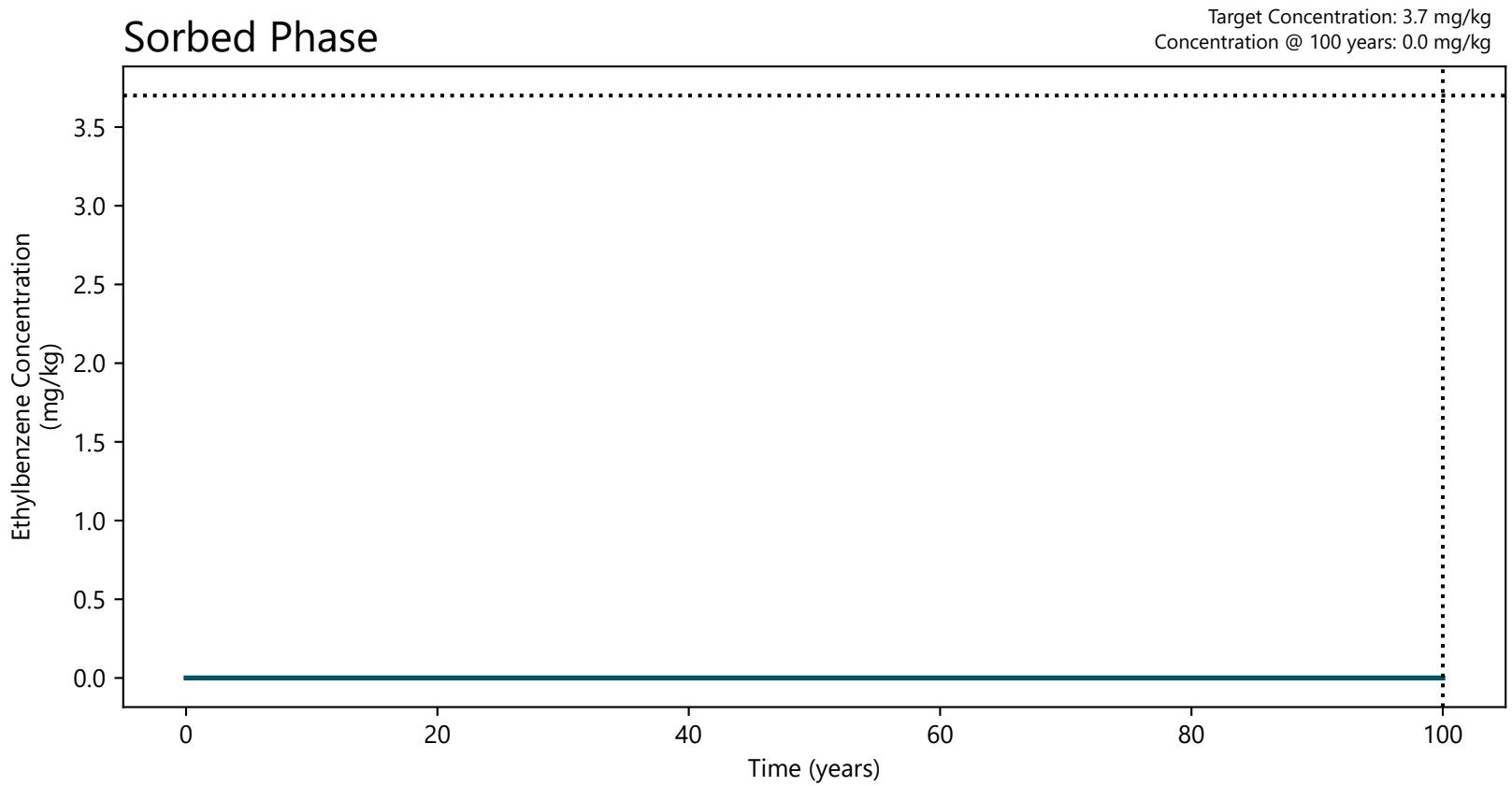
Figure 28
Vertically Averaged Toluene Concentration in the top 15 cm of the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-16_Ethylbenzene.csv

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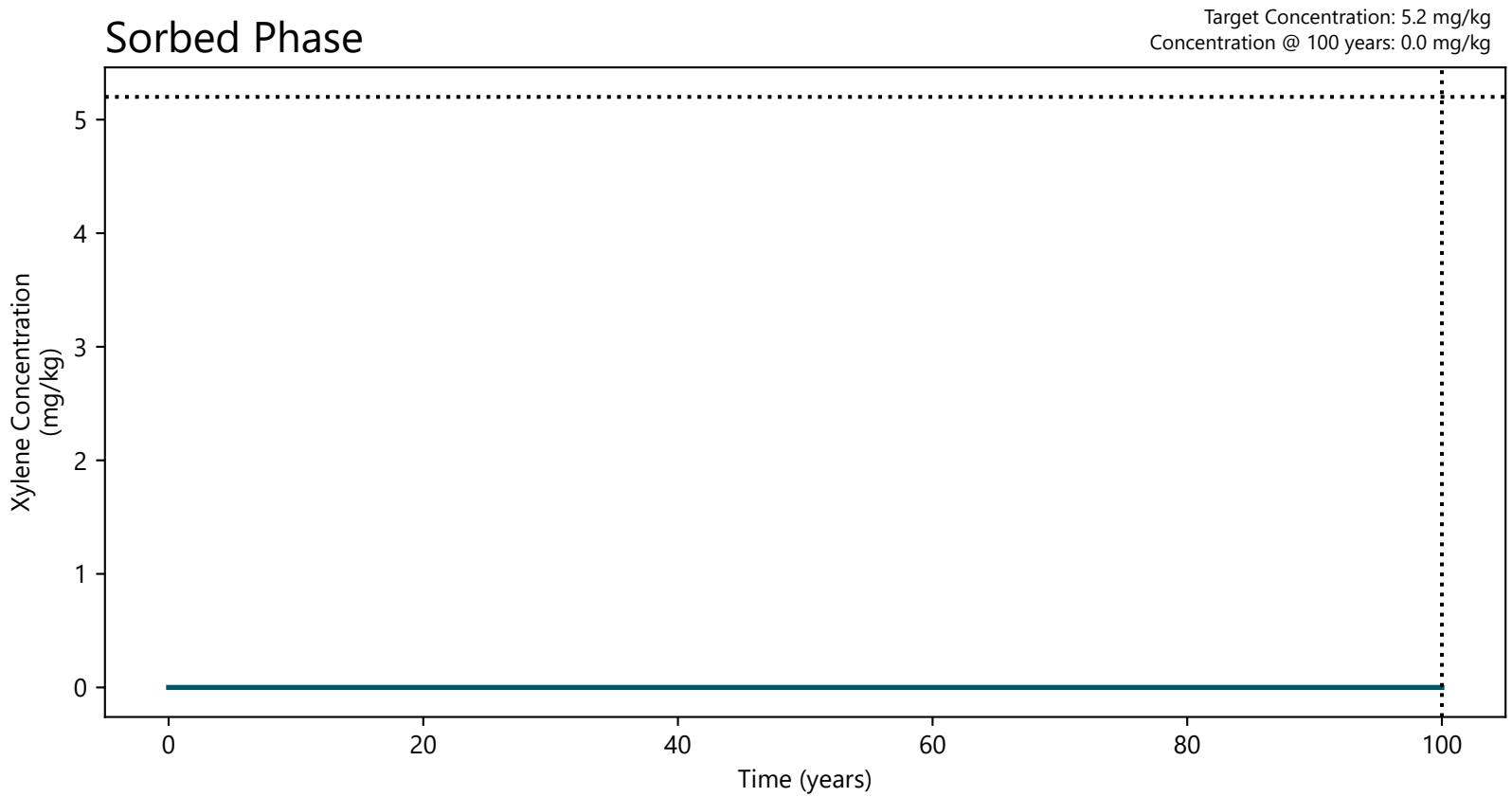
Figure 29
Vertically Averaged Ethylbenzene Concentration in the top 15 cm of the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site



Notes: The vertical dotted line at 100 years represents the length of time that protectiveness of the cap was evaluated.
The target concentration is shown as a horizontal dotted line for a subset of COCs.
CIL: Chemical Isolation Layer
GAC: Granular Activated Carbon
Source: output_2401-16_Xylene.csv

Publish Date: 06/12/2024 12:46 PM | User: WCL-EMES
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Figure 30
Vertically Averaged Xylene Concentration in the top 15 cm of the Cap: Downstream Segment
0.5 foot CIL with 5% by Weight GAC

Preliminary Chemical Isolation Layer Design Analysis
Former Haverhill MGP Site

Appendix E-2
Erosion-Protection Evaluation

July 2022
Former Haverhill MGP Site – 284 Winter Street, Haverhill, Massachusetts

Appendix A:
Erosion-Protection Evaluation

Prepared for Boston Gas Company d/b/a National Grid

July 2022
Former Haverhill MGP Site – 284 Winter Street, Haverhill, Massachusetts

Appendix A:
Erosion-Protection Evaluation

Prepared for
National Grid
40 Sylvan Road
Waltham, Massachusetts 02451

Prepared by
Anchor QEA, LLC
9 Water Street, First Floor
Amesbury, Massachusetts 01913

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ABBREVIATIONS

cfs	cubic feet per second
D_{50}	median diameter
D_{100}	maximum diameter
FEMA	Federal Emergency Management Agency
FIS	Flood Insurance Study
HEC-RAS	Hydrologic Engineering Center River Analysis System
NAVD88	North American Vertical Datum of 1988
Phase III RAP	*Phase III Remedial Action Plan*
Site	284 Winter Street, Haverhill, Massachusetts
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USCS	Unified Soil Classification System

1 Introduction

This appendix presents the erosion-protection evaluation performed for the in-river (i.e., Little River) portion of the former Haverhill manufactured gas plant site at 284 Winter Street in Haverhill, Massachusetts (Site), as part of the *Phase III Remedial Action Plan* (Phase III RAP) for the Site (Anchor QEA 2022). As discussed in the Phase III RAP, the remedial design may include the placement of either a single-layer physical cover or a multiple-layer engineered cap (including a chemical isolation component) to mitigate exposure to the constituents of concern. Both the physical cover layer and the engineered cap would require particle sizes able to withstand potential erosive forces (i.e., an erosion-protection layer).

The evaluation to identify potential erosive forces and stable particle sizes was performed in accordance with the U.S. Environmental Protection Agency's (USEPA's) and the U.S. Army Corps of Engineers' (USACE's) *Assessment and Remediation of Contaminated Sediments (ARCS) Program: Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al. 1998) and other technical guidance documents referenced where appropriate.

Hydrodynamic flows (i.e., current velocities) resulting from extreme flow events are the primary potential erosive forces that may affect the stability of the erosion-protection layer. There is no motorized vessel access to the Site; therefore, vessel-related impacts including vessel-generated waves, propeller wash, and anchor drag were not considered. Wind-generated waves are not expected to affect the stability of a cap erosion-protection layer at the Site. Ice was assumed to not affect the stability of a cap erosion-protection layer for this evaluation. Potential ice impacts will be further evaluated during subsequent design phases of the project.

The results of previous hydraulic analyses were used to estimate the stable particle sizes required to resist potential erosive forces from various flow events. This appendix summarizes the key hydrodynamic flow characteristics and the evaluation of median stable particle sizes.

2 Design and Performance Criteria

Setting performance standards is a necessary first step in developing the design requirements for the erosion-protection layer. The following description of the functions of a cap erosion-protection layer is found in Palermo et al. (1998):

> The cap component for stabilization/erosion protection has a dual function. On the one hand, this component of the cap is intended to stabilize the contaminated sediments being capped, and prevent them from being resuspended and transported offsite. The other function of this component is to make the cap itself resistant to erosion. These functions may be accomplished by a single component, or may require two separate components in an in-situ cap.

Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (USEPA 2005) provides the following guidance about cap design:

> [T]he design of the erosion-protection features of an in-situ cap (i.e., armor layers) should be based on the magnitude and probability of occurrence of relatively extreme erosive forces estimated at the capping site. Generally, in-situ caps should be designed to withstand forces with a probability of 0.01 per year, for example, the 100-year storm.

The erosion-protection layer was evaluated using methods published by USEPA and USACE specifically for in-situ caps, including *Appendix A: Design of Armor Layers* (Maynord 1998). Consistent with USEPA guidance and based on project requirements, the design and performance criteria for the erosion-protection layer include being physically stable under the conditions predicted to occur during a 100-year flood flow event.

3 Hydraulic Analysis

As flow moves through a channel, hydraulic characteristics such as water surface elevation and current velocity are affected by the geometry of the channel cross section. Hydrodynamic flows, particularly during high-flow events, can result in elevated current velocities and corresponding bed shear stresses.

The erosion-protection evaluation used the results from a hydraulic analysis performed by Fuss and O'Neill for the Little River as part of the Little Dam Removal Feasibility Study (Fuss and O'Neill 2021). The analysis presented in Fuss and O'Neill (2021) assessed the hydraulic characteristics during various return-interval flow events, including predicted flow velocities and water surface elevations, and compared pre- and post-dam-removal conditions. Flow events evaluated ranged from base flow conditions up to the 500-year return-interval event including the 100-year event.

The hydraulic analysis presented in Fuss and O'Neill (2021) was performed using the USACE Hydrologic Engineering Center River Analysis System (HEC-RAS) model. HEC-RAS is a public-domain, general-purpose model designed to assess 1D flow in natural streams and channels.

3.1 Site Hydraulic Characteristics

The Little River is approximately 12.9 miles long. It rises in Kingston, New Hampshire, and discharges into the Merrimack River approximately 0.3 mile downstream of the Site. The Site is an approximately 500-foot-long reach of the Little River between the Winter Street bridge and the Little River Conduit, which discharges into the Merrimack River in the city of Haverhill, Massachusetts.

The Site is constrained by several structures. Approximately 70 feet upstream of the Site is the Little River Dam. The dam is a run-of-river structure and does not control flows at the Site. The upstream boundary of the Site is at the Winter Street bridge. The downstream boundary of the Site is the headwall and inlet for the Little River Conduit. A vertical retaining wall 15 to 20 feet tall runs along most of the eastern side of the Little River at the Site. The river's western bank and the southern portion of the eastern bank are heavily overgrown, steep, and may include remnants of former structures such as retaining walls.

The Merrimack River is tidally influenced for 22 miles from the ocean to Haverhill. The Little River may be tidally influenced up to the Little River Dam, which is just upstream of the Site. As described in Fuss and O'Neill (2021), most of the Little River within the conduit just downstream of the Site experienced daily impacts from tides, but due to the channel bottom elevations only extremely high tides or coastal storm surges appear to affect the Little River upstream of the conduit at the Site.

The *Flood Insurance Study* (FIS) for Essex County, Massachusetts, developed by the Federal Emergency Management Agency (FEMA; FEMA 2018), estimated return-interval flow rates for the

Little River near the Site, including the 10-, 50-, 100-, and 500-year return-interval flow events. The FEMA FIS shows that the extents of the 100-year floodplain are limited along the Little River near the Site, which results in higher flows being conveyed in the channel (FEMA 2018). Therefore, current velocities at the Site are expected to increase during extreme flow events due to the limited extents of the floodplain. Fuss and O'Neill (2021) estimated lower-flow-condition discharges near the Site, including a base flow during the seasonal low period in August and September and fish passage flows during passage season from March 1 to June 30. Table A-1 shows the range of flow values at the Site estimated by Fuss and O'Neill (2021) and FEMA (2018).

Table A-1
Model Simulation Flow Conditions

Flow Event	Discharge (cfs)
Base flow	9.8[a]
95% exceedance flow	13.3[b]
50% exceedance flow	56.3[b]
5% exceedance flow	201.7[b]
FEMA 10-year event	1,160[c]
FEMA 50-year event	1,920[c]
FEMA 100-year event	2,330[c]
FEMA 500-year event	3,520[c]

Notes:
a. Value, from Fuss and O'Neill (2021), represents estimated base flow during seasonal low-flow period in August and September.
b. Values, from Fuss and O'Neill (2021), represent estimated fish passage flows during passage season from March 1 to June 30.
c. Extreme event discharge data obtained from FEMA (2018).

3.2 Hydraulic Modeling

The hydraulic analysis described in Fuss and O'Neill (2021) was performed using HEC-RAS version 5.0.7 for all model simulations.

FEMA developed a HEC-2 (predecessor to HEC-RAS) model for the Little River as part of the FIS for Essex County, Massachusetts (FEMA 2018). Fuss and O'Neill obtained the completed HEC-2 model developed by FEMA and used that information to develop the HEC-RAS model for the hydraulic analysis for the Little River, including the portion of the river at the Site (Fuss and O'Neill 2021). The upstream boundary of the HEC-RAS model was approximately 120 feet upstream of the Rosemont Avenue bridge crossing. The downstream boundary was the confluence of the Little River and the Merrimack River. The HEC-RAS results were compared to the FEMA FIS water surface elevations for the 100-year flow event to confirm the model performance was acceptable (Fuss and O'Neill 2021).

The HEC-RAS model was updated to incorporate Site-specific bathymetric data collected from select portions of the model extents. Additional transects, including two at the Site, were added to the model to increase its resolution (Fuss and O'Neill 2021).

Model simulations were run for the range of flow events listed in Table A-1 under existing (i.e., pre-dam-removal) conditions and proposed (i.e., post-dam-removal) conditions. The results of the pre- and post-dam-removal simulations were compared to evaluate changes in hydraulic characteristics such as water surface elevations and flow velocities throughout the model extents, including the portion of the Little River at the Site (Fuss and O'Neill 2021).

3.2.1 Model Results

The model results showed minimal differences in water surface elevations and flow velocities between the pre- and post-dam-removal simulations for the FEMA 10-year, 50-year, 100-year, and 500-year flow events. Flow velocities near the Site ranged from approximately 2.9 to 6.3 feet per second for the return-interval flow events, with the highest flow velocity resulting from the 100-year flow event near the upstream end of the Site. Maximum water depth for the 100-year flow event ranged from approximately 13.1 to 14.6 feet at each transect near the Site (Fuss and O'Neill 2021).

The flow velocities for the base flow condition were less than approximately 2.5 feet per second near the Site, and the maximum water depth at each transect near the Site ranged from less than approximately 0.5 to 2 feet. The flow velocities for the range of fish passage flows were less than approximately 4.1 feet per second near the Site, and maximum water depth at each transect near the Site ranged from less than approximately 0.5 to 3.5 feet (Fuss and O'Neill 2021).

Table A-2 summarizes the maximum predicted flow velocities and corresponding water surface elevations from Fuss and O'Neill (2021) at the Site for each flow event evaluated.

Table A-2
Maximum Flow Velocities and Water Surface Elevations at the Site

Flow Event	Maximum Predicted Flow Velocity at the Site (fps)[1]	Water Surface Elevation (feet NAVD88)[2]
Base flow	2.5	7.2
95% exceedance flow	2.6	7.2
50% exceedance flow	3.9	7.5
5% exceedance flow	4.1	8.7
FEMA 10-year event	5.1	15.0
FEMA 50-year event	5.9	18.5
FEMA 100-year event	6.3	20.1
FEMA 500-year event	5.4	26.1

Notes:
1. Values shown are from Fuss and O'Neill (2021).
2. Value from Fuss and O'Neill (2021) corresponding to case with maximum flow velocity at the Site.
fps: feet per second

As shown in Table A-2, both the predicted current velocity and the water surface elevation at the Site increase as the discharge increases, which is to be expected because the limited extents of the Little River floodplain near the Site cause higher flows to be conveyed in the channel.

4 Stable Particle Size Evaluation

As discussed previously, the design of an erosion-protection layer must consider potential erosive forces that may act on the river bottom so an appropriate, stable particle size that will adequately resist erosive forces can be selected. Hydrodynamic forces are considered the most significant potential erosive force that may affect the stability of the erosion-protection layer at the Site because wind- or vessel-generated waves, vessel-induced propeller wash, anchor drag, and ice are not expected to affect the erosion-protection layer. Potential ice impacts will be evaluated further during subsequent design phases of the project.

4.1 Hydrodynamic Flows

Equation A-1 was used to estimate the median diameter (D_{50}) stable particle size required to resist erosive forces from the maximum predicted flow velocities and corresponding bed shear stresses for the cases simulated as described in Section 3.2.1. The methodology, outlined in Maynord (1998), is based on USACE's *Hydraulic Design of Flood Control Channels* (USACE 1994).

Equation A-1

$$D_{50} = S_f C_s C_v C_T C_G d \left[\left(\frac{\gamma_w}{\gamma_s - \gamma_w} \right)^{\frac{1}{2}} \frac{V}{\sqrt{K_1 g d}} \right]^{2.5} \text{ where:}$$

D_{50}	=	median particle size in feet
Sf	=	safety factor = 1.5 (minimum 1.1)
Cs	=	stability coefficient for incipient failure = 0.30 for angular rock
C_V	=	velocity distribution coefficient = 1.0 for straight channels or inside of bends
C_T	=	blanket thickness coefficient = 1.0 for flood flows
C_G	=	gradation coefficient = $(D85/D15)^{1/3}$
D_{85}/D_{15}	=	gradation uniformity coefficient = 3.5 (typical range = 1.8 to 3.5)
d	=	water depth in feet
γ_s	=	unit weight of stone = 165 pounds per cubic foot
γ_w	=	unit weight of water = 62.4 pounds per cubic foot
V	=	depth-averaged velocity in feet per second (used maximum 100-year flow velocity near the Site)
K_1	=	side slope correction factor = 0.90 (conservative value used to represent a slope over the cap area of approximately 2 feet horizontal to 1 foot vertical)
g	=	acceleration due to gravity = 32.2 feet per second squared

For the maximum 100-year flow velocity of 6.3 feet per second and the corresponding maximum water depth of approximately 14 feet, the computed median stable particle size (D_{50}) was approximately 3.4 inches. A D_{50} of 3.4 inches corresponds to cobble-sized material according to the Unified Soil Classification System (USCS). A shallower water depth of 7 feet was evaluated with a flow velocity of 6.3 feet per second, and the computed stable D_{50} particle size was approximately 4 inches, also a USCS cobble-sized material. A flow velocity of 4.1 feet per second—the maximum velocity under a lower flow condition (i.e., non-return-interval event)—was evaluated with a water depth of 0.5 foot; the computed D_{50} particle size was approximately 2.7 inches, a USCS coarse gravel-sized material.

Based on the computed D_{50} values, a D_{50} of 4 inches is required to resist the potential erosive forces from the 100-year return-interval flow event for a cap erosion-protection (i.e., armor) layer.

Figure A-1 shows the existing conditions and riverbed substrate near the upstream portion of the Site containing sand, gravel, and cobble-sized materials. As can be seen here, the computed stable cobble material for the cap erosion-protection layer is consistent with the existing riverbed substrate.

Figure A-1
Existing Conditions in the Upstream Portion of the Site

Note:
Photograph of upstream portion of Site near the Winter Street bridge taken on June 22, 2022, by Anchor QEA

4.2 Erosion-Protection Layer Thickness

Maynord (1998) recommends that the thickness of the erosion-protection layer be twice the median particle diameter ($2 \times D_{50}$) or 1.5 times the maximum particle diameter ($1.5 \times D_{100}$), whichever is greater. With a D_{50} of approximately 4 inches, the D_{100} was estimated to be approximately 6 inches based on guidance in USACE (1992). Therefore, the estimated minimum erosion-protection layer thickness is approximately 9 inches, which is 1.5 times the D_{100} of 6 inches.

4.3 Filter Layer Considerations

A filter layer provides an interface between the erosion-protection layer and the protected material and is an essential element for protecting contaminated sediments (Maynord 1998). As described in the USACE engineering manual *Design of Coastal Revetments, Seawalls, and Bulkheads* (USACE 1995), a filter is a transitional layer of gravel, small stone, or fabric placed between the underlying soil and the structure. The filter prevents migration of one granular material through another (often referred to as "piping"), distributes the weight of the armor units to provide more uniform settlement, and permits relief of hydrostatic pressures within the soils. For areas above the waterline, filters also prevent surface water from causing erosion (gullies) beneath the armor stone.

A filter layer is often required when using larger diameter material for the erosion-protection layer of an engineered cap. The same armor-to-filter relationships are used to assess the potential for piping between the filter layer and the chemical isolation layer and may be used to evaluate the gradations for the chemical isolation material as well. For an erosion-protection layer of cobble-sized material, it is expected that a filter layer consisting of gravel-sized material will likely be required as part of the cap design. As shown in Figure A-1, a gravel-sized material is consistent with the existing riverbed substrate. The gradation of the filter layer will be evaluated and designed for compatibility with the armor layer and with the underlying chemical isolation layer of the engineered cap as part of subsequent design phases.

5 References

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Appendix E-3
Ebullition-Facilitated NAPL Flux Calculation

CALCULATION SHEET

PROJECT:	Phase IV Remedy Implementation Plan Former Haverhill MGP Site, 284 Winter Street, Haverhill, MA Project # 180327-08.01	**CALC NO.** 1	**SHEET** 1 of 1
SUBJECT:	Ebullition-Facilitated NAPL Flux Calculation		

Objective: Design a NAPL sorbent layer to manage ebullition-facilitated flux of NAPL from sediment to the water column.

Sheen Thickness by Observed Color

Sheen Color	Low-end (um)	High-end (um)	Low-end (m)	High-end (m)	Average (m)
Silver	1.0000E-01	3.0000E-01	1.0000E-07	3.0000E-07	2.0000E-07
Metallic	3.0000E+00	5.0000E+00	3.0000E-06	5.0000E-06	4.0000E-06
Rainbow	2.0000E-01	3.0000E+00	2.0000E-07	3.0000E-06	1.6000E-06

Source: ASTM International Standard Guide for Visually Estimating Oil Spill Thickness in Water (ASTM 2017)and the Bonn Agreement Aerial Operations Handbook, 2017 (Bonn Agreement 2017).
The average value for rainbow sheen was used for analysis.

Assumptions:

Remedial Footprint	22,000	SF	Source: Phase III Remedial Action Plan (Anchor QEA 2023)
Remedial Footprint	2,044	square meters	
Area within which a sheen is produced	100	SF	
Area within which a sheen is produced	9.3	square meters	
Average Sheen diameter	12	inches	
Average sheen area	113	square inches	
Typical sheen color	Rainbow		
Number of sheens produced in 60 minutes	1		
Duration over which a sheen is produced	60	minutes	

Calculation:

NAPL Flux Via Ebulliton	No. Sheens per day	Average Sheen Diameter (m^2)	Sheen Area per day (m^2)	Volume (m^3) of NAPL per day	Volume (m^3) of NAPL per year	Volume (m^3) of NAPL per 100-yrs	NAPL Thickness per m^2 (m)	Volume (ft^3) of NAPL per 100-yrs	NAPL Thickness per SF (ft)	Gallons per 100-yrs
Rainbow Sheen	5,280	0.07	385	0.001	0.2	22	0.01	795	0.036	5,944
									NAPL Thickness per SF (in)	
									0.4	

ANCHOR QEA

Appendix F
Health and Safety Plan

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Health and Safety Plan

Prepared for Boston Gas Company d/b/a National Grid

PLAYING IT SAFE

Stop Play Record Rewind

June 2024
Former Haverhill MGP Site
284 Winter Street, Haverhill, Massachusetts

Health and Safety Plan

Prepared for
National Grid
170 Data Drive
Waltham, Massachusetts 02451

Prepared by
Anchor QEA,
9 Water Street, First Floor
Amesbury, MA 01913

Certification Page

Billie-Jo L Gauley

Billie-Jo Gauley	(To Be Determined)
Project Manager	Field Lead
Anchor QEA,	Anchor QEA
Date: June 10, 2024	Date:

The information in this Health and Safety Plan has been designed for the Scope of Work presently contemplated by Anchor QEA. Therefore, this document may not be appropriate if the work is not performed by or using the methods presently contemplated by Anchor QEA. In addition, as the work is performed, conditions different from those anticipated may be encountered and this document may have to be modified. Therefore, Anchor QEA only intends this plan to address currently anticipated activities and conditions and makes no representations or warranties as to the adequacy of the Health and Safety Plan for all conditions encountered.

Health and Safety Plan Acknowledgement Form

Project Number: 180327-08.01

Project Name: 284 Winter Street, Haverhill MGP

My signature below certifies that I have read and understand the policies and procedures specified in this Health and Safety Plan (HASP). For non-Anchor QEA employees, this HASP may include company-specific appendices to this plan developed by entities other than Anchor QEA. Non-affiliated personnel may be required to sign the Liability Waiver following this Acknowledgement Form.

Date	Name (print)	Signature	Company

Date	Name (print)	Signature	Company

Site Emergency Procedures

Site Map

Figure A
General Site Location Overview

Emergency Contact Information

Table A
Site Emergency Form and Emergency Phone Numbers*

Category	Information
Possible Chemicals of Concern	Coal tar pitch volatiles, polycyclic aromatic hydrocarbons, including naphthalene, hydrogen sulfide
Minimum Level of Protection	Modified Level D – long pants, shirt, work boots, hard hat, safety glasses, gloves, cold-weather clothes, personal flotation device
Site(s) Location Address	284 Winter Street, Haverhill, Massachusetts
Emergency Phone Numbers	
Ambulance	911
Fire	911
Police	911

Category	Information	
Poison Control	(800) 222-1222	
Client Contact	Jesse Edmands	Cell: (781) 434-8631
Project Manager (PM)	Billie-Jo Gauley	Office: (978) 712-4475 Cell: (818) 422-4820
Field Lead (FL)	(To Be Determined [TBD])	Office: TBD Cell: TBD
State Emergency Response System	(888) 304-1133	
EPA Emergency Response Team,[1] Region 01	(800) 424-8802	

Notes:

* In the event of any emergency, contact the PM and FL.

1. For local resources, please visit: http://www2.epa.gov/emergency-response/emergency-response-my-community. The National Response Center hotline is (800) 424-8802.

Table B
Hospital Information

Category	Information
Hospital Name	Holy Family Hospital
Address	140 Lincoln Avenue
City, State	Haverhill, Massachusetts
Phone	(978) 374-2000
Emergency Phone	911

Hospital Route Map and Driving Directions

Start out going **east** on Winter St/MA-97 toward Hale St.

Then 0.52 miles

Turn **right** onto Main St/MA-97/MA-125. Continue to follow Main St/MA-125.

Main St is just past Welcome St.

If you are on Summer St and reach Newcomb St you've gone a little too far.

Then 0.17 miles

Turn **left** onto Water St/MA-113.

If you are on S Main St and reach Middlesex St you've gone about 0.1 miles too far.

Then 0.37 miles

Turn **slight right** onto Water St/MA-97/MA-113. Continue to follow MA-97/MA-113.

MA-97 is 0.1 miles past Chestnut St.

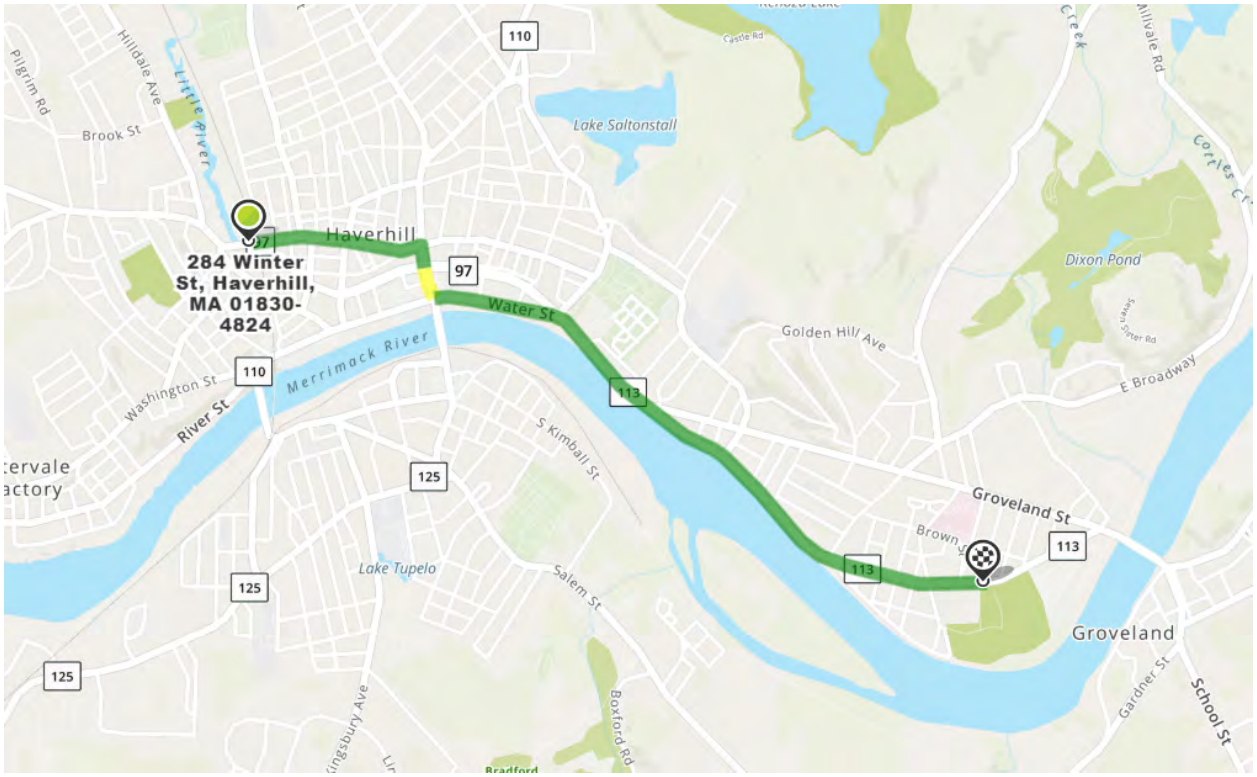
Then 1.63 miles

170 Lincoln Ave, Haverhill, MA 01830-6736, 170 LINCOLN AVE is on the **left**.

Your destination is just past Douglas St.

If you reach Crowell St you've gone a little too far.

Figure B
Hospital Route Map



Care Management—WorkCare Incident Intervention

Anchor QEA has an additional Incident Intervention resource from WorkCare to help answer questions, alleviate uncertainty and stress in a potential injury situation, and maintain the health and safety of our employees. Incident Intervention is an injury and illness management tool that provides employees with 24 hours a day/7 days a week (24/7) immediate telephone access to a member of WorkCare's clinical staff of nurses and physicians who intervene at the time of a workplace injury or illness. Contact information is provided below:

- **Access WorkCare 24/7 from anywhere using the toll-free number: 1-888-449-7787**

At the time of a workplace injury or illness, the employee, manager, or another employee at the scene notifies WorkCare using the toll-free number listed above. The caller provides information on the type of incident, possible cause, and the scope of the situation. With the details of the incident recorded, an experienced nurse or physician provides the following:

- Responsive evaluation of the incident
- Direction on the appropriate course of action

- Consultation with the employee's treating physician to design a quality care treatment plan that meets the needs of the employee and Anchor QEA

All employees are encouraged to use this service should a workplace injury or illness occur.

Key Safety Personnel

The following people share responsibility for health and safety at the site. See Section 4 of this Health and Safety Plan (HASP) for a description of the role and responsibility of each.

Client Contact: Jesse Edmands	Cell: (781) 434-8631
Project Manager (PM): Billie-Jo Gauley	Office: (978) 712-4475 Cell: (818) 422-4820
Field Lead (FL): TBD	Office: TBD Cell: TBD
Director of Health and Safety (DOHS): Tim Shaner	Office: (251) 375-5282 Cell: (251) 281-3386

Personal Incident Response Procedures

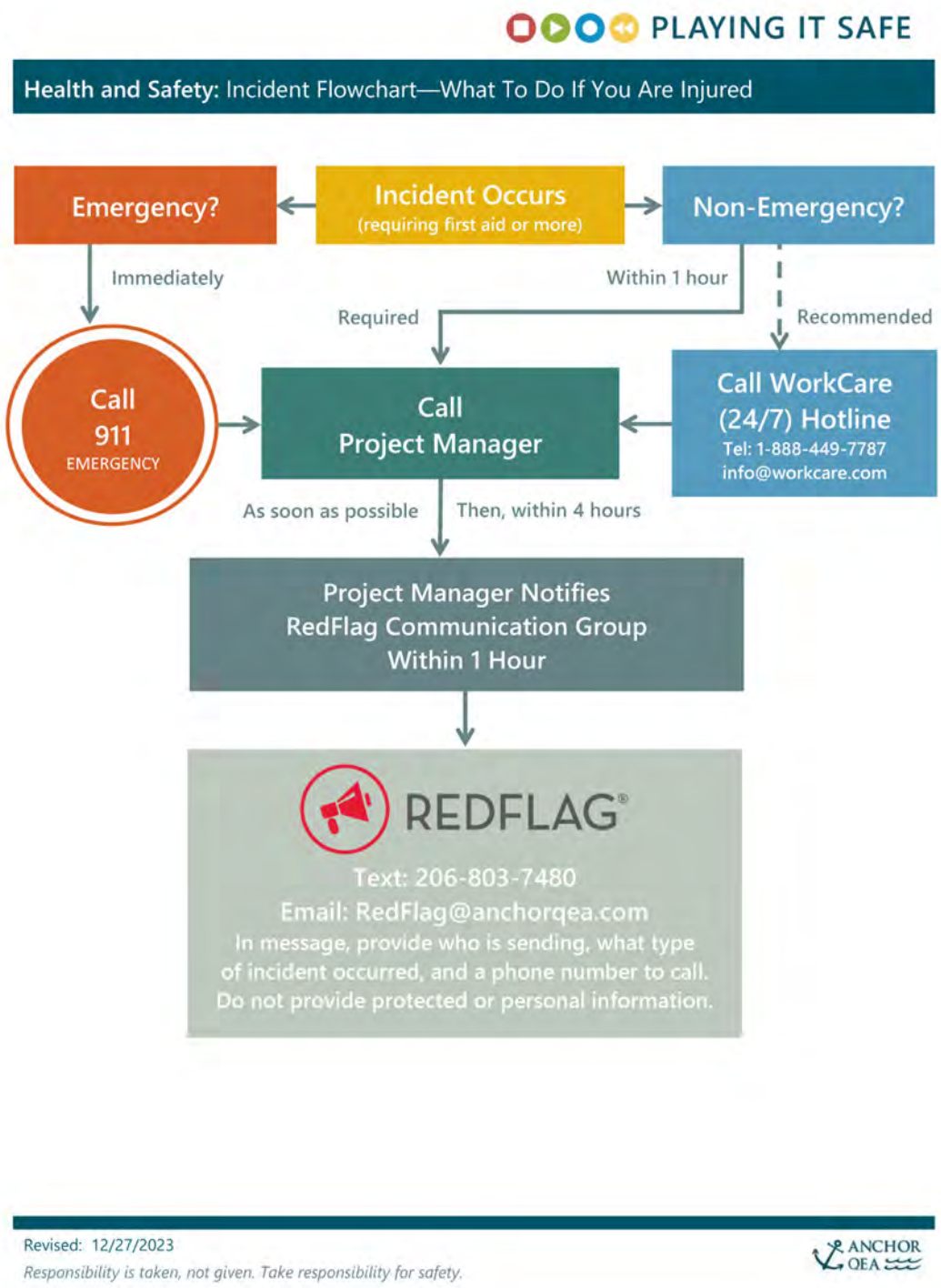
In the event of an emergency, immediate action must be taken by the first person to recognize the event. Use the following steps as a guideline and refer to Figure C:

1. Survey the situation to verify that it is safe for you and the victim. Do not endanger your own life. Do not enter an area to rescue someone who has been overcome unless properly equipped and trained. Verify that all protocols are followed. If applicable, review Safety Data Sheets (SDS) to evaluate response actions for chemical exposures.
2. Call the appropriate emergency number (911, if available) or direct someone else to do this immediately (see Table A). Explain the physical injury, chemical exposure, fire, or release and location of the incident.
3. Have someone retrieve the nearest first aid kit (containing appropriate items for the particular work scope) and Automated External Defibrillator (AED), if available. Note: Only use an AED if you have been properly trained and are currently certified to do so.
4. Decontaminate the victim without delaying life-saving procedures (see Section 8).
5. Administer first aid and cardiopulmonary resuscitation (CPR), if properly trained, until emergency responders arrive.[1]
6. In the event that evacuation is required, the FL must perform a head count to verify that all Anchor QEA personnel are accounted for.

[1] Personnel qualified and currently certified in basic first aid or CPR are protected under Good Samaritan policies as long as they only perform the basic tasks that they were taught. Do not perform first aid or CPR tasks if you have not been trained in first aid or CPR.

7. Notify the Field Lead (FL) and Project Manager (PM); the PM will notify the client contact. The PM will also contact the Director of Health and Safety (DOHS). The DOHS will facilitate the incident investigation. All client requirements pertinent to personal incident reporting will also be adhered to.
8. Complete the appropriate incident investigation reports.

Figure C
Incident Flowchart



Non-Personal Incident Response Procedures

All incidents including, but not limited to, fire, explosion, property damage, or environmental release will be responded to in accordance with the site-specific HASP. In general, this includes securing the site appropriate to the incident, turning control over to the emergency responders, or securing the site and summoning appropriate remedial personnel or equipment. Anchor QEA will immediately notify the client of any major incident, fire, equipment or property damage, or environmental incident with a preliminary report. A full report will be provided within 72 hours.

Spills and Releases of Hazardous Materials

When required, notify the National Response Center and local state agencies. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of incident location
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside the facility

The emergency telephone number for the National Response Center is (800) 424-8802. If hazardous waste is released or produced through control of the incident, verify the following:

- Waste is collected and contained
- Containers of waste are removed or isolated from the immediate site of the emergency
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided
- No waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed

Verify that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.

Near-Miss Reporting

All near-miss incidents (i.e., those that could have reasonably led to an injury, environmental release, or other incident) must be reported to the FL and PM immediately, so action can be taken to verify that such conditions that led to the near-miss incident are readily corrected to prevent future occurrences.

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Appendix D	Certifications
Appendix E	Pandemic and Epidemic Safety Plan
Appendix F	Heat Exposure Management Plan

ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
AED	Automated External Defibrillator
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
APR	Air-Purifying Respirator
ASTM	ASTM International
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
COC	chemical of concern
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
dBA	A-weighted decibel
dB	decibel
DOHS	Director of Health and Safety
DOT	U.S. Department of Transportation
DPT	direct push technology
EPA	U.S. Environmental Protection Agency
eV	electron volts
EZ	Exclusion Zone/Hot Zone
FID	flame ionization detector
FL	Field Lead
GFCI	ground-fault circuit interrupter
H:V	horizontal to vertical
HASP	Health and Safety Plan
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
HMIS	Hazardous Material Information System
IDLH	immediately dangerous to life or health
JSA	Job Safety Analysis
kPa	kilopascal
kV	kilovolt
LEL	lower-explosive limit
LO/TO	lockout/tagout
mg/m^3	milligram per cubic meter
MHR	maximum heart rate
MUTCD	Manual of Uniform Traffic Control Devices

NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NPL	National Priority List
NRR	Noise Reduction Rating
O_2	oxygen
OSHA	Occupational Safety and Health Act or Administration
OV	organic vapor
OVM	organic vapor monitor
PAH	polycyclic aromatic hydrocarbon
PE	Professional Engineer
PEL	Permissible Exposure Limit
PFD	personal flotation device
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PRCS	Permit-Required Confined Spaces
QLFT	qualitative fit test
REL	Recommended Exposure Limit
RCRA	Resource Conservation and Recovery Act
RPP	Respiratory Protection Program
SDS	Safety Data Sheets
SZ	Support Zone/Clean Zone
TLV	Threshold Limit Value
TSD	treatment, storage, and disposal
tsf	ton per square foot
TWA	time-weighted average
TWIC	Transportation Worker Identification Credential
TBD	to be determined
USCG	U.S. Coast Guard
UV	ultraviolet
VOC	volatile organic compound
WBGT	wet bulb globe temperature
XRF	x-ray fluorescence

1 Introduction

This Health and Safety Plan (HASP) was prepared on behalf of Boston Gas Company d/b/a National Grid (National Grid) and presents health and safety requirements and procedures that will be followed by Anchor QEA, personnel and at a minimum by Anchor QEA subcontractors during work activities at 284 Winter Street (the site). This HASP was developed in accordance with Title 29 of the Code of Federal Regulations (CFR), Part 1910.120(b), and will be used in conjunction with Anchor QEA's Corporate Health and Safety Program. See Section 1.1 for HASP modification procedures.

The provisions of this HASP are mandatory for all Anchor QEA personnel assigned to the project. A copy of this HASP must be maintained on site and available for employee review at all times. Anchor QEA subcontractors are also expected to follow the provisions of this HASP unless they have their own HASP that covers their specific activities related to this project. Any subcontractor HASPs must include the requirements set forth in this HASP, at a minimum. All visitors to the work site must also abide by the requirements of this HASP and will attend a pre-work briefing where the contents of this HASP will be presented and discussed.

Personnel assigned to work at the project site will be required to read this plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this HASP.

Subcontractors are ultimately responsible for the health and safety of their employees. Subcontractors may mandate health and safety protection measures for their employees beyond the minimum requirements specified in this HASP.

The objectives of this HASP are to identify potential physical, chemical, and biological hazards associated with field activities; establish safe working conditions and protective measures to control those hazards; define emergency procedures; and describe the responsibilities, training requirements, and medical monitoring requirements for site personnel.

This HASP prescribes the procedures that must be followed during specific site activities. Significant operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager (PM) and the Director of Health and Safety (DOHS).

Issuance of this approved HASP documents that the workplace has been evaluated for hazards. A hazard assessment was performed, and the adequacy of the personal protective equipment (PPE) selected was evaluated as required by 29 CFR 1910.132(d)—Personal Protective Equipment, General Requirements (General Industry); 29 CFR 1910.134—Respiratory Protection; 29 CFR 1926.28—Personal Protective Equipment (Construction Industry); and 29 CFR 1926.55—Gases, Vapors, Fumes,

Dusts and Mist, and is duly noted by the signature(s) and date appearing on the certification page of this document.

1.1 Health and Safety Plan Modifications

This HASP will be modified by amendment, if necessary, to address changing field conditions or additional work tasks not already described in this document. Modifications will be proposed by the Field Lead (FL) using the Modification to Health and Safety Plan form included in Appendix A. Modifications will be reviewed by the DOHS or authorized representative and approved by the PM.

2 Site Description and Background Information

2.1 Site Description

The 284 Winter Street property is an approximately 1.2-acre parcel currently occupied by a Haffner's gasoline service station and car wash. The property is almost entirely covered by pavement or structures and is separated from the adjacent Little River to the west by a masonry retaining wall. A Manufactured Gas Plant (MGP) operated by the Haverhill Gas Company was present at the Site prior to 1975. Commercial and industrial properties surround the property, which is located within downtown Haverhill.

The Site is abutted to the north by Winter Street, across which is a vacant industrial mill complex. The Site is abutted to the south and west by the Little River, beyond which are commercial and residential buildings. The Site is abutted to the east by an active Massachusetts Bay Transportation Authority (MBTA) railroad right-of-way, beyond which is a residential apartment complex.

The Little River discharges to the Merrimack River approximately ¼ mile to the south of the Site, after flowing through a tunnel beneath various properties within the City of Haverhill.

2.2 Site Background Information

The Site was historically the location of a MGP facility operated by the Haverhill Gas Works from approximately 1853 to 1970. The former MGP originally manufactured coal gas. On-site infrastructure associated with the coal gas manufacturing process included two holders, retorts, condensers, and purifiers, as well as auxiliary sheds and other support structures. The manufactured gas was stored in holders on the Site until 1893, when storage was moved to holders located on Hilldale Avenue. Based on historical research documented in a previous report, the MGP facility was converted to a carbureted gas manufacturing facility that used gas oil to manufacture gas sometime between 1910 and 1912. Subsequently, in 1951, the MGP began producing oil gas until production ended in 1960.

Sometime between 1970 and 1976, the vast majority of aboveground portions of the former MGP structures were removed and/or demolished. An aerial photo from 1971 indicates that the only above ground buildings/structures remaining at that time were the former coal bins located adjacent to the railroad along the eastern perimeter of the Site, an office and stock room on the northwestern portion of the Site, and one aboveground oil tank. Haffner Realty Trust has been continuously operating a retail gasoline station, car wash, and fuel oil distribution facility at the Site since approximately 1976/1977 when the Haffner facility was constructed.

3 Scope of Work

3.1 Project Scope of Work

This plan addresses health and safety issues associated with the following field tasks:

- Construction observation of site mobilization activities, including the installation of erosion and sedimentation controls and the construction of temporary facilities by a selected contractor
- Construction observation of in-water dredging and capping activities conducted by a selected contractor
- Construction observation of material handling and processing by a selected contractor
- Surface water quality monitoring
- Potential sediment core collection and processing

4 Authority and Responsibilities of Key Personnel

This section describes the authority and responsibilities of key Anchor QEA project personnel. The names and contact information for the following key safety personnel are listed in the Site Emergency Procedures section at the beginning of this HASP. Should key site personnel change during the course of the project, a new list will be established and posted immediately at the site. The emergency phone number for the site is **911** and should be used for all medical, fire, and police emergencies.

4.1 Project Manager

The PM provides overall direction for the project. The PM is responsible for ensuring that the project meets the client's objectives in a safe and timely manner. The PM is responsible for providing qualified staff for the project and adequate resources and budget for the health and safety staff to carry out their responsibilities during the field work. The PM will be in regular contact with the FL and DOHS to verify that appropriate health and safety procedures are implemented into each project task.

The PM has authority to direct response operations; the PM assumes total control over project activities but may assign responsibility for aspects of the project to others. In addition, the PM performs the following tasks:

- Overseeing the preparation and organization of background review of the project, the Scope of Work, and the field team
- Verifying that the team obtains permission for site access and coordinates activities with appropriate officials
- Briefing the FL and field personnel on specific assignments
- Together with the FL, seeing that health and safety requirements are met
- Consulting with the DOHS regarding unsafe conditions, incidents, or changes in site conditions or the Scope of Work

4.2 Field Lead

The FL reports to the PM, has authority to direct response operations, and assumes control over on-site activities. The FL will direct field activities, will coordinate the technical and health and safety components of the field program, and is responsible in general for enforcing this site-specific HASP and Corporate Health and Safety Program requirements. The FL will be the primary point of contact for all field personnel and visitors and has direct responsibility for implementation and administration of this HASP. The FL and any other member of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work in the event of an emergency, if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if

conditions arise that warrant modifications to this HASP. It is critical that both the FL and PM communicate regularly to proactively identify and address any safety-related concerns that may arise. The functions of the FL related to this HASP include, but are not necessarily limited to, the following:

- Conducting and documenting daily safety meetings or designate an alternate FL in his or her absence
- Executing the Scope of Work and schedule
- Conducting periodic field health and safety inspections to verify compliance with this HASP
- Overseeing implementation of safety procedures
- Implementing site personnel protection levels
- Enforcing site control measures to help verify that only authorized personnel are allowed on site
- Notifying, when necessary, local public emergency officials (all personnel on site may conduct this task as needed)
- Following up on incident reports to the PM
- Periodically inspecting protective clothing and equipment for adequacy and safety compliance
- Verifying that protective clothing and equipment are properly stored and maintained
- Performing or overseeing air monitoring (if required) in accordance with this HASP
- Maintaining and overseeing operation of monitoring equipment and interpretation of data from the monitoring equipment
- Monitoring site personnel for signs of stress, including heat stress, overexertion, cold exposure, and fatigue
- Requiring participants to use the "buddy" system in performing tasks
- Providing (via implementation of this HASP) emergency procedures, evacuation routes, and telephone numbers for the local hospital, poison control center, fire department, and police department
- Communicating incidents promptly to the PM
- Maintaining communication with the DOHS regarding on-site activities
- If applicable, verifying that decontamination and disposal procedures are followed
- Maintaining the availability of required safety equipment
- Advising appropriate health services and medical personnel of potential exposures
- Notifying emergency response personnel in the event of an emergency and coordinate emergency medical care

The FL will record health-and-safety-related details of the project in the field logbook. At a minimum, each day's entries must include the following information:

- Project name or location

- Names of all on-site personnel
- Level of PPE worn and any other specifics regarding PPE
- Weather conditions
- Type of field work being performed

The FL will have completed the required Occupational Safety and Health Administration (OSHA) 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training and annual updates, the 8-hour Supervisor training, medical monitoring clearance, and current first aid and cardiopulmonary resuscitation (CPR) training. Other certifications or training may be stipulated based on client or site requirements.

4.3 Director of Health and Safety

The DOHS (or designee) will be responsible for managing on-site health and safety activities and will provide support to the PM and FL on health and safety-related issues. The following are specific duties of the DOHS:

- Providing technical input into the design and implementation of this HASP
- Advising on the potential for occupational exposure to project hazards, along with appropriate methods and/or controls to eliminate site hazards
- Verifying that a hazard assessment has been performed and that the adequacy of the PPE selected was evaluated as required by 29 CFR 1910.132(d), 29 CFR 1910.134, 29 CFR 1926.25, and 29 CFR 1926.55, and is duly noted by the signatures and date appearing on the Certification Page of this document
- Consulting with the FL on matters relating to suspending site activities in the event of an emergency
- Verifying that all on-site Anchor QEA personnel and subcontractors have read and signed the HASP Acknowledgement Form
- Verifying that corrective actions resulting from deficiencies identified by audit and observations are implemented and effective

The DOHSor designee will have completed the required OSHA 40-hour HAZWOPER training and annual updates as well as the 8-hour Supervisor training (or a minimum of 5 years of supervisory experience).

4.4 Project Field Team

All project field team members will attend a project-specific meeting conducted by the FL concerning safety issues and project work task review before beginning work on site. All field team members, including subcontractors, must be familiar with and comply with this HASP. The field team has the responsibility to immediately report any potentially unsafe or hazardous conditions to the FL,

and all members of the field team have **STOP WORK AUTHORITY**—the authority to stop or suspend work if conditions arise that pose an unacceptable health and safety risk to the field team or environment, or if conditions arise that warrant modifications to this HASP. It is critical that all field team members proactively communicate with the FL to identify potential unsafe conditions. The field team reports to the FL for on-site activities and is responsible for the following:

- Reviewing and maintaining a working knowledge of this HASP
- Safely completing on-site tasks required to fulfill the Scope of Work
- Complying with the HASP
- Attending and participating in daily safety meetings
- Notifying the FL of existing or potential safety conditions at the site
- Reporting all incidents to the FL
- Demonstrating safety and health-conscious conduct

Per OSHA 1910.120(e)(3)(i),[2] newly assigned HAZWOPER 40-hour trained field team members must have at least 3 days of field work supervised by an experienced FL (preferably an individual with HAZWOPER Supervisor training). It is the responsibility of the PM to identify such "short service" personnel and verify that their supervised field experience occurs (or has occurred) and is documented in the project field notes and on the Daily Safety Briefing form (Appendix A).

[2] "General site workers (such as equipment operators, general laborers and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off the site, and a minimum of three days actual field experience under the direct supervision of a trained experienced supervisor."

5 Project-Specific Requirements

This section provides activity-specific levels of protection and air monitoring requirements to be used on this site based on the Scope of Work and the chemicals of concern (COCs).

5.1 Activity-Specific Level of Protection Requirements

Refer to Section 10 for general requirements for PPE. Level D is the minimum acceptable level for most sites. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can come in contact with the skin or work uniform. An upgrade to Level C occurs when there is a potential for exposure to airborne COCs (i.e., if the results of air monitoring reveal that action levels have been exceeded). Hearing protection must be worn when there are high noise levels. Site personnel must maintain proficiency in the use and care of PPE that is to be worn.

Table 5-1 describes the specific means of protection needed for each identified work activity.

5.2 Project Air Monitoring Requirements

Refer to Section 11 of this plan for general requirements for air monitoring at the project site, including information on air monitoring equipment. Upgrade from Level D and/or Modified Level D to Level C when the results of air monitoring reveals that action levels have been exceeded. Use of Level C by Anchor QEA staff requires participation in Anchor QEA's Respiratory Protection Program (RPP).

Table 5-2 describes the specific air monitoring required for each identified work activity.

Table 5-1
Project Job Tasks and Required Personal Protective Equipment

Job Tasks		PPE Requirements
EXAMPLES: • Construction observation • Surface water quality monitoring • Potential sediment core collection and processing	☒	Standard work uniform/coveralls
	☒	Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
	☒	High-visibility traffic safety vest
	☐	Chemical-resistant clothing <u>check appropriate garments</u>: ☐ One-piece coverall ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical coveralls ☐ Chemical-resistant hood and apron ☐ Bib-style overalls and jacket with hood **Fabric Type**: Tyvek NOTE: Thick rain pants and coveralls may be substituted for coated Tyvek if sediments are not obviously contaminated with polycyclic aromatic hydrocarbons (PAHs) or related petroleum products. Rain slickers cannot be effectively decontaminated of tar/petroleum contamination.
	☐	Disposable inner gloves (latex or equivalent "surgical")
	☒	Disposable chemical-resistant outer gloves **Material Type**: Nitrile
	☐	Chemical-resistant boots with safety toe conforming to ASTM F2412-05/ASTM F2413-05 or disposable boot covers for safety toe/work boots **Material Type**: Rubber or leather
	☐	Puncture-resistant shanks in safety shoes conforming to ASTM F2412-05/ASTM F2413-05
	☐	Metatarsal guards conforming to ASTM F2412-05/ASTM F2413-05
	☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
	☐	Splash-proof safety goggles
	☒	Safety glasses
	☒	Hard hat
	☐	Hard hat with face shield
	☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 decibels [dB] based on an 8-hour time-weighted average [TWA]). **Type**: Ear plugs
	☐	Two-way radio communication (intrinsically safe, if explosive atmosphere is a potential)

Job Tasks		PPE Requirements
	☐	Long cotton underwear
	☒	High-visibility, U.S. Coast Guard (USCG)-approved personal flotation device (PFD) (if working on any water vessel or without fall protection within 10 feet of water)
	☒	USCG-approved float coat and bib-overalls (e.g., full two-piece "Mustang" survival suit or similar) or one-piece survival suit if combined air and water temperature is below 90°F
	☐	Half-face Air-Purifying Respirator (APR) (OSHA/NIOSH-approved)
	☐	Full-face APR (OSHA/NIOSH-approved)
	☐	**Type of Cartridges to be Used**: ☐ **OV or** ☐ **OV/HEPA (if samples are dry)**

Table 5-2
Project Air Monitoring Requirements

Contaminant/ Instrument[1]	Job Tasks/Functions	Measurement	Monitoring Schedule[2]	Actions[3]
Total Organic Vapors (using Photoionization Detector with 10.6 eV Lamp)	Conduct air monitoring for organic vapors during intrusive activities. Monitor in the workers' breathing zone.	0 to 1 ppm above background	Continuous	Acceptable, continue work.
		>1 ppm above background (sustained for 2 minutes)	Continuous	Begin engineering and/or work practice controls, then perform compound-specific monitoring for Benzene or if no compound-specific monitoring available, stop work. **If Benzene is present, follow the Benzene specific monitoring below in addition to the PID**.
		1 – 10 ppm above background	Continuous	Acceptable to continue work. Investigate cause of reading and implement engineering and/or work practice controls, then perform compound-specific monitoring for Benzene of if no compound-specific monitoring available, stop work. If Benzene is present, follow the benzene specific monitoring below in addition to the PID.
		> 10 ppm above background	Continuous	Stop work. Evacuate area. Investigate cause of reading, consult with Project Manager and Health and Safety.
Benzene UltraRae	Conduct air monitoring for benzene during activities where contaminated media are present and/or PID readings require benzene-specific sampling. Monitor in the workers' breathing zone.	< 0.1 ppm benzene	If PID >1 ppm (sustained for 2 minutes) Continuous	Acceptable, continue work.
		0.1 - 1 ppm benzene	If PID >1 ppm (sustained for 2 minutes) Continuous	Begin engineering and/or work practice controls if readings cannot be reduced below the lower action level (0.1 ppm) within 15 minutes stop work or upgrade to Level C protection (full face respirator) if current for a qualitative fit test, training, and medical clearance. Ensure that respirator cartridge is appropriate for Benzene as approved by H&S.
		> 1 ppm -10 ppm benzene	If PID >1 ppm (sustained for 2 minutes) Continuous	Stop work, evacuate area, investigate cause of reading, consult with Project Manager and Health and Safety, upgrade to Level C protection (full face respirator) if current for a qualitative fit test, training, and medical clearance. Ensure that respirator cartridge is appropriate for Benzene as approved by H&S.
		> 10 ppm benzene	If PID >1 ppm (sustained for 2 minutes) Continuous	Stop work, evacuate area, investigate cause of reading, consult with Project Manager and Health and Safety.

Contaminant/ Instrument[1]	Job Tasks/Functions	Measurement	Monitoring Schedule[2]	Actions[3]
Dust Monitor (respirable fraction) DustTrak	Conduct monitoring when dusty conditions are encountered in areas that contain potentially contaminated soils. Monitor in employee breathing zones and general areas. Determine if potentially contaminated materials are migrating off-site. Dust concentration action levels are based on downwind minus upwind measurements.	< 0.5 mg/m^3	Initially and every 15 minutes while conditions persist	Continue work.
		0.5 to 5 mg/m^3 above background	Continuously	Upgrade to Level C protection (HEPA filters);[4] initiate dust suppression activities.
		> 5 mg/m^3 above background		Stop dust-producing activity if levels cannot be maintained < 5 mg/m^3. Move support zone to upwind location.
Hydrogen Sulfide 4 Gas monitor or MultiRae	Conduct air monitoring for hydrogen sulfide during activities where contaminated media are present and/or when potentially contaminated media is disturbed. Additionally, anytime where hydrogen sulfide could be present from sub surface work. Monitor in the workers' breathing zone.	Less than 5 ppm (1 minute average)	Periodically every 15 minutes	Acceptable – continue work
		'> 5 ppm (1 minute average)		Stop work required. Leave work area and contact PM and DOHS for guidance.

Notes:

*Note: Instruments must be calibrated according to manufacturer's recommendations.

1. For VOCs, a sustained reading for greater than 2 minutes in excess of the action level will trigger a protective measure.
2. Contact with the DOHS and PM must be made prior to continuance of work. A hazard review must be conducted before proceeding with work. Corrective actions may include temporary work stoppage to allow vapors to dissipate, and then returning to work if air monitoring data permits.
3. Monitoring frequency is from the beginning of each task and at specified intervals thereafter, or when detectable soil contamination is encountered (as indicated by strong, sustained odor, visual evidence of product, or petroleum-discolored soils).
4. Work must be conducted in accordance with Anchor QEA's RPP. Contact the DOHS for respiratory protection fit testing and air purifying cartridge change-out requirements.

6 Risk Analysis and Control

The following sections discuss the potential health and safety hazards associated with the field tasks described in the Scope of Work. Controls of these hazards are addressed through the mechanical and physical control measures, use of PPE, monitoring, training, decontamination, emergency response, and safety procedures.

Significant changes in the Scope of Work covered by this HASP must be communicated to the PM and DOHS, and a modification to this HASP must be created as needed (see Section 1.1). Any task conducted beyond those identified in the Scope of Work and this HASP must be evaluated using the Job Safety Analysis (JSA) process prior to conducting the work.

6.1 Job Safety Analysis

Anchor QEA work tasks have been evaluated for their hazards and JSA documents have been developed that detail the chemical, physical, and biological hazards associated with these tasks along with the control measures (e.g., engineering controls, administrative controls, and/or PPE) that will be used to conduct them in a safe manner.

The PM and FL are responsible for identifying work tasks and project site conditions that are beyond the previously developed JSA documents and for communicating such information to the DOHS. The DOHS will provide support, as needed, to the PM and the FL, who will have primary responsibility to develop project-specific JSAs.

The contents of the JSA documents shall be communicated to project personnel during the site orientation meeting and during daily safety meetings when conducting work where the specific JSAs are applicable.

JSA documents applicable to this project are located in Appendix B and include the following field tasks:

- Field activities
- Sediment sampling
- Motor vehicle operation
- Decontamination activities
- Investigation derived water management
- NAPL handling and removal
- Water sampling
- Wading
- Sample and laboratory glassware handling

6.1.1 Augmented Job Safety Analysis Process

If significant work tasks are identified during the course of the project that were not previously addressed in the JSA documentation supplied in Appendix B, then a task-specific JSA document must be developed prior to conducting the work. The PM and FL shall develop this document(s) with input from the DOHS, as needed, and this HASP will be modified to include the JSA document (see Section 1.1 for HASP modification procedures). Project personnel shall be trained on the contents of the developed task-specific JSA prior to its implementation. Appendix B of this HASP includes a blank JSA form that can be used to create a new task-specific JSA.

6.2 Exposure Routes

Possible routes of exposure to the chemicals potentially encountered on this project include inhalation, dermal contact, and ingestion of dust, mist, gas, vapor, or liquid. Exposure will be minimized by using safe work practices and by wearing the appropriate PPE. A further discussion of PPE requirements is presented in Section 10.

6.2.1 Inhalation

Inhalation of particulates, dust, mist, gas, or vapor during field activities is possible. Whenever possible, work activities will be oriented so that personnel are upwind of the sampling location. An organic vapor monitor (OVM) may be used to monitor ambient air and the breathing zone within the work area for organic compounds. Section 5.2 describes potential OVM action levels and response procedures.

6.2.2 Dermal Contact

Dermal contact with potentially contaminated soil, sediment, or groundwater during field activities is possible. Direct contact will be minimized by using appropriate PPE and decontamination procedures.

6.2.3 Ingestion

Direct ingestion of contaminants can occur by inhaling airborne dust, mist, or vapors, or by swallowing contaminants trapped in the upper respiratory tract. Indirect ingestion can occur by introducing the contaminants into the mouth by way of food, tobacco, fingers, or other carriers. Although ingestion of contaminants can occur, proper hygiene, decontamination, and contamination reduction procedures should reduce the probability of this route of exposure.

6.3 Chemicals of Concern Profile

Table 6-1 provides a summary profile for the COCs for this project. As available, this profile is based on recent site history and site characterization information. For more detailed and specific

information, always refer to the Safety Data Sheet (SDS) or equivalent information for the chemical (see Appendix C).

Table 6-1
Chemicals of Concern Profile

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit (OEL)	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Total Petroleum Hydrocarbons (TPH) as Benzene CAS# 71-43-2	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow (leukemia)	ACGIH TLC 0.02 ppm	1.5	1.2	9.24
Polycyclic aromatic hydrocarbons (PAHs) – as coal tar pitch volatiles. CAS# 65996-93-2	Inhalation, skin and/or eye contact	Direct contact or exposure to the vapors may be irritating to the eyes. Direct contact can be highly irritating to the skin and can cause dermatitis. Exposure to high vapor concentrations may cause headaches, nausea, vomiting, and other symptoms. Includes human carcinogens. Exposure to all routes should be carefully controlled to levels as low as possible. Confirmed Animal Carcinogen.	Respiratory system, skin, bladder, kidneys	0.1 mg/m^3 TWA_8 NIOSH REL (Cyclohexane-extractable fraction)	Varies	NA	NA

Chemical	Exposure Routes	Symptoms	Target Organs	Occupational Exposure Limit (OEL)	Odor Threshold (ppm)	LEL (%)	Ionization Potential (eV)
Naphthalene CAS # 91-20-3	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage.	Eyes, skin, blood, liver, kidneys, central nervous system	NIOSH REL 10 ppm NIOSH STEL 15 ppm	0.44 mg/m^3	0.9%	8.12

https://www.acgih.org/benzene-2/

7 Site Control and Communications

The primary purposes for site controls are to establish the hazardous area perimeter, reduce migration of contaminants into clean areas, and prevent unauthorized access or exposure to hazardous materials by site personnel and the public. Site control is especially important in emergency situations.

7.1 General Site Control Safety Procedures

The following standard safe work practices apply to all Anchor QEA site personnel and subcontractors and shall be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, and smoking are prohibited on site except in designated areas.
- Hands and faces must be washed upon leaving the work area and before eating, drinking, chewing gum or tobacco, and smoking.
- A buddy system will be used. Radio, cell phone, or hand signals will be established to maintain communication.
- During site operations, each worker will consider himself/herself as a safety backup to his/her partner.
- Visual contact will be maintained between buddies on site when performing potentially hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and (if required) medical monitoring certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy as established in this HASP may be subject to corrective action, potentially including but not limited to, being reprimanded or immediately dismissed.
- Proper decontamination procedures must be followed before leaving a contaminated work area.

7.2 Work Area Access Control

If work is performed in public areas, the following precautions shall be taken to protect both the site personnel and the public. Access control to the work area will be accomplished using a combination of the following devices and/or methods:

- Fences and/or barricades
- Traffic control devices and/or use of flaggers
- Caution tape
- Other methods to keep the site secure and provide a visual barrier to help keep unauthorized personnel from entering the site and active work areas

7.3 Hazardous Waste Site Work Control Procedures

To prevent contamination from migrating from personnel and equipment, work areas will be clearly specified as an Exclusion Zone/Hot Zone (EZ), Contamination Reduction Zone (CRZ), or Support Zone/Clean Zone (SZ) prior to beginning operations. Each work area will be clearly identified using signs or physical barriers. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry.

The site work zones will be defined as follows:

- **Exclusion Zone/Hot Zone (EZ).** The EZ will be the "hot zone" or contaminated area inside the site perimeter (or sample collection area of boat). The EZ is the defined area where potential respiratory and/or health hazards exist. All personnel entering the EZ must use the required PPE, as set forth in this HASP, and meet the appropriate training and medical clearance. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the EZ should be posted (e.g., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT REQUIRED BEYOND THIS POINT). Personnel and equipment decontamination must be performed upon exiting the EZ.
- **Contamination Reduction Zone (CRZ).** The CRZ, also known as the "warm zone," is a transitional zone between the EZ and the SZ (also known as the "cold zone" or "clean zone"). The CRZ provides a location for removal and decontamination of PPE and tools leaving the EZ. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the CRZ. If the CRZ is compromised at any time, a new CRZ will be established.
- **Support Zone/Clean Zone (SZ).** This uncontaminated zone will be the area outside the EZ and CRZ and within the geographic perimeters of the site (including boat and processing areas). The SZ is used for support personnel; staging materials; parking vehicles; office, laboratory, and sanitation facilities; and receiving deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, and others who will not necessarily be permitted in the EZ or CRZ.

A log of all personnel visiting, entering, or working on the site shall be maintained by the FL. No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e),(f) (and 29 CFR 1926.1101(k)(9),(m) if appropriate). Visitors will attend a site orientation given by the FL and sign the HASP.

7.4 Site-Specific Work Zone Requirements

This section contains guidelines for maintaining safe conditions when working from a boat, in a roadway, or at an excavation site.

7.4.1 Sediment Sampling Work Zones

This subsection contains guidelines concerning health and safety aboard marine sampling vessels. The vessel captain, onshore coring operator, and the FL will delineate the boundaries of the work zones aboard the vessel and will inform the field team of the arrangement. The purpose of the zones is to limit the migration of sample material out of the zones and to restrict access to active work areas.

Two work zones will be observed aboard the vessel. One will encompass the "moonhole" of the vessel where the samplers will be deployed and recovered. Only the coring team may enter this zone unless assistance is required by other personnel. The second work zone will be a sample processing area on the upland. The contractor team will deliver sediment core tubes to this zone. Anchor QEA personnel will open, log, and process the sediment cores on shore.

Both the collection and processing areas on the vessel and onshore will have a SZ outside the CRZ to stage clean equipment, don PPE, take rest breaks, or perform any other site activities that do not involve potentially contaminated materials.

7.4.1.1 Sampling Decontamination Area

A station will be set up for decontaminating sample processing equipment and personnel gear such as boots or PPE. The station will have the buckets, brushes, soapy water, rinse water, or wipes necessary to perform decontamination operations. Plastic bags will be provided for expendable and disposable materials. Decontamination fluids will be stored in sealable containers and will be properly disposed of.

7.4.1.2 Access Control

Security and control of access to the sampling vessel and onshore area will be the responsibility of the captain and FL. Additional security measures may be placed into effect by the client, or as required by national security threat levels determined by the federal government. Access to the vessel and onshore areas will only be granted to necessary project personnel and authorized visitors. Any security or access control problems will be reported to the client or appropriate authorities.

7.4.1.3 Safety Equipment

In addition to PPE that will be worn by shipboard personnel, basic emergency and first aid equipment will also be provided. Equipment will include:

- U.S. Coast Guard (USCG)-approved personal flotation devices (PFDs)
- First aid kit adequate for the number of personnel
- Emergency eyewash

Anchor QEA and/or subconsultants will provide this equipment, which must be at the location(s) where field activities are being performed. Equipment will be checked daily to verify its readiness for use.

7.4.2 Working in a Roadway

Work conducted in public streets may require coordination with local governments and development and submittal of a traffic control plan in accordance with the U.S. Department of Transportation (DOT) Manual on Uniform Traffic Control Devices (MUTCD). Use of personnel qualified as Flaggers may also be required to provide temporary traffic control.

Observe the following site control practices and procedures when working in roadways:

- Plan and conduct work in a manner that traffic may be continuously observed. This may require having a spotter equipped with a noise-making device such as an air horn or a whistle, as appropriate.
- Wear a high-visibility traffic vest and hardhat when a vehicle hazard exists[3]. Include lighted elements when possible in high hazard environments.
- Use cones, flag-mounted cones, caution tape, and/or barricades.
- Protect the work area with a vehicle or piece of heavy equipment if this does not pose an additional hazard. The vehicle should have a strobe light and operating headlights or running lights (if equipped).
- Develop a traffic flow plan for high-traffic situations (as appropriate):
  - Use a flag person
  - Use a flashing arrow sign
  - Use "WORKER AHEAD" signs liberally
  - Obtain lane closing permits
  - Engage police details

See Sections 12.1.12 and 12.1.13 for additional information regarding motor vehicle operation and vehicular traffic.

7.5 Field Communications

Communications between all Anchor QEA employees and subcontractors at the work site can be verbal and/or non-verbal. Verbal communication can be affected by the on-site background noise and various PPE. See Table 7-1 for a list of the types of communication methods and equipment to use, depending on site conditions. Communication equipment must be checked daily to verify

[3] The 2009 MUTCD (ANSI 107-2004) federal standard for High-Visibility Apparel and Headwear stipulates specific requirements for, among other characteristics, reflectivity of work vests and headwear. This standard must be reviewed and provisions included if work covered by this HASP includes work in controlled roadways.

proper operation. All project personnel must be initially briefed on the communication methods prior to starting work; communication methods should be reviewed in daily safety meetings.

Table 7-1
Field Communication Methods

Type of Communication	Communication Device	Signal
Emergency notification	On-site Telephone or Cellular Telephone	Initiate phone call using applicable emergency numbers
Emergency notification among site personnel	Two-way Radio	Initiate radio communication with Code Red message
Hailing site personnel for non-emergency	Compressed Air Horn	One long blast, one short blast
Hailing site personnel for emergency evacuation	Compressed Air Horn	Three long, continuous blasts
Hailing site personnel for distress, need help	Visual	Arms waved in circle over head
Hailing site personnel for emergency evacuation	Visual	Arms waved in criss-cross over head
Contaminated air/strong odor	Visual	Hands clutching throat
Break, lunch, end of day	Visual	Two hands together, break apart

8 Decontamination Procedures and Practices

8.1 Minimization of Contamination

The following measures will be observed to prevent or minimize exposure to potentially contaminated materials:

Personnel

- Do not walk through spilled materials.
- Do not handle, touch, or smell sample media directly.
- Make sure PPE has no cuts or tears prior to use.
- Protect and cover any skin injuries.
- Stay upwind of airborne dusts and vapors.
- Do not eat, drink, chew tobacco, or smoke in the work zones.

Sampling Equipment and Vehicles/Vessels

- Use care to avoid getting sampled media on the outside of sample containers.
- If necessary, bag sample containers before filling with sampled media.
- Place clean equipment on a plastic sheet to avoid direct contact with contaminated media.
- Keep contaminated equipment and tools separate from clean equipment and tools.
- Fill sample containers over a plastic tub to contain spillage.
- Clean up spilled material immediately to avoid tracking around the vehicle/vessel.

8.2 Decontamination Equipment

All vehicles, vessels, and equipment that have entered potentially contaminated areas will be visually inspected and, if necessary, decontaminated prior to leaving the area. If the level of vehicle contamination is low, decontamination may be limited to rinsing tires and wheel wells with an appropriate detergent and water. If the vehicle is significantly contaminated, steam cleaning or pressure washing may be required. Tools will be cleaned in the same manner. Rinsate from all decontamination activities will be collected for proper disposal. Decontamination of equipment and tools will take place within the CRZ.

The following supplies will be available to perform decontamination activities:

- Wash and rinse buckets
- Tap water and phosphate-free detergent
- Scrub brushes
- Distilled/deionized water
- Deck pump with pressurized freshwater hose (aboard the vessel)
- Pressure washer/steam cleaner, if appropriate
- Paper towels and plastic garbage bags

8.3 Personnel Decontamination

The FL will verify that all site personnel are familiar with personnel decontamination procedures as listed below. All personnel wearing PPE in a work area (EZ) must undergo decontamination prior to entering the SZ. Personnel will perform the following decontamination procedures:

- Wash and rinse outer gloves and boots in portable buckets to remove gross contamination.
- If suit is heavily soiled, rinse it off.
- Remove outer gloves; inspect and discard if damaged. Leave inner gloves on. Personnel will remove their outer garment and gloves, dispose of them, and properly label container or drum. Personnel will then decontaminate their hard hats and boots with an aqueous solution of detergent or other appropriate cleaning solution. These items then will be hand-carried to the next station. Remove inner gloves.
- Thoroughly wash hands and face before leaving CRZ.
- Sanitize respirators and place in a clean plastic bag.

8.4 Sampling and Processing Equipment Decontamination

To prevent sample cross-contamination, sampling and processing equipment in contact with soil, sediment, or water samples will undergo the following decontamination procedures when work is completed in the CRZ and prior to additional use:

1. Rinse with potable water and wash with scrub brush.
2. Wash with phosphate-free detergent (Alconox).
3. Visually inspect the sampler and repeat the scrub and rinse step, if necessary. If scrubbing and rinsing with Alconox is insufficient to remove visually observable tar-related contamination on equipment, the equipment will be scrubbed and rinsed using hexane (or similar type solution) until all visual signs of contamination are absent.
4. Rinse external sampling equipment with potable water three times prior to use. Rinse homogenizing equipment once with potable water and three times with distilled water prior to and between sample processing.

8.5 Handling of Investigation-Derived Waste

All remaining soil or sediment, fluids used for decontamination of sampling equipment, and sample collection disposable wastes (e.g., gloves, paper towels, foil, or others) will be placed into appropriate containers and staged on site for disposal.

8.5.1 Disposable Personal Protective Equipment

Disposable PPE may include Tyvek suits, inner latex gloves, and respirator cartridges. Dispose of PPE according to the requirements of the client and state and federal agencies.

8.5.2 Non-Disposable Personal Protective Equipment

Non-disposable PPE may include respirators and boots and gloves. When decontaminating respirators, observe the following practices and procedures:

- Wipe out the respirator with a disinfecting pad prior to donning.
- Decontaminate the respirator on site at the close of each day with an approved sanitizing solution.

When decontaminating boots and gloves, observe the following practices and procedures:

- Decontaminate the boots or gloves outside with a solution of detergent and water; rinse with water prior to leaving the site.
- Protect the boots or gloves from exposure by covering with disposable covers such as plastic to minimize required decontamination activities.

8.6 Sanitizing Personal Protective Equipment

Respirators, reusable protective clothing, and other personal articles must be not only decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

8.7 Emergency Personnel Decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

8.8 Containment of Decontamination Fluids

As necessary, spill control measures will be used to contain contaminated runoff that may enter into clean areas. Use plastic sheeting, hay bales, or install a spill control system to prevent spills and contain contaminated water.

9 Health and Safety Training and Informational Programs

This section describes the health and safety training and informational programs with which Anchor QEA project site personnel must comply. All certifications required in this section are provided in Appendix D and will be kept on internal file.

9.1 Initial Project Site Orientation

Work on all Anchor QEA project sites requires participation in an initial health and safety orientation presented by the PM or FL that will consist of, at a minimum, the following topics:

- A review of the contents of this HASP, including the Scope of Work and associated site hazards and control methods and procedures.
- Provisions of this plan are mandatory for all Anchor QEA personnel assigned to the project.
- Anchor QEA subcontractors are also expected to follow the provisions of this plan unless they have their own HASP that covers their specific activities related to this project and includes the minimum requirements of this HASP.
- All visitors to the work site will also be required to abide by the requirements of this plan.
- Personnel assigned to perform work at the project site, working under the provisions of this HASP, will be required to read the plan and must sign the Health and Safety Plan Acknowledgement Form to confirm that they understand and agree to abide by the provisions of this plan. Personnel not directly affiliated with the project (i.e., visitors) may also be required to sign the Liability Waiver.

9.2 Daily Safety Meetings

Daily safety meetings ("tailgate meetings") make accident prevention a top priority for everyone and reinforce awareness of important accident-prevention techniques. The following daily safety meeting procedures and practices are required:

- Daily safety meetings will be held each morning prior to conducting site activities.
- The Daily Safety Briefing form in Appendix A will be used to document each meeting.
- Copies of the completed Daily Safety Briefing forms will be maintained on site during the course of the project.

9.3 End-of-Day Wellness Checks

Similar to the daily safety meetings, field staff will gather at the end of the day to verify group health and wellness and discuss any near misses that occurred that day. The wellness checks will be recorded on that day's Daily Safety Briefing form.

9.4 Hazardous Waste Operations Training

Personnel working on project sites that present a potential exposure to hazardous wastes or other hazardous substances shall be trained in accordance with the requirements of the 29 CFR 1910.120 (HAZWOPER) regulation. Training requirements will consist of the following:

- Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction.
- Field personnel must complete a minimum of 3 days of supervised field instruction.
- Field personnel assigned to the site will also have received 8 hours of refresher training if the time lapse since their previous training has exceeded 1 year.
- On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations will receive an additional 8 hours of supervisory training.
- Field personnel shall be current in first aid/CPR training offered by the American Red Cross or equivalent.
- Other training may be required depending on the task to be performed (e.g., confined space, excavation/trenching, underground storage tank removal, fall protection, respiratory protection, and hazard communication).

9.5 Hazard Communication Program

The purpose of hazard communication (Employee Right-to-Know) is to verify that the hazards of all chemicals located at the field project site are communicated to all Anchor QEA personnel and subcontractors according to 29 CFR 1926.59. Refer to the Anchor QEA Hazard Communication Program document for additional information.

Every container of hazardous materials must be labeled by the manufacturer, who must also provide a SDS upon initial order of the product and upon request thereafter. The actual format may differ from company to company (e.g., National Fire Protection Association [NFPA], Hazardous Material Information System [HMIS], or other), but the labels must contain similar types of information. Maintain manufacturer labels if possible. The label may use words or symbols to communicate the following:

- Introduction
- Hazard(s) identification
- Composition/information on ingredients
- First-aid measures
- Fire-fighting measures
- Accidental release response measures
- Handling and storage
- Exposure controls/personal protection
- Physical and chemical properties

- Stability and reactivity properties
- Toxicological properties
- Ecological properties
- Disposal considerations
- Transport considerations
- Regulatory information
- Other information, including at a minimum, label preparation or last revision date

SDS for all chemicals brought onto the site or anticipated to be used on site shall be provided in Appendix C of this HASP. These SDS shall be readily available for reference by site personnel and emergency response personnel.

Hazardous materials received without proper labels shall be set aside and not distributed for use until properly labeled.

If a hazardous chemical is transferred into a portable container (approved safety can), even if for immediate use only, the contents (e.g., acetone or gasoline) of the portable container must be identified.

9.6 Respiratory Protection Training

Anchor QEA employees who use respiratory protection must be trained in accordance with Anchor QEA's RPP, as required by 29 CFR 1910.134. This training includes the following:

- Medical evaluations of employees required to use respirators
- Fit testing procedures for tight-fitting respirators
- Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations
- Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators
- Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations
- Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance

See Section 10.2 for additional information.

10 General PPE Requirements

The minimum level of PPE should be selected according to the hazards that may be encountered during site activities in accordance with established U.S. Environmental Protection Agency (EPA) levels of protection (D and C). Only PPE that meets American National Standards Institute (ANSI) standards shall be worn. Site personnel must maintain proficiency in the use and care of PPE. Damaged or defective PPE must be replaced and may not be used. Anchor QEA will provide all necessary PPE for its employees as described in this HASP.

Refer to Section 5 for site-specific job task and level-of-protection requirements.

10.1 Minimum Requirements: Level D Protection

The minimum level of protection on project sites will be Level D protection, which consists of the following equipment:

- Standard work uniform/coveralls
- Work boots with safety toe conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05
- Approved safety glasses or goggles (meets ANSI Z87.1—2010 requirements for eye protection)
- Hard hat (meets ANSI Z89.1—1986 requirements for head protection)
- High-visibility traffic safety vest
- Hearing protection when there are high noise levels

Level D protection will be used only when:

- The atmosphere contains no known hazards
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals
- Atmospheric concentrations of contaminants are less than the Permissible Exposure Limit (PEL) and/or Threshold Limit Value (TLV)

10.1.1 Modified Level D Protection Requirements

Depending on the Scope of Work and the potential hazards to be encountered, Level D protection shall be modified to include additional protective equipment such as USCG-approved PFDs, face shields/goggles, chemical-resistant clothing, and disposable gloves of varying materials depending on the chemical substances involved. An upgrade to Modified Level D occurs when there is a possibility that contaminated media can contact the skin or work uniform, or if unique, site-specific hazards exist.

10.2 Respiratory Protection Requirements

Respiratory protection devices may potentially be used for protection against particulates and organic vapors during the course of an Anchor QEA field project. The need for respiratory protection will be determined by air monitoring results and site conditions, and in accordance with Anchor QEA's RPP (contact Tim Shaner with questions). However, engineering and administrative controls must first be evaluated for use as the primary controls for protection against site respiratory hazards. In the event that engineering and administrative controls are deemed not feasible, respiratory protection will be required. However, it is not anticipated that respiratory protection will be used for this work. If conditions change where it may be needed work will be stopped and the DOHS will be consulted.

11 General Air Monitoring Requirements

11.1 General Requirements

In general, air monitoring shall be conducted when the possibility of hazardous atmospheres, chemical volatilization, or contaminated airborne dust exists (e.g., from intrusive activities involving contaminated soils or groundwater, developing new monitoring wells, working with wells containing known COCs, confined space entry, or others).

Air movers or other engineering controls shall be used to exhaust or dilute solvent vapors emanating from monitoring wells or hazardous atmospheres in confined spaces prior to the use of respiratory protection devices.

Site-specific air monitoring action levels are provided in Section 5.2.

11.2 Real-Time Air Monitoring Equipment

As applicable, organic vapor concentrations shall be monitored in the field with either a photoionization detector (PID) or flame ionization detector (FID). Flammable vapors and/or gasses are monitored with an oxygen/lower-explosive limit (O_2/LEL) real-time instrument. Organic vapor measurements are usually taken in the breathing zone of the worker while O_2/LEL measurements are taken at the point of operation (e.g., monitoring well head or auger point).

As applicable, airborne dust/particulate concentrations shall be measured using a real-time aerosol monitor (using a scattered light photometric sensing cell) when there are visible signs of potentially contaminated airborne dust. Both area and personal air monitoring readings are to be taken to characterize site activities.

As applicable, colorimetric detector tubes shall be used to monitor specific COCs such as benzene or vinyl chloride if there is a possibility that they may be present in elevated concentrations based upon the background of the project site, the Scope of Work, and conditions discovered at the site.

As applicable, other real-time air monitoring equipment, such as hydrogen cyanide meters, may be utilized depending upon the Scope of Work and COCs.

Air monitoring results shall be documented on the Daily Air Monitoring Record form (see Appendix A) or in the field logbook.

11.3 Time-Integrated Air Monitoring Equipment

Some Anchor QEA projects may require the use of time-integrated air monitoring equipment to determine employee exposures to COCs. Time-integrated air monitoring would be required if there is the possibility that employees would be exposed to concentrations of a COC that approach or

exceed an established exposure limit. Typical time-integrated sampling methods will usually involve the use of personal sampling pumps and associated filter and/or charcoal sampling media, or the use of diffusion-based sampling media. Exposed sampling media are normally sent to an accredited laboratory for analysis. Contact the DOHS for consultation and assistance with the performance of time-integrated air monitoring activities.

11.4 Equipment Calibration and Maintenance

Calibration and maintenance of air monitoring equipment shall follow manufacturer specifications and must be documented. Recalibration and adjustment of air monitoring equipment shall be completed as site conditions and equipment operation warrant. Record all air monitoring equipment calibration and adjustment information on the Daily Air Monitoring Record form (see Appendix A) and in the field logbook.

11.5 Air Monitoring Action Levels

Air monitoring action levels have been developed that stipulate the chemical concentrations in the breathing zone that require an upgrade in level of PPE.

Air monitoring action levels are typically set at one-half of the OSHA PEL, NIOSH Recommended Exposure Limit (REL), or the American Conference of Governmental Industrial Hygienists (ACGIH) TLVs. The rationale for establishing action levels is based on the available data that characterize COCs in site media.

Air monitoring measurements shall generally be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 2-minute period. Similarly, if chemical odors are detected that are a nuisance, bothersome, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities.

11.6 Air Monitoring Frequency Guidelines

In general, conduct periodic air monitoring when:

- It is possible that an immediately dangerous to life or health (IDLH) condition or a flammable atmosphere has developed (e.g., confined space entry or intrusive activities).
- There is an indication that exposures may have risen over established action levels, PELs, or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with the following situations:
  - Change in site area (e.g., work begins on a different section of the site).
  - Change in on-site activity (e.g., one operation ends and another begins).
  - Change in contaminants (e.g., handling contaminants other than those first identified).

- Visible signs of particulate exposure from intrusive activities such as drilling, boring, or excavation.
- Perceptible chemical odors or symptoms of exposure.
- Handling leaking drums or containers.
- Working with obvious liquid contamination (e.g., a spill or lagoon).
- When the possibility of volatilization exists (such as with a new monitoring well or a well containing known COCs).

12 Health and Safety Procedures and Practices

In addition to the task-specific JSAs listed in Section 6.1 and presented in Appendix B, this section lists the health and safety procedures and practices applicable to this project. For additional information, consult with the PM.

12.1 Physical Hazards and Controls

12.1.1 General Site Activities

Observe the following general procedures and practices to prevent physical hazards:

- Legible and understandable precautionary labels shall be affixed prominently to containers of potentially contaminated soil, sediment, water, and clothing.
- No food or beverages shall be present or consumed in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- No tobacco products or cosmetics shall be present or used in areas that have the potential to contain COCs and/or contaminated materials or equipment.
- An emergency eyewash unit shall be located immediately adjacent to employees who handle hazardous or corrosive materials, including decontamination fluids. All operations involving the potential for eye injury or splash must have approved eyewash units locally available capable of delivering at least 0.4 gallons per minute for at least 15 minutes.
- Personnel working within 10 feet of bodies of water shall wear USCG-approved PFDs.
- Certain project sites may have newly finished work (e.g., concrete, paving, framing, habitat reconstruction, or sediment caps) that may be damaged by unnecessary contact, or that could cause dangerous conditions for personnel (e.g., slipping, sinking, or tripping). Personnel working in or around these areas shall communicate with the PM, FL, and client contact as needed to prevent damaging new work or entering dangerous conditions.
- Generally, all on-site activities will be conducted during daylight hours. If work after dusk is planned or becomes necessary due to an emergency, adequate lighting must be provided.
- Hazardous work, such as handling hazardous materials and heavy loads and operating equipment, should not be conducted during severe storms.
- All temporary electrical power must have a ground-fault circuit interrupter (GFCI) as part of its circuit if the circuit is not part of permanent wiring. All equipment must be suitable and approved for the class of hazard present.

12.1.2 Slips, Trips, and Falls

Observe the following procedures and practices to prevent slips, trips, and falls:

- Inspect each work area for slip, trip, and fall potential prior to each work task.

- Slip, trip, and fall hazards identified must be communicated to all personnel. Hazards identified shall be corrected or labeled with warning signs to be avoided.
- All personnel must be aware of their surroundings and maintain constant communication with each other at all times.

12.1.3 Ergonomic Considerations

Certain field tasks may involve workers in fixed positions (e.g., observing subcontractor work) or performing repetitive motions over a period of time (e.g., sediment sample processing). It is important that workers self-monitor for ergonomic fatigue (e.g., soreness, tightness, stiffness, or pain in muscles) and make adjustments to work tasks, body positions, or work areas so that ergonomic stressors are minimized. Suggestions for decreasing the likelihood of ergonomic stress include the following:

- Limit fixed positions. Periodically vary standing and sitting positions, take frequent short walks, and modify observation locations when possible.
- Minimize extreme postures. Conduct work tasks using comfortable postures (particularly if the tasks are repetitive), and use tools or structures to minimize the need to hold or work with materials or access the work area.
- Limit contact stress. Be aware of soft tissue resting on hard surfaces, and limit these occurrences (e.g., use comfortable footwear, and use tools to hold materials).
- Contact the Field Mobilization Team in advance for prolonged field efforts that involve a field trailer. This group can set up field staff with a monitor, mouse, and keyboard so they are not working solely on laptops.
- Take breaks from work tasks, particularly repetitive ones.
- Consider performing stretching exercises before and during work activities, if those tasks are anticipated to be long in duration and/or strenuous.

12.1.4 Corrosive Material Handling Procedures

Corrosive materials include acids and bases. They are extremely corrosive materials with a variety of uses. Acids include hydrochloric, nitric, and sulfuric acids. Bases include sodium hydroxide. Observe the following procedures when working with corrosive materials:

- Wear gloves and eye-splash protection while using acid dispensed from a small dropper bottle during water sampling.
- Wear a full-face APR equipped with combination cartridges (organic vapor/acid gas) as well as Tyvek coveralls and nitrile gloves for large volume applications.
- Have an eyewash bottle and/or portable eyewash station on site.
- Do not add anything into a virgin chemical drum, including unused product.

- Avoid mixing strong acids and bases. Consult the DOHS for task-specific evaluation. If mixing is absolutely necessary, do it slowly. Avoid vapors or fumes that are generated.
- When diluting acids and bases, add the acid or base to water in small quantities and mix cautiously.

12.1.5 Sediment Core Sampling

Sediment samples will be collected using a "Mud Mole" or vibracore sampling equipment operated from a boat. Please see Sections 12.1.16 for additional safety information regarding working on or near the water.

All operations involving the use of powered sediment coring rigs will follow generally accepted drilling/coring practices. One person will be assigned the responsibility of Lead Driller/Corer. Additional personnel will assist with equipment as needed. The Lead Driller/Corer will be responsible for operating the drilling/coring rig and ensuring safety.

General rules associated with drilling/coring rig operations will be as follows:

- While drilling, all non-essential personnel shall remain at a distance that is past the radius of any moving parts.
- All operators and team members will be familiar with the rig operations and will have received practical training.
- All personnel will be instructed in the use of the emergency kill switch/shutdown on the drill rig.
- No loose-fitting clothing, jewelry, or free long hair is permitted near the drilling rig or moving machinery parts.
- A first aid kit and fire extinguisher will be available at all times.
- No drilling will occur during impending electrical storms or tornadoes, or when rain, ice, snow, or wind conditions create undue potential hazards.
- Never allow "horsing around" within the vicinity of the drill rig and tool and supply storage areas, even when the drill rig is shut down.

12.1.6 Underground or Overhead Utility Line Contact Prevention

Observe the following underground/overhead utility line contact prevention procedures and practices:

- Prior to conducting work, the PM or FL shall verify that all existing underground or overhead utilities in the work area are located per the state or local mark-out methods and subcontract. Documentation of utility mark-out shall be completed using the Utility Contact Prevention Checklist form (see Appendix A). No excavation work is to be performed until all utility mark-outs are verified.

- The PM or FL shall conduct a site survey to search for signs of other buried or overhead utilities. The results of such surveys shall be documented on the Utility Mark-out documentation form.
- The property owner or facility operator shall be consulted on the issue of underground utilities. As-built drawings shall be reviewed, when available, to verify that underground utility locations are consistent with the utility location mark-outs. All knowledge of past and present utilities must be evaluated prior to conducting work.
- If on-site subsurface utility locations are in question, a private locating service shall be contacted to verify locations. If the investigation calls for boreholes in an area not covered by the municipal One-Call system, then a private utility locate firm shall be contacted to determine the location of other underground utilities.
- The PM shall have documented verbal contact and an agreement with the fiber optic company for all work within 50 feet of any fiber optic cables.
- **Only non-destructive excavation, such as hand digging or hydro excavation, is permitted within 3 feet of underground high voltage, product, or gas lines.** Once the line is exposed, heavy equipment can be used, but must remain at least 3 feet from the exposed line.
- Elevated superstructures (e.g., drill rig, backhoe, scaffolding, ladders, and cranes) shall remain a distance of 10 feet away from utility lines and 20 feet away from power lines. Distance from utility lines may be adjusted by the FL depending on actual voltage of the lines.
- Overhead utility locations shall be marked with warning tape or flags where equipment has the potential for contacting overhead utilities.

Table 12-1 shows the minimum clearances required for energized overhead electrical lines.

Table 12-1
Overhead Utility Clearance Requirements

Minimum Clearance from Energized Overhead Electric Lines	
Nominal System Voltage	**Minimum Required Clearance**
0 to 50 kV	10 feet
51 to 100 kV	12 feet
101 to 200 kV	15 feet
201 to 300 kV	20 feet
301 to 500 kV	25 feet
501 to 750 kV	35 feet
751 to 1,000 kV	45 feet

Notes:
Whenever equipment operations must be performed closer than 20 feet from overhead power lines, the FL must be notified. When clearance to proceed is received from the FL, the electric utility company must be contacted to turn the power off or physically insulate (protect) the lines if the operation must be performed closer to the power line than is allowed in this table. For voltages not listed on this table, add 0.4 inches per kilovolt (kV) to obtain the safe distance between equipment and power lines.

12.1.7 Electric Safety

Observe the following procedures and practices to prevent electric shock:

- General
  - Use only appropriately trained and certified electricians to perform tasks related to electrical equipment. A good rule of thumb is to defer any task that would not normally and reasonably be completed by the average public consumer.
  - Each circuit encountered will be considered live until proven otherwise.
  - Only proper tools will be used to test circuits.
  - No wire will be touched until the circuit is determined to be de-energized.
- Extension Cords
  - All extension cords used on any project will be three-pronged.
  - All extension cords will be in good working order.
  - Each extension cord ground will be tested for continuity on at least a quarterly basis and marked to indicate when the inspection occurred.
  - Each extension cord will be visually inspected before each use.
  - If any extension cord is found in disrepair or fails the continuity test, it will be taken out of service.
  - Any extension cord that does not have the grounding pin will be taken out of service and not used.
  - Extension cords will not be used in place of fixed wiring.
  - Extension cords will not be run through holes in walls, ceilings, or floors.
  - Extension cords will not be attached to the surface of any building.
  - No extension cord will be of the “flat wire” type. Every extension cord will have each individual wire insulated and further protected by an outside cover.
  - Be sure to locate extension cords out of traffic areas or, if this is unavoidable, flag cords and protect workers from tripping over them (i.e., use barricades and tape the cord down).
  - Do not stage extension cords or powered equipment in wet areas, to the degree possible. Elevate cords, connections, and equipment out of puddles.
- Power Tools/Plug and Cord Sets
  - Any cord that is cut in a way that exposes insulation will be removed from service.
  - All tools and plug and cord sets will be tested for continuity.
  - If grounding pins are missing, the plug and cord will be removed from service.
  - Any tool or plug and cord set failing the continuity test will be removed from service.
  - All power tools will have three-pronged plugs unless double insulated.

- Ground-fault Circuit Interrupters
  - Each 120-volt electrical wall receptacle providing power to the job site will be protected by a portable GFCI.
  - Each GFCI will be tested quarterly and marked to indicate when the inspection occurred.
  - Each 120-volt, single-phase, 15- and 20-ampere receptacle outlet, including those on generators, will have an approved GFCI.
  - GFCIs will be located in line as close to the piece of equipment as possible.
- Specific
  - If unsure if a task requires specific electrical training, err on the side of caution and contact the PM and FL prior to proceeding.
  - If subsurface work is to be performed, follow the guidelines in Section 12.1.6 and conduct utility locating prior to work and in accordance with local ordinances.
  - If lock out/tag out (LO/TO) procedures are required (i.e., de-energizing machinery or equipment so work may be performed), the equipment owner must provide LO/TO procedures and training. By default, the equipment owner should perform any LO/TO. If it becomes necessary for Anchor QEA personnel to perform LO/TO tasks, contact the PM and FL prior to doing so.
  - Maintain appropriate distance from overhead utilities (see Table 12-1).
  - If unexpected electrical equipment is encountered (i.e., buried wire) assume it is live, stop work, and contact the PM and FL immediately.
  - If working in enclosed or restricted areas where electrical hazards may be present, contact a licensed electrician or other suitably trained party to provide barriers, shields, or insulating materials to prevent electric shock.
  - If working in areas where electrical hazards are present, verify that conductive clothing and jewelry is replaced with non-conductive clothing, or removed.

12.1.8 General Falls and Ladder Usage

Observe the following general falls and ladder usage procedures and practices:

- Assess work areas for fall hazards. A fall protection system that meets OSHA and ANSI Z3591 standards must be used if work is conducted 6 feet or more above the surface.
- Use ANSI Type 1A rated ladders.
- Verify that ladders are placed so their rungs, cleats, and steps are parallel, level, and uniformly spaced prior to use.
- Make sure ladder rungs are sturdy and free of cracks.
- Use ladders with secure safety feet.
- Pitch ladders at a 1 horizontal to 4 vertical (1H:4V) ratio.
- Secure ladders at the top or have another person at the bottom to help stabilize it.

- Ladders used to access an upper landing surface shall extend at least 3 feet above the upper landing surface.
- Use non-conductive ladders near electrical wires.
- The top rung of a ladder should not be used as a step.
- Do not carry any object or load that could cause a loss of balance or a fall.
- If a ladder is defective, damaged, or in disrepair (i.e., broken or missing rungs, cleats, or steps; broken or split rails; corroded components; or other faulty or defective components), tag the ladder "Do Not Use" and remove it from service until repaired.

12.1.9 Heavy Equipment Operations

Observe the following heavy equipment operations procedures and practices:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, verify that all employees have fall protection that meets OSHA and ANSI Z3591 standards.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.
- The subcontractor or Anchor QEA equipment operator must conduct pre-operational inspections of all equipment. In addition, daily inspections will be conducted on the equipment prior to site activities.
- Maintain the appropriate distance from overhead utilities (see Table 12-1):
- Always stay out of the swing radius of all heavy equipment. Always use a spotter during movement of equipment. The spotter and others, as appropriate, shall maintain constant communication with the operator.
- All operators must have adequate training and be qualified to operate the particular heavy equipment unit.
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- When using a crane, do not use hands when the load is being lifted or lowered. Use non-conductive tag line to help direct and position the load.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible

12.1.10 Working from an Aerial Lift

Observe the following practices and procedures when working from aerial lift:

- Wear leather gloves while attaching support members to protect against pinching injuries.
- While working from elevated levels greater than 6 feet, verify that all employees have fall protection that meets OSHA and ANSI Z3591 standards.
- Do not stand under loads that are being raised or lowered with cranes or aerial lifts.

- Conduct a pre-operational inspection of aerial lifts, including the following:
  - Check tire air pressure and hydraulic fluid level and pressure.
  - Make sure pivot pins are secured.
  - Check hoses for worn areas.
  - Check for cracks or deviations in welded parts.
  - Check that the safety limit switch works freely.
  - Check the security of the guardrail system on the platform.
  - Check both ground and platform control functions.
  - Raise and lower each boom system separately, listen for any unusual noises, vibrations, or uneven operations.
- Maintain the appropriate distance from overhead utilities (see Table 12-1):
- Conduct a site evaluation to determine proper positioning for the unit. Make sure the surface is level. Cordon off holes, drop-offs, bumps, or weak ground surfaces.
- Never climb a raised platform or stand on the mid-rail or top-rail.
- Tools should always be hung or put into a belt whenever possible.
- Specific training must be obtained on the aerial lift to be used.

12.1.11 Hand and Power Tools

Observe the following procedures and practices when working with hand and power tools:

- Keep hand tools sharp, clean, oiled, dressed, and not abused.
- Worn tools are dangerous. For example, the "teeth" in a pipe wrench can slip if worn smooth, an adjustable wrench will slip if the jaws are sprung, and hammerheads can fly off loose handles.
- Tools subject to impact (e.g., chisels, star drills, and caulking irons) tend to "mushroom." Keep them dressed to avoid flying spalls, and use tool holders.
- Do not force tools beyond their capacity.
- Flying objects can result from operating almost any power tool, so always warn people in the vicinity and use proper eye protection.
- Each power tool should be examined before use for damaged parts, loose fittings, and frayed or cut electric cords. Tag and return defective tools for repairs. Verify that there is adequate lighting, inspect tools for proper lubrication, and relocate tools or material that could "vibrate into trouble."
- Compressed air must be shut off or the electric cord unplugged before making tool adjustments. Air must be "bled down" before replacement or disconnection.
- Proper guards or shields must be installed on all power tools before issue. Do not use improper tools or tools without guards in place.
- Replace all guards before startup. Remove cranks, keys, or wrenches used in service work.

12.1.12 Motor Vehicle Operation

All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. **Anchor QEA prohibits the use of hand-held wireless devices while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law**. Additionally, site-specific motor vehicle requirements must be followed, if any.

When driving to, from, and within the job site, be aware of potential hazards including:

- Vehicle accidents
- Distractions
- Fatigue
- Weather and road conditions

To mitigate these hazards, observe the following procedures and practices regarding motor vehicle operation:

- Before leaving, inspect fuel and fluid levels and air pressure in tires, and adjust mirrors and seat positions appropriately.
- Wear a seat belt at all times and make sure that clothing will not interfere with driving.
- Plan your travel route and check maps for directions or discuss with colleagues.
- Clean windows and mirrors as needed throughout the trip.
- Wear sunglasses as needed.
- Fill up when the fuel level is low (not near empty).
- Follow a vehicle maintenance schedule to reduce the possibility of a breakdown while driving.
- Stop driving the vehicle, regardless of the speed (e.g., even 5 miles per hour) or location (e.g., a private road), when the potential of being distracted by conversation exists.
- Using hand-held communication devices (e.g., cell phones) while operating any motor vehicle is prohibited.
- Get adequate rest prior to driving.
- Periodically change your seat position, stretch, open the window, or turn on the radio to stay alert.
- Pull over and rest if you are experiencing drowsiness.
- Check road and weather conditions prior to driving.
- Be prepared to adjust your driving plans if conditions change.
- Travel in daylight hours, if possible.
- Give yourself plenty of time to allow for slowdowns due to construction, accidents, or other unforeseen circumstances.
- Use lights at night and lights and wipers during inclement weather.

12.1.13 Vehicular Traffic

Observe the following procedures and practices regarding vehicular traffic:

- Wear a high-visibility traffic safety vest when vehicle hazards exist.
- Use cones, flags, barricades, and caution tape to define the work area.
- Use a vehicle to block the work area (if conditions allow).
- Engage a police detail for high-traffic situations.
- Always use a spotter in tight or congested areas for material deliveries.
- As necessary, develop traffic control plans and train personnel as flaggers in accordance with the DOT MUTCD and/or local requirements.

See Section 7.4.2 for additional information regarding work in roadways.

12.1.14 Working Near Railways

When working near railways or in rail yards, observe the following procedures and practices:

- Plan work activities well ahead of time, including coordination with the railway owner(s) and operator(s).
- Always assume work near railways requires a permit from the railway owner/operator.
- Maintain emergency rail yard and railway owner/operator contact information at the field location.
- Become cognizant of train signals such as horns and lights, in order to understand potential train activity.
- Follow all railway owner/operator required procedures.
- Plan work activities to minimize time spent adjacent to tracks.
- Expect movement from on-track equipment at any time.
- Before approaching a track, look in both directions. Make sure it's safe to get on or cross the track.
- Never cross a track in front of oncoming traffic.
- When on-track equipment is approaching, stay at least 30 feet from the track while the equipment is passing.
- Watch for protruding structures on passing equipment as well as other hazards.
- Do not stage or store equipment unattended within 30 feet of tracks.
- When rail traffic is approaching, move away from the track, and warn your coworkers of approaching rail traffic.
- Never sit, walk, step, stand, or lie down on rails, including other track components such as switch points, frogs, guard rails, derails, and wheel stops.
- Do not lean on, climb on, or go under any on-track equipment unless your job requires it, in which case do so only after all required safety procedures have been put in place.

- Do not walk between on-track equipment unless they are separated by at least 50 feet.
- Keep at least 30 feet from the end of standing trains, cars, or locomotives. This will allow you time to react safely to any movement of the equipment.
- Avoid being trapped between on-track equipment passing on adjacent tracks.

12.1.15 Boating Operations

The following precautions shall be followed when conducting boating trailer and launch activities:

- Follow the trailer and boat manufacturers' instructions for securing the boat to the trailer.
- Follow the trailer manufacturer's instructions for securing the trailer to the towing vehicle.
- Prohibit site personnel from moving into trailer/vehicle pinch points without advising the vehicle operator.
- Use experienced operators when backing trailers on boat ramps.
- Wear proper work gloves when the possibility of pinching or other injury may be caused by moving or handling large or heavy objects.
- Maintain all equipment in a safe condition.
- Launch boats one at a time to avoid collisions.
- Use a spotter for vehicles backing boats to the launch area.
- Understand and review hand signals.
- Wear boots with non-slip soles when launching boats.
- Wear USCG-approved PFDs when working within 10 feet of the water.
- Keep ropes and lines coiled and stowed to eliminate trip hazards.
- Maintain three-point contact on dock/pier or boat ladders.
- Verify that drain plugs are in place.

The following precautions shall be followed when conducting boating operations:

- Maintain a current boater's license(s) as required.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.
- Obtain and review information regarding dams that may be present in work areas, particularly with regard to "no boating" zones and safety buoys, cables, and warning signage.
- Maintain boat anchorage devices commensurate with anticipated currents, distance to shore, and water depths.
- Provide a floating ring buoy in the immediate boat launch/landing areas with at least 60 feet (18.3 meters) of line for a vessel less than 65 feet (19.8 meters) in length, or 90 feet (27.4 meters) of line for a vessel 65 feet (19.8 meters) or greater in length (see https://www.law.cornell.edu/cfr/text/46/117.70 for more information).
- Step into the center of the boat.
- Keep your weight low when moving on the boat.
- Move slowly and deliberately.

- Steer directly across other boat wakes at a 90-degree angle to avoid capsizing.
- Steer the boat facing forward.
- Watch for floating objects in the water.
- Right-of-way is yielded to vessels on your boat's right, or starboard, and vessels with limited ability to maneuver such as any wind-propelled vessel.

The following precautions shall be followed when working on a boat:

- Observe proper lifting techniques.
- Obey lifting limits (see Section 12.1.18)
- Use mechanical lifting equipment (i.e., pulleys or winches) to move large or awkward loads.
- Wear USCG-approved PFDs for work activities within 10 feet of the water.

The safety-related items listed in Table 12-2 shall be available when conducting boating operations.

Table 12-2
Safety Equipment Specific to In-Water Work

Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard Requirements:
• Proper vessel registration, numbering, and documentation (registered with state, certificate of vessel registration number displayed, and carrying a valid certificate of number) • USCG-approved personal flotation devices (PFDs; or life jackets) for every person on the sampling vessel (Type I, II, III, or V are required). High-visibility required by Anchor QEA. • Appropriate, non-expired, visual distress devices for day and night use from the following: – Three hand-held red flares (day and night), or – One hand-held red flare and two parachute flares (day and night), or – One hand-held orange smoke signal, two floating orange smoke signals (day), and one electric distress light (night only) • Alternate means of propulsion (oars or paddles) • Dewatering device (pump or bailer) • Properly maintained and inspected USCG-approved fire extinguishers (no fixed system = (2) B-1 or (1) B-2 type extinguishers; fixed system = (1) B-1 type extinguisher) • Proper ventilation of gasoline-powered vessels • Sound-producing device (whistle, bell, or horn) • VHF 2-way radio • Proper navigational light display • Throwable life ring with attached line (any vessel larger than 16 feet is required to carry one Type IV [throwable] PFD)

Additional Safety Equipment for Sampling Vessel per U.S. Coast Guard Requirements:	
Additional USCG Recommended Equipment Includes:	
• Extra visual distress signals • Primary and spare anchor • Heaving line • Fenders • First aid kit • Flashlight • Mirror • Searchlight • Sunburn lotion • Tool kit • Spare fuel	• Boat hook • Spare propeller • Mooring line • Food and water • Binoculars • Spare batteries • Sunglasses • Marine hardware • Extra clothing • Spare parts • Pertinent navigational chart(s) and compass

12.1.16 Working Over or Near Water

12.1.16.1 Personal Flotation Devices

PFDs are not required where employees are continuously protected from the hazard of drowning by railings, nets, safety belts, or other applicable provisions.

Type I, II, III or V USCG-approved, high-visibility PFD shall be provided and properly worn by all personnel in the following circumstances:

- On or within 10 feet of water
- On floating pipelines, pontoons, rafts, or stages
- On structures extending over or next to the water, except where guard rails or safety nets are provided for employees
- Working alone at night where there are drowning hazards, regardless of other safeguards provided
- In skiffs, small boats, or launches, unless in an enclosed cabin or cockpit
- Whenever there is a drowning hazard

The following precautions shall be followed when using PFDs:

- Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective devices or devices with less than 13 pounds buoyancy shall be removed from service.
- All PFDs shall be equipped with reflective tape as specified in 46 CFR 25.25-15.
- Thirty-inch USCG-approved ring buoys with at least 150 feet of 600-pound capacity line shall be provided and readily available for emergency rescue operations. The distance between ring buoys shall not exceed 200 feet.

- PFD lights conforming to 46 CFR 161.012 shall be required whenever there is a potential need for life rings to be used after dark. Onshore installations, at least one life ring, and every third one thereafter, shall have a PFD light attached. PFD lights on life rings are required only in locations where adequate general lighting (e.g., floodlights or light stanchions) is not provided.

12.1.16.2 Cold Water Work

When the combined air and water temperature is below 90°F, field personnel working on or near water shall wear either a float coat and bib overalls (e.g., a full two-piece "Mustang" survival suit or similar) or a one-piece survival suit. Suits or float coats shall be USCG approved. If extremely cold or severe weather conditions are forecast, work activities should be postponed. Work activities will be continually reviewed and adjustments made if wearing a survival suit during work activities potentially poses a hazard due to warm air temperatures, or limited mobility or agility. In addition, proximity of water work to shore and scope/duration/timing of work activities will be considered when stipulating the above requirement. Overall, if water craft will be used during work, or work will be conducted near water, it is imperative that site-specific conditions are considered and evaluated so that proper safeguards and procedures are in place prior to beginning work.

In addition to considering the use of apparel appropriate for anticipated air, weather, and water conditions, field teams shall identify any procedures necessary for cold-water "man-overboard" scenarios. These procedures should be identified in the site-specific HASP, described in the JSA used for boating activities and, if prudent, practiced before work.

12.1.16.3 Work Near Dams

Work near dams should be avoided unless necessary to complete the required work scope. In the event that working near dams is required, the following shall be considered:

- Obtain safety procedures from the dam owner/operator prior to beginning work.
- Follow required safety procedures including no boating offsets and fall protection procedures.
- Obtain dam operation (i.e., spillway use and trash rack locations) schedules and plan work activities to the extent practicable during periods of no or low dam activity.

12.1.17 Noise

Excessive noise is hazardous not only because of its potential to damage hearing, but also because of its potential to disrupt communications and instructions. The following procedures and practices shall be followed to prevent noise-related hazards:

- All employees will have access to ear protection with a Noise Reduction Rating of not less than 30.

- Ear protection must be worn in any environment where site personnel must raise their voices to be heard while standing at a distance of 3 feet or less.
- Ear protection must be worn by any personnel observing or operating concrete cutting or sawing equipment, pile driving, or other loud noise-generating activities.

Hearing protection is required for site personnel operating or working near noisy equipment or operations, where the noise level is greater than 85 A-weighted decibels (dBA) (time-weighted average [TWA]), as well as personnel working around heavy equipment. The FL will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

When needed, a sound level meter will be used to measure noise levels at selected locations in the work area and on the site perimeter. When used, noise monitoring equipment must be calibrated before and after each shift.

If continuous noise levels are found to exceed 85 dBA at any location within the work area, warning signs will be posted. Site personnel and visitors will be notified that hearing protection is required. Appropriate hearing protection (i.e., ear plugs or ear muffs) will be worn whenever personnel or visitors are working in that location. A supply of ear plugs will be maintained on site.

Action levels in Table 12-3 will trigger the use of appropriate hearing protection (plugs or muffs). Hearing protection must be able to attenuate noise below 90 dBA (8-hour TWA). Each hearing protection or device has a Noise Reduction Rating (NRR) assigned by EPA. The calculation for a hearing protection device's effectiveness is as follows:

Equation 1

$$\text{Noise reading } dBA - (NNR - 7dB) < 90dBA$$

where:

dB	=	decibel
dBA	=	A-weighted decibel
NRR	=	Noise Reduction Rating

Table 12-3
Noise Exposure Action Levels

Instrument	Measurement	Action
	> 80 dBA to 85 dBA	Hearing protection recommended. Limit work duration to 8-hour shifts.
	> 85 dBA to 90 dBA	Hearing protection required. Limit work duration to 8-hour shifts.

Instrument	Measurement	Action
Type I or Type II Sound Level Meter or Dosimeter	> 90 dBA to 115 dBA	Hearing protection required. Investigate use of engineering controls. Limit work duration to 8-hour shifts.
	> 115 dBA	Stop work. Consult DOHS.

12.1.18 Lifting and Material Handling

Observe the following procedures and practices for lifting and material handling:

- Use leather gloves when handling metal, wire rope, sharp debris, or transporting materials (e.g., wood, piping, or drums).
- The size, shape, and weight of the object to be lifted must first be considered. No individual employee is permitted to lift any object that weighs more than 60 pounds. Multiple employees or mechanical lifting devices are required for objects heavier than the 60-pound limit.
- Plan a lift before doing it. Bend at the knees and lift with the legs; maintain the natural curves of the back; do not use back muscles.
- Check the planned route for clearance.
- Use the buddy system when lifting heavy or awkward objects.
- Do not twist your body while lifting.
- Know the capacity of any handling device (e.g., crane, forklift, chain fall, or come-along) that you intend to use.
- Use tag lines to control loads.
- Verify that your body, material, tools, and equipment are safe from such unexpected movement as falling, slipping, rolling, tripping, bowing, or any other uncontrolled motion.
- Trucks (i.e., flat beds) hauling equipment or materials must not be moved once rigging has been released.
- Chock all material and equipment (such as pipe, drums, tanks, reels, trailers, and wagons) as necessary to prevent rolling.
- Tie down all light, large-surface-area material that might be moved by the wind.
- When working at heights, secure tools, equipment, and wrenches against falling.
- Do not store materials or tools on ducts, lighting fixtures, beam flanges, hung ceilings, or similar elevated locations.
- Fuel-powered tools used inside buildings or enclosures shall be vented and checked for excessive noise.

12.1.19 Fire Control

Observe the following fire control procedures and practices:

- Smoke only in designated areas.
- Keep flammable liquids in closed containers.

- Keep the work site clean; avoid accumulating combustible debris such as paper.
- Obtain and follow property owner hot work safety procedures when welding or performing other activities requiring an open flame.
- Isolate flammable and combustible materials from ignition sources.
- Verify fire safety integrity of equipment installations according to National Electrical Code (NEC) specifications.

12.1.20 Static Electricity and Transfer of Flammable Liquids

Observe the following procedures and practices regarding static electricity when transferring flammable liquids:

- Electrically bond and ground pumps, transfer vessels, tanks, drums, bailers, and probes when moving flammable liquids.
- Electrically bond and ground vacuum trucks and the tanks they are emptying.
- Do not splash fill containers with flammable liquids.
- Pour flammable liquids slowly and carefully.
- Two fire extinguishers (2A20:BC) must be available, charged, inspected, and readily accessible.

12.1.21 Cleaning Equipment

Observe the following procedures and practices when cleaning equipment:

- Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, Alconox, or other cleaning materials.
- Stand upwind to minimize any potential inhalation exposure.
- Dispose of spent cleaning solutions and rinses accordingly.

12.2 Environmental Hazards and Controls

12.2.1 Fatigue Management

Because Anchor QEA personnel may be working during both daytime and nighttime hours several days per week, depending on the activity, it is important that all personnel are aware of the hazards related to fatigue. Fatigue can be defined as an increasing difficulty in performing physical or mental activities. Signs of fatigue may include tiredness, changes in behavior, loss of energy, and reduced ability to concentrate. Fatigued site personnel may have a reduced ability to recognize or avoid risks on the work site, which may lead to an increase in the number and severity of injuries and other incidents. Fatigue can occur at any time when working and may cause safety concerns due to decreased manual dexterity, reaction time, and alertness.

Fatigue results from insufficient rest and sleep between activities. Contributing factors to fatigue may include the following:

- The time of day that work takes place
- The length of time spent at work and in work-related duties
- The type and duration of a work task and the environment (e.g., weather conditions and ambient noise) in which it is performed
- The quantity and quality of rest obtained prior to, during, and after a work period
- Non-work activities
- Individual factors such as sleeping disorders, medications, or emotional state

Personnel suffering from fatigue may exhibit both physical and mental effects, such as the following:

- Slower movements
- Poor coordination
- Slower response time to interaction
- Bloodshot eyes
- Slumped or weary appearance
- Nodding off
- Distractedness or poor concentration
- Inability to complete tasks
- Fixed gaze
- Appearing depressed, irritable, frustrated, or disinterested

Employees are strongly encouraged to get sufficient pre-work rest, maintain sufficient nutritional intake during work (i.e., eat and drink at regular intervals), and communicate with team members and leaders if their level of fatigue elevates.

Use the following procedures to help detect and address fatigue-related issues:

- Periodically observe and query coworkers for signs or symptoms of fatigue.
- Site personnel that express concern over their level of fatigue, or that are observed to be fatigued such that elevated worker risk is evident, will be relieved or have their work tasks adjusted so that they may rest sufficiently.
- Work schedules will consider fatigue factors and optimize continuous periods available for uninterrupted sleep. The employee is responsible for reporting to work properly rested and fit for duty. In case of an emergency or operational difficulties (e.g., limited access due to water levels or boat repairs), work hours may require adjustment.
- Maintain a routine exercise program and regular sleep schedule as much as possible over the course of the work.

- Avoid heavy meals or caffeine and minimize or eliminate the consumption of alcohol and nicotine before sleeping.

12.2.2 Heat Stress

Observe the following general procedures and practices regarding heat stress:

- Increase the number of rest breaks and/or rotate site personnel in shorter work shifts.
- Watch for signs and symptoms of heat stress and fatigue (see Section 12.2.2.1).
- During hot months, plan work for early morning or evening.
- Use ice vests when necessary.
- Rest in cool, dry areas.
- Verify that employees have access to potable drinking water and shade.
- During conditions exceeding 95°F, verify that the following additional procedures are adhered to:
  - Establish effective communication by voice, observation, or electronic means.
  - Observe employees for alertness and signs or symptoms of heat illness.
  - Designate one or more employees on each work site as authorized to call for emergency medical services.
  - Remind employees to drink water throughout the shift.
  - Conduct pre-shift meetings before beginning work to review the high heat procedures, encourage drinking water, and remind employees of their right to take a cool-down rest when necessary.

12.2.2.1 Signs, Symptoms, and Treatment

The FL will be trained in heat stress prevention, including the following, prior to supervising employees:

- Procedures to prevent heat illness.
- Procedures to follow when an employee exhibits symptoms consistent with possible heat illness, including emergency response procedures.

The information provided below addresses these training requirements.

Adverse climatic conditions are important considerations in planning and conducting site operations. High ambient temperature can result in health effects ranging from transient heat fatigue, physical discomfort, reduced efficiency, personal illness, and increased accident probability to serious illness or death. Heat stress is of particular concern when chemical protective garments are worn because they prevent evaporative body cooling. Wearing PPE places employees at considerable risk of developing heat stress.

Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably

one of the most common (and potentially serious) illnesses, regular monitoring and other preventive precautions are vital.

Heat Rash. Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat-soaked clothing, rubber boots, or impermeable waders. The condition is characterized by a localized red skin rash and reduced sweating. Heat rash reduces the ability to tolerate heat. To treat, keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing. Take measures to prevent heat rash by changing clothes often to maximize use of dry garments, or taking frequent breaks to allow doffing of equipment and drying of skin.

Heat Cramps. Heat cramps are caused by profuse perspiration with inadequate electrolytic fluid replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood, which can cause painful muscle spasms and pain in the extremities and abdomen. To treat, move the employee to a cool place and give sips of water or an electrolytic drink. Watch for signs of heat exhaustion or heat stroke.

Heat Exhaustion. Heat exhaustion is a mild form of shock caused by increased stress on various organs to meet increased demand to cool the body. Onset is gradual and symptoms should subside within 1 hour. Symptoms include a weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; and fatigue. To treat, move the employee to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continuously to remove heat by convection. Do not allow the affected person to become chilled. Treat for shock if necessary.

Heat Stroke. Heat stroke is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. ***This is a medical emergency!*** Symptoms include red, hot, dry skin; a body temperature of 105°F or higher; no perspiration; nausea; dizziness and confusion; and a strong, rapid pulse. Because heat stroke is a true medical emergency, transport the individual to a medical facility immediately. Prior to transport, remove as much clothing as possible and wrap the individual in a sheet soaked with water. Fan the individual vigorously while transporting to help reduce body temperature. If available, apply cold packs under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing the individual in a cool-water bath (however, be careful not to over-chill the individual once body temperature is reduced below 102°F). If this is not possible, keep the individual wrapped in a sheet and continuously douse with water and fan.

12.2.2.2 Prevention

The implementation of preventative measures is the most effective way to limit the effects of heat-related illnesses. During periods of high heat, adequate liquids must be provided to replace lost body fluids. Replacement fluids can be a 0.1% saltwater solution, a commercial mix such as Gatorade,

or a combination of these with fresh water. The replacement fluid should be kept cool, 50°F to 60°F, and it should be placed close to the work area. Employees must be encouraged to drink more than the amount required to satisfy thirst. Employees should also be encouraged to salt their foods more heavily during hot times of the year.

Cooling devices such as vortex tubes or cooling vests can be worn beneath impermeable clothing. If cooling devices are worn, only physiological monitoring will be used to determine work activity.

All site personnel are to rest when any symptoms of heat stress are noticed. Rest breaks are to be taken in a cool, shaded rest area. Employees shall remove chemical protective garments during rest periods and will not be assigned other tasks.

All employees shall be informed of the importance of adequate rest and proper diet, including the harmful effects of excessive alcohol and caffeine consumption.

12.2.2.3 Monitoring

Heat stress monitoring should be performed when employees are working in environments exceeding 90°F ambient air temperature. If employees are wearing impermeable clothing, this monitoring should begin at 77°F. There are two general types of monitoring that the health and safety representative can designate to be used: wet bulb globe temperature (WBGT), and physiological. The Heat Stress Monitoring Record form (see Appendix A) will be used to record the results of heat stress monitoring.

Note that some states such as Washington and California have specific regulatory standards for protection of employees from heat stress-related injuries.

Wet Bulb Globe Temperature (WBGT). The WBGT index is the simplest and most suitable technique to measure the environmental factors that most nearly correlate with core body temperature and other physiological responses to heat. When WBGT exceeds 25°C (77°F), the work regimen in Table 12-4 should be followed.

Table 12-4
Permissible Heat Exposure Threshold Limit Values

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous work	86°F (30.0°C)	80°F (26.7°C)	77°F (25.0°C)
75% work, 25% rest each hour	87°F (30.6°C)	82°F (28.0°C)	78°F (25.9°C)
50% work, 50% rest, each hour	89°F (31.4°C)	85°F (29.4°C)	82°F (27.9°C)
25% work, 75% rest, each hour	90°F (32.2°C)	88°F (31.1°C)	86°F (30.0°C)
These TLVs assume that nearly all acclimated, fully-clothed site personnel with adequate water and salt intake should be able to function effectively under the given working conditions without exceeding a deep body temperature of 100.4°F (38°C).			

(From OSHA Technical Manual, Section III: Chapter 4 - Heat Stress)

The TLVs denoted in Table 12-4 apply to physically fit and acclimatized individuals wearing light, summer clothing. If heavier clothing that impedes sweat or has a higher insulation value is required, the permissible heat exposure TLVs should be adjusted based on the WBGT Correction Factors in Table 12-5.

Table 12-5
Wet Bulb Globe Temperature Correction Factors

Clothing Type	WBGT Correction
Summer lightweight working clothing	0°F (0°C)
Cotton coveralls	-3.6°F (-2°C)
Winter work clothing	-7.2°F (-4°C)
Water barrier, permeable	-10.8°F (-6°C)
Fully encapsulating	-14.4°F (-10°C)

Physiological. Physiological monitoring can be used in lieu of, or in addition to, WBGT. This monitoring can be self-performed once the health and safety representative demonstrates appropriate techniques to affected employees. Because individuals vary in their susceptibility to heat, this type of monitoring has its advantages. The following two parameters are to be monitored at the beginning of each rest period:

- **Heart Rate:** The maximum heart rate (MHR) is the amount of work (beats) per minute a healthy person's heart can be expected to safely deliver. Each individual will count his/her radial (wrist) pulse for 1 minute as early as possible during each rest period. If the heart rate of any individual exceeds 75% of his/her calculated MHR (MHR = 200 - age) at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain

the same. An individual is not permitted to return to work until his/her sustained heart rate is below 75% of his/her calculated MHR.

- **Temperature:** Each individual will measure his/her temperature with a thermometer for 1 minute as early as possible in the first rest period. If the temperature exceeds 99.6°F at the beginning of the rest period, then the work cycle will be decreased by one-third. The rest period will remain the same. An individual is not permitted to return to work if his/her temperature exceeds 100.4°F.

12.2.2.4 Training

Employees potentially exposed to heat stress conditions will be instructed on the contents of this procedure. This training can be conducted during daily tailgate safety meetings.

12.2.3 Cold Stress

Observe the following procedures and practices regarding cold stress:

- Take breaks in heated shelters when working in extremely cold temperatures.
- Upon entering the shelter, remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration.
- Drink warm liquids to reduce the susceptibility to cold stress.
- Be aware of cold stress symptoms, including shivering, numbness in the extremities, and sluggishness.
- Provide adequate insulating dry clothing to maintain warmth if work is performed in air temperature below 40°F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required.
- If the air temperature is 32°F or less, hands should be protected.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer wear should be changed as it becomes wetted. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is made available, or until weather conditions improve.
- Implement a buddy system in which site personnel are responsible for observing fellow workers for early signs and symptoms of cold stress.

12.2.3.1 Signs, Symptoms, and Treatment

Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below. The appropriate guidelines should be followed if any personnel exhibit these symptoms:

Frostbite. Frostbite is characterized by pain in the extremities and loss of manual dexterity. "Frostnip," or reddening of the tissue, is accompanied by a tingling or loss of sensation in the extremities and continuous shivering.

Hypothermia. Hypothermia is characterized by pain in the extremities and loss of manual dexterity, with severe, uncontrollable shivering, and an inability to maintain the level of activity. Symptoms include excessive fatigue, drowsiness, irritability, or euphoria. Severe hypothermia includes clouded consciousness, low blood pressure, pupil dilation, cessation of shivering, unconsciousness, and possible death.

Move the individual to a warm, dry place. If the individual's clothing is wet, remove it and replace it with dry clothing. Keep the individual warm. Re-warming of the individual should be gradual to avoid stroke symptoms. Dehydration, or the loss of body fluids, may result in a cold injury due to a significant change in blood flow to the extremities. If the individual is conscious and alert, warm sweet liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Extremities affected by frostbite should be gradually warmed up and returned to normal temperature. Moist compresses should be applied; begin with lukewarm compresses and slowly increase the temperature as changes in skin temperature are detected. Keep the individual warm and calm and move them to a medical facility as soon as possible.

12.2.4 Sunlight and Ultraviolet Exposure

Observe the following procedures and practices regarding ultraviolet (UV) exposure:

- Protect against extended exposure to sunlight with shade, long clothing, sunscreen, and high-SPF, broad-spectrum sunscreen applied frequently.
- Plan work to avoid unnecessary UV exposure (see Section 12.2.4.2).
- During peak daylight months, plan work for early morning or evening.
- Many factors affect the hazards associated with UV exposure, including the following:
  - **Time of day:** UV rays are strongest between 10:00 a.m. and 4:00 p.m.
  - **Season of the year:** UV rays are stronger during spring and summer months. This is less of a factor near the equator.
  - **Distance from the equator (latitude):** UV exposure goes down as you get farther from the equator.
  - **Altitude:** More UV rays reach the ground at higher elevations.
  - **Cloud cover**: The effect of clouds can vary. Sometimes cloud cover blocks some UV from the sun and lowers UV exposure, while some types of clouds can reflect UV and

increase UV exposure. What is important to know is that UV rays can get through, even on a cloudy day. Consider monitoring the UV index for your work area: http://www2.epa.gov/sunwise/uv-index.

  - **Reflection off surfaces**: UV rays can bounce off surfaces like water, sand, snow, pavement, or grass, leading to an increase in UV exposure.
- Evaluate site-specific factors affecting UV exposure and address work practices as appropriate.

12.2.4.1 Signs, Symptoms, and Treatment

The best way to treat sunburn is to prevent it using the guidelines listed in the preceding bullets and in Section 12.2.4.2. Signs of sunburn include the following:

- Pinkness or redness
- Skin that feels warm or hot to the touch
- Pain, tenderness, or itching
- Swelling
- Small, fluid-filled blisters, which may break
- Headache, fever, chills, and fatigue if the sunburn is severe

If signs of sunburn are noticed, avoid further exposure and immediately implement treatment. If the sunburn is blistering *and* covers 15% or more of the body, seek medical attention.

12.2.4.2 Prevention

UV exposure hazards and their impacts on each worksite should be evaluated to determine the best practices for risk mitigation. The most effective way to prevent skin damage from UV exposure is to protect bare skin from the exposure. This can be accomplished with shade, clothing (e.g., pants, long sleeves, or hats), sunscreen, and sunglasses. Plan work to either create shade or take advantage of natural shade, and avoid peak UV times during the day when possible.

12.2.5 Inclement Weather

Observe the following procedures and practices regarding inclement weather:

- Evaluate the worksite for hazards that may be amplified during inclement weather, such as traction issues, ingress and egress, slope stability, or wind-driven hazards (e.g., dust, debris, or falling trees).
- Stop outdoor work during electrical storms (lightning strikes), hailstorms, high winds, and other extreme weather conditions such as extreme heat or cold.
- Take cover indoors or in a vehicle that will provide adequate protection. In some cases, this may require exiting the worksite, such as during windstorms in areas with overhead hazards (e.g., trees or power lines).

- Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
- Verify that on-site equipment and resources are adequately protected from inclement weather.
- If working in an unfamiliar geographic location, consult with local resources for unique weather hazards.

12.2.6 Insects and Spiders

Observe the following general procedures and practices regarding insects/spiders:

- Tuck pants into socks.
- Wear long sleeves.
- Use insect repellent.
- Avoid contact by always looking ahead to where you will be walking, standing, sitting, leaning, grabbing, lifting, or reaching.
- Check for signs of insect/spider bites, such as redness, swelling, and flu-like symptoms.

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Table 12-6.

Table 12-6
North American Hazardous Spider Identification Guide

Hazardous Spider Identification Guide	
Black Widow Spider • Abdomen usually shows hourglass marking • Female is 3 to 4 centimeters in diameter • Have been found in well casings and flush-mount covers • Not aggressive, but more likely to bite if guarding eggs • Light, local swelling and reddening are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea • If bitten, see a physician as soon as possible	
Brown Spiders (aka Brown Recluse or Fiddleback) • Found in the central and southern United States, although in some other areas, as well • 1/4-to-1/2-inch-long body, and size of a silver dollar • Hide in baseboards, ceiling cracks, and undisturbed piles of material • Bite may either go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of the affected tissue, and very slow healing • If bitten, see a physician as soon as possible	

12.2.7 Bees and Wasps

Many encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger and, if one is present, remove it as soon as possible. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the PM and project FL first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

12.2.8 Ticks

Ticks in North America can be carriers of several diseases, including Lyme disease, Rocky Mountain spotted fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when exposed to tick-infested habitats. Measures to prevent tick exposure include the following:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light-colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.
- Conduct tick checks on buddies upon exiting any suspect area (may be needed multiple times per work day).
- Be aware of seasonal activity; ticks are often most active in the spring.

Observe the following procedures and practices if you are bitten by a tick:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.

- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2 to 3 weeks. Place the tick in a sealed plastic bag in the freezer, and mark the bag with the date of the bite.

12.2.9 Mosquitoes

Mosquitoes in the United States have been known to carry West Nile virus, Zika virus, St. Louis encephalitis, and dengue fever. Avoid mosquito bites by doing the following:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when outdoors. DEET is very effective, but could potentially contaminate samples.
- Read and follow the product directions whenever you use insect repellent.
- Wear long-sleeved clothes and long pants treated with repellent to further reduce your risk, or stay indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- If you need to destroy a nest, consult with the PM and project FL first.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with the local government officials to establish a program.

12.2.9.1 Zika Virus

The Zika virus has generated concern starting in 2016 in the southern United States. According to the Centers for Disease Control and Prevention (CDC),[4] Zika infection during pregnancy can cause a birth defect of the brain called microcephaly and other severe fetal brain defects. There have also been increased reports of Guillain-Barré syndrome, an uncommon sickness of the nervous system, in areas affected by Zika. The practices listed in the bullets above should be followed to avoid mosquito bites and help prevent contraction of the Zika virus. Symptoms of Zika and treatment options are listed

[4] https://www.cdc.gov/zika/about/overview.html

below, should you suspect that you or another employee has been in contact with Zika-infected mosquitoes:

- The most common symptoms of Zika (similar to those of dengue fever) are fever, rash, joint pain, or conjunctivitis (red eyes). Other common symptoms include muscle pain and headache. The incubation period (the time from exposure to symptoms) for Zika virus disease is not known, but is likely to be a few days to a week.
- The illness is usually mild, with symptoms lasting for several days to a week. Severe disease requiring hospitalization is uncommon.
- Call WorkCare or see your healthcare provider if you develop the symptoms described above and have visited an area where Zika is found. If you have recently traveled, tell your healthcare provider when and where you traveled. Your healthcare provider may order blood tests to look for Zika or other similar viruses like dengue fever.

12.2.10 Venomous Snakes

Observe the following procedures and practices regarding poisonous snakes:

- Avoid walking in areas where snakes may nest or hide. When walking, always look ahead for signs of snakes.
- Use extreme caution when moving or lifting objects that could be used by snakes as cover.
- Never reach under or behind objects or into other areas where snakes may hide.
- Wear sturdy leather boots.
- Poisonous snakebites are medical emergencies. If bitten by any type of snake, immediately seek medical attention.

12.2.11 Bird Droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost—especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- If allowable, modify the structure or use methods to prevent birds from re-establishing the roost.

12.2.12 Feral Dogs

Feral (i.e., "wild" or "stray") dogs have been observed at several Anchor QEA job sites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Do not run away or run past the dog.
- Remain calm. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Do not turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim's condition. Call 911 if paramedic response is required.

12.2.13 Rodent-Borne Diseases

Rodent infestation on a site has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus, which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings, or nesting materials are stirred up.

Working conditions that may put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine, which may mobilize particles of these wastes into the air where they may be inhaled
- Entry into rooms or warehouses that have been closed up and infested for extended periods
- Activities that stir up dust that may mobilize hantavirus

If working in areas of obvious rodent infestation, the CDC recommends the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed-up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location
- If an exterminator is not available or possible, employees should clean up the infested area using the following steps:
    - When going into outbuildings or rooms that have been closed for an extended period, open them up and air them out before cleaning.
    - Don an APR equipped with HEPA P-100 cartridges and nitrile gloves before cleaning.
    - Do not stir up dust by sweeping or vacuuming droppings, urine, or nesting materials.

- Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of a commercial disinfectant.
- Once everything is wet, pick up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
- Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose of in an appropriate waste disposal system. Contact the local or state health department for other disposal methods.
- Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact your supervisor immediately.

12.2.14 Poisonous Plants

Poisonous plants include poison ivy, poison oak, and poison sumac as shown in Table 12-10. Observe the following procedures and practices regarding poisonous plants:

- Avoid entering areas infested with poisonous plants.
- Immediately wash any areas that come into contact with poisonous plants.
- Use PPE when there is a possibility of contact with poisonous plants.

Table 12-10
North American Hazardous Plant Identification Guide

Hazardous Plant Identification Guide		
Poison Ivy • Grows in the West, Midwest, Texas, and the East Coast • Several forms—vine, trailing shrub, or shrub • Three leaflets (can vary from three to nine) • Leaves are green in summer and red in fall • Yellow or green flowers • White berries		
Poison Oak • Grows in the East (New Jersey to Texas) and Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves in clusters of three • Yellow berries		
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern United States • Shrub up to 15 feet tall • Seven to 13 smooth-edged leaflets • Glossy pale yellow or cream-colored berries		

If you have been exposed to poison ivy, oak, or sumac, act quickly because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

1. Cleanse the exposed skin with generous amounts of isopropyl alcohol.
2. Wash the skin with water.
3. Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
4. Wash clothes, tools, and anything else that may have been in contact with the toxin with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Over-the-counter products that are available to alleviate symptoms include Cortaid, Lanacort, baking soda, Aveeno oatmeal baths, and calamine lotion.

12.2.15 The Public at Large

The community residents around worksites may pose their own specific hazards. These conditions may include the following:

- Unintentional disruption of work
- Benign or malicious trespass
- Criminal intent

Scenarios may include the following:

- Pedestrians, cyclists, or motorists disregarding site boundaries due to distraction or willful disobedience.
- Public use of private site facilities for shelter, relief, and other reasons with no ill-intention.
- Public use of private site facilities for mischievous or criminal activity, such as loitering, vandalism, or theft.
- Encounters with community members who are disgruntled with the project activity.
- Encounters with criminal activities on or near a project site.

If any of the previously mentioned scenarios are anticipated to be likely, take the following precautions as appropriate:

- Verify that the site is adequately marked and barricaded to limit unintentional disruptions of the work by the public.
- Review the site for attractive nuisances (e.g., hazards or conditions that are likely to attract children), and mitigate those.
- Secure all equipment and site facilities to prevent unauthorized access or use.
- Remove valuable items from the site or adequately secure them on site to limit the temptation for potential criminals.
- Have contact information for the client's or owner's public relations office while on site, and direct disgruntled community members to that office. If necessary, vacate the site to relieve the situation and notify the PM or FL.
- Work in pairs when uncertain of the public safety situation at a site. In questionable situations, postpone work as necessary until a plan of action can be developed to verify a safe working environment.

12.2.16 Personal Health and Safety

In addition to hazards associated with chemicals of concern, equipment, operations, or site conditions discussed above, there may be additional personal safety issues to consider at a site, including those related to one or multiple protected classes, such as race, gender, religion, ability,

sexual orientation, or gender identity. These conditions may involve the following, perpetrated by the public or those associated with the work:

- Malicious disruption of work
- Harassment, including unwanted comments, gestures, or actions
- Threats of violence, either implied (using derogatory language) or explicit
- Assault

<u>It is critical that the work environment be discussed within the project team to evaluate risks, ways to avoid those risks, and communication protocols. Anchor QEA requires that work be performed in teams.</u>

Specifically, if any of the above are anticipated, take the following precautions as appropriate:

- Alert the PM, FL, DOHS, and Human Resources Department of potential issue(s).
- Formulate a plan of action to verify and maintain a safe working environment prior to field work, which may include the following:
  - Working in pairs and/or within a certain physical distance of other work groups.
  - Coordinated check-ins (calls to or from the office or visual check-ins with other field members).
- Whenever possible, schedule work only within daylight hours (which fluctuate seasonally) or on weekends when questionable scenarios may be less likely.
  - If night work is required, maintain a minimum of two field personnel at all times, and potentially increase the total number of personnel.
  - If working in high-risk areas, discuss the possibility of hiring security if work needs to be performed at night, in low light, or near potentially dangerous areas (e.g., abandoned buildings, public displays of hostility, discrimination, or gang-related activity).
- Maintain a field phone with active GPS and non-locking 911 capability at all times while out in the field.
- If a need arises for a change in field work (e.g., additional sampling or moving to an area that was not planned) or travel plans (e.g., dead battery or flat tire), immediately alert the FL and PM as to the event.

In addition, practice active awareness of your environment. Discuss personal health and safety concerns at the daily tailgate meeting. If you feel unsafe based on the potential behavior of others, immediately bring it up to field team coworkers. If the issue is not resolved to your satisfaction, alert the PM, FL, DOHS, and Human Resources Department to assist in resolving any potential issue(s).

13 Medical Monitoring Program

This section describes the medical monitoring program that Anchor QEA field personnel must comply with when working on sites where there is a potential for exposure to hazardous wastes or other hazardous substances.

13.1 General Requirements

Anchor QEA employees shall be enrolled in a medical monitoring program in compliance with OSHA standards (29 CFR 1910.120(f)) under the following circumstances:

- If they are involved with any of the following operations:
  - *Cleanup operations* required by a governmental body, whether federal, state, local, or other involving hazardous substances that are conducted at uncontrolled hazardous waste sites (including, but not limited to, the EPA's National Priority List [NPL] sites, state priority list sites, sites recommended for the EPA NPL, and initial investigation of government-identified sites that are conducted before the presence or absence of hazardous substances has been ascertained)
  - *Corrective actions* involving cleanup operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA) as amended (42 United States Code 6901 et seq)
  - *Voluntary cleanup operations* at sites recognized by federal, state, local, or other governmental bodies as uncontrolled hazardous waste sites
  - *Operations involving hazardous wastes* that are conducted at treatment, storage, and disposal (TSD) facilities regulated by 40 CFR 264 and 40 CFR 265 pursuant to RCRA or by agencies under agreement with the EPA to implement RCRA regulations
  - *Emergency response operations* for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard
- And, if they meet the following criteria:
  - Are or may be exposed to hazardous substances or health hazards at or above the established PEL, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more per year
- In addition, employees are required to be enrolled in the medical monitoring program if they meet any of the following conditions:
  - Wear a respirator for 30 days or more per year
  - Are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operations
  - Are members of a Hazardous Materials (HAZMAT) team

Anchor QEA employees required to be enrolled in a medical monitoring program under 29 CFR 1910.120(f) shall have medical examinations and consultations made available to them by Anchor QEA on the following schedule:

- Prior to assignment
- At least once every 12 months unless the attending physician believes a longer interval (not greater than biennially) is appropriate
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not had an examination within the last 6 months
- As soon as possible upon notification that the employee has developed signs or symptoms indicating possible overexposure to hazardous substances or health hazards, or that the employee has been injured or exposed above the PEL or published exposure levels in an emergency situation
- At more frequent times, if the examining physician determines that an increased frequency of examination is medically necessary

The content of medical examinations or consultations made available to employees shall be determined by the attending physician but shall include, at a minimum, a medical and work history with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness for duty including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site.

The attending physician shall provide Anchor QEA with a written opinion for each examined employee that contains the following information:

- Whether the employee has any detected medical conditions that would place the employee at an increased risk of impairment of the employee's health from hazardous waste operations work, emergency response, or respirator use
- Any recommended limitations on the employee's assigned work
- A statement that the employee has been informed of the results of the medical examination and any medical conditions that require further examination or treatment

The written opinion obtained by Anchor QEA shall not reveal specific findings or diagnoses unrelated to occupational exposures. Medical monitoring and other employee-related medical records shall be retained for at least the duration of employment plus 30 years.

13.2 Team Self-Monitoring

All personnel will be instructed to look for and inform each other of any deleterious changes in their physical or mental condition during the performance of all field activities. Examples of such changes are as follows:

- Headaches
- Dizziness
- Nausea
- Blurred vision
- Cramps
- Irritation of eyes, skin, or respiratory system
- Skin chafing from damp or wet clothing
- Changes in complexion or skin color
- Changes in apparent motor coordination
- Increased frequency of minor mistakes
- Excessive salivation or changes in papillary response
- Changes in speech ability or speech pattern
- Symptoms of heat stress or heat exhaustion
- Symptoms of hypothermia

If any of these conditions develop, the affected person will be moved from the immediate work location and evaluated. If further assistance is needed, personnel at the local hospital will be notified, and an ambulance will be summoned if the condition is thought to be serious. If the condition is the result of sample collection or processing activities, procedures and/or PPE will be modified to address the problem.

Appendix A
Health and Safety Logs and Forms

Modification to Health and Safety Plan

ANCHOR QEA

Date: _____

Project No: _____

Project Name: _____

Modification: _____

_____

_____

_____

_____

Reason for Modification: _____

_____

_____

_____

_____

_____

Site Personnel Briefed

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Name: _____ **Date:** _____

Approvals

Field Lead: _____ _____ _____
Printed Name Signature Date

Project Manager: _____ _____ _____
Printed Name Signature Date

Daily Safety Briefing Form

ANCHOR QEA

Date: _____

Project No: _____

Project Name: _____

Submit a Playing It Safe Event

Person Conducting Meeting: _____ **Health & Safety Officer:** _____ **Project Manager:** _____

TOPICS COVERED: *Highlighted topics are required*

- ☐ Emergency Procedures and Evacuation Route
- ☐ Directions to Hospital
- ☐ HASP Review and Location
- ☐ Safety Equipment Location
- ☐ Proper Safety Equipment Use
- ☐ Employee Right-to-Know/ SDS Location
- ☐ Fire Extinguisher Location
- ☐ Eye Wash Station Location
- ☐ Buddy System
- ☐ Self and Coworker Monitoring
- ☐ Lines of Authority
- ☐ Communication
- ☐ Site Security
- ☐ Vessel Safety Protocols
- ☐ Work Zones
- ☐ Vehicle Safety and Driving/ Road Conditions
- ☐ Equipment Safety and Operation
- ☐ Proper Use of PPE
- ☐ Decontamination Procedures
- ☐ Near Miss Reporting Procedures
- ☐ Lifting Techniques
- ☐ Slips, Trips, and Falls
- ☐ Hazard Exposure Routes
- ☐ Heat and Cold Stress
- ☐ Overhead and Underfoot Hazards
- ☐ Chemical Hazards
- ☐ Flammable Hazards
- ☐ Biological Hazards
- ☐ Eating/Drinking/Smoking
- ☐ Reviewed Prior Lessons Learned
- ☐ Field Team Medical Conditions for Emergency Purposes (Confidential): _____
- ☐ Other: _____

Weather Conditions: _____

Daily Work Scope: _____

Site-specific Hazards: _____

Safety Comments: _____

Attendees

Printed Name	Signature

End of Day Wellness Check

Field Safety Equipment Checklist

The following is a list of safety-related gear that may be appropriate depending on the type of work being conducted. The purpose of this checklist is twofold: 1) ensure that all field crew members think about appropriate safety gear needs before heading to the worksite; and 2) provide an extensive list of gear to consider in order to serve as a reminder of potential safety gear needs during a field effort.

☐ **Safety Briefing Log or Notebook**

Personal Protective Gear

- ☐ Rain pants and jacket
- ☐ Hard hats
- ☐ Boots (steel-toed, if appropriate)
- ☐ Safety glasses
- ☐ Ear protection
- ☐ Nitrile gloves (inner and outer pair)
- ☐ Tyvek overalls
- ☐ H_2S sensor
- ☐ Flashlight
- ☐ EpiPen (inquire if any field staff use one)
- ☐ Other:

Communications

- ☐ Notify office staff of day's field plan
- ☐ Walkie Talkies
- ☐ Cell phones
- ☐ Satellite phone (if appropriate)
- ☐ Contact numbers (e.g., for other field crew members, the PM, or others to notify that you are accessing site)

Boat Safety Gear

U.S. Coast Guard Required Gear:

- ☐ 1. Personal flotation device (PFD), preferably life jacket, for each occupant
- ☐ 2. Fire extinguisher (filled to operable range)
- ☐ 3. Flares (unexpired)
- ☐ 4. Horn
- ☐ 5. Navigation lights
- ☐ First aid kit
- ☐ Bowline and stern line
- ☐ Anchor and anchor line
- ☐ Paddle

Warm Weather Safety Gear

- ☐ Sunscreen
- ☐ Water
- ☐ Hat
- ☐ Light clothes

Cold Weather Safety Gear

- ☐ Warm clothes (preferably synthetics)
- ☐ Hat
- ☐ Gloves
- ☐ Boot warmers
- ☐ Thermos of warm drink/soup

General Gear for Work Near Water

- ☐ Life jacket
- ☐ Boots or waders (hip or chest)
- ☐ Throwline
- ☐ Spare propeller and linchpin
- ☐ Appropriate personal protective gear (boots or waders) to step onto shore if necessary
- ☐ Drain plug (and spare)
- ☐ Boat fuel and oil
- ☐ Weather radio (if appropriate)
- ☐ Weather, tides, and currents forecasts
- ☐ Warm clothes/blanket in dry bag

ANCHOR QEA

Daily Float Plan

Today's Date: _____

Vessel Name: _____

Operator: _____

Departure Time: _____ **Expected Time of Return:** _____

Cell Phone Number(s): _____

Office Contact Person Notified of Departure and Return: _____

Destination and Itinerary:

_____

_____

_____

Names of Personnel on Board:

_____

_____

_____

If expected time of return is exceeded by 1 hour, the following steps will be taken:

1. Office Contact Person will attempt to contact crew members.
2. Office Contact Person will notify Field Manager, if not the same person.

If Office Contact Person is not able to establish contact with crew, the following steps will be taken in a logical order:

1. Field Manager will contact Health and Safety Officer.
2. Field Manager will contact Project Manager.
3. Local hospitals and emergency centers will be contacted.
4. Local search and rescue will be notified.

Daily Air Monitoring Record

Project Name: _____ **Date:** _____

Project Number: _____ **Location:** _____

Temperature: _____

Conditions: _____

_____

_____

_____

COC	Instrument	S/N	Calibration Date	Calibration Gas/Method	Calibration by
Organic vapors					
Particulates					
O_2					
Other:					
Other:					
Other:					

Time	Location/Description	Organic Vapor (ppm)	O2%	CG %LEL	Other	Other

Notes:

Completed by:

_____ _____ _____

Printed Name Signature Date

Utility Contact Prevention Checklist

ANCHOR QEA

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Purpose: This form is intended to help the Field Lead confirm that underground or overhead utilities are identified to the extent practicable and consistent with applicable regulations **PRIOR** to site work.

INVESTIGATIONS MUST NOT OCCUR UNTIL MULTIPLE LINES OF EVIDENCE INDICATE THAT SUBSURFACE OR OVERHEAD UTILITIES ARE NOT PRESENT IN THE WORK AREA

Project Name/No: _____ **Date:** _____

Field Lead: _____ **Project Address:** _____

Project Manager: _____ **Health & Safety Officer:** _____

Emergency Contact Information for One Call: _____

Duration/Summary of Work to be Performed: _____

_____

_____

Consideration	Check		Explanation	Initial
Has the state One Call been contacted?	☐ Yes	☐ No		
Has the property owner or client been contacted for local knowledge of utilities, as applicable?	☐ Yes	☐ No		
Does the property owner or client have specific utility contact prevention procedures and, if so, have they been completed?	☐ Yes	☐ No		
Are any as-built drawings available? If so, do they show any utilities?	☐ Yes	☐ No		
Has a visual inspection of the work area(s) been completed?	☐ Yes	☐ No		
Has the potential presence of in-water utilities been assessed (shore markers, streets dead-ending at water's edge, etc.)	☐ Yes	☐ No		
Is evidence of electrical utilities present? (electric meters on structures, conduits, overhead lines, light poles, etc.)	☐ Yes	☐ No		
Is evidence of water/sewer utilities present? (water meter, hydrants, restrooms, grates in ground, etc.)	☐ Yes	☐ No		
Is evidence of telecommunications utilities present? (fiber optic warning signs, conduits from utility poles, wall-mounted boxes, etc.)	☐ Yes	☐ No		
Is other evidence of utilities present? (unknown ground markings, manholes or valve covers, "Call Before You Dig" signs, linear asphalt or concrete repair characteristics, liner subsidence of ground surface, pin flags or stakes, etc.)	☐ Yes	☐ No		

Utility Contact Prevention Checklist

NOTE: Utility mark-out requirements vary from state to state; consult state authorities before beginning work.

Consideration	Check		Explanation	Initial
Has a private locating service been contacted?	☐ Yes	☐ No		
Were any utilities identified and marked out through a private locating service? If so, duplicate mark-outs on site drawings.	☐ Yes	☐ No		
Are there any fiber optic cables, fuel lines, or high-pressure lines within 50 feet of work locations?	☐ Yes	☐ No		
If fiber optic cables, fuel lines, or high-pressure lines are within 50 feet, has an agreement with the utility owner been established?	☐ Yes	☐ No		
Can a test borehole be advanced by hand digging, probing, post-hole digging, and/or air knifing to 5 feet below ground surface (bgs)?	☐ Yes	☐ No		
If hand digging, probing, post-hole digging, and/or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, why?	☐ Yes	☐ No		
Other considerations:				

NOTE: Please fill in second page and attach additional reports, drawings, or other information, as necessary.

Confirmation Number: _____

Contact Name: _____ **Organization:** _____

Contact Date: _____ **Contact Time:** _____

Response: _____

_____

_____

_____

Completed by:

_____ _____ _____
Printed Name Signature Date

Contractor:

_____ _____ _____
Printed Name Signature Date

Heat Stress Monitoring Record

ANCHOR QEA

Date: _____

Project No: _____

Project Name: _____

Location: _____

Employee Name	Monitoring Results												
	Initial Reading Time:	First Work Period Time:		Second Work Period Time:		Third Work Period Time:		Fourth Work Period Time:		Fifth Work Period Time:		Sixth Work Period Time:	
	WBGT (°F):	WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):		WBGT (°F):	
	Air Temp (°F):	Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):		Air Temp (°F):	
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:
	Initial Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:	Initial Temp:	Final Temp:
	Initial H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:	Initial H.R.:	Final H.R.:

Notes:

Completed by:

Printed Name _____ Signature _____ Date _____

Incident Report Form

ANCHOR QEA

Please immediately contact your manager when a work-related incident has occurred. It is your responsibility (or your manager's if you are not able) to contact Human Resources (HR) and Health and Safety (H&S) ASAP when an incident happens.

This Incident Report is the first form you must complete when a work-related incident has occurred. Once completed, forward this form to HR and H&S.

Incident Type: ☐ Injury ☐ Illness ☐ Near Miss ☐ Spill ☐ Fire ☐ Other _____

Employees Involved in Incident

_____

_____

Was anyone injured? ☐ Yes ☐ No

(If **Yes**, complete **a** and **b** below)

a. Information Regarding Injured or Ill Employee

Full name: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Date of birth: _____ **Sex:** _____

Date hired: _____ **Job title:** _____

b. Information about the Physician or Health Care Professional

Was medical treatment required? ☐ Yes ☐ No

First aid only: ☐ Yes ☐ No

Name of physician/health care professional: _____

If treatment was given away from the worksite, where was it given?

Facility: _____

Street: _____

City: _____ **State:** _____ **Zip:** _____

Was employee treated in emergency room? ☐ Yes ☐ No

Was employee hospitalized overnight as an in-patient? ☐ Yes ☐ No

Did the employee miss a full day of work following the incident? ☐ Yes ☐ No

Date of last day worked: _____

Date of return to work: _____

Number of restricted days of work: _____

Incident Report Form

ANCHOR QEA

Information about the Incident:

Date of incident: _____

Time of incident: _____

Location of incident: _____

Were there any witnesses? ☐ Yes ☐ No

Name and phone number of witness: _____

_____

What was employee doing just before the incident occurred? Describe the activity, as well as the tools, equipment, or material the employee was using. Be specific (e.g., climbing a ladder while carrying roofing materials, spraying chlorine from hand sprayer, daily computer key-entry).

What happened? Tell us how the injury occurred (e.g., when ladder slipped on wet floor, worker fell 20 feet; worker was sprayed with chlorine when gasket broke during replacement; worker developed soreness in wrist over time).

If an injury or illness, what was it? Tell us the part of the body that was affected and how it was affected.

Employer Use Only:

Date Recorded in Incident Log: _____ **By:** _____

Investigation:

Date Investigation Started: _____ **Date Investigation Concluded:** _____

Investigation Team Leader and Title: _____

Investigation Team Member Names and Titles:

Name	Title

Root Cause Determination (attach other sheets as necessary)

Any statements, photographs, sketches, or other documents should be attached to this document.

Incident Report Form

Corrective Actions: *Documentation supporting completion of corrective actions should be attached to this report.

Corrective Action	Person Responsible	Due Date	Completion Date	Completion Notes	Completed By

Appendix B
Job Safety Analysis (JSA) Documents

Job Safety Analysis

Field Activities – General

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 001	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Field activities	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
Outdoor, physical activity	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Be aware of and limit loose clothing or untied shoelaces that may contribute to slips, trip, and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Field Activities – General

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides, within 10 miles, for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Job Safety Analysis

Field Activities – General

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Outdoor, physical activity (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area. • Be aware of potential wildlife and defensive behavior (e.g., nesting birds, or animals with young).	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Sediment Sampling

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 002	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Sediment sampling	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
If using glassware		• Follow the JSA for handling glassware.	
Sediment sample retrieval and processing	Injury from hand and power tool operation (e.g., spatula or drill)	• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they are in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.

Job Safety Analysis

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (continued)	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants/seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants, or skin or eye contact with contaminants	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift on deck quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts on sampling gear. • Avoid placing hands or self between boat and dock/piles.	

Job Safety Analysis

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Sediment sample retrieval and processing (continued)	Wading	• Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction. • Be aware of water depth and potential drop-offs. • Be aware of existing and projected river flows. • Wear hip or chest waders as appropriate for traction and to protect against cold water. • Keep extra dry clothes on hand, including socks. • Use a wading staff for balance and to check for obstructions in murky water. • Always wear a PFD equipped with a whistle, even if water looks shallow or slow; drop-offs occur and water is often moving faster than it looks. • Waders should fit the person and not be overly baggy. • A wading belt should always be worn (some waders come equipped with one). • Wear felt and/or studded wading boots. • When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet. • Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth. • Water should be entered from the bank and only from a boat that is anchored or on the bank. • If a boat is being used, all applicable boating H&S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag). • When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible. • Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading. • If the current makes it difficult to hold your position, stop and cease wading. • Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.	• Inspect work area for tripping hazards visible from streambank. • Inspect waders for leaks. • Check depths and flows before wading. • Ensure that change of dry clothes is available if wading in cold weather or cold water conditions. • Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.

Job Safety Analysis

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides, within 10 miles, for 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.

Sediment Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellant. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 003	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Anchor QEA motor vehicle operation	**Superintendent/Competent Person:** Vehicle Driver	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Wear seat belt at all times • Make sure that clothing will not interfere with driving		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation	Unfamiliar with the vehicle	• Allow yourself some time to get familiar with an Anchor QEA vehicle, a rental vehicle, or one not used often. • Test the lights, windshield wipers, hazard lights, horn, parking brake, and other important functions. • Review the dashboard controls, steering radius, and overhead and side clearances. • Allow extra side, front, and back space around the vehicle while driving or parking an unfamiliar vehicle. • Adjust mirrors and the seat while the vehicle is in park. • Drive slowly in confined locations, as in a parking garage, parking lots, or industrial settings. Confirm adequate clearances by sight before turning or backing up in tight or unfamiliar locations. • Use a second person to be a spotter outside the vehicle if needed in tight spaces.	• Inspect fluid levels and air pressure in tires, adjust mirrors and seat positions appropriately, monitor the fuel level, and fill up when the fuel level is low

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Speed and braking	• Fasten and properly adjust the seat belt. • Obey all posted and designated speed limits. • Radar detectors are prohibited in all company-owned, leased, or rented vehicles. • Reduce travel speed during hazardous conditions (e.g., rain, fog, or snow). • Identify whether your vehicle has the Anti-Lock Braking System (ABS). If it does, DO NOT pump the brakes to stop when the vehicle has begun to skid. Apply steady pressure to the brakes. If the vehicle does not have ABS, pump the brakes to stop during slippery conditions.	• Seatbelt • Identify designated speed limits • Determine if vehicle has ABS
	Distance spacing	• Continually check your rear and side view mirrors. • Use the 3-second rule to keep a safe distance between vehicles. • Increase the 3-second rule as necessary during hazardous travel conditions. • Regularly scan the area you will be entering in the next 10 to 12 seconds. • Always leave yourself an “out” during travel. • When stopping, make sure that you leave enough distance between you and the car in front of you. You should be able to see the rear tires of the vehicle in front when stopped. • Obey the speed limit and traffic regulations. • When at a red light and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake. • DO NOT TAILGATE. • Keep headlights (and running lights, if available) on for maximum visibility.	• Seatbelt
	Skids	• If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary. • Reduce speed during hazardous travel conditions. • Use 4-wheel drive, if available, when driving vehicles off-road, on steep inclines, or in muddy conditions. • Do not take vehicles off-road if they cannot be operated safely in such conditions.	• Seatbelt

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Blind spots	• Become familiar with any blind spots associated with your vehicle. • Adjust mirrors to give the maximum viewing area. • Use your directional devices to signal all turns and when changing lanes; check rear and side view mirror and glance over your shoulder to check that the lane is clear. • Avoid other driver's blind spots; slow down and let the other vehicle pass. • If parked for an extended period and staying in the vehicle, be sure to inspect the area for changed conditions (e.g., a car that moved in behind you) before leaving.	• Seatbelt • Mirrors
	Backing	• Back into parking spaces upon arrival whenever possible. • Perform a 360-degree walk around the vehicle before backing to identify any new conditions or obstructions. • Use a spotter when backing whenever possible. • Understand hand signals. • Sound the horn prior to backing. • Check the rear and side view mirrors prior to backing. • Back slowly in areas of obstructed vision. • Anticipate others who may be backing out into your pathway and adjust accordingly.	• Seatbelt • Mirrors
	Distractions (e.g., cell phones, reading maps or directions, eating)	• Do not engage in distracted driving—focus on operating the vehicle, and on your surroundings (e.g., road conditions and other drivers). • Obey state or local laws regarding cell phone use, at a minimum. • Certain clients prohibit cell phone use regardless of the state you are operating in—know your client's policy. • Use hands-free devices (not hand-held cellular phones) while driving. • Pull over to the side of the road when making a call or checking directions.	• Seatbelt • Hands-free devices connected and ready for use
	Accidents	• In the event of an accident, use the following procedures: – Stop, call for medical assistance, notify police, and complete an accident report and submit it to your supervisor. – Notify the Project Manager (PM) and Field Lead (FL). – Complete the appropriate incident investigation reports. – Contact Sara Weiskotten, Operations Liaison, at (857) 445-4987. – Contact Diana Reynolds, Insurance Liaison, at (302) 236-8403.	• Seatbelt

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Anchor QEA motor vehicle operation (continued)	Influenced by drugs or alcohol	• NEVER DRIVE UNDER THE INFLUENCE OF DRUGS OR ALCOHOL. • Keep in mind that the person in another vehicle may be under the influence of controlled substances, and be prepared for erratic or sudden driving changes on their part.	• Seatbelt
	Driver attitude	• Do not operate any vehicle when abnormally tired, temporarily disabled (i.e., injured), or under the influence of drugs or alcohol. • Keep an even temper when driving. Do not let the actions of others affect your attitude. • Do not allow yourself to become frustrated, rushed, distracted, or drowsy.	• Seatbelt
	Fatigue	• Stop and rest if fatigued. Exit the road and enter a safe area. Rest until fully refreshed. • Be aware that certain medications (such as cold or allergy medicines) may make you drowsy when driving a vehicle.	• Seatbelt
	Vehicle loading	• DO NOT OVERLOAD the vehicle. • Secure all equipment and supplies within the body of the vehicle using proper tie-downs. • Do not block side view mirrors with the load. • Do not transport U.S. Department of Transportation (DOT)-manifested hazardous materials. • Dispatch all equipment and personnel with proper forms and identification.	• Seatbelt
	Equipment failure	• Perform daily inspections of your vehicle. • Maintain vehicle safety equipment (e.g., mirrors, alarms, horns, wipers, lights, and brakes). • Maintain the vehicle (e.g., tire pressure and fluid levels). • Any vehicle with mechanical defects that may endanger the safety of the driver, passengers, or the public shall not be used. • Ensure that appropriate safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles should be available in larger trucks. • Ensure that the proper documentation is in the vehicle. Documentation should include an operations manual for the vehicle, insurance card, vehicle registration, and accident forms.	• Inspect and maintain the vehicle

Training Requirements:

- All drivers are required to have a valid driver's license, and all vehicles must have appropriate state vehicle registration and inspection stickers. The use of hand-held wireless devices is prohibited while driving any vehicle for business use at any time, for personal use during business hours, and as defined by law.
- **If operating a vehicle or vehicle and trailer with a capacity greater than 10,000 pounds, U.S. Department of Transportation regulations may apply. Contact the PM prior to any travel in this configuration.**
- All assigned employees are required to read, familiarize themselves with the contents of this Job Safety Analysis, and sign the signature page before the operation of an Anchor QEA vehicle, and review it with their supervisor during their daily safety meeting.
- All assigned employees are required to complete required annual driver training.

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Vehicle Operation Job Safety Analysis Acknowledgement Form

The Anchor QEA Motor Vehicle Operation Job Safety Analysis must be read, understood, and signed before the operation of any Anchor QEA vehicle. My signature below certifies that I have read and understand the procedures presented in the Anchor QEA Motor Vehicle Operation Job Safety Analysis and have completed annual driver training.

Date	Name (print)	Signature

Job Safety Analysis

Anchor QEA Motor Vehicle Operation

Date	Name (print)	Signature

Job Safety Analysis

Decontamination Activities

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 004	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Decontamination activities	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • High-visibility safety vest • Hard hat where overhead hazards and/or heavy equipment are present • U.S. Coast Guard-approved personal flotation device (PFD), if boating (see cold stress section for cold-weather PFD information)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
Decontamination area set up	Vehicle, heavy equipment traffic, or boat traffic in work area	• Wear high-visibility safety vest and hard hat PPE. • Be alert when working around heavy equipment and/or other boats, especially if wearing hearing protection.	• Ensure that safety vests are available for staff and visitors.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects. • If boating, avoid carrying objects directly onto or off of the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Biological hazards (flora [e.g., poison ivy, and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Decontamination activities	Injury from hand and power tool operation (e.g., spatula or drill)	• Be aware of sharp edges on hand tools (e.g., spatulas, knives, drill bits, and saw blades). • Be aware of electrical connections and water hazards when working with electric- or battery-operated tools. • Ensure that all tools are working properly; repair or replace defective tools. Repair when unplugged and off. • Keep guards on power tools when not in use.	• Inspect tools to ensure that they are in good working order. • Inspect electrical connections (if applicable). • Inspect tools periodically to ensure dry and clean operation.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.
	Ingestion of contaminants or decontamination fluids, or skin or eye contact with contaminants or decontamination fluids	• Wear appropriate PPE to prevent/reduce exposure. • Contact 911, as necessary; perform CPR if breathing stops. • Move exposed person away from source of contamination, and rinse mouth. If exposure to skin occurs, promptly wash contaminated skin using soap or mild detergent and water. Rinse eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.

Job Safety Analysis

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides, within 10 miles, for at least 30 minutes. Disconnect and do not use or touch electronic equipment.	• Obtain weather forecast and updates as needed.

Decontamination Activities

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (continued)	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state or provincial boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Investigation-Derived Waste Management

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 005	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA, LLC	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Investigation-derived waste management	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD).		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Containerizing investigation-derived waste (IDW) at the source	Lifting	• Use care when lifting to redistribute IDW from one container (e.g., drums and buckets) to another at the source. • Seek assistance if loads are too heavy, or if you are experiencing fatigue. • Fill containers only to the degree that will be manageable in the future (e.g., half full) and to limit weight.	• Inspect containers for competency (i.e., no cracks, and handles in good repair).
	Pinch points	• Wear hand protection when closing containers. • Use the buddy system when affixing drum rings.	• Inspect drums for rust or sharp edges prior to opening or closing.
Relocating or staging IDW containers	Lifting	• Use task-specific tools whenever possible to move full containers (i.e., hoists, drum caddies or dollies, and vehicles). • When task-specific tools are not available, use the buddy system to move containers that are reasonable to lift. • Never roll drums or containers holding IDW. • Stage containers in areas protected from heavy traffic and weather, if possible.	• Ensure tools are in good repair. • Assess IDW container weight prior to moving.

Job Safety Analysis

Investigation-Derived Waste Management

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Relocating or staging IDW containers (continued)	Pinch points or crushing	• Use tools to achieve the final arrangement when staging containers—do not place hands on the edges of containers while moving them into place. • Stand well clear of containers being moved in case they become dislodged from their handling tool during transport. • Do not stack IDW containers, as this poses a risk for container toppling and damage. • Place containers on a pallet for easy transfer using a pallet jack, if possible. • If transporting containers on a pallet, strap or band the containers together to prevent them from falling off.	• Inspect drums for evidence of cracks or rust.
IDW management – general	Splash	• Wear the required PPE at all times. • Use care to minimize splashing or smearing of IDW during handling and containerization.	• Inspect PPE upon donning and periodically during tasks.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

NAPL Handling and Removal

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 006	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: NAPL handling and removal	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and/or Tyvek coveralls if handling potentially contaminated media or non-aqueous phase liquid (NAPL), and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Safety glasses/splash goggles, hard hat, nitrile outer gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
If using glassware		• Follow the JSA for handling glassware.	
NAPL handling and retrieval	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants or seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel or work zone, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

NAPL Handling and Removal

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
NAPL handling and retrieval (continued)	Ingestion of contaminants, or skin or eye contact with contaminants	• Place additional focus on mitigating direct contact hazards (use double gloves, protect arms, etc.) from NAPL • Ensure air monitoring is conducted per the Health and Safety Plan (HASP). • Wear appropriate PPE to prevent or reduce exposure. • Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops. • Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water. • Follow decontamination procedures as outlined in the HASP.	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts on sampling gear. • If boating, avoid placing your hands or yourself between the boat and the dock or piles.	

Job Safety Analysis

NAPL Handling and Removal

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Wading	• Place additional focus on ensuring removed NAPL does not get spilled into the water body. • Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction. • Be aware of the water depth and potential drop-offs. • Be aware of existing and projected river flows. • Wear hip or chest waders as appropriate for traction and to protect against cold water. • Keep an extra set of dry clothes on hand, including socks. • Use a wading staff for balance and to check for obstructions in murky water. • Always wear a PFD, even if water looks shallow or slow; drop-offs occur, and water is often moving faster than it looks. • Waders should fit the person and not be overly baggy. • A wading belt should always be worn (some waders come equipped with one). • When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet. • Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth. • Water should be entered from the bank and only from a boat that is anchored or on the bank. • If a boat is being used, all applicable boating H&S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag). • When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible. • Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading. • If the current makes it difficult to hold your position, stop and cease wading. • Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat. • Wear felt and/or studded wading boots.	• Inspect work area for tripping hazards visible from streambank. • Inspect waders for leaks. • Check depths and flows before wading. • Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.

NAPL Handling and Removal

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
NAPL handling and retrieval (continued)	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.

NAPL Handling and Removal

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
NAPL handling and retrieval (continued)	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides, within 10 miles, for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.

NAPL Handling and Removal

- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Water Sampling

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 007	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Water *sampling*	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD; see cold stress section for cold-weather PFD information)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
If boating		• Follow the Job Safety Analysis (JSA) for boating activities.	
If using glassware		• Follow the JSA for handling glassware.	
Water sample retrieval	Slips, trips, and falls	• Avoid walking while writing or texting—maintain a heads-up posture. • Be aware of potentially slippery surfaces, including boat decks, riprap, muddy or algae-covered rocks, shoreline plants or seaweed, thick mud, and tripping hazards. Use handrails where available. Wear footwear that has sufficient traction. • Maintain good housekeeping practices. Clean up all spills immediately. • Be aware of weather effects on the work area, including wet and/or frozen ground. • Jumping, running, and horseplay are prohibited. • Be cautious when entering or exiting the vessel, and load/unload items onto/off of the pier or shore once boarded. • Keep all areas clean and free of debris to prevent any trips and falls. • Notify the field team members of any unsafe conditions.	• Routinely inspect work area for unsafe conditions.

Job Safety Analysis

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Water sample retrieval (continued)	Ingestion of contaminants, or skin or eye contact with contaminants	• Wear appropriate PPE to prevent or reduce exposure. • Contact 911 if necessary, and perform cardiopulmonary resuscitation (CPR) if breathing stops. • Move the exposed person away from the source of contamination and rinse their mouth. If skin exposure occurs, promptly wash the contaminated skin using soap or mild detergent and water. If eye exposure occurs, rinse the eyes with large amounts of water. • Follow decontamination procedures as outlined in the Health and Safety Plan (HASP).	• Ensure that decontamination procedures are on hand and are reviewed. • Ensure that PPE and rinsing water are available.
	Pinch points	• If boating, secure any unsecured objects on deck; they may shift quickly in wave, current, or engine acceleration conditions. • Maintain a safe distance from closing mechanisms and moving parts on sampling gear. • If boating, avoid placing your hands or yourself between the boat and the dock or piles.	

Job Safety Analysis

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Water sample retrieval (continued)	Wading	• Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction. • Be aware of water depth and potential drop-offs. • Be aware of existing and projected river flows. • Wear hip or chest waders as appropriate for traction and to protect against cold water. • Keep extra dry clothes on hand, including socks. • Use a wading staff for balance and to check for obstructions in murky water. • Always wear a PFD equipped with a whistle, even if water looks shallow or slow; drop-offs occur and water is often moving faster than it looks. • Waders should fit the person and not be overly baggy. • A wading belt should always be worn (some waders come equipped with one). • Wear felt and/or studded wading boots. • When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet. • Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth. • Water should be entered from the bank and only from a boat that is anchored or on the bank. • If a boat is being used, all applicable boating H&S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag).	• Inspect work area for tripping hazards visible from streambank. • Inspect waders for leaks. • Check depths and flows before wading. • Ensure that change of dry clothes is available if wading in cold weather or cold-water conditions.
		• When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible. • Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading. • If the current makes it difficult to hold your position, stop and cease wading. • Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.	

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Water sample retrieval (continued)	Biological hazards (flora [e.g., poison ivy and poison oak] and fauna [e.g., ticks, bees, spiders, mosquitoes, and snakes])	• Be aware of likely biological hazards in the work area. • Wear appropriate clothing (i.e., hat, long-sleeve shirt, long pants, leather gloves, boots, and Tyvek coveralls, as appropriate), and apply insect repellent. • Wear hand and arm protection when clearing plants or debris from the work area.	• Ensure that insect repellent is available. • Inspect clothing and skin for insects (e.g., ticks) after working in insect-prone areas.
	Muscle strain or injuries from improper lifting	• Use proper lifting techniques or ask for assistance with heavy objects, buckets, or other unwieldy equipment. • If boating, avoid carrying objects directly onto or off the boat; rather, load/unload objects while on the boat to/from the pier/shore.	• Evaluate weight and center of gravity of heavier items prior to lifting or moving.
	Noise exposure	• Wear hearing protection in high noise environments or when working around heavy machinery or equipment (action level of 85 decibels averaged over an 8-hour day).	• Ensure that hearing protection is available.
Working outdoors	Heat stress	• Adjust work schedules, as necessary, to avoid the hottest part of the day. • Take rest breaks as warranted. • Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods. • Maintain body fluids at normal levels. • Train workers to recognize the symptoms of heat-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions. • Monitor outside temperature versus worker activity.
	Cold stress	• Provide shelter (enclosed, heated environment) to protect personnel during rest periods. • Educate workers to recognize the symptoms of frostbite and hypothermia. • Use appropriate cold-weather gear, up to and including Mustang-type bib coveralls or jacket/bib combinations. • Consider additional precautions if working near water in cold weather. • Have a dry change of clothing available. • Train workers to recognize the symptoms of cold-related illness.	• Review weather forecast prior to field work. • Monitor workers' physical conditions and PPE. • Monitor outside and water temperature versus worker activity and PPE.

Job Safety Analysis

Water Sampling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Working outdoors (continued)	Rain or snow	• Wear appropriate PPE (rain gear). • Be aware of slip hazards, puddles, and electrical hazards when working in wet conditions. • If extremely cold conditions are forecast, consider additional precautions or postponing work activity.	• Review weather forecast prior to field work. • Inspect PPE daily prior to use. • Routinely inspect work area for deteriorating conditions.
	Sunshine	• Have sunscreen available for ultraviolet protection. • Have abundant water available to prevent dehydration. • Consider wearing wide-brimmed headwear and light-colored, lightweight, sun-blocking clothing.	• Ensure that sunscreen and water are available.
	Lightning	• Do not begin or continue work until lightning subsides, within 10 miles, for at least 30 minutes. Disconnect and do not use or touch electronic equipment. • Immediately head for shore if on the water and lightning is observed. If not able to get to shore, disconnect and do not use or touch the major electronic equipment, including the radio, throughout the duration of the storm.	• Obtain weather forecast and updates as needed.
	High winds	• Wear goggles or safety glasses if dust or debris are visible.	• Review weather forecast prior to field work. • Ensure that goggles or safety glasses are available.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- If boating is involved, and a professional captained vessel is not in use, boat operators must take the appropriate state boater safety courses.
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Sample and Laboratory Glassware Handling

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 008	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Sample and laboratory glassware handling	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Modified Level D—Long pants, long sleeves, and steel-toed footwear conforming to ASTM International (ASTM) F2412-05/ASTM F2413-05 • Depending on activity, the following PPE may also be required: safety glasses/splash goggles, hard hat, nitrile outer gloves and latex inner gloves, and, if boating, U.S. Coast Guard-approved personal flotation device (PFD)		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Transporting and using glassware	Breakage of containers during field activities	• Use appropriately sized tubs or bottle carriers with dividers to prevent bottle-to-bottle contact during transport. • Consider using coated glassware, if practicable. • Carry oversize bottles in tubs or bottle carriers using both hands during transfer to the sampling vessel and whenever the vessel is underway. • Wear chemical resistant gloves when handling glassware with preservatives.	• Ensure dividers are sufficient and will remain in place during transport.
	Faulty glassware	• Replace any glassware that is chipped, nicked, or cracked.	• Inspect glassware before use.
	Impact with equipment and other objects	• Use care when loading and unloading sampling equipment. • Minimize the handling of individual containers to the extent possible.	
Filling sample containers	Over-tightening of bottle lids causing breakage	• Avoid use of excessive force to tighten bottle caps (i.e., finger tight). • Secure lids with clear tape to prevent opening during transport.	

Job Safety Analysis

Sample and Laboratory Glassware Handling

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
	Breakage during sample collection	• Place containers in plastic tubs between aliquots to limit contact with hard surfaces. • Place containers on a stable and non-slip surface during collection. • Use the buddy system as needed to hold bottles during filling.	
Filling sample containers (continued)	Contact with sample preservatives (generally HCL or H_2SO_4 to lower pH to less than 2)	• Wear nitrile gloves and protective eyewear to prevent skin and eye contact if a container is damaged. • Do not open preserved bottles until necessary.	
Packing samples for shipment	Breakage during packing and shipment	• Use bottle wraps, foam sleeves, or bubble wrap to prevent bottle contact in the cooler. • Pack coolers snugly, but do not over pack.	• Ensure glass bottles do not touch to minimize potential breakage during transport.
Unpacking glassware returned from a laboratory	Breakage during packing and shipment	• Carefully inspect cooler contents prior to reaching in with hands. • If glassware is broken, utilize cut-resistant gloves or no-touch tool to remove from cooler.	• Ensure glassware did not break during packing or shipment.
	Contact with sample preservatives (generally HCL or H_2SO_4 to lower pH to less than 2)	• Wear nitrile gloves and protective eyewear to prevent skin and eye contact in the event that glassware preservatives have leaked into the cooler.	• Look for unexpected moister in cooler.

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including, but not limited to initial 40-hour, 8-hour supervisor, and annual 8-hour refresher trainings.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120(f).
- All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their supervisor during their daily safety meeting.

Job Safety Analysis

Wading

Project Name: 284 Winter Street, Haverhill MGP	**Project Number:** 180327-08.01	**JSA Number:** 009	**Issue Date:** 5/21/2024
Location: Haverhill, Massachusetts	**Contractor:** Anchor QEA	**Analysis by:** Sonnet Agran-St. Pierre	**Analysis Date:** 5/7/2024
Work Operation: Wading	**Superintendent/Competent Person:** Billie-Jo Gauley	**Revised by:**	**Revised Date:**
Required Personal Protective Equipment (PPE): • Level D PPE (consider steel toe waders, high-visibility vest, safety glasses, hard hat, nitrile gloves, long pants, hearing protection [if above 85 decibels time-weighted average]) • U.S. Coast Guard-approved personal floatation device (PFD) if working on or within 10 feet of a body of water • Life vests should be equipped with a whistle • Chest waders if entering water body with felt or studded wading boots • A wading staff		**Reviewed by:** John Colvin	**Reviewed Date:** 5/16/2024
		Approved by: Billie-Jo Gauley	**Approved Date:** 5/23/2024

Work Activity	Potential Hazards	Preventative or Corrective Measures	Inspection Requirements
Wading in river or stream	Slips, trips, and falls	• Be aware of potentially slippery surfaces and tripping hazards such as fallen brush, logs, rocks, and other debris. Wear footwear that has sufficient traction. • Be aware of the water depth and potential drop-offs. • Be aware of existing and projected river flows. • Wear hip or chest waders as appropriate for traction and to protect against cold water. • Keep an extra set of dry clothes on hand, including socks. • Use a wading staff for balance and to check for obstructions in murky water. • Always wear a PFD, even if water looks shallow or slow; drop-offs occur, and water is often moving faster than it looks. • Waders should fit the person and not be overly baggy. • A wading belt should always be worn (some waders come equipped with one). • Wear felt and/or studded wading boots.	• Inspect work area for tripping hazards visible from streambank. • Inspect waders for leaks. • Check depths and flows before wading. • Inspect PFDs for integrity, particularly the cartridge charge on inflatable PFDs.

Job Safety Analysis

Wading

Work Activity	Potential Hazards	Preventative or Corrective Measures	Inspection Requirements
Wading in river or stream (continued)	Slips, trips, and falls (continued)	• When water is deeper than knee deep, walk sideways, at an angle, or shuffle your feet when walking and never cross your feet. • Bottom conditions, water conditions, and flow can change and must be considered when determining safe allowable wading depth. Higher flow conditions will reduce the safe allowable wading depth. • Water should be entered from the bank and only from a boat that is anchored or on the bank. • If a boat is being used, all applicable boating H&S procedures should be followed (e.g., throwable safety buoy/line, also called a throw bag). • When entering the water, depth at entry point should be 1 foot or less and the bottom should be visible. • Wading should not be conducted if there is overhanging vegetation, logs, or other obstructions that would prevent standing upright while wading. • If the current makes it difficult to hold your position, stop and cease wading. • Deepest water depth acceptable for wading is to an individual's waist. If water depth increases beyond that point, do not proceed into deeper water. Look for an area with shallower water. If shallower water cannot be found, work must be completed from a boat.	

Training Requirements:

- All personnel working on hazardous waste sites must receive appropriate training as required by 29 Code of Federal Regulations (CFR) 1910.120(e), including but not limited to initial 40-hour and annual 8-hour refresher training.
- Medical clearance must be received on an annual basis as required by 29 CFR 1910.120 (f).
- All assigned employees are required to familiarize themselves with the contents of this Job Safety Analysis before starting a work activity.

Appendix C
Safety Data Sheets (SDS)

SAFETY DATA SHEET

Version 6.5
Revision Date 12/21/2023
Print Date 02/24/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Hydrogen sulfide

Product Number : 295442
Brand : Aldrich
Index-No. : 016-001-00-4
CAS-No. : 7783-06-4

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable gases (Category 1), H220
Gases under pressure (Liquefied gas), H280
Acute toxicity, Inhalation (Category 1), H330
Short-term (acute) aquatic hazard (Category 1), H400

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

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Pictogram	
Signal Word	Danger

Hazard Statements

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H330	Fatal if inhaled.
H400	Very toxic to aquatic life.

Precautionary Statements

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P260	Do not breathe dust/ fume/ gas/ mist/ vapors/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381	Eliminate all ignition sources if safe to do so.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.
P410 + P403	Protect from sunlight. Store in a well-ventilated place.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Contact with liquid or refrigerated gas can cause cold burns and frostbite.

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	H_2S
Molecular weight	:	34.08 g/mol
CAS-No.	:	7783-06-4
EC-No.	:	231-977-3
Index-No.	:	016-001-00-4

Component	Classification	Concentration
Hydrogen sulphide		
	Flam. Gas 1; Press. Gas Liquefied gas; Acute Tox. 1; Aquatic Acute 1; H220, H280, H330, H400 M-Factor - Aquatic Acute: 10	<= 100 %

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For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Immediately call in physician. If breathing stops: immediately apply artificial respiration, if necessary also oxygen.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: immediately make victim drink water (two glasses at most). Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture
Sulfur oxides
Not combustible.
Pay attention to flashback.
Ambient fire may liberate hazardous vapours.

5.3 Advice for firefighters
Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

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5.4 Further information

Remove container from danger zone and cool with water. Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe gas. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Stop flow of gas, move leaking cylinder to open air if without risk.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Hygiene measures
Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Keep locked up or in an area accessible only to qualified or authorized persons. Keep away from combustible materials and sources of ignition.

Moisture sensitive.

Storage class
Storage class (TRGS 510): 2A: Gases

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Hydrogen sulphide	7783-06-4	TWA	1 ppm	USA. ACGIH Threshold Limit Values (TLV)
		STEL	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		C	10 ppm 15 mg/m3	USA. NIOSH Recommended Exposure Limits
		CEIL	20 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		STEL	15 ppm 21 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	50 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		PEL	10 ppm 14 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Change contaminated clothing. Preventive skin protection recommended. Wash hands after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

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This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter type B
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Liquefied gas Color: colorless
b)	Odor	Stench.
c)	Odor Threshold	0.0005 ppm
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -85 °C (-121 °F) - lit.
f)	Initial boiling point and boiling range	-60 °C -76 °F - lit.
g)	Flash point	()Not applicable
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 46 %(V) 45.5 %(V) Lower explosion limit: 4 %(V)4.3 %(V)4 %(V)
k)	Vapor pressure	17,369.8 hPa at 21 °C (70 °F)

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l)	Vapor density	1.17 - (Air = 1.0)
m)	Density	No data available
	Relative density	No data available
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	No data available
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

Relative vapor density	1.17 - (Air = 1.0)

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Exothermic reaction with:
Ammonia
alkaline earth hydroxides
Ethylene oxide
Sodium hydroxide
Potassium hydroxide
sulphur dioxide
sulfuric acid
Tungsten
Copper
in powder form
Risk of ignition or formation of inflammable gases or vapours with:
Hypochlorites
Lead oxides
Chlorine
chromium(VI) oxide
chromyl chloride
Amines
Fluorine

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Oxidizing agents
halogens
Potassium
metallic oxides
sodium
Peroxides
Nitric acid
Oxygen
barium oxide
barium peroxide
Risk of explosion with:
halogen-halogen compounds
halogen oxides
ferric oxide
iodates
perchloryl fluoride
Rust
bromates
nitrogen dioxide
nitrogen trichloride
chromates/perchromates
Copper
with
Oxygen
mercury oxide
with
Air

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Oral: No data available
LC50 Inhalation - Mouse - 1 h - 634 ppm

LC50 Inhalation - Rat - 444 ppm

Remarks: Lungs, Thorax, or Respiration:Other changes.
Diarrhea
Kidney, Ureter, Bladder:Urine volume increased.
Dermal: No data available

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Skin corrosion/irritation
No data available

Serious eye damage/eye irritation
No data available

Respiratory or skin sensitization
No data available

Germ cell mutagenicity
No data available

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

RTECS: MX1225000
Hydrogen sulfide is strongly bound to methemoglobin in a manner similar to cyanide. Toxicologically, its reaction with enzymes in the blood stream inhibits cell respiration resulting in pulmonary paralysis, sudden collapse, and death. It is recognized by its characteristic odor of "rotten eggs". The detectable, minimum perceptible odor occurs at 0.13ppm, rapid olfactory fatigue can occur at high concentrations (>100 ppm). At concentrations of 20ppm hydrogen sulfide begins acting as an irritant on the mucous membranes of the eyes and respiratory tract and increases with concentration and exposure time. Eye irritation is characterized by irritation of the conjunctiva with photophobia to keratoconjunctivitis and vesiculation of the cornea epithelium. Prolonged exposure to moderate concentrations (250ppm) may cause pulmonary edema. At concentrations over 500ppm, drowsiness, dizziness, excitement, headache, unstable gait, and other systemic symptoms occur within a few minutes. Sudden loss of consciousness without premonition, anxiety, or sense of struggle are characteristic of acute exposure at concentrations above 700ppm. At concentrations of 1000-2000ppm hydrogen sulfide is rapidly absorbed through the lung into the blood. In this range a single inhalation may cause coma and may be rapidly fatal. Initially hyperpnea occurs, followed by rapid collapse and respiratory inhibition. At higher concentrations, hydrogen sulfide exerts an immediate paralyzing effect on the respiratory centers. When concentration reaches 5000ppm, imminent death almost always results., Exposure to and/or consumption of alcohol may increase toxic effects.

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To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption:

The following applies to hydrogen sulfide: odour perception limit 0.025 - 8 ppm. After inhalation: < 100 ppm: rhinitis, photophobia, mucosal irritations, coughing, irritations after contact with the eyes. > 500 ppm: headache, dizziness, ataxia (impaired locomotor coordination), cardiovascular disorders, agitation, spasms. Inhalation may lead to the formation of oedemas in the respiratory tract. > 1000 ppm: respiratory arrest within seconds to minutes. Late sequelae: the following organs may be damaged after uptake: lungs, heart, eyes.

This substance should be handled with particular care.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 0.016 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - < 1 mg/l Remarks: (Hommel)
Toxicity to bacteria	EC50 - Bacteria - 90 mg/l - 24 h Remarks: (Lit.)

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. Pressurised gas bottle: dispose of only in empty condition! See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

SECTION 14: Transport information

DOT (US)

UN number: 1053 Class: 2.3 (2.1)
Proper shipping name: Hydrogen sulfide
Reportable Quantity (RQ): 100 lbs
Poison Inhalation Hazard: Hazard Zone D

IMDG

UN number: 1053 Class: 2.3 (2.1) EMS-No: F-D, S-U
Proper shipping name: HYDROGEN SULPHIDE
Marine pollutant : yes

IATA

UN number: 1053 Class: 2.3 (2.1)
Proper shipping name: Hydrogen sulphide
IATA Passenger: Not permitted for transport
IATA Cargo: Not permitted for transport

SECTION 15: Regulatory information

SARA 302 Components

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

SARA 311/312 Hazards

Fire Hazard, Sudden Release of Pressure Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

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	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Hydrogen sulphide	7783-06-4	2007-03-01

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.5 Revision Date: 12/21/2023 Print Date: 02/24/2024

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SAFETY DATA SHEET

Version 6.11
Revision Date 12/07/2023
Print Date 02/24/2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Benzene

Product Number : 319953
Brand : SIGALD
Index-No. : 601-020-00-8
CAS-No. : 71-43-2

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure (Category 1), Blood, H372
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 3), H412

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For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal Word: Danger

Hazard Statements

H225	Highly flammable liquid and vapor.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H372	Causes damage to organs (Blood) through prolonged or repeated exposure.
H401	Toxic to aquatic life.
H412	Harmful to aquatic life with long lasting effects.

Precautionary Statements

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe mist or vapors.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal

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plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

Formula	:	C_6H_6
Molecular weight	:	78.11 g/mol
CAS-No.	:	71-43-2
EC-No.	:	200-753-7
Index-No.	:	601-020-00-8

Component	Classification	Concentration
benzene		
	Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Chronic 3; H225, H315, H319, H340, H350, H372, H304, H412	<= 100 %

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice
Show this material safety data sheet to the doctor in attendance.

If inhaled
After inhalation: fresh air. Call in physician.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact
After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed
After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
No data available

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SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide (CO2) Foam Dry powder

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides
Flash back possible over considerable distance., Container explosion may occur under fire conditions.
Combustible.
Pay attention to flashback.
Vapors are heavier than air and may spread along floors.
Development of hazardous combustion gases or vapours possible in the event of fire.
Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.
Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

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SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling
Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.Take precautionary measures against static discharge.

Hygiene measures
Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Keep locked up or in an area accessible only to qualified or authorized persons.

Storage class
Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen Danger of cutaneous absorption		

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		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z-2
		Z37.40-1969		
		See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.		
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen See Appendix A		

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm

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Break through time: 480 min
Material tested:Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Flame retardant antistatic protective clothing.

Respiratory protection
Recommended Filter type: Filter A-(P3)
The entrepeneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer. These measures have to be properly documented.
required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: clear, colorless
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 5.5 °C (41.9 °F) - lit.
f)	Initial boiling point and boiling range	80 °C 176 °F - lit.
g)	Flash point	-11 °C (12 °F) - DIN 51755 Part 1
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	Upper explosion limit: 8.0 %(V) Lower explosion limit: 1.2 %(V)

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k)	Vapor pressure	100 hPa at 20 °C (68 °F)
l)	Vapor density	No data available
m)	Density	0.874 g/cm3 at 25 °C (77 °F) - lit.
	Relative density	No data available
n)	Water solubility	ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble
o)	Partition coefficient: n-octanol/water	log Pow: 2.13 at 25 °C (77 °F) - Bioaccumulation is not expected., (ECHA)
p)	Autoignition temperature	498 °C (928 °F) at 1,013.5 hPa
q)	Decomposition temperature	No data available
r)	Viscosity	0.604 mm2/s at 25 °C (77 °F) -
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information

No data available

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Exothermic reaction with:
halogens
Halogenated hydrocarbon
in the presence of:
Light metals
Risk of explosion with:
halogen-halogen compounds
Nitric acid
Boranes
Ozone
peroxi compounds
perchlorates
permanganic acid
perchloryl fluoride
Strong oxidizing agents
Chlorine
fluorides
uranium hexafluoride
Oxygen

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liquid
Risk of ignition or formation of inflammable gases or vapours with:
chromium(VI) oxide
Fluorine
nitryl compounds
Oxygen
oxyhalogenic compounds
Violent reactions possible with:
mineral acids
sulfur

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
rubber, various plastics

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - male - > 2,000 mg/kg
(OECD Test Guideline 401)
Symptoms: Nausea
LD50 Oral - Rat - male and female - 3,002 mg/kg
(OECD Test Guideline 401)
Symptoms: Risk of aspiration upon vomiting., Aspiration may cause pulmonary edema and pneumonitis.
Inhalation: No data available
Symptoms: mucosal irritations
LD50 Dermal - Rabbit - 13,630 mg/kg
Remarks: (IUCLID)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating
(OECD Test Guideline 404)
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Irritating to eyes.
(OECD Test Guideline 405)
Remarks: (IUCLID)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Maximization Test - Guinea pig

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Result: negative
(OECD Test Guideline 406)

Germ cell mutagenicity
May cause genetic defects.
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative

Test Type: Mutagenicity (mammal cell test): micronucleus.
Species: Mouse
Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: OECD Test Guideline 474
Result: positive

Carcinogenicity
May cause cancer. Positive evidence from human epidemiological studies.

IARC:	1 - Group 1: Carcinogenic to humans (benzene)
NTP:	Known - Known to be human carcinogen (benzene)
OSHA:	OSHA specifically regulated carcinogen (benzene)

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
Causes damage to organs through prolonged or repeated exposure.
- Blood
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard
Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 600 mg/kg

RTECS: CY1400000

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Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

After absorption of large quantities:

narcosis
respiratory arrest
Convulsions

Possible damages:

Damage to:

Liver
Kidney
Central nervous system

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	semi-static test LC50 - Oryzias latipes (Orange-red killifish) - > 100 mg/l - 96 h (OECD Test Guideline 203)
Toxicity to daphnia and other aquatic invertebrates	semi-static test EC50 - Daphnia magna (Water flea) - > 1,000 mg/l - 48 h (OECD Test Guideline 202)
	semi-static test NOEC - Daphnia magna (Water flea) - > 1,000 mg/l - 48 h

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	(OECD Test Guideline 202)
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - > 1,000 mg/l - 72 h (OECD Test Guideline 201)
	static test NOEC - Pseudokirchneriella subcapitata (green algae) - >= 1,000 mg/l - 72 h (OECD Test Guideline 201)
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209)
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Pimephales promelas (fathead minnow) - 0.8 mg/l - 32 d Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test LC50 - Daphnia magna (Water flea) - > 100 mg/l - 21 d (OECD Test Guideline 211)

12.2 Persistence and degradability

Biodegradability	aerobic - Exposure time 28 d Result: 96 % - Readily biodegradable. (OECD Test Guideline 301F)

12.3 Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l(benzene) Bioconcentration factor (BCF): 10

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

Endangers drinking-water supplies if allowed to enter soil or water.
Discharge into the environment must be avoided.

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE

IATA

UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
benzene	71-43-2	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D018 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

benzene	CAS-No.	Revision Date

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

	71-43-2	2007-07-01

California Prop. 65 Components

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.benzene	CAS-No. 71-43-2	Revision Date 2009-02-01

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.11 Revision Date: 12/07/2023 Print Date: 02/24/2024

The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada

Safety Data Sheet

Material Name: CARBON PITCH TYPE A **SDS ID: 00228333**

* * * Section 1 - PRODUCT AND COMPANY IDENTIFICATION * * *

Manufacturer Information

KOPPERS INC.

436 Seventh Avenue

Pittsburgh, PA 15219-1800

Mfg Contact: 412-227-2001 (SDS Requests: 866-852-5239)

CHEMTREC: 800-424-9300 (Outside USA: +1 703-527-3887)

Emergencies (Medical in USA): 877-737-9047

Emergencies (Medical Outside of USA): 651-632-9269

Email: naorgmsds@koppers.com

Material Name: CARBON PITCH TYPE A

Chemical Family

hydrocarbons, coal-tar

Synonyms

INDUSTRIAL PITCH / COAL TAR PETROLEUM; CARBON PITCH TYPE A - SOLID; CARBON PITCH TYPE A - LIQUID; CARBON PITCH CO-DISTILLED TYPE A; COAL TAR PITCH; PENCIL PITCH TYPE A

Product Use

process chemical

* * * Section 2 - HAZARDS IDENTIFICATION * * *

EMERGENCY OVERVIEW

Physical Form: changes from solid to liquid as temperature increases

Color: black

Odor: coal tar odor

Signal Word: WARNING!

Major Health Hazards: respiratory tract irritation, skin irritation, eye irritation, lung cancer, skin cancer, bladder cancer, scrotal cancer, (See Section 11 for additional information on potential hazards of constituents of the product.)

Precautionary Statements: Do not breathe vapor or fumes. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation. Observe good hygiene and safety practices when handling this product. Do not use this product until the MSDS has been read and understood.

POTENTIAL HEALTH EFFECTS

Inhalation

Short Term: irritation

Long Term: changes in body temperature, vomiting, difficulty breathing, headache, drowsiness, dizziness, loss of coordination, convulsions, lung cancer, bladder cancer

Skin

Short Term: irritation, sensitivity to sunlight, skin discoloration, skin disorders, thermal burns from heated material

Long Term: skin disorders, sensitivity to sunlight, skin cancer, scrotal cancer

Eye

Short Term: irritation, sensitivity to sunlight, eye damage, thermal burns from heated material

Long Term: irritation, sensitivity to sunlight, eye damage

Ingestion

Short Term: irritation, nausea, vomiting, stomach pain

Long Term: no information on significant adverse effects

* * * Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS	Component	Percent
65996-93-2	HIGH TEMPERATURE COAL TAR PITCH	70 - 100
68187-58-6	PETROLEUM PITCH	0 - 30
50-32-8	BENZO(A)PYRENE	1.11 - 1.42
191-24-2	BENZO(G,H,I)PERYLENE	0.88 - 1.30
193-39-5	INDENO(1,2,3-CD)PYRENE	0.97 - 1.15
206-44-0	FLUORANTHENE	0.77 - 1.27
Not Available	POLYCYCLIC AROMATIC HYDROCARBONS	>1

129-00-0	PYRENE	0.67 - 1.19
218-01-9	1,2-BENZPHENANTHRENE	0.72 - 1.03
56-55-3	1,2-BENZANTHRACENE	0.71 - 1.04
205-99-2	BENZO(B)FLUORANTHENE	0.72 - 0.92
189-64-0	DIBENZO(A,H)PYRENE	0.50 - 0.81
205-82-3	BENZO(J)FLUORANTHENE	0.51 - 0.66
207-08-9	BENZO(K)FLUORANTHENE	0.48 - 0.62
192-65-4	DIBENZO(A,E)PYRENE	0.26 - 0.50
189-55-9	DIBENZO(A,I)PYRENE	0.16 - 0.44
53-70-3	DIBENZ(A,H)ANTHRACENE	0.22 - 0.30
86-74-8	CARBAZOLE	0.02 - 0.10

Component Related Regulatory Information

This product may be regulated, have exposure limits or other information identified as the following: Aromatic hydrocarbons, polycyclic (130498-29-2).

* * * Section 4 - FIRST AID MEASURES * * *

Inhalation

If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

Skin

For thermal burns, cool affected areas as quickly as possible by drenching or immersing in water. Wash skin with soap and water for at least 15 minutes, or use a waterless handcleaner, while removing contaminated clothing and shoes. Get immediate medical attention, if needed.

Eyes

Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

Ingestion

DO NOT induce vomiting. If a large amount is swallowed, get medical attention. Do not give anything by mouth to unconscious or convulsive person. If vomiting occurs, keep head lower than hips to help prevent aspiration.

* * * Section 5 - FIRE FIGHTING MEASURES * * *

See Section 9 for Flammability Properties

NFPA Ratings: Health= 2 **Fire=** 1 **Reactivity=** 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Flammable Properties

During fire conditions, vapors and decomposition products may be released, forming flammable/explosive mixtures in air. Containers may rupture or explode if exposed to heat.

Sensitivity to Mechanical Impact

No

Sensitivity to Static Discharge

Yes (dust)

Extinguishing Media

regular dry chemical, carbon dioxide, regular foam, water spray

Protective Equipment and Precautions for Firefighters

Full fire fighting turn-out gear (bunker gear).

Fire Fighting Measures

Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Directly spraying water or foam onto hot burning product may cause frothing. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire.

* * * Section 6 - ACCIDENTAL RELEASE MEASURES * * *

Water Release

Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

Occupational Spill / Release

Collect spilled material in appropriate container for disposal. Keep out of water supplies and sewers. Keep unnecessary people away, isolate hazard area and deny entry. In Canada, report releases to provincial authorities, municipal authorities, or both, as required. Due to the concentration of Benzo(a)pyrene and the CERCLA (40 CFR 302.4) reportable quantity of 1 pound, the release of 70 pounds of this product requires National Response Center notification.

* * * Section 7 - HANDLING AND STORAGE * * *

Handling Procedures

Avoid breathing vapors of heated materials. Avoid contact with eyes, skin and clothing. When using, do not eat, drink or smoke. Wash exposed areas thoroughly with soap and water, or a waterless handcleaner, after skin contact and before eating, drinking, using tobacco products, or restrooms. Use protective skin cream on exposed skin before and during work shift. To reduce sun sensitivity a sun-blocking lotion (SPF 15+) can also be applied prior to application of a protective cream. Contaminated clothing should be removed and laundered before reuse.

Storage Procedures

Store and handle in accordance with all current regulations and standards. Label all containers. Keep container in a well-ventilated place. Keep away from heat, sparks and flame. Protect from physical damage. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355 Part B).

* * * Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Exposure Guidelines

Component Exposure Limits

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

OSHA (US): 0.2 mg/m3 TWA (benzene soluble fraction)

ACGIH: 0.2 mg/m3 TWA (as benzene soluble aerosol)

NIOSH: 0.1 mg/m3 TWA (cyclohexane-extractable fraction)

Mexico: 0.002 mg/m3 TWA; 0.02 mg/m3 TWA (as Particulate polycyclic aromatic hydrocarbons)

0.015 ppm STEL; 0.03 mg/m3 STEL

BENZO(A)PYRENE (50-32-8)

OSHA (US): 0.2 mg/m3 TWA

1,2-BENZPHENANTHRENE (218-01-9)

OSHA (US): 0.2 mg/m3 TWA

Ventilation

Ensure adequate ventilation. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Eyes / Face

ANSI Z87.1-1989 approved safety glasses with side shields. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. At elevated temperatures: A faceshield is recommended.

Protective Clothing

Wear protective clothing to prevent contact. Use protective skin cream on exposed skin before and during work shift. Contaminated clothing should be removed and laundered before reuse. When material is at an elevated temperature, wear appropriate heat resistant clothing.

Glove Recommendations

Wear appropriate gloves. When material is at an elevated temperature, wear appropriate heat resistant gloves.

Protective Material Types

protective skin creams, chemical resistant material, heat resistant material

Respiratory Protection

If the applicable TLVs and/or PELs are exceeded, use canister or cartridge respirators, which are MSHA/NIOSH-approved, with organic vapor cartridges.

* * * Section 9 - PHYSICAL AND CHEMICAL PROPERTIES * * *

Physical State:	Solid	**Color:**	black
Physical Form:	changes from solid to liquid as temperature increases	**Odor:**	coal tar odor
pH:	Not available	**Freezing / Melting Point:**	>21 °C
Boiling Point:	>240 °C	**Flash Point:**	>190 °C (PMCC)
Decomposition Temperature:	Not available	**Evaporation Rate:**	Not available
Lower Explosive Limit:	Not available	**Upper Explosive Limit:**	Not available
Vapor Pressure:	0 mmHg @ 20 °C	**Vapor Density:**	>1
Specific Gravity (water=1):	1.26 - 1.34 @ 15.5 °C	**Water Solubility:**	almost insoluble
Coefficient of Water/Oil Dist:	Not available	**Autoignition:**	>399 °C
Viscosity:	Not available	**Volatility:**	Not available

* * * Section 10 - STABILITY AND REACTIVITY * * *

Chemical Stability

Stable at normal temperatures and pressure.

Conditions to Avoid

Avoid heat, flames, sparks and other sources of ignition. Avoid contact with incompatible materials.

Materials to Avoid (Incompatibilites)

oxidizing materials

Decomposition Products

carbon monoxide, carbon dioxide, oxides of nitrogen, sulfur compounds, polynuclear aromatic hydrocarbons

Possibility of Hazardous Reactions

Will not polymerize.

* * * Section 11 - TOXICOLOGICAL INFORMATION * * *

Irritation / Corrosive Information

RTECS Irritation

The components of this material have been reviewed and RTECS publishes no applicable data as of the date on this document.

Local Effects

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

Irritant: skin, eye.

Acute and Chronic Toxicity

Component Analysis - LD50/LC50

The components of this material have been reviewed in various sources and the following selected endpoints are published:

PETROLEUM PITCH (68187-58-6)

Oral LD50 Rat 4320 mg/kg; Dermal LD50 Rat >2000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

RTECS Acute Toxicity (selected)

The components of this material have been reviewed and RTECS publishes no applicable data as of the date on this document.

Carcinogenicity (Product)

OSHA: No

NTP: Yes

IARC: Yes

(See below for additional information on component carcinogen status)

Component Carcinogenicity

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

ACGIH: A1 - Confirmed Human Carcinogen

NIOSH: potential occupational carcinogen

NTP: Known Human Carcinogen (Select Carcinogen)

IARC: Supplement 7 [1987]; Monograph 35 [1985] (Group 1 (carcinogenic to humans))

RTECS Tumorigenic

The components of this material have been reviewed, and RTECS publishes data for one or more components.

Mutagenic Data (Product)

Ames Salmonella with Activation - Positive.

RTECS Mutagenic

The components of this material have been reviewed, and RTECS publishes data for one or more components.

RTECS Reproductive Effects

The components of this material have been reviewed, and RTECS publishes data for one or more components.

Target Organs (Product)

respiratory system, skin, eyes, bladder, scrotum

Medical Conditions Aggravated by Exposure Based on Product and Component Information

respiratory disorders, skin disorders, eye disorders, central nervous system disorders (i.e. headache, drowsiness, dizziness, loss of coordination)

Additional Information (Product)

This product contains coal tar pitch. Volume 35 of the IARC monograph states that there is sufficient evidence that coal tar pitches are carcinogenic in humans. IARC's conclusion is based upon studies suggesting an association between skin cancer and chronic occupational dermal exposure to coal tar pitches and upon other historical studies and anecdotal reports showing an association between dermal exposure to coal tar pitch and scrotal cancer in the absence of good hygiene practices.

Epidemiological studies of aluminum reduction workers showed an excess risk of developing bladder cancer for workers with chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. Studies also suggest an association between lung cancer and chronic inhalation overexposure to coal tar pitch volatiles in excess of the recommended permissible exposure level. A recent animal study may suggest an association between lung cancer and pulmonary deposition of particulate matter originating from coal tar pitches. It is not anticipated, however, that use of this product in liquid form will create a respirable dust.

In addition to containing information about the product as a whole, this data sheet also contains information about individual components of the product. Information of this nature may not have been derived from studies or data relating to this product and/or may have been derived from studies or data that did not involve human exposure and involved animal exposure only.

Additional Information Based on Component Data

Some polycyclic aromatic hydrocarbons (PAHs), found in coal tar complex substances, have been reported to cause lung and skin cancer in humans under conditions of poor personal hygiene, prolonged/repeated contact, and exposure to sunlight. The National Toxicology Program (NTP) and IARC have independently classified various PAH compounds present in coal tar substances as reasonably anticipated to be human carcinogens (NTP), probably carcinogenic to humans (IARC Group 2A), possibly carcinogenic to humans (IARC Group 2B), and not classifiable as to carcinogenicity to humans (IARC Group 3). The cancers reported in the studies upon which IARC based its conclusions involved lung, skin, liver, stomach, kidney and blood cancers in animals. Based on the results of animal experiments PAHs may cause injury to the liver, kidneys, lungs, blood and lymph systems. Some PAH's have also been associated with impaired fertility, heritable genetic damage and birth defects in mice.

* * * Section 12 - ECOLOGICAL INFORMATION * * *

Component Analysis - Aquatic Toxicity

PETROLEUM PITCH (68187-58-6)

Fish: 96 Hr LC50 Brachydanio rerio: 48 mg/L [semi-static]

PYRENE (129-00-0)

Invertebrate: 48 Hr EC50 water flea: 1.8 mg/L

1,2-BENZANTHRACENE (56-55-3)

Invertebrate: 96 Hr LC50 Daphnia magna: 0.01 mg/L [Static]; 48 Hr EC50 Daphnia magna: 0.0042 mg/L

1,2-BENZPHENANTHRENE (218-01-9)

Invertebrate: 2 Hr EC50 water flea: 1.9 mg/L

CARBAZOLE (86-74-8)

Fish: 48 Hr LC50 Mugil cephalus: 1 mg/L [static]

Algae: 60 Hr EC50 Tetrahymena pyriformis: 6.7 mg/L

* * * Section 13 - DISPOSAL CONSIDERATIONS * * *

Disposal Methods

Dispose in accordance with all applicable regulations.

Component Waste Numbers

There are no applicable U.S. EPA waste numbers for this product's components.

* * * Section 14 - TRANSPORT INFORMATION * * *

US DOT Information

Shipping Name: Other regulated substances, solid, n.o.s. (Contains: HIGH-TEMP. COAL TAR PITCH), RQ

UN/NA #: NA3077 **Hazard Class:** 9 **Packing Group:** III

Other Information: Applicable shipping classification depends on temperature of product. Product in Tank Car or Tank Truck is shipped as 'Elevated temperature liquid, n.o.s.' 'Other regulated substances, solid, n.o.s.' applies for all container sizes.

US DOT Reportable Quantities

BENZO(A)PYRENE (50-32-8)

1 lb RQ; 0.454 kg RQ

INDENO(1,2,3-CD)PYRENE (193-39-5)

100 lb RQ; 45.4 kg RQ

FLUORANTHENE (206-44-0)

100 lb RQ; 45.4 kg RQ

1,2-BENZANTHRACENE (56-55-3)

10 lb RQ; 4.54 kg RQ

1,2-BENZPHENANTHRENE (218-01-9)

100 lb RQ; 45.4 kg RQ

BENZO(B)FLUORANTHENE (205-99-2)

1 lb RQ; 0.454 kg RQ

TDG Information

Shipping Name: Elevated temperature liquid, n.o.s.

UN #: UN3257 **Hazard Class:** 9 **Packing Group:** III

Required Label(s): 9

* * * Section 15 - REGULATORY INFORMATION * * *

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Sections 302/304 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), TSCA 12(b), and/or require an OSHA process safety plan.

BENZO(A)PYRENE (50-32-8)

SARA 313: 0.1 % Supplier notification limit

BENZO(G,H,I)PERYLENE (191-24-2)

SARA 313: 1.0 % Supplier notification limit

INDENO(1,2,3-CD)PYRENE (193-39-5)

SARA 313: 0.1 % Supplier notification limit

FLUORANTHENE (206-44-0)

SARA 313: 1.0 % Supplier notification limit

PYRENE (129-00-0)

SARA 302: 1000 lb lower TPQ; 10000 lb upper TPQ

SARA 304: 5000 lb EPCRA RQ

1,2-BENZANTHRACENE (56-55-3)

SARA 313: 0.1 % Supplier notification limit

1,2-BENZPHENANTHRENE (218-01-9)

SARA 313: 1.0 % Supplier notification limit

BENZO(B)FLUORANTHENE (205-99-2)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,H)PYRENE (189-64-0)

SARA 313: 0.1 % Supplier notification limit

BENZO(J)FLUORANTHENE (205-82-3)

SARA 313: 0.1 % Supplier notification limit

BENZO(K)FLUORANTHENE (207-08-9)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,E)PYRENE (192-65-4)

SARA 313: 0.1 % Supplier notification limit

DIBENZO(A,I)PYRENE (189-55-9)

SARA 313: 0.1 % Supplier notification limit

DIBENZ(A,H)ANTHRACENE (53-70-3)

SARA 313: 0.1 % Supplier notification limit

SARA 311/312 Hazardous Categories (40 CFR 370 Subparts B and C)

Acute Health: Yes **Chronic Health:** Yes **Fire:** No **Pressure:** No **Reactive:** No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS#	CA	MA	MN	NJ	PA	RI
HIGH TEMPERATURE COAL TAR PITCH	65996-93-2	Yes	Yes	Yes	Yes	Yes	No
BENZO(A)PYRENE	50-32-8	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(G,H,I)PERYLENE ([1]related to: Aromatic hydrocarbons, polycyclic)	191-24-2	Yes	Yes	Yes[1]	Yes	Yes	Yes[1]
INDENO(1,2,3-CD)PYRENE ([1]related to: Aromatic hydrocarbons, polycyclic)	193-39-5	Yes	Yes	Yes	Yes	Yes	Yes[1]
FLUORANTHENE ([1]related to: Aromatic hydrocarbons, polycyclic)	206-44-0	Yes	Yes	Yes[1]	Yes	Yes	Yes[1]
PYRENE ([1]related to: Aromatic hydrocarbons, polycyclic)	129-00-0	Yes	Yes	Yes[1]	Yes	Yes	Yes[1]
1,2-BENZANTHRACENE	56-55-3	Yes	Yes	Yes	Yes	Yes	Yes
1,2-BENZPHENANTHRENE	218-01-9	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(B)FLUORANTHENE	205-99-2	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZO(A,H)PYRENE	189-64-0	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(J)FLUORANTHENE	205-82-3	Yes	Yes	Yes	Yes	Yes	Yes
BENZO(K)FLUORANTHENE ([1]related to: Aromatic hydrocarbons, polycyclic)	207-08-9	Yes	Yes	Yes	Yes	Yes	Yes[1]
DIBENZO(A,E)PYRENE	192-65-4	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZO(A,I)PYRENE	189-55-9	Yes	Yes	Yes	Yes	Yes	Yes
DIBENZ(A,H)ANTHRACENE	53-70-3	Yes	Yes	Yes	Yes	Yes	Yes
CARBAZOLE	86-74-8	Yes	No	No	No	No	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

Canadian Regulations

WHMIS Classification

D2A.

WHMIS Ingredient Disclosure List

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

HIGH TEMPERATURE COAL TAR PITCH (65996-93-2)

0.1 %

BENZO(A)PYRENE (50-32-8)

0.1 %

INDENO(1,2,3-CD)PYRENE (193-39-5)

0.1 %

FLUORANTHENE (206-44-0)

1 %

1,2-BENZANTHRACENE (56-55-3)

0.1 %

1,2-BENZPHENANTHRENE (218-01-9)

0.1 %

BENZO(B)FLUORANTHENE (205-99-2)

0.1 %

DIBENZO(A,H)PYRENE (189-64-0)

0.1 %

DIBENZO(A,I)PYRENE (189-55-9)

0.1 %

DIBENZ(A,H)ANTHRACENE (53-70-3)

0.1 %

Canada Inventory Information (Product)

One or more components of this product are not listed on either the DSL or the NDSL.

U.S. Inventory (TSCA) Information (Product)

One or more components of this product are not listed.

Inventory Status (Components)

Component Analysis - Inventory

Component	CAS#	US	CA
HIGH TEMPERATURE COAL TAR PITCH	65996-93-2	Yes	DSL
PETROLEUM PITCH	68187-58-6	Yes	DSL
BENZO(A)PYRENE	50-32-8	Yes	DSL
BENZO(G,H,I)PERYLENE	191-24-2	No	No
INDENO(1,2,3-CD)PYRENE	193-39-5	Yes	NSL
FLUORANTHENE	206-44-0	Yes	NSL
PYRENE	129-00-0	Yes	DSL
1,2-BENZANTHRACENE	56-55-3	Yes	NSL
1,2-BENZPHENANTHRENE	218-01-9	Yes	DSL
BENZO(B)FLUORANTHENE	205-99-2	No	No
DIBENZO(A,H)PYRENE	189-64-0	No	No
BENZO(J)FLUORANTHENE	205-82-3	No	No
BENZO(K)FLUORANTHENE	207-08-9	No	No
DIBENZO(A,E)PYRENE	192-65-4	No	No
DIBENZO(A,I)PYRENE	189-55-9	No	No
DIBENZ(A,H)ANTHRACENE	53-70-3	Yes	NSL
CARBAZOLE	86-74-8	Yes	DSL

* * * Section 16 - OTHER INFORMATION * * *

Key / Legend

ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

Other Information

The information set forth in this Safety Data Sheet does not purport to be all-inclusive and should be used only as a guide. While the information and recommendations set forth herein are believed to be accurate, the company makes no warranty regarding such information and recommendations and disclaims all liability from reliance thereon.

End of Sheet 00228333

Appendix D
Certifications

ANCHOR QEA

Individual User Report

Training Summary

Christopher Cernak

Report Date : May 07,2024

Name: Christopher Cernak

Completion History

Title	Completed	Expiry
2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC]	25/04/2022	-
2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC]	27/07/2022	-
2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC]	12/10/2022	-
Adult & Pediatric First Aid/CPR/AED [American Red Cross]	07/12/2022	07/12/2024
All About Non-Permit Confined Spaces [BIZ Library]	02/06/2023	-
Annual Respirator Clearance and Fit Test Exam [Occupational Health Monitoring]	05/03/2024	05/03/2025
Boating Safety Course [State of New York]	11/02/2022	-
DOT Medical Exam Certification 1 [Occupational Health Monitoring]	05/03/2024	05/03/2025
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	29/01/2022	-
HAZWOPER Supervisor 8 Hour Initial [Safety Unlimited, Inc.]	01/06/2023	-
Medical Surveillance Exam [Occupational Health Monitoring]	08/03/2024	08/03/2025

Mercury & Heavy Metals Testing [Occupational Health Monitoring]	07/12/2022	-
OSHA Respiratory Protection [Safety Provisions]	06/07/2023	06/07/2024
Vaccination HEP A (1st) [Occupational Health Monitoring]	06/07/2023	-
Vaccination HEP A (2nd) [Occupational Health Monitoring]	05/03/2024	-
Vaccination HEP B (1st) [Occupational Health Monitoring]	06/07/2023	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	05/03/2024	-
Vaccination TDAP [Occupational Health Monitoring]	06/07/2023	06/07/2033
HAZWOPER 8 Hour Refresher 2024 In-Person [Anchor QEA]	29-02-2024	28-02-2025

Individual User Report

Training Summary

Billie-Jo Gauley

Report Date : May 07,2024

Name: Billie-Jo Gauley

Completion History

Title	Completed	Expiry
2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC]	25/04/2022	-
2023 Driving Safety: The Basics [MARCOM_BIZ Library]	22/12/2023	22/12/2024
2023 Fire Extinguisher Training [Anchor QEA, LLC]	22/12/2023	22/12/2024
Adult First Aid/CPR/AED [ProTrainings]	28/12/2022	28/12/2024
All About Non-Permit Confined Spaces [BIZ Library]	20/12/2022	-
Bloodborne Pathogens Course [ProTrainings]	22/12/2023	22/12/2024
Distracted Driving Course [Smith System]	14/06/2018	-
Hazard Communication Training [Anchor QEA, LLC]	21/11/2013	-
Hazardous Materials Transportation [Compliance Solutions]	05/09/2007	-
HAZWOPER 40 Hour Training [Environmental Training and Compliance]	23/02/2003	-
HAZWOPER Supervisor 8 Hour Initial [Compliance Solutions]	14/04/2006	-

IATA Dangerous Goods Transportation [Compliance Solutions]	06/09/2007	-
Medical Authorization Release Letter [Occupational Health Monitoring]	27/07/2017	-
Medical Surveillance Exam [Occupational Health Monitoring]	06/09/2023	06/09/2024
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	07/12/2022	-
Vaccination HEP A (1st) [Occupational Health Monitoring]	27/06/2014	-
Vaccination HEP A (2nd) [Occupational Health Monitoring]	28/07/2014	-
Vaccination HEP B (1st) [Occupational Health Monitoring]	27/06/2014	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	28/07/2014	-
Vaccination HEP B (3rd) [Occupational Health Monitoring]	03/02/2015	-
Vaccination Tetanus [Occupational Health Monitoring]	27/06/2014	27/06/2024
Workspace - Identify Safety Items	19/09/2022	-
Fieldwork Support Questionnaire	19/09/2022	-
HAZWOPER 8 Hour Refresher 2024 In-Person [Anchor QEA]	01-03-2024	01-03-2025

Individual User Report

Training Summary

Sonnet Agran-St. Pierre

Report Date : February 19,2024

Name: Sonnet Agran-St. Pierre

Completed		
Title	**Completed**	**Expiry**
2022 Quarter 2 Quarterly Field Services Notes [Anchor QEA, LLC]	25/04/2022	-
2022 Quarter 3 Quarterly Field Services Notes [Anchor QEA, LLC]	28/07/2022	-
2022 Quarter 4 Quarterly Field Services Notes [Anchor QEA, LLC]	17/10/2022	-
2023 Driving Safety: The Basics [MARCOM_BIZ Library]	29/12/2023	29/12/2024
2023 Fire Extinguisher Training [Anchor QEA, LLC]	29/12/2023	29/12/2024
Adult First Aid/CPR/AED [American Red Cross]	22/07/2022	22/07/2024
Bloodborne Pathogens Course [ProTrainings]	08/09/2023	08/09/2024
HAZWOPER 40 Hour Training [Safety Unlimited, Inc.]	22/11/2019	-
Medical Surveillance Exam [Occupational Health Monitoring]	27/11/2023	27/11/2024
Mercury & Heavy Metals Testing [Occupational Health Monitoring]	03/01/2023	-
Vaccination HEP A (1st) [Occupational Health Monitoring]	20/07/2023	-

Vaccination HEP B (1st) [Occupational Health Monitoring]	20/07/2023	-
Vaccination HEP B (2nd) [Occupational Health Monitoring]	25/08/2023	-
Vaccination TDAP [Occupational Health Monitoring]	20/07/2023	-
Fieldwork Support Questionnaire	27/09/2022	-

Appendix E
Pandemic and Epidemic Safety Plan

November 2022

ANCHOR QEA

Pandemic and Epidemic Safety Plan

PLAYING IT SAFE

Stop Play Record Rewind

November 2022

Pandemic and Epidemic Safety Plan

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ABBREVIATIONS

CDC	U.S. Centers for Disease Control and Prevention
EPA	U.S. Environmental Protection Agency
H&S	Health and Safety
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment

1 Introduction and Background

Anchor QEA, LLC, and all subsidiaries (Anchor QEA) has developed this Pandemic and Epidemic Safety Plan, which applies to both office and field work. The objective of this Safety Plan is to provide operational guidelines that address the challenges presented by a pandemic or epidemic and ensure consistency in Anchor QEA's response actions across the firm. We have developed this Safety Plan to support operational efforts. There are a lot of issues to consider, but the underlying priority is protecting employees, coworkers, and families. This plan will be applied pre- and post-pandemic in addition to during a designated pandemic or epidemic at the discretion of the Health and Safety (H&S) Program Lead, Director of Health and Safety, Chief Executive Officer, and/or Managing Committee. This plan may require periodic updates as conditions change.

These guidelines take the recommendations from the U.S. Centers for Disease Control and Prevention (CDC) into account, in addition to local and state laws and requirements. The following principles are the basis of the operational guidelines presented in this Safety Plan:

- Apply operational decisions consistent with applicable orders, requirements, and regulations.
- Require anyone who is sick to stay home.
- Focus on efforts to protect all employees.
- Require employees and visitors to self-check prior to entry.
- Evaluate guidelines and communication protocols for those buildings with common areas not in Anchor QEA's control.
- Clean, disinfect, and evaluate ventilation systems.
- Provide sustainable supplies of hand sanitizer, disinfectant wipes, and other personal cleaning supplies.
- Communicate immediately to office staff, visitors, and building management of a primary exposure situation as appropriate.
- Implement contact tracing of employees who have been confirmed or presumptive confirmed.
- Continue field work in accordance with this Safety Plan.
- Field programs will follow this Safety Plan unless the client, prime contractor, federal, state, or local government establish more restrictive measures, in which case the more restrictive measures will be followed.
- Updated information can be found at the CDC website (https://www.cdc.gov/), as well as state and local health agency websites.
- Field project schedules, modifications, and regulatory requirements will be discussed with the client representatives.
- All personnel have Stop Work Authority.

2 Plan Requirements

The objective of this Safety Plan is to provide operational guidelines that address pandemics and epidemics in addition to maintaining consistency in Anchor QEA's response actions across the organization.

If you have questions or concerns, please direct those to your Office Lead, Staff Manager, Project Manager, or H&S Program Lead.

Some site owners or prime contractors may conduct temperature readings or screening prior to entering an office or site, which is in accordance with some current guidance. Some site owners or prime contractors may want to record actual temperature readings, test results, or information other than general "yes" or "no" questions related to travel, symptoms, vaccination status, or other items. If you choose not to participate in the recording of screening information, the site owner or prime contractor may not allow you to access the site. You should immediately contact your Field Lead, Staff Manager, or Project Manager to discuss alternative work and available options.

Prior to Coming to Work

If an employee has had close contact with a confirmed case within the prior 10 days, we require that they be cleared by WorkCare through the screening process:

- **Regardless of vaccination status, if employees feel that they are sick or showing symptoms, they are required to stay home and not report to work (office or field).**
  - If employees are showing symptoms, they are to contact WorkCare and/or their healthcare provider for medical advice. If employees feel the need to visit a medical professional, it is recommended that the medical office be contacted first to determine when it is appropriate to visit.
  - They should call their Staff Manager immediately and notify them that they are sick. Showing up to work with symptoms will result in the employee being asked to leave to avoid potentially exposing others to an infectious disease.
- If employees show any symptoms while at work, they will be asked to leave and not return until they have been cleared by WorkCare.
- Exposure to, or close contact with, means being within 6 feet of an individual for 15 minutes or greater in a 24-hour period or being exposed to their cough or sneeze.
- If you meet the criteria listed for Primary or Secondary exposure listed in the Case Response section, you should take the following measures:
  - Do not report to work until cleared by WorkCare.
  - Contact your Staff Manager and Health and Safety.

- If masks (i.e., N95 or KN95) are used, they should be used in accordance with the Occupational Safety and Health Administration (OSHA) standard 1910.120, stating, in part, that the user must be fit-tested and in a surveillance program. However, if employees wish to provide their own N95 or KN95 mask, they must complete appropriate acknowledgements with Health and Safety prior to use.

Vaccination Policy

People are considered fully vaccinated 2 weeks after they have received the second dose in a two-dose series, or 2 weeks after they have received a single-dose vaccine. People are asked to maintain current vaccination by receiving a booster dose when eligible.

At this time, Anchor QEA does not require employees to be vaccinated except where required by law or regulation. However, there are locations and projects that may require additional vaccinations or an approved accommodation. In those cases, Anchor QEA will follow those requirements and only assign employees who meet the necessary requirements. For employees to be considered fully vaccinated against an infectious disease, their information must be uploaded to the WorkCare screening portal or recorded in other designated locations.

Screening

A daily self-check protocol is being instituted to replace the daily screening through WorkCare in an attempt to prevent sick or symptomatic employees from coming to work and spreading infection. Employees will self-check themselves for any symptoms that could be consistent with an infectious disease as listed in this plan or by CDC. If an employee has symptoms that could be consistent with disease, they are not to report to work, and if already at work, they should notify their Staff Manager and Health and Safety or Human Resources and return home. They should complete a Risk Stratification Survey through WorkCare and not return until cleared. Employees who report for work are stating that they do not have symptoms that could be consistent with an infectious disease, or they have been cleared by a healthcare professional.

Visitors

- Visitors are allowed; however, if they have any symptoms that could be consistent with an infectious disease they should not visit.
- Meetings with outside parties should take place virtually, when possible.
- Delivery personnel must follow all current protocols.

Case Response

According to the CDC, symptoms can appear 2 to 14 days after exposure. Symptoms or combinations of symptoms that may be consistent with an infectious disease include the following:

- Fever (100.4°F [37.8°C] or greater) or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches (longer than 48 hours)
- Headache
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea
- New loss of taste or smell
- Positive test

If you have symptoms that are consistent with the above or others designated by CDC but have not tested positive, regardless of vaccination status, you are to not go into work until you have been cleared to return by WorkCare. Immediately contact your Staff Manager and Health and Safety or Human Resources. You should additionally contact the Project Manager if working in the field for a project.

Regarding exposures, there are two general scenarios that now apply, as follows:

1. **Primary Exposure:** These are employees who have tested positive for or have symptoms consistent with an infectious disease. If you have tested positive for an infectious disease, you must be in self-isolation and those with whom you have had close contact in the work environment within the time specified by the CDC and/or WorkCare will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees (and building management if applicable) who were identified. Project Managers will be responsible for notification of clients and other contractors with whom you were in close contact. You must not return to work until you have been cleared by WorkCare. The exception to this would be if your primary physician recommends more restrictive measures.
2. **Secondary Exposure:** These are employees who, within the time specified by the CDC and/or WorkCare, have had close contact with someone who has tested positive for an infectious disease or has symptoms consistent with an infectious disease. You must follow the direction of WorkCare and may not return to work until cleared by WorkCare. If you start to have symptoms or test positive, follow the appropriate guidance for Primary Exposure noted above.

In the event there is a documented case of an employee becoming infected with an infectious disease or symptoms consistent with an infectious disease (Primary Exposure), management will take immediate action as follows:

- The employee should be immediately self-isolated until they have been cleared by WorkCare.
- Notify the Staff Manager, Health and Safety, and Project Manager (if in the field) immediately.
- The employee will identify those with whom they have had close contact in the work environment within the time specified by CDC and/or WorkCare.
- Employees who came in close contact with the individual will be notified. Health and Safety will work with the Office Lead and Human Resources to notify the Anchor QEA employees who were identified. Project Managers will be responsible for notification of clients and other contractors with whom the individual was in close contact.
- Confidentiality for the employee should be maintained.

If an employee has had close contact with someone diagnosed with an infectious disease (Secondary Exposure) within the current time specified by the CDC and/or WorkCare, the Staff Manager, Office Lead, and/or Health and Safety will take immediate action as follows:

- If the employee is asymptomatic, have them wear a well-fitting face covering until 10 days have passed since the exposure.
- If the employee tests positive or develops symptoms, this becomes a Primary Exposure scenario, and that guidance should then be followed.

Workplace Requirements

All work locations are to follow the guidance in this document at a minimum. In locations where state or local requirements require specific plans, forms, risk evaluations, or other documents, those documents will be prepared for those specific instances. For field projects, follow the site-specific Health and Safety Plan personal protective equipment (PPE) requirements in addition to this document.

Travel Considerations

Travel will be considered based upon the current levels of transmission, restrictions, and overall risk to the employees at the time. They may range from no restrictions to stopping all travel.

- Employees must follow the same prevention guidelines off site, which includes travel, hotel, and other activities, to address potential exposures outside the workplace.
- When at hotels, consider disinfecting your own room with U.S. Environmental Protection Agency (EPA)-registered cleaners or alternatives, and consider using the “No Housekeeping” sign to minimize the people coming into your room.
- When traveling, follow all requirements in place for the location(s) that you visit, including any requirements for transportation to include air travel.

Face Covering and Physical Distancing Requirements

- As always, regardless of whether required at the time, individuals are permitted to wear a face covering if they desire as long as there is no safety risk.
- In some instances, a location, local area, or state may have more restrictive requirements in place. All individuals must follow the more restrictive requirements in those cases.
- Those who are at high or increased risk should consult with their healthcare provider about whether they need to wear a mask/face covering or take other precautions.
- Physical distancing, 6 feet or greater, is also an effective method to reduce the risk associated with contracting an infectious disease.
- All employees should have a face covering available in case they are requested to wear one when in close contact or enclosed situations.

Designated Coordinators

Anchor QEA will designate the following Coordinators in the workplace:

- For office locations, the Office Lead will be the Coordinator with support from the H&S Office Representative(s).
- For field sites, the Field Lead or Senior Person will be the Coordinator with support from the Project Manager.
- The H&S Program Lead and H&S Coordinator(s) will be the Corporate Coordinators with support from the Task Force and Managing Committee.

The responsibilities of the Coordinators are as follows:

- Ensure that information on required workplace safety protocols is provided to employees and all other individuals likely to be present at workplaces.
  - Communicate the required workplace safety protocols and related policies by email, websites, memoranda, flyers, or other means, and post signage at covered workplaces that sets forth the requirements and workplace safety protocols in a readily understandable manner as necessary.
  - This includes communicating the workplace safety protocols and requirements related to face coverings and physical distancing to visitors and all other individuals present at workplaces.
- If the designated Coordinator (or support person) becomes aware of individuals failing to comply with the requirements established at that time, do the following:
  - Ask the individual to comply.
  - If they still do not wish to comply, ask them to leave the workplace.
    - If they are a visitor ensure their company is notified.
    - If they are an employee notify Human Resources.

- If a location has more restrictive requirements, individuals will follow the more restrictive requirements.

The Corporate Coordinators will also be responsible for the following:

- Work with WorkCare and/or others to maintain proper vaccination documentation as appropriate.
- Provide support to the office and field Coordinators.

Prevention and Cleaning Requirements

An important step to control spread of the virus in the workplace focuses on hygiene and cleaning:

- All employees and management staff will follow CDC guidance regarding hand washing: https://www.cdc.gov/handwashing/index.html. Sanitizing wipes or gel will be made readily available around the office.
- All employees will be responsible for multiple daily cleaning of high-touch surfaces.
- Employees should follow published guidance to limit transmission outside of and at work: https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html.
- The following link provides a list of EPA-recommended cleaning products able to kill the virus, as well as some initial guidance with alternatives if supplies run out: https://cfpub.epa.gov/wizards/disinfectants/. If these products are not available, then either a diluted bleach solution or 70% alcohol solution will work. The following link provides general recommendations for routine cleaning and disinfection: https://www.cdc.gov/coronavirus/2019-ncov/community/disinfecting-building-facility.html#anchor_1617548446719.
- Catch coughs and sneezes with a disposable tissue, etc. and throw away, then wash hands. If tissues are not available, direct coughs and sneezes into elbow.
- Avoid touching your own mouth, nose, or eyes.
- All employees will have their own PPE and will not share with others. Respirators and PPE will be cleaned/disinfected when doffing, along with a thorough arm, hand, and face washing when exiting.

Disinfection

- A sustainable supply of disinfectant wipes will be available for employees to wipe down surfaces that are touched in restrooms and other common areas when they leave the area.
- Staff Managers should still maintain regular contact with personnel even when they return to the office.

Table 1
Supply Recommendations

Item	Specifications	Required On-Hand Quantity*
Face coverings	Face coverings meeting CDC guidelines. Employees are responsible for their own face coverings and cleaning because use outside the office (on the bus, at the store, getting coffee, on the elevator) is important to avoid bringing the virus to the office.	Anchor QEA will provide face coverings as necessary.
Gloves	Disposable gloves of sufficient material to be used when cleaning common touch surfaces	Sustainable supply
Disinfectant spray or wipes	Wipes or manufactured disinfecting material. If using a solution, it must meet EPA guidance and be made fresh daily.	Sustainable supply
Hand sanitizer and motion sensor-activated dispensers	Hand sanitizer meeting CDC guidelines	Sustainable supply
Hand soap	Premanufactured soap available at various sink locations	Sustainable supply
Paper towels	Rolls or refills for hand towel machines that are already in place or are installed prior to opening	Sustainable supply
Spray bottles	Spray containers for use with disinfectant solutions that are mixed on site	As needed; sustainable supply

Note:
*Required On-Hand Quantity must be maintained in a sustainable supply. When quantities drop to a critical level and quantities cannot be immediately increased, appropriate actions should be taken.

Table 2
Office Responsibilities

Responsibility	Responsible Person(s)	Comments
Tracking State Requirements	Office Lead or Project Manager	
Office Reclosure	Office Lead, Anchor QEA Managing Committee, and/or H&S Program Lead	"Stop Work" can be applied as necessary
Office Access	Office Lead	
Workspace Configurations	Office Lead or Project Manager	
Shared Areas	Office Lead or Project Manager	
Staff Office Rotations	Office Lead or Project Manager	If needed
Screening (Staff/Visitors) – Oversight	Office Lead or Project Manager	
Local Field Project Staffing	Regional Leads, Project Managers, and Health and Safety	
Cleaning – Oversight	All	
Exposure Response (Source Tracing)	Health and Safety or Human Resources and Office Lead or Project Manager	
Office Procedures – Review and Modification	H&S Program Lead or Human Resources and Office Lead or Project Manager	If needed

3 Source Materials

CDC (Centers for Disease Control and Prevention), 2021. CDC website: cdc.gov.

Lear Corporation, 2020. *Safe Work Playbook: An interactive guide for COVID-19 Pandemic Preparedness and Response Second Edition*. June 26, 2020.

Lotito, M.J., M.J. Ackie, and B.J. Sarchet, 2020. *Back to Work? Assessing Whether, When and How to Re-Open for Business*. Littler Workplace Policy Institute. Webinar. April 27, 2020.

Safer Federal Workforce Task Force, 2021. *COVID-19 Workplace Safety: Guidance for Federal Contractors and Subcontractors*. September 24, 2021. Available at: https://www.saferfederalworkforce.gov/downloads/Draft%20contractor%20guidance%20doc_20210922.pdf

Appendix F
Heat Exposure Management Plan

Field Program Heat Exposure Management Plan

Date: _____
Project No: _____
Project Name: _____

This Field Program Heat Exposure Management Plan (Plan) is an addendum to the existing project-specific Health and Safety Plan (HASP) for field activities. All personnel who have previously signed acknowledging the HASP must sign off acknowledging this Plan. Acknowledgement of this Plan will be included with future acknowledgements of the overall HASP. This Plan is intended to be used primarily from May to September of each year; however, depending on temperatures it may also be needed during other months.

Heat-related illnesses can happen if workplace activities in a hot environment overwhelm the body's ability to cool itself. This becomes more likely if any of the risk factors are present. Examples include working in a hot environment without adequate access to water for rehydration, working in protective gear that does not allow air circulation across the skin, or working where the humidity is too high for sweat to evaporate.

This Plan should be applied for anyone working outdoors more than 15 minutes in any 60-minute period in heat index temperatures:

- As low as 52°F when wearing clothing that is non-breathable or provides a vapor barrier like rain gear, chemical resistant suits, or Level A suits
- Starting at 77°F when wearing double layer woven clothing like sweatshirts, coveralls, and jackets on top of other clothes
- At 80°F when wearing any other type of clothing like typical shirts and pants

Some individuals are more susceptible to heat stress than others—for example, individuals who are not acclimatized or who come to work dehydrated.

Prevention Measures

The field team shares responsibility for safety at the work site. This includes watching out for yourself and others because heat illness can become a life-threatening condition quickly if unnoticed or ignored. Speak up if you notice anything that could be unsafe or result in someone getting hurt or sick.

Set up the Work Site for Shade

Before work begins, the Field Lead will assess shade options for the work site. Shade such as trees, walls, or structures like a portable canopy can be used. Fans can help if the air temperature does not go above 95°F, but if air-conditioned spaces are available, like cabs, they can be used to cool individuals off. The Field Lead is responsible to ensure that equipment is available, functional,

transported, and set up properly. The shade area must either be open to the air or provide mechanical ventilation for cooling.

The amount of shade present must be at least enough to accommodate the number of staff on recovery or rest periods, so that they can sit in a normal posture fully in the shade. The shade must be located as close as practical to the areas where staff are working. Shade present during meal periods must be large enough to accommodate the number of staff on the meal period that remain on site. If shade cannot be provided due to safety or feasibility concerns, alternative cooling measures must be implemented.

Schedule Work to Reduce Heat Exposure

The Field Lead, in coordination with the Project Manager, will consider changes to shift timing to avoid working during the hottest period of the day. This could include starting earlier, working in the evening, or splitting the day with a break during the hottest part of the day.

Stay Hydrated

Do not wait to be thirsty to drink water, and do not drink it all at once. In fact, it is best to start drinking water before work. Drink small amounts often throughout the day to stay hydrated. Additional water breaks are allowed during hot days. Potable water should be cool (66ºF to 77ºF) or cold (35ºF to 65ºF). During moderate activity, in moderately hot conditions, staff should drink about 8 ounces of liquid every 15 to 20 minutes.

Sports drinks low in sugar are okay but should not completely replace water. Avoid drinks with caffeine and high sugar content like sodas because they will not hydrate you.

There should be enough water to allow each staff member to drink at least a quart of water each hour. (Drink at least 1 cup every 15 to 20 minutes.)

The Field Lead will ensure that water is available to staff and that it is consumed on a regular basis.

Encourage staff to eat regular meals and snacks because these provide enough salt and electrolytes to replace those lost through sweating if enough water is consumed.

Allow Time to Adjust to Heat (Acclimatization)

It takes about 2 weeks to fully adjust to hot working conditions. This adjustment is lost if you are away from the hot conditions for a week or more. Acclimatization is especially critical for heavy work in hot temperatures.

Start with light physical work and/or short durations of work time, and slowly increase each day. Increase by 20% (of the total shift) each day for non-acclimatized staff.

Training

Each year, staff who may encounter the working conditions listed above will be provided with safety training on the dangers of outdoor heat exposure, the steps we take to protect them, and actions they must follow to prevent heat-related illness. This information will additionally be covered in tailgate meetings at the project site.

NWS Heat Index — Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

Caution | Extreme Caution | Danger | Extreme Danger

Source: https://www.weather.gov/images/safety/heatindexchart-650.jpg

High Heat Practices

The following additional high heat practices must be implemented when the ambient heat index exceeds 90ºF:

- Ensure that effective communication by voice, observation, or electronic means is maintained so that staff at the work site can contact a Supervisor when necessary. An electronic device, such as a mobile phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Ensure that staff are observed for alertness and signs and symptoms of heat illness and monitored to determine whether medical attention is necessary by implementing one or more of the following:
  - Establish regular communication with staff working alone, such as by radio, mobile phone, or other alternative means.

  - Create a mandatory buddy system.
  - Implement other equally effective means of observation or communication.
- The Field Lead must designate and equip one or more staff on the work site as authorized to call for emergency medical services and must allow other staff to call for emergency services when designated staff are not immediately available (such a practice supplements existing requirements to ensure that emergency medical care is immediately available in all workplaces).
- The Field Lead must ensure that each staff member takes a minimum 10-minute preventative cool-down rest period in the shade at least every 2 hours, regardless of the overall length of the shift.

Responding to Heat-Related Illness

Let a Supervisor or someone nearby know if you or a coworker are experiencing any signs or symptoms of heat-related illness and take immediate action to ensure things do not get dangerously worse.

- Time is critical. Get the individual away from the hot area into a cool shaded area. Quick action increases the chances for a full recovery.
- Let the individual rest and drink cool water.
- Remove any PPE as appropriate.
- Use ice packs or cooling towels as appropriate and available.
- Never leave an individual who is experiencing heat-related problems alone; things could get worse.
- If the individual is a lone worker, an Anchor QEA representative will stay on the line with the individual. Also, in the case of a lone worker, emergency services will be called to the location of the individual unless an Anchor QEA representative or representative of another company can quickly arrive at the location.
- If the individual does not respond quickly, call emergency medical services.
- Follow the steps in the main HASP document for notifying emergency services to include directions to the site.
- If the individual is in a remote or non-developed area with unidentified roads, you may need to have someone meet emergency services at the closest point to guide them to the victim's location.
- Notify Health and Safety.

If the individual receives medical attention, a written authorization must be obtained from the provider indicating that the individual can get back to work and whether there are any restrictions or limitations.

Risk Factors

The following are environmental risk factors for heat illness:

- Air temperature above 90ºF
- Relative humidity above 40%
- Radiant heat from the sun and other sources
- Conductive heat sources such as dark-colored work surfaces
- Lack of air movement
- Physical effort needed for the work
- Use of nonbreathable protective clothing and other Personal Protective Equipment (PPE)

The following are personal risk factors for heat illness:

- Lack of acclimation to warmer temperatures
- Poor general health
- Dehydration
- Alcohol consumption
- Caffeine consumption
- Previous heat-related illness
- Use of prescription medications that affect the body's water retention or other physiological responses to heat such as beta blockers, diuretics, antihistamines, tranquilizers, and antipsychotics

Heat-Related Illnesses

Heat Rash

Heat rash is the most common health problem in hot work environments. It is caused by sweating and looks like a red cluster of pimples or small blisters. Heat rash usually appears on parts of the body that overlap or rub other parts of the body, such as in the groin area, under the arms or breasts, and in knee or elbow creases. If an individual has symptoms of heat rash, provide a cooler, less humid work environment, if possible. Advise the individual to keep the area dry and not to use ointments and creams that make the skin warm or moist, which can make the rash worse.

Heat Exhaustion

Heat exhaustion can best be prevented by being aware of one's physical limits in a hazardous environment on hot, humid days. The most important factor is to drink enough clear fluids (especially water, not alcohol or caffeine) to replace fluids lost to perspiration. Signs and symptoms of heat exhaustion typically include the following:

- Profuse sweating

- Weakness and fatigue
- Nausea and vomiting
- Muscle cramps (associated with dehydration)
- Headache
- Light-headedness or fainting (fainting or loss of consciousness is potentially serious and should be treated as a medical emergency)

When you recognize heat exhaustion symptoms in an individual, you must intervene; stop the activity, and move the individual to a cooler environment. Cooling off and rehydrating with water (or electrolyte-replacing sports drinks) is the cornerstone of treatment for heat exhaustion. If the individual resumes work before their core temperature returns to normal levels, symptoms may quickly return.

If there is no intervention and the body's temperature regulation fails, heat exhaustion can rapidly progress to heat stroke, a life-threatening condition!

Heat Stroke

Heat stroke requires an immediate emergency medical response. The individual may stop sweating, become confused or lethargic, and may even have a seizure! The internal body temperature may exceed 106ºF. Signs and symptoms of heat stroke typically include the following:

- Absence of sweating
- Dry skin
- Agitation or strange behavior
- Dizziness, disorientation, or lethargy
- Seizures or signs that mimic those of a heart attack

Ensure that emergency responders are summoned immediately if heat stroke is suspected. While waiting for emergency responders to arrive, cool the individual; move the individual to an air-conditioned environment or a cool, shady area, and help the individual remove any unnecessary clothing. Do not leave the individual unattended. Heat stroke requires immediate medical attention to prevent permanent damage to the brain and other vital organs that can result in death.

Responsibilities

Staff need to be aware of the following:

- How heat can make them sick, and how to recognize the common signs and symptoms of heat-related illness in themselves and coworkers. The four most common conditions are heat rash, heat cramps, heat exhaustion, and heat stroke.

- The environmental factors that increase risk for heat-related illness such as higher temperatures, humidity, sunlight (working under direct sunlight makes it feel about 15 degrees hotter), additional sources of heat like powered equipment and asphalt, no wind, level of physical activity, and wearing of PPE or layers of clothing
- Personal factors that may increase susceptibility to heat-related illness including age, not being acclimatized, having medical conditions such as hormonal and heart issues and diabetes, dehydration, and use of substances that can affect the body's response to heat like drugs, alcohol, caffeine, nicotine, and medications
- The importance of removing heat-retaining PPE such as non-breathable chemical resistant clothing during all breaks to allow the body to cool down
- How to stay well hydrated by drinking small quantities of water or other acceptable beverages frequently throughout the day
- The importance of acclimatization (to get used to the conditions). It takes about 5 days to start and 2 weeks to be fully acclimated
- How to immediately report signs or symptoms of heat-related illness they experience or observe in coworkers, and how to immediately respond to prevent the situation from becoming a medical emergency. How to identify and what to do during a heat-related medical emergency (e.g., potential heat stroke)

Supervisors need to know the following (in addition to what is detailed for staff above):

- The procedures to follow to implement the heat-related illness prevention plan, including the acclimatization schedule, how to keep track of environmental conditions throughout the day, when to increase the number of breaks or stop work early, checking that staff are accessing shade and water (especially for mobile operations), encouraging them to stay hydrated, and communicating with lone workers to ensure they are safe. The free OSHA-NIOSH Heat Safety Tool app could be helpful: https://www.cdc.gov/niosh/topics/heatstress/heatapp.html
- When to provide PPE like cooling vests and gel-filled bandanas
- What the Supervisor needs to do if an individual shows signs and symptoms of possible heat-related illness, including appropriate emergency response procedures and how to transport any affected staff to a medical service provider

Sources

https://osha.oregon.gov/OSHAPubs/pubform/heat-sample-program.pdf

https://www.lni.wa.gov/safety-health/_docs/HRIAPPAddendum.doc

Heat Exposure Management Plan Acknowledgement

Project Number: _____

Project Name: _____

My signature below certifies that I have read and understand the policies and procedures specified in this Field Program Heat Exposure Management Plan.

Date	Name (print)	Signature	Company

Appendix G
Public Notices

9 Water Street, First Floor
Amesbury, Massachusetts 01913
978.792.5737

December 16, 2022

Haffner Realty Trust
c/o Ms. Sarah T. Connolly, Esq., Trustee
Nixon Peabody LLP
53 State Street
Boston, Massachusetts 02109

Re: Results of Environmental Analyses
Release Tracking Number (RTN) 3-32792
284 Winter Street
Haverhill, Massachusetts
Little River Sediment Sampling

Dear Attorney Connolly,

Massachusetts regulations require that results of environmental sample analyses be provided to any owner of property where samples are collected as part of a response action under the Massachusetts Contingency Plan (MCP – 310 CMR 40.0000). These notice requirements are contained in the MCP (310 CMR 40.1403[10]). The sampling is part of a Phase IV Remedy Implementation Plan (Phase IV RIP) of the referenced property that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

Anchor QEA collected porewater and sediment samples from within the Little River adjacent to the 284 Winter Street property on October 19, 20, and 21 and November 4, 2022, and submitted them to Alpha Analytical of Westborough, Massachusetts for chemical analysis. Extracted data from the laboratory reports applicable to the above reference property are attached to this letter. National Grid will have the results summarized and discussed in a Phase IV RIP report that National Grid will have submitted to MassDEP. We have also enclosed a copy of the MassDEP transmittal form (BWSC123) that National Grid will use.

Please note that public involvement opportunities are available under 310 CMR 40.1403(9) and 40.1404. For more information about the public involvement regulations that require this notice and a description of such public involvement activities available under the MCP, please refer to the following MassDEP web address https://www.mass.gov/orgs/bureau-of-waste-site-cleanup-massdep.

Sincerely,

Billie-Jo L Gauley

Billie-Jo L. Gauley
Anchor QEA, LLC

cc: Charles A. Lindberg, LSP (GZA GeoEnvironmental, Inc.)
Jesse Edmands (National Grid)
Robin Main and Christine Dieter (Hinckley Allen)
Matthew LaLone (Energy North Group)

Attachments

BWSC123 Form – Notice of Environmental Sampling
Approximate Sample Location Map
Analytical Data

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

A. The address of the disposal site related to this Notice and Release Tracking Number (provided above):

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

B. This notice is being provided to the following party:

1. Name: Haffner Realty Trust c/o Ms. Sarah T Connolly, Esq.
2. Street Address: 53 State Street

City/Town: Boston Zip Code: 02109

C. This notice is being given to inform its recipient (the party listed in Section B):

☑ 1. That environmental sampling will be/has been conducted at property owned by the recipient of this notice.

☑ 2. Of the results of environmental sampling conducted at property owned by the recipient of this notice.

☑ 3. Check to indicate if the analytical results are attached. (If item 2. above is checked, the analytical results from the environmental sampling must be attached to this notice.)

D. Location of the property where the environmental sampling will be/has been conducted:

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

2. MCP phase of work during which the sampling will be/has been conducted:

☐ Immediate Response Action
☐ Release Abatement Measure
☐ Utility-related Abatement Measure
☐ Phase I Initial Site Investigation
☐ Phase II Comprehensive Site Assessment
☐ Phase III Feasibility Evaluation
☑ Phase IV Remedy Implementation Plan
☐ Phase V/Remedy Operation Status
☐ Post-Temporary Solution Operation, Maintenance and Monitoring
☐ Other _____ (specify)

3. Description of property where sampling will be/has been conducted:

☐ residential ☑ commercial ☐ industrial ☐ school/playground ☐ Other _____ (specify)

4. Description of the sampling locations and types (e.g., soil, groundwater, indoor air, soil gas) to the extent known at the time of this notice.

Collection of porewater and sediment samples within the Little River at the 284 Winter Street property.

E. Contact information related to the party providing this notice:

Contact Name: Jesse Edmands
Street Address: 170 Data Drive
City/Town: Waltham Zip Code: 02451
Telephone: (781) 906-3987 Email: jesse.edmands@nationalgrid.com

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

MASSACHUSETTS REGULATIONS THAT REQUIRE THIS NOTICE

This notice is being provided pursuant to the Massachusetts Contingency Plan and the notification requirement at 310 CMR 40.1403(10). The Massachusetts Contingency Plan is a state regulation that specifies requirements for parties who are taking actions to address releases of chemicals (oil or hazardous material) to the environment.

THE PERSON(S) PROVIDING THIS NOTICE

This notice has been sent to you by the party who is addressing a release of oil or hazardous material to the environment at the location listed in **Section A** on the reverse side of this form. (The regulations refer to the area where the oil or hazardous material is present as the "disposal site".)

PURPOSE OF THIS NOTICE

When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed in **Section B** on the reverse side of this form) be given notice of the environmental sampling. The regulations also require that the property owner subsequently receive the analytical results following the analysis of the environmental samples.

Section C on the reverse side of this form indicates the circumstance under which you are receiving this notice at this time. If you are receiving this notice to inform you of the analytical results following the analysis of the environmental samples, you should also have received, as an attachment, a copy of analytical results. These results should indicate the number and type(s) of samples (e.g., soil, groundwater) analyzed, any chemicals identified, and the measured concentrations of those chemicals.

Section D on the reverse side of this form identifies the property where the environmental sampling will be/has been conducted, provides a description of the sampling locations within the property, and indicates the phase of work under the Massachusetts Contingency Plan regulatory process during which the samples will be/were collected.

FOR MORE INFORMATION

Information about the general process for addressing releases of oil or hazardous material under the Massachusetts Contingency Plan and related public involvement opportunities may be found at http://www.mass.gov/eea/agencies/massdep/cleanup. For more information regarding this notice, you may contact the party listed in **Section E** on the reverse side of this form. Information about the disposal site identified in Section A is also available in files at the Massachusetts Department of Environmental Protection. See http://public.dep.state.ma.us/SearchableSites2/Search.aspx to view site-specific files on-line or http://mass.gov/eea/agencies/massdep/about/contacts/conduct-a-file-review.html if you would like to make an appointment to see these files in person. Please reference the **Release Tracking Number** listed in the upper right hand corner on the reverse side of this form when making file review appointments.

LEGEND:

- Tax Parcel
- Property Boundary
- Approximate Porewater Sample Location
- Approximate Sedimetn Core Location

NOTES:

1. Horizontal datum is Massachusetts State Plane, North American Datum of 1983, U.S. Feet.
2. Aerial image is acquired from MassGIS at https://www.mass.gov/info-details/massgis-data-layers. Image date is 2019.
3. Tax parcels acquired from MassGIS at https://massgis.maps.arcgis.com on August 27, 2019.
4. Property boundary as recorded on ALTA/ACSM Land Title Survey plan

0 50
Feet

Publish Date: 2022/10/13, 3:26 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\National_Grid_0327\284_Winter_Street\Maps\Sampling_October2022\AQ_F01_ProposedPDI_locations.mxd

ANCHOR QEA

Figure 1
Approximate Sample Locations
Former Haverhill MGP Site

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D
Client ID: AQPW-10-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 10:53
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 14:36
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	200	68.	100
1,1-Dichloroethane	ND		ug/l	100	21.	100
Chloroform	ND		ug/l	100	22.	100
Carbon tetrachloride	ND		ug/l	100	13.	100
1,2-Dichloropropane	ND		ug/l	100	14.	100
Dibromochloromethane	ND		ug/l	100	15.	100
1,1,2-Trichloroethane	ND		ug/l	100	14.	100
Tetrachloroethene	ND		ug/l	100	18.	100
Chlorobenzene	ND		ug/l	100	18.	100
Trichlorofluoromethane	ND		ug/l	200	16.	100
1,2-Dichloroethane	ND		ug/l	100	13.	100
1,1,1-Trichloroethane	ND		ug/l	100	16.	100
Bromodichloromethane	ND		ug/l	100	19.	100
trans-1,3-Dichloropropene	ND		ug/l	40	16.	100
cis-1,3-Dichloropropene	ND		ug/l	40	14.	100
1,3-Dichloropropene, Total	ND		ug/l	40	14.	100
1,1-Dichloropropene	ND		ug/l	200	24.	100
Bromoform	ND		ug/l	200	25.	100
1,1,2,2-Tetrachloroethane	ND		ug/l	100	17.	100
Benzene	410		ug/l	50	16.	100
Toluene	34	J	ug/l	100	20.	100
Ethylbenzene	1600		ug/l	100	17.	100
Chloromethane	ND		ug/l	200	20.	100
Bromomethane	ND		ug/l	200	26.	100
Vinyl chloride	ND		ug/l	100	7.1	100
Chloroethane	ND		ug/l	200	13.	100
1,1-Dichloroethene	ND		ug/l	100	17.	100
trans-1,2-Dichloroethene	ND		ug/l	100	16.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D Date Collected: 10/19/22 10:53

Client ID: AQPW-10-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	100	18.	100
1,2-Dichlorobenzene	ND		ug/l	100	18.	100
1,3-Dichlorobenzene	ND		ug/l	100	19.	100
1,4-Dichlorobenzene	ND		ug/l	100	19.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	1300		ug/l	200	33.	100
o-Xylene	790		ug/l	100	39.	100
Xylenes, Total	2100		ug/l	100	33.	100
cis-1,2-Dichloroethene	ND		ug/l	100	19.	100
1,2-Dichloroethene, Total	ND		ug/l	100	16.	100
Dibromomethane	ND		ug/l	200	36.	100
1,2,3-Trichloropropane	ND		ug/l	200	18.	100
Styrene	ND		ug/l	100	36.	100
Dichlorodifluoromethane	ND		ug/l	200	24.	100
Acetone	ND		ug/l	500	150	100
Carbon disulfide	ND		ug/l	200	30.	100
Methyl ethyl ketone	ND		ug/l	500	190	100
Methyl isobutyl ketone	ND		ug/l	500	42.	100
2-Hexanone	ND		ug/l	500	52.	100
Bromochloromethane	ND		ug/l	200	15.	100
Tetrahydrofuran	ND		ug/l	200	52.	100
2,2-Dichloropropane	ND		ug/l	200	20.	100
1,2-Dibromoethane	ND		ug/l	200	19.	100
1,3-Dichloropropane	ND		ug/l	200	21.	100
1,1,1,2-Tetrachloroethane	ND		ug/l	100	16.	100
Bromobenzene	ND		ug/l	200	15.	100
n-Butylbenzene	ND		ug/l	200	19.	100
sec-Butylbenzene	ND		ug/l	200	18.	100
tert-Butylbenzene	ND		ug/l	200	20.	100
o-Chlorotoluene	ND		ug/l	200	22.	100
p-Chlorotoluene	ND		ug/l	200	18.	100
1,2-Dibromo-3-chloropropane	ND		ug/l	200	35.	100
Hexachlorobutadiene	ND		ug/l	60	22.	100
Isopropylbenzene	180	J	ug/l	200	19.	100
p-Isopropyltoluene	24	J	ug/l	200	19.	100
Naphthalene	9900		ug/l	200	22.	100
n-Propylbenzene	44	J	ug/l	200	17.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D Date Collected: 10/19/22 10:53

Client ID: AQPW-10-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	200	23.	100
1,2,4-Trichlorobenzene	ND		ug/l	200	22.	100
1,3,5-Trimethylbenzene	260		ug/l	200	22.	100
1,2,4-Trimethylbenzene	900		ug/l	200	19.	100
Diethyl ether	ND		ug/l	200	16.	100
Diisopropyl Ether	ND		ug/l	200	42.	100
Ethyl-Tert-Butyl-Ether	ND		ug/l	200	18.	100
Tertiary-Amyl Methyl Ether	ND		ug/l	200	28.	100
1,4-Dioxane	ND		ug/l	25000	6100	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	92		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 15:17
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	3300		ug/l	25	8.0	50
Toluene	40	J	ug/l	50	10.	50
Ethylbenzene	1500		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D Date Collected: 10/19/22 11:37

Client ID: AQPW-09-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	ND		ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	970		ug/l	100	17.	50
o-Xylene	730		ug/l	50	20.	50
Xylenes, Total	1700		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	120		ug/l	100	9.4	50
p-Isopropyltoluene	18	J	ug/l	100	9.4	50
Naphthalene	7300		ug/l	100	11.	50
n-Propylbenzene	30	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	200		ug/l	100	11.	50
1,2,4-Trimethylbenzene	660		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D
Client ID: AQPW-08-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 12:30
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 16:40
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	20	6.8	10
1,1-Dichloroethane	ND		ug/l	10	2.1	10
Chloroform	ND		ug/l	10	2.2	10
Carbon tetrachloride	ND		ug/l	10	1.3	10
1,2-Dichloropropane	ND		ug/l	10	1.4	10
Dibromochloromethane	ND		ug/l	10	1.5	10
1,1,2-Trichloroethane	ND		ug/l	10	1.4	10
Tetrachloroethene	ND		ug/l	10	1.8	10
Chlorobenzene	ND		ug/l	10	1.8	10
Trichlorofluoromethane	ND		ug/l	20	1.6	10
1,2-Dichloroethane	ND		ug/l	10	1.3	10
1,1,1-Trichloroethane	ND		ug/l	10	1.6	10
Bromodichloromethane	ND		ug/l	10	1.9	10
trans-1,3-Dichloropropene	ND		ug/l	4.0	1.6	10
cis-1,3-Dichloropropene	ND		ug/l	4.0	1.4	10
1,3-Dichloropropene, Total	ND		ug/l	4.0	1.4	10
1,1-Dichloropropene	ND		ug/l	20	2.4	10
Bromoform	ND		ug/l	20	2.5	10
1,1,2,2-Tetrachloroethane	ND		ug/l	10	1.7	10
Benzene	520		ug/l	5.0	1.6	10
Toluene	3.5	J	ug/l	10	2.0	10
Ethylbenzene	250		ug/l	10	1.7	10
Chloromethane	ND		ug/l	20	2.0	10
Bromomethane	ND		ug/l	20	2.6	10
Vinyl chloride	ND		ug/l	10	0.71	10
Chloroethane	ND		ug/l	20	1.3	10
1,1-Dichloroethene	ND		ug/l	10	1.7	10
trans-1,2-Dichloroethene	ND		ug/l	10	1.6	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D Date Collected: 10/19/22 12:30

Client ID: AQPW-08-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	10	1.8	10
1,2-Dichlorobenzene	ND		ug/l	10	1.8	10
1,3-Dichlorobenzene	ND		ug/l	10	1.9	10
1,4-Dichlorobenzene	ND		ug/l	10	1.9	10
Methyl tert butyl ether	ND		ug/l	20	1.7	10
p/m-Xylene	23		ug/l	20	3.3	10
o-Xylene	66		ug/l	10	3.9	10
Xylenes, Total	89		ug/l	10	3.3	10
cis-1,2-Dichloroethene	ND		ug/l	10	1.9	10
1,2-Dichloroethene, Total	ND		ug/l	10	1.6	10
Dibromomethane	ND		ug/l	20	3.6	10
1,2,3-Trichloropropane	ND		ug/l	20	1.8	10
Styrene	ND		ug/l	10	3.6	10
Dichlorodifluoromethane	ND		ug/l	20	2.4	10
Acetone	ND		ug/l	50	15.	10
Carbon disulfide	ND		ug/l	20	3.0	10
Methyl ethyl ketone	ND		ug/l	50	19.	10
Methyl isobutyl ketone	ND		ug/l	50	4.2	10
2-Hexanone	ND		ug/l	50	5.2	10
Bromochloromethane	ND		ug/l	20	1.5	10
Tetrahydrofuran	ND		ug/l	20	5.2	10
2,2-Dichloropropane	ND		ug/l	20	2.0	10
1,2-Dibromoethane	ND		ug/l	20	1.9	10
1,3-Dichloropropane	ND		ug/l	20	2.1	10
1,1,1,2-Tetrachloroethane	ND		ug/l	10	1.6	10
Bromobenzene	ND		ug/l	20	1.5	10
n-Butylbenzene	ND		ug/l	20	1.9	10
sec-Butylbenzene	ND		ug/l	20	1.8	10
tert-Butylbenzene	ND		ug/l	20	2.0	10
o-Chlorotoluene	ND		ug/l	20	2.2	10
p-Chlorotoluene	ND		ug/l	20	1.8	10
1,2-Dibromo-3-chloropropane	ND		ug/l	20	3.5	10
Hexachlorobutadiene	ND		ug/l	6.0	2.2	10
Isopropylbenzene	39		ug/l	20	1.9	10
p-Isopropyltoluene	3.8	J	ug/l	20	1.9	10
Naphthalene	1200		ug/l	20	2.2	10
n-Propylbenzene	15	J	ug/l	20	1.7	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D Date Collected: 10/19/22 12:30

Client ID: AQPW-08-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	20	2.3	10
1,2,4-Trichlorobenzene	ND		ug/l	20	2.2	10
1,3,5-Trimethylbenzene	24		ug/l	20	2.2	10
1,2,4-Trimethylbenzene	150		ug/l	20	1.9	10
Diethyl ether	ND		ug/l	20	1.6	10
Diisopropyl Ether	ND		ug/l	20	4.2	10
Ethyl-Tert-Butyl-Ether	ND		ug/l	20	1.8	10
Tertiary-Amyl Methyl Ether	ND		ug/l	20	2.8	10
1,4-Dioxane	ND		ug/l	2500	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	106		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 15:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	410		ug/l	25	8.0	50
Toluene	33	J	ug/l	50	10.	50
Ethylbenzene	1600		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D Date Collected: 10/19/22 00:00

Client ID: DUP1-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	ND		ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	1300		ug/l	100	17.	50
o-Xylene	820		ug/l	50	20.	50
Xylenes, Total	2100		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	170		ug/l	100	9.4	50
p-Isopropyltoluene	22	J	ug/l	100	9.4	50
Naphthalene	9400		ug/l	100	11.	50
n-Propylbenzene	43	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	240		ug/l	100	11.	50
1,2,4-Trimethylbenzene	860		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	10	3.4	5
1,1-Dichloroethane	ND		ug/l	5.0	1.0	5
Chloroform	ND		ug/l	5.0	1.1	5
Carbon tetrachloride	ND		ug/l	5.0	0.67	5
1,2-Dichloropropane	ND		ug/l	5.0	0.68	5
Dibromochloromethane	ND		ug/l	5.0	0.74	5
1,1,2-Trichloroethane	ND		ug/l	5.0	0.72	5
Tetrachloroethene	ND		ug/l	5.0	0.90	5
Chlorobenzene	ND		ug/l	5.0	0.89	5
Trichlorofluoromethane	ND		ug/l	10	0.80	5
1,2-Dichloroethane	ND		ug/l	5.0	0.66	5
1,1,1-Trichloroethane	ND		ug/l	5.0	0.79	5
Bromodichloromethane	ND		ug/l	5.0	0.96	5
trans-1,3-Dichloropropene	ND		ug/l	2.0	0.82	5
cis-1,3-Dichloropropene	ND		ug/l	2.0	0.72	5
1,3-Dichloropropene, Total	ND		ug/l	2.0	0.72	5
1,1-Dichloropropene	ND		ug/l	10	1.2	5
Bromoform	ND		ug/l	10	1.2	5
1,1,2,2-Tetrachloroethane	ND		ug/l	5.0	0.84	5
Benzene	3.5		ug/l	2.5	0.80	5
Toluene	ND		ug/l	5.0	1.0	5
Ethylbenzene	60		ug/l	5.0	0.84	5
Chloromethane	ND		ug/l	10	1.0	5
Bromomethane	ND		ug/l	10	1.3	5
Vinyl chloride	ND		ug/l	5.0	0.36	5
Chloroethane	ND		ug/l	10	0.67	5
1,1-Dichloroethene	ND		ug/l	5.0	0.84	5
trans-1,2-Dichloroethene	ND		ug/l	5.0	0.82	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D Date Collected: 10/19/22 15:35

Client ID: AQPW-07-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	5.0	0.88	5
1,2-Dichlorobenzene	ND		ug/l	5.0	0.92	5
1,3-Dichlorobenzene	ND		ug/l	5.0	0.93	5
1,4-Dichlorobenzene	ND		ug/l	5.0	0.94	5
Methyl tert butyl ether	ND		ug/l	10	0.83	5
p/m-Xylene	22		ug/l	10	1.7	5
o-Xylene	25		ug/l	5.0	2.0	5
Xylenes, Total	47		ug/l	5.0	1.7	5
cis-1,2-Dichloroethene	ND		ug/l	5.0	0.94	5
1,2-Dichloroethene, Total	ND		ug/l	5.0	0.82	5
Dibromomethane	ND		ug/l	10	1.8	5
1,2,3-Trichloropropane	ND		ug/l	10	0.88	5
Styrene	ND		ug/l	5.0	1.8	5
Dichlorodifluoromethane	ND		ug/l	10	1.2	5
Acetone	ND		ug/l	25	7.3	5
Carbon disulfide	ND		ug/l	10	1.5	5
Methyl ethyl ketone	ND		ug/l	25	9.7	5
Methyl isobutyl ketone	ND		ug/l	25	2.1	5
2-Hexanone	ND		ug/l	25	2.6	5
Bromochloromethane	ND		ug/l	10	0.76	5
Tetrahydrofuran	ND		ug/l	10	2.6	5
2,2-Dichloropropane	ND		ug/l	10	1.0	5
1,2-Dibromoethane	ND		ug/l	10	0.96	5
1,3-Dichloropropane	ND		ug/l	10	1.1	5
1,1,1,2-Tetrachloroethane	ND		ug/l	5.0	0.82	5
Bromobenzene	ND		ug/l	10	0.76	5
n-Butylbenzene	ND		ug/l	10	0.96	5
sec-Butylbenzene	ND		ug/l	10	0.90	5
tert-Butylbenzene	ND		ug/l	10	0.98	5
o-Chlorotoluene	ND		ug/l	10	1.1	5
p-Chlorotoluene	ND		ug/l	10	0.92	5
1,2-Dibromo-3-chloropropane	ND		ug/l	10	1.8	5
Hexachlorobutadiene	ND		ug/l	3.0	1.1	5
Isopropylbenzene	9.4	J	ug/l	10	0.94	5
p-Isopropyltoluene	2.1	J	ug/l	10	0.94	5
Naphthalene	570		ug/l	10	1.1	5
n-Propylbenzene	3.7	J	ug/l	10	0.86	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	10	1.2	5
1,2,4-Trichlorobenzene	ND		ug/l	10	1.1	5
1,3,5-Trimethylbenzene	16		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	53		ug/l	10	0.96	5
Diethyl ether	ND		ug/l	10	0.82	5
Diisopropyl Ether	ND		ug/l	10	2.1	5
Ethyl-Tert-Butyl-Ether	ND		ug/l	10	0.90	5
Tertiary-Amyl Methyl Ether	ND		ug/l	10	1.4	5
1,4-Dioxane	ND		ug/l	1200	300	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D
Client ID: AQPW-06-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 14:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:35
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	20	6.8	10
1,1-Dichloroethane	ND		ug/l	10	2.1	10
Chloroform	ND		ug/l	10	2.2	10
Carbon tetrachloride	ND		ug/l	10	1.3	10
1,2-Dichloropropane	ND		ug/l	10	1.4	10
Dibromochloromethane	ND		ug/l	10	1.5	10
1,1,2-Trichloroethane	ND		ug/l	10	1.4	10
Tetrachloroethene	ND		ug/l	10	1.8	10
Chlorobenzene	ND		ug/l	10	1.8	10
Trichlorofluoromethane	ND		ug/l	20	1.6	10
1,2-Dichloroethane	ND		ug/l	10	1.3	10
1,1,1-Trichloroethane	ND		ug/l	10	1.6	10
Bromodichloromethane	ND		ug/l	10	1.9	10
trans-1,3-Dichloropropene	ND		ug/l	4.0	1.6	10
cis-1,3-Dichloropropene	ND		ug/l	4.0	1.4	10
1,3-Dichloropropene, Total	ND		ug/l	4.0	1.4	10
1,1-Dichloropropene	ND		ug/l	20	2.4	10
Bromoform	ND		ug/l	20	2.5	10
1,1,2,2-Tetrachloroethane	ND		ug/l	10	1.7	10
Benzene	49		ug/l	5.0	1.6	10
Toluene	5.8	J	ug/l	10	2.0	10
Ethylbenzene	400		ug/l	10	1.7	10
Chloromethane	ND		ug/l	20	2.0	10
Bromomethane	ND		ug/l	20	2.6	10
Vinyl chloride	ND		ug/l	10	0.71	10
Chloroethane	ND		ug/l	20	1.3	10
1,1-Dichloroethene	ND		ug/l	10	1.7	10
trans-1,2-Dichloroethene	ND		ug/l	10	1.6	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D Date Collected: 10/19/22 14:00

Client ID: AQPW-06-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	10	1.8	10
1,2-Dichlorobenzene	ND		ug/l	10	1.8	10
1,3-Dichlorobenzene	ND		ug/l	10	1.9	10
1,4-Dichlorobenzene	ND		ug/l	10	1.9	10
Methyl tert butyl ether	ND		ug/l	20	1.7	10
p/m-Xylene	36		ug/l	20	3.3	10
o-Xylene	220		ug/l	10	3.9	10
Xylenes, Total	260		ug/l	10	3.3	10
cis-1,2-Dichloroethene	ND		ug/l	10	1.9	10
1,2-Dichloroethene, Total	ND		ug/l	10	1.6	10
Dibromomethane	ND		ug/l	20	3.6	10
1,2,3-Trichloropropane	ND		ug/l	20	1.8	10
Styrene	ND		ug/l	10	3.6	10
Dichlorodifluoromethane	ND		ug/l	20	2.4	10
Acetone	ND		ug/l	50	15.	10
Carbon disulfide	ND		ug/l	20	3.0	10
Methyl ethyl ketone	ND		ug/l	50	19.	10
Methyl isobutyl ketone	ND		ug/l	50	4.2	10
2-Hexanone	ND		ug/l	50	5.2	10
Bromochloromethane	ND		ug/l	20	1.5	10
Tetrahydrofuran	ND		ug/l	20	5.2	10
2,2-Dichloropropane	ND		ug/l	20	2.0	10
1,2-Dibromoethane	ND		ug/l	20	1.9	10
1,3-Dichloropropane	ND		ug/l	20	2.1	10
1,1,1,2-Tetrachloroethane	ND		ug/l	10	1.6	10
Bromobenzene	ND		ug/l	20	1.5	10
n-Butylbenzene	ND		ug/l	20	1.9	10
sec-Butylbenzene	ND		ug/l	20	1.8	10
tert-Butylbenzene	ND		ug/l	20	2.0	10
o-Chlorotoluene	ND		ug/l	20	2.2	10
p-Chlorotoluene	ND		ug/l	20	1.8	10
1,2-Dibromo-3-chloropropane	ND		ug/l	20	3.5	10
Hexachlorobutadiene	ND		ug/l	6.0	2.2	10
Isopropylbenzene	36		ug/l	20	1.9	10
p-Isopropyltoluene	3.9	J	ug/l	20	1.9	10
Naphthalene	1100		ug/l	20	2.2	10
n-Propylbenzene	13	J	ug/l	20	1.7	10

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D Date Collected: 10/19/22 14:00

Client ID: AQPW-06-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	20	2.3	10
1,2,4-Trichlorobenzene	ND		ug/l	20	2.2	10
1,3,5-Trimethylbenzene	16	J	ug/l	20	2.2	10
1,2,4-Trimethylbenzene	140		ug/l	20	1.9	10
Diethyl ether	ND		ug/l	20	1.6	10
Diisopropyl Ether	ND		ug/l	20	4.2	10
Ethyl-Tert-Butyl-Ether	ND		ug/l	20	1.8	10
Tertiary-Amyl Methyl Ether	ND		ug/l	20	2.8	10
1,4-Dioxane	ND		ug/l	2500	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 20:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	400	140	200
1,1-Dichloroethane	ND		ug/l	200	42.	200
Chloroform	ND		ug/l	200	44.	200
Carbon tetrachloride	ND		ug/l	200	27.	200
1,2-Dichloropropane	ND		ug/l	200	27.	200
Dibromochloromethane	ND		ug/l	200	30.	200
1,1,2-Trichloroethane	ND		ug/l	200	29.	200
Tetrachloroethene	ND		ug/l	200	36.	200
Chlorobenzene	ND		ug/l	200	36.	200
Trichlorofluoromethane	ND		ug/l	400	32.	200
1,2-Dichloroethane	ND		ug/l	200	26.	200
1,1,1-Trichloroethane	ND		ug/l	200	32.	200
Bromodichloromethane	ND		ug/l	200	38.	200
trans-1,3-Dichloropropene	ND		ug/l	80	33.	200
cis-1,3-Dichloropropene	ND		ug/l	80	29.	200
1,3-Dichloropropene, Total	ND		ug/l	80	29.	200
1,1-Dichloropropene	ND		ug/l	400	48.	200
Bromoform	ND		ug/l	400	50.	200
1,1,2,2-Tetrachloroethane	ND		ug/l	200	33.	200
Benzene	16000		ug/l	100	32.	200
Toluene	70	J	ug/l	200	41.	200
Ethylbenzene	1600		ug/l	200	33.	200
Chloromethane	ND		ug/l	400	40.	200
Bromomethane	ND		ug/l	400	51.	200
Vinyl chloride	ND		ug/l	200	14.	200
Chloroethane	ND		ug/l	400	27.	200
1,1-Dichloroethene	ND		ug/l	200	34.	200
trans-1,2-Dichloroethene	ND		ug/l	200	33.	200

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D Date Collected: 10/19/22 16:20

Client ID: AQPW-05-101922 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	200	35.	200
1,2-Dichlorobenzene	ND		ug/l	200	37.	200
1,3-Dichlorobenzene	ND		ug/l	200	37.	200
1,4-Dichlorobenzene	ND		ug/l	200	37.	200
Methyl tert butyl ether	210	J	ug/l	400	33.	200
p/m-Xylene	590		ug/l	400	66.	200
o-Xylene	780		ug/l	200	78.	200
Xylenes, Total	1400		ug/l	200	66.	200
cis-1,2-Dichloroethene	ND		ug/l	200	37.	200
1,2-Dichloroethene, Total	ND		ug/l	200	33.	200
Dibromomethane	ND		ug/l	400	73.	200
1,2,3-Trichloropropane	ND		ug/l	400	35.	200
Styrene	ND		ug/l	200	72.	200
Dichlorodifluoromethane	ND		ug/l	400	49.	200
Acetone	ND		ug/l	1000	290	200
Carbon disulfide	ND		ug/l	400	60.	200
Methyl ethyl ketone	ND		ug/l	1000	390	200
Methyl isobutyl ketone	ND		ug/l	1000	83.	200
2-Hexanone	ND		ug/l	1000	100	200
Bromochloromethane	ND		ug/l	400	30.	200
Tetrahydrofuran	ND		ug/l	400	100	200
2,2-Dichloropropane	ND		ug/l	400	41.	200
1,2-Dibromoethane	ND		ug/l	400	39.	200
1,3-Dichloropropane	ND		ug/l	400	42.	200
1,1,1,2-Tetrachloroethane	ND		ug/l	200	33.	200
Bromobenzene	ND		ug/l	400	30.	200
n-Butylbenzene	ND		ug/l	400	38.	200
sec-Butylbenzene	ND		ug/l	400	36.	200
tert-Butylbenzene	ND		ug/l	400	39.	200
o-Chlorotoluene	ND		ug/l	400	43.	200
p-Chlorotoluene	ND		ug/l	400	37.	200
1,2-Dibromo-3-chloropropane	ND		ug/l	400	71.	200
Hexachlorobutadiene	ND		ug/l	120	43.	200
Isopropylbenzene	64	J	ug/l	400	37.	200
p-Isopropyltoluene	ND		ug/l	400	38.	200
Naphthalene	3500		ug/l	400	43.	200
n-Propylbenzene	ND		ug/l	400	35.	200

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	400	47.	200
1,2,4-Trichlorobenzene	ND		ug/l	400	44.	200
1,3,5-Trimethylbenzene	63	J	ug/l	400	43.	200
1,2,4-Trimethylbenzene	230	J	ug/l	400	38.	200
Diethyl ether	ND		ug/l	400	33.	200
Diisopropyl Ether	ND		ug/l	400	85.	200
Ethyl-Tert-Butyl-Ether	ND		ug/l	400	36.	200
Tertiary-Amyl Methyl Ether	ND		ug/l	400	56.	200
1,4-Dioxane	ND		ug/l	50000	12000	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	105		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08
Client ID: HAV-TB1
Sample Location: HAVERHILL, MA

Date Collected: 10/16/22 18:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 10/28/22 19:20
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08 Date Collected: 10/16/22 18:15

Client ID: HAV-TB1 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-08 Date Collected: 10/16/22 18:15

Client ID: HAV-TB1 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	105		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	117		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D
Client ID: AQPW-04-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:02
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:58
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	200	68.	100
1,1-Dichloroethane	ND		ug/l	100	21.	100
Chloroform	ND		ug/l	100	22.	100
Carbon tetrachloride	ND		ug/l	100	13.	100
1,2-Dichloropropane	ND		ug/l	100	14.	100
Dibromochloromethane	ND		ug/l	100	15.	100
1,1,2-Trichloroethane	ND		ug/l	100	14.	100
Tetrachloroethene	ND		ug/l	100	18.	100
Chlorobenzene	ND		ug/l	100	18.	100
Trichlorofluoromethane	ND		ug/l	200	16.	100
1,2-Dichloroethane	ND		ug/l	100	13.	100
1,1,1-Trichloroethane	ND		ug/l	100	16.	100
Bromodichloromethane	ND		ug/l	100	19.	100
trans-1,3-Dichloropropene	ND		ug/l	40	16.	100
cis-1,3-Dichloropropene	ND		ug/l	40	14.	100
1,3-Dichloropropene, Total	ND		ug/l	40	14.	100
1,1-Dichloropropene	ND		ug/l	200	24.	100
Bromoform	ND		ug/l	200	25.	100
1,1,2,2-Tetrachloroethane	ND		ug/l	100	17.	100
Benzene	14000		ug/l	50	16.	100
Toluene	130		ug/l	100	20.	100
Ethylbenzene	3500		ug/l	100	17.	100
Chloromethane	ND		ug/l	200	20.	100
Bromomethane	ND		ug/l	200	26.	100
Vinyl chloride	ND		ug/l	100	7.1	100
Chloroethane	ND		ug/l	200	13.	100
1,1-Dichloroethene	ND		ug/l	100	17.	100
trans-1,2-Dichloroethene	ND		ug/l	100	16.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D Date Collected: 10/20/22 11:02

Client ID: AQPW-04-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	100	18.	100
1,2-Dichlorobenzene	ND		ug/l	100	18.	100
1,3-Dichlorobenzene	ND		ug/l	100	19.	100
1,4-Dichlorobenzene	ND		ug/l	100	19.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	3400		ug/l	200	33.	100
o-Xylene	1900		ug/l	100	39.	100
Xylenes, Total	5300		ug/l	100	33.	100
cis-1,2-Dichloroethene	ND		ug/l	100	19.	100
1,2-Dichloroethene, Total	ND		ug/l	100	16.	100
Dibromomethane	ND		ug/l	200	36.	100
1,2,3-Trichloropropane	ND		ug/l	200	18.	100
Styrene	ND		ug/l	100	36.	100
Dichlorodifluoromethane	ND		ug/l	200	24.	100
Acetone	ND		ug/l	500	150	100
Carbon disulfide	ND		ug/l	200	30.	100
Methyl ethyl ketone	ND		ug/l	500	190	100
Methyl isobutyl ketone	ND		ug/l	500	42.	100
2-Hexanone	ND		ug/l	500	52.	100
Bromochloromethane	ND		ug/l	200	15.	100
Tetrahydrofuran	ND		ug/l	200	52.	100
2,2-Dichloropropane	ND		ug/l	200	20.	100
1,2-Dibromoethane	ND		ug/l	200	19.	100
1,3-Dichloropropane	ND		ug/l	200	21.	100
1,1,1,2-Tetrachloroethane	ND		ug/l	100	16.	100
Bromobenzene	ND		ug/l	200	15.	100
n-Butylbenzene	ND		ug/l	200	19.	100
sec-Butylbenzene	ND		ug/l	200	18.	100
tert-Butylbenzene	ND		ug/l	200	20.	100
o-Chlorotoluene	ND		ug/l	200	22.	100
p-Chlorotoluene	ND		ug/l	200	18.	100
1,2-Dibromo-3-chloropropane	ND		ug/l	200	35.	100
Hexachlorobutadiene	ND		ug/l	60	22.	100
Isopropylbenzene	110	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	6300		ug/l	200	22.	100
n-Propylbenzene	35	J	ug/l	200	17.	100

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D Date Collected: 10/20/22 11:02

Client ID: AQPW-04-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	200	23.	100
1,2,4-Trichlorobenzene	ND		ug/l	200	22.	100
1,3,5-Trimethylbenzene	140	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	510		ug/l	200	19.	100
Diethyl ether	ND		ug/l	200	16.	100
Diisopropyl Ether	ND		ug/l	200	42.	100
Ethyl-Tert-Butyl-Ether	ND		ug/l	200	18.	100
Tertiary-Amyl Methyl Ether	ND		ug/l	200	28.	100
1,4-Dioxane	ND		ug/l	25000	6100	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	103		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D
Client ID: AQPW-03-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:50
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/01/22 21:44
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	100	34.	50
1,1-Dichloroethane	ND		ug/l	50	10.	50
Chloroform	ND		ug/l	50	11.	50
Carbon tetrachloride	ND		ug/l	50	6.7	50
1,2-Dichloropropane	ND		ug/l	50	6.8	50
Dibromochloromethane	ND		ug/l	50	7.4	50
1,1,2-Trichloroethane	ND		ug/l	50	7.2	50
Tetrachloroethene	ND		ug/l	50	9.0	50
Chlorobenzene	ND		ug/l	50	8.9	50
Trichlorofluoromethane	ND		ug/l	100	8.0	50
1,2-Dichloroethane	ND		ug/l	50	6.6	50
1,1,1-Trichloroethane	ND		ug/l	50	7.9	50
Bromodichloromethane	ND		ug/l	50	9.6	50
trans-1,3-Dichloropropene	ND		ug/l	20	8.2	50
cis-1,3-Dichloropropene	ND		ug/l	20	7.2	50
1,3-Dichloropropene, Total	ND		ug/l	20	7.2	50
1,1-Dichloropropene	ND		ug/l	100	12.	50
Bromoform	ND		ug/l	100	12.	50
1,1,2,2-Tetrachloroethane	ND		ug/l	50	8.4	50
Benzene	42		ug/l	25	8.0	50
Toluene	28	J	ug/l	50	10.	50
Ethylbenzene	1200		ug/l	50	8.4	50
Chloromethane	ND		ug/l	100	10.	50
Bromomethane	ND		ug/l	100	13.	50
Vinyl chloride	ND		ug/l	50	3.6	50
Chloroethane	ND		ug/l	100	6.7	50
1,1-Dichloroethene	ND		ug/l	50	8.4	50
trans-1,2-Dichloroethene	ND		ug/l	50	8.2	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D Date Collected: 10/20/22 11:50

Client ID: AQPW-03-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	50	8.8	50
1,2-Dichlorobenzene	11	J	ug/l	50	9.2	50
1,3-Dichlorobenzene	ND		ug/l	50	9.3	50
1,4-Dichlorobenzene	ND		ug/l	50	9.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	500		ug/l	100	17.	50
o-Xylene	500		ug/l	50	20.	50
Xylenes, Total	1000		ug/l	50	17.	50
cis-1,2-Dichloroethene	ND		ug/l	50	9.4	50
1,2-Dichloroethene, Total	ND		ug/l	50	8.2	50
Dibromomethane	ND		ug/l	100	18.	50
1,2,3-Trichloropropane	ND		ug/l	100	8.8	50
Styrene	ND		ug/l	50	18.	50
Dichlorodifluoromethane	ND		ug/l	100	12.	50
Acetone	ND		ug/l	250	73.	50
Carbon disulfide	ND		ug/l	100	15.	50
Methyl ethyl ketone	ND		ug/l	250	97.	50
Methyl isobutyl ketone	ND		ug/l	250	21.	50
2-Hexanone	ND		ug/l	250	26.	50
Bromochloromethane	ND		ug/l	100	7.6	50
Tetrahydrofuran	ND		ug/l	100	26.	50
2,2-Dichloropropane	ND		ug/l	100	10.	50
1,2-Dibromoethane	ND		ug/l	100	9.6	50
1,3-Dichloropropane	ND		ug/l	100	11.	50
1,1,1,2-Tetrachloroethane	ND		ug/l	50	8.2	50
Bromobenzene	ND		ug/l	100	7.6	50
n-Butylbenzene	ND		ug/l	100	9.6	50
sec-Butylbenzene	ND		ug/l	100	9.0	50
tert-Butylbenzene	ND		ug/l	100	9.8	50
o-Chlorotoluene	ND		ug/l	100	11.	50
p-Chlorotoluene	ND		ug/l	100	9.2	50
1,2-Dibromo-3-chloropropane	ND		ug/l	100	18.	50
Hexachlorobutadiene	ND		ug/l	30	11.	50
Isopropylbenzene	98	J	ug/l	100	9.4	50
p-Isopropyltoluene	13	J	ug/l	100	9.4	50
Naphthalene	4700		ug/l	100	11.	50
n-Propylbenzene	38	J	ug/l	100	8.6	50

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D Date Collected: 10/20/22 11:50

Client ID: AQPW-03-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	100	12.	50
1,2,4-Trichlorobenzene	ND		ug/l	100	11.	50
1,3,5-Trimethylbenzene	89	J	ug/l	100	11.	50
1,2,4-Trimethylbenzene	330		ug/l	100	9.6	50
Diethyl ether	ND		ug/l	100	8.2	50
Diisopropyl Ether	ND		ug/l	100	21.	50
Ethyl-Tert-Butyl-Ether	ND		ug/l	100	9.0	50
Tertiary-Amyl Methyl Ether	ND		ug/l	100	14.	50
1,4-Dioxane	ND		ug/l	12000	3000	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	107		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	93		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D
Client ID: AQPW-02-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 15:52
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 06:21
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	10	3.4	5
1,1-Dichloroethane	ND		ug/l	5.0	1.0	5
Chloroform	ND		ug/l	5.0	1.1	5
Carbon tetrachloride	ND		ug/l	5.0	0.67	5
1,2-Dichloropropane	ND		ug/l	5.0	0.68	5
Dibromochloromethane	ND		ug/l	5.0	0.74	5
1,1,2-Trichloroethane	ND		ug/l	5.0	0.72	5
Tetrachloroethene	ND		ug/l	5.0	0.90	5
Chlorobenzene	4.1	J	ug/l	5.0	0.89	5
Trichlorofluoromethane	ND		ug/l	10	0.80	5
1,2-Dichloroethane	ND		ug/l	5.0	0.66	5
1,1,1-Trichloroethane	ND		ug/l	5.0	0.79	5
Bromodichloromethane	ND		ug/l	5.0	0.96	5
trans-1,3-Dichloropropene	ND		ug/l	2.0	0.82	5
cis-1,3-Dichloropropene	ND		ug/l	2.0	0.72	5
1,3-Dichloropropene, Total	ND		ug/l	2.0	0.72	5
1,1-Dichloropropene	ND		ug/l	10	1.2	5
Bromoform	ND		ug/l	10	1.2	5
1,1,2,2-Tetrachloroethane	ND		ug/l	5.0	0.84	5
Benzene	30		ug/l	2.5	0.80	5
Toluene	1.3	J	ug/l	5.0	1.0	5
Ethylbenzene	80		ug/l	5.0	0.84	5
Chloromethane	ND		ug/l	10	1.0	5
Bromomethane	ND		ug/l	10	1.3	5
Vinyl chloride	ND		ug/l	5.0	0.36	5
Chloroethane	ND		ug/l	10	0.67	5
1,1-Dichloroethene	ND		ug/l	5.0	0.84	5
trans-1,2-Dichloroethene	ND		ug/l	5.0	0.82	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D Date Collected: 10/20/22 15:52
Client ID: AQPW-02-102022 Date Received: 10/21/22
Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	5.0	0.88	5
1,2-Dichlorobenzene	3.0	J	ug/l	5.0	0.92	5
1,3-Dichlorobenzene	ND		ug/l	5.0	0.93	5
1,4-Dichlorobenzene	ND		ug/l	5.0	0.94	5
Methyl tert butyl ether	10		ug/l	10	0.83	5
p/m-Xylene	10		ug/l	10	1.7	5
o-Xylene	27		ug/l	5.0	2.0	5
Xylenes, Total	37		ug/l	5.0	1.7	5
cis-1,2-Dichloroethene	ND		ug/l	5.0	0.94	5
1,2-Dichloroethene, Total	ND		ug/l	5.0	0.82	5
Dibromomethane	ND		ug/l	10	1.8	5
1,2,3-Trichloropropane	ND		ug/l	10	0.88	5
Styrene	ND		ug/l	5.0	1.8	5
Dichlorodifluoromethane	ND		ug/l	10	1.2	5
Acetone	11	J	ug/l	25	7.3	5
Carbon disulfide	ND		ug/l	10	1.5	5
Methyl ethyl ketone	ND		ug/l	25	9.7	5
Methyl isobutyl ketone	ND		ug/l	25	2.1	5
2-Hexanone	ND		ug/l	25	2.6	5
Bromochloromethane	ND		ug/l	10	0.76	5
Tetrahydrofuran	ND		ug/l	10	2.6	5
2,2-Dichloropropane	ND		ug/l	10	1.0	5
1,2-Dibromoethane	ND		ug/l	10	0.96	5
1,3-Dichloropropane	ND		ug/l	10	1.1	5
1,1,1,2-Tetrachloroethane	ND		ug/l	5.0	0.82	5
Bromobenzene	ND		ug/l	10	0.76	5
n-Butylbenzene	ND		ug/l	10	0.96	5
sec-Butylbenzene	ND		ug/l	10	0.90	5
tert-Butylbenzene	ND		ug/l	10	0.98	5
o-Chlorotoluene	ND		ug/l	10	1.1	5
p-Chlorotoluene	ND		ug/l	10	0.92	5
1,2-Dibromo-3-chloropropane	ND		ug/l	10	1.8	5
Hexachlorobutadiene	ND		ug/l	3.0	1.1	5
Isopropylbenzene	15		ug/l	10	0.94	5
p-Isopropyltoluene	5.5	J	ug/l	10	0.94	5
Naphthalene	620		ug/l	10	1.1	5
n-Propylbenzene	8.4	J	ug/l	10	0.86	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D Date Collected: 10/20/22 15:52

Client ID: AQPW-02-102022 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	10	1.2	5
1,2,4-Trichlorobenzene	ND		ug/l	10	1.1	5
1,3,5-Trimethylbenzene	16		ug/l	10	1.1	5
1,2,4-Trimethylbenzene	61		ug/l	10	0.96	5
Diethyl ether	ND		ug/l	10	0.82	5
Diisopropyl Ether	ND		ug/l	10	2.1	5
Ethyl-Tert-Butyl-Ether	ND		ug/l	10	0.90	5
Tertiary-Amyl Methyl Ether	ND		ug/l	10	1.4	5
1,4-Dioxane	ND		ug/l	1200	300	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8260D
Analytical Date: 11/02/22 14:20
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	50	17.	25
1,1-Dichloroethane	ND		ug/l	25	5.2	25
Chloroform	ND		ug/l	25	5.6	25
Carbon tetrachloride	ND		ug/l	25	3.4	25
1,2-Dichloropropane	ND		ug/l	25	3.4	25
Dibromochloromethane	ND		ug/l	25	3.7	25
1,1,2-Trichloroethane	ND		ug/l	25	3.6	25
Tetrachloroethene	ND		ug/l	25	4.5	25
Chlorobenzene	ND		ug/l	25	4.4	25
Trichlorofluoromethane	ND		ug/l	50	4.0	25
1,2-Dichloroethane	ND		ug/l	25	3.3	25
1,1,1-Trichloroethane	ND		ug/l	25	4.0	25
Bromodichloromethane	ND		ug/l	25	4.8	25
trans-1,3-Dichloropropene	ND		ug/l	10	4.1	25
cis-1,3-Dichloropropene	ND		ug/l	10	3.6	25
1,3-Dichloropropene, Total	ND		ug/l	10	3.6	25
1,1-Dichloropropene	ND		ug/l	50	6.0	25
Bromoform	ND		ug/l	50	6.2	25
1,1,2,2-Tetrachloroethane	ND		ug/l	25	4.2	25
Benzene	30		ug/l	12	4.0	25
Toluene	29		ug/l	25	5.1	25
Ethylbenzene	910		ug/l	25	4.2	25
Chloromethane	ND		ug/l	50	5.0	25
Bromomethane	ND		ug/l	50	6.4	25
Vinyl chloride	ND		ug/l	25	1.8	25
Chloroethane	ND		ug/l	50	3.4	25
1,1-Dichloroethene	ND		ug/l	25	4.2	25
trans-1,2-Dichloroethene	ND		ug/l	25	4.1	25

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D Date Collected: 10/21/22 09:00

Client ID: AQPW-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	25	4.4	25
1,2-Dichlorobenzene	ND		ug/l	25	4.6	25
1,3-Dichlorobenzene	ND		ug/l	25	4.6	25
1,4-Dichlorobenzene	ND		ug/l	25	4.7	25
Methyl tert butyl ether	ND		ug/l	50	4.2	25
p/m-Xylene	320		ug/l	50	8.3	25
o-Xylene	300		ug/l	25	9.8	25
Xylenes, Total	620		ug/l	25	8.3	25
cis-1,2-Dichloroethene	ND		ug/l	25	4.7	25
1,2-Dichloroethene, Total	ND		ug/l	25	4.1	25
Dibromomethane	ND		ug/l	50	9.1	25
1,2,3-Trichloropropane	ND		ug/l	50	4.4	25
Styrene	ND		ug/l	25	9.0	25
Dichlorodifluoromethane	ND		ug/l	50	6.1	25
Acetone	ND		ug/l	120	36.	25
Carbon disulfide	ND		ug/l	50	7.5	25
Methyl ethyl ketone	ND		ug/l	120	48.	25
Methyl isobutyl ketone	ND		ug/l	120	10.	25
2-Hexanone	ND		ug/l	120	13.	25
Bromochloromethane	ND		ug/l	50	3.8	25
Tetrahydrofuran	ND		ug/l	50	13.	25
2,2-Dichloropropane	ND		ug/l	50	5.1	25
1,2-Dibromoethane	ND		ug/l	50	4.8	25
1,3-Dichloropropane	ND		ug/l	50	5.3	25
1,1,1,2-Tetrachloroethane	ND		ug/l	25	4.1	25
Bromobenzene	ND		ug/l	50	3.8	25
n-Butylbenzene	ND		ug/l	50	4.8	25
sec-Butylbenzene	ND		ug/l	50	4.5	25
tert-Butylbenzene	ND		ug/l	50	4.9	25
o-Chlorotoluene	ND		ug/l	50	5.4	25
p-Chlorotoluene	ND		ug/l	50	4.6	25
1,2-Dibromo-3-chloropropane	ND		ug/l	50	8.8	25
Hexachlorobutadiene	ND		ug/l	15	5.4	25
Isopropylbenzene	58		ug/l	50	4.7	25
p-Isopropyltoluene	7.8	J	ug/l	50	4.7	25
Naphthalene	2600		ug/l	50	5.4	25
n-Propylbenzene	17	J	ug/l	50	4.3	25

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	50	5.8	25
1,2,4-Trichlorobenzene	ND		ug/l	50	5.5	25
1,3,5-Trimethylbenzene	30	J	ug/l	50	5.4	25
1,2,4-Trimethylbenzene	170		ug/l	50	4.8	25
Diethyl ether	ND		ug/l	50	4.1	25
Diisopropyl Ether	ND		ug/l	50	11.	25
Ethyl-Tert-Butyl-Ether	ND		ug/l	50	4.5	25
Tertiary-Amyl Methyl Ether	ND		ug/l	50	7.0	25
1,4-Dioxane	ND		ug/l	6200	1500	25

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	92		70-130
Dibromofluoromethane	122		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13
Client ID: RB1-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 11:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:39
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13 Date Collected: 10/21/22 11:00

Client ID: RB1-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	2.2	J	ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13 Date Collected: 10/21/22 11:00

Client ID: RB1-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 10/28/22 15:43
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 08 Batch: WG1705574-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	107		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:09
Analyst: KJD

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 07,10 Batch: WG1706971-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:24
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-05 Batch: WG1707020-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	108		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 05:12
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 06,09,11-12 Batch: WG1707170-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	87		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 19:16
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 13 Batch: WG1707538-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	119		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Methylene chloride	110		110		70-130	0		20
1,1-Dichloroethane	110		120		70-130	9		20
Chloroform	120		120		70-130	0		20
Carbon tetrachloride	120		120		70-130	0		20
1,2-Dichloropropane	100		110		70-130	10		20
Dibromochloromethane	100		110		70-130	10		20
1,1,2-Trichloroethane	98		100		70-130	2		20
Tetrachloroethene	120		120		70-130	0		20
Chlorobenzene	110		110		70-130	0		20
Trichlorofluoromethane	120		120		70-130	0		20
1,2-Dichloroethane	110		110		70-130	0		20
1,1,1-Trichloroethane	120		120		70-130	0		20
Bromodichloromethane	110		120		70-130	9		20
trans-1,3-Dichloropropene	110		110		70-130	0		20
cis-1,3-Dichloropropene	110		110		70-130	0		20
1,1-Dichloropropene	110		120		70-130	9		20
Bromoform	100		110		70-130	10		20
1,1,2,2-Tetrachloroethane	100		100		70-130	0		20
Benzene	110		110		70-130	0		20
Toluene	110		110		70-130	0		20
Ethylbenzene	120		120		70-130	0		20
Chloromethane	95		88		70-130	8		20
Bromomethane	110		**140**	Q	70-130	**24**	Q	20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Vinyl chloride	110		99		70-130	11		20
Chloroethane	120		120		70-130	0		20
1,1-Dichloroethene	120		120		70-130	0		20
trans-1,2-Dichloroethene	120		120		70-130	0		20
Trichloroethene	120		120		70-130	0		20
1,2-Dichlorobenzene	110		110		70-130	0		20
1,3-Dichlorobenzene	110		120		70-130	9		20
1,4-Dichlorobenzene	110		110		70-130	0		20
Methyl tert butyl ether	110		110		70-130	0		20
p/m-Xylene	115		120		70-130	4		20
o-Xylene	115		125		70-130	8		20
cis-1,2-Dichloroethene	120		120		70-130	0		20
Dibromomethane	100		120		70-130	18		20
1,2,3-Trichloropropane	100		98		70-130	2		20
Styrene	120		130		70-130	8		20
Dichlorodifluoromethane	99		**58**	Q	70-130	**52**	Q	20
Acetone	98		100		70-130	2		20
Carbon disulfide	120		**160**	Q	70-130	**29**	Q	20
Methyl ethyl ketone	95		94		70-130	1		20
Methyl isobutyl ketone	98		92		70-130	6		20
2-Hexanone	96		89		70-130	8		20
Bromochloromethane	120		120		70-130	0		20
Tetrahydrofuran	100		110		70-130	10		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
2,2-Dichloropropane	120		130		70-130	8		20
1,2-Dibromoethane	100		110		70-130	10		20
1,3-Dichloropropane	97		100		70-130	3		20
1,1,1,2-Tetrachloroethane	110		110		70-130	0		20
Bromobenzene	110		110		70-130	0		20
n-Butylbenzene	120		120		70-130	0		20
sec-Butylbenzene	110		120		70-130	9		20
tert-Butylbenzene	110		120		70-130	9		20
o-Chlorotoluene	110		110		70-130	0		20
p-Chlorotoluene	110		110		70-130	0		20
1,2-Dibromo-3-chloropropane	97		100		70-130	3		20
Hexachlorobutadiene	130		**140**	Q	70-130	7		20
Isopropylbenzene	110		110		70-130	0		20
p-Isopropyltoluene	120		120		70-130	0		20
Naphthalene	110		110		70-130	0		20
n-Propylbenzene	110		110		70-130	0		20
1,2,3-Trichlorobenzene	130		130		70-130	0		20
1,2,4-Trichlorobenzene	130		130		70-130	0		20
1,3,5-Trimethylbenzene	110		120		70-130	9		20
1,2,4-Trimethylbenzene	110		120		70-130	9		20
Diethyl ether	100		110		70-130	10		20
Diisopropyl Ether	98		99		70-130	1		20
Ethyl-Tert-Butyl-Ether	100		100		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 08 Batch: WG1705574-3 WG1705574-4								
Tertiary-Amyl Methyl Ether	110		100		70-130	10		20
1,4-Dioxane	**136**	Q	102		70-130	**29**	Q	20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	101		102		70-130
Toluene-d8	96		98		70-130
4-Bromofluorobenzene	94		96		70-130
Dibromofluoromethane	106		109		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Methylene chloride	100		99		70-130	1		20
1,1-Dichloroethane	110		110		70-130	0		20
Chloroform	99		96		70-130	3		20
Carbon tetrachloride	100		87		70-130	14		20
1,2-Dichloropropane	100		99		70-130	1		20
Dibromochloromethane	79		80		70-130	1		20
1,1,2-Trichloroethane	82		80		70-130	2		20
Tetrachloroethene	87		84		70-130	4		20
Chlorobenzene	90		86		70-130	5		20
Trichlorofluoromethane	90		87		70-130	3		20
1,2-Dichloroethane	92		90		70-130	2		20
1,1,1-Trichloroethane	93		93		70-130	0		20
Bromodichloromethane	88		87		70-130	1		20
trans-1,3-Dichloropropene	80		77		70-130	4		20
cis-1,3-Dichloropropene	83		81		70-130	2		20
1,1-Dichloropropene	89		88		70-130	1		20
Bromoform	**68**	Q	**64**	Q	70-130	6		20
1,1,2,2-Tetrachloroethane	72		**69**	Q	70-130	4		20
Benzene	97		95		70-130	2		20
Toluene	95		92		70-130	3		20
Ethylbenzene	96		93		70-130	3		20
Chloromethane	120		110		70-130	9		20
Bromomethane	74		75		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Vinyl chloride	110		110		70-130	0		20
Chloroethane	100		100		70-130	0		20
1,1-Dichloroethene	97		97		70-130	0		20
trans-1,2-Dichloroethene	100		100		70-130	0		20
Trichloroethene	90		88		70-130	2		20
1,2-Dichlorobenzene	86		82		70-130	5		20
1,3-Dichlorobenzene	85		82		70-130	4		20
1,4-Dichlorobenzene	85		83		70-130	2		20
Methyl tert butyl ether	80		81		70-130	1		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		95		70-130	5		20
cis-1,2-Dichloroethene	100		99		70-130	1		20
Dibromomethane	85		85		70-130	0		20
1,2,3-Trichloropropane	70		**67**	Q	70-130	4		20
Styrene	95		90		70-130	5		20
Dichlorodifluoromethane	75		72		70-130	4		20
Acetone	100		110		70-130	10		20
Carbon disulfide	74		73		70-130	1		20
Methyl ethyl ketone	82		80		70-130	2		20
Methyl isobutyl ketone	85		87		70-130	2		20
2-Hexanone	86		86		70-130	0		20
Bromochloromethane	95		92		70-130	3		20
Tetrahydrofuran	99		97		70-130	2		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
2,2-Dichloropropane	90		90		70-130	0		20
1,2-Dibromoethane	83		80		70-130	4		20
1,3-Dichloropropane	88		85		70-130	3		20
1,1,1,2-Tetrachloroethane	80		76		70-130	5		20
Bromobenzene	81		76		70-130	6		20
n-Butylbenzene	86		83		70-130	4		20
sec-Butylbenzene	88		85		70-130	3		20
tert-Butylbenzene	88		85		70-130	3		20
o-Chlorotoluene	87		83		70-130	5		20
p-Chlorotoluene	87		84		70-130	4		20
1,2-Dibromo-3-chloropropane	**67**	Q	**62**	Q	70-130	8		20
Hexachlorobutadiene	77		74		70-130	4		20
Isopropylbenzene	85		82		70-130	4		20
p-Isopropyltoluene	88		85		70-130	3		20
Naphthalene	76		73		70-130	4		20
n-Propylbenzene	89		85		70-130	5		20
1,2,3-Trichlorobenzene	78		76		70-130	3		20
1,2,4-Trichlorobenzene	78		74		70-130	5		20
1,3,5-Trimethylbenzene	84		80		70-130	5		20
1,2,4-Trimethylbenzene	84		80		70-130	5		20
Diethyl ether	89		88		70-130	1		20
Diisopropyl Ether	100		100		70-130	0		20
Ethyl-Tert-Butyl-Ether	91		90		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 07,10 Batch: WG1706971-3 WG1706971-4								
Tertiary-Amyl Methyl Ether	77		75		70-130	3		20
1,4-Dioxane	102		102		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	103		104		70-130
Toluene-d8	104		104		70-130
4-Bromofluorobenzene	94		90		70-130
Dibromofluoromethane	106		106		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Methylene chloride	99		99		70-130	0		20
1,1-Dichloroethane	100		100		70-130	0		20
Chloroform	100		110		70-130	10		20
Carbon tetrachloride	110		110		70-130	0		20
1,2-Dichloropropane	98		97		70-130	1		20
Dibromochloromethane	100		100		70-130	0		20
1,1,2-Trichloroethane	95		97		70-130	2		20
Tetrachloroethene	110		110		70-130	0		20
Chlorobenzene	100		100		70-130	0		20
Trichlorofluoromethane	110		110		70-130	0		20
1,2-Dichloroethane	100		100		70-130	0		20
1,1,1-Trichloroethane	110		110		70-130	0		20
Bromodichloromethane	100		100		70-130	0		20
trans-1,3-Dichloropropene	100		100		70-130	0		20
cis-1,3-Dichloropropene	110		110		70-130	0		20
1,1-Dichloropropene	100		100		70-130	0		20
Bromoform	100		100		70-130	0		20
1,1,2,2-Tetrachloroethane	95		97		70-130	2		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	86		87		70-130	1		20
Bromomethane	110		110		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Vinyl chloride	96		99		70-130	3		20
Chloroethane	95		99		70-130	4		20
1,1-Dichloroethene	100		100		70-130	0		20
trans-1,2-Dichloroethene	100		100		70-130	0		20
Trichloroethene	110		110		70-130	0		20
1,2-Dichlorobenzene	100		100		70-130	0		20
1,3-Dichlorobenzene	110		100		70-130	10		20
1,4-Dichlorobenzene	100		100		70-130	0		20
Methyl tert butyl ether	100		100		70-130	0		20
p/m-Xylene	105		110		70-130	5		20
o-Xylene	105		110		70-130	5		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	100		110		70-130	10		20
1,2,3-Trichloropropane	92		90		70-130	2		20
Styrene	110		115		70-130	4		20
Dichlorodifluoromethane	85		87		70-130	2		20
Acetone	91		95		70-130	4		20
Carbon disulfide	100		100		70-130	0		20
Methyl ethyl ketone	92		91		70-130	1		20
Methyl isobutyl ketone	88		86		70-130	2		20
2-Hexanone	84		89		70-130	6		20
Bromochloromethane	110		110		70-130	0		20
Tetrahydrofuran	93		100		70-130	7		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
2,2-Dichloropropane	110		110		70-130	0		20
1,2-Dibromoethane	100		100		70-130	0		20
1,3-Dichloropropane	94		93		70-130	1		20
1,1,1,2-Tetrachloroethane	100		100		70-130	0		20
Bromobenzene	100		100		70-130	0		20
n-Butylbenzene	110		100		70-130	10		20
sec-Butylbenzene	100		100		70-130	0		20
tert-Butylbenzene	100		100		70-130	0		20
o-Chlorotoluene	99		100		70-130	1		20
p-Chlorotoluene	100		98		70-130	2		20
1,2-Dibromo-3-chloropropane	95		96		70-130	1		20
Hexachlorobutadiene	120		110		70-130	9		20
Isopropylbenzene	100		100		70-130	0		20
p-Isopropyltoluene	110		110		70-130	0		20
Naphthalene	100		100		70-130	0		20
n-Propylbenzene	100		100		70-130	0		20
1,2,3-Trichlorobenzene	110		110		70-130	0		20
1,2,4-Trichlorobenzene	120		110		70-130	9		20
1,3,5-Trimethylbenzene	100		100		70-130	0		20
1,2,4-Trimethylbenzene	100		100		70-130	0		20
Diethyl ether	97		100		70-130	3		20
Diisopropyl Ether	91		91		70-130	0		20
Ethyl-Tert-Butyl-Ether	100		99		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-05 Batch: WG1707020-3 WG1707020-4								
Tertiary-Amyl Methyl Ether	100		100		70-130	0		20
1,4-Dioxane	108		112		70-130	4		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		98		70-130
Toluene-d8	95		99		70-130
4-Bromofluorobenzene	93		93		70-130
Dibromofluoromethane	99		102		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Lab Number: L2259175
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Methylene chloride	98		110		70-130	12		20
1,1-Dichloroethane	100		110		70-130	10		20
Chloroform	95		100		70-130	5		20
Carbon tetrachloride	88		94		70-130	7		20
1,2-Dichloropropane	100		100		70-130	0		20
Dibromochloromethane	88		85		70-130	3		20
1,1,2-Trichloroethane	90		87		70-130	3		20
Tetrachloroethene	100		100		70-130	0		20
Chlorobenzene	97		97		70-130	0		20
Trichlorofluoromethane	82		99		70-130	19		20
1,2-Dichloroethane	86		92		70-130	7		20
1,1,1-Trichloroethane	91		100		70-130	9		20
Bromodichloromethane	88		94		70-130	7		20
trans-1,3-Dichloropropene	88		84		70-130	5		20
cis-1,3-Dichloropropene	90		88		70-130	2		20
1,1-Dichloropropene	97		98		70-130	1		20
Bromoform	80		74		70-130	8		20
1,1,2,2-Tetrachloroethane	81		76		70-130	6		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	100		120		70-130	18		20
Bromomethane	83		98		70-130	17		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Vinyl chloride	120		120		70-130	0		20
Chloroethane	89		120		70-130	**30**	Q	20
1,1-Dichloroethene	98		110		70-130	12		20
trans-1,2-Dichloroethene	100		110		70-130	10		20
Trichloroethene	99		98		70-130	1		20
1,2-Dichlorobenzene	93		93		70-130	0		20
1,3-Dichlorobenzene	95		93		70-130	2		20
1,4-Dichlorobenzene	95		94		70-130	1		20
Methyl tert butyl ether	85		83		70-130	2		20
p/m-Xylene	105		110		70-130	5		20
o-Xylene	100		105		70-130	5		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	86		92		70-130	7		20
1,2,3-Trichloropropane	84		75		70-130	11		20
Styrene	100		100		70-130	0		20
Dichlorodifluoromethane	89		97		70-130	9		20
Acetone	**150**	Q	100		70-130	**40**	Q	20
Carbon disulfide	81		78		70-130	4		20
Methyl ethyl ketone	120		78		70-130	**42**	Q	20
Methyl isobutyl ketone	110		89		70-130	**21**	Q	20
2-Hexanone	100		78		70-130	**25**	Q	20
Bromochloromethane	93		100		70-130	7		20
Tetrahydrofuran	130		95		70-130	**31**	Q	20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
2,2-Dichloropropane	91		98		70-130	7		20
1,2-Dibromoethane	95		90		70-130	5		20
1,3-Dichloropropane	94		92		70-130	2		20
1,1,1,2-Tetrachloroethane	89		86		70-130	3		20
Bromobenzene	90		87		70-130	3		20
n-Butylbenzene	98		94		70-130	4		20
sec-Butylbenzene	97		98		70-130	1		20
tert-Butylbenzene	96		97		70-130	1		20
o-Chlorotoluene	93		92		70-130	1		20
p-Chlorotoluene	93		94		70-130	1		20
1,2-Dibromo-3-chloropropane	84		73		70-130	14		20
Hexachlorobutadiene	100		89		70-130	12		20
Isopropylbenzene	94		93		70-130	1		20
p-Isopropyltoluene	98		97		70-130	1		20
Naphthalene	93		81		70-130	14		20
n-Propylbenzene	96		96		70-130	0		20
1,2,3-Trichlorobenzene	99		84		70-130	16		20
1,2,4-Trichlorobenzene	97		83		70-130	16		20
1,3,5-Trimethylbenzene	93		91		70-130	2		20
1,2,4-Trimethylbenzene	93		89		70-130	4		20
Diethyl ether	86		91		70-130	6		20
Diisopropyl Ether	100		100		70-130	0		20
Ethyl-Tert-Butyl-Ether	97		94		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 Batch: WG1707170-3 WG1707170-4								
Tertiary-Amyl Methyl Ether	86		82		70-130	5		20
1,4-Dioxane	**140**	Q	78		70-130	**57**	Q	20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	91		96		70-130
Toluene-d8	102		103		70-130
4-Bromofluorobenzene	93		91		70-130
Dibromofluoromethane	95		103		70-130

Lab Control Sample Analysis
Batch Quality Control

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Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Methylene chloride	110		110		70-130	0		20
1,1-Dichloroethane	120		110		70-130	9		20
Chloroform	100		100		70-130	0		20
Carbon tetrachloride	94		99		70-130	5		20
1,2-Dichloropropane	100		110		70-130	10		20
Dibromochloromethane	82		86		70-130	5		20
1,1,2-Trichloroethane	83		88		70-130	6		20
Tetrachloroethene	100		99		70-130	1		20
Chlorobenzene	99		97		70-130	2		20
Trichlorofluoromethane	99		99		70-130	0		20
1,2-Dichloroethane	90		93		70-130	3		20
1,1,1-Trichloroethane	100		100		70-130	0		20
Bromodichloromethane	89		94		70-130	5		20
trans-1,3-Dichloropropene	82		85		70-130	4		20
cis-1,3-Dichloropropene	85		91		70-130	7		20
1,1-Dichloropropene	96		98		70-130	2		20
Bromoform	**69**	Q	73		70-130	6		20
1,1,2,2-Tetrachloroethane	74		77		70-130	4		20
Benzene	100		100		70-130	0		20
Toluene	100		100		70-130	0		20
Ethylbenzene	100		100		70-130	0		20
Chloromethane	130		120		70-130	8		20
Bromomethane	87		81		70-130	7		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Vinyl chloride	130		130		70-130	0		20
Chloroethane	120		120		70-130	0		20
1,1-Dichloroethene	110		110		70-130	0		20
trans-1,2-Dichloroethene	110		110		70-130	0		20
Trichloroethene	97		98		70-130	1		20
1,2-Dichlorobenzene	95		94		70-130	1		20
1,3-Dichlorobenzene	97		94		70-130	3		20
1,4-Dichlorobenzene	97		95		70-130	2		20
Methyl tert butyl ether	75		83		70-130	10		20
p/m-Xylene	110		110		70-130	0		20
o-Xylene	110		110		70-130	0		20
cis-1,2-Dichloroethene	100		110		70-130	10		20
Dibromomethane	90		92		70-130	2		20
1,2,3-Trichloropropane	72		76		70-130	5		20
Styrene	105		100		70-130	5		20
Dichlorodifluoromethane	96		97		70-130	1		20
Acetone	94		100		70-130	6		20
Carbon disulfide	83		79		70-130	5		20
Methyl ethyl ketone	71		82		70-130	14		20
Methyl isobutyl ketone	81		88		70-130	8		20
2-Hexanone	74		82		70-130	10		20
Bromochloromethane	100		100		70-130	0		20
Tetrahydrofuran	89		100		70-130	12		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
2,2-Dichloropropane	99		100		70-130	1		20
1,2-Dibromoethane	84		89		70-130	6		20
1,3-Dichloropropane	89		92		70-130	3		20
1,1,1,2-Tetrachloroethane	84		85		70-130	1		20
Bromobenzene	89		88		70-130	1		20
n-Butylbenzene	98		97		70-130	1		20
sec-Butylbenzene	100		99		70-130	1		20
tert-Butylbenzene	100		98		70-130	2		20
o-Chlorotoluene	96		94		70-130	2		20
p-Chlorotoluene	98		95		70-130	3		20
1,2-Dibromo-3-chloropropane	**67**	Q	70		70-130	4		20
Hexachlorobutadiene	92		89		70-130	3		20
Isopropylbenzene	97		95		70-130	2		20
p-Isopropyltoluene	100		98		70-130	2		20
Naphthalene	79		81		70-130	3		20
n-Propylbenzene	100		98		70-130	2		20
1,2,3-Trichlorobenzene	85		86		70-130	1		20
1,2,4-Trichlorobenzene	84		84		70-130	0		20
1,3,5-Trimethylbenzene	93		93		70-130	0		20
1,2,4-Trimethylbenzene	93		91		70-130	2		20
Diethyl ether	84		91		70-130	8		20
Diisopropyl Ether	100		110		70-130	10		20
Ethyl-Tert-Butyl-Ether	87		95		70-130	9		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 13 Batch: WG1707538-3 WG1707538-4								
Tertiary-Amyl Methyl Ether	75		82		70-130	9		20
1,4-Dioxane	116		124		70-130	7		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	94		98		70-130
Toluene-d8	104		101		70-130
4-Bromofluorobenzene	94		92		70-130
Dibromofluoromethane	101		104		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
Methylene chloride	ND	100	110	110		110	110		70-130	0		20
1,1-Dichloroethane	ND	100	110	110		110	110		70-130	0		20
Chloroform	ND	100	100	100		110	110		70-130	10		20
Carbon tetrachloride	ND	100	110	110		94	94		70-130	16		20
1,2-Dichloropropane	ND	100	100	100		100	100		70-130	0		20
Dibromochloromethane	ND	100	82	82		86	86		70-130	5		20
1,1,2-Trichloroethane	ND	100	83	83		86	86		70-130	4		20
Tetrachloroethene	ND	100	98	98		98	98		70-130	0		20
Chlorobenzene	ND	100	96	96		99	99		70-130	3		20
Trichlorofluoromethane	ND	100	96	96		96	96		70-130	0		20
1,2-Dichloroethane	ND	100	91	91		91	91		70-130	0		20
1,1,1-Trichloroethane	ND	100	99	99		100	100		70-130	1		20
Bromodichloromethane	ND	100	92	92		93	93		70-130	1		20
trans-1,3-Dichloropropene	ND	100	80	80		84	84		70-130	5		20
cis-1,3-Dichloropropene	ND	100	87	87		88	88		70-130	1		20
1,1-Dichloropropene	ND	100	95	95		96	96		70-130	1		20
Bromoform	ND	100	72	72		72	72		70-130	0		20
1,1,2,2-Tetrachloroethane	ND	100	74	74		75	75		70-130	1		20
Benzene	49	100	150	101		150	101		70-130	0		20
Toluene	5.8J	100	100	100		110	110		70-130	10		20
Ethylbenzene	400	100	450	**50**	Q	460	**60**	Q	70-130	2		20
Chloromethane	ND	100	120	120		110	110		70-130	9		20
Bromomethane	ND	100	63	**63**	Q	63	**63**	Q	70-130	0		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
Vinyl chloride	ND	100	120	120		120	120		70-130	0		20
Chloroethane	ND	100	120	120		120	120		70-130	0		20
1,1-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
trans-1,2-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
Trichloroethene	ND	100	97	97		96	96		70-130	1		20
1,2-Dichlorobenzene	ND	100	91	91		94	94		70-130	3		20
1,3-Dichlorobenzene	ND	100	93	93		95	95		70-130	2		20
1,4-Dichlorobenzene	ND	100	93	93		95	95		70-130	2		20
Methyl tert butyl ether	ND	100	79	79		81	81		70-130	3		20
p/m-Xylene	36	200	240	102		250	107		70-130	4		20
o-Xylene	220	200	400	90		420	100		70-130	5		20
cis-1,2-Dichloroethene	ND	100	110	110		110	110		70-130	0		20
Dibromomethane	ND	100	93	93		93	93		70-130	0		20
1,2,3-Trichloropropane	ND	100	71	71		73	73		70-130	3		20
Styrene	ND	200	200	100		200	100		70-130	0		20
Dichlorodifluoromethane	ND	100	93	93		92	92		70-130	1		20
Acetone	ND	100	97	97		100	100		70-130	3		20
Carbon disulfide	ND	100	79	79		80	80		70-130	1		20
Methyl ethyl ketone	ND	100	72	72		76	76		70-130	5		20
Methyl isobutyl ketone	ND	100	80	80		84	84		70-130	5		20
2-Hexanone	ND	100	73	73		75	75		70-130	3		20
Bromochloromethane	ND	100	100	100		100	100		70-130	0		20
Tetrahydrofuran	ND	100	86	86		89	89		70-130	3		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-06-101922	Associated sample(s): 06,09,11-12			QC Batch ID: WG1707170-6		WG1707170-7			QC Sample: L2259175-06			Client ID:
2,2-Dichloropropane	ND	100	98	98		98	98		70-130	0		20
1,2-Dibromoethane	ND	100	86	86		89	89		70-130	3		20
1,3-Dichloropropane	ND	100	87	87		90	90		70-130	3		20
1,1,1,2-Tetrachloroethane	ND	100	84	84		88	88		70-130	5		20
Bromobenzene	ND	100	84	84		87	87		70-130	4		20
n-Butylbenzene	ND	100	96	96		98	98		70-130	2		20
sec-Butylbenzene	ND	100	94	94		95	95		70-130	1		20
tert-Butylbenzene	ND	100	92	92		95	95		70-130	3		20
o-Chlorotoluene	ND	100	91	91		93	93		70-130	2		20
p-Chlorotoluene	ND	100	90	90		93	93		70-130	3		20
1,2-Dibromo-3-chloropropane	ND	100	70	70		71	71		70-130	1		20
Hexachlorobutadiene	ND	100	86	86		88	88		70-130	2		20
Isopropylbenzene	36	100	120	84		120	84		70-130	0		20
p-Isopropyltoluene	3.9J	100	100	100		100	100		70-130	0		20
Naphthalene	1100	100	1100	**0**	Q	1100	**0**	Q	70-130	0		20
n-Propylbenzene	13J	100	100	100		100	100		70-130	0		20
1,2,3-Trichlorobenzene	ND	100	88	88		90	90		70-130	2		20
1,2,4-Trichlorobenzene	ND	100	86	86		88	88		70-130	2		20
1,3,5-Trimethylbenzene	16J	100	100	100		110	110		70-130	10		20
1,2,4-Trimethylbenzene	140	100	220	80		220	80		70-130	0		20
Diethyl ether	ND	100	88	88		90	90		70-130	2		20
Diisopropyl Ether	ND	100	96	96		97	97		70-130	1		20
Ethyl-Tert-Butyl-Ether	ND	100	90	90		91	91		70-130	1		20

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 06,09,11-12 QC Batch ID: WG1707170-6 WG1707170-7 QC Sample: L2259175-06 Client ID: AQPW-06-101922												
Tertiary-Amyl Methyl Ether	ND	100	80	80		81	81		70-130	1		20
1,4-Dioxane	ND	5000	4400	88		4300	86		70-130	2		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		95		70-130
4-Bromofluorobenzene	88		89		70-130
Dibromofluoromethane	106		105		70-130
Toluene-d8	102		103		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-01 D
Client ID: AQPW-10-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 10:53
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 12:32
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5920000		ng/l	20000	3540	2000
2-Methylnaphthalene	686000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	124000		ng/l	20000	3220	2000
Fluorene	35300		ng/l	20000	3460	2000
Phenanthrene	34300		ng/l	20000	3780	2000
Anthracene	6440	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	3130	J	ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-02 D
Client ID: AQPW-09-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 11:37
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 13:05
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3710000		ng/l	20000	3540	2000
2-Methylnaphthalene	322000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	138000		ng/l	20000	3220	2000
Fluorene	38300		ng/l	20000	3460	2000
Phenanthrene	33300		ng/l	20000	3780	2000
Anthracene	4230	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-03 D
Client ID: AQPW-08-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 12:30
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 13:39
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	650000		ng/l	19000	3370	2000
2-Methylnaphthalene	45700		ng/l	19000	2020	2000
2-Chloronaphthalene	ND		ng/l	19000	4190	2000
Acenaphthylene	30700		ng/l	19000	3370	2000
Acenaphthene	119000		ng/l	19000	3070	2000
Fluorene	48100		ng/l	19000	3300	2000
Phenanthrene	49200		ng/l	19000	3600	2000
Anthracene	7390	J	ng/l	19000	3700	2000
Fluoranthene	ND		ng/l	19000	2840	2000
Pyrene	ND		ng/l	19000	2900	2000
Benz(a)anthracene	ND		ng/l	19000	3300	2000
Chrysene	ND		ng/l	19000	1780	2000
Benzo(b)fluoranthene	ND		ng/l	19000	2820	2000
Benzo(k)fluoranthene	ND		ng/l	19000	2230	2000
Benzo(a)pyrene	ND		ng/l	19000	1600	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	19000	1020	2000
Dibenz(a,h)anthracene	ND		ng/l	19000	1300	2000
Benzo(ghi)perylene	ND		ng/l	19000	2500	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-04 D
Client ID: DUP1-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 14:12
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5670000		ng/l	20000	3540	2000
2-Methylnaphthalene	665000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	131000		ng/l	20000	3220	2000
Fluorene	45100		ng/l	20000	3460	2000
Phenanthrene	36700		ng/l	20000	3780	2000
Anthracene	6240	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-05 D
Client ID: AQPW-07-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 15:35
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 14:46
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	369000		ng/l	20000	3540	2000
2-Methylnaphthalene	76100		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	4180	J	ng/l	20000	3540	2000
Acenaphthene	52400		ng/l	20000	3220	2000
Fluorene	35400		ng/l	20000	3460	2000
Phenanthrene	54300		ng/l	20000	3780	2000
Anthracene	6490	J	ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-06 D
Client ID: AQPW-06-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 14:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 15:20
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	1280000		ng/l	20000	3540	2000
2-Methylnaphthalene	94000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	69100		ng/l	20000	3220	2000
Fluorene	44300		ng/l	20000	3460	2000
Phenanthrene	67100		ng/l	20000	3780	2000
Anthracene	11100	J	ng/l	20000	3880	2000
Fluoranthene	5810	J	ng/l	20000	2980	2000
Pyrene	3980	J	ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-07 D
Client ID: AQPW-05-101922
Sample Location: HAVERHILL, MA

Date Collected: 10/19/22 16:20
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 17:01
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2720000		ng/l	20000	3540	2000
2-Methylnaphthalene	162000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	3730	J	ng/l	20000	3540	2000
Acenaphthene	71000		ng/l	20000	3220	2000
Fluorene	22500		ng/l	20000	3460	2000
Phenanthrene	24500		ng/l	20000	3780	2000
Anthracene	ND		ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-09 D
Client ID: AQPW-04-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:02
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 17:35
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5420000		ng/l	20000	3540	2000
2-Methylnaphthalene	553000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	79200		ng/l	20000	3220	2000
Fluorene	28000		ng/l	20000	3460	2000
Phenanthrene	25000		ng/l	20000	3780	2000
Anthracene	ND		ng/l	20000	3880	2000
Fluoranthene	ND		ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-10 D
Client ID: AQPW-03-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 11:50
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 18:09
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3630000		ng/l	19600	3470	2000
2-Methylnaphthalene	522000		ng/l	19600	2080	2000
2-Chloronaphthalene	ND		ng/l	19600	4310	2000
Acenaphthylene	ND		ng/l	19600	3470	2000
Acenaphthene	100000		ng/l	19600	3160	2000
Fluorene	27000		ng/l	19600	3390	2000
Phenanthrene	26100		ng/l	19600	3700	2000
Anthracene	ND		ng/l	19600	3800	2000
Fluoranthene	ND		ng/l	19600	2920	2000
Pyrene	ND		ng/l	19600	2980	2000
Benz(a)anthracene	ND		ng/l	19600	3390	2000
Chrysene	ND		ng/l	19600	1840	2000
Benzo(b)fluoranthene	ND		ng/l	19600	2900	2000
Benzo(k)fluoranthene	ND		ng/l	19600	2290	2000
Benzo(a)pyrene	ND		ng/l	19600	1650	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	19600	1040	2000
Dibenz(a,h)anthracene	ND		ng/l	19600	1340	2000
Benzo(ghi)perylene	ND		ng/l	19600	2570	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-11 D
Client ID: AQPW-02-102022
Sample Location: HAVERHILL, MA

Date Collected: 10/20/22 15:52
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 18:42
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	581000		ng/l	20400	3610	2000
2-Methylnaphthalene	204000		ng/l	20400	2160	2000
2-Chloronaphthalene	ND		ng/l	20400	4490	2000
Acenaphthylene	ND		ng/l	20400	3610	2000
Acenaphthene	61600		ng/l	20400	3280	2000
Fluorene	16600	J	ng/l	20400	3530	2000
Phenanthrene	20800		ng/l	20400	3860	2000
Anthracene	ND		ng/l	20400	3960	2000
Fluoranthene	ND		ng/l	20400	3040	2000
Pyrene	ND		ng/l	20400	3100	2000
Benz(a)anthracene	ND		ng/l	20400	3530	2000
Chrysene	ND		ng/l	20400	1910	2000
Benzo(b)fluoranthene	ND		ng/l	20400	3020	2000
Benzo(k)fluoranthene	ND		ng/l	20400	2390	2000
Benzo(a)pyrene	ND		ng/l	20400	1710	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20400	1090	2000
Dibenz(a,h)anthracene	ND		ng/l	20400	1400	2000
Benzo(ghi)perylene	ND		ng/l	20400	2670	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-12 D
Client ID: AQPW-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 09:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Porewater
Analytical Method: 141,8270E-SIM
Analytical Date: 11/11/22 19:16
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2480000		ng/l	20000	3540	2000
2-Methylnaphthalene	413000		ng/l	20000	2120	2000
2-Chloronaphthalene	ND		ng/l	20000	4400	2000
Acenaphthylene	ND		ng/l	20000	3540	2000
Acenaphthene	114000		ng/l	20000	3220	2000
Fluorene	52300		ng/l	20000	3460	2000
Phenanthrene	71300		ng/l	20000	3780	2000
Anthracene	9460	J	ng/l	20000	3880	2000
Fluoranthene	3870	J	ng/l	20000	2980	2000
Pyrene	ND		ng/l	20000	3040	2000
Benz(a)anthracene	ND		ng/l	20000	3460	2000
Chrysene	ND		ng/l	20000	1870	2000
Benzo(b)fluoranthene	ND		ng/l	20000	2960	2000
Benzo(k)fluoranthene	ND		ng/l	20000	2340	2000
Benzo(a)pyrene	ND		ng/l	20000	1680	2000
Indeno(1,2,3-cd)Pyrene	ND		ng/l	20000	1070	2000
Dibenz(a,h)anthracene	ND		ng/l	20000	1370	2000
Benzo(ghi)perylene	ND		ng/l	20000	2620	2000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-13
Client ID: RB1-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 11:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 11/14/22 21:28
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	196		ng/l	10.0	1.77	1
2-Methylnaphthalene	99.3		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	15.9		ng/l	10.0	1.77	1
Acenaphthene	52.6		ng/l	10.0	1.61	1
Fluorene	47.5		ng/l	10.0	1.73	1
Phenanthrene	85.4		ng/l	10.0	1.89	1
Anthracene	25.7		ng/l	10.0	1.94	1
Fluoranthene	41.4		ng/l	10.0	1.49	1
Pyrene	42.0		ng/l	10.0	1.52	1
Benz(a)anthracene	26.0		ng/l	10.0	1.73	1
Chrysene	23.3		ng/l	10.0	0.936	1
Benzo(b)fluoranthene	19.8		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	14.4		ng/l	10.0	1.17	1
Benzo(a)pyrene	22.0		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	13.2		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	3.16	J	ng/l	10.0	0.685	1
Benzo(ghi)perylene	13.4		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	70		30-130
Pyrene-d10	70		30-130
Benzo(b)fluoranthene-d12	77		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/07/22 13:41
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 10/26/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-07,09-13 Batch: WG1704210-1					
Naphthalene	1.92	J	ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	2.07	J	ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	75		30-130
Pyrene-d10	83		30-130
Benzo(b)fluoranthene-d12	93		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 Batch: WG1704210-2 WG1704210-3								
Naphthalene	66		72		40-140	9		20
2-Methylnaphthalene	63		67		40-140	6		20
2-Chloronaphthalene	73		79		40-140	8		20
Acenaphthylene	68		71		40-140	4		20
Acenaphthene	66		71		40-140	7		20
Fluorene	71		83		40-140	16		20
Phenanthrene	72		76		40-140	5		20
Anthracene	79		85		40-140	7		20
Fluoranthene	99		85		40-140	15		20
Pyrene	78		76		40-140	3		20
Benz(a)anthracene	85		87		40-140	2		20
Chrysene	85		87		40-140	2		20
Benzo(b)fluoranthene	80		121		40-140	**41**	Q	20
Benzo(k)fluoranthene	99		67		40-140	**39**	Q	20
Benzo(a)pyrene	82		86		40-140	5		20
Indeno(1,2,3-cd)Pyrene	81		100		40-140	**21**	Q	20
Dibenz(a,h)anthracene	84		95		40-140	12		20
Benzo(ghi)perylene	86		92		40-140	7		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 Batch: WG1704210-2 WG1704210-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	76		80		30-130
Pyrene-d10	84		85		30-130
Benzo(b)fluoranthene-d12	91		94		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 QC Batch ID: WG1704210-4 WG1704210-5 QC Sample: L2259175-06 Client ID: AQPW-06-101922												
Naphthalene	1280000	490	893000	**0**	Q	1030000	**0**	Q	40-140	14		20
2-Methylnaphthalene	94000	490	73200	**0**	Q	85600	**0**	Q	40-140	16		20
2-Chloronaphthalene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Acenaphthylene	ND	490	ND	**0**	Q	3490J	**712**	Q	40-140	NC		20
Acenaphthene	69100	490	47600	**0**	Q	51600	**0**	Q	40-140	8		20
Fluorene	44300	490	30100	**0**	Q	35900	**0**	Q	40-140	18		20
Phenanthrene	67100	490	50800	**0**	Q	60000	**0**	Q	40-140	17		20
Anthracene	11100J	490	7210J	**1470**	Q	7930J	**1620**	Q	40-140	10		20
Fluoranthene	5810J	490	3870J	**789**	Q	5760J	**1180**	Q	40-140	**39**	Q	20
Pyrene	3980J	490	ND	**0**	Q	3660J	**747**	Q	40-140	NC		20
Benz(a)anthracene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Chrysene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(b)fluoranthene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(k)fluoranthene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(a)pyrene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Indeno(1,2,3-cd)Pyrene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Dibenz(a,h)anthracene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20
Benzo(ghi)perylene	ND	490	ND	**0**	Q	ND	**0**	Q	40-140	NC		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	**0**	Q	30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-07,09-13 QC Batch ID: WG1704210-4 WG1704210-5 QC Sample: L2259175-06 Client ID: AQPW-06-101922												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Pyrene-d10	**0**	Q	**0**	Q	30-130

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Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent
C	Absent
D	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-01A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-01E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)

*Values in parentheses indicate holding time in days

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Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-05A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-05E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-08A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

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Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-09A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-09E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-14A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14A1	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)

*Values in parentheses indicate holding time in days

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Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-14B1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14D1	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-14E1	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-15A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-15B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-15E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)

*Values in parentheses indicate holding time in days

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GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

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Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

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REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 10/21/22

ALPHA Job #: L2259175

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone:
Email: bgauley@anchorqea.com

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	Sample Comments	TOTAL # BOTTLES
S9175-01	AQPW-10-101922	10/19/22	1053	X1	BJLG SA	X	X		5
-02	AQPW-09-101922		1137	X1		X	X		5
-03	AQPW-08-101922		1230	X1		X	X		5
-04	DUP1-101922		—	X1		X	X		5
-05	AQPW-07-101922		1535	X1		X	X		5
-06	AQPW-06-101922		1400	X1		X	X	MS/MSD	15
-07	AQPW-05-101922		1620	X1		X	X		5
-08	HAV-TB1	10/16/22	1815	X2		X	BJLG 10/21/22		3

Container Type	G	A
Preservative	B	A

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. L. Gauley	10/21/22 1342	[signature] AAL	10/21/22 13:42
[signature] AAL	10/21/22 17:00	[signature]	10/21/22 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 10/21/22

ALPHA Job #: L2259175

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 978-792-5737
Email: bgauley@anchorqea.com

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB	TPH	Sample Comments	TOTAL # BOTTLES
59175-09	AQPW-04-102022	10/20/22	1102	X1	SA	X	X								5
-10	AQPW-03-102022	10/20/22	11:50	X1	SA	X	X								5
-11	AQPW-02-102022	10/20/22	15:52	X1	SA	X	X								5
-12	AQPW-01-102122	10/21/22	0900	X1	BJLG/SA	X	X								5
-13	RB1-102122	10/21/22	11:00	X2	BJLG	X	X								5
~~-14~~	~~AQHA-01-102122~~	↓	~~1015~~	~~B~~	~~BJLG~~	~~X~~	~~X~~							MS/MSD	10
~~-15~~	~~DUP2-102122~~	↓		~~B~~	~~BJLG~~	~~X~~	~~X~~								5

Container Type	G	A
Preservative	B	A

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H= $Na_2S_2O_3$
I= Ascorbic Acid
J= NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. L Gauley	10/21/22 1342	[signature] AAL	10/21/22 13:42
[signature] AAL	10/21/22 17:00	[signature]	10/21/22 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

ANALYTICAL REPORT

Lab Number:	L2262370
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	12/09/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2262370-01	AQSS-22-1.5-2.0	SEDIMENT	HAVERHILL, MA	11/04/22 16:00	11/07/22
L2262370-02	AQSS-22-2.0-2.5	SEDIMENT	HAVERHILL, MA	11/04/22 16:05	11/07/22
L2262370-03	DUP1-110422	SEDIMENT	HAVERHILL, MA	11/04/22 00:00	11/07/22
L2262370-04	RINSE-110422	WATER	HAVERHILL, MA	11/04/22 16:26	11/07/22
L2262370-05	TRIP BLANK	WATER	HAVERHILL, MA	11/04/22 16:00	11/07/22

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L2262370: The sediment samples were frozen upon receipt in order to arrest the holding time.

MCP Related Narratives

Volatile Organics

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2262370-01, -01D: The sample was re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range. The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2262370-01, -02: The analysis of Volatile Organics by EPA Method 5035/8260 Low Level could not be performed due to the elevated concentrations of target compounds in the sample.

In reference to question H:

L2262370-01, -01D and -02: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: bromochloromethane (0.0808)

Verification: dichlorodifluoromethane (148%), ethyl ether (135%), carbon disulfide (151%)

L2262370-01, -01D and -02: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2262370-04 and -05: Initial calibration utilized a quadratic fit for: bromomethane

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

L2262370-04 and -05: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,4-dioxane (0.0033)
Average Response Factor: 1,4-dioxane
Verification: carbon disulfide (193%)
L2262370-04 and -05: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.
The WG1714879-3/-4 LCS/LCSD recoveries, associated with L2262370-01, are above the individual acceptance criteria for bromomethane (133%/137%), but within the overall method allowances. The results of the associated samples are reported; however, all positive detects for these compounds are considered to have a potentially high bias.

Semivolatile Organics by SIM
In reference to question G:
One or more of the target analytes did not achieve the requested CAM reporting limits.
L2262370-01D, -02D, -03D and WG1718985-4D and WG1718985-5D (MS/MSD): The samples have elevated detection limits due to the dilution required by the sample matrix.
The WG1718985-4D/-5D MS/MSD recoveries and RPDs, performed on L2262370-01, are outside the acceptance criteria for several compounds. The unacceptable percent recoveries are attributed to the elevated concentrations of target compounds present in the native sample. See the MS/MSD Summary Report for details.

Non-MCP Related Narratives
Total Organic Carbon
The WG1719298-4/-5 MS/MSD recoveries and RPDs (Rep1 - 47%), (Rep2 - 0%, 41% RPD) performed on L2262370-01, are outside the 75-125% acceptance criteria, possibly due to sample matrix. The associated

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Case Narrative (continued)

SRM recoveries are within criteria, indicating the sample batch was in control, and all sample results were accepted.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 12/09/22

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP Volatile Organics by EPA 5035 High - Westborough Lab								
8260D	Batch QC	WG1713088-3	Bromomethane	LCS	145	70-130	01-02	potential high bias
8260D	Batch QC	WG1713088-4	Bromomethane	LCSD	145	70-130	01-02	potential high bias
8260D	Batch QC	WG1714879-3	Bromomethane	LCS	133	70-130	01	potential high bias
8260D	Batch QC	WG1714879-4	Bromomethane	LCSD	137	70-130	01	potential high bias
MCP PAHs by GC/MS-SIM - Mansfield Lab								
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Naphthalene	MS	1070	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	2-Methylnaphthalene	MS	306	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Acenaphthylene	MS	303	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Acenaphthene	MS	338	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Fluorene	MS	356	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Phenanthrene	MS	2670	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Anthracene	MS	1160	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Fluoranthene	MS	3920	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Pyrene	MS	2670	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benz(a)anthracene	MS	1760	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Chrysene	MS	1500	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(b)fluoranthene	MS	1170	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(k)fluoranthene	MS	1230	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(a)pyrene	MS	1580	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Indeno(1,2,3-cd)Pyrene	MS	819	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Dibenz(a,h)anthracene	MS	278	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-4 D	Benzo(ghi)perylene	MS	712	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Naphthalene	MSD	0	40-140	01-03	potential low bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	2-Methylnaphthalene	MSD	0	40-140	01-03	potential low bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Acenaphthylene	MSD	1090	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Acenaphthene	MSD	941	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluorene	MSD	1090	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Phenanthrene	MSD	35	30	01-03	non-directional bias

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Phenanthrene	MSD	15600	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Anthracene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Anthracene	MSD	6120	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluoranthene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Fluoranthene	MSD	24300	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Pyrene	MSD	46	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Pyrene	MSD	20100	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benz(a)anthracene	MSD	49	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benz(a)anthracene	MSD	13000	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Chrysene	MSD	45	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Chrysene	MSD	9830	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(b)fluoranthene	MSD	55	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(b)fluoranthene	MSD	9770	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(k)fluoranthene	MSD	5270	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(a)pyrene	MSD	46	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(a)pyrene	MSD	10900	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Indeno(1,2,3-cd)Pyrene	MSD	49	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Indeno(1,2,3-cd)Pyrene	MSD	6250	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Dibenz(a,h)anthracene	MSD	44	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Dibenz(a,h)anthracene	MSD	1460	40-140	01-03	potential high bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(ghi)perylene	MSD	43	30	01-03	non-directional bias
8270E-SIM	Batch QC (L2262370-01)	WG1718985-5 D	Benzo(ghi)perylene	MSD	4670	40-140	01-03	potential high bias
Total Organic Carbon - Mansfield Lab								
9060A	Batch QC (L2262370-01)	WG1719298-4	Total Organic Carbon (Rep2)	MS	0	75-125	01-03	potential low bias
9060A	Batch QC (L2262370-01)	WG1719298-5	Total Organic Carbon (Rep1)	MSD	47	75-125	01-03	potential low bias
9060A	Batch QC (L2262370-01)	WG1719298-5	Total Organic Carbon (Rep2)	MSD	41	25	01-03	non-directional bias

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/18/22 17:04
Analyst: JIC
Percent Solids: 87%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	340	160	1
1,1-Dichloroethane	ND		ug/kg	69	10.	1
Chloroform	ND		ug/kg	100	9.7	1
Carbon tetrachloride	ND		ug/kg	69	16.	1
1,2-Dichloropropane	ND		ug/kg	69	8.6	1
Dibromochloromethane	ND		ug/kg	69	9.7	1
1,1,2-Trichloroethane	ND		ug/kg	69	18.	1
Tetrachloroethene	ND		ug/kg	34	14.	1
Chlorobenzene	ND		ug/kg	34	8.8	1
Trichlorofluoromethane	ND		ug/kg	280	48.	1
1,2-Dichloroethane	110		ug/kg	69	18.	1
1,1,1-Trichloroethane	ND		ug/kg	34	12.	1
Bromodichloromethane	ND		ug/kg	34	7.5	1
trans-1,3-Dichloropropene	ND		ug/kg	69	19.	1
cis-1,3-Dichloropropene	ND		ug/kg	34	11.	1
1,3-Dichloropropene, Total	ND		ug/kg	34	11.	1
1,1-Dichloropropene	ND		ug/kg	34	11.	1
Bromoform	ND		ug/kg	280	17.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	34	11.	1
Benzene	740		ug/kg	34	11.	1
Toluene	220		ug/kg	69	38.	1
Ethylbenzene	250		ug/kg	69	9.7	1
Chloromethane	ND		ug/kg	280	64.	1
Bromomethane	ND		ug/kg	140	40.	1
Vinyl chloride	ND		ug/kg	69	23.	1
Chloroethane	ND		ug/kg	140	31.	1
1,1-Dichloroethene	ND		ug/kg	69	16.	1
trans-1,2-Dichloroethene	ND		ug/kg	100	9.5	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 Date Collected: 11/04/22 16:00

Client ID: AQSS-22-1.5-2.0 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	300		ug/kg	34	9.5	1
1,2-Dichlorobenzene	ND		ug/kg	140	10.	1
1,3-Dichlorobenzene	ND		ug/kg	140	10.	1
1,4-Dichlorobenzene	19	J	ug/kg	140	12.	1
Methyl tert butyl ether	ND		ug/kg	140	14.	1
p/m-Xylene	210		ug/kg	140	39.	1
o-Xylene	120		ug/kg	69	20.	1
Xylenes, Total	330		ug/kg	69	20.	1
cis-1,2-Dichloroethene	110		ug/kg	69	12.	1
1,2-Dichloroethene, Total	110		ug/kg	69	9.5	1
Dibromomethane	ND		ug/kg	140	16.	1
1,2,3-Trichloropropane	ND		ug/kg	140	8.8	1
Styrene	24	J	ug/kg	69	14.	1
Dichlorodifluoromethane	ND		ug/kg	690	63.	1
Acetone	ND		ug/kg	690	330	1
Carbon disulfide	82	J	ug/kg	690	76.	1
Methyl ethyl ketone	ND		ug/kg	690	150	1
Methyl isobutyl ketone	ND		ug/kg	690	88.	1
2-Hexanone	ND		ug/kg	690	82.	1
Bromochloromethane	ND		ug/kg	140	14.	1
Tetrahydrofuran	ND		ug/kg	280	110	1
2,2-Dichloropropane	ND		ug/kg	140	14.	1
1,2-Dibromoethane	ND		ug/kg	69	19.	1
1,3-Dichloropropane	ND		ug/kg	140	12.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	34	9.1	1
Bromobenzene	ND		ug/kg	140	10.	1
n-Butylbenzene	18	J	ug/kg	69	12.	1
sec-Butylbenzene	ND		ug/kg	69	10.	1
tert-Butylbenzene	ND		ug/kg	140	8.2	1
o-Chlorotoluene	ND		ug/kg	140	13.	1
p-Chlorotoluene	ND		ug/kg	140	7.5	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	210	69.	1
Hexachlorobutadiene	ND		ug/kg	280	12.	1
Isopropylbenzene	50	J	ug/kg	69	7.5	1
p-Isopropyltoluene	14	J	ug/kg	69	7.5	1
Naphthalene	24000	E	ug/kg	280	45.	1
n-Propylbenzene	25	J	ug/kg	69	12.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 Date Collected: 11/04/22 16:00

Client ID: AQSS-22-1.5-2.0 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	140	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	140	19.	1
1,3,5-Trimethylbenzene	71	J	ug/kg	140	13.	1
1,2,4-Trimethylbenzene	200		ug/kg	140	23.	1
Diethyl ether	ND		ug/kg	140	24.	1
Diisopropyl Ether	ND		ug/kg	140	15.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	140	8.8	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	140	12.	1
1,4-Dioxane	ND		ug/kg	5500	2400	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-01	D	Date Collected:	11/04/22 16:00
Client ID:	AQSS-22-1.5-2.0		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified

Sample Depth:

Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/16/22 03:34
Analyst: NLK
Percent Solids: 87%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Naphthalene	21000		ug/kg	550	90.	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02
Client ID: AQSS-22-2.0-2.5
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:05
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:01
Analyst: NLK
Percent Solids: 89%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	370	170	1
1,1-Dichloroethane	ND		ug/kg	75	11.	1
Chloroform	ND		ug/kg	110	10.	1
Carbon tetrachloride	ND		ug/kg	75	17.	1
1,2-Dichloropropane	ND		ug/kg	75	9.3	1
Dibromochloromethane	ND		ug/kg	75	10.	1
1,1,2-Trichloroethane	ND		ug/kg	75	20.	1
Tetrachloroethene	ND		ug/kg	37	15.	1
Chlorobenzene	ND		ug/kg	37	9.5	1
Trichlorofluoromethane	ND		ug/kg	300	52.	1
1,2-Dichloroethane	ND		ug/kg	75	19.	1
1,1,1-Trichloroethane	ND		ug/kg	37	12.	1
Bromodichloromethane	ND		ug/kg	37	8.1	1
trans-1,3-Dichloropropene	ND		ug/kg	75	20.	1
cis-1,3-Dichloropropene	ND		ug/kg	37	12.	1
1,3-Dichloropropene, Total	ND		ug/kg	37	12.	1
1,1-Dichloropropene	ND		ug/kg	37	12.	1
Bromoform	ND		ug/kg	300	18.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	37	12.	1
Benzene	420		ug/kg	37	12.	1
Toluene	140		ug/kg	75	40.	1
Ethylbenzene	120		ug/kg	75	10.	1
Chloromethane	ND		ug/kg	300	70.	1
Bromomethane	ND		ug/kg	150	43.	1
Vinyl chloride	ND		ug/kg	75	25.	1
Chloroethane	ND		ug/kg	150	34.	1
1,1-Dichloroethene	ND		ug/kg	75	18.	1
trans-1,2-Dichloroethene	ND		ug/kg	110	10.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02 Date Collected: 11/04/22 16:05

Client ID: AQSS-22-2.0-2.5 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	180		ug/kg	37	10.	1
1,2-Dichlorobenzene	ND		ug/kg	150	11.	1
1,3-Dichlorobenzene	ND		ug/kg	150	11.	1
1,4-Dichlorobenzene	ND		ug/kg	150	13.	1
Methyl tert butyl ether	ND		ug/kg	150	15.	1
p/m-Xylene	120	J	ug/kg	150	42.	1
o-Xylene	49	J	ug/kg	75	22.	1
Xylenes, Total	170	J	ug/kg	75	22.	1
cis-1,2-Dichloroethene	46	J	ug/kg	75	13.	1
1,2-Dichloroethene, Total	46	J	ug/kg	75	10.	1
Dibromomethane	ND		ug/kg	150	18.	1
1,2,3-Trichloropropane	ND		ug/kg	150	9.5	1
Styrene	ND		ug/kg	75	15.	1
Dichlorodifluoromethane	ND		ug/kg	750	68.	1
Acetone	ND		ug/kg	750	360	1
Carbon disulfide	ND		ug/kg	750	82.	1
Methyl ethyl ketone	ND		ug/kg	750	160	1
Methyl isobutyl ketone	ND		ug/kg	750	96.	1
2-Hexanone	ND		ug/kg	750	88.	1
Bromochloromethane	ND		ug/kg	150	15.	1
Tetrahydrofuran	ND		ug/kg	300	120	1
2,2-Dichloropropane	ND		ug/kg	150	15.	1
1,2-Dibromoethane	ND		ug/kg	75	21.	1
1,3-Dichloropropane	ND		ug/kg	150	12.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	37	9.8	1
Bromobenzene	ND		ug/kg	150	11.	1
n-Butylbenzene	ND		ug/kg	75	12.	1
sec-Butylbenzene	ND		ug/kg	75	11.	1
tert-Butylbenzene	ND		ug/kg	150	8.8	1
o-Chlorotoluene	ND		ug/kg	150	14.	1
p-Chlorotoluene	ND		ug/kg	150	8.1	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	220	74.	1
Hexachlorobutadiene	ND		ug/kg	300	13.	1
Isopropylbenzene	ND		ug/kg	75	8.1	1
p-Isopropyltoluene	ND		ug/kg	75	8.1	1
Naphthalene	6900		ug/kg	300	48.	1
n-Propylbenzene	ND		ug/kg	75	13.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02 Date Collected: 11/04/22 16:05

Client ID: AQSS-22-2.0-2.5 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	150	24.	1
1,2,4-Trichlorobenzene	ND		ug/kg	150	20.	1
1,3,5-Trimethylbenzene	28	J	ug/kg	150	14.	1
1,2,4-Trimethylbenzene	75	J	ug/kg	150	25.	1
Diethyl ether	ND		ug/kg	150	25.	1
Diisopropyl Ether	ND		ug/kg	150	16.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	150	9.6	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	150	13.	1
1,4-Dioxane	ND		ug/kg	6000	2600	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	95		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04
Client ID: RINSE-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:26
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/16/22 06:40
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04 Date Collected: 11/04/22 16:26

Client ID: RINSE-110422 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04 Date Collected: 11/04/22 16:26

Client ID: RINSE-110422 Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	95		70-130
Dibromofluoromethane	111		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05
Client ID: TRIP BLANK
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 11/16/22 06:14
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Methylene chloride	ND		ug/l	2.0	0.68	1
1,1-Dichloroethane	ND		ug/l	1.0	0.21	1
Chloroform	ND		ug/l	1.0	0.22	1
Carbon tetrachloride	ND		ug/l	1.0	0.13	1
1,2-Dichloropropane	ND		ug/l	1.0	0.14	1
Dibromochloromethane	ND		ug/l	1.0	0.15	1
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14	1
Tetrachloroethene	ND		ug/l	1.0	0.18	1
Chlorobenzene	ND		ug/l	1.0	0.18	1
Trichlorofluoromethane	ND		ug/l	2.0	0.16	1
1,2-Dichloroethane	ND		ug/l	1.0	0.13	1
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16	1
Bromodichloromethane	ND		ug/l	1.0	0.19	1
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16	1
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14	1
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14	1
1,1-Dichloropropene	ND		ug/l	2.0	0.24	1
Bromoform	ND		ug/l	2.0	0.25	1
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17	1
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Chloromethane	ND		ug/l	2.0	0.20	1
Bromomethane	ND		ug/l	2.0	0.26	1
Vinyl chloride	ND		ug/l	1.0	0.07	1
Chloroethane	ND		ug/l	2.0	0.13	1
1,1-Dichloroethene	ND		ug/l	1.0	0.17	1
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05 Date Collected: 11/04/22 16:00

Client ID: TRIP BLANK Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Trichloroethene	ND		ug/l	1.0	0.18	1
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18	1
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19	1
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Xylenes, Total	ND		ug/l	1.0	0.33	1
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19	1
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16	1
Dibromomethane	ND		ug/l	2.0	0.36	1
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18	1
Styrene	ND		ug/l	1.0	0.36	1
Dichlorodifluoromethane	ND		ug/l	2.0	0.24	1
Acetone	ND		ug/l	5.0	1.5	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
Methyl ethyl ketone	ND		ug/l	5.0	1.9	1
Methyl isobutyl ketone	ND		ug/l	5.0	0.42	1
2-Hexanone	ND		ug/l	5.0	0.52	1
Bromochloromethane	ND		ug/l	2.0	0.15	1
Tetrahydrofuran	ND		ug/l	2.0	0.52	1
2,2-Dichloropropane	ND		ug/l	2.0	0.20	1
1,2-Dibromoethane	ND		ug/l	2.0	0.19	1
1,3-Dichloropropane	ND		ug/l	2.0	0.21	1
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16	1
Bromobenzene	ND		ug/l	2.0	0.15	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
sec-Butylbenzene	ND		ug/l	2.0	0.18	1
tert-Butylbenzene	ND		ug/l	2.0	0.20	1
o-Chlorotoluene	ND		ug/l	2.0	0.22	1
p-Chlorotoluene	ND		ug/l	2.0	0.18	1
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35	1
Hexachlorobutadiene	ND		ug/l	0.60	0.22	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-05 Date Collected: 11/04/22 16:00

Client ID: TRIP BLANK Date Received: 11/07/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23	1
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1
Diethyl ether	ND		ug/l	2.0	0.16	1
Diisopropyl Ether	ND		ug/l	2.0	0.42	1
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18	1
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28	1
1,4-Dioxane	ND		ug/l	250	61.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	90		70-130
Dibromofluoromethane	114		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	30	J	ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/15/22 20:53
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01-02 Batch: WG1713088-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
Methylene chloride	ND		ug/l	2.0	0.68
1,1-Dichloroethane	ND		ug/l	1.0	0.21
Chloroform	ND		ug/l	1.0	0.22
Carbon tetrachloride	ND		ug/l	1.0	0.13
1,2-Dichloropropane	ND		ug/l	1.0	0.14
Dibromochloromethane	ND		ug/l	1.0	0.15
1,1,2-Trichloroethane	ND		ug/l	1.0	0.14
Tetrachloroethene	ND		ug/l	1.0	0.18
Chlorobenzene	ND		ug/l	1.0	0.18
Trichlorofluoromethane	ND		ug/l	2.0	0.16
1,2-Dichloroethane	ND		ug/l	1.0	0.13
1,1,1-Trichloroethane	ND		ug/l	1.0	0.16
Bromodichloromethane	ND		ug/l	1.0	0.19
trans-1,3-Dichloropropene	ND		ug/l	0.40	0.16
cis-1,3-Dichloropropene	ND		ug/l	0.40	0.14
1,3-Dichloropropene, Total	ND		ug/l	0.40	0.14
1,1-Dichloropropene	ND		ug/l	2.0	0.24
Bromoform	ND		ug/l	2.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/l	1.0	0.17
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Chloromethane	ND		ug/l	2.0	0.20
Bromomethane	ND		ug/l	2.0	0.26
Vinyl chloride	ND		ug/l	1.0	0.07
Chloroethane	ND		ug/l	2.0	0.13
1,1-Dichloroethene	ND		ug/l	1.0	0.17
trans-1,2-Dichloroethene	ND		ug/l	1.0	0.16
Trichloroethene	ND		ug/l	1.0	0.18

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
1,2-Dichlorobenzene	ND		ug/l	1.0	0.18
1,3-Dichlorobenzene	ND		ug/l	1.0	0.19
1,4-Dichlorobenzene	ND		ug/l	1.0	0.19
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Xylenes, Total	ND		ug/l	1.0	0.33
cis-1,2-Dichloroethene	ND		ug/l	1.0	0.19
1,2-Dichloroethene, Total	ND		ug/l	1.0	0.16
Dibromomethane	ND		ug/l	2.0	0.36
1,2,3-Trichloropropane	ND		ug/l	2.0	0.18
Styrene	ND		ug/l	1.0	0.36
Dichlorodifluoromethane	ND		ug/l	2.0	0.24
Acetone	ND		ug/l	5.0	1.5
Carbon disulfide	ND		ug/l	2.0	0.30
Methyl ethyl ketone	ND		ug/l	5.0	1.9
Methyl isobutyl ketone	ND		ug/l	5.0	0.42
2-Hexanone	ND		ug/l	5.0	0.52
Bromochloromethane	ND		ug/l	2.0	0.15
Tetrahydrofuran	ND		ug/l	2.0	0.52
2,2-Dichloropropane	ND		ug/l	2.0	0.20
1,2-Dibromoethane	ND		ug/l	2.0	0.19
1,3-Dichloropropane	ND		ug/l	2.0	0.21
1,1,1,2-Tetrachloroethane	ND		ug/l	1.0	0.16
Bromobenzene	ND		ug/l	2.0	0.15
n-Butylbenzene	ND		ug/l	2.0	0.19
sec-Butylbenzene	ND		ug/l	2.0	0.18
tert-Butylbenzene	ND		ug/l	2.0	0.20
o-Chlorotoluene	ND		ug/l	2.0	0.22

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/16/22 04:54
Analyst: MCM

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 04-05 Batch: WG1713273-5					
p-Chlorotoluene	ND		ug/l	2.0	0.18
1,2-Dibromo-3-chloropropane	ND		ug/l	2.0	0.35
Hexachlorobutadiene	ND		ug/l	0.60	0.22
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,2,3-Trichlorobenzene	ND		ug/l	2.0	0.23
1,2,4-Trichlorobenzene	ND		ug/l	2.0	0.22
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19
Diethyl ether	ND		ug/l	2.0	0.16
Diisopropyl Ether	ND		ug/l	2.0	0.42
Ethyl-Tert-Butyl-Ether	ND		ug/l	2.0	0.18
Tertiary-Amyl Methyl Ether	ND		ug/l	2.0	0.28
1,4-Dioxane	ND		ug/l	250	61.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	93		70-130
Dibromofluoromethane	109		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/18/22 09:01
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 01 Batch: WG1714879-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	98		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Methylene chloride	102		101		70-130	1		20
1,1-Dichloroethane	109		109		70-130	0		20
Chloroform	108		108		70-130	0		20
Carbon tetrachloride	115		112		70-130	3		20
1,2-Dichloropropane	106		105		70-130	1		20
Dibromochloromethane	95		94		70-130	1		20
1,1,2-Trichloroethane	103		102		70-130	1		20
Tetrachloroethene	109		107		70-130	2		20
Chlorobenzene	106		104		70-130	2		20
Trichlorofluoromethane	119		118		70-130	1		20
1,2-Dichloroethane	103		102		70-130	1		20
1,1,1-Trichloroethane	116		115		70-130	1		20
Bromodichloromethane	104		103		70-130	1		20
trans-1,3-Dichloropropene	101		100		70-130	1		20
cis-1,3-Dichloropropene	107		106		70-130	1		20
1,1-Dichloropropene	110		108		70-130	2		20
Bromoform	97		98		70-130	1		20
1,1,2,2-Tetrachloroethane	98		99		70-130	1		20
Benzene	110		109		70-130	1		20
Toluene	106		105		70-130	1		20
Ethylbenzene	106		104		70-130	2		20
Chloromethane	113		113		70-130	0		20
Bromomethane	**145**	Q	**145**	Q	70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Vinyl chloride	124		121		70-130	2		20
Chloroethane	107		107		70-130	0		20
1,1-Dichloroethene	115		114		70-130	1		20
trans-1,2-Dichloroethene	109		109		70-130	0		20
Trichloroethene	100		100		70-130	0		20
1,2-Dichlorobenzene	101		102		70-130	1		20
1,3-Dichlorobenzene	102		103		70-130	1		20
1,4-Dichlorobenzene	101		103		70-130	2		20
Methyl tert butyl ether	101		100		70-130	1		20
p/m-Xylene	108		106		70-130	2		20
o-Xylene	105		103		70-130	2		20
cis-1,2-Dichloroethene	107		107		70-130	0		20
Dibromomethane	104		105		70-130	1		20
1,2,3-Trichloropropane	98		99		70-130	1		20
Styrene	103		102		70-130	1		20
Dichlorodifluoromethane	118		116		70-130	2		20
Acetone	92		91		70-130	1		20
Carbon disulfide	101		100		70-130	1		20
Methyl ethyl ketone	93		92		70-130	1		20
Methyl isobutyl ketone	99		99		70-130	0		20
2-Hexanone	89		88		70-130	1		20
Bromochloromethane	108		107		70-130	1		20
Tetrahydrofuran	91		91		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
2,2-Dichloropropane	114		112		70-130	2		20
1,2-Dibromoethane	98		96		70-130	2		20
1,3-Dichloropropane	100		101		70-130	1		20
1,1,1,2-Tetrachloroethane	97		95		70-130	2		20
Bromobenzene	100		102		70-130	2		20
n-Butylbenzene	112		111		70-130	1		20
sec-Butylbenzene	110		110		70-130	0		20
tert-Butylbenzene	106		106		70-130	0		20
o-Chlorotoluene	99		101		70-130	2		20
p-Chlorotoluene	102		102		70-130	0		20
1,2-Dibromo-3-chloropropane	100		98		70-130	2		20
Hexachlorobutadiene	118		119		70-130	1		20
Isopropylbenzene	106		105		70-130	1		20
p-Isopropyltoluene	108		108		70-130	0		20
Naphthalene	94		95		70-130	1		20
n-Propylbenzene	105		106		70-130	1		20
1,2,3-Trichlorobenzene	105		106		70-130	1		20
1,2,4-Trichlorobenzene	108		109		70-130	1		20
1,3,5-Trimethylbenzene	105		105		70-130	0		20
1,2,4-Trimethylbenzene	102		103		70-130	1		20
Diethyl ether	107		108		70-130	1		20
Diisopropyl Ether	101		101		70-130	0		20
Ethyl-Tert-Butyl-Ether	102		102		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01-02 Batch: WG1713088-3 WG1713088-4								
Tertiary-Amyl Methyl Ether	101		101		70-130	0		20
1,4-Dioxane	93		92		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	100		99		70-130
Toluene-d8	99		98		70-130
4-Bromofluorobenzene	93		94		70-130
Dibromofluoromethane	98		96		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Methylene chloride	98		100		70-130	2		20
1,1-Dichloroethane	100		100		70-130	0		20
Chloroform	100		100		70-130	0		20
Carbon tetrachloride	110		110		70-130	0		20
1,2-Dichloropropane	100		100		70-130	0		20
Dibromochloromethane	110		110		70-130	0		20
1,1,2-Trichloroethane	100		110		70-130	10		20
Tetrachloroethene	120		120		70-130	0		20
Chlorobenzene	110		110		70-130	0		20
Trichlorofluoromethane	110		110		70-130	0		20
1,2-Dichloroethane	97		99		70-130	2		20
1,1,1-Trichloroethane	110		100		70-130	10		20
Bromodichloromethane	100		100		70-130	0		20
trans-1,3-Dichloropropene	110		110		70-130	0		20
cis-1,3-Dichloropropene	100		100		70-130	0		20
1,1-Dichloropropene	110		100		70-130	10		20
Bromoform	110		120		70-130	9		20
1,1,2,2-Tetrachloroethane	100		100		70-130	0		20
Benzene	110		100		70-130	10		20
Toluene	110		110		70-130	0		20
Ethylbenzene	110		110		70-130	0		20
Chloromethane	89		84		70-130	6		20
Bromomethane	130		130		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Vinyl chloride	98		98		70-130	0		20
Chloroethane	100		100		70-130	0		20
1,1-Dichloroethene	110		100		70-130	10		20
trans-1,2-Dichloroethene	110		100		70-130	10		20
Trichloroethene	110		110		70-130	0		20
1,2-Dichlorobenzene	110		110		70-130	0		20
1,3-Dichlorobenzene	110		110		70-130	0		20
1,4-Dichlorobenzene	110		110		70-130	0		20
Methyl tert butyl ether	97		98		70-130	1		20
p/m-Xylene	115		120		70-130	4		20
o-Xylene	110		115		70-130	4		20
cis-1,2-Dichloroethene	100		100		70-130	0		20
Dibromomethane	92		94		70-130	2		20
1,2,3-Trichloropropane	95		99		70-130	4		20
Styrene	115		120		70-130	4		20
Dichlorodifluoromethane	85		81		70-130	5		20
Acetone	92		91		70-130	1		20
Carbon disulfide	110		100		70-130	10		20
Methyl ethyl ketone	90		89		70-130	1		20
Methyl isobutyl ketone	92		94		70-130	2		20
2-Hexanone	89		87		70-130	2		20
Bromochloromethane	110		110		70-130	0		20
Tetrahydrofuran	91		89		70-130	2		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
2,2-Dichloropropane	110		110		70-130	0		20
1,2-Dibromoethane	110		110		70-130	0		20
1,3-Dichloropropane	100		100		70-130	0		20
1,1,1,2-Tetrachloroethane	110		110		70-130	0		20
Bromobenzene	100		110		70-130	10		20
n-Butylbenzene	120		120		70-130	0		20
sec-Butylbenzene	110		110		70-130	0		20
tert-Butylbenzene	110		110		70-130	0		20
o-Chlorotoluene	100		110		70-130	10		20
p-Chlorotoluene	100		100		70-130	0		20
1,2-Dibromo-3-chloropropane	94		96		70-130	2		20
Hexachlorobutadiene	120		130		70-130	8		20
Isopropylbenzene	110		110		70-130	0		20
p-Isopropyltoluene	120		120		70-130	0		20
Naphthalene	110		110		70-130	0		20
n-Propylbenzene	110		110		70-130	0		20
1,2,3-Trichlorobenzene	120		120		70-130	0		20
1,2,4-Trichlorobenzene	120		120		70-130	0		20
1,3,5-Trimethylbenzene	110		110		70-130	0		20
1,2,4-Trimethylbenzene	110		110		70-130	0		20
Diethyl ether	97		98		70-130	1		20
Diisopropyl Ether	95		94		70-130	1		20
Ethyl-Tert-Butyl-Ether	99		100		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 04-05 Batch: WG1713273-3 WG1713273-4								
Tertiary-Amyl Methyl Ether	98		99		70-130	1		20
1,4-Dioxane	122		124		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		94		70-130
Toluene-d8	97		98		70-130
4-Bromofluorobenzene	92		90		70-130
Dibromofluoromethane	101		97		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Methylene chloride	97		101		70-130	4		20
1,1-Dichloroethane	105		109		70-130	4		20
Chloroform	103		103		70-130	0		20
Carbon tetrachloride	109		113		70-130	4		20
1,2-Dichloropropane	103		106		70-130	3		20
Dibromochloromethane	90		93		70-130	3		20
1,1,2-Trichloroethane	97		99		70-130	2		20
Tetrachloroethene	101		102		70-130	1		20
Chlorobenzene	99		101		70-130	2		20
Trichlorofluoromethane	112		114		70-130	2		20
1,2-Dichloroethane	100		104		70-130	4		20
1,1,1-Trichloroethane	110		114		70-130	4		20
Bromodichloromethane	100		104		70-130	4		20
trans-1,3-Dichloropropene	97		98		70-130	1		20
cis-1,3-Dichloropropene	101		106		70-130	5		20
1,1-Dichloropropene	104		108		70-130	4		20
Bromoform	90		94		70-130	4		20
1,1,2,2-Tetrachloroethane	91		95		70-130	4		20
Benzene	104		108		70-130	4		20
Toluene	100		101		70-130	1		20
Ethylbenzene	100		102		70-130	2		20
Chloromethane	112		114		70-130	2		20
Bromomethane	**133**	Q	**137**	Q	70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Vinyl chloride	110		113		70-130	3		20
Chloroethane	101		105		70-130	4		20
1,1-Dichloroethene	109		110		70-130	1		20
trans-1,2-Dichloroethene	103		106		70-130	3		20
Trichloroethene	96		99		70-130	3		20
1,2-Dichlorobenzene	93		97		70-130	4		20
1,3-Dichlorobenzene	95		98		70-130	3		20
1,4-Dichlorobenzene	94		98		70-130	4		20
Methyl tert butyl ether	96		100		70-130	4		20
p/m-Xylene	101		103		70-130	2		20
o-Xylene	97		100		70-130	3		20
cis-1,2-Dichloroethene	100		104		70-130	4		20
Dibromomethane	99		104		70-130	5		20
1,2,3-Trichloropropane	91		98		70-130	7		20
Styrene	96		99		70-130	3		20
Dichlorodifluoromethane	111		114		70-130	3		20
Acetone	90		92		70-130	2		20
Carbon disulfide	96		99		70-130	3		20
Methyl ethyl ketone	90		94		70-130	4		20
Methyl isobutyl ketone	93		98		70-130	5		20
2-Hexanone	84		86		70-130	2		20
Bromochloromethane	100		105		70-130	5		20
Tetrahydrofuran	89		92		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
2,2-Dichloropropane	110		112		70-130	2		20
1,2-Dibromoethane	92		96		70-130	4		20
1,3-Dichloropropane	96		98		70-130	2		20
1,1,1,2-Tetrachloroethane	91		93		70-130	2		20
Bromobenzene	91		97		70-130	6		20
n-Butylbenzene	102		107		70-130	5		20
sec-Butylbenzene	101		105		70-130	4		20
tert-Butylbenzene	97		101		70-130	4		20
o-Chlorotoluene	94		97		70-130	3		20
p-Chlorotoluene	95		99		70-130	4		20
1,2-Dibromo-3-chloropropane	92		96		70-130	4		20
Hexachlorobutadiene	108		111		70-130	3		20
Isopropylbenzene	96		100		70-130	4		20
p-Isopropyltoluene	99		103		70-130	4		20
Naphthalene	85		87		70-130	2		20
n-Propylbenzene	98		101		70-130	3		20
1,2,3-Trichlorobenzene	95		96		70-130	1		20
1,2,4-Trichlorobenzene	99		102		70-130	3		20
1,3,5-Trimethylbenzene	97		101		70-130	4		20
1,2,4-Trimethylbenzene	95		99		70-130	4		20
Diethyl ether	101		104		70-130	3		20
Diisopropyl Ether	99		103		70-130	4		20
Ethyl-Tert-Butyl-Ether	99		102		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1714879-3 WG1714879-4								
Tertiary-Amyl Methyl Ether	96		100		70-130	4		20
1,4-Dioxane	99		103		70-130	4		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	101		99		70-130
Toluene-d8	100		98		70-130
4-Bromofluorobenzene	94		94		70-130
Dibromofluoromethane	98		99		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01 D
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 12/09/22 09:45
Analyst: GP
Percent Solids: 87%

Extraction Method: EPA 3570
Extraction Date: 12/03/22 11:59
Cleanup Method: EPA 3630
Cleanup Date: 12/08/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	30900		ug/kg	901	80.7	200
2-Methylnaphthalene	9480		ug/kg	901	112.	200
2-Chloronaphthalene	ND		ug/kg	901	70.6	200
Acenaphthylene	11400		ug/kg	901	60.4	200
Acenaphthene	10700		ug/kg	901	101.	200
Fluorene	21700		ug/kg	901	60.2	200
Phenanthrene	147000		ug/kg	901	106.	200
Anthracene	40900		ug/kg	901	112.	200
Fluoranthene	172000		ug/kg	901	165.	200
Pyrene	138000		ug/kg	901	91.9	200
Benz(a)anthracene	81700		ug/kg	901	241.	200
Chrysene	66800		ug/kg	901	79.2	200
Benzo(b)fluoranthene	53100		ug/kg	901	93.7	200
Benzo(k)fluoranthene	52300		ug/kg	901	92.8	200
Benzo(a)pyrene	72900		ug/kg	901	105.	200
Indeno(1,2,3-cd)Pyrene	40000		ug/kg	901	257.	200
Dibenz(a,h)anthracene	9440		ug/kg	901	92.8	200
Benzo(ghi)perylene	34400		ug/kg	901	74.3	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	87		30-130
Pyrene-d10	100		30-130
Benzo(b)fluoranthene-d12	102		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-02	D	Date Collected:	11/04/22 16:05
Client ID:	AQSS-22-2.0-2.5		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified
Sample Depth:				
Matrix:	Sediment		Extraction Method:	EPA 3570
Analytical Method:	141,8270E-SIM		Extraction Date:	12/03/22 11:59
Analytical Date:	12/09/22 11:21		Cleanup Method:	EPA 3630
Analyst:	GP		Cleanup Date:	12/08/22
Percent Solids:	89%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	6700		ug/kg	414	37.0	100
2-Methylnaphthalene	1960		ug/kg	414	51.3	100
2-Chloronaphthalene	ND		ug/kg	414	32.4	100
Acenaphthylene	3370		ug/kg	414	27.7	100
Acenaphthene	3240		ug/kg	414	46.4	100
Fluorene	7030		ug/kg	414	27.6	100
Phenanthrene	44800		ug/kg	414	48.8	100
Anthracene	14600		ug/kg	414	51.3	100
Fluoranthene	61900		ug/kg	414	75.8	100
Pyrene	48400		ug/kg	414	42.2	100
Benz(a)anthracene	27400		ug/kg	414	110.	100
Chrysene	22500		ug/kg	414	36.4	100
Benzo(b)fluoranthene	17900		ug/kg	414	43.0	100
Benzo(k)fluoranthene	17000		ug/kg	414	42.6	100
Benzo(a)pyrene	23900		ug/kg	414	48.4	100
Indeno(1,2,3-cd)Pyrene	13200		ug/kg	414	118.	100
Dibenz(a,h)anthracene	3170		ug/kg	414	42.6	100
Benzo(ghi)perylene	11300		ug/kg	414	34.1	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	93		30-130
Pyrene-d10	103		30-130
Benzo(b)fluoranthene-d12	104		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

SAMPLE RESULTS

Lab ID:	L2262370-03	D	Date Collected:	11/04/22 00:00
Client ID:	DUP1-110422		Date Received:	11/07/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified
Sample Depth:				
Matrix:	Sediment		Extraction Method:	EPA 3570
Analytical Method:	141,8270E-SIM		Extraction Date:	12/03/22 11:59
Analytical Date:	12/09/22 12:26		Cleanup Method:	EPA 3630
Analyst:	GP		Cleanup Date:	12/08/22
Percent Solids:	86%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	38300		ug/kg	1760	157.	400
2-Methylnaphthalene	12800		ug/kg	1760	218.	400
2-Chloronaphthalene	ND		ug/kg	1760	137.	400
Acenaphthylene	14800		ug/kg	1760	118.	400
Acenaphthene	15100		ug/kg	1760	196.	400
Fluorene	31400		ug/kg	1760	117.	400
Phenanthrene	209000		ug/kg	1760	207.	400
Anthracene	61100		ug/kg	1760	218.	400
Fluoranthene	230000		ug/kg	1760	321.	400
Pyrene	181000		ug/kg	1760	179.	400
Benz(a)anthracene	106000		ug/kg	1760	469.	400
Chrysene	87800		ug/kg	1760	154.	400
Benzo(b)fluoranthene	68600		ug/kg	1760	182.	400
Benzo(k)fluoranthene	67700		ug/kg	1760	181.	400
Benzo(a)pyrene	94700		ug/kg	1760	205.	400
Indeno(1,2,3-cd)Pyrene	53200		ug/kg	1760	500.	400
Dibenz(a,h)anthracene	12300		ug/kg	1760	181.	400
Benzo(ghi)perylene	43900		ug/kg	1760	145.	400

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	91		30-130
Pyrene-d10	99		30-130
Benzo(b)fluoranthene-d12	103		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-04
Client ID: RINSE-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:26
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 11/17/22 10:56
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 11/11/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	49.3		ng/l	10.0	1.77	1
2-Methylnaphthalene	3.02	J	ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	4.04	J	ng/l	10.0	1.77	1
Acenaphthene	ND		ng/l	10.0	1.61	1
Fluorene	ND		ng/l	10.0	1.73	1
Phenanthrene	3.83	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	3.94	J	ng/l	10.0	1.49	1
Pyrene	3.56	J	ng/l	10.0	1.52	1
Benz(a)anthracene	2.00	J	ng/l	10.0	1.73	1
Chrysene	0.990	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17	1
Benzo(a)pyrene	ND		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	ND		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	68		30-130
Pyrene-d10	76		30-130
Benzo(b)fluoranthene-d12	92		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/15/22 12:43
Analyst: GP

Extraction Method: EPA 3510C
Extraction Date: 11/11/22 08:45

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 04 Batch: WG1710943-1					
Naphthalene	2.15	J	ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	ND		ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	72		30-130
Pyrene-d10	78		30-130
Benzo(b)fluoranthene-d12	89		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 12/09/22 08:41
Analyst: GP

Extraction Method: EPA 3570
Extraction Date: 12/03/22 11:59
Cleanup Method: EPA 3630
Cleanup Date: 12/08/22

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-03 Batch: WG1718985-1					
Naphthalene	0.441	J	ug/kg	4.00	0.358
2-Methylnaphthalene	ND		ug/kg	4.00	0.496
2-Chloronaphthalene	ND		ug/kg	4.00	0.313
Acenaphthylene	ND		ug/kg	4.00	0.268
Acenaphthene	ND		ug/kg	4.00	0.448
Fluorene	ND		ug/kg	4.00	0.267
Phenanthrene	ND		ug/kg	4.00	0.472
Anthracene	ND		ug/kg	4.00	0.496
Fluoranthene	ND		ug/kg	4.00	0.732
Pyrene	ND		ug/kg	4.00	0.408
Benz(a)anthracene	ND		ug/kg	4.00	1.07
Chrysene	ND		ug/kg	4.00	0.352
Benzo(b)fluoranthene	ND		ug/kg	4.00	0.416
Benzo(k)fluoranthene	ND		ug/kg	4.00	0.412
Benzo(a)pyrene	ND		ug/kg	4.00	0.468
Indeno(1,2,3-cd)Pyrene	ND		ug/kg	4.00	1.14
Dibenz(a,h)anthracene	ND		ug/kg	4.00	0.412
Benzo(ghi)perylene	ND		ug/kg	4.00	0.330

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	77		30-130
Pyrene-d10	88		30-130
Benzo(b)fluoranthene-d12	100		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 04 Batch: WG1710943-2 WG1710943-3								
Naphthalene	77		76		40-140	1		20
2-Methylnaphthalene	77		76		40-140	1		20
2-Chloronaphthalene	76		70		40-140	8		20
Acenaphthylene	71		65		40-140	9		20
Acenaphthene	71		65		40-140	9		20
Fluorene	72		67		40-140	7		20
Phenanthrene	74		71		40-140	4		20
Anthracene	78		74		40-140	5		20
Fluoranthene	80		77		40-140	4		20
Pyrene	67		68		40-140	1		20
Benz(a)anthracene	79		83		40-140	5		20
Chrysene	74		77		40-140	4		20
Benzo(b)fluoranthene	77		81		40-140	5		20
Benzo(k)fluoranthene	75		79		40-140	5		20
Benzo(a)pyrene	72		78		40-140	8		20
Indeno(1,2,3-cd)Pyrene	82		82		40-140	0		20
Dibenz(a,h)anthracene	78		80		40-140	3		20
Benzo(ghi)perylene	80		84		40-140	5		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 04 Batch: WG1710943-2 WG1710943-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	91		89		30-130
Pyrene-d10	75		76		30-130
Benzo(b)fluoranthene-d12	82		86		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 Batch: WG1718985-2 WG1718985-3								
Naphthalene	87		80		40-140	8		30
2-Methylnaphthalene	82		75		40-140	9		30
2-Chloronaphthalene	85		78		40-140	9		30
Acenaphthylene	85		76		40-140	11		30
Acenaphthene	83		76		40-140	9		30
Fluorene	84		80		40-140	5		30
Phenanthrene	86		81		40-140	6		30
Anthracene	92		85		40-140	8		30
Fluoranthene	90		83		40-140	8		30
Pyrene	89		82		40-140	8		30
Benz(a)anthracene	99		92		40-140	7		30
Chrysene	91		83		40-140	9		30
Benzo(b)fluoranthene	102		94		40-140	8		30
Benzo(k)fluoranthene	96		90		40-140	6		30
Benzo(a)pyrene	100		92		40-140	8		30
Indeno(1,2,3-cd)Pyrene	104		97		40-140	7		30
Dibenz(a,h)anthracene	111		101		40-140	9		30
Benzo(ghi)perylene	105		98		40-140	7		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 Batch: WG1718985-2 WG1718985-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	83		77		30-130
Pyrene-d10	91		82		30-130
Benzo(b)fluoranthene-d12	97		90		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab AQSS-22-1.5-2.0	Associated sample(s): 01-03		QC Batch ID: WG1718985-4	WG1718985-5		QC Sample: L2262370-01			Client ID:			
Naphthalene	30900	562	36900	**1070**	Q	28800	**0**	Q	40-140	25		30
2-Methylnaphthalene	9480	562	11200	**306**	Q	9050	**0**	Q	40-140	21		30
2-Chloronaphthalene	ND	562	477J	85		461J	87		40-140	3		30
Acenaphthylene	11400	562	13100	**303**	Q	17200	**1090**	Q	40-140	27		30
Acenaphthene	10700	562	12600	**338**	Q	15700	**941**	Q	40-140	22		30
Fluorene	21700	562	23700	**356**	Q	27500	**1090**	Q	40-140	15		30
Phenanthrene	147000	562	162000	**2670**	Q	230000E	**15600**	Q	40-140	**35**	Q	30
Anthracene	40900	562	47400	**1160**	Q	73400	**6120**	Q	40-140	**43**	Q	30
Fluoranthene	172000	562	194000E	**3920**	Q	301000E	**24300**	Q	40-140	**43**	Q	30
Pyrene	138000	562	153000	**2670**	Q	245000E	**20100**	Q	40-140	**46**	Q	30
Benz(a)anthracene	81700	562	91600	**1760**	Q	151000	**13000**	Q	40-140	**49**	Q	30
Chrysene	66800	562	75200	**1500**	Q	119000	**9830**	Q	40-140	**45**	Q	30
Benzo(b)fluoranthene	53100	562	59700	**1170**	Q	105000	**9770**	Q	40-140	**55**	Q	30
Benzo(k)fluoranthene	52300	562	59200	**1230**	Q	80300	**5270**	Q	40-140	30		30
Benzo(a)pyrene	72900	562	81800	**1580**	Q	131000	**10900**	Q	40-140	**46**	Q	30
Indeno(1,2,3-cd)Pyrene	40000	562	44600	**819**	Q	73200	**6250**	Q	40-140	**49**	Q	30
Dibenz(a,h)anthracene	9440	562	11000	**278**	Q	17200	**1460**	Q	40-140	**44**	Q	30
Benzo(ghi)perylene	34400	562	38400	**712**	Q	59200	**4670**	Q	40-140	**43**	Q	30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	87		89		30-130
Benzo(b)fluoranthene-d12	97		102		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1718985-4 WG1718985-5 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Pyrene-d10	95		102		30-130

INORGANICS
&
MISCELLANEOUS

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-01
Client ID: AQSS-22-1.5-2.0
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	4.42		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.45		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.93		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	86.5		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-02
Client ID: AQSS-22-2.0-2.5
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 16:05
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	3.18		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.98		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.58		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	88.8		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

SAMPLE RESULTS

Lab ID: L2262370-03
Client ID: DUP1-110422
Sample Location: HAVERHILL, MA

Date Collected: 11/04/22 00:00
Date Received: 11/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	4.15		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	3.27		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	3.71		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	86.0		%	0.100	0.100	1	-	11/18/22 13:58	121,2540G	AM

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2262370

Project Number: 180327-08.01 **Report Date:** 12/09/22

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab for sample(s): 01-03 Batch: WG1719298-1										
Total Organic Carbon (Rep1)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Rep2)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP
Total Organic Carbon (Average)	ND		%	0.010	0.010	1	-	12/04/22 09:34	1,9060A	SP

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 Batch: WG1719298-2								
Total Organic Carbon (Rep1)	98		-		75-125	-		25
Total Organic Carbon (Rep2)	100		-		75-125	-		25
Total Organic Carbon (Average)	99		-		75-125	-		25

Matrix Spike Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2262370
Report Date: 12/09/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1719298-4 WG1719298-5 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0												
Total Organic Carbon (Rep1)	4.42	0.817	5.26	103		4.93	**47**	Q	75-125	6		25
Total Organic Carbon (Rep2)	3.45	1.08	3.15	**0**	Q	4.75	105		75-125	**41**	Q	25

Lab Duplicate Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2262370

Report Date: 12/09/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1719298-3 QC Sample: L2262370-01 Client ID: AQSS-22-1.5-2.0						
Total Organic Carbon (Rep1)	4.42	3.62	%	20		25
Total Organic Carbon (Rep2)	3.45	3.98	%	14		25
Total Organic Carbon (Average)	3.93	3.80	%	3		25

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2262370
Report Date: 12/09/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2262370-01A	Vial MeOH preserved	A	NA		2.7	Y	Absent		MCP-8260HLW-21(14)
L2262370-01B	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-01C	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-01D	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-01E	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-02A	Vial MeOH preserved	A	NA		2.7	Y	Absent		MCP-8260HLW-21(14)
L2262370-02B	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-02C	Vial water preserved	A	NA		2.7	Y	Absent	**07-NOV-22 18:56**	MCP-8260HLW-21(14)
L2262370-02D	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-02E	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-03A	Plastic 2oz unpreserved for TS	A	NA		2.7	Y	Absent		A2-TS(7)
L2262370-03B	Glass 120ml/4oz unpreserved	A	NA		2.7	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2262370-04A	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04B	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04C	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-04D	Amber 1000ml unpreserved	A	7	7	2.7	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2262370-04E	Amber 1000ml unpreserved	A	7	7	2.7	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2262370-05A	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-05B	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)
L2262370-05C	Vial HCl preserved	A	NA		2.7	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2262370
Project Number:	180327-08.01	**Report Date:**	12/09/22

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 11/7/22

ALPHA Job #: L2262370

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 818-422-4820
Email: bgauley@anchorqea.com

Additional Project Information:

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #:
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; TOC; TS

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	METALS	METALS	EPH	VPH	PCB	TPH	TOC	TS	Sample Comments	TOTAL # BOTTLES
62370-01	AQSS-22-1.5-2.0	11/4/22	1600	SED	SAS	X	X							X	X	MS/MSD	5
02	AQSS-22-2.0-2.5		1605	SED	~~SAS~~ CC BJLG 11/6	X	X							X	X		5
03	DUP1-110422		—	SED	SAS		X							X	X		2
04	Rinse-110422		1626	Water	SAS	X	X										5
05	Trip Blank	10/16/22	1600	Water	BJLG	X											3
					Container Type	A	A							A	P		
					Preservative	B	A							A	A		

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J L Gauley	11/7/22 1225	[signature] Plum ARL	11/7/22 1225
[signature]	11/7/22 1632	[signature]	11/7/22 1632

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1713088-5	**Lab File ID**	: V11221115N05
Instrument ID	: VOA111		
Matrix	: SOIL	**Analysis Date**	: 11/15/22 20:53

Client Sample No.	Lab Sample ID	Analysis Date
WG1713088-3LCS	WG1713088-3	11/15/22 19:33
WG1713088-4LCSD	WG1713088-4	11/15/22 19:59
AQSS-22-1.5-2.0	L2262370-01D	11/16/22 03:34
AQSS-22-2.0-2.5	L2262370-02	11/16/22 04:01

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1713273-5	**Lab File ID**	: J221116A04
Instrument ID	: JACK2		
Matrix	: WATER	**Analysis Date**	: 11/16/22 04:54

Client Sample No.	Lab Sample ID	Analysis Date
WG1713273-3LCS	WG1713273-3	11/16/22 03:34
WG1713273-4LCSD	WG1713273-4	11/16/22 04:00
TRIP BLANK	L2262370-05	11/16/22 06:14
RINSE-110422	L2262370-04	11/16/22 06:40

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2262370
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1714879-5	**Lab File ID**	: V11221118A05
Instrument ID	: VOA111		
Matrix	: SOIL	**Analysis Date**	: 11/18/22 09:01

Client Sample No.	Lab Sample ID	Analysis Date
WG1714879-3LCS	WG1714879-3	11/18/22 07:41
WG1714879-4LCSD	WG1714879-4	11/18/22 08:08
AQSS-22-1.5-2.0	L2262370-01	11/18/22 17:04

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	80	0
Dichlorodifluoromethane	0.198	0.207	-	-4.5	20	80	0
Chloromethane	0.238	0.238	-	0	20	78	0
Vinyl chloride	0.308	0.331	-	-7.5	20	81	0
Bromomethane	0.211	0.271	-	-28.4*	20	103	0
Chloroethane	0.183	0.174	-	4.9	20	78	0
Trichlorofluoromethane	0.347	0.361	-	-4	20	81	0
Ethyl ether	0.108	0.112	-	-3.7	20	79	0
1,1-Dichloroethene	0.202	0.202	-	0	20	78	0
Carbon disulfide	0.487	0.421	-	13.6	20	76	0
Freon-113	0.21	0.227	-	-8.1	20	81	0
Acrolein	0.034	0.034	-	0	20	83	0
Methylene chloride	40	36.52	-	8.7	20	75	0
Acetone	40	36.527	-	8.7	20	73	0
trans-1,2-Dichloroethene	0.24	0.231	-	3.7	20	76	0
Methyl acetate	0.149	0.143	-	4	20	84	0
Methyl tert-butyl ether	0.629	0.612	-	2.7	20	78	0
tert-Butyl alcohol	0.025	0.026	-	-4	20	79	0
Diisopropyl ether	0.807	0.773	-	4.2	20	76	0
1,1-Dichloroethane	0.446	0.433	-	2.9	20	75	0
Halothane	0.167	0.169	-	-1.2	20	77	0
Acrylonitrile	0.065	0.063	-	3.1	20	78	0
Ethyl tert-butyl ether	0.82	0.797	-	2.8	20	77	0
Vinyl acetate	0.536	0.556	-	-3.7	20	84	0
cis-1,2-Dichloroethene	0.271	0.259	-	4.4	20	75	0
2,2-Dichloropropane	0.383	0.388	-	-1.3	20	80	0
Bromochloromethane	0.12	0.121	-	-0.8	20	76	0
Cyclohexane	0.398	0.393	-	1.3	20	78	0
Chloroform	0.472	0.445	-	5.7	20	73	0
Ethyl acetate	0.238	0.218	-	8.4	20	77	0
Carbon tetrachloride	0.322	0.321	-	0.3	20	77	0
Tetrahydrofuran	0.062	0.055	-	11.3	20	74	0
Dibromofluoromethane	0.262	0.252	-	3.8	20	78	0
1,1,1-Trichloroethane	0.357	0.36	-	-0.8	20	76	-.01
2-Butanone	0.1	0.094	-	6	20	76	0
1,1-Dichloropropene	40	38.199	-	4.5	20	77	0
Benzene	0.974	0.947	-	2.8	20	75	0
tert-Amyl methyl ether	0.762	0.735	-	3.5	20	77	0
1,2-Dichloroethane-d4	0.278	0.272	-	2.2	20	80	0
1,2-Dichloroethane	0.348	0.334	-	4	20	76	0
Methyl cyclohexane	0.413	0.416	-	-0.7	20	79	0
Trichloroethene	40	34.97	-	12.6	20	74	-.01
Dibromomethane	0.157	0.157	-	0	20	77	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.262	0.253	-	3.4	20	75	0
2-Chloroethyl vinyl ether	0.113	0.113	-	0	20	78	0
Bromodichloromethane	0.366	0.343	-	6.3	20	73	0
1,4-Dioxane	2000	1817.782	-	9.1	20	75	-.01
cis-1,3-Dichloropropene	0.426	0.421	-	1.2	20	75	0
Chlorobenzene-d5	1	1	-	0	20	81	0
Toluene-d8	1.321	1.318	-	0.2	20	81	0
Toluene	0.808	0.771	-	4.6	20	75	0
4-Methyl-2-pentanone	0.105	0.105	-	0	20	76	0
Tetrachloroethene	40	37.84	-	5.4	20	78	0
trans-1,3-Dichloropropene	0.536	0.516	-	3.7	20	76	0
Ethyl methacrylate	0.424	0.392	-	7.5	20	74	0
1,1,2-Trichloroethane	0.242	0.241	-	0.4	20	77	0
Chlorodibromomethane	40	35.593	-	11	20	73	0
1,3-Dichloropropane	0.503	0.485	-	3.6	20	76	0
1,2-Dibromoethane	40	37.725	-	5.7	20	76	0
2-Hexanone	0.218	0.195	-	10.6	20	75	0
Chlorobenzene	0.892	0.858	-	3.8	20	74	0
Ethylbenzene	1.58	1.499	-	5.1	20	75	0
1,1,1,2-Tetrachloroethane	40	35.511	-	11.2	20	73	0
p/m Xylene	0.593	0.577	-	2.7	20	75	0
o Xylene	0.572	0.542	-	5.2	20	74	0
Styrene	0.997	0.933	-	6.4	20	74	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	84	0
Bromoform	0.425	0.392	-	7.8	20	76	0
Isopropylbenzene	2.807	2.63	-	6.3	20	76	0
4-Bromofluorobenzene	0.9	0.835	-	7.2	20	77	0
Bromobenzene	0.723	0.675	-	6.6	20	76	0
n-Propylbenzene	3.495	3.304	-	5.5	20	76	0
1,4-Dichlorobutane	0.921	0.798	-	13.4	20	73	0
1,1,2,2-Tetrachloroethane	0.686	0.666	-	2.9	20	79	0
4-Ethyltoluene	2.782	2.616	-	6	20	76	0
2-Chlorotoluene	2.042	1.832	-	10.3	20	74	0
1,3,5-Trimethylbenzene	2.425	2.291	-	5.5	20	75	0
1,2,3-Trichloropropane	0.562	0.536	-	4.6	20	77	0
trans-1,4-Dichloro-2-buten	0.205	0.207	-	-1	20	79	0
4-Chlorotoluene	2.154	1.991	-	7.6	20	74	0
tert-Butylbenzene	1.981	1.882	-	5	20	76	0
1,2,4-Trimethylbenzene	2.442	2.28	-	6.6	20	76	0
sec-Butylbenzene	3.024	2.934	-	3	20	77	0
p-Isopropyltoluene	2.558	2.465	-	3.6	20	77	0
1,3-Dichlorobenzene	1.389	1.306	-	6	20	77	0
1,4-Dichlorobenzene	1.408	1.323	-	6	20	77	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/15/22 19:07
Lab File ID	: V11221115N01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1713088-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.529	1.475	-	3.5	20	78	0
n-Butylbenzene	2.429	2.41	-	0.8	20	79	0
1,2-Dichlorobenzene	1.297	1.221	-	5.9	20	77	0
1,2,4,5-Tetramethylbenzene	2.378	2.17	-	8.7	20	75	0
1,2-Dibromo-3-chloropropan	0.1	0.097	-	3	20	78	0
1,3,5-Trichlorobenzene	0.998	1.003	-	-0.5	20	82	0
Hexachlorobutadiene	0.443	0.464	-	-4.7	20	81	0
1,2,4-Trichlorobenzene	0.864	0.876	-	-1.4	20	82	0
Naphthalene	1.767	1.622	-	8.2	20	75	0
1,2,3-Trichlorobenzene	0.739	0.728	-	1.5	20	78	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	94	0
Dichlorodifluoromethane	0.458	0.392	-	14.4	20	81	0
Chloromethane	0.48	0.425	-	11.5	20	86	0
Vinyl chloride	0.484	0.474	-	2.1	20	87	0
Bromomethane	10	13.078	-	-30.8*	20	149	0
Chloroethane	0.258	0.266	-	-3.1	20	92	0
Trichlorofluoromethane	0.653	0.726	-	-11.2	20	99	0
Ethyl ether	0.222	0.215	-	3.2	20	92	0
1,1-Dichloroethene	0.448	0.491	-	-9.6	20	98	0
Carbon disulfide	0.795	0.855	-	-7.5	20	98	0
Freon-113	0.463	0.528	-	-14	20	100	-.01
Acrolein	0.07	0.073	-	-4.3	20	109	0
Methylene chloride	0.509	0.5	-	1.8	20	93	0
Acetone	0.115	0.105	-	8.7	20	93	-.01
trans-1,2-Dichloroethene	0.49	0.531	-	-8.4	20	100	0
Methyl acetate	0.298	0.27	-	9.4	20	93	-.01
Methyl tert-butyl ether	1.136	1.1	-	3.2	20	96	-.01
tert-Butyl alcohol	0.042	0.047	-	-11.9	20	114	0
Diisopropyl ether	1.331	1.262	-	5.2	20	96	-.01
1,1-Dichloroethane	0.876	0.896	-	-2.3	20	95	0
Halothane	0.378	0.414	-	-9.5	20	99	0
Acrylonitrile	0.139	0.135	-	2.9	20	89	0
Ethyl tert-butyl ether	1.324	1.316	-	0.6	20	99	0
Vinyl acetate	0.766	0.848	-	-10.7	20	125	0
cis-1,2-Dichloroethene	0.534	0.565	-	-5.8	20	96	0
2,2-Dichloropropane	0.7	0.784	-	-12	20	105	-.01
Bromochloromethane	0.245	0.267	-	-9	20	97	-.01
Cyclohexane	0.834	0.859	-	-3	20	94	0
Chloroform	0.838	0.867	-	-3.5	20	96	-.01
Ethyl acetate	0.396	0.347	-	12.4	20	94	-.01
Carbon tetrachloride	0.604	0.682	-	-12.9	20	101	0
Tetrahydrofuran	0.121	0.111	-	8.3	20	99	0
Dibromofluoromethane	0.247	0.249	-	-0.8	20	87	0
1,1,1-Trichloroethane	0.688	0.73	-	-6.1	20	99	0
2-Butanone	0.177	0.16	-	9.6	20	92	0
1,1-Dichloropropene	0.633	0.681	-	-7.6	20	103	0
Benzene	2.014	2.135	-	-6	20	101	0
tert-Amyl methyl ether	1.243	1.222	-	1.7	20	97	0
1,2-Dichloroethane-d4	0.292	0.28	-	4.1	20	90	-.01
1,2-Dichloroethane	0.588	0.568	-	3.4	20	95	-.01
Methyl cyclohexane	0.774	0.902	-	-16.5	20	109	0
Trichloroethene	0.484	0.525	-	-8.5	20	96	0
Dibromomethane	0.248	0.229	-	7.7	20	88	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.489	0.488	-	0.2	20	99	0
2-Chloroethyl vinyl ether	0.272	0.25	-	8.1	20	96	0
Bromodichloromethane	0.638	0.639	-	-0.2	20	97	0
1,4-Dioxane	0.00399	0.00489*	-	-22.6*	20	115	-.01
cis-1,3-Dichloropropene	0.758	0.792	-	-4.5	20	100	0
Chlorobenzene-d5	1	1	-	0	20	89	-.01
Toluene-d8	1.272	1.228	-	3.5	20	87	-.01
Toluene	1.577	1.72	-	-9.1	20	100	-.01
4-Methyl-2-pentanone	0.208	0.19	-	8.7	20	95	0
Tetrachloroethene	0.674	0.812	-	-20.5*	20	106	0
trans-1,3-Dichloropropene	0.805	0.872	-	-8.3	20	100	0
Ethyl methacrylate	0.725	0.648	-	10.6	20	83	0
1,1,2-Trichloroethane	0.424	0.441	-	-4	20	100	-.01
Chlorodibromomethane	0.565	0.609	-	-7.8	20	103	0
1,3-Dichloropropane	0.898	0.908	-	-1.1	20	100	0
1,2-Dibromoethane	0.512	0.546	-	-6.6	20	103	0
2-Hexanone	0.35	0.311	-	11.1	20	90	0
Chlorobenzene	1.716	1.835	-	-6.9	20	97	0
Ethylbenzene	2.802	3.147	-	-12.3	20	98	0
1,1,1,2-Tetrachloroethane	0.567	0.62	-	-9.3	20	101	0
p/m Xylene	1.14	1.321	-	-15.9	20	100	0
o Xylene	1.072	1.203	-	-12.2	20	98	0
Styrene	1.705	1.996	-	-17.1	20	99	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	89	0
Bromoform	0.663	0.721	-	-8.7	20	105	0
Isopropylbenzene	5.062	5.415	-	-7	20	103	0
4-Bromofluorobenzene	0.88	0.806	-	8.4	20	86	0
Bromobenzene	1.296	1.371	-	-5.8	20	103	0
n-Propylbenzene	5.874	6.408	-	-9.1	20	102	0
1,4-Dichlorobutane	1.525	1.396	-	8.5	20	91	0
1,1,2,2-Tetrachloroethane	1.151	1.185	-	-3	20	102	0
4-Ethyltoluene	4.901	5.32	-	-8.5	20	100	0
2-Chlorotoluene	4.04	4.267	-	-5.6	20	100	0
1,3,5-Trimethylbenzene	4.127	4.621	-	-12	20	104	0
1,2,3-Trichloropropane	0.979	0.935	-	4.5	20	94	0
trans-1,4-Dichloro-2-buten	0.329	0.28	-	14.9	20	86	0
4-Chlorotoluene	3.742	3.882	-	-3.7	20	100	0
tert-Butylbenzene	3.485	3.854	-	-10.6	20	105	0
1,2,4-Trimethylbenzene	4.051	4.521	-	-11.6	20	103	0
sec-Butylbenzene	4.989	5.732	-	-14.9	20	108	0
p-Isopropyltoluene	4.203	5.032	-	-19.7	20	110	0
1,3-Dichlorobenzene	2.373	2.672	-	-12.6	20	105	0
1,4-Dichlorobenzene	2.405	2.66	-	-10.6	20	106	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: JACK2	Calibration Date	: 11/16/22 03:34
Lab File ID	: J221116A01	Init. Calib. Date(s)	: 10/20/22 10/21/22
Sample No	: WG1713273-2	Init. Calib. Times	: 18:11 01:01
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	2.463	2.882	-	-17	20	112	0
n-Butylbenzene	3.45	4.044	-	-17.2	20	111	0
1,2-Dichlorobenzene	2.226	2.445	-	-9.8	20	105	0
1,2,4,5-Tetramethylbenzene	3.461	3.829	-	-10.6	20	109	0
1,2-Dibromo-3-chloropropan	10	9.432	-	5.7	20	102	0
1,3,5-Trichlorobenzene	1.51	1.831	-	-21.3*	20	114	0
Hexachlorobutadiene	0.557	0.695	-	-24.8*	20	115	0
1,2,4-Trichlorobenzene	1.272	1.537	-	-20.8*	20	114	0
Naphthalene	3.649	3.896	-	-6.8	20	106	0
1,2,3-Trichlorobenzene	1.176	1.427	-	-21.3*	20	116	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	85	0
Dichlorodifluoromethane	0.198	0.233	-	-17.7	20	96	0
Chloromethane	0.238	0.292	-	-22.7*	20	101	0
Vinyl chloride	0.308	0.367	-	-19.2	20	95	0
Bromomethane	0.211	0.299	-	-41.7*	20	121	0
Chloroethane	0.183	0.202	-	-10.4	20	96	0
Trichlorofluoromethane	0.347	0.41	-	-18.2	20	97	0
Ethyl ether	0.108	0.124	-	-14.8	20	94	0
1,1-Dichloroethene	0.202	0.229	-	-13.4	20	93	0
Carbon disulfide	0.487	0.493	-	-1.2	20	94	0
Freon-113	0.21	0.255	-	-21.4*	20	96	0
Acrolein	0.034	0.037	-	-8.8	20	97	0
Methylene chloride	40	42.825	-	-7.1	20	94	0
Acetone	40	41.26	-	-3.1	20	86	0
trans-1,2-Dichloroethene	0.24	0.263	-	-9.6	20	92	-.01
Methyl acetate	0.149	0.153	-	-2.7	20	95	0
Methyl tert-butyl ether	0.629	0.669	-	-6.4	20	90	-.01
tert-Butyl alcohol	0.025	0.026	-	-4	20	86	0
Diisopropyl ether	0.807	0.897	-	-11.2	20	93	0
1,1-Dichloroethane	0.446	0.514	-	-15.2	20	94	0
Halothane	0.167	0.19	-	-13.8	20	93	0
Acrylonitrile	0.065	0.069	-	-6.2	20	91	0
Ethyl tert-butyl ether	0.82	0.902	-	-10	20	92	0
Vinyl acetate	0.536	0.621	-	-15.9	20	100	0
cis-1,2-Dichloroethene	0.271	0.298	-	-10	20	92	0
2,2-Dichloropropane	0.383	0.451	-	-17.8	20	99	0
Bromochloromethane	0.12	0.134	-	-11.7	20	88	0
Cyclohexane	0.398	0.447	-	-12.3	20	94	0
Chloroform	0.472	0.511	-	-8.3	20	89	0
Ethyl acetate	0.238	0.231	-	2.9	20	87	0
Carbon tetrachloride	0.322	0.364	-	-13	20	93	0
Tetrahydrofuran	0.062	0.06	-	3.2	20	87	-.01
Dibromofluoromethane	0.262	0.256	-	2.3	20	84	0
1,1,1-Trichloroethane	0.357	0.414	-	-16	20	93	0
2-Butanone	0.1	0.099	-	1	20	85	0
1,1-Dichloropropene	40	43.215	-	-8	20	93	0
Benzene	0.974	1.093	-	-12.2	20	92	0
tert-Amyl methyl ether	0.762	0.805	-	-5.6	20	89	0
1,2-Dichloroethane-d4	0.278	0.278	-	0	20	87	0
1,2-Dichloroethane	0.348	0.386	-	-10.9	20	94	0
Methyl cyclohexane	0.413	0.456	-	-10.4	20	92	0
Trichloroethene	40	39.616	-	1	20	89	-.01
Dibromomethane	0.157	0.17	-	-8.3	20	89	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.262	0.291	-	-11.1	20	91	0
2-Chloroethyl vinyl ether	0.113	0.109	-	3.5	20	79	0
Bromodichloromethane	0.366	0.401	-	-9.6	20	91	0
1,4-Dioxane	2000	2091.481	-	-4.6	20	92	-.01
cis-1,3-Dichloropropene	0.426	0.477	-	-12	20	90	0
Chlorobenzene-d5	1	1	-	0	20	87	0
Toluene-d8	1.321	1.307	-	1.1	20	85	0
Toluene	0.808	0.862	-	-6.7	20	90	0
4-Methyl-2-pentanone	0.105	0.109	-	-3.8	20	85	0
Tetrachloroethene	40	42.346	-	-5.9	20	93	0
trans-1,3-Dichloropropene	0.536	0.57	-	-6.3	20	89	0
Ethyl methacrylate	0.424	0.414	-	2.4	20	83	0
1,1,2-Trichloroethane	0.242	0.258	-	-6.6	20	88	0
Chlorodibromomethane	40	39.54	-	1.2	20	87	0
1,3-Dichloropropane	0.503	0.535	-	-6.4	20	89	0
1,2-Dibromoethane	40	39.977	-	0.1	20	86	0
2-Hexanone	0.218	0.203	-	6.9	20	83	0
Chlorobenzene	0.892	0.961	-	-7.7	20	89	0
Ethylbenzene	1.58	1.681	-	-6.4	20	90	0
1,1,1,2-Tetrachloroethane	40	39.751	-	0.6	20	87	0
p/m Xylene	0.593	0.643	-	-8.4	20	89	0
o Xylene	0.572	0.603	-	-5.4	20	88	0
Styrene	0.997	1.049	-	-5.2	20	88	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	92	0
Bromoform	0.425	0.418	-	1.6	20	89	0
Isopropylbenzene	2.807	2.868	-	-2.2	20	90	0
4-Bromofluorobenzene	0.9	0.839	-	6.8	20	85	0
Bromobenzene	0.723	0.729	-	-0.8	20	90	0
n-Propylbenzene	3.495	3.621	-	-3.6	20	92	0
1,4-Dichlorobutane	0.921	0.887	-	3.7	20	89	0
1,1,2,2-Tetrachloroethane	0.686	0.7	-	-2	20	90	0
4-Ethyltoluene	2.782	2.868	-	-3.1	20	91	0
2-Chlorotoluene	2.042	2.094	-	-2.5	20	92	0
1,3,5-Trimethylbenzene	2.425	2.512	-	-3.6	20	90	0
1,2,3-Trichloropropane	0.562	0.571	-	-1.6	20	90	0
trans-1,4-Dichloro-2-buten	0.205	0.224	-	-9.3	20	94	0
4-Chlorotoluene	2.154	2.219	-	-3	20	91	0
tert-Butylbenzene	1.981	2.049	-	-3.4	20	90	0
1,2,4-Trimethylbenzene	2.442	2.513	-	-2.9	20	92	0
sec-Butylbenzene	3.024	3.208	-	-6.1	20	92	0
p-Isopropyltoluene	2.558	2.665	-	-4.2	20	91	0
1,3-Dichlorobenzene	1.389	1.437	-	-3.5	20	93	0
1,4-Dichlorobenzene	1.408	1.444	-	-2.6	20	93	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2262370
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA111	Calibration Date	: 11/18/22 07:15
Lab File ID	: V11221118A01	Init. Calib. Date(s)	: 11/09/22 11/10/22
Sample No	: WG1714879-2	Init. Calib. Times	: 19:20 00:14
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
p-Diethylbenzene	1.529	1.604	-	-4.9	20	93	0
n-Butylbenzene	2.429	2.622	-	-7.9	20	94	0
1,2-Dichlorobenzene	1.297	1.323	-	-2	20	92	0
1,2,4,5-Tetramethylbenzene	2.378	2.359	-	0.8	20	89	0
1,2-Dibromo-3-chloropropan	0.1	0.099	-	1	20	88	0
1,3,5-Trichlorobenzene	0.998	1.07	-	-7.2	20	96	0
Hexachlorobutadiene	0.443	0.485	-	-9.5	20	93	0
1,2,4-Trichlorobenzene	0.864	0.921	-	-6.6	20	94	0
Naphthalene	1.767	1.581	-	10.5	20	80	0
1,2,3-Trichlorobenzene	0.739	0.753	-	-1.9	20	89	0

*** Value outside of QC limits.**

9 Water Street, First Floor
Amesbury, Massachusetts 01913
978.792.5737

ANCHOR QEA

December 16, 2022

Mr. Joseph Alosky
Trustee, Alosky Realty Trust
203 Essex Street
Haverhill, MA 01832

Re: Results of Environmental Analyses
Release Tracking Number (RTN) 3-32792
203 Essex Street
Haverhill, Massachusetts
Little River Sediment Sampling

Dear Mr. Alosky,

Massachusetts regulations require that results of environmental sample analyses be provided to any owner of property where samples are collected as part of a response action under the Massachusetts Contingency Plan (MCP – 310 CMR 40.0000). These notice requirements are contained in the MCP (310 CMR 40.1403[10]). Access to the property to collect samples was granted via verbal agreement on October 12, 2022. The work is part of a Phase IV Remedy Implementation Plan (Phase IV RIP) of the referenced property that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

Anchor QEA collected a sediment sample from within the Little River adjacent to the 203 Essex Street property on October 21, 2022, and submitted it to Alpha Analytical of Westborough, Massachusetts for chemical analysis. Extracted data from the analytical laboratory reports applicable to the above reference property are attached to this letter. National Grid will have the results summarized and discussed in a Phase IV RIP report that National Grid will have submitted to MassDEP. We have also enclosed a copy of the MassDEP transmittal form (BWSC123) that National Grid will use.

Please note that public involvement opportunities are available under 310 CMR 40.1403(9) and 40.1404. For more information about the public involvement regulations that require this notice and a description of such public involvement activities available under the MCP, please refer to the following MassDEP web address https://www.mass.gov/orgs/bureau-of-waste-site-cleanup-massdep.

Sincerely,

Billie-Jo L Gauley

Billie-Jo L. Gauley
Anchor QEA, LLC

cc: Charles A. Lindberg, LSP (GZA GeoEnvironmental, Inc.)
Jesse Edmands (National Grid)
Jason Alosky (Jason@spool.com)

Attachments

BWSC123 Form – Notice of Environmental Sampling
Sediment Core Location Map
Analytical Data

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

A. The address of the disposal site related to this Notice and Release Tracking Number (provided above):

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

B. This notice is being provided to the following party:

1. Name: Mr. Joseph Alosky
2. Street Address: 203 Essex Street

City/Town: Haverhill Zip Code: 01832

C. This notice is being given to inform its recipient (the party listed in Section B):

☑ 1. That environmental sampling will be/has been conducted at property owned by the recipient of this notice.

☑ 2. Of the results of environmental sampling conducted at property owned by the recipient of this notice.

☑ 3. Check to indicate if the analytical results are attached. (If item 2. above is checked, the analytical results from the environmental sampling must be attached to this notice.)

D. Location of the property where the environmental sampling will be/has been conducted:

1. Street Address: 203 Essex Street

City/Town: Haverhill Zip Code: 01832

2. MCP phase of work during which the sampling will be/has been conducted:

☐ Immediate Response Action
☐ Release Abatement Measure
☐ Utility-related Abatement Measure
☐ Phase I Initial Site Investigation
☐ Phase II Comprehensive Site Assessment
☐ Phase III Feasibility Evaluation
☑ Phase IV Remedy Implementation Plan
☐ Phase V/Remedy Operation Status
☐ Post-Temporary Solution Operation, Maintenance and Monitoring
☐ Other _____ (specify)

3. Description of property where sampling will be/has been conducted:

☐ residential ☑ commercial ☐ industrial ☐ school/playground ☐ Other _____ (specify)

4. Description of the sampling locations and types (e.g., soil, groundwater, indoor air, soil gas) to the extent known at the time of this notice.

Collection of sediment samples within the Little River at the 284 Winter Street property.

E. Contact information related to the party providing this notice:

Contact Name: Jesse Edmands
Street Address: 170 Data Drive
City/Town: Waltham Zip Code: 02451
Telephone: (781) 906-3987 Email: jesse.edmands@nationalgrid.com

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

MASSACHUSETTS REGULATIONS THAT REQUIRE THIS NOTICE

This notice is being provided pursuant to the Massachusetts Contingency Plan and the notification requirement at 310 CMR 40.1403(10). The Massachusetts Contingency Plan is a state regulation that specifies requirements for parties who are taking actions to address releases of chemicals (oil or hazardous material) to the environment.

THE PERSON(S) PROVIDING THIS NOTICE

This notice has been sent to you by the party who is addressing a release of oil or hazardous material to the environment at the location listed in **Section A** on the reverse side of this form. (The regulations refer to the area where the oil or hazardous material is present as the "disposal site".)

PURPOSE OF THIS NOTICE

When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed in **Section B** on the reverse side of this form) be given notice of the environmental sampling. The regulations also require that the property owner subsequently receive the analytical results following the analysis of the environmental samples.

Section C on the reverse side of this form indicates the circumstance under which you are receiving this notice at this time. If you are receiving this notice to inform you of the analytical results following the analysis of the environmental samples, you should also have received, as an attachment, a copy of analytical results. These results should indicate the number and type(s) of samples (e.g., soil, groundwater) analyzed, any chemicals identified, and the measured concentrations of those chemicals.

Section D on the reverse side of this form identifies the property where the environmental sampling will be/has been conducted, provides a description of the sampling locations within the property, and indicates the phase of work under the Massachusetts Contingency Plan regulatory process during which the samples will be/were collected.

FOR MORE INFORMATION

Information about the general process for addressing releases of oil or hazardous material under the Massachusetts Contingency Plan and related public involvement opportunities may be found at http://www.mass.gov/eea/agencies/massdep/cleanup. For more information regarding this notice, you may contact the party listed in **Section E** on the reverse side of this form. Information about the disposal site identified in Section A is also available in files at the Massachusetts Department of Environmental Protection. See http://public.dep.state.ma.us/SearchableSites2/Search.aspx to view site-specific files on-line or http://mass.gov/eea/agencies/massdep/about/contacts/conduct-a-file-review.html if you would like to make an appointment to see these files in person. Please reference the **Release Tracking Number** listed in the upper right hand corner on the reverse side of this form when making file review appointments.

LEGEND:

- Approximate Sediment Core Location
- Location Tax Parcel
- Property Boundary
- Tax Parcel of Focus
- Tax Parcel Sample Area

NOTES:

1. Horizontal datum is Massachusetts State Plane, North American Datum of 1983, U.S. Feet.
2. Aerial image is acquired from MassGIS at https://www.mass.gov/info-details/massgis-data-layers. Image date is 2019.
3. Tax parcels acquired from MassGIS at https://massgis.maps.arcgis.com on August 27, 2019.
4. Property boundary as recorded on ALTA/ACSM Land Title Survey plan performed by MHF Design Consultants (stamped February 12, 2015)

0 50
Feet

Publish Date: 2022/10/13, 3:20 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\National_Grid_0327\284_Winter_Street\Maps\Sampling_October2022\AQ_F01_ProposedSedimentCores_HandAuger.mxd

ANCHOR QEA

Figure 1
Approximate Sediment Core Location
Former Haverhill MGP Site

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/03/22 17:15
Analyst: MKS
Percent Solids: 78%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	510	230	1
1,1-Dichloroethane	ND		ug/kg	100	15.	1
Chloroform	ND		ug/kg	150	14.	1
Carbon tetrachloride	ND		ug/kg	100	24.	1
1,2-Dichloropropane	ND		ug/kg	100	13.	1
Dibromochloromethane	ND		ug/kg	100	14.	1
1,1,2-Trichloroethane	ND		ug/kg	100	27.	1
Tetrachloroethene	ND		ug/kg	51	20.	1
Chlorobenzene	ND		ug/kg	51	13.	1
Trichlorofluoromethane	ND		ug/kg	410	71.	1
1,2-Dichloroethane	ND		ug/kg	100	26.	1
1,1,1-Trichloroethane	ND		ug/kg	51	17.	1
Bromodichloromethane	ND		ug/kg	51	11.	1
trans-1,3-Dichloropropene	ND		ug/kg	100	28.	1
cis-1,3-Dichloropropene	ND		ug/kg	51	16.	1
1,3-Dichloropropene, Total	ND		ug/kg	51	16.	1
1,1-Dichloropropene	ND		ug/kg	51	16.	1
Bromoform	ND		ug/kg	410	25.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	51	17.	1
Benzene	280		ug/kg	51	17.	1
Toluene	350		ug/kg	100	56.	1
Ethylbenzene	1300		ug/kg	100	14.	1
Chloromethane	ND		ug/kg	410	96.	1
Bromomethane	ND		ug/kg	200	60.	1
Vinyl chloride	ND		ug/kg	100	34.	1
Chloroethane	ND		ug/kg	200	46.	1
1,1-Dichloroethene	ND		ug/kg	100	24.	1
trans-1,2-Dichloroethene	ND		ug/kg	150	14.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 Date Collected: 10/21/22 10:15

Client ID: AQHA-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	ND		ug/kg	51	14.	1
1,2-Dichlorobenzene	ND		ug/kg	200	15.	1
1,3-Dichlorobenzene	ND		ug/kg	200	15.	1
1,4-Dichlorobenzene	ND		ug/kg	200	18.	1
Methyl tert butyl ether	ND		ug/kg	200	21.	1
p/m-Xylene	460		ug/kg	200	57.	1
o-Xylene	280		ug/kg	100	30.	1
Xylenes, Total	740		ug/kg	100	30.	1
cis-1,2-Dichloroethene	ND		ug/kg	100	18.	1
1,2-Dichloroethene, Total	ND		ug/kg	100	14.	1
Dibromomethane	ND		ug/kg	200	24.	1
1,2,3-Trichloropropane	ND		ug/kg	200	13.	1
Styrene	ND		ug/kg	100	20.	1
Dichlorodifluoromethane	ND		ug/kg	1000	94.	1
Acetone	ND		ug/kg	1000	490	1
Carbon disulfide	ND		ug/kg	1000	110	1
Methyl ethyl ketone	ND		ug/kg	1000	230	1
Methyl isobutyl ketone	ND		ug/kg	1000	130	1
2-Hexanone	ND		ug/kg	1000	120	1
Bromochloromethane	ND		ug/kg	200	21.	1
Tetrahydrofuran	ND		ug/kg	410	160	1
2,2-Dichloropropane	ND		ug/kg	200	21.	1
1,2-Dibromoethane	ND		ug/kg	100	29.	1
1,3-Dichloropropane	ND		ug/kg	200	17.	1
1,1,1,2-Tetrachloroethane	ND		ug/kg	51	14.	1
Bromobenzene	ND		ug/kg	200	15.	1
n-Butylbenzene	110		ug/kg	100	17.	1
sec-Butylbenzene	29	J	ug/kg	100	15.	1
tert-Butylbenzene	ND		ug/kg	200	12.	1
o-Chlorotoluene	ND		ug/kg	200	20.	1
p-Chlorotoluene	ND		ug/kg	200	11.	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	310	100	1
Hexachlorobutadiene	ND		ug/kg	410	17.	1
Isopropylbenzene	530		ug/kg	100	11.	1
p-Isopropyltoluene	290		ug/kg	100	11.	1
Naphthalene	29000		ug/kg	410	67.	1
n-Propylbenzene	320		ug/kg	100	18.	1

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 Date Collected: 10/21/22 10:15

Client ID: AQHA-01-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	200	33.	1
1,2,4-Trichlorobenzene	ND		ug/kg	200	28.	1
1,3,5-Trimethylbenzene	990		ug/kg	200	20.	1
1,2,4-Trimethylbenzene	3400		ug/kg	200	34.	1
Diethyl ether	ND		ug/kg	200	35.	1
Diisopropyl Ether	ND		ug/kg	200	22.	1
Ethyl-Tert-Butyl-Ether	ND		ug/kg	200	13.	1
Tertiary-Amyl Methyl Ether	ND		ug/kg	200	18.	1
1,4-Dioxane	ND		ug/kg	8200	3600	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	114		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	96		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00
Client ID: DUP2-102122 Date Received: 10/21/22
Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/02/22 17:09
Analyst: NLK
Percent Solids: 77%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Methylene chloride	ND		ug/kg	2100	970	5
1,1-Dichloroethane	ND		ug/kg	420	61.	5
Chloroform	ND		ug/kg	630	59.	5
Carbon tetrachloride	ND		ug/kg	420	97.	5
1,2-Dichloropropane	ND		ug/kg	420	53.	5
Dibromochloromethane	ND		ug/kg	420	59.	5
1,1,2-Trichloroethane	ND		ug/kg	420	110	5
Tetrachloroethene	ND		ug/kg	210	83.	5
Chlorobenzene	ND		ug/kg	210	54.	5
Trichlorofluoromethane	ND		ug/kg	1700	290	5
1,2-Dichloroethane	ND		ug/kg	420	110	5
1,1,1-Trichloroethane	ND		ug/kg	210	70.	5
Bromodichloromethane	ND		ug/kg	210	46.	5
trans-1,3-Dichloropropene	ND		ug/kg	420	120	5
cis-1,3-Dichloropropene	ND		ug/kg	210	67.	5
1,3-Dichloropropene, Total	ND		ug/kg	210	67.	5
1,1-Dichloropropene	ND		ug/kg	210	67.	5
Bromoform	ND		ug/kg	1700	100	5
1,1,2,2-Tetrachloroethane	ND		ug/kg	210	70.	5
Benzene	160	J	ug/kg	210	70.	5
Toluene	270	J	ug/kg	420	230	5
Ethylbenzene	2100		ug/kg	420	60.	5
Chloromethane	ND		ug/kg	1700	390	5
Bromomethane	ND		ug/kg	840	240	5
Vinyl chloride	ND		ug/kg	420	140	5
Chloroethane	ND		ug/kg	840	190	5
1,1-Dichloroethene	ND		ug/kg	420	100	5
trans-1,2-Dichloroethene	ND		ug/kg	630	58.	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00

Client ID: DUP2-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Trichloroethene	ND		ug/kg	210	58.	5
1,2-Dichlorobenzene	ND		ug/kg	840	61.	5
1,3-Dichlorobenzene	ND		ug/kg	840	62.	5
1,4-Dichlorobenzene	ND		ug/kg	840	72.	5
Methyl tert butyl ether	ND		ug/kg	840	85.	5
p/m-Xylene	420	J	ug/kg	840	240	5
o-Xylene	810		ug/kg	420	120	5
Xylenes, Total	1200	J	ug/kg	420	120	5
cis-1,2-Dichloroethene	ND		ug/kg	420	74.	5
1,2-Dichloroethene, Total	ND		ug/kg	420	58.	5
Dibromomethane	ND		ug/kg	840	100	5
1,2,3-Trichloropropane	ND		ug/kg	840	54.	5
Styrene	ND		ug/kg	420	83.	5
Dichlorodifluoromethane	ND		ug/kg	4200	390	5
Acetone	ND		ug/kg	4200	2000	5
Carbon disulfide	ND		ug/kg	4200	460	5
Methyl ethyl ketone	ND		ug/kg	4200	940	5
Methyl isobutyl ketone	ND		ug/kg	4200	540	5
2-Hexanone	ND		ug/kg	4200	500	5
Bromochloromethane	ND		ug/kg	840	87.	5
Tetrahydrofuran	ND		ug/kg	1700	670	5
2,2-Dichloropropane	ND		ug/kg	840	85.	5
1,2-Dibromoethane	ND		ug/kg	420	120	5
1,3-Dichloropropane	ND		ug/kg	840	70.	5
1,1,1,2-Tetrachloroethane	ND		ug/kg	210	56.	5
Bromobenzene	ND		ug/kg	840	61.	5
n-Butylbenzene	530		ug/kg	420	70.	5
sec-Butylbenzene	170	J	ug/kg	420	62.	5
tert-Butylbenzene	ND		ug/kg	840	50.	5
o-Chlorotoluene	ND		ug/kg	840	81.	5
p-Chlorotoluene	ND		ug/kg	840	46.	5
1,2-Dibromo-3-chloropropane	ND		ug/kg	1300	420	5
Hexachlorobutadiene	ND		ug/kg	1700	71.	5
Isopropylbenzene	3200		ug/kg	420	46.	5
p-Isopropyltoluene	1800		ug/kg	420	46.	5
Naphthalene	180000	E	ug/kg	1700	270	5
n-Propylbenzene	1700		ug/kg	420	72.	5

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D2 Date Collected: 10/21/22 00:00

Client ID: DUP2-102122 Date Received: 10/21/22

Sample Location: HAVERHILL, MA Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
1,2,3-Trichlorobenzene	ND		ug/kg	840	140	5
1,2,4-Trichlorobenzene	ND		ug/kg	840	110	5
1,3,5-Trimethylbenzene	5800		ug/kg	840	82.	5
1,2,4-Trimethylbenzene	20000		ug/kg	840	140	5
Diethyl ether	ND		ug/kg	840	140	5
Diisopropyl Ether	ND		ug/kg	840	90.	5
Ethyl-Tert-Butyl-Ether	ND		ug/kg	840	54.	5
Tertiary-Amyl Methyl Ether	ND		ug/kg	840	74.	5
1,4-Dioxane	ND		ug/kg	34000	15000	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	89		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID:	L2259175-15	D	Date Collected:	10/21/22 00:00
Client ID:	DUP2-102122		Date Received:	10/21/22
Sample Location:	HAVERHILL, MA		Field Prep:	Not Specified

Sample Depth:

Matrix: Sediment
Analytical Method: 141,8260D
Analytical Date: 11/01/22 17:35
Analyst: AJK
Percent Solids: 77%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics by EPA 5035 High - Westborough Lab						
Naphthalene	200000		ug/kg	6800	1100	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	88		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/01/22 08:53
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1706907-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	88		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/02/22 08:56
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 15 Batch: WG1707425-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
1,3-Dichloropropene, Total	ND		ug/kg	25	7.9
1,1-Dichloropropene	ND		ug/kg	25	8.0
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
Xylenes, Total	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
1,2-Dichloroethene, Total	ND		ug/kg	50	6.8
Dibromomethane	ND		ug/kg	100	12.
1,2,3-Trichloropropane	ND		ug/kg	100	6.4
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	55.
Methyl ethyl ketone	ND		ug/kg	500	110
Methyl isobutyl ketone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
Tetrahydrofuran	ND		ug/kg	200	80.
2,2-Dichloropropane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
1,3-Dichloropropane	ND		ug/kg	100	8.4
1,1,1,2-Tetrachloroethane	ND		ug/kg	25	6.6
Bromobenzene	ND		ug/kg	100	7.2
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
tert-Butylbenzene	ND		ug/kg	100	5.9
o-Chlorotoluene	ND		ug/kg	100	9.6

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 11/03/22 08:49
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 14 Batch: WG1708247-5					
p-Chlorotoluene	ND		ug/kg	100	5.4
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Hexachlorobutadiene	ND		ug/kg	200	8.4
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
Naphthalene	ND		ug/kg	200	32.
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Diethyl ether	ND		ug/kg	100	17.
Diisopropyl Ether	ND		ug/kg	100	11.
Ethyl-Tert-Butyl-Ether	ND		ug/kg	100	6.4
Tertiary-Amyl Methyl Ether	ND		ug/kg	100	8.8
1,4-Dioxane	ND		ug/kg	4000	1800

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	122		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	104		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Methylene chloride	89		89		70-130	0		20
1,1-Dichloroethane	100		101		70-130	1		20
Chloroform	86		86		70-130	0		20
Carbon tetrachloride	98		97		70-130	1		20
1,2-Dichloropropane	94		95		70-130	1		20
Dibromochloromethane	99		98		70-130	1		20
1,1,2-Trichloroethane	86		86		70-130	0		20
Tetrachloroethene	122		122		70-130	0		20
Chlorobenzene	104		104		70-130	0		20
Trichlorofluoromethane	96		98		70-130	2		20
1,2-Dichloroethane	84		83		70-130	1		20
1,1,1-Trichloroethane	97		97		70-130	0		20
Bromodichloromethane	83		84		70-130	1		20
trans-1,3-Dichloropropene	92		92		70-130	0		20
cis-1,3-Dichloropropene	92		91		70-130	1		20
1,1-Dichloropropene	102		102		70-130	0		20
Bromoform	94		95		70-130	1		20
1,1,2,2-Tetrachloroethane	79		80		70-130	1		20
Benzene	93		94		70-130	1		20
Toluene	101		101		70-130	0		20
Ethylbenzene	98		98		70-130	0		20
Chloromethane	99		100		70-130	1		20
Bromomethane	80		83		70-130	4		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Vinyl chloride	96		97		70-130	1		20
Chloroethane	88		89		70-130	1		20
1,1-Dichloroethene	114		114		70-130	0		20
trans-1,2-Dichloroethene	104		105		70-130	1		20
Trichloroethene	103		102		70-130	1		20
1,2-Dichlorobenzene	101		102		70-130	1		20
1,3-Dichlorobenzene	103		104		70-130	1		20
1,4-Dichlorobenzene	102		103		70-130	1		20
Methyl tert butyl ether	82		83		70-130	1		20
p/m-Xylene	108		107		70-130	1		20
o-Xylene	102		102		70-130	0		20
cis-1,2-Dichloroethene	96		97		70-130	1		20
Dibromomethane	84		84		70-130	0		20
1,2,3-Trichloropropane	78		81		70-130	4		20
Styrene	97		98		70-130	1		20
Dichlorodifluoromethane	86		86		70-130	0		20
Acetone	**69**	Q	**69**	Q	70-130	0		20
Carbon disulfide	**69**	Q	70		70-130	1		20
Methyl ethyl ketone	**69**	Q	**68**	Q	70-130	1		20
Methyl isobutyl ketone	93		91		70-130	2		20
2-Hexanone	74		72		70-130	3		20
Bromochloromethane	107		107		70-130	0		20
Tetrahydrofuran	76		74		70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
2,2-Dichloropropane	101		101		70-130	0		20
1,2-Dibromoethane	96		95		70-130	1		20
1,3-Dichloropropane	87		87		70-130	0		20
1,1,1,2-Tetrachloroethane	103		103		70-130	0		20
Bromobenzene	102		104		70-130	2		20
n-Butylbenzene	95		96		70-130	1		20
sec-Butylbenzene	99		101		70-130	2		20
tert-Butylbenzene	104		106		70-130	2		20
o-Chlorotoluene	95		96		70-130	1		20
p-Chlorotoluene	96		97		70-130	1		20
1,2-Dibromo-3-chloropropane	94		95		70-130	1		20
Hexachlorobutadiene	116		119		70-130	3		20
Isopropylbenzene	97		98		70-130	1		20
p-Isopropyltoluene	105		106		70-130	1		20
Naphthalene	95		95		70-130	0		20
n-Propylbenzene	94		96		70-130	2		20
1,2,3-Trichlorobenzene	106		107		70-130	1		20
1,2,4-Trichlorobenzene	110		112		70-130	2		20
1,3,5-Trimethylbenzene	100		101		70-130	1		20
1,2,4-Trimethylbenzene	99		99		70-130	0		20
Diethyl ether	88		88		70-130	0		20
Diisopropyl Ether	94		95		70-130	1		20
Ethyl-Tert-Butyl-Ether	99		100		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1706907-3 WG1706907-4								
Tertiary-Amyl Methyl Ether	87		87		70-130	0		20
1,4-Dioxane	116		115		70-130	1		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	88		87		70-130
Toluene-d8	101		100		70-130
4-Bromofluorobenzene	94		95		70-130
Dibromofluoromethane	104		103		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Methylene chloride	84		84		70-130	0		20
1,1-Dichloroethane	94		94		70-130	0		20
Chloroform	81		81		70-130	0		20
Carbon tetrachloride	88		88		70-130	0		20
1,2-Dichloropropane	90		90		70-130	0		20
Dibromochloromethane	93		92		70-130	1		20
1,1,2-Trichloroethane	84		83		70-130	1		20
Tetrachloroethene	114		115		70-130	1		20
Chlorobenzene	99		98		70-130	1		20
Trichlorofluoromethane	87		90		70-130	3		20
1,2-Dichloroethane	78		78		70-130	0		20
1,1,1-Trichloroethane	88		89		70-130	1		20
Bromodichloromethane	79		79		70-130	0		20
trans-1,3-Dichloropropene	91		90		70-130	1		20
cis-1,3-Dichloropropene	88		88		70-130	0		20
1,1-Dichloropropene	96		96		70-130	0		20
Bromoform	90		89		70-130	1		20
1,1,2,2-Tetrachloroethane	80		78		70-130	3		20
Benzene	89		89		70-130	0		20
Toluene	97		96		70-130	1		20
Ethylbenzene	94		93		70-130	1		20
Chloromethane	88		88		70-130	0		20
Bromomethane	76		76		70-130	0		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Vinyl chloride	89		87		70-130	2		20
Chloroethane	81		82		70-130	1		20
1,1-Dichloroethene	107		106		70-130	1		20
trans-1,2-Dichloroethene	97		97		70-130	0		20
Trichloroethene	94		94		70-130	0		20
1,2-Dichlorobenzene	95		95		70-130	0		20
1,3-Dichlorobenzene	97		96		70-130	1		20
1,4-Dichlorobenzene	96		95		70-130	1		20
Methyl tert butyl ether	80		79		70-130	1		20
p/m-Xylene	102		101		70-130	1		20
o-Xylene	97		97		70-130	0		20
cis-1,2-Dichloroethene	90		89		70-130	1		20
Dibromomethane	80		79		70-130	1		20
1,2,3-Trichloropropane	77		79		70-130	3		20
Styrene	94		93		70-130	1		20
Dichlorodifluoromethane	79		78		70-130	1		20
Acetone	**65**	Q	**62**	Q	70-130	5		20
Carbon disulfide	**65**	Q	**65**	Q	70-130	0		20
Methyl ethyl ketone	**64**	Q	**64**	Q	70-130	0		20
Methyl isobutyl ketone	94		89		70-130	5		20
2-Hexanone	72		**68**	Q	70-130	6		20
Bromochloromethane	99		98		70-130	1		20
Tetrahydrofuran	71		**68**	Q	70-130	4		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
2,2-Dichloropropane	94		93		70-130	1		20
1,2-Dibromoethane	93		91		70-130	2		20
1,3-Dichloropropane	87		85		70-130	2		20
1,1,1,2-Tetrachloroethane	97		95		70-130	2		20
Bromobenzene	96		96		70-130	0		20
n-Butylbenzene	90		89		70-130	1		20
sec-Butylbenzene	94		94		70-130	0		20
tert-Butylbenzene	98		97		70-130	1		20
o-Chlorotoluene	91		91		70-130	0		20
p-Chlorotoluene	92		92		70-130	0		20
1,2-Dibromo-3-chloropropane	94		90		70-130	4		20
Hexachlorobutadiene	112		111		70-130	1		20
Isopropylbenzene	92		92		70-130	0		20
p-Isopropyltoluene	98		98		70-130	0		20
Naphthalene	91		88		70-130	3		20
n-Propylbenzene	90		90		70-130	0		20
1,2,3-Trichlorobenzene	102		100		70-130	2		20
1,2,4-Trichlorobenzene	105		103		70-130	2		20
1,3,5-Trimethylbenzene	95		94		70-130	1		20
1,2,4-Trimethylbenzene	94		94		70-130	0		20
Diethyl ether	86		85		70-130	1		20
Diisopropyl Ether	86		86		70-130	0		20
Ethyl-Tert-Butyl-Ether	94		93		70-130	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 15 Batch: WG1707425-3 WG1707425-4								
Tertiary-Amyl Methyl Ether	85		84		70-130	1		20
1,4-Dioxane	116		114		70-130	2		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	86		85		70-130
Toluene-d8	103		102		70-130
4-Bromofluorobenzene	97		97		70-130
Dibromofluoromethane	100		99		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Methylene chloride	89		92		70-130	3		20
1,1-Dichloroethane	86		89		70-130	3		20
Chloroform	97		101		70-130	4		20
Carbon tetrachloride	96		100		70-130	4		20
1,2-Dichloropropane	85		86		70-130	1		20
Dibromochloromethane	99		101		70-130	2		20
1,1,2-Trichloroethane	90		92		70-130	2		20
Tetrachloroethene	103		107		70-130	4		20
Chlorobenzene	98		100		70-130	2		20
Trichlorofluoromethane	101		104		70-130	3		20
1,2-Dichloroethane	99		101		70-130	2		20
1,1,1-Trichloroethane	98		101		70-130	3		20
Bromodichloromethane	92		96		70-130	4		20
trans-1,3-Dichloropropene	94		97		70-130	3		20
cis-1,3-Dichloropropene	98		100		70-130	2		20
1,1-Dichloropropene	95		97		70-130	2		20
Bromoform	92		91		70-130	1		20
1,1,2,2-Tetrachloroethane	81		78		70-130	4		20
Benzene	93		96		70-130	3		20
Toluene	91		94		70-130	3		20
Ethylbenzene	93		97		70-130	4		20
Chloromethane	**67**	Q	**69**	Q	70-130	3		20
Bromomethane	119		120		70-130	1		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Vinyl chloride	78		81		70-130	4		20
Chloroethane	84		86		70-130	2		20
1,1-Dichloroethene	96		95		70-130	1		20
trans-1,2-Dichloroethene	88		92		70-130	4		20
Trichloroethene	92		96		70-130	4		20
1,2-Dichlorobenzene	96		96		70-130	0		20
1,3-Dichlorobenzene	94		96		70-130	2		20
1,4-Dichlorobenzene	94		95		70-130	1		20
Methyl tert butyl ether	96		95		70-130	1		20
p/m-Xylene	98		101		70-130	3		20
o-Xylene	96		99		70-130	3		20
cis-1,2-Dichloroethene	90		94		70-130	4		20
Dibromomethane	96		98		70-130	2		20
1,2,3-Trichloropropane	87		86		70-130	1		20
Styrene	96		99		70-130	3		20
Dichlorodifluoromethane	79		82		70-130	4		20
Acetone	73		**68**	Q	70-130	7		20
Carbon disulfide	**67**	Q	70		70-130	4		20
Methyl ethyl ketone	**64**	Q	**57**	Q	70-130	12		20
Methyl isobutyl ketone	74		71		70-130	4		20
2-Hexanone	**69**	Q	**66**	Q	70-130	4		20
Bromochloromethane	99		100		70-130	1		20
Tetrahydrofuran	70		**68**	Q	70-130	3		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
2,2-Dichloropropane	89		92		70-130	3		20
1,2-Dibromoethane	96		97		70-130	1		20
1,3-Dichloropropane	95		96		70-130	1		20
1,1,1,2-Tetrachloroethane	101		104		70-130	3		20
Bromobenzene	94		94		70-130	0		20
n-Butylbenzene	90		93		70-130	3		20
sec-Butylbenzene	89		91		70-130	2		20
tert-Butylbenzene	88		89		70-130	1		20
o-Chlorotoluene	88		88		70-130	0		20
p-Chlorotoluene	91		92		70-130	1		20
1,2-Dibromo-3-chloropropane	80		81		70-130	1		20
Hexachlorobutadiene	100		100		70-130	0		20
Isopropylbenzene	88		89		70-130	1		20
p-Isopropyltoluene	90		92		70-130	2		20
Naphthalene	85		84		70-130	1		20
n-Propylbenzene	89		91		70-130	2		20
1,2,3-Trichlorobenzene	100		99		70-130	1		20
1,2,4-Trichlorobenzene	99		98		70-130	1		20
1,3,5-Trimethylbenzene	91		93		70-130	2		20
1,2,4-Trimethylbenzene	91		92		70-130	1		20
Diethyl ether	99		98		70-130	1		20
Diisopropyl Ether	78		80		70-130	3		20
Ethyl-Tert-Butyl-Ether	86		89		70-130	3		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 Batch: WG1708247-3 WG1708247-4								
Tertiary-Amyl Methyl Ether	92		93		70-130	1		20
1,4-Dioxane	84		84		70-130	0		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	103		106		70-130
Toluene-d8	100		101		70-130
4-Bromofluorobenzene	95		93		70-130
Dibromofluoromethane	99		98		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Methylene chloride	ND	10000	12000	115		11000	114		70-130	1		30
1,1-Dichloroethane	ND	10000	11000	107		11000	107		70-130	0		30
Chloroform	ND	10000	12000	115		12000	115		70-130	0		30
Carbon tetrachloride	ND	10000	12000	119		12000	117		70-130	2		30
1,2-Dichloropropane	ND	10000	10000	100		10000	100		70-130	0		30
Dibromochloromethane	ND	10000	11000	110		11000	111		70-130	1		30
1,1,2-Trichloroethane	ND	10000	11000	106		11000	106		70-130	0		30
Tetrachloroethene	ND	10000	9300	93		9400	94		70-130	1		30
Chlorobenzene	ND	10000	8600	86		8800	88		70-130	2		30
Trichlorofluoromethane	ND	10000	10000	101		10000	100		70-130	1		30
1,2-Dichloroethane	ND	10000	12000	116		12000	115		70-130	1		30
1,1,1-Trichloroethane	ND	10000	12000	122		12000	122		70-130	0		30
Bromodichloromethane	ND	10000	11000	106		11000	106		70-130	0		30
trans-1,3-Dichloropropene	ND	10000	10000	103		10000	104		70-130	1		30
cis-1,3-Dichloropropene	ND	10000	11000	107		11000	107		70-130	0		30
1,1-Dichloropropene	ND	10000	11000	113		11000	113		70-130	0		30
Bromoform	ND	10000	10000	102		11000	106		70-130	4		30
1,1,2,2-Tetrachloroethane	ND	10000	9300	93		9600	96		70-130	3		30
Benzene	280	10000	11000	109		11000	108		70-130	1		30
Toluene	350	10000	9500	91		9600	93		70-130	1		30
Ethylbenzene	1300	10000	8400	71		8600	73		70-130	2		30
Chloromethane	ND	10000	8800	88		8900	89		70-130	1		30
Bromomethane	ND	10000	15000	**154**	Q	14000	**144**	Q	70-130	7		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Vinyl chloride	ND	10000	11000	112		11000	111		70-130	1		30
Chloroethane	ND	10000	9400	94		9300	93		70-130	0		30
1,1-Dichloroethene	ND	10000	13000	**131**	Q	13000	130		70-130	1		30
trans-1,2-Dichloroethene	ND	10000	11000	111		11000	107		70-130	4		30
Trichloroethene	ND	10000	9900	99		10000	100		70-130	0		30
1,2-Dichlorobenzene	ND	10000	6900	**69**	Q	7300	73		70-130	6		30
1,3-Dichlorobenzene	ND	10000	6100	**61**	Q	6300	**63**	Q	70-130	4		30
1,4-Dichlorobenzene	ND	10000	6000	**60**	Q	6300	**63**	Q	70-130	5		30
Methyl tert butyl ether	ND	10000	12000	122		12000	122		70-130	0		30
p/m-Xylene	460	20000	15000	74		15000	75		70-130	1		30
o-Xylene	280	20000	16000	77		16000	79		70-130	2		30
cis-1,2-Dichloroethene	ND	10000	11000	109		11000	109		70-130	0		30
Dibromomethane	ND	10000	11000	112		11000	112		70-130	0		30
1,2,3-Trichloropropane	ND	10000	9700	97		10000	100		70-130	3		30
Styrene	ND	20000	16000	78		16000	80		70-130	1		30
Dichlorodifluoromethane	ND	10000	12000	116		12000	116		70-130	0		30
Acetone	ND	10000	11000	105		10000	101		70-130	4		30
Carbon disulfide	ND	10000	8600	86		8500	85		70-130	1		30
Methyl ethyl ketone	ND	10000	7900	79		8000	80		70-130	2		30
Methyl isobutyl ketone	ND	10000	9500	95		9700	97		70-130	2		30
2-Hexanone	ND	10000	8800	88		8800	88		70-130	1		30
Bromochloromethane	ND	10000	12000	116		12000	115		70-130	1		30
Tetrahydrofuran	ND	10000	8600	86		8600	86		70-130	0		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14
Client ID: AQHA-01-102122

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
2,2-Dichloropropane	ND	10000	11000	112		11000	110		70-130	2		30
1,2-Dibromoethane	ND	10000	11000	111		11000	111		70-130	0		30
1,3-Dichloropropane	ND	10000	11000	110		11000	110		70-130	0		30
1,1,1,2-Tetrachloroethane	ND	10000	11000	105		11000	106		70-130	1		30
Bromobenzene	ND	10000	7800	78		8100	81		70-130	4		30
n-Butylbenzene	110	10000	3600	**35**	Q	3900	**38**	Q	70-130	6		30
sec-Butylbenzene	29J	10000	4700	**46**	Q	4900	**49**	Q	70-130	5		30
tert-Butylbenzene	ND	10000	5500	**55**	Q	5700	**57**	Q	70-130	4		30
o-Chlorotoluene	ND	10000	6100	**61**	Q	6200	**62**	Q	70-130	3		30
p-Chlorotoluene	ND	10000	5800	**58**	Q	6000	**60**	Q	70-130	5		30
1,2-Dibromo-3-chloropropane	ND	10000	9700	97		10000	100		70-130	3		30
Hexachlorobutadiene	ND	10000	3200	**32**	Q	3600	**36**	Q	70-130	11		30
Isopropylbenzene	530	10000	6500	**60**	Q	6800	**62**	Q	70-130	3		30
p-Isopropyltoluene	290	10000	4400	**41**	Q	4600	**43**	Q	70-130	6		30
Naphthalene	29000	10000	32000E	**29**	Q	32000E	**31**	Q	70-130	1		30
n-Propylbenzene	320	10000	5400	**50**	Q	5600	**53**	Q	70-130	5		30
1,2,3-Trichlorobenzene	ND	10000	7100	71		7500	75		70-130	5		30
1,2,4-Trichlorobenzene	ND	10000	6300	**63**	Q	6600	**66**	Q	70-130	6		30
1,3,5-Trimethylbenzene	990	10000	6200	**52**	Q	6400	**54**	Q	70-130	4		30
1,2,4-Trimethylbenzene	3400	10000	7300	**38**	Q	7500	**41**	Q	70-130	4		30
Diethyl ether	ND	10000	12000	120		12000	122		70-130	2		30
Diisopropyl Ether	ND	10000	9800	98		9800	98		70-130	0		30
Ethyl-Tert-Butyl-Ether	ND	10000	11000	111		11000	110		70-130	1		30

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 14 QC Batch ID: WG1708247-6 WG1708247-7 QC Sample: L2259175-14 Client ID: AQHA-01-102122												
Tertiary-Amyl Methyl Ether	ND	10000	12000	116		12000	116		70-130	0		30
1,4-Dioxane	ND	510000	520000	101		530000	104		70-130	3		30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		102		70-130
4-Bromofluorobenzene	97		99		70-130
Dibromofluoromethane	97		98		70-130
Toluene-d8	101		103		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14 D
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 11/16/22 10:27
Analyst: GP
Percent Solids: 78%

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	87700		ug/kg	498	44.5	100
2-Methylnaphthalene	43000		ug/kg	498	61.7	100
2-Chloronaphthalene	74.3	J	ug/kg	498	39.0	100
Acenaphthylene	10100		ug/kg	498	33.3	100
Acenaphthene	51700		ug/kg	498	55.7	100
Fluorene	29800		ug/kg	498	33.2	100
Phenanthrene	99300		ug/kg	498	58.7	100
Anthracene	26700		ug/kg	498	61.7	100
Fluoranthene	38500		ug/kg	498	91.1	100
Pyrene	41200		ug/kg	498	50.8	100
Benz(a)anthracene	19800		ug/kg	498	133.	100
Chrysene	19600		ug/kg	498	43.8	100
Benzo(b)fluoranthene	8930		ug/kg	498	51.8	100
Benzo(k)fluoranthene	7820		ug/kg	498	51.3	100
Benzo(a)pyrene	15500		ug/kg	498	58.2	100
Indeno(1,2,3-cd)Pyrene	6960		ug/kg	498	142.	100
Dibenz(a,h)anthracene	2040		ug/kg	498	51.3	100
Benzo(ghi)perylene	8320		ug/kg	498	41.0	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		30-130
Pyrene-d10	68		30-130
Benzo(b)fluoranthene-d12	69		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15 D
Client ID: DUP2-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment
Analytical Method: 141,8270E-SIM
Analytical Date: 11/16/22 09:54
Analyst: GP
Percent Solids: 77%

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	42900		ug/kg	242	21.7	50
2-Methylnaphthalene	19000		ug/kg	242	30.0	50
2-Chloronaphthalene	125	J	ug/kg	242	19.0	50
Acenaphthylene	713		ug/kg	242	16.2	50
Acenaphthene	13700		ug/kg	242	27.1	50
Fluorene	7010		ug/kg	242	16.2	50
Phenanthrene	20800		ug/kg	242	28.6	50
Anthracene	5210		ug/kg	242	30.0	50
Fluoranthene	6100		ug/kg	242	44.3	50
Pyrene	7180		ug/kg	242	24.7	50
Benz(a)anthracene	2510		ug/kg	242	64.7	50
Chrysene	2590		ug/kg	242	21.3	50
Benzo(b)fluoranthene	1260		ug/kg	242	25.2	50
Benzo(k)fluoranthene	935		ug/kg	242	25.0	50
Benzo(a)pyrene	1580		ug/kg	242	28.3	50
Indeno(1,2,3-cd)Pyrene	773		ug/kg	242	69.0	50
Dibenz(a,h)anthracene	263		ug/kg	242	25.0	50
Benzo(ghi)perylene	900		ug/kg	242	20.0	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	56		30-130
Pyrene-d10	65		30-130
Benzo(b)fluoranthene-d12	65		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 11/15/22 11:04
Analyst: GP

Extraction Method: EPA 3570
Extraction Date: 11/10/22 11:04
Cleanup Method: EPA 3630
Cleanup Date: 11/14/22

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 14-15 Batch: WG1710501-1					
Naphthalene	0.412	J	ug/kg	4.00	0.358
2-Methylnaphthalene	ND		ug/kg	4.00	0.496
2-Chloronaphthalene	ND		ug/kg	4.00	0.313
Acenaphthylene	ND		ug/kg	4.00	0.268
Acenaphthene	ND		ug/kg	4.00	0.448
Fluorene	ND		ug/kg	4.00	0.267
Phenanthrene	ND		ug/kg	4.00	0.472
Anthracene	ND		ug/kg	4.00	0.496
Fluoranthene	ND		ug/kg	4.00	0.732
Pyrene	ND		ug/kg	4.00	0.408
Benz(a)anthracene	ND		ug/kg	4.00	1.07
Chrysene	ND		ug/kg	4.00	0.352
Benzo(b)fluoranthene	ND		ug/kg	4.00	0.416
Benzo(k)fluoranthene	ND		ug/kg	4.00	0.412
Benzo(a)pyrene	ND		ug/kg	4.00	0.468
Indeno(1,2,3-cd)Pyrene	ND		ug/kg	4.00	1.14
Dibenz(a,h)anthracene	ND		ug/kg	4.00	0.412
Benzo(ghi)perylene	ND		ug/kg	4.00	0.330

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	45		30-130
Pyrene-d10	66		30-130
Benzo(b)fluoranthene-d12	77		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 Batch: WG1710501-2 WG1710501-3								
Naphthalene	49		45		40-140	9		30
2-Methylnaphthalene	44		42		40-140	5		30
2-Chloronaphthalene	57		55		40-140	4		30
Acenaphthylene	51		49		40-140	4		30
Acenaphthene	53		52		40-140	2		30
Fluorene	54		58		40-140	7		30
Phenanthrene	57		61		40-140	7		30
Anthracene	57		63		40-140	10		30
Fluoranthene	56		62		40-140	10		30
Pyrene	50		56		40-140	11		30
Benz(a)anthracene	60		67		40-140	11		30
Chrysene	54		60		40-140	11		30
Benzo(b)fluoranthene	59		63		40-140	7		30
Benzo(k)fluoranthene	56		64		40-140	13		30
Benzo(a)pyrene	55		62		40-140	12		30
Indeno(1,2,3-cd)Pyrene	64		73		40-140	13		30
Dibenz(a,h)anthracene	64		70		40-140	9		30
Benzo(ghi)perylene	64		70		40-140	9		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 Batch: WG1710501-2 WG1710501-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	45		42		30-130
Pyrene-d10	53		61		30-130
Benzo(b)fluoranthene-d12	60		65		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab AQHA-01-102122	Associated sample(s): 14-15		QC Batch ID: WG1710501-4			WG1710501-5		QC Sample: L2259175-14		Client ID:		
Naphthalene	87700	604	109000E	**3530**	Q	70300	**0**	Q	40-140	**43**	Q	30
2-Methylnaphthalene	43000	604	54400	**1890**	Q	35300	**0**	Q	40-140	**43**	Q	30
2-Chloronaphthalene	74.3J	604	582	96		448J	76		40-140	26		30
Acenaphthylene	10100	604	14300	**695**	Q	9250	**0**	Q	40-140	**43**	Q	30
Acenaphthene	51700	604	65300	**2250**	Q	42600	**0**	Q	40-140	**42**	Q	30
Fluorene	29800	604	38700	**1470**	Q	25300	**0**	Q	40-140	**42**	Q	30
Phenanthrene	99300	604	126000E	**4420**	Q	81600	**0**	Q	40-140	**43**	Q	30
Anthracene	26700	604	33800	**1180**	Q	21500	**0**	Q	40-140	**44**	Q	30
Fluoranthene	38500	604	48000	**1570**	Q	31600	**0**	Q	40-140	**41**	Q	30
Pyrene	41200	604	53600	**2050**	Q	34300	**0**	Q	40-140	**44**	Q	30
Benz(a)anthracene	19800	604	24100	**712**	Q	15500	**0**	Q	40-140	**43**	Q	30
Chrysene	19600	604	25200	**927**	Q	15800	**0**	Q	40-140	**46**	Q	30
Benzo(b)fluoranthene	8930	604	10500	**260**	Q	7180	**0**	Q	40-140	**38**	Q	30
Benzo(k)fluoranthene	7820	604	10300	**411**	Q	6020	**0**	Q	40-140	**52**	Q	30
Benzo(a)pyrene	15500	604	19400	**646**	Q	12100	**0**	Q	40-140	**46**	Q	30
Indeno(1,2,3-cd)Pyrene	6960	604	9200	**371**	Q	5880	**0**	Q	40-140	**44**	Q	30
Dibenz(a,h)anthracene	2040	604	2810	127		1760	**0**	Q	40-140	**46**	Q	30
Benzo(ghi)perylene	8320	604	11200	**477**	Q	6790	**0**	Q	40-140	**49**	Q	30

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	59		52		30-130
Benzo(b)fluoranthene-d12	66		55		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1710501-4 WG1710501-5 QC Sample: L2259175-14 Client ID: AQHA-01-102122												

Surrogate	MS % Recovery	Qualifier	MSD % Recovery	Qualifier	Acceptance Criteria
Pyrene-d10	71		56		30-130

INORGANICS
&
MISCELLANEOUS

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-14
Client ID: AQHA-01-102122
Sample Location: HAVERHILL, MA
Sample Depth:
Matrix: Sediment

Date Collected: 10/21/22 10:15
Date Received: 10/21/22
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	1.26		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	1.31		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	1.28		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	78.4		%	0.100	0.100	1	-	10/24/22 10:48	121,2540G	AM

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

SAMPLE RESULTS

Lab ID: L2259175-15
Client ID: DUP2-102122
Sample Location: HAVERHILL, MA

Date Collected: 10/21/22 00:00
Date Received: 10/21/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sediment

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab										
Total Organic Carbon (Rep1)	1.58		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	1.54		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	1.56		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
General Chemistry - Mansfield Lab										
Solids, Total	77.0		%	0.100	0.100	1	-	10/24/22 10:48	121,2540G	AM

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2259175

Project Number: 180327-08.01 **Report Date:** 11/16/22

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Organic Carbon - Mansfield Lab for sample(s): 14-15 Batch: WG1708881-1										
Total Organic Carbon (Rep1)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Rep2)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP
Total Organic Carbon (Average)	0.010		%	0.010	0.010	1	-	11/06/22 09:30	1,9060A	SP

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 Batch: WG1708881-2								
Total Organic Carbon (Rep1)	103		-		75-125	-		25
Total Organic Carbon (Rep2)	110		-		75-125	-		25
Total Organic Carbon (Average)	106		-		75-125	-		25

Matrix Spike Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2259175
Report Date: 11/16/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1708881-4 WG1708881-5 QC Sample: L2259175-14 Client ID: AQHA-01-102122												
Total Organic Carbon (Rep1)	1.26	1.06	2.69	**135**	Q	2.14	101		75-125	23		25
Total Organic Carbon (Rep2)	1.31	0.876	2.54	**140**	Q	2.27	107		75-125	11		25

Lab Duplicate Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2259175

Report Date: 11/16/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Organic Carbon - Mansfield Lab Associated sample(s): 14-15 QC Batch ID: WG1708881-3 QC Sample: L2259175-14 Client ID: AQHA-01-102122						
Total Organic Carbon (Rep1)	1.26	1.54	%	20		25
Total Organic Carbon (Rep2)	1.31	1.31	%	0		25
Total Organic Carbon (Average)	1.28	1.42	%	10		25

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent
C	Absent
D	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-01A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-01D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-01E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-02D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-02E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-03D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-03E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-04D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-04E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-05A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-05D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-05E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06A2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06B2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C1	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06C2	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-06D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06D2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E1	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-06E2	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-07D	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-07E	Amber 1000ml unpreserved	A	7	7	5.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-08A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-08C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2259175
Report Date: 11/16/22

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-09A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-09D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-09E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-10D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-10E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-11D	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-11E	Amber 1000ml unpreserved	D	7	7	4.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-12D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-12E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2259175-13D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-13E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2259175-14A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14A1	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-14B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)

*Values in parentheses indicate holding time in days

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Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2259175-14B1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14C1	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-14D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14D1	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-14E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-14E1	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)
L2259175-15A	Vial MeOH preserved	B	NA		5.8	Y	Absent		MCP-8260HLW-21(14)
L2259175-15B	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15C	Vial water preserved	B	NA		5.8	Y	Absent	22-OCT-22 09:57	MCP-8260HLW-21(14)
L2259175-15D	Plastic 2oz unpreserved for TS	C	NA		2.8	Y	Absent		A2-TS(7)
L2259175-15E	Glass 120ml/4oz unpreserved	C	NA		2.8	Y	Absent		A2-MCPPAH-8270SIM-21(14),A2-TOC-9060-2REPS(28)

*Values in parentheses indicate holding time in days

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GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

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Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

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Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

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REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

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ALPHA Job #: L2259175

ALPHA Analytical Laboratories
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor, Amesbury, MA 01913
Phone: 978-792-5737
Email: bgauley@anchorqea.com

Additional Project Information:

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client Info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SOG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☒ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC											Sample Comments	Total # Bottles
59175-09	AQPW-04-102022	10/20/22	1102	X1	SA	X	X												5
-10	AQPW-03-102022	10/20/22	11:50	X1	SA	X	X												5
-11	AQPW-02-102022	10/20/22	15:52	X1	SA	X	X												5
-12	AQPW-01-102122	10/21/22	0900	X1	BJLG/SA	X	X												5
-13	RAJ-102122	10/21/22	11:00	X2	BJLG	X	X												5
-14	AQHA-01-102122	↓	1015	B	BJLG	X	X											MS/MSD	10
-15	DUP2-102122	↓	—	B	BJLG	X	X												5
					Container Type	G	A												
					Preservative	B	A												

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Belle G. Lauly	10/21/22 1342	[illegible] AAL	10/21/22 13:42
[illegible] AAL	10/21/22 17:00	[illegible]	10/21/22 1700

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

9 Water Street, First Floor
Amesbury, Massachusetts 01913
978.792.5737

February 13, 2023

HEG 284 Winter Street LLC
c/o Matthew LaLone, Esq.
Haffner's | Energy North Group
2 International Way
Lawrence, Massachusetts 01843

Re: Results of Environmental Analyses
Release Tracking Number (RTN) 3-32792
284 Winter Street
Haverhill, Massachusetts
Little River Sheen Net Sampling

Dear Attorney LaLone,

Massachusetts regulations require that results of environmental sample analyses be provided to any owner of property where samples are collected as part of a response action under the Massachusetts Contingency Plan (MCP – 310 CMR 40.0000). These notice requirements are contained in the MCP (310 CMR 40.1403[10]). The sampling is part of a Phase IV Remedy Implementation Plan (Phase IV RIP) of the referenced property that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

Anchor QEA collected a sheen net sample from within the Little River adjacent to the 284 Winter Street property on December 12, 2022, and submitted it to Alpha Analytical of Westborough, Massachusetts for chemical analysis. The associated laboratory report is attached to this letter. National Grid will have the results summarized and discussed in a Phase IV RIP report that National Grid will have submitted to MassDEP. We have also enclosed a copy of the MassDEP transmittal form (BWSC123) that National Grid will use.

Please note that public involvement opportunities are available under 310 CMR 40.1403(9) and 40.1404. For more information about the public involvement regulations that require this notice and a description of such public involvement activities available under the MCP, please refer to the following MassDEP web address https://www.mass.gov/orgs/bureau-of-waste-site-cleanup-massdep.

Sincerely,

Billie-Jo L Gauley

Billie-Jo L. Gauley
Anchor QEA, LLC

cc: Charles A. Lindberg, LSP (GZA GeoEnvironmental, Inc.)
Jesse Edmands (National Grid)
Robin Main and Christine Dieter (Hinckley Allen)

Attachments

BWSC123 Form – Notice of Environmental Sampling
Approximate Sample Location Map
Analytical Data

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

A. The address of the disposal site related to this Notice and Release Tracking Number (provided above):

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

B. This notice is being provided to the following party:

1. Name: HEG 284 Winter St LLC c/o Matthew LaLone, Esq
2. Street Address: 2 International Way

City/Town: Lawrence Zip Code: 01843

C. This notice is being given to inform its recipient (the party listed in Section B):

☑ 1. That environmental sampling will be/has been conducted at property owned by the recipient of this notice.

☑ 2. Of the results of environmental sampling conducted at property owned by the recipient of this notice.

☑ 3. Check to indicate if the analytical results are attached. (If item 2. above is checked, the analytical results from the environmental sampling must be attached to this notice.)

D. Location of the property where the environmental sampling will be/has been conducted:

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

2. MCP phase of work during which the sampling will be/has been conducted:

☐ Immediate Response Action
☐ Release Abatement Measure
☐ Utility-related Abatement Measure
☐ Phase I Initial Site Investigation
☐ Phase II Comprehensive Site Assessment
☐ Phase III Feasibility Evaluation
☑ Phase IV Remedy Implementation Plan
☐ Phase V/Remedy Operation Status
☐ Post-Temporary Solution Operation, Maintenance and Monitoring
☐ Other _____ (specify)

3. Description of property where sampling will be/has been conducted:

☐ residential ☑ commercial ☐ industrial ☐ school/playground ☐ Other _____ (specify)

4. Description of the sampling locations and types (e.g., soil, groundwater, indoor air, soil gas) to the extent known at the time of this notice.

Collection of sheen net sample within the Little River at the 284 Winter Street property.

E. Contact information related to the party providing this notice:

Contact Name: Jesse Edmands
Street Address: 170 Data Drive
City/Town: Waltham Zip Code: 02451
Telephone: (781) 906-3987 Email: jesse.edmands@nationalgrid.com

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

MASSACHUSETTS REGULATIONS THAT REQUIRE THIS NOTICE

This notice is being provided pursuant to the Massachusetts Contingency Plan and the notification requirement at 310 CMR 40.1403(10). The Massachusetts Contingency Plan is a state regulation that specifies requirements for parties who are taking actions to address releases of chemicals (oil or hazardous material) to the environment.

THE PERSON(S) PROVIDING THIS NOTICE

This notice has been sent to you by the party who is addressing a release of oil or hazardous material to the environment at the location listed in **Section A** on the reverse side of this form. (The regulations refer to the area where the oil or hazardous material is present as the "disposal site".)

PURPOSE OF THIS NOTICE

When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed in **Section B** on the reverse side of this form) be given notice of the environmental sampling. The regulations also require that the property owner subsequently receive the analytical results following the analysis of the environmental samples.

Section C on the reverse side of this form indicates the circumstance under which you are receiving this notice at this time. If you are receiving this notice to inform you of the analytical results following the analysis of the environmental samples, you should also have received, as an attachment, a copy of analytical results. These results should indicate the number and type(s) of samples (e.g., soil, groundwater) analyzed, any chemicals identified, and the measured concentrations of those chemicals.

Section D on the reverse side of this form identifies the property where the environmental sampling will be/has been conducted, provides a description of the sampling locations within the property, and indicates the phase of work under the Massachusetts Contingency Plan regulatory process during which the samples will be/were collected.

FOR MORE INFORMATION

Information about the general process for addressing releases of oil or hazardous material under the Massachusetts Contingency Plan and related public involvement opportunities may be found at http://www.mass.gov/eea/agencies/massdep/cleanup. For more information regarding this notice, you may contact the party listed in **Section E** on the reverse side of this form. Information about the disposal site identified in Section A is also available in files at the Massachusetts Department of Environmental Protection. See http://public.dep.state.ma.us/SearchableSites2/Search.aspx to view site-specific files on-line or http://mass.gov/eea/agencies/massdep/about/contacts/conduct-a-file-review.html if you would like to make an appointment to see these files in person. Please reference the **Release Tracking Number** listed in the upper right hand corner on the reverse side of this form when making file review appointments.

LEGEND:

- Tax Parcel
- Property Boundary
- Approximate Sheen Net Sample Location

NOTES:

1. Horizontal datum is Massachusetts State Plane, North American Datum of 1983, U.S. Feet.
2. Aerial image is acquired from MassGIS at https://www.mass.gov/info-details/massgis-data-layers. Image date is 2019.
3. Tax parcels acquired from MassGIS at https://massgis.maps.arcgis.com on August 27, 2019.
4. Property boundary as recorded on ALTA/ACSM Land Title Survey plan

0 50
Feet

Publish Date: 2022/10/13, 3:26 PM | User: alesueur
Filepath: \\orcas\gis\Jobs\National_Grid_0327\284_Winter_Street\Maps\Sampling_October2022\AQ_F01_ProposedPDI_locations.mxd

ANCHOR QEA

Figure 1
Approximate Sample Location
Former Haverhill MGP Site

ANALYTICAL REPORT

Lab Number:	L2270115
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	HAVERHILL, MA
Project Number:	Not Specified
Report Date:	01/12/23

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2270115-01	AQSN-121222	SHEEN NET	HAVERHILL, MA	12/12/22 15:15	12/13/22

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Alkylated PAHs

L2270115-01D: The sample has elevated detection limits due to the dilution required by the sample matrix.

L2270115-01D: The surrogate recovery was outside the acceptance criteria for benzo(a)pyrene-d12 (49%); however, re-extraction could not be performed due to lack of additional sample. The results of the original analysis are reported; however, all associated compounds are considered to have a potential bias.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Susan E O'Neil Susan O' Neil

Title: Technical Director/Representative Date: 01/12/23

ORGANICS

SEMIVOLATILES

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sheen Net
Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/09/23 12:27
Analyst: CNC
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
cis/trans-Decalin	81.1		ng Abs	10.0	1.66	2
C1-Decalins	848		ng Abs	10.0	1.66	2
C2-Decalins	3530		ng Abs	10.0	1.66	2
C3-Decalins	5980		ng Abs	10.0	1.66	2
C4-Decalins	22600		ng Abs	10.0	1.66	2
Naphthalene	1000		ng Abs	20.0	5.92	2
C1-Naphthalenes	7770		ng Abs	20.0	5.92	2
C2-Naphthalenes	37600		ng Abs	20.0	5.92	2
C3-Naphthalenes	38100		ng Abs	20.0	5.92	2
C4-Naphthalenes	16900		ng Abs	20.0	5.92	2
2-Methylnaphthalene	692		ng Abs	20.0	5.64	2
1-Methylnaphthalene	11700		ng Abs	20.0	3.04	2
Benzothiophene	53.1		ng Abs	20.0	4.40	2
C1-Benzo(b)thiophenes	817		ng Abs	20.0	4.40	2
C2-Benzo(b)thiophenes	1550		ng Abs	20.0	4.40	2
C3-Benzo(b)thiophenes	2390		ng Abs	20.0	4.40	2
C4-Benzo(b)thiophenes	981		ng Abs	20.0	4.40	2
Biphenyl	894		ng Abs	20.0	4.04	2
2,6-Dimethylnaphthalene	18200		ng Abs	20.0	4.26	2
Dibenzofuran	915		ng Abs	20.0	4.92	2
Acenaphthylene	1450		ng Abs	20.0	3.88	2
Acenaphthene	8320		ng Abs	20.0	5.48	2
2,3,5-Trimethylnaphthalene	2630		ng Abs	20.0	3.40	2
Fluorene	2970		ng Abs	20.0	6.32	2
C1-Fluorenes	4210		ng Abs	20.0	6.32	2
C2-Fluorenes	5510		ng Abs	20.0	6.32	2
C3-Fluorenes	2730		ng Abs	20.0	6.32	2
Dibenzothiophene	1130		ng Abs	20.0	2.74	2

Project Name: HAVERHILL, MA
Project Number: Not Specified
Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA
Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
4-Methyldibenzothiophene(4MDT)	1130		ng Abs	20.0	2.74	2
2/3-Methyldibenzothiophene(2MDT)	1540		ng Abs	20.0	2.74	2
1-Methyldibenzothiophene(1MDT)	228		ng Abs	20.0	2.74	2
C1-Dibenzothiophenes BS	3110		ng Abs	20.0	2.74	2
C2-Dibenzothiophenes	2360		ng Abs	20.0	2.74	2
C3-Dibenzothiophenes	1200		ng Abs	20.0	2.74	2
C4-Dibenzothiophenes	402		ng Abs	20.0	2.74	2
Phenanthrene	9000		ng Abs	20.0	5.16	2
3-Methylphenanthrene (3MP)	2490		ng Abs	20.0	5.16	2
2-Methylphenanthrene (2MP)	2790		ng Abs	20.0	5.16	2
2-Methylanthracene (2MA)	1010		ng Abs	20.0	5.16	2
9/4-Methylphenanthrene (9MP)	2580		ng Abs	20.0	5.16	2
C1-Phenanthrenes/Anthracenes	10500		ng Abs	20.0	5.16	2
C2-Phenanthrenes/Anthr BS	7090		ng Abs	20.0	5.16	2
C3-Phenanthrenes/Anthracenes	2760		ng Abs	20.0	5.16	2
C4-Phenanthrenes/Anthracenes	884		ng Abs	20.0	5.16	2
Retene	ND		ng Abs	20.0	5.16	2
Anthracene	2570		ng Abs	20.0	3.32	2
Carbazole	34.4		ng Abs	20.0	5.18	2
1-Methylphenanthrene	2280		ng Abs	20.0	4.22	2
Fluoranthene	3300		ng Abs	20.0	2.20	2
Benzo(b)fluorene	1060		ng Abs	20.0	3.16	2
7H-Benzo(c)fluorene	412		ng Abs	20.0	3.16	2
2-Methylpyrene[1]	914		ng Abs	20.0	3.00	2
4-Methylpyrene[1]	863		ng Abs	20.0	3.00	2
1-Methylpyrene[1]	1030		ng Abs	20.0	3.00	2
Pyrene	5710		ng Abs	20.0	3.00	2
C1-Fluoranthenes/Pyrenes	6640		ng Abs	20.0	3.00	2
C2-Fluoranthenes/Pyrenes	4230		ng Abs	20.0	3.00	2
C3-Fluoranthenes/Pyrenes	2070		ng Abs	20.0	3.00	2
C4-Fluoranthenes/Pyrenes	404		ng Abs	20.0	3.00	2
Naphthobenzothiophenes	1220		ng Abs	20.0	3.28	2
C1-Naphthobenzothiophenes	1370		ng Abs	20.0	3.28	2
C2-Naphthobenzothiophenes	629		ng Abs	20.0	3.28	2
C3-Naphthobenzothiophenes	342		ng Abs	20.0	3.28	2
C4-Naphthobenzothiophenes	178		ng Abs	20.0	3.28	2
Benz(a)anthracene	2960		ng Abs	20.0	2.60	2

Project Name: HAVERHILL, MA
Project Number: Not Specified
Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01 D
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA
Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
PAHs - Mansfield Lab						
Chrysene	2950		ng Abs	20.0	2.54	2
C1-Chrysenes	1960		ng Abs	20.0	2.54	2
C2-Chrysenes BS	1090		ng Abs	20.0	2.54	2
C3-Chrysenes	558		ng Abs	20.0	2.54	2
C4-Chrysenes	ND		ng Abs	20.0	2.54	2
Benzo(b)fluoranthene	635		ng Abs	20.0	2.46	2
Benzo(j)+(k)fluoranthene	669		ng Abs	20.0	2.82	2
Benzo(a)fluoranthene	355		ng Abs	20.0	2.82	2
Benzo(e)pyrene	636		ng Abs	20.0	3.24	2
Benzo(a)pyrene	1190		ng Abs	20.0	3.24	2
Perylene	144		ng Abs	20.0	5.02	2
Indeno(1,2,3-cd)pyrene	434		ng Abs	20.0	4.12	2
Dibenz(a,h)+(a,c)anthracene	170		ng Abs	20.0	2.72	2
Benzo(g,h,i)perylene	446		ng Abs	20.0	3.28	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Naphthalene-d8	59		50-130
Phenanthrene-d10	58		50-130
Benzo(a)pyrene-d12	**49**	Q	50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
cis/trans-Decalin	ND		ng Abs	5.00	0.830
C1-Decalins	ND		ng Abs	5.00	0.830
C2-Decalins	ND		ng Abs	5.00	0.830
C3-Decalins	ND		ng Abs	5.00	0.830
C4-Decalins	ND		ng Abs	5.00	0.830
Naphthalene	ND		ng Abs	10.0	2.96
C1-Naphthalenes	ND		ng Abs	10.0	2.96
C2-Naphthalenes	ND		ng Abs	10.0	2.96
C3-Naphthalenes	ND		ng Abs	10.0	2.96
C4-Naphthalenes	ND		ng Abs	10.0	2.96
2-Methylnaphthalene	ND		ng Abs	10.0	2.82
1-Methylnaphthalene	ND		ng Abs	10.0	1.52
Benzothiophene	ND		ng Abs	10.0	2.20
C1-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C2-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C3-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
C4-Benzo(b)thiophenes	ND		ng Abs	10.0	2.20
Biphenyl	ND		ng Abs	10.0	2.02
2,6-Dimethylnaphthalene	ND		ng Abs	10.0	2.13
Dibenzofuran	ND		ng Abs	10.0	2.46
Acenaphthylene	ND		ng Abs	10.0	1.94
Acenaphthene	ND		ng Abs	10.0	2.74
2,3,5-Trimethylnaphthalene	ND		ng Abs	10.0	1.70
Fluorene	ND		ng Abs	10.0	3.16
C1-Fluorenes	ND		ng Abs	10.0	3.16
C2-Fluorenes	ND		ng Abs	10.0	3.16
C3-Fluorenes	ND		ng Abs	10.0	3.16
Dibenzothiophene	ND		ng Abs	10.0	1.37
4-Methyldibenzothiophene(4MDT)	ND		ng Abs	10.0	1.37

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
2/3-Methyldibenzothiophene(2MDT)	ND		ng Abs	10.0	1.37
1-Methyldibenzothiophene(1MDT)	ND		ng Abs	10.0	1.37
C1-Dibenzothiophenes BS	ND		ng Abs	10.0	1.37
C2-Dibenzothiophenes	ND		ng Abs	10.0	1.37
C3-Dibenzothiophenes	ND		ng Abs	10.0	1.37
C4-Dibenzothiophenes	ND		ng Abs	10.0	1.37
Phenanthrene	ND		ng Abs	10.0	2.58
3-Methylphenanthrene (3MP)	ND		ng Abs	10.0	2.58
2-Methylphenanthrene (2MP)	ND		ng Abs	10.0	2.58
2-Methylanthracene (2MA)	ND		ng Abs	10.0	2.58
9/4-Methylphenanthrene (9MP)	ND		ng Abs	10.0	2.58
C1-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
C2-Phenanthrenes/Anthr BS	ND		ng Abs	10.0	2.58
C3-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
C4-Phenanthrenes/Anthracenes	ND		ng Abs	10.0	2.58
Retene	ND		ng Abs	10.0	2.58
Anthracene	ND		ng Abs	10.0	1.66
Carbazole	ND		ng Abs	10.0	2.59
1-Methylphenanthrene	ND		ng Abs	10.0	2.11
Fluoranthene	1.49	J	ng Abs	10.0	1.10
Benzo(b)fluorene	ND		ng Abs	10.0	1.58
7H-Benzo(c)fluorene	ND		ng Abs	10.0	1.58
2-Methylpyrene[1]	ND		ng Abs	10.0	1.50
4-Methylpyrene[1]	ND		ng Abs	10.0	1.50
1-Methylpyrene[1]	ND		ng Abs	10.0	1.50
Pyrene	1.96	J	ng Abs	10.0	1.50
C1-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
C2-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
C3-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E-SIM(M)
Analytical Date: 01/08/23 16:26
Analyst: CNC

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
PAHs - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
C4-Fluoranthenes/Pyrenes	ND		ng Abs	10.0	1.50
Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C1-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C2-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C3-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
C4-Naphthobenzothiophenes	ND		ng Abs	10.0	1.64
Benz(a)anthracene	ND		ng Abs	10.0	1.30
Chrysene	ND		ng Abs	10.0	1.27
C1-Chrysenes	ND		ng Abs	10.0	1.27
C2-Chrysenes BS	ND		ng Abs	10.0	1.27
C3-Chrysenes	ND		ng Abs	10.0	1.27
C4-Chrysenes	ND		ng Abs	10.0	1.27
Benzo(b)fluoranthene	ND		ng Abs	10.0	1.23
Benzo(j)+(k)fluoranthene	ND		ng Abs	10.0	1.41
Benzo(a)fluoranthene	ND		ng Abs	10.0	1.41
Benzo(e)pyrene	ND		ng Abs	10.0	1.62
Benzo(a)pyrene	ND		ng Abs	10.0	1.62
Perylene	ND		ng Abs	10.0	2.51
Indeno(1,2,3-cd)pyrene	ND		ng Abs	10.0	2.06
Dibenz(a,h)+(a,c)anthracene	ND		ng Abs	10.0	1.36
Benzo(g,h,i)perylene	ND		ng Abs	10.0	1.64

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Naphthalene-d8	61		50-130
Phenanthrene-d10	119		50-130
Benzo(a)pyrene-d12	84		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PAHs - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								
Naphthalene	64		66		50-130	3		30
2-Methylnaphthalene	69		73		50-130	6		30
Acenaphthylene	67		69		50-130	3		30
Acenaphthene	73		76		50-130	4		30
Fluorene	73		77		50-130	5		30
Phenanthrene	76		79		50-130	4		30
Anthracene	83		87		50-130	5		30
Fluoranthene	117		103		50-130	13		30
Pyrene	101		81		50-130	22		30
Benz(a)anthracene	79		82		50-130	4		30
Chrysene	76		80		50-130	5		30
Benzo(b)fluoranthene	80		81		50-130	1		30
Benzo(j)+(k)fluoranthene	92		95		50-130	3		30
Benzo(a)pyrene	82		84		50-130	2		30
Indeno(1,2,3-cd)pyrene	96		96		50-130	0		30
Dibenz(a,h)+(a,c)anthracene	98		99		50-130	1		30
Benzo(g,h,i)perylene	93		94		50-130	1		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: HAVERHILL, MA

Project Number: Not Specified

Lab Number: L2270115

Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
PAHs - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Naphthalene-d8	69		70		50-130
Phenanthrene-d10	87		89		50-130
Benzo(a)pyrene-d12	85		85		50-130

PETROLEUM HYDROCARBONS

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:
Matrix: Sheen Net
Analytical Method: 1,8015D(M)
Analytical Date: 01/10/23 01:37
Analyst: WR
Percent Solids: Results reported on an 'AS RECEIVED' basis.

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Nonane (C9)	ND		ug Abs	1.00	0.297	1
n-Decane (C10)	0.381	J	ug Abs	1.00	0.319	1
n-Undecane (C11)	0.594	J	ug Abs	1.00	0.299	1
n-Dodecane (C12)	1.30		ug Abs	1.00	0.218	1
n-Tridecane (C13)	5.32		ug Abs	1.00	0.274	1
2,6,10-Trimethyldodecane (1380)	19.3		ug Abs	1.00	0.150	1
n-Tetradecane (C14)	5.62		ug Abs	1.00	0.150	1
2,6,10-Trimethyltridecane (1470)	38.9		ug Abs	1.00	0.119	1
n-Pentadecane (C15)	ND		ug Abs	1.00	0.119	1
n-Hexadecane (C16)	10.5		ug Abs	1.00	0.151	1
Norpristane (1650)	34.5		ug Abs	1.00	0.330	1
n-Heptadecane (C17)	4.63		ug Abs	1.00	0.330	1
Pristane	57.2		ug Abs	1.00	0.214	1
n-Octadecane (C18)	ND		ug Abs	1.00	0.201	1
Phytane	23.2		ug Abs	1.00	0.126	1
n-Nonadecane (C19)	ND		ug Abs	1.00	0.257	1
n-Eicosane (C20)	ND		ug Abs	1.00	0.142	1
n-Heneicosane (C21)	ND		ug Abs	1.00	0.120	1
n-Docosane (C22)	0.548	J	ug Abs	1.00	0.104	1
n-Tricosane (C23)	1.76		ug Abs	1.00	0.127	1
n-Tetracosane (C24)	4.40		ug Abs	1.00	0.167	1
n-Pentacosane (C25)	7.23		ug Abs	1.00	0.529	1
n-Hexacosane (C26)	8.11		ug Abs	1.00	0.147	1
n-Heptacosane (C27)	7.95		ug Abs	1.00	0.120	1
n-Octacosane (C28)	7.11		ug Abs	1.00	0.214	1
n-Nonacosane (C29)	9.66		ug Abs	1.00	0.666	1
n-Triacontane (C30)	4.18		ug Abs	1.00	0.115	1
n-Hentriacontane (C31)	2.68		ug Abs	1.00	0.142	1

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

SAMPLE RESULTS

Lab ID: L2270115-01
Client ID: AQSN-121222
Sample Location: HAVERHILL, MA

Date Collected: 12/12/22 15:15
Date Received: 12/13/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Saturated Hydrocarbons by GC-FID - Mansfield Lab						
n-Dotriacontane (C32)	1.31		ug Abs	1.00	0.126	1
n-Tritriacontane (C33)	0.770	J	ug Abs	1.00	0.141	1
n-Tetratriacontane (C34)	0.507	J	ug Abs	1.00	0.159	1
n-Pentatriacontane (C35)	0.391	J	ug Abs	1.00	0.174	1
n-Hexatriacontane (C36)	0.264	J	ug Abs	1.00	0.199	1
n-Heptatriacontane (C37)	0.323	J	ug Abs	1.00	0.222	1
n-Octatriacontane (C38)	ND		ug Abs	1.00	0.233	1
n-Nonatriacontane (C39)	ND		ug Abs	1.00	0.325	1
n-Tetracontane (C40)	ND		ug Abs	1.00	0.325	1
Total Petroleum Hydrocarbons (C9-C44)	3770		ug Abs	33.0	7.26	1
Total Saturated Hydrocarbons	259	J	ug Abs	1.00	0.104	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	88		50-130
d50-Tetracosane	82		50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 01/09/23 19:37
Analyst: WR

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
n-Nonane (C9)	ND		ug Abs	1.00	0.297
n-Decane (C10)	ND		ug Abs	1.00	0.319
n-Undecane (C11)	ND		ug Abs	1.00	0.299
n-Dodecane (C12)	ND		ug Abs	1.00	0.218
n-Tridecane (C13)	ND		ug Abs	1.00	0.274
2,6,10-Trimethyldodecane (1380)	ND		ug Abs	1.00	0.150
n-Tetradecane (C14)	ND		ug Abs	1.00	0.150
2,6,10-Trimethyltridecane (1470)	ND		ug Abs	1.00	0.119
n-Pentadecane (C15)	ND		ug Abs	1.00	0.119
n-Hexadecane (C16)	ND		ug Abs	1.00	0.151
Norpristane (1650)	ND		ug Abs	1.00	0.330
n-Heptadecane (C17)	ND		ug Abs	1.00	0.330
Pristane	ND		ug Abs	1.00	0.214
n-Octadecane (C18)	ND		ug Abs	1.00	0.201
Phytane	ND		ug Abs	1.00	0.126
n-Nonadecane (C19)	ND		ug Abs	1.00	0.257
n-Eicosane (C20)	ND		ug Abs	1.00	0.142
n-Heneicosane (C21)	ND		ug Abs	1.00	0.120
n-Docosane (C22)	ND		ug Abs	1.00	0.104
n-Tricosane (C23)	ND		ug Abs	1.00	0.127
n-Tetracosane (C24)	ND		ug Abs	1.00	0.167
n-Pentacosane (C25)	ND		ug Abs	1.00	0.529
n-Hexacosane (C26)	ND		ug Abs	1.00	0.147
n-Heptacosane (C27)	ND		ug Abs	1.00	0.120
n-Octacosane (C28)	ND		ug Abs	1.00	0.214
n-Nonacosane (C29)	0.860	JC	ug Abs	1.00	0.666
n-Triacontane (C30)	ND		ug Abs	1.00	0.115
n-Hentriacontane (C31)	ND		ug Abs	1.00	0.142
n-Dotriacontane (C32)	ND		ug Abs	1.00	0.126

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 01/09/23 19:37
Analyst: WR

Extraction Method: ALPHA OP-013
Extraction Date: 12/23/22 15:11

Parameter	Result	Qualifier	Units	RL	MDL
Saturated Hydrocarbons by GC-FID - Mansfield Lab for sample(s): 01 Batch: WG1727210-1					
n-Tritriacontane (C33)	ND		ug Abs	1.00	0.141
n-Tetratriacontane (C34)	ND		ug Abs	1.00	0.159
n-Pentatriacontane (C35)	ND		ug Abs	1.00	0.174
n-Hexatriacontane (C36)	ND		ug Abs	1.00	0.199
n-Heptatriacontane (C37)	ND		ug Abs	1.00	0.222
n-Octatriacontane (C38)	ND		ug Abs	1.00	0.233
n-Nonatriacontane (C39)	ND		ug Abs	1.00	0.325
n-Tetracontane (C40)	ND		ug Abs	1.00	0.325
Total Petroleum Hydrocarbons (C9-C44)	ND		ug Abs	33.0	7.26
Total Saturated Hydrocarbons	0.860	J	ug Abs	1.00	0.104

Surrogate	%Recovery	Qualifier	Acceptance Criteria
ortho-terphenyl	92		50-130
d50-Tetracosane	88		50-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Saturated Hydrocarbons by GC-FID - Mansfield Lab Associated sample(s): 01 Batch: WG1727210-2 WG1727210-3								
Nonane (C9)	74		75		50-130	1		30
n-Decane (C10)	83		84		50-130	1		30
n-Dodecane (C12)	89		90		50-130	1		30
n-Tetradecane (C14)	88		91		50-130	3		30
n-Hexadecane (C16)	95		98		50-130	3		30
n-Octadecane (C18)	100		104		50-130	4		30
n-Nonadecane (C19)	93		97		50-130	4		30
n-Eicosane (C20)	92		96		50-130	4		30
n-Docosane (C22)	93		98		50-130	5		30
n-Tetracosane (C24)	94		98		50-130	4		30
n-Hexacosane (C26)	93		96		50-130	3		30
n-Octacosane (C28)	96		99		50-130	3		30
n-Triacontane (C30)	92		94		50-130	2		30
n-Hexatriacontane (C36)	84		86		50-130	2		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
ortho-terphenyl	91		92		50-130
d50-Tetracosane	87		88		50-130

Project Name: HAVERHILL, MA
Project Number: Not Specified

Lab Number: L2270115
Report Date: 01/12/23

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
B	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2270115-01A	Glass 120ml/4oz w/1:4 Acetone:Hexane	B	NA		3.3	Y	Absent		A2-SHC(14),A2-ALKPAH(14)

*Values in parentheses indicate holding time in days

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

Data Qualifiers

Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	HAVERHILL, MA	**Lab Number:**	L2270115
Project Number:	Not Specified	**Report Date:**	01/12/23

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Date Rec'd in Lab: 12/13/22

ALPHA Job #: L2270115

Project Information

Project Name: Haverhill MA
Project Location: Haverhill, MA
Project #: 0
Project Manager: Billie-Jo Gauley
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☒ EMAIL

Billing Information

☒ Same as Client info PO #:

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor
Amesbury, MA 01913
Phone: 978-712-4475
Email: bgauley@anchorqea.com

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☐ Yes ☒ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program _____ ☐ Criteria _____

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:
Alkylated PAH analysis including fluoranthenes/pyrenes and naphthabenzothisphenes.

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Alkylated PAH - EPA Method 8270; TPH Fingerprint

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	Alkylated PAH - EPA Method 8270	TPH Fingerprint	Sample Comments	TOTAL # BOTTLES
70115-01	AQSN-121222	12/12/22	1515	Sheen net	BJLG	X	X		1
					Container Type	A	A		
					Preservative	A	A		

Container Type
P= Plastic
A= Amber glass
V= Vial
G= Glass
B= Bacteria cup
C= Cube
O= Other
E= Encore
D= BOD Bottle

Preservative
A= None
B= HCl
C= HNO_3
D= H_2SO_4
E= NaOH
F= MeOH
G= $NaHSO_4$
H = $Na_2S_2O_3$
I= Ascorbic Acid
J = NH_4Cl
K= Zn Acetate
O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie J. Gauley	12/13/22 1614	Eric Woods	12/13/22 1616
Eric Woods	12/13/22 1815	[illegible]	12/13/22 1815

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

9 Water Street, First Floor
Amesbury, Massachusetts 01913
978.792.5737

May 28, 2024

HEG 284 Winter Street LLC
c/o Matthew LaLone, Esq.
Haffner's | Energy North Group
2 International Way
Lawrence, Massachusetts 01843

Re: Results of Environmental Analyses
Release Tracking Number (RTN) 3-32792
284 Winter Street
Haverhill, Massachusetts
Little River Sediment Sampling

Dear Attorney LaLone,

Massachusetts regulations require that results of environmental sample analyses be provided to any owner of property where samples are collected as part of a response action under the Massachusetts Contingency Plan (MCP – 310 CMR 40.0000). These notice requirements are contained in the MCP (310 CMR 40.1403[10]). The sampling is part of a Phase IV Remedy Implementation Plan (Phase IV RIP) of the referenced property that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

Anchor QEA collected 10 porewater and 5 surface water samples (not including quality assurance/quality control samples) from within the Little River adjacent to the 284 Winter Street property on April 11, 12, and 15, 2024, and submitted them to Pace Analytical (formerly Alpha Analytical) of Westborough, Massachusetts for chemical analysis. The associated laboratory reports are attached to this letter. The results are anticipated to be included in a future Phase IV RIP deliverable that National Grid will submit to MassDEP. We have also enclosed a copy of the MassDEP transmittal form (BWSC123) that National Grid will use.

Please note that public involvement opportunities are available under 310 CMR 40.1403(9) and 40.1404. For more information about the public involvement regulations that require this notice and a description of such public involvement activities available under the MCP, please refer to the following MassDEP web address https://www.mass.gov/orgs/bureau-of-waste-site-cleanup-massdep.

Sincerely,

Billie-Jo L Gauley

Billie-Jo L. Gauley
Anchor QEA, LLC

cc: Charles A. Lindberg, LSP (GZA GeoEnvironmental, Inc.)
Jesse Edmands (National Grid)
Robin Main (Hinckley Allen)

Attachments

BWSC123 Form – Notice of Environmental Sampling
Approximate Sample Location Map
Analytical Data

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

A. The address of the disposal site related to this Notice and Release Tracking Number (provided above):

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

B. This notice is being provided to the following party:

1. Name: HEG 284 Winter St LLC c/o Matthew LaLone, Esq
2. Street Address: 2 International Way

City/Town: Lawrence Zip Code: 01843

C. This notice is being given to inform its recipient (the party listed in Section B):

☑ 1. That environmental sampling will be/has been conducted at property owned by the recipient of this notice.

☑ 2. Of the results of environmental sampling conducted at property owned by the recipient of this notice.

☑ 3. Check to indicate if the analytical results are attached. (If item 2. above is checked, the analytical results from the environmental sampling must be attached to this notice.)

D. Location of the property where the environmental sampling will be/has been conducted:

1. Street Address: 284 Winter Street

City/Town: Haverhill Zip Code: 01832

2. MCP phase of work during which the sampling will be/has been conducted:

☐ Immediate Response Action
☐ Release Abatement Measure
☐ Utility-related Abatement Measure
☐ Phase I Initial Site Investigation
☐ Phase II Comprehensive Site Assessment
☐ Phase III Feasibility Evaluation
☑ Phase IV Remedy Implementation Plan
☐ Phase V/Remedy Operation Status
☐ Post-Temporary Solution Operation, Maintenance and Monitoring
☐ Other _____ (specify)

3. Description of property where sampling will be/has been conducted:

☐ residential ☑ commercial ☐ industrial ☐ school/playground ☐ Other _____ (specify)

4. Description of the sampling locations and types (e.g., soil, groundwater, indoor air, soil gas) to the extent known at the time of this notice.

Collection of ten porewater and five surface water samples within the Little River at the 284 Winter Street property.

E. Contact information related to the party providing this notice:

Contact Name: Jesse Edmands
Street Address: 170 Data Drive
City/Town: Waltham Zip Code: 02451
Telephone: (781) 906-3987 Email: jesse.edmands@nationalgrid.com

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC123

This Notice is Related to:
Release Tracking Number

3 - 32792

NOTICE OF ENVIRONMENTAL SAMPLING

As required by 310 CMR 40.1403(10) of the Massachusetts Contingency Plan

MASSACHUSETTS REGULATIONS THAT REQUIRE THIS NOTICE

This notice is being provided pursuant to the Massachusetts Contingency Plan and the notification requirement at 310 CMR 40.1403(10). The Massachusetts Contingency Plan is a state regulation that specifies requirements for parties who are taking actions to address releases of chemicals (oil or hazardous material) to the environment.

THE PERSON(S) PROVIDING THIS NOTICE

This notice has been sent to you by the party who is addressing a release of oil or hazardous material to the environment at the location listed in **Section A** on the reverse side of this form. (The regulations refer to the area where the oil or hazardous material is present as the "disposal site".)

PURPOSE OF THIS NOTICE

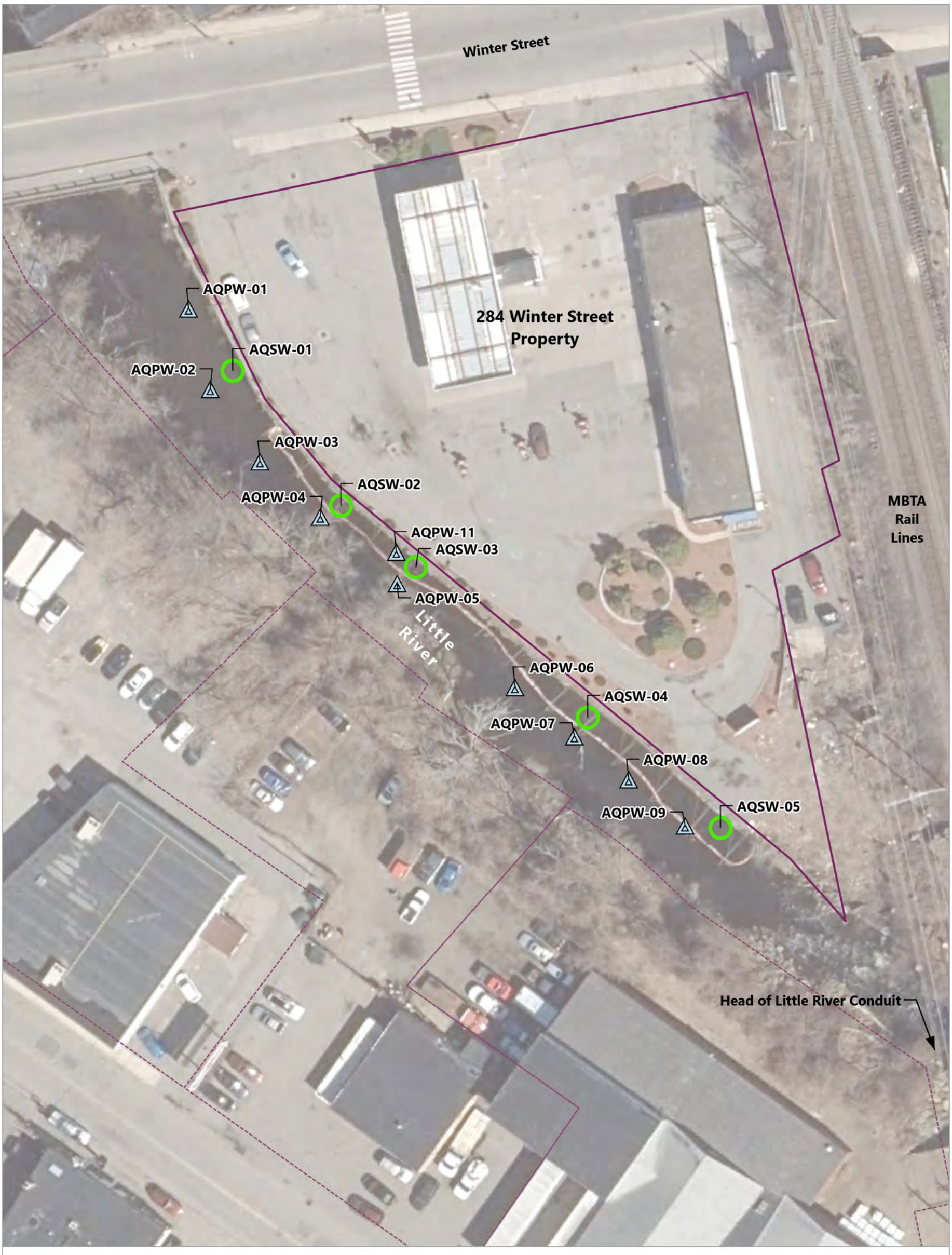
When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed in **Section B** on the reverse side of this form) be given notice of the environmental sampling. The regulations also require that the property owner subsequently receive the analytical results following the analysis of the environmental samples.

Section C on the reverse side of this form indicates the circumstance under which you are receiving this notice at this time. If you are receiving this notice to inform you of the analytical results following the analysis of the environmental samples, you should also have received, as an attachment, a copy of analytical results. These results should indicate the number and type(s) of samples (e.g., soil, groundwater) analyzed, any chemicals identified, and the measured concentrations of those chemicals.

Section D on the reverse side of this form identifies the property where the environmental sampling will be/has been conducted, provides a description of the sampling locations within the property, and indicates the phase of work under the Massachusetts Contingency Plan regulatory process during which the samples will be/were collected.

FOR MORE INFORMATION

Information about the general process for addressing releases of oil or hazardous material under the Massachusetts Contingency Plan and related public involvement opportunities may be found at http://www.mass.gov/eea/agencies/massdep/cleanup. For more information regarding this notice, you may contact the party listed in **Section E** on the reverse side of this form. Information about the disposal site identified in Section A is also available in files at the Massachusetts Department of Environmental Protection. See http://public.dep.state.ma.us/SearchableSites2/Search.aspx to view site-specific files on-line or http://mass.gov/eea/agencies/massdep/about/contacts/conduct-a-file-review.html if you would like to make an appointment to see these files in person. Please reference the **Release Tracking Number** listed in the upper right hand corner on the reverse side of this form when making file review appointments.



LEGEND:

- Approximate Porewater Sample Location
- Approximate Surface Water Sample Location
- Tax Parcel
- Property Boundary

NOTES:

1. Horizontal datum is Massachusetts State Plane, North American Datum of 1983, U.S. Feet.
2. Aerial image is acquired from MassGIS at https://www.mass.gov/info-details/massgis-data-layers. Image date is 2019.
3. Tax parcels acquired from MassGIS at https://massgis.maps.arcgis.com on August 27, 2019.
4. Property boundary as recorded on ALTA/ACSM Land Title Survey plan performed by MHF Design Consultants (stamped February 12, 2015)

0 50
Feet

Publish Date: 2024/05/22, 4:46 PM | User: emueller
Filepath: \\GSTFile01\GIS\Jobs\National_Grid_0327\284_Winter_Street\Maps\PDI_SummaryReport\Haverhill_PDI_Summary.aprx | AQ_Haverhill_PDI_Fig1_ApproximateSampleLocations

ANCHOR QEA

Figure 1
Approximate Sample Locations
Former Haverhill MGP Site

ANALYTICAL REPORT

Lab Number:	L2420526
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	04/29/24

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420526
Report Date: 04/29/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2420526-01	AQPW-04-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 11:30	04/15/24
L2420526-02	AQPW-11-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 14:30	04/15/24
L2420526-03	AQPW-03-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 10:30	04/15/24
L2420526-04	AQPW-06-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 12:30	04/15/24
L2420526-05	AQPW-05-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 13:30	04/15/24
L2420526-06	AQPW-FD-240412	GROUNDWATER	HAVERHILL, MA	04/12/24 00:00	04/15/24
L2420526-07	TRIPBLANK-240412	GROUNDWATER	HAVERHILL, MA	04/03/24 00:00	04/15/24
L2420526-08	AQPW-02-240415	GROUNDWATER	HAVERHILL, MA	04/15/24 11:45	04/15/24
L2420526-09	AQPW-01-04152024	GROUNDWATER	HAVERHILL, MA	04/15/24 10:30	04/15/24

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

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Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Volatile Organics

In reference to question I:

All samples were analyzed for a subset of MCP elements per the Chain of Custody.

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

L2420526-01D, -02D, -03D, -04D, -05D, -06D, -08D, and -09D: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

In reference to question H:

The WG1913683-3/-4 LCS/LCSD RPD(s), associated with L2420526-01D, -02D, -03D, -04D, and -07, are above the acceptance criteria for carbon disulfide (26%), n-butylbenzene (22%), p-isopropyltoluene (22%) and n-propylbenzene (21%).

L2420526-05D, -06D, -08D, and -09D: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,1-dichloroethane (0.2955), cis-1,2-dichloroethene (0.1747),bromochloromethane (0.0842), chloroform (0.254), trichloroethene (0.1807), 1,2-dichloropropane (0.1739),bromodichloromethane (0.217), 1,4-dioxane (0.0012), cis-1,3-dichloropropene (0.2308), trans-1,3-dichloropropene (0.2563), 1,1,2-Trichloroethane (0.1596), 1,2-Dibromoethane (0.1759)

Average Response Factor: cis-1,2-dichloroethene, bromochloromethane, chloroform, trichloroethene, 1,2-dichloropropane, bromodichloromethane, 1,4-dioxane, cis-1,3-dichloropropene, 1,1,2-trichloroethane, 1,2-dibromoethane

L2420526-05D, -06D, -08D, and -09D: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the

Case Narrative (continued)

continuing calibration standard is included as an addendum to this report.
L2420526-01D, -02D, -03D, -04D, and -07: Initial Calibration did not meet:
Lowest Calibration Standard Minimum Response Factor: 1,1-dichloroethane (0.2955), cis-1,2-dichloroethene (0.1747),bromochloromethane (0.0842), chloroform (0.254), trichloroethene (0.1807), 1,2-dichloropropane (0.1739),bromodichloromethane (0.217), 1,4-dioxane (0.0012), cis-1,3-dichloropropene (0.2308), trans-1,3-dichloropropene (0.2563), 1,1,2-Trichloroethane (0.1596), 1,2-Dibromoethane (0.1759)
Average Response Factor: cis-1,2-dichloroethene, bromochloromethane, chloroform, trichloroethene, 1,2-dichloropropane, bromodichloromethane, 1,4-dioxane, cis-1,3-dichloropropene, 1,1,2-trichloroethane, 1,2-dibromoethane
L2420526-01D, -02D, -03D, -04D, and -07: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

Semivolatile Organics by SIM
In reference to question I:
All samples were analyzed for a subset of MCP elements per the Chain of Custody.
In reference to question G:
One or more of the target analytes did not achieve the requested CAM reporting limits.
L2420526-01, -02, -03, -04, -05, -06, -08D, and -09D: The samples have elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.
L2420526-01, -02, -03, -04, -05, -06, -08D and -09D: The samples were re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.
In reference to question H:
L2420526-08D2, -09D2, and -09D: The surrogate recoveries are below the acceptance criteria for 2-

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Case Narrative (continued)

methylnaphthalene-d10 (0%), pyrene-d10 (0%) and benzo(b)fluoranthene-d12 (0%) due to the dilution required to quantitate the sample. Re-extraction was not required; therefore, the results of the original analysis are reported.

The WG1910175-2/-3 LCS/LCSD RPD(s), associated with L2420526-08D, -08D2, -09D, and -09D2, are above the acceptance criteria for benzo(k)fluoranthene (22%).

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative

Date: 04/29/24

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420526
Report Date: 04/29/24

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP Volatile Organics - Westborough Lab								
8260D	Batch QC	WG1913683-4	Carbon disulfide	LCSD	26	20	01-04,07	non-directional bias
8260D	Batch QC	WG1913683-4	n-Butylbenzene	LCSD	22	20	01-04,07	non-directional bias
8260D	Batch QC	WG1913683-4	p-Isopropyltoluene	LCSD	22	20	01-04,07	non-directional bias
8260D	Batch QC	WG1913683-4	n-Propylbenzene	LCSD	21	20	01-04,07	non-directional bias
MCP PAHs by GC/MS-SIM - Mansfield Lab								
8270E-SIM	AQPW-02-240415	L2420526-08 D2	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-02-240415	L2420526-08 D2	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-02-240415	L2420526-08 D2	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D2	2-Methylnaphthalene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D2	Pyrene-d10	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	AQPW-01-04152024	L2420526-09 D2	Benzo(b)fluoranthene-d12	Surrogate	0	30-130	-	- - not applicable - -
8270E-SIM	Batch QC	WG1910175-3	Benzo(k)fluoranthene	LCSD	22	20	08-09	non-directional bias

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-01 D
Client ID: AQPW-04-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 11:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 15:43
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	8700		ug/l	50	16.	100
Toluene	140		ug/l	100	20.	100
Ethylbenzene	2700		ug/l	100	17.	100
Methyl tert butyl ether	ND		ug/l	200	17.	100
p/m-Xylene	2400		ug/l	200	33.	100
o-Xylene	1400		ug/l	100	39.	100
Carbon disulfide	ND		ug/l	200	30.	100
n-Butylbenzene	ND		ug/l	200	19.	100
Isopropylbenzene	93	J	ug/l	200	19.	100
p-Isopropyltoluene	ND		ug/l	200	19.	100
Naphthalene	6000		ug/l	200	22.	100
n-Propylbenzene	34	J	ug/l	200	17.	100
1,3,5-Trimethylbenzene	120	J	ug/l	200	22.	100
1,2,4-Trimethylbenzene	440		ug/l	200	19.	100

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-02 D
Client ID: AQPW-11-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 14:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 16:06
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	3100		ug/l	20	6.4	40
Toluene	22	J	ug/l	40	8.1	40
Ethylbenzene	850		ug/l	40	6.7	40
Methyl tert butyl ether	ND		ug/l	80	6.6	40
p/m-Xylene	500		ug/l	80	13.	40
o-Xylene	470		ug/l	40	16.	40
Carbon disulfide	ND		ug/l	80	12.	40
n-Butylbenzene	ND		ug/l	80	7.7	40
Isopropylbenzene	35	J	ug/l	80	7.5	40
p-Isopropyltoluene	ND		ug/l	80	7.5	40
Naphthalene	3600		ug/l	80	8.6	40
n-Propylbenzene	15	J	ug/l	80	6.9	40
1,3,5-Trimethylbenzene	44	J	ug/l	80	8.7	40
1,2,4-Trimethylbenzene	170		ug/l	80	7.6	40

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-03 D
Client ID: AQPW-03-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 16:29
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	290		ug/l	25	8.0	50
Toluene	59		ug/l	50	10.	50
Ethylbenzene	3600		ug/l	50	8.4	50
Methyl tert butyl ether	11	J	ug/l	100	8.3	50
p/m-Xylene	1200		ug/l	100	17.	50
o-Xylene	930		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	120		ug/l	100	9.4	50
p-Isopropyltoluene	12	J	ug/l	100	9.4	50
Naphthalene	6700		ug/l	100	11.	50
n-Propylbenzene	34	J	ug/l	100	8.6	50
1,3,5-Trimethylbenzene	120		ug/l	100	11.	50
1,2,4-Trimethylbenzene	410		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130
Dibromofluoromethane	102		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-04 D
Client ID: AQPW-06-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 12:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 16:52
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	5300		ug/l	25	8.0	50
Toluene	200		ug/l	50	10.	50
Ethylbenzene	3000		ug/l	50	8.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	3000		ug/l	100	17.	50
o-Xylene	1600		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	170		ug/l	100	9.4	50
p-Isopropyltoluene	14	J	ug/l	100	9.4	50
Naphthalene	6700		ug/l	100	11.	50
n-Propylbenzene	47	J	ug/l	100	8.6	50
1,3,5-Trimethylbenzene	200		ug/l	100	11.	50
1,2,4-Trimethylbenzene	730		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-05 D
Client ID: AQPW-05-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 13:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 20:17
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	5300		ug/l	25	8.0	50
Toluene	71		ug/l	50	10.	50
Ethylbenzene	1400		ug/l	50	8.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	1000		ug/l	100	17.	50
o-Xylene	890		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	76	J	ug/l	100	9.4	50
p-Isopropyltoluene	15	J	ug/l	100	9.4	50
Naphthalene	6600		ug/l	100	11.	50
n-Propylbenzene	21	J	ug/l	100	8.6	50
1,3,5-Trimethylbenzene	100		ug/l	100	11.	50
1,2,4-Trimethylbenzene	390		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-06 D
Client ID: AQPW-FD-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 00:00
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 20:40
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	4700		ug/l	25	8.0	50
Toluene	180		ug/l	50	10.	50
Ethylbenzene	2700		ug/l	50	8.4	50
Methyl tert butyl ether	ND		ug/l	100	8.3	50
p/m-Xylene	2700		ug/l	100	17.	50
o-Xylene	1400		ug/l	50	20.	50
Carbon disulfide	ND		ug/l	100	15.	50
n-Butylbenzene	ND		ug/l	100	9.6	50
Isopropylbenzene	150		ug/l	100	9.4	50
p-Isopropyltoluene	10	J	ug/l	100	9.4	50
Naphthalene	5800		ug/l	100	11.	50
n-Propylbenzene	42	J	ug/l	100	8.6	50
1,3,5-Trimethylbenzene	180		ug/l	100	11.	50
1,2,4-Trimethylbenzene	630		ug/l	100	9.6	50

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	98		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-07
Client ID: TRIPBLANK-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/03/24 00:00
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 10:24
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-08 D
Client ID: AQPW-02-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 11:45
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 21:03
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	9.7	J	ug/l	10	3.2	20
Toluene	ND		ug/l	20	4.1	20
Ethylbenzene	290		ug/l	20	3.3	20
Methyl tert butyl ether	ND		ug/l	40	3.3	20
p/m-Xylene	73		ug/l	40	6.6	20
o-Xylene	90		ug/l	20	7.8	20
Carbon disulfide	ND		ug/l	40	6.0	20
n-Butylbenzene	ND		ug/l	40	3.8	20
Isopropylbenzene	44		ug/l	40	3.7	20
p-Isopropyltoluene	9.5	J	ug/l	40	3.8	20
Naphthalene	2100		ug/l	40	4.3	20
n-Propylbenzene	16	J	ug/l	40	3.5	20
1,3,5-Trimethylbenzene	43		ug/l	40	4.3	20
1,2,4-Trimethylbenzene	160		ug/l	40	3.8	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-09 D
Client ID: AQPW-01-04152024
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/25/24 21:26
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	7.8	J	ug/l	12	4.0	25
Toluene	6.2	J	ug/l	25	5.1	25
Ethylbenzene	460		ug/l	25	4.2	25
Methyl tert butyl ether	ND		ug/l	50	4.2	25
p/m-Xylene	110		ug/l	50	8.3	25
o-Xylene	140		ug/l	25	9.8	25
Carbon disulfide	ND		ug/l	50	7.5	25
n-Butylbenzene	ND		ug/l	50	4.8	25
Isopropylbenzene	58		ug/l	50	4.7	25
p-Isopropyltoluene	8.6	J	ug/l	50	4.7	25
Naphthalene	3000		ug/l	50	5.4	25
n-Propylbenzene	18	J	ug/l	50	4.3	25
1,3,5-Trimethylbenzene	28	J	ug/l	50	5.4	25
1,2,4-Trimethylbenzene	170		ug/l	50	4.8	25

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	97		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 04/25/24 19:55
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 05-06,08-09 Batch: WG1913681-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	101		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 04/25/24 10:01
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-04,07 Batch: WG1913683-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	101		70-130
Dibromofluoromethane	101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 05-06,08-09 Batch: WG1913681-3 WG1913681-4								
Benzene	99		95		70-130	4		20
Toluene	99		94		70-130	5		20
Ethylbenzene	100		96		70-130	4		20
Methyl tert butyl ether	92		93		70-130	1		20
p/m-Xylene	100		95		70-130	5		20
o-Xylene	100		95		70-130	5		20
Carbon disulfide	110		97		70-130	13		20
n-Butylbenzene	100		95		70-130	5		20
Isopropylbenzene	100		94		70-130	6		20
p-Isopropyltoluene	100		96		70-130	4		20
Naphthalene	96		97		70-130	1		20
n-Propylbenzene	100		96		70-130	4		20
1,3,5-Trimethylbenzene	99		93		70-130	6		20
1,2,4-Trimethylbenzene	100		94		70-130	6		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	102		102		70-130
Toluene-d8	100		99		70-130
4-Bromofluorobenzene	98		99		70-130
Dibromofluoromethane	98		100		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-04,07 Batch: WG1913683-3 WG1913683-4								
Benzene	110		95		70-130	15		20
Toluene	110		95		70-130	15		20
Ethylbenzene	110		94		70-130	16		20
Methyl tert butyl ether	93		88		70-130	6		20
p/m-Xylene	110		95		70-130	15		20
o-Xylene	110		95		70-130	15		20
Carbon disulfide	130		100		70-130	**26**	Q	20
n-Butylbenzene	120		96		70-130	**22**	Q	20
Isopropylbenzene	110		95		70-130	15		20
p-Isopropyltoluene	120		96		70-130	**22**	Q	20
Naphthalene	96		88		70-130	9		20
n-Propylbenzene	120		97		70-130	**21**	Q	20
1,3,5-Trimethylbenzene	110		94		70-130	16		20
1,2,4-Trimethylbenzene	110		94		70-130	16		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	100		103		70-130
Toluene-d8	101		99		70-130
4-Bromofluorobenzene	101		99		70-130
Dibromofluoromethane	98		100		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-01
Client ID: AQPW-04-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 11:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/22/24 23:36
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	4800000	E	ng/l	1000	177.	1
2-Methylnaphthalene	416000	E	ng/l	1000	106.	1
2-Chloronaphthalene	417	J	ng/l	1000	220.	1
Acenaphthylene	1300		ng/l	1000	177.	1
Acenaphthene	62900		ng/l	1000	161.	1
Fluorene	25900		ng/l	1000	173.	1
Phenanthrene	28700		ng/l	1000	189.	1
Anthracene	4290		ng/l	1000	194.	1
Fluoranthene	1500		ng/l	1000	149.	1
Pyrene	1090		ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	66		30-130
Pyrene-d10	82		30-130
Benzo(b)fluoranthene-d12	82		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-01 D
Client ID: AQPW-04-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 11:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 21:42
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	4650000		ng/l	10000	1770	10
2-Methylnaphthalene	454000		ng/l	10000	1060	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	75		30-130
Pyrene-d10	88		30-130
Benzo(b)fluoranthene-d12	91		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-02
Client ID: AQPW-11-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 14:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 00:09
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3180000	E	ng/l	1000	177.	1
2-Methylnaphthalene	174000		ng/l	1000	106.	1
2-Chloronaphthalene	ND		ng/l	1000	220.	1
Acenaphthylene	26800		ng/l	1000	177.	1
Acenaphthene	69400		ng/l	1000	161.	1
Fluorene	47700		ng/l	1000	173.	1
Phenanthrene	57100		ng/l	1000	189.	1
Anthracene	10700		ng/l	1000	194.	1
Fluoranthene	3800		ng/l	1000	149.	1
Pyrene	2750		ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	64		30-130
Pyrene-d10	78		30-130
Benzo(b)fluoranthene-d12	80		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-02 D
Client ID: AQPW-11-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 14:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 22:15
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2960000		ng/l	10000	1770	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	69		30-130
Pyrene-d10	81		30-130
Benzo(b)fluoranthene-d12	81		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-03
Client ID: AQPW-03-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 00:43
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5610000	E	ng/l	1000	177.	1
2-Methylnaphthalene	585000	E	ng/l	1000	106.	1
2-Chloronaphthalene	360	J	ng/l	1000	220.	1
Acenaphthylene	1120		ng/l	1000	177.	1
Acenaphthene	99700		ng/l	1000	161.	1
Fluorene	34300		ng/l	1000	173.	1
Phenanthrene	37100		ng/l	1000	189.	1
Anthracene	5820		ng/l	1000	194.	1
Fluoranthene	2070		ng/l	1000	149.	1
Pyrene	1600		ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	59		30-130
Pyrene-d10	78		30-130
Benzo(b)fluoranthene-d12	81		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-03 D
Client ID: AQPW-03-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 22:49
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	4920000		ng/l	20000	3540	20
2-Methylnaphthalene	594000		ng/l	20000	2120	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	65		30-130
Pyrene-d10	73		30-130
Benzo(b)fluoranthene-d12	75		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-04
Client ID: AQPW-06-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 12:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 01:03
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	5220000	E	ng/l	1000	177.	1
2-Methylnaphthalene	677000	E	ng/l	1000	106.	1
2-Chloronaphthalene	ND		ng/l	1000	220.	1
Acenaphthylene	4650		ng/l	1000	177.	1
Acenaphthene	95900		ng/l	1000	161.	1
Fluorene	50000		ng/l	1000	173.	1
Phenanthrene	48000		ng/l	1000	189.	1
Anthracene	6590		ng/l	1000	194.	1
Fluoranthene	2720		ng/l	1000	149.	1
Pyrene	2370		ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	69		30-130
Pyrene-d10	85		30-130
Benzo(b)fluoranthene-d12	89		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-04 D
Client ID: AQPW-06-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 12:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 23:22
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	4070000		ng/l	20000	3540	20
2-Methylnaphthalene	608000		ng/l	20000	2120	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	69		30-130
Pyrene-d10	78		30-130
Benzo(b)fluoranthene-d12	82		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-05
Client ID: AQPW-05-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 13:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 01:37
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	4390000	E	ng/l	1000	177.	1
2-Methylnaphthalene	539000	E	ng/l	1000	106.	1
2-Chloronaphthalene	ND		ng/l	1000	220.	1
Acenaphthylene	2140		ng/l	1000	177.	1
Acenaphthene	122000		ng/l	1000	161.	1
Fluorene	46900		ng/l	1000	173.	1
Phenanthrene	46200		ng/l	1000	189.	1
Anthracene	5490		ng/l	1000	194.	1
Fluoranthene	900	J	ng/l	1000	149.	1
Pyrene	786	J	ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	56		30-130
Pyrene-d10	70		30-130
Benzo(b)fluoranthene-d12	75		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-05 D
Client ID: AQPW-05-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 13:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 23:56
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3720000		ng/l	20000	3540	20
2-Methylnaphthalene	513000		ng/l	20000	2120	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	56		30-130
Pyrene-d10	66		30-130
Benzo(b)fluoranthene-d12	69		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-06
Client ID: AQPW-FD-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 00:00
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 02:10
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2990000	E	ng/l	1000	177.	1
2-Methylnaphthalene	408000	E	ng/l	1000	106.	1
2-Chloronaphthalene	ND		ng/l	1000	220.	1
Acenaphthylene	2930		ng/l	1000	177.	1
Acenaphthene	58800		ng/l	1000	161.	1
Fluorene	30400		ng/l	1000	173.	1
Phenanthrene	32500		ng/l	1000	189.	1
Anthracene	4450		ng/l	1000	194.	1
Fluoranthene	1820		ng/l	1000	149.	1
Pyrene	1590		ng/l	1000	152.	1
Benz(a)anthracene	ND		ng/l	1000	173.	1
Chrysene	ND		ng/l	1000	93.6	1
Benzo(b)fluoranthene	ND		ng/l	1000	148.	1
Benzo(k)fluoranthene	ND		ng/l	1000	117.	1
Benzo(a)pyrene	ND		ng/l	1000	84.0	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	1000	53.3	1
Dibenz(a,h)anthracene	ND		ng/l	1000	68.5	1
Benzo(ghi)perylene	ND		ng/l	1000	131.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	44		30-130
Pyrene-d10	53		30-130
Benzo(b)fluoranthene-d12	58		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-06 D
Client ID: AQPW-FD-240412
Sample Location: HAVERHILL, MA

Date Collected: 04/12/24 00:00
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 00:29
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2480000		ng/l	20000	3540	20
2-Methylnaphthalene	381000		ng/l	20000	2120	20

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	42		30-130
Pyrene-d10	49		30-130
Benzo(b)fluoranthene-d12	53		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-08 D2
Client ID: AQPW-02-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 11:45
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 18:19
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/18/24 11:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2630000		ng/l	5260	932.	500

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-08 D
Client ID: AQPW-02-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 11:45
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 02:43
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/18/24 11:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2410000	E	ng/l	2100	373.	200
2-Methylnaphthalene	577000		ng/l	2100	223.	200
2-Chloronaphthalene	ND		ng/l	2100	463.	200
Acenaphthylene	1010	J	ng/l	2100	373.	200
Acenaphthene	121000		ng/l	2100	339.	200
Fluorene	34100		ng/l	2100	364.	200
Phenanthrene	41600		ng/l	2100	398.	200
Anthracene	7270		ng/l	2100	408.	200
Fluoranthene	3410		ng/l	2100	314.	200
Pyrene	2610		ng/l	2100	320.	200
Benz(a)anthracene	ND		ng/l	2100	364.	200
Chrysene	ND		ng/l	2100	197.	200
Benzo(b)fluoranthene	ND		ng/l	2100	312.	200
Benzo(k)fluoranthene	ND		ng/l	2100	246.	200
Benzo(a)pyrene	ND		ng/l	2100	177.	200
Indeno(1,2,3-cd)Pyrene	ND		ng/l	2100	112.	200
Dibenz(a,h)anthracene	ND		ng/l	2100	144.	200
Benzo(ghi)perylene	ND		ng/l	2100	276.	200

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	105		30-130
Pyrene-d10	101		30-130
Benzo(b)fluoranthene-d12	111		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-09 D2
Client ID: AQPW-01-04152024
Sample Location: HAVERHILL, MA

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 18:53
Analyst: MC

Date Collected: 04/15/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Extraction Method: EPA 3510C
Extraction Date: 04/18/24 11:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3430000		ng/l	10200	1810	1000

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420526

Project Number: 180327-08.01 **Report Date:** 04/29/24

SAMPLE RESULTS

Lab ID: L2420526-09 D
Client ID: AQPW-01-04152024
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 10:30
Date Received: 04/15/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 03:17
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/18/24 11:10

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	3730000	E	ng/l	5100	903.	500
2-Methylnaphthalene	535000		ng/l	5100	541.	500
2-Chloronaphthalene	ND		ng/l	5100	1120	500
Acenaphthylene	2130	J	ng/l	5100	903.	500
Acenaphthene	174000		ng/l	5100	821.	500
Fluorene	74100		ng/l	5100	883.	500
Phenanthrene	85500		ng/l	5100	964.	500
Anthracene	14400		ng/l	5100	990.	500
Fluoranthene	6290		ng/l	5100	760.	500
Pyrene	4180	J	ng/l	5100	776.	500
Benz(a)anthracene	ND		ng/l	5100	883.	500
Chrysene	ND		ng/l	5100	478.	500
Benzo(b)fluoranthene	ND		ng/l	5100	755.	500
Benzo(k)fluoranthene	ND		ng/l	5100	597.	500
Benzo(a)pyrene	ND		ng/l	5100	428.	500
Indeno(1,2,3-cd)Pyrene	ND		ng/l	5100	272.	500
Dibenz(a,h)anthracene	ND		ng/l	5100	349.	500
Benzo(ghi)perylene	ND		ng/l	5100	668.	500

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	**0**	Q	30-130
Pyrene-d10	**0**	Q	30-130
Benzo(b)fluoranthene-d12	**0**	Q	30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420526
Report Date: 04/29/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 04/21/24 13:28
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/18/24 11:10

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 08-09 Batch: WG1910175-1					
Naphthalene	ND		ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	ND		ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	68		30-130
Pyrene-d10	81		30-130
Benzo(b)fluoranthene-d12	87		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 04/21/24 15:08
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/19/24 15:11

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-06 Batch: WG1910871-1					
Naphthalene	ND		ng/l	10.0	1.77
2-Methylnaphthalene	ND		ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	ND		ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	67		30-130
Pyrene-d10	81		30-130
Benzo(b)fluoranthene-d12	87		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 08-09 Batch: WG1910175-2 WG1910175-3								
Naphthalene	73		75		40-140	3		20
2-Methylnaphthalene	72		73		40-140	1		20
2-Chloronaphthalene	74		75		40-140	1		20
Acenaphthylene	76		81		40-140	6		20
Acenaphthene	75		79		40-140	5		20
Fluorene	81		84		40-140	4		20
Phenanthrene	90		86		40-140	5		20
Anthracene	73		80		40-140	9		20
Fluoranthene	90		91		40-140	1		20
Pyrene	84		88		40-140	5		20
Benz(a)anthracene	101		93		40-140	8		20
Chrysene	75		86		40-140	14		20
Benzo(b)fluoranthene	106		94		40-140	12		20
Benzo(k)fluoranthene	70		87		40-140	**22**	Q	20
Benzo(a)pyrene	71		80		40-140	12		20
Indeno(1,2,3-cd)Pyrene	93		92		40-140	1		20
Dibenz(a,h)anthracene	88		88		40-140	0		20
Benzo(ghi)perylene	103		104		40-140	1		20

Lab Control Sample Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420526

Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 08-09 Batch: WG1910175-2 WG1910175-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	70		76		30-130
Pyrene-d10	83		83		30-130
Benzo(b)fluoranthene-d12	85		84		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-06 Batch: WG1910871-2 WG1910871-3								
Naphthalene	72		83		40-140	14		20
2-Methylnaphthalene	70		81		40-140	15		20
2-Chloronaphthalene	71		83		40-140	16		20
Acenaphthylene	73		85		40-140	15		20
Acenaphthene	73		84		40-140	14		20
Fluorene	79		86		40-140	8		20
Phenanthrene	79		84		40-140	6		20
Anthracene	79		86		40-140	8		20
Fluoranthene	84		88		40-140	5		20
Pyrene	80		81		40-140	1		20
Benz(a)anthracene	83		82		40-140	1		20
Chrysene	79		88		40-140	11		20
Benzo(b)fluoranthene	84		84		40-140	0		20
Benzo(k)fluoranthene	78		91		40-140	15		20
Benzo(a)pyrene	70		81		40-140	15		20
Indeno(1,2,3-cd)Pyrene	80		85		40-140	6		20
Dibenz(a,h)anthracene	75		84		40-140	11		20
Benzo(ghi)perylene	91		100		40-140	9		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420526
Report Date: 04/29/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-06 Batch: WG1910871-2 WG1910871-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	66		78		30-130
Pyrene-d10	77		80		30-130
Benzo(b)fluoranthene-d12	77		82		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420526
Report Date: 04/29/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2420526-01A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-01B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-01C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-01D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-01E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-02A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-02B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-02C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-02D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-02E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-03A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-03B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-03C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-03D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-03E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-04A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-04B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-04C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-04D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-04E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-05A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-05B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420526
Report Date: 04/29/24

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2420526-05C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-05D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-05E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-06A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-06B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-06C	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-06D	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-06E	Amber 1000ml unpreserved	B	7	7	5.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-07A	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-07B	Vial HCl preserved	B	NA		5.8	Y	Absent		MCP-8260-21(14)
L2420526-08A	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-08B	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-08C	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-08D	Amber 1000ml unpreserved	A	7	7	5.6	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-08E	Amber 1000ml unpreserved	A	7	7	5.6	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-09A	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-09B	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-09C	Vial HCl preserved	A	NA		5.6	Y	Absent		MCP-8260-21(14)
L2420526-09D	Amber 1000ml unpreserved	A	7	7	5.6	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420526-09E	Amber 1000ml unpreserved	A	7	7	5.6	Y	Absent		A2-MCPPAH-8270SIM-21(7)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420526
Project Number:	180327-08.01	**Report Date:**	04/29/24

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Nonpotable Water: EPA RSK-175 Dissolved Gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 4/15/24

ALPHA Job #: L2420526

ALPHA Analytical
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor, Amesbury, MA 01913
Phone: 978-712-4475
Email: bgauley@anchorqea.com

Additional Project Information:

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: 10 day TAT VOCs, 15 day TAT PAHs

Report Information - Data Deliverables

☒ ADEx ☐ EMAIL

Billing Information

☒ Same as Client Info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☒ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☒ Other State /Fed Program MA MCP Criteria

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	Sample Comments	TOTAL # BOTTLES
20526-01	AQPW-04-240412	4/12/24	1130	GW	EM	X	X		5
-02	AQPW-11-240412	↓	1430	GW	↓	X	X		5
-03	AQPW-03-240412		1030	GW		X	X		5
-04	AQPW-06-240412		1230	GW		X	X		5
-05	AQPW-05-240412		1530	GW		X	X		5
-06	AQPW-FD-240412	↓	—	GW	↓	X	X		5
-07	Tripblank-240418	~~4/12/24~~ BUG 4/3/24	0859	—	SB	X			2
-08	AQPW-02-240415	4/15/24	1145	GW	EM	X	X		5
-09	AQPW-01-04152024	4/15/24	1030	GW	EM	X	X		5
					Container Type	V	A		
					Preservative	B	A		

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie Jo Daly	4/15/24 1223	[illegible]	4/15/24 1223
[illegible]	4/15/24 1900	[illegible]	4/15/24 1900

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2420526
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1913683-5	**Lab File ID**	: VQ240425A05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 04/25/24 10:01

Client Sample No.	Lab Sample ID	Analysis Date
WG1913683-3LCS	WG1913683-3	04/25/24 08:30
WG1913683-4LCSD	WG1913683-4	04/25/24 08:53
TRIPBLANK-240412	L2420526-07	04/25/24 10:24
AQPW-04-240412	L2420526-01D	04/25/24 15:43
AQPW-11-240412	L2420526-02D	04/25/24 16:06
AQPW-03-240412	L2420526-03D	04/25/24 16:29
AQPW-06-240412	L2420526-04D	04/25/24 16:52

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2420526
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1913681-5	**Lab File ID**	: VQ240425N05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 04/25/24 19:55

Client Sample No.	Lab Sample ID	Analysis Date
WG1913681-3LCS	WG1913681-3	04/25/24 18:23
WG1913681-4LCSD	WG1913681-4	04/25/24 18:46
AQPW-05-240412	L2420526-05D	04/25/24 20:17
AQPW-FD-240412	L2420526-06D	04/25/24 20:40
AQPW-02-240415	L2420526-08D	04/25/24 21:03
AQPW-01-04152024	L2420526-09D	04/25/24 21:26

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 08:30
Lab File ID	: VQ240425A01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913683-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	99	-.01
Dichlorodifluoromethane	0.15	0.175	-	-16.7	20	125	0
Chloromethane	0.209	0.241	-	-15.3	20	121	0
Vinyl chloride	0.167	0.203	-	-21.6*	20	127	0
Bromomethane	0.078	0.089	-	-14.1	20	128	0
Chloroethane	0.089	0.106	-	-19.1	20	126	0
Trichlorofluoromethane	0.18	0.204	-	-13.3	20	117	0
Ethyl ether	0.071	0.068	-	4.2	20	101	0
1,1-Dichloroethene	0.116	0.132	-	-13.8	20	123	0
Carbon disulfide	0.299	0.39	-	-30.4*	20	137	0
Freon-113	0.12	0.136	-	-13.3	20	119	0
Iodomethane	0.17	0.172	-	-1.2	20	115	0
Acrolein	0.02	0.017	-	15	20	90	0
Methylene chloride	0.132	0.14	-	-6.1	20	115	-.01
Acetone	10	8.726	-	12.7	20	86	-.01
trans-1,2-Dichloroethene	0.125	0.143	-	-14.4	20	123	0
Methyl acetate	0.102	0.089	-	12.7	20	89	-.01
Methyl tert-butyl ether	0.378	0.352	-	6.9	20	98	0
tert-Butyl alcohol	0.014	0.011	-	21.4*	20	80	-.01
Diisopropyl ether	0.638	0.667	-	-4.5	20	111	-.01
1,1-Dichloroethane	0.314	0.339	-	-8	20	113	0
Halothane	0.121	0.129	-	-6.6	20	113	0
Acrylonitrile	0.052	0.046	-	11.5	20	94	0
Ethyl tert-butyl ether	0.563	0.561	-	0.4	20	106	0
Vinyl acetate	0.362	0.38	-	-5	20	114	-.01
cis-1,2-Dichloroethene	0.174	0.186*	-	-6.9	20	113	-.01
2,2-Dichloropropane	0.24	0.259	-	-7.9	20	115	0
Bromochloromethane	0.084	0.085*	-	-1.2	20	107	0
Cyclohexane	0.316	0.354	-	-12	20	118	0
Chloroform	0.268	0.287	-	-7.1	20	112	0
Ethyl acetate	0.171	0.14	-	18.1	20	89	0
Carbon tetrachloride	0.212	0.227	-	-7.1	20	113	0
Tetrahydrofuran	0.056	0.046	-	17.9	20	84	0
Dibromofluoromethane	0.253	0.247	-	2.4	20	97	-.01
1,1,1-Trichloroethane	0.239	0.254	-	-6.3	20	113	0
2-Butanone	0.074	0.058	-	21.6*	20	79	0
1,1-Dichloropropene	0.205	0.231	-	-12.7	20	121	-.01
Benzene	0.609	0.662	-	-8.7	20	116	0
tert-Amyl methyl ether	0.438	0.422	-	3.7	20	103	-.01
1,2-Dichloroethane-d4	0.292	0.291	-	0.3	20	95	-.01
1,2-Dichloroethane	0.22	0.221	-	-0.5	20	105	-.01
Methyl cyclohexane	0.253	0.279	-	-10.3	20	119	0
Trichloroethene	0.168	0.177*	-	-5.4	20	117	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 08:30
Lab File ID	: VQ240425A01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913683-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Dibromomethane	0.092	0.09	-	2.2	20	105	0
1,2-Dichloropropane	0.181	0.188	-	-3.9	20	111	0
2-Chloroethyl vinyl ether	0.108	0.1	-	7.4	20	97	0
Bromodichloromethane	0.217	0.218*	-	-0.5	20	108	0
1,4-Dioxane	0.00126	0.00104*	-	17.5	20	80	0
cis-1,3-Dichloropropene	0.257	0.268*	-	-4.3	20	111	0
Chlorobenzene-d5	1	1	-	0	20	98	0
Toluene-d8	1.301	1.311	-	-0.8	20	98	0
Toluene	0.51	0.563	-	-10.4	20	114	-.01
4-Methyl-2-pentanone	0.079	0.066	-	16.5	20	85	0
Tetrachloroethene	0.217	0.244	-	-12.4	20	116	0
trans-1,3-Dichloropropene	0.301	0.31	-	-3	20	107	0
Ethyl methacrylate	0.248	0.222	-	10.5	20	94	0
1,1,2-Trichloroethane	0.151	0.147*	-	2.6	20	104	0
Chlorodibromomethane	0.22	0.213	-	3.2	20	102	-.01
1,3-Dichloropropane	0.308	0.31	-	-0.6	20	103	0
1,2-Dibromoethane	0.182	0.179*	-	1.6	20	100	0
2-Hexanone	0.15	0.118	-	21.3*	20	82	0
Chlorobenzene	0.575	0.626	-	-8.9	20	112	0
Ethylbenzene	0.952	1.054	-	-10.7	20	114	0
1,1,1,2-Tetrachloroethane	0.222	0.233	-	-5	20	110	0
p/m Xylene	0.377	0.42	-	-11.4	20	113	0
o Xylene	0.37	0.408	-	-10.3	20	111	0
Styrene	0.603	0.665	-	-10.3	20	111	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	95	0
Bromoform	0.247	0.238	-	3.6	20	97	0
Isopropylbenzene	1.696	1.907	-	-12.4	20	112	0
4-Bromofluorobenzene	0.911	0.919	-	-0.9	20	95	0
Bromobenzene	0.452	0.5	-	-10.6	20	111	0
n-Propylbenzene	1.901	2.2	-	-15.7	20	115	0
1,4-Dichlorobutane	0.64	0.629	-	1.7	20	98	0
1,1,2,2-Tetrachloroethane	0.39	0.367	-	5.9	20	95	0
4-Ethyltoluene	1.635	1.879	-	-14.9	20	114	0
2-Chlorotoluene	1.364	1.531	-	-12.2	20	114	-.01
1,3,5-Trimethylbenzene	1.429	1.604	-	-12.2	20	112	0
1,2,3-Trichloropropane	0.315	0.298	-	5.4	20	91	0
trans-1,4-Dichloro-2-buten	0.14	0.125	-	10.7	20	90	0
4-Chlorotoluene	1.234	1.396	-	-13.1	20	114	0
tert-Butylbenzene	1.231	1.398	-	-13.6	20	111	0
1,2,4-Trimethylbenzene	1.405	1.591	-	-13.2	20	113	0
sec-Butylbenzene	1.654	1.915	-	-15.8	20	113	0
p-Isopropyltoluene	1.507	1.746	-	-15.9	20	113	0
1,3-Dichlorobenzene	0.829	0.928	-	-11.9	20	113	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 08:30
Lab File ID	: VQ240425A01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913683-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,4-Dichlorobenzene	0.837	0.947	-	-13.1	20	112	0
p-Diethylbenzene	0.897	1.028	-	-14.6	20	114	0
n-Butylbenzene	1.151	1.342	-	-16.6	20	117	0
1,2-Dichlorobenzene	0.805	0.881	-	-9.4	20	109	0
1,2,4,5-Tetramethylbenzene	1.476	1.666	-	-12.9	20	111	0
1,2-Dibromo-3-chloropropan	0.068	0.061	-	10.3	20	86	0
1,3,5-Trichlorobenzene	0.577	0.645	-	-11.8	20	113	0
Hexachlorobutadiene	0.171	0.211	-	-23.4*	20	128	0
1,2,4-Trichlorobenzene	0.546	0.582	-	-6.6	20	109	0
Naphthalene	1.348	1.295	-	3.9	20	93	0
1,2,3-Trichlorobenzene	0.516	0.533	-	-3.3	20	103	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	101	-.01
Dichlorodifluoromethane	0.15	0.154	-	-2.7	20	113	0
Chloromethane	0.209	0.21	-	-0.5	20	108	0
Vinyl chloride	0.167	0.171	-	-2.4	20	109	0
Bromomethane	0.078	0.095	-	-21.8*	20	141	0
Chloroethane	0.089	0.09	-	-1.1	20	109	0
Trichlorofluoromethane	0.18	0.188	-	-4.4	20	110	0
Ethyl ether	0.071	0.066	-	7	20	100	0
1,1-Dichloroethene	0.116	0.12	-	-3.4	20	113	0
Carbon disulfide	0.299	0.334	-	-11.7	20	120	0
Freon-113	0.12	0.124	-	-3.3	20	111	0
Iodomethane	0.17	0.098	-	42.4*	20	67	0
Acrolein	0.02	0.018	-	10	20	97	0
Methylene chloride	0.132	0.126	-	4.5	20	106	-.01
Acetone	10	10.021	-	-0.2	20	100	-.01
trans-1,2-Dichloroethene	0.125	0.125	-	0	20	111	0
Methyl acetate	0.102	0.09	-	11.8	20	92	-.01
Methyl tert-butyl ether	0.378	0.348	-	7.9	20	99	0
tert-Butyl alcohol	0.014	0.012	-	14.3	20	92	-.01
Diisopropyl ether	0.638	0.623	-	2.4	20	106	0
1,1-Dichloroethane	0.314	0.304	-	3.2	20	104	0
Halothane	0.121	0.116	-	4.1	20	104	0
Acrylonitrile	0.052	0.048	-	7.7	20	100	0
Ethyl tert-butyl ether	0.563	0.528	-	6.2	20	102	0
Vinyl acetate	0.362	0.344	-	5	20	105	-.01
cis-1,2-Dichloroethene	0.174	0.17*	-	2.3	20	106	-.01
2,2-Dichloropropane	0.24	0.227	-	5.4	20	103	0
Bromochloromethane	0.084	0.08*	-	4.8	20	103	0
Cyclohexane	0.316	0.321	-	-1.6	20	109	0
Chloroform	0.268	0.265	-	1.1	20	106	0
Ethyl acetate	0.171	0.143	-	16.4	20	93	0
Carbon tetrachloride	0.212	0.201	-	5.2	20	103	0
Tetrahydrofuran	0.056	0.048	-	14.3	20	89	-.01
Dibromofluoromethane	0.253	0.248	-	2	20	100	-.01
1,1,1-Trichloroethane	0.239	0.234	-	2.1	20	106	0
2-Butanone	0.074	0.061	-	17.6	20	85	0
1,1-Dichloropropene	0.205	0.208	-	-1.5	20	111	-.01
Benzene	0.609	0.604	-	0.8	20	108	0
tert-Amyl methyl ether	0.438	0.404	-	7.8	20	100	0
1,2-Dichloroethane-d4	0.292	0.299	-	-2.4	20	99	-.01
1,2-Dichloroethane	0.22	0.207	-	5.9	20	100	-.01
Methyl cyclohexane	0.253	0.258	-	-2	20	113	0
Trichloroethene	0.168	0.162*	-	3.6	20	109	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Dibromomethane	0.092	0.086	-	6.5	20	102	0
1,2-Dichloropropane	0.181	0.171	-	5.5	20	103	0
2-Chloroethyl vinyl ether	0.108	0.075	-	30.6*	20	75	0
Bromodichloromethane	0.217	0.199*	-	8.3	20	101	0
1,4-Dioxane	0.00126	0.00114*	-	9.5	20	90	0
cis-1,3-Dichloropropene	0.257	0.242*	-	5.8	20	103	0
Chlorobenzene-d5	1	1	-	0	20	102	0
Toluene-d8	1.301	1.297	-	0.3	20	101	0
Toluene	0.51	0.504	-	1.2	20	106	0
4-Methyl-2-pentanone	0.079	0.066	-	16.5	20	89	0
Tetrachloroethene	0.217	0.22	-	-1.4	20	109	0
trans-1,3-Dichloropropene	0.301	0.282*	-	6.3	20	101	0
Ethyl methacrylate	0.248	0.212	-	14.5	20	93	0
1,1,2-Trichloroethane	0.151	0.142*	-	6	20	104	0
Chlorodibromomethane	0.22	0.197*	-	10.5	20	98	-.01
1,3-Dichloropropane	0.308	0.293	-	4.9	20	101	-.01
1,2-Dibromoethane	0.182	0.171*	-	6	20	100	-.01
2-Hexanone	0.15	0.123	-	18	20	88	-.01
Chlorobenzene	0.575	0.567	-	1.4	20	106	0
Ethylbenzene	0.952	0.972	-	-2.1	20	109	0
1,1,1,2-Tetrachloroethane	0.222	0.211	-	5	20	103	-.01
p/m Xylene	0.377	0.383	-	-1.6	20	107	0
o Xylene	0.37	0.368	-	0.5	20	104	-.01
Styrene	0.603	0.599	-	0.7	20	104	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	100	0
Bromoform	0.247	0.218	-	11.7	20	94	0
Isopropylbenzene	1.696	1.708	-	-0.7	20	106	0
4-Bromofluorobenzene	0.911	0.896	-	1.6	20	98	0
Bromobenzene	0.452	0.451	-	0.2	20	106	0
n-Propylbenzene	1.901	1.95	-	-2.6	20	107	0
1,4-Dichlorobutane	0.64	0.598	-	6.6	20	98	0
1,1,2,2-Tetrachloroethane	0.39	0.354	-	9.2	20	97	0
4-Ethyltoluene	1.635	1.676	-	-2.5	20	107	0
2-Chlorotoluene	1.364	1.347	-	1.2	20	106	-.01
1,3,5-Trimethylbenzene	1.429	1.417	-	0.8	20	104	0
1,2,3-Trichloropropane	0.315	0.294	-	6.7	20	95	0
trans-1,4-Dichloro-2-buten	0.14	0.123	-	12.1	20	94	0
4-Chlorotoluene	1.234	1.234	-	0	20	106	0
tert-Butylbenzene	1.231	1.259	-	-2.3	20	106	0
1,2,4-Trimethylbenzene	1.405	1.418	-	-0.9	20	106	0
sec-Butylbenzene	1.654	1.724	-	-4.2	20	108	0
p-Isopropyltoluene	1.507	1.559	-	-3.5	20	107	0
1,3-Dichlorobenzene	0.829	0.833	-	-0.5	20	107	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420526
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,4-Dichlorobenzene	0.837	0.838	-	-0.1	20	105	0
p-Diethylbenzene	0.897	0.916	-	-2.1	20	108	0
n-Butylbenzene	1.151	1.202	-	-4.4	20	111	0
1,2-Dichlorobenzene	0.805	0.799	-	0.7	20	104	0
1,2,4,5-Tetramethylbenzene	1.476	1.485	-	-0.6	20	105	0
1,2-Dibromo-3-chloropropan	0.068	0.057	-	16.2	20	86	0
1,3,5-Trichlorobenzene	0.577	0.585	-	-1.4	20	108	0
Hexachlorobutadiene	0.171	0.188	-	-9.9	20	121	0
1,2,4-Trichlorobenzene	0.546	0.533	-	2.4	20	105	0
Naphthalene	1.348	1.301	-	3.5	20	99	0
1,2,3-Trichlorobenzene	0.516	0.505	-	2.1	20	104	0

* Value outside of QC limits.

ANALYTICAL REPORT

Lab Number:	L2420626
Client:	Anchor QEA, LLC 9 Water Street, 1st Floor Amesbury, MA 01913
ATTN:	Billie-Jo Gauley
Phone:	(978) 712-4475
Project Name:	FORMER HAVERHILL MGP
Project Number:	180327-08.01
Report Date:	05/07/24

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Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0825), DoD (L2474), FL (E87814), IL (200081), IN (C-MA-04), KY (KY98046), LA (85084), ME (MA00030), MD (350), MI (9110), MN (025-999-495), NJ (MA015), NY (11627), NC (685), OR (MA-0262), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #525-23-107-88708A1), USFWS (Permit #A24920).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2420626-01	AQSW-01-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 17:30	04/16/24
L2420626-02	AQSW-02-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 18:10	04/16/24
L2420626-03	AQSW-03-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 18:30	04/16/24
L2420626-04	RINSE1-240415	WATER	HAVERHILL, MA	04/15/24 20:00	04/16/24
L2420626-05	RINSE2-240415	WATER	HAVERHILL, MA	04/15/24 20:16	04/16/24
L2420626-06	TRIPBLANK-240415	WATER	HAVERHILL, MA	04/15/24 00:00	04/16/24
L2420626-07	AQSW-DUP1-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 00:00	04/16/24
L2420626-08	AQSW-04-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 17:05	04/16/24
L2420626-09	AQSW-05-240415	SURFACE WATER	HAVERHILL, MA	04/15/24 16:46	04/16/24
L2420626-10	AQPW-07-240415	GROUNDWATER	HAVERHILL, MA	04/15/24 13:10	04/16/24
L2420626-11	AQPW-09-240415	GROUNDWATER	HAVERHILL, MA	04/15/24 16:13	04/16/24
L2420626-12	AQPW-08-240415	GROUNDWATER	HAVERHILL, MA	04/15/24 14:55	04/16/24

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	NO
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	NO
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	NO

For any questions answered "No", please refer to the case narrative section on the following page(s).

Please note that sample matrix information is located in the Sample Results section of this report.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

Case Narrative (continued)

Report Submission

May 7, 2024: This is a final report.

April 29, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Volatile Organics

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

In reference to question H:

L2420626-05 through -12: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: cis-1,2-dichloroethene (0.1719), bromochloromethane (0.0793), chloroform (0.2711), trichloroethene (0.1848), 1,2-dichloropropane (0.1455), bromodichloromethane (0.2021), 1,4-dioxane (0.0008), cis-1,3-dichloropropene (0.2102), 1,1,2-trichloroethane (0.0973), chlorodibromomethane (0.1724), 1,2-dibromoethane (0.1105)

Average Response Factor: cis-1,2-dichloroethene, bromochloromethane, trichloroethene, 1,2-dichloropropane, bromodichloromethane, 1,4-dioxane, cis-1,3-dichloropropene, 1,1,2-trichloroethane, 1,2-dibromoethane

Verification: carbon disulfide (69%)

L2420626-05 through -12: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

L2420626-01 through -04: Initial Calibration did not meet:

Lowest Calibration Standard Minimum Response Factor: 1,1-dichloroethane (0.2955), cis-1,2-dichloroethene (0.1747),bromochloromethane (0.0842), chloroform (0.254), trichloroethene (0.1807), 1,2-dichloropropane

Case Narrative (continued)

(0.1739),bromodichloromethane (0.217), 1,4-dioxane (0.0012), cis-1,3-dichloropropene (0.2308), trans-1,3-dichloropropene (0.2563), 1,1,2-Trichloroethane (0.1596), 1,2-Dibromoethane (0.1759)
Average Response Factor: cis-1,2-dichloroethene, bromochloromethane, chloroform, trichloroethene, 1,2-dichloropropane, bromodichloromethane, 1,4-dioxane, cis-1,3-dichloropropene, 1,1,2-trichloroethane, 1,2-dibromoethane
Verification: NONE
L2420626-01 through -04: The associated continuing calibration standard is outside the acceptance criteria for several compounds; however, it is within overall method allowances. Associated results are considered to be biased high if the %D is negative and biased low if the %D is positive. A copy of the continuing calibration standard is included as an addendum to this report.

Semivolatile Organics by SIM
In reference to question G:
L2420626-10, -11, -12: The samples were re-analyzed on dilution in order to quantitate the results within the calibration range. The result(s) should be considered estimated, and are qualified with an E flag, for any compound(s) that exceeded the calibration range in the initial analysis. The re-analysis was performed only for the compound(s) that exceeded the calibration range.
In reference to question H:
The WG1911809-4 MS recovery, performed on L2420626-12, is outside the acceptance criteria for naphthalene (168%). The unacceptable percent recovery is attributed to the elevated concentrations of target compounds present in the native sample. In addition, the WG1911809-4/-5 MS/MSD RPDs, are outside the acceptance criteria for benz(a)anthracene (21%), chrysene (22%) and benzo(b)fluoranthene (21%). The associated LCS/LCSD met the criteria, no further action was required.
The WG1911809-4D/-5D MS/MSD recoveries, performed on L2420626-12, are outside the acceptance criteria for acenaphthylene (1560%/1540), acenaphthene (2300%/3130%), fluorene (1800%/2990%), phenanthrene (4500%/5510%), anthracene (320%/590%), fluoranthene (446%/481%) and pyrene (566%/652%). The unacceptable percent recoveries are attributed to the elevated concentrations of target

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
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Case Narrative (continued)

compounds present in the native sample. The associated LCS/LCSD met the criteria, no further action was required.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Elizabeth Porta

Title: Technical Director/Representative Date: 05/07/24

QC OUTLIER SUMMARY REPORT

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP PAHs by GC/MS-SIM - Mansfield Lab								
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4	Naphthalene	MS	168	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Acenaphthylene	MS	1560	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Acenaphthene	MS	2300	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Fluorene	MS	1800	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Phenanthrene	MS	4500	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Anthracene	MS	320	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Fluoranthene	MS	446	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-4 D	Pyrene	MS	566	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5	Benz(a)anthracene	MSD	21	20	01-05,07-12	non-directional bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5	Chrysene	MSD	22	20	01-05,07-12	non-directional bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5	Benzo(b)fluoranthene	MSD	21	20	01-05,07-12	non-directional bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Acenaphthylene	MSD	1540	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Acenaphthene	MSD	3130	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Fluorene	MSD	2990	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Phenanthrene	MSD	5510	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Anthracene	MSD	590	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Fluoranthene	MSD	481	40-140	01-05,07-12	potential high bias
8270E-SIM	Batch QC (L2420626-12)	WG1911809-5 D	Pyrene	MSD	652	40-140	01-05,07-12	potential high bias

ORGANICS

VOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-01
Client ID: AQSW-01-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 17:30
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 02:44
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	0.22	J	ug/l	1.0	0.20	1
Ethylbenzene	0.21	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.33	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	99		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-02
Client ID: AQSW-02-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 18:10
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:07
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	0.39	J	ug/l	1.0	0.20	1
Ethylbenzene	0.21	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.31	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-03
Client ID: AQSW-03-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 18:30
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:30
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	0.38	J	ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.36	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-04
Client ID: RINSE1-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 20:00
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:52
Analyst: MJV

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	95		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	100		70-130
Dibromofluoromethane	100		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-05
Client ID: RINSE2-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 20:16
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 02:36
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	112		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-06
Client ID: TRIPBLANK-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 00:00
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 02:13
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	114		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-07
Client ID: AQSW-DUP1-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 00:00
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:00
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	ND		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	ND		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	110		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	118		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-08
Client ID: AQSW-04-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 17:05
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:24
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	0.18	J	ug/l	0.50	0.16	1
Toluene	0.43	J	ug/l	1.0	0.20	1
Ethylbenzene	0.17	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.26	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	114		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	126		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-09
Client ID: AQSW-05-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 16:46
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8260D
Analytical Date: 04/26/24 03:47
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	0.24	J	ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	ND		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	ND		ug/l	2.0	0.19	1
Isopropylbenzene	ND		ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	0.28	J	ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	110		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	92		70-130
Dibromofluoromethane	119		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-10
Client ID: AQPW-07-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 13:10
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/26/24 04:11
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	12		ug/l	0.50	0.16	1
Toluene	0.95	J	ug/l	1.0	0.20	1
Ethylbenzene	37		ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	2.4		ug/l	2.0	0.33	1
o-Xylene	4.2		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	0.66	J	ug/l	2.0	0.19	1
Isopropylbenzene	6.6		ug/l	2.0	0.19	1
p-Isopropyltoluene	0.34	J	ug/l	2.0	0.19	1
Naphthalene	90		ug/l	2.0	0.22	1
n-Propylbenzene	2.1		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	1.9	J	ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	12		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	104		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	89		70-130
Dibromofluoromethane	110		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-11
Client ID: AQPW-09-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 16:13
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/26/24 04:34
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	0.42	J	ug/l	0.50	0.16	1
Toluene	0.26	J	ug/l	1.0	0.20	1
Ethylbenzene	0.23	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	ND		ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	0.47	J	ug/l	2.0	0.19	1
Isopropylbenzene	0.42	J	ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	4.8		ug/l	2.0	0.22	1
n-Propylbenzene	ND		ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	93		70-130
4-Bromofluorobenzene	91		70-130
Dibromofluoromethane	111		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-12
Client ID: AQPW-08-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 14:55
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8260D
Analytical Date: 04/26/24 04:58
Analyst: MKS

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP Volatile Organics - Westborough Lab						
Benzene	0.58		ug/l	0.50	0.16	1
Toluene	ND		ug/l	1.0	0.20	1
Ethylbenzene	0.30	J	ug/l	1.0	0.17	1
Methyl tert butyl ether	0.18	J	ug/l	2.0	0.17	1
p/m-Xylene	ND		ug/l	2.0	0.33	1
o-Xylene	ND		ug/l	1.0	0.39	1
Carbon disulfide	ND		ug/l	2.0	0.30	1
n-Butylbenzene	0.57	J	ug/l	2.0	0.19	1
Isopropylbenzene	0.44	J	ug/l	2.0	0.19	1
p-Isopropyltoluene	ND		ug/l	2.0	0.19	1
Naphthalene	5.4		ug/l	2.0	0.22	1
n-Propylbenzene	0.31	J	ug/l	2.0	0.17	1
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22	1
1,2,4-Trimethylbenzene	0.84	J	ug/l	2.0	0.19	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	94		70-130
4-Bromofluorobenzene	94		70-130
Dibromofluoromethane	114		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 04/25/24 21:05
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 05-12 Batch: WG1913677-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	110		70-130
Toluene-d8	95		70-130
4-Bromofluorobenzene	96		70-130
Dibromofluoromethane	116		70-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8260D
Analytical Date: 04/25/24 19:55
Analyst: MAG

Parameter	Result	Qualifier	Units	RL	MDL
MCP Volatile Organics - Westborough Lab for sample(s): 01-04 Batch: WG1913681-5					
Benzene	ND		ug/l	0.50	0.16
Toluene	ND		ug/l	1.0	0.20
Ethylbenzene	ND		ug/l	1.0	0.17
Methyl tert butyl ether	ND		ug/l	2.0	0.17
p/m-Xylene	ND		ug/l	2.0	0.33
o-Xylene	ND		ug/l	1.0	0.39
Carbon disulfide	ND		ug/l	2.0	0.30
n-Butylbenzene	ND		ug/l	2.0	0.19
Isopropylbenzene	ND		ug/l	2.0	0.19
p-Isopropyltoluene	ND		ug/l	2.0	0.19
Naphthalene	ND		ug/l	2.0	0.22
n-Propylbenzene	ND		ug/l	2.0	0.17
1,3,5-Trimethylbenzene	ND		ug/l	2.0	0.22
1,2,4-Trimethylbenzene	ND		ug/l	2.0	0.19

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		70-130
Toluene-d8	99		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	101		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 05-12 Batch: WG1913677-3 WG1913677-4								
Benzene	110		100		70-130	10		20
Toluene	100		99		70-130	1		20
Ethylbenzene	98		95		70-130	3		20
Methyl tert butyl ether	82		84		70-130	2		20
p/m-Xylene	100		100		70-130	0		20
o-Xylene	100		95		70-130	5		20
Carbon disulfide	110		100		70-130	10		20
n-Butylbenzene	110		100		70-130	10		20
Isopropylbenzene	90		89		70-130	1		20
p-Isopropyltoluene	100		100		70-130	0		20
Naphthalene	83		84		70-130	1		20
n-Propylbenzene	100		98		70-130	2		20
1,3,5-Trimethylbenzene	95		92		70-130	3		20
1,2,4-Trimethylbenzene	92		89		70-130	3		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	99		97		70-130
Toluene-d8	100		97		70-130
4-Bromofluorobenzene	90		91		70-130
Dibromofluoromethane	106		104		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-04 Batch: WG1913681-3 WG1913681-4								
Benzene	99		95		70-130	4		20
Toluene	99		94		70-130	5		20
Ethylbenzene	100		96		70-130	4		20
Methyl tert butyl ether	92		93		70-130	1		20
p/m-Xylene	100		95		70-130	5		20
o-Xylene	100		95		70-130	5		20
Carbon disulfide	110		97		70-130	13		20
n-Butylbenzene	100		95		70-130	5		20
Isopropylbenzene	100		94		70-130	6		20
p-Isopropyltoluene	100		96		70-130	4		20
Naphthalene	96		97		70-130	1		20
n-Propylbenzene	100		96		70-130	4		20
1,3,5-Trimethylbenzene	99		93		70-130	6		20
1,2,4-Trimethylbenzene	100		94		70-130	6		20

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	102		102		70-130
Toluene-d8	100		99		70-130
4-Bromofluorobenzene	98		99		70-130
Dibromofluoromethane	98		100		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab AQPW-08-240415	Associated sample(s): 05-12		QC Batch ID: WG1913677-6			WG1913677-7		QC Sample: L2420626-12			Client ID:	
Benzene	0.58	10	12	114		11	104		70-130	9		20
Toluene	ND	10	10	100		10	100		70-130	0		20
Ethylbenzene	0.30J	10	10	100		10	100		70-130	0		20
Methyl tert butyl ether	0.18J	10	9.4	94		9.2	92		70-130	2		20
p/m-Xylene	ND	20	21	105		21	105		70-130	0		20
o-Xylene	ND	20	20	100		21	105		70-130	5		20
Carbon disulfide	ND	10	11	110		11	110		70-130	0		20
n-Butylbenzene	0.57J	10	12	120		12	120		70-130	0		20
Isopropylbenzene	0.44J	10	11	110		11	110		70-130	0		20
p-Isopropyltoluene	ND	10	13	130		13	130		70-130	0		20
Naphthalene	5.4	10	16	106		15	96		70-130	6		20
n-Propylbenzene	0.31J	10	11	110		11	110		70-130	0		20
1,3,5-Trimethylbenzene	ND	10	10	100		10	100		70-130	0		20
1,2,4-Trimethylbenzene	0.84J	10	11	110		11	110		70-130	0		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	91		88		70-130
4-Bromofluorobenzene	97		97		70-130
Dibromofluoromethane	101		100		70-130
Toluene-d8	95		97		70-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1913681-6 WG1913681-7 QC Sample: L2420626-02 Client ID: AQSW-02-240415												
Benzene	ND	10	11	110		11	110		70-130	0		20
Toluene	0.39J	10	11	110		11	110		70-130	0		20
Ethylbenzene	0.21J	10	11	110		11	110		70-130	0		20
Methyl tert butyl ether	ND	10	9.8	98		9.8	98		70-130	0		20
p/m-Xylene	ND	20	22	110		22	110		70-130	0		20
o-Xylene	ND	20	22	110		22	110		70-130	0		20
Carbon disulfide	ND	10	12	120		12	120		70-130	0		20
n-Butylbenzene	ND	10	11	110		11	110		70-130	0		20
Isopropylbenzene	ND	10	11	110		11	110		70-130	0		20
p-Isopropyltoluene	ND	10	11	110		11	110		70-130	0		20
Naphthalene	0.31J	10	9.7	97		9.8	98		70-130	1		20
n-Propylbenzene	ND	10	11	110		11	110		70-130	0		20
1,3,5-Trimethylbenzene	ND	10	11	110		11	110		70-130	0		20
1,2,4-Trimethylbenzene	ND	10	11	110		11	110		70-130	0		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	100		100		70-130
4-Bromofluorobenzene	98		97		70-130
Dibromofluoromethane	100		100		70-130
Toluene-d8	98		98		70-130

SEMIVOLATILES

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-01
Client ID: AQSW-01-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 17:30
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 03:50
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	144		ng/l	10.0	1.77	1
2-Methylnaphthalene	14.4		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	1.83	J	ng/l	10.0	1.77	1
Acenaphthene	4.82	J	ng/l	10.0	1.61	1
Fluorene	3.23	J	ng/l	10.0	1.73	1
Phenanthrene	7.28	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	9.39	J	ng/l	10.0	1.49	1
Pyrene	6.93	J	ng/l	10.0	1.52	1
Benz(a)anthracene	3.20	J	ng/l	10.0	1.73	1
Chrysene	4.27	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	4.36	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	2.34	J	ng/l	10.0	1.17	1
Benzo(a)pyrene	2.82	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	2.72	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	0.851	J	ng/l	10.0	0.685	1
Benzo(ghi)perylene	3.21	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		30-130
Pyrene-d10	76		30-130
Benzo(b)fluoranthene-d12	77		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-02
Client ID: AQSW-02-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 18:10
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 04:23
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	109		ng/l	9.90	1.75	1
2-Methylnaphthalene	11.4		ng/l	9.90	1.05	1
2-Chloronaphthalene	ND		ng/l	9.90	2.18	1
Acenaphthylene	ND		ng/l	9.90	1.75	1
Acenaphthene	5.72	J	ng/l	9.90	1.59	1
Fluorene	2.83	J	ng/l	9.90	1.71	1
Phenanthrene	5.37	J	ng/l	9.90	1.87	1
Anthracene	ND		ng/l	9.90	1.92	1
Fluoranthene	8.11	J	ng/l	9.90	1.48	1
Pyrene	6.07	J	ng/l	9.90	1.50	1
Benz(a)anthracene	2.82	J	ng/l	9.90	1.71	1
Chrysene	3.25	J	ng/l	9.90	0.927	1
Benzo(b)fluoranthene	3.44	J	ng/l	9.90	1.46	1
Benzo(k)fluoranthene	1.92	J	ng/l	9.90	1.16	1
Benzo(a)pyrene	2.17	J	ng/l	9.90	0.832	1
Indeno(1,2,3-cd)Pyrene	2.24	J	ng/l	9.90	0.528	1
Dibenz(a,h)anthracene	ND		ng/l	9.90	0.678	1
Benzo(ghi)perylene	2.58	J	ng/l	9.90	1.30	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	68		30-130
Pyrene-d10	74		30-130
Benzo(b)fluoranthene-d12	75		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-03
Client ID: AQSW-03-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 18:30
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 06:03
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	164		ng/l	10.0	1.77	1
2-Methylnaphthalene	17.7		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	2.01	J	ng/l	10.0	1.77	1
Acenaphthene	8.99	J	ng/l	10.0	1.61	1
Fluorene	3.43	J	ng/l	10.0	1.73	1
Phenanthrene	5.97	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	6.87	J	ng/l	10.0	1.49	1
Pyrene	5.70	J	ng/l	10.0	1.52	1
Benz(a)anthracene	2.69	J	ng/l	10.0	1.73	1
Chrysene	2.94	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	2.54	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	1.74	J	ng/l	10.0	1.17	1
Benzo(a)pyrene	1.87	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	1.64	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	2.06	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	66		30-130
Pyrene-d10	70		30-130
Benzo(b)fluoranthene-d12	62		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-04
Client ID: RINSE1-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 20:00
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 19:27
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	18.1		ng/l	10.0	1.77	1
2-Methylnaphthalene	5.75	J	ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	ND		ng/l	10.0	1.77	1
Acenaphthene	ND		ng/l	10.0	1.61	1
Fluorene	ND		ng/l	10.0	1.73	1
Phenanthrene	ND		ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	ND		ng/l	10.0	1.49	1
Pyrene	ND		ng/l	10.0	1.52	1
Benz(a)anthracene	ND		ng/l	10.0	1.73	1
Chrysene	ND		ng/l	10.0	0.936	1
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17	1
Benzo(a)pyrene	ND		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	ND		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	65		30-130
Pyrene-d10	74		30-130
Benzo(b)fluoranthene-d12	75		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-05
Client ID: RINSE2-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 20:16
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 20:01
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	23.8		ng/l	10.0	1.77	1
2-Methylnaphthalene	11.2		ng/l	10.0	1.06	1
2-Chloronaphthalene	3.31	J	ng/l	10.0	2.20	1
Acenaphthylene	9.41	J	ng/l	10.0	1.77	1
Acenaphthene	11.2		ng/l	10.0	1.61	1
Fluorene	19.0		ng/l	10.0	1.73	1
Phenanthrene	112		ng/l	10.0	1.89	1
Anthracene	24.0		ng/l	10.0	1.94	1
Fluoranthene	26.2		ng/l	10.0	1.49	1
Pyrene	27.2		ng/l	10.0	1.52	1
Benz(a)anthracene	3.44	J	ng/l	10.0	1.73	1
Chrysene	2.44	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	2.74	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17	1
Benzo(a)pyrene	ND		ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	ND		ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	67		30-130
Pyrene-d10	73		30-130
Benzo(b)fluoranthene-d12	68		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-07
Client ID: AQSW-DUP1-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 00:00
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 20:34
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	166		ng/l	10.0	1.77	1
2-Methylnaphthalene	15.5		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	ND		ng/l	10.0	1.77	1
Acenaphthene	5.02	J	ng/l	10.0	1.61	1
Fluorene	3.14	J	ng/l	10.0	1.73	1
Phenanthrene	5.35	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	6.96	J	ng/l	10.0	1.49	1
Pyrene	6.05	J	ng/l	10.0	1.52	1
Benz(a)anthracene	2.80	J	ng/l	10.0	1.73	1
Chrysene	3.17	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	3.85	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	1.46	J	ng/l	10.0	1.17	1
Benzo(a)pyrene	2.08	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	1.85	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	2.44	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	61		30-130
Pyrene-d10	65		30-130
Benzo(b)fluoranthene-d12	58		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-08
Client ID: AQSW-04-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 17:05
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 21:08
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	197		ng/l	9.90	1.75	1
2-Methylnaphthalene	26.7		ng/l	9.90	1.05	1
2-Chloronaphthalene	ND		ng/l	9.90	2.18	1
Acenaphthylene	2.17	J	ng/l	9.90	1.75	1
Acenaphthene	10.4		ng/l	9.90	1.59	1
Fluorene	5.25	J	ng/l	9.90	1.71	1
Phenanthrene	7.78	J	ng/l	9.90	1.87	1
Anthracene	ND		ng/l	9.90	1.92	1
Fluoranthene	7.88	J	ng/l	9.90	1.48	1
Pyrene	6.95	J	ng/l	9.90	1.50	1
Benz(a)anthracene	3.24	J	ng/l	9.90	1.71	1
Chrysene	3.85	J	ng/l	9.90	0.927	1
Benzo(b)fluoranthene	3.85	J	ng/l	9.90	1.46	1
Benzo(k)fluoranthene	2.76	J	ng/l	9.90	1.16	1
Benzo(a)pyrene	2.77	J	ng/l	9.90	0.832	1
Indeno(1,2,3-cd)Pyrene	2.35	J	ng/l	9.90	0.528	1
Dibenz(a,h)anthracene	ND		ng/l	9.90	0.678	1
Benzo(ghi)perylene	3.10	J	ng/l	9.90	1.30	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	57		30-130
Pyrene-d10	64		30-130
Benzo(b)fluoranthene-d12	57		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-09
Client ID: AQSW-05-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 16:46
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Surface Water
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 21:42
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	178		ng/l	10.0	1.77	1
2-Methylnaphthalene	17.9		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	ND		ng/l	10.0	1.77	1
Acenaphthene	9.53	J	ng/l	10.0	1.61	1
Fluorene	5.22	J	ng/l	10.0	1.73	1
Phenanthrene	6.62	J	ng/l	10.0	1.89	1
Anthracene	ND		ng/l	10.0	1.94	1
Fluoranthene	6.65	J	ng/l	10.0	1.49	1
Pyrene	5.54	J	ng/l	10.0	1.52	1
Benz(a)anthracene	2.70	J	ng/l	10.0	1.73	1
Chrysene	2.56	J	ng/l	10.0	0.936	1
Benzo(b)fluoranthene	4.46	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17	1
Benzo(a)pyrene	1.64	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	1.66	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685	1
Benzo(ghi)perylene	2.15	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		30-130
Pyrene-d10	68		30-130
Benzo(b)fluoranthene-d12	64		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-10
Client ID: AQPW-07-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 13:10
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/25/24 03:49
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	46000	E	ng/l	10.4	1.84	1
2-Methylnaphthalene	2590	E	ng/l	10.4	1.10	1
2-Chloronaphthalene	ND		ng/l	10.4	2.29	1
Acenaphthylene	2760	E	ng/l	10.4	1.84	1
Acenaphthene	27100	E	ng/l	10.4	1.68	1
Fluorene	23800	E	ng/l	10.4	1.80	1
Phenanthrene	49400	E	ng/l	10.4	1.97	1
Anthracene	7260	E	ng/l	10.4	2.02	1
Fluoranthene	8480	E	ng/l	10.4	1.55	1
Pyrene	5060	E	ng/l	10.4	1.58	1
Benz(a)anthracene	179		ng/l	10.4	1.80	1
Chrysene	172		ng/l	10.4	0.975	1
Benzo(b)fluoranthene	37.2		ng/l	10.4	1.54	1
Benzo(k)fluoranthene	33.8		ng/l	10.4	1.22	1
Benzo(a)pyrene	32.2		ng/l	10.4	0.875	1
Indeno(1,2,3-cd)Pyrene	21.8		ng/l	10.4	0.555	1
Dibenz(a,h)anthracene	5.93	J	ng/l	10.4	0.714	1
Benzo(ghi)perylene	26.8		ng/l	10.4	1.36	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		30-130
Pyrene-d10	81		30-130
Benzo(b)fluoranthene-d12	72		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-10 D
Client ID: AQPW-07-240415
Sample Location: HAVERHILL, MA

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 22:15
Analyst: MC

Date Collected: 04/15/24 13:10
Date Received: 04/16/24
Field Prep: Not Specified

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	40000		ng/l	417	73.8	40
2-Methylnaphthalene	2600		ng/l	417	44.2	40
Acenaphthylene	2720		ng/l	417	73.8	40
Acenaphthene	21900		ng/l	417	67.1	40
Fluorene	17300		ng/l	417	72.1	40
Phenanthrene	39700		ng/l	417	78.8	40
Anthracene	7240		ng/l	417	80.8	40
Fluoranthene	7740		ng/l	417	62.1	40
Pyrene	5140		ng/l	417	63.3	40

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	67		30-130
Pyrene-d10	85		30-130
Benzo(b)fluoranthene-d12	72		30-130

Project Name: FORMER HAVERHILL MGP **Lab Number:** L2420626

Project Number: 180327-08.01 **Report Date:** 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-11
Client ID: AQPW-09-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 16:13
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/25/24 04:23
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2040		ng/l	10.0	1.77	1
2-Methylnaphthalene	311		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	28700	E	ng/l	10.0	1.77	1
Acenaphthene	27100	E	ng/l	10.0	1.61	1
Fluorene	63900	E	ng/l	10.0	1.73	1
Phenanthrene	72400	E	ng/l	10.0	1.89	1
Anthracene	8710	E	ng/l	10.0	1.94	1
Fluoranthene	3740	E	ng/l	10.0	1.49	1
Pyrene	4100	E	ng/l	10.0	1.52	1
Benz(a)anthracene	72.3		ng/l	10.0	1.73	1
Chrysene	81.8		ng/l	10.0	0.936	1
Benzo(b)fluoranthene	6.65	J	ng/l	10.0	1.48	1
Benzo(k)fluoranthene	1.88	J	ng/l	10.0	1.17	1
Benzo(a)pyrene	4.35	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	2.62	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	0.990	J	ng/l	10.0	0.685	1
Benzo(ghi)perylene	3.32	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	75		30-130
Pyrene-d10	76		30-130
Benzo(b)fluoranthene-d12	76		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-11 D
Client ID: AQPW-09-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 16:13
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 22:49
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Acenaphthylene	26100		ng/l	400	70.8	40
Acenaphthene	23600		ng/l	400	64.4	40
Fluorene	45300		ng/l	400	69.2	40
Phenanthrene	59400		ng/l	400	75.6	40
Anthracene	9740		ng/l	400	77.6	40
Fluoranthene	3710		ng/l	400	59.6	40
Pyrene	3870		ng/l	400	60.8	40

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	68		30-130
Pyrene-d10	71		30-130
Benzo(b)fluoranthene-d12	71		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-12
Client ID: AQPW-08-240415
Sample Location: HAVERHILL, MA

Date Collected: 04/15/24 14:55
Date Received: 04/16/24
Field Prep: Not Specified

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/25/24 04:56
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Naphthalene	2810		ng/l	10.0	1.77	1
2-Methylnaphthalene	598		ng/l	10.0	1.06	1
2-Chloronaphthalene	ND		ng/l	10.0	2.20	1
Acenaphthylene	16100	E	ng/l	10.0	1.77	1
Acenaphthene	30800	E	ng/l	10.0	1.61	1
Fluorene	41200	E	ng/l	10.0	1.73	1
Phenanthrene	48900	E	ng/l	10.0	1.89	1
Anthracene	5670	E	ng/l	10.0	1.94	1
Fluoranthene	3570	E	ng/l	10.0	1.49	1
Pyrene	3080	E	ng/l	10.0	1.52	1
Benz(a)anthracene	33.2		ng/l	10.0	1.73	1
Chrysene	35.9		ng/l	10.0	0.936	1
Benzo(b)fluoranthene	15.9		ng/l	10.0	1.48	1
Benzo(k)fluoranthene	9.35	J	ng/l	10.0	1.17	1
Benzo(a)pyrene	9.12	J	ng/l	10.0	0.840	1
Indeno(1,2,3-cd)Pyrene	5.55	J	ng/l	10.0	0.533	1
Dibenz(a,h)anthracene	1.87	J	ng/l	10.0	0.685	1
Benzo(ghi)perylene	7.20	J	ng/l	10.0	1.31	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	62		30-130
Pyrene-d10	76		30-130
Benzo(b)fluoranthene-d12	75		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

SAMPLE RESULTS

Lab ID: L2420626-12 D
Client ID: AQPW-08-240415
Sample Location: HAVERHILL, MA

Sample Depth:
Matrix: Groundwater
Analytical Method: 141,8270E-SIM
Analytical Date: 04/24/24 23:22
Analyst: MC

Date Collected: 04/15/24 14:55
Date Received: 04/16/24
Field Prep: Not Specified

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
MCP PAHs by GC/MS-SIM - Mansfield Lab						
Acenaphthylene	16500		ng/l	400	70.8	40
Acenaphthene	30100		ng/l	400	64.4	40
Fluorene	35000		ng/l	400	69.2	40
Phenanthrene	40500		ng/l	400	75.6	40
Anthracene	5860		ng/l	400	77.6	40
Fluoranthene	3360		ng/l	400	59.6	40
Pyrene	3030		ng/l	400	60.8	40

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	66		30-130
Pyrene-d10	72		30-130
Benzo(b)fluoranthene-d12	72		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 141,8270E-SIM
Analytical Date: 04/23/24 20:01
Analyst: MC

Extraction Method: EPA 3510C
Extraction Date: 04/22/24 22:05

Parameter	Result	Qualifier	Units	RL	MDL
MCP PAHs by GC/MS-SIM - Mansfield Lab for sample(s): 01-05,07-12 Batch: WG1911809-1					
Naphthalene	1.89	J	ng/l	10.0	1.77
2-Methylnaphthalene	1.11	J	ng/l	10.0	1.06
2-Chloronaphthalene	ND		ng/l	10.0	2.20
Acenaphthylene	ND		ng/l	10.0	1.77
Acenaphthene	ND		ng/l	10.0	1.61
Fluorene	ND		ng/l	10.0	1.73
Phenanthrene	2.43	J	ng/l	10.0	1.89
Anthracene	ND		ng/l	10.0	1.94
Fluoranthene	ND		ng/l	10.0	1.49
Pyrene	ND		ng/l	10.0	1.52
Benz(a)anthracene	ND		ng/l	10.0	1.73
Chrysene	ND		ng/l	10.0	0.936
Benzo(b)fluoranthene	ND		ng/l	10.0	1.48
Benzo(k)fluoranthene	ND		ng/l	10.0	1.17
Benzo(a)pyrene	ND		ng/l	10.0	0.840
Indeno(1,2,3-cd)Pyrene	ND		ng/l	10.0	0.533
Dibenz(a,h)anthracene	ND		ng/l	10.0	0.685
Benzo(ghi)perylene	ND		ng/l	10.0	1.31

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	80		30-130
Pyrene-d10	91		30-130
Benzo(b)fluoranthene-d12	91		30-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-05,07-12 Batch: WG1911809-2 WG1911809-3								
Naphthalene	67		66		40-140	2		20
2-Methylnaphthalene	66		63		40-140	5		20
2-Chloronaphthalene	71		69		40-140	3		20
Acenaphthylene	76		78		40-140	3		20
Acenaphthene	76		75		40-140	1		20
Fluorene	80		82		40-140	2		20
Phenanthrene	79		80		40-140	1		20
Anthracene	80		82		40-140	2		20
Fluoranthene	85		85		40-140	0		20
Pyrene	78		84		40-140	7		20
Benz(a)anthracene	83		85		40-140	2		20
Chrysene	86		91		40-140	6		20
Benzo(b)fluoranthene	96		94		40-140	2		20
Benzo(k)fluoranthene	81		84		40-140	4		20
Benzo(a)pyrene	83		86		40-140	4		20
Indeno(1,2,3-cd)Pyrene	87		90		40-140	3		20
Dibenz(a,h)anthracene	89		91		40-140	2		20
Benzo(ghi)perylene	101		106		40-140	5		20

Lab Control Sample Analysis
Batch Quality Control

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01
Lab Number: L2420626
Report Date: 05/07/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-05,07-12 Batch: WG1911809-2 WG1911809-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Methylnaphthalene-d10	73		72		30-130
Pyrene-d10	79		83		30-130
Benzo(b)fluoranthene-d12	87		86		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-05,07-12 QC Batch ID: WG1911809-4 WG1911809-5 QC Sample: L2420626-12 Client ID: AQPW-08-240415												
Naphthalene	2810	500	3650	**168**	Q	3270	93		40-140	11		20
2-Methylnaphthalene	598	500	954	71		1030	87		40-140	8		20
2-Chloronaphthalene	ND	500	536	107		558	113		40-140	4		20
Benz(a)anthracene	33.2	500	523	105		643	123		40-140	**21**	Q	20
Chrysene	35.9	500	513	103		640	122		40-140	**22**	Q	20
Benzo(b)fluoranthene	15.9	500	377	75		467	91		40-140	**21**	Q	20
Benzo(k)fluoranthene	9.35J	500	433	87		393	79		40-140	10		20
Benzo(a)pyrene	9.12J	500	412	82		429	87		40-140	4		20
Indeno(1,2,3-cd)Pyrene	5.55J	500	394	79		436	88		40-140	10		20
Dibenz(a,h)anthracene	1.87J	500	314	63		324	65		40-140	3		20
Benzo(ghi)perylene	7.20J	500	436	87		470	95		40-140	8		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	75		75		30-130
Benzo(b)fluoranthene-d12	77		82		30-130
Pyrene-d10	79		90		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-05,07-12 QC Batch ID: WG1911809-4 WG1911809-5 QC Sample: L2420626-12 Client ID: AQPW-08-240415												
Acenaphthylene	16500	500	24300	**1560**	Q	24100	**1540**	Q	40-140	1		20
Acenaphthene	30100	500	41600	**2300**	Q	45600	**3130**	Q	40-140	9		20
Fluorene	35000	500	44000	**1800**	Q	49800	**2990**	Q	40-140	12		20
Phenanthrene	40500	500	63000	**4500**	Q	67800	**5510**	Q	40-140	7		20
Anthracene	5860	500	7460	**320**	Q	8780	**590**	Q	40-140	16		20
Fluoranthene	3360	500	5590	**446**	Q	5740	**481**	Q	40-140	3		20
Pyrene	3030	500	5860	**566**	Q	6260	**652**	Q	40-140	7		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	65		62		30-130
Benzo(b)fluoranthene-d12	78		78		30-130
Pyrene-d10	83		76		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab AQSW-02-240415	Associated sample(s): 01-05,07-12			QC Batch ID: WG1911809-6		WG1911809-7			QC Sample: L2420626-02			Client ID:
Naphthalene	109	495	420	63		441	67		40-140	5		20
2-Methylnaphthalene	11.4	495	282	55		314	61		40-140	11		20
2-Chloronaphthalene	ND	495	279	56		315	64		40-140	12		20
Acenaphthylene	ND	495	308	62		333	67		40-140	8		20
Acenaphthene	5.72J	495	313	63		332	67		40-140	6		20
Fluorene	2.83J	495	326	66		351	71		40-140	7		20
Phenanthrene	5.37J	495	356	72		365	74		40-140	2		20
Anthracene	ND	495	367	74		361	73		40-140	2		20
Fluoranthene	8.11J	495	381	77		391	79		40-140	3		20
Pyrene	6.07J	495	361	73		365	74		40-140	1		20
Benz(a)anthracene	2.82J	495	371	75		383	77		40-140	3		20
Chrysene	3.25J	495	385	78		380	77		40-140	1		20
Benzo(b)fluoranthene	3.44J	495	373	75		395	80		40-140	6		20
Benzo(k)fluoranthene	1.92J	495	366	74		357	72		40-140	2		20
Benzo(a)pyrene	2.17J	495	355	72		367	74		40-140	3		20
Indeno(1,2,3-cd)Pyrene	2.24J	495	334	68		348	70		40-140	4		20
Dibenz(a,h)anthracene	ND	495	319	64		350	71		40-140	9		20
Benzo(ghi)perylene	2.58J	495	402	81		415	84		40-140	3		20

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
2-Methylnaphthalene-d10	58		65		30-130
Benzo(b)fluoranthene-d12	73		73		30-130

Matrix Spike Analysis

Batch Quality Control

Project Name: FORMER HAVERHILL MGP

Project Number: 180327-08.01

Lab Number: L2420626

Report Date: 05/07/24

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
MCP PAHs by GC/MS-SIM - Mansfield Lab Associated sample(s): 01-05,07-12 QC Batch ID: WG1911809-6 WG1911809-7 QC Sample: L2420626-02 Client ID: AQSW-02-240415												

Surrogate	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
Pyrene-d10	72		73		30-130

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent
B	Absent
C	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2420626-01A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-01B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-01C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-01D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-01E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02A1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02A2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02B1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02B2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02C1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02C2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-02D	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02D1	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02D2	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02E	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02E1	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-02E2	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-03A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2420626-03B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-03C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-03D	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-03E	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-04A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-04B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-04C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-04D	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-04E	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-05A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-05B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-05C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-05D	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-05E	Amber 1000ml unpreserved	B	7	7	5.3	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-06A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-06B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-07A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-07B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-07C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-07D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-07E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-08A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-08B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-08C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-08D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-08E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-09A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-09B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2420626-09C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-09D	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-09E	Amber 1000ml unpreserved	C	7	7	2.8	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-10A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-10B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-10C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-10D	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-10E	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-11A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-11B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-11C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-11D	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-11E	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12A	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12A1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12A2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12B	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12B1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12B2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12C	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12C1	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12C2	Vial HCl preserved	C	NA		2.8	Y	Absent		MCP-8260-21(14)
L2420626-12D	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12D1	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12D2	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12E	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12E1	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)
L2420626-12E2	Amber 1000ml unpreserved	A	7	7	3.9	Y	Absent		A2-MCPPAH-8270SIM-21(7)

*Values in parentheses indicate holding time in days

Project Name: FORMER HAVERHILL MGP
Project Number: 180327-08.01

Lab Number: L2420626
Report Date: 05/07/24

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)

*Values in parentheses indicate holding time in days

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

Report Format: DU Report with 'J' Qualifiers

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

Data Qualifiers

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

V - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Z - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name:	FORMER HAVERHILL MGP	**Lab Number:**	L2420626
Project Number:	180327-08.01	**Report Date:**	05/07/24

REFERENCES

141 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA and IIB, November 2021.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625.1: alpha-Terpineol
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Nonpotable Water: EPA RSK-175 Dissolved Gases
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
EPA 625.1: SVOC (Acid/Base/Neutral Extractables).
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

CHAIN OF CUSTODY

PAGE 1 OF 2

Date Rec'd in Lab: 4/18/24

ALPHA Job #: L2420626

ALPHA LABORATORIES
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St, 1st Floor, Amesbury, MA 01913
Phone: 978-712-4475
Email: bgauley@anchorqea.com

Project Information

Project Name: Haverhill MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B Gauley
ALPHA Quote #:

Report Information - Data Deliverables

☒ ADEx ☐ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program MA MCP Criteria

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: 10 day TAT VOCS; 15 day TAT PAHs

Additional Project Information:
Please allow AQSW-# samples to settle and sample from top

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO
Filtration: ☐ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC	SVOC	Sample Comments	Total # Bottles
20626-01	AQSW-01-240415	4-15-24	1730	SW	EM	X	X		5
02	AQSW-02-240415	4-15-24	1810	SW	BJLG	X	X	MS|MSD	15
03	AQSW-03-240415	↓	1830	SW	EM	X	X		5
04	Rinse 1-240415	↓	2000	X	BJLG	X	X		5
05	Rinse 2-240415	↓	2016	X	BJLG	X	X		5
06	Tripblank-240415	4/3/24	—		SB	X			2
07	AQSW-DUP1-240415	4-15-24	—	SW	EM	X	X		5
08	AQSW-04-240415	↓	1705	SW	EM	X	X		5
09	AQSW-05-240415	↓	1646	SW	EM	X	X		5
10	AQPW-07-240415	↓	1310	GW	EM	X	X		5
					Container Type	V	A		
					Preservative	B	A		

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie Jo Gauley AAL	4/16/24 1025	AAL	4/16/24 1025
	4/16/24		4/16/24 1600
	4/16/24 2030		4/16/24 2030
	4-18-24	AAL	4/18/24 1500

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

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AAL 4/18/24 1709

4/18/24 1709

CHAIN OF CUSTODY

PAGE 2 OF 2

Date Rec'd in Lab: 4/18/24

ALPHA Job #: L2420626

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

Client Information

Client: Anchor QEA
Address: 9 Water St. 1st Floor, Amesbury, MA 01913
Phone: 978-772-4475
Email: bgauley@anchorqea.com

Additional Project Information:

Project Information

Project Name: Haverhill, MA
Project Location: Haverhill, MA
Project #: 180327-08.01
Project Manager: B. Gauley
ALPHA Quote #:

Turn-Around Time

☐ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: 10 day TAT VOCS, 15 day TAT PAHs

Report Information - Data Deliverables

☒ ADEx ☐ EMAIL

Billing Information

☒ Same as Client info PO #:

Regulatory Requirements & Project Information Requirements

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☒ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☒ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☒ No NPDES RGP
☐ Other State /Fed Program MAMCP Criteria

ANALYSIS: VOC: ☒ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☒ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint

SAMPLE INFO
Filtration: ☐ Field ☐ Lab to do
Preservation: ☐ Lab to do

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler Initials	VOC: 8260	SVOC: PAH	Sample Comments	Total # Bottles
11	AQPW-09-240415	4-15-24	1613	GW	EM	X	X		5
12	AQPW-08-240415	4-15-24	1455	GW	EM	X	X	MS/MSD	15

Container Type	V	A
Preservative	B	A

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= HNO_3, D= H_2SO_4, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= NH_4Cl, K= Zn Acetate, O= Other

Relinquished By:	Date/Time	Received By:	Date/Time
Billie Jo L Gauley	4/16/24 1025	AAL	4/16/24 1025
AAL	4/16/24 1515		4/16/24 1515
	4/16/24 2050		4/16 2050
		AAL	4/18/24 1500

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

AAL 4/18/24 1709

4/18/24 1709

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2420626
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1913681-5	**Lab File ID**	: VQ240425N05
Instrument ID	: QUIMBY		
Matrix	: WATER	**Analysis Date**	: 04/25/24 19:55

Client Sample No.	Lab Sample ID	Analysis Date
WG1913681-3LCS	WG1913681-3	04/25/24 18:23
WG1913681-4LCSD	WG1913681-4	04/25/24 18:46
AQSW-01-240415	L2420626-01	04/26/24 02:44
AQSW-02-240415	L2420626-02	04/26/24 03:07
AQSW-03-240415	L2420626-03	04/26/24 03:30
RINSE1-240415	L2420626-04	04/26/24 03:52
AQSW-02-240415MS	WG1913681-6	04/26/24 04:15
AQSW-02-240415MSD	WG1913681-7	04/26/24 04:38

Method Blank Summary
Form 4
Volatiles

Client	: Anchor QEA, LLC	**Lab Number**	: L2420626
Project Name	: FORMER HAVERHILL MGP	**Project Number**	: 180327-08.01
Lab Sample ID	: WG1913677-5	**Lab File ID**	: V16240425N06
Instrument ID	: VOA116		
Matrix	: WATER	**Analysis Date**	: 04/25/24 21:05

Client Sample No.	Lab Sample ID	Analysis Date
WG1913677-3LCS	WG1913677-3	04/25/24 19:54
WG1913677-4LCSD	WG1913677-4	04/25/24 20:17
TRIPBLANK-240415	L2420626-06	04/26/24 02:13
RINSE2-240415	L2420626-05	04/26/24 02:36
AQSW-DUP1-240415	L2420626-07	04/26/24 03:00
AQSW-04-240415	L2420626-08	04/26/24 03:24
AQSW-05-240415	L2420626-09	04/26/24 03:47
AQPW-07-240415	L2420626-10	04/26/24 04:11
AQPW-09-240415	L2420626-11	04/26/24 04:34
AQPW-08-240415	L2420626-12	04/26/24 04:58
AQPW-08-240415MS	WG1913677-6	04/26/24 05:22
AQPW-08-240415MSD	WG1913677-7	04/26/24 05:45

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	101	-.01
Dichlorodifluoromethane	0.15	0.154	-	-2.7	20	113	0
Chloromethane	0.209	0.21	-	-0.5	20	108	0
Vinyl chloride	0.167	0.171	-	-2.4	20	109	0
Bromomethane	0.078	0.095	-	-21.8*	20	141	0
Chloroethane	0.089	0.09	-	-1.1	20	109	0
Trichlorofluoromethane	0.18	0.188	-	-4.4	20	110	0
Ethyl ether	0.071	0.066	-	7	20	100	0
1,1-Dichloroethene	0.116	0.12	-	-3.4	20	113	0
Carbon disulfide	0.299	0.334	-	-11.7	20	120	0
Freon-113	0.12	0.124	-	-3.3	20	111	0
Iodomethane	0.17	0.098	-	42.4*	20	67	0
Acrolein	0.02	0.018	-	10	20	97	0
Methylene chloride	0.132	0.126	-	4.5	20	106	-.01
Acetone	10	10.021	-	-0.2	20	100	-.01
trans-1,2-Dichloroethene	0.125	0.125	-	0	20	111	0
Methyl acetate	0.102	0.09	-	11.8	20	92	-.01
Methyl tert-butyl ether	0.378	0.348	-	7.9	20	99	0
tert-Butyl alcohol	0.014	0.012	-	14.3	20	92	-.01
Diisopropyl ether	0.638	0.623	-	2.4	20	106	0
1,1-Dichloroethane	0.314	0.304	-	3.2	20	104	0
Halothane	0.121	0.116	-	4.1	20	104	0
Acrylonitrile	0.052	0.048	-	7.7	20	100	0
Ethyl tert-butyl ether	0.563	0.528	-	6.2	20	102	0
Vinyl acetate	0.362	0.344	-	5	20	105	-.01
cis-1,2-Dichloroethene	0.174	0.17*	-	2.3	20	106	-.01
2,2-Dichloropropane	0.24	0.227	-	5.4	20	103	0
Bromochloromethane	0.084	0.08*	-	4.8	20	103	0
Cyclohexane	0.316	0.321	-	-1.6	20	109	0
Chloroform	0.268	0.265	-	1.1	20	106	0
Ethyl acetate	0.171	0.143	-	16.4	20	93	0
Carbon tetrachloride	0.212	0.201	-	5.2	20	103	0
Tetrahydrofuran	0.056	0.048	-	14.3	20	89	-.01
Dibromofluoromethane	0.253	0.248	-	2	20	100	-.01
1,1,1-Trichloroethane	0.239	0.234	-	2.1	20	106	0
2-Butanone	0.074	0.061	-	17.6	20	85	0
1,1-Dichloropropene	0.205	0.208	-	-1.5	20	111	-.01
Benzene	0.609	0.604	-	0.8	20	108	0
tert-Amyl methyl ether	0.438	0.404	-	7.8	20	100	0
1,2-Dichloroethane-d4	0.292	0.299	-	-2.4	20	99	-.01
1,2-Dichloroethane	0.22	0.207	-	5.9	20	100	-.01
Methyl cyclohexane	0.253	0.258	-	-2	20	113	0
Trichloroethene	0.168	0.162*	-	3.6	20	109	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Dibromomethane	0.092	0.086	-	6.5	20	102	0
1,2-Dichloropropane	0.181	0.171	-	5.5	20	103	0
2-Chloroethyl vinyl ether	0.108	0.075	-	30.6*	20	75	0
Bromodichloromethane	0.217	0.199*	-	8.3	20	101	0
1,4-Dioxane	0.00126	0.00114*	-	9.5	20	90	0
cis-1,3-Dichloropropene	0.257	0.242*	-	5.8	20	103	0
Chlorobenzene-d5	1	1	-	0	20	102	0
Toluene-d8	1.301	1.297	-	0.3	20	101	0
Toluene	0.51	0.504	-	1.2	20	106	0
4-Methyl-2-pentanone	0.079	0.066	-	16.5	20	89	0
Tetrachloroethene	0.217	0.22	-	-1.4	20	109	0
trans-1,3-Dichloropropene	0.301	0.282*	-	6.3	20	101	0
Ethyl methacrylate	0.248	0.212	-	14.5	20	93	0
1,1,2-Trichloroethane	0.151	0.142*	-	6	20	104	0
Chlorodibromomethane	0.22	0.197*	-	10.5	20	98	-.01
1,3-Dichloropropane	0.308	0.293	-	4.9	20	101	-.01
1,2-Dibromoethane	0.182	0.171*	-	6	20	100	-.01
2-Hexanone	0.15	0.123	-	18	20	88	-.01
Chlorobenzene	0.575	0.567	-	1.4	20	106	0
Ethylbenzene	0.952	0.972	-	-2.1	20	109	0
1,1,1,2-Tetrachloroethane	0.222	0.211	-	5	20	103	-.01
p/m Xylene	0.377	0.383	-	-1.6	20	107	0
o Xylene	0.37	0.368	-	0.5	20	104	-.01
Styrene	0.603	0.599	-	0.7	20	104	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	100	0
Bromoform	0.247	0.218	-	11.7	20	94	0
Isopropylbenzene	1.696	1.708	-	-0.7	20	106	0
4-Bromofluorobenzene	0.911	0.896	-	1.6	20	98	0
Bromobenzene	0.452	0.451	-	0.2	20	106	0
n-Propylbenzene	1.901	1.95	-	-2.6	20	107	0
1,4-Dichlorobutane	0.64	0.598	-	6.6	20	98	0
1,1,2,2-Tetrachloroethane	0.39	0.354	-	9.2	20	97	0
4-Ethyltoluene	1.635	1.676	-	-2.5	20	107	0
2-Chlorotoluene	1.364	1.347	-	1.2	20	106	-.01
1,3,5-Trimethylbenzene	1.429	1.417	-	0.8	20	104	0
1,2,3-Trichloropropane	0.315	0.294	-	6.7	20	95	0
trans-1,4-Dichloro-2-buten	0.14	0.123	-	12.1	20	94	0
4-Chlorotoluene	1.234	1.234	-	0	20	106	0
tert-Butylbenzene	1.231	1.259	-	-2.3	20	106	0
1,2,4-Trimethylbenzene	1.405	1.418	-	-0.9	20	106	0
sec-Butylbenzene	1.654	1.724	-	-4.2	20	108	0
p-Isopropyltoluene	1.507	1.559	-	-3.5	20	107	0
1,3-Dichlorobenzene	0.829	0.833	-	-0.5	20	107	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: QUIMBY	Calibration Date	: 04/25/24 18:23
Lab File ID	: VQ240425N01	Init. Calib. Date(s)	: 04/24/24 04/24/24
Sample No	: WG1913681-2	Init. Calib. Times	: 15:09 18:58
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,4-Dichlorobenzene	0.837	0.838	-	-0.1	20	105	0
p-Diethylbenzene	0.897	0.916	-	-2.1	20	108	0
n-Butylbenzene	1.151	1.202	-	-4.4	20	111	0
1,2-Dichlorobenzene	0.805	0.799	-	0.7	20	104	0
1,2,4,5-Tetramethylbenzene	1.476	1.485	-	-0.6	20	105	0
1,2-Dibromo-3-chloropropan	0.068	0.057	-	16.2	20	86	0
1,3,5-Trichlorobenzene	0.577	0.585	-	-1.4	20	108	0
Hexachlorobutadiene	0.171	0.188	-	-9.9	20	121	0
1,2,4-Trichlorobenzene	0.546	0.533	-	2.4	20	105	0
Naphthalene	1.348	1.301	-	3.5	20	99	0
1,2,3-Trichlorobenzene	0.516	0.505	-	2.1	20	104	0

*** Value outside of QC limits.**

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 04/25/24 19:54
Lab File ID	: V16240425N03	Init. Calib. Date(s)	: 02/04/24 02/04/24
Sample No	: WG1913677-2	Init. Calib. Times	: 17:58 21:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
Fluorobenzene	1	1	-	0	20	86	0
Dichlorodifluoromethane	0.245	0.223	-	9	20	74	0
Chloromethane	0.24	0.25	-	-4.2	20	87	0
Vinyl chloride	0.224	0.21	-	6.3	20	75	0
Bromomethane	0.116	0.096	-	17.2	20	73	0
Chloroethane	0.127	0.115	-	9.4	20	73	0
Trichlorofluoromethane	0.257	0.257	-	0	20	81	0
Ethyl ether	0.07	0.07	-	0	20	88	0
1,1-Dichloroethene	0.154	0.158	-	-2.6	20	84	0
Carbon disulfide	0.523	0.555	-	-6.1	20	88	0
Freon-113	0.165	0.181	-	-9.7	20	87	0
Acrolein	0.019	0.014	-	26.3*	20	72	0
Methylene chloride	0.179	0.192	-	-7.3	20	93	0
Acetone	10	10.689	-	-6.9	20	93	0
trans-1,2-Dichloroethene	0.172	0.172	-	0	20	84	0
Methyl acetate	0.085	0.087	-	-2.4	20	96	0
Methyl tert-butyl ether	0.353	0.289	-	18.1	20	73	0
tert-Butyl alcohol	0.00935	0.00728*	-	22.1*	20	67	0
Diisopropyl ether	0.547	0.55	-	-0.5	20	89	0
1,1-Dichloroethane	0.339	0.354	-	-4.4	20	89	0
Halothane	0.136	0.141	-	-3.7	20	86	0
Acrylonitrile	10	11.09	-	-10.9	20	96	0
Ethyl tert-butyl ether	0.473	0.391	-	17.3	20	74	0
Vinyl acetate	0.228	0.209	-	8.3	20	85	0
cis-1,2-Dichloroethene	0.19	0.191*	-	-0.5	20	86	0
2,2-Dichloropropane	0.243	0.193	-	20.6*	20	66	0
Bromochloromethane	0.082	0.096*	-	-17.1	20	95	0
Cyclohexane	0.345	0.348	-	-0.9	20	83	0
Chloroform	0.318	0.328	-	-3.1	20	91	0
Ethyl acetate	0.116	0.117	-	-0.9	20	87	0
Carbon tetrachloride	0.241	0.248	-	-2.9	20	82	0
Tetrahydrofuran	10	12.026	-	-20.3*	20	98	0
Dibromofluoromethane	0.27	0.287	-	-6.3	20	92	0
1,1,1-Trichloroethane	0.283	0.274	-	3.2	20	81	0
2-Butanone	0.052	0.051	-	1.9	20	79	0
1,1-Dichloropropene	0.232	0.235	-	-1.3	20	82	0
Benzene	0.657	0.704	-	-7.2	20	91	0
tert-Amyl methyl ether	0.371	0.283	-	23.7*	20	70	0
1,2-Dichloroethane-d4	0.289	0.285	-	1.4	20	87	0
1,2-Dichloroethane	0.229	0.255	-	-11.4	20	93	0
Methyl cyclohexane	0.31	0.315	-	-1.6	20	86	0
Trichloroethene	0.185	0.216	-	-16.8	20	98	0
Dibromomethane	0.093	0.101	-	-8.6	20	95	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 04/25/24 19:54
Lab File ID	: V16240425N03	Init. Calib. Date(s)	: 02/04/24 02/04/24
Sample No	: WG1913677-2	Init. Calib. Times	: 17:58 21:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
1,2-Dichloropropane	0.177	0.186	-	-5.1	20	90	0
Bromodichloromethane	0.249	0.266*	-	-6.8	20	90	0
1,4-Dioxane	0.0009	0.00081*	-	10	20	80	0
cis-1,3-Dichloropropene	0.246	0.235*	-	4.5	20	81	0
Chlorobenzene-d5	1	1	-	0	20	90	0
Toluene-d8	1.298	1.294	-	0.3	20	89	0
Toluene	0.563	0.574	-	-2	20	89	0
4-Methyl-2-pentanone	10	7.452	-	25.5*	20	68	0
Tetrachloroethene	0.256	0.251	-	2	20	82	0
trans-1,3-Dichloropropene	10	8.457	-	15.4	20	81	0
Ethyl methacrylate	0.182	0.136	-	25.3*	20	68	0
1,1,2-Trichloroethane	0.136	0.156*	-	-14.7	20	100	0
Chlorodibromomethane	0.217	0.223	-	-2.8	20	93	0
1,3-Dichloropropane	0.28	0.297	-	-6.1	20	95	0
1,2-Dibromoethane	0.162	0.172*	-	-6.2	20	93	0
2-Hexanone	0.09	0.073	-	18.9	20	75	0
Chlorobenzene	0.62	0.64	-	-3.2	20	92	0
Ethylbenzene	1.079	1.058	-	1.9	20	85	0
1,1,1,2-Tetrachloroethane	0.22	0.225	-	-2.3	20	91	0
p/m Xylene	0.418	0.427	-	-2.2	20	88	0
o Xylene	0.406	0.404	-	0.5	20	86	0
Styrene	0.665	0.693	-	-4.2	20	90	0
1,4-Dichlorobenzene-d4	1	1	-	0	20	94	0
Bromoform	0.245	0.205	-	16.3	20	88	0
Isopropylbenzene	1.969	1.774	-	9.9	20	83	0
4-Bromofluorobenzene	0.868	0.783	-	9.8	20	87	0
Bromobenzene	0.476	0.446	-	6.3	20	90	0
n-Propylbenzene	2.309	2.326	-	-0.7	20	90	0
1,4-Dichlorobutane	0.51	0.504	-	1.2	20	99	0
1,1,2,2-Tetrachloroethane	0.323	0.341	-	-5.6	20	106	0
4-Ethyltoluene	1.957	1.869	-	4.5	20	86	0
2-Chlorotoluene	1.579	1.608	-	-1.8	20	94	0
1,3,5-Trimethylbenzene	1.664	1.579	-	5.1	20	86	0
1,2,3-Trichloropropane	0.258	0.265	-	-2.7	20	101	0
trans-1,4-Dichloro-2-buten	0.101	0.101	-	0	20	95	0
4-Chlorotoluene	1.423	1.401	-	1.5	20	90	0
tert-Butylbenzene	1.424	1.343	-	5.7	20	85	0
1,2,4-Trimethylbenzene	1.608	1.476	-	8.2	20	84	0
sec-Butylbenzene	2.069	2.206	-	-6.6	20	95	0
p-Isopropyltoluene	1.142	1.183	-	-3.6	20	90	0
1,3-Dichlorobenzene	1.092	1.126	-	-3.1	20	97	0
1,4-Dichlorobenzene	0.924	0.951	-	-2.9	20	96	0
p-Diethylbenzene	1.114	0.972	-	12.7	20	81	0

* Value outside of QC limits.

Calibration Verification Summary
Form 7
Volatiles

Client	: Anchor QEA, LLC	Lab Number	: L2420626
Project Name	: FORMER HAVERHILL MGP	Project Number	: 180327-08.01
Instrument ID	: VOA116	Calibration Date	: 04/25/24 19:54
Lab File ID	: V16240425N03	Init. Calib. Date(s)	: 02/04/24 02/04/24
Sample No	: WG1913677-2	Init. Calib. Times	: 17:58 21:32
Channel	:		

Compound	Ave. RRF	RRF	Min RRF	%D	Max %D	Area%	Dev(min)
n-Butylbenzene	10	10.836	-	-8.4	20	97	0
1,2-Dichlorobenzene	0.841	0.852	-	-1.3	20	95	0
1,2,4,5-Tetramethylbenzene	1.384	1.195	-	13.7	20	84	0
1,2-Dibromo-3-chloropropan	10	8.416	-	15.8	20	85	0
1,3,5-Trichlorobenzene	0.638	0.625	-	2	20	93	0
Hexachlorobutadiene	0.23	0.23	-	0	20	91	0
1,2,4-Trichlorobenzene	0.544	0.472	-	13.2	20	84	0
Naphthalene	1.049	0.876	-	16.5	20	83	0
1,2,3-Trichlorobenzene	0.487	0.438	-	10.1	20	87	0

* Value outside of QC limits.

APPENDIX B - LIMITATIONS

LIMITATIONS

1. This revised Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan has been prepared on behalf of and for the exclusive use of Boston Gas Company d/b/a National Grid (National Grid) , solely for use in summarizing recent remedial evaluations completed at the 284 Winter Street property located in Haverhill, Massachusetts (Release Tracking Number 3-32792) under the Massachusetts Contingency Plan (MCP - 310 CMR 40.0000). This report and the findings contained herein shall not, in whole or in part, be disseminated or conveyed to any other party, nor used by any other party in whole or in part, without the prior written consent of GZA or National Grid. However, GZA acknowledges and agrees that the report may be conveyed to the Massachusetts Department of Environmental Protection (MassDEP).

2. GZA's work was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and GZA observed that degree of care and skill generally exercised by other consultants under similar circumstances and conditions. GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the limited data gathered during the course of the study. No other warranty, express or implied is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during completion of Phase IV remedial work.

3. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based upon services performed and observations made by GZA.

4. In the event that National Grid or others authorized to use this report obtain information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

5. The conclusions and recommendations contained in this report are based in part upon the data obtained from environmental samples obtained from relatively widely spread subsurface explorations. The nature and extent of variations between these explorations may not become evident until further exploration. If variations or other latent conditions then appear evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

7. In the event this work included the collection of water level data, these readings have been made in the test pits, borings and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

8. The conclusions contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the report. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA and the conclusions and recommendations presented herein modified accordingly.

9. In the event this work included the performance of a risk evaluation, GZA's risk evaluation was performed in accordance with generally accepted practices of the Massachusetts Contingency Plan and other consultants undertaking similar studies. The findings of the risk evaluation are dependent on numerous assumptions and uncertainties inherent in the risk assessment process. Sources of uncertainty may include the description of Site conditions and the nature and extent of chemical distribution and the use of toxicity information. Consequently, the findings of the risk assessment are not an absolute characterization of actual risks, but rather serve to highlight potential sources of risk at the Site. Although the range of uncertainties has not been quantified, the use of conservative assumptions and parameters throughout the assessment would be expected to err on the side of protection of human health and the environment.

10. This report contains approximate cost estimates for purposes of evaluating alternative remedial programs. These estimates involve approximate quantity evaluations. A preliminary estimate of this nature is likely to vary substantially from Contractors' Bid Prices and is not to be considered the equivalent of nor as reliable as Contractors' Bid Prices. Prices for similar work undertaken in the future will be subject to general and sometimes erratic price increases

APPENDIX C - TRANSMITTAL FORM BWSC108

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC 108

Release Tracking Number
3 - 32792

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

A. SITE LOCATION:

1. Site Name: HAFFNER'S

2. Street Address: 284 WINTER STREET

3. City/Town: HAVERHILL 4. ZIP Code: 018300000

☑ 5. Check here if the disposal site that is the source of the release is Tier Classified. Check the current Tier Classification Category:

☑ a. Tier I ☐ b. Tier ID ☐ c. Tier II

B. THIS FORM IS BEING USED TO: (check all that apply)

☐ 1. Submit a **Phase I Completion Statement,** pursuant to 310 CMR 40.0484.

☐ 2. Submit a **Revised Phase I Completion Statement,** pursuant to 310 CMR 40.0484.

☐ 3. Submit a **Phase II Scope of Work,** pursuant to 310 CMR 40.0834.

☐ 4. Submit an **interim Phase II Report.** This report does not satisfy the response action deadline requirements in 310 CMR 40.0500.

☐ 5. Submit a **final Phase II Report and Completion Statement,** pursuant to 310 CMR 40.0836.

☐ 6. Submit a **Revised Phase II Report and Completion Statement,** pursuant to 310 CMR 40.0836.

☐ 7. Submit a **Phase III Remedial Action Plan and Completion Statement,** pursuant to 310 CMR 40.0862.

☑ 8. Submit a **Revised Phase III Remedial Action Plan and Completion Statement,** pursuant to 310 CMR 40.0862.

☑ 9. Submit a **Phase IV Remedy Implementation Plan,** pursuant to 310 CMR 40.0874.

☐ 10. Submit a **Modified Phase IV Remedy Implementation Plan,** pursuant to 310 CMR 40.0874.

☐ 11. Submit an **As-Built Construction Report,** pursuant to 310 CMR 40.0875.

☐ 12. Submit a **Phase IV Status Report,** pursuant to 310 CMR 40.0877.

☐ 13. Submit a **Phase IV Completion Statement,** pursuant to 310 CMR 40.0878 and 40.0879.

Specify the outcome of Phase IV activities: (check one)

☐ a. Phase V Operation, Maintenance or Monitoring of the Comprehensive Remedial Action is necessary to achieve a Permanent or Temporary Solution.

☐ b. The requirements of a Permanent Solution have been met. A completed Permanent Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Temporary Solution have been met. A completed Temporary Solution Statement and Report (BWSC104) will be submitted to DEP.

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B. THIS FORM IS BEING USED TO (cont.): (check all that apply)

☐ 14. Submit a **Revised Phase IV Completion Statement,** pursuant to 310 CMR 40.0878 and 40.0879.

☐ 15. Submit a **Phase V Status Report,** pursuant to 310 CMR 40.0892.

☐ 16. Submit a **Remedial Monitoring Report.** (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☐ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

☐ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.

☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.

☐ iii. A Remedial Monitoring Report(s) submitted every six months, concurrent with a Status Report.

☐ iv. A Remedial Monitoring Report(s) submitted, concurrent with a Status Report.

c. Status of Site: (check one) ☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Temporary Solution

d. Number of Remedial Systems and/or Monitoring Programs: _____

A separate BWSC108A, CRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 17. Submit a **Remedy Operation Status,** pursuant to 310 CMR 40.0893.

☐ 18. Submit a **Status Report to maintain a Remedy Operation Status,** pursuant to 310 CMR 40.0893(2).

☐ 19. Submit a **Transfer and/or a Modification of Persons Maintaining a Remedy Operation Status (ROS),** pursuant to 310 CMR 40.0893(5) (check one, or both, if applicable).

☐ a. Submit a Transfer of Persons Maintaining an ROS (the transferee should be the person listed in Section D, "Person Undertaking Response Actions").

☐ b. Submit a Modification of Persons Maintaining an ROS (the primary representative should be the person listed in Section D, "Person Undertaking Response Actions").

c. Number of Persons Maintaining an ROS not including the primary representative: _____

☐ 20. Submit a **Termination of a Remedy Operation Status,** pursuant to 310 CMR 40.0893(6).(check one)

☐ a. Submit a notice indicating ROS performance standards have not been met. A plan and timetable pursuant to 310 CMR 40.0893(6)(b) for resuming the ROS are attached.

☐ b. Submit a notice of Termination of ROS.

☐ 21. Submit a **Phase V Completion Statement,** pursuant to 310 CMR 40.0894.

Specify the outcome of Phase V activities: (check one)

☐ a. The requirements of a Permanent Solution have been met. A completed Permanent Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ b. The requirements for a Temporary Solution have been met. A completed Temporary Solution Statement and Report (BWSC104) will be submitted to DEP.

☐ 22. Submit a **Revised Phase V Completion Statement,** pursuant to 310 CMR 40.0894.

☐ 23. Submit a **Temporary Solution Status Report,** pursuant to 310 CMR 40.0898.

☐ 24. Submit a **Plan for the Application of Remedial Additives** near a sensitive receptor, pursuant to 310 CMR 40.0046(3).

a. Status of Site: (check one)

☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Temporary Solution

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C. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that a* ***Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement*** *and/or a* ***Termination of a Remedy Operation Status*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that a* ***Phase II Scope of Work*** *or a* ***Phase IV Remedy Implementation Plan*** *is being submitted,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that an* ***As-Built Construction Report,*** *a* ***Remedy Operation Status,*** *a* ***Phase IV, Phase V or Temporary Solution Status Report,*** *a* ***Status Report to Maintain a Remedy Operation Status,*** *a* ***Transfer or Modification of Persons Maintaining a Remedy Operation Status*** *and/or a* ***Remedial Monitoring Report*** *is being submitted,* the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

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I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP#: 6891
2. First Name: CHARLES A
3. Last Name: LINDBERG
4. Telephone: 7812783830
5. Ext.:
6. Email: charles.lindberg@gza.com
7. Signature:
8. Date: (mm/dd/yyyy)
9. LSP Stamp:

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT
Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

D. PERSON UNDERTAKING RESPONSE ACTIONS:

1. Check all that apply: ☐ a. change in contact name ☑ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: BOSTON GAS COMPANY

3. Contact First Name: JESSE 4. Last Name: EDMANDS

5. Street: 170 DATA DRIVE 6. Title: PROGRAM MANAGER

7. City/Town: WALTHAM 8. State: MA 9. ZIP Code: 024512222

10. Telephone: 7819073682 11. Ext: 12. Email: jesse.edmands@nationalgrid.com

E. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTIONS: ☐ Check here to change relationship

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions Specify Relationship:

F. REQUIRED ATTACHMENT AND SUBMITTALS:

DRAFT COPY

☑ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of any Phase Reports to DEP.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase III Remedial Action Plan.

☑ 4. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase IV Remedy Implementation Plan.

☐ 5. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of any field work involving the implementation of a Phase IV Remedial Action.

☐ 6. If submitting a Transfer of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for the person making this submittal (transferee) is attached.

☐ 7. If submitting a Modification of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for each new person making this submittal is attached.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Release Address/Location Aid. Send corrections to: BWSC.eDEP@Mass.Gov.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data including, but not limited to: pressure measurements, maps, graphs, or diagrams, and other information is attached.

G. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTIONS:

1. I, _____, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

>*if Section B indicates that this is a* **Modification of a Remedy Operation Status (ROS),** I attest under the pains and penalties of perjury that I am fully authorized to act on behalf of all persons performing response actions under the ROS as stated in 310 CMR 40.0893(5)(d) to receive oral and written correspondence from MassDEP with respect to performance of response actions under the ROS, and to receive a statement of fee amount as per 4.03(3).

I understand that any material received by the Primary Representative from MassDEP shall be deemed received by all the persons performing response actions under the ROS, and I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate or incomplete information.

2. By: _____ (Signature) 3. Title: PROGRAM MANAGER

4. For: BOSTON GAS COMPANY (Name of person or entity recorded in Section D) 5. Date: _____ (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section D.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. Email: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

DRAFT COPY

Date Stamp (DEP USE ONLY:)

ATTACHMENT TO BWSC108 FORM, RTN 3-32792 (June 2024)

Statement Pursuant to Section F, Item 1.

The Phase III work under Release Tracking Number (RTN) 3-32792 is subject to an Administrative Consent Order and Notice of Noncompliance (ACO Enforcement Document Number: 00009941NT) dated October 2, 2020 between the Massachusetts Department of Environmental Protection (MassDEP) and National Grid and modified on May 23, 2023.

APPENDIX D - GEOPHYSICAL STUDY REPORT

UTILITY LOCATION SURVEY
FORMER MGP SITE
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

Prepared for:

GZA
249 Vanderbilt Avenue
Norwood, Massachusetts 02062

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 22J72
September 2022

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HAGER-RICHTER
GEOSCIENCE, INC.

GEOPHYSICS FOR THE ENGINEERING COMMUNITY
SALEM, NEW HAMPSHIRE
Tel: 603.893.9944
FORDS, NEW JERSEY
Tel: 732.661.0555

September 19, 2022
File 22J72

Justin Ivas
Assistant Project Manager
GZA
249 Vanderbilt Avenue
Norwood, Massachusetts 02062

Phn: 781-278-5843
Cell: 781-223-7329
Email: justin.ivas@gza.com

RE: Geophysical Survey
Former MGP Site
284 Winter Street
Haverhill, Massachusetts

Dear Mr. Ivas:

In this report, we summarize the results of a geophysical survey conducted by Hager-Richter Geoscience, Inc. (HRGS) at the above referenced site in Haverhill, Massachusetts for GZA in August 2022. The scope of the survey and area of interest were specified by GZA. As you know, HRGS conducted a survey of a larger portion of the site in 2016, and features detected by that survey in the current area of interest are included in figures accompanying this report.

INTRODUCTION

The site is a former manufactured gas plant (MGP) site located at 284 Winter Street in Haverhill, Massachusetts. The general location of the site is shown in Figure 1. The site is currently in use as a service station. As part of an environmental investigation of the site, GZA requested a geophysical survey in an approximately 1/4-acre area of interest (AOI) to detect underground utilities and other obstructions. In particular, GZA indicated that several electric lines that emanate from the southwest side of the site carwash were of particular interest. In addition, GZA was interested in determining whether a former gas holder, not detected by the 2016 survey, could be located.

The area of interest consists of an approximately 100-ft by 70-ft area located south of the fuel pump island area and west of the carwash, and an approximately 30-ft by 40-ft area located south of the carwash entrance. The AOI includes asphalt and concrete paved areas, as well as landscaped areas. The approximate locations of the areas are shown in Figure 2.

OBJECTIVE

The objective of the geophysical survey was to detect, and if detected, to locate subsurface utilities and other subsurface features in the accessible portions of the specified AOI at the site

THE SURVEY

Steven Grant, P.G., of HRGS conducted the geophysical survey on August 29, 2022. The project was coordinated with Mr. Justin Ivas of GZA. Ms. Victoria Rouleau, also of GZA, was present for the survey. Access to the area of interest was limited by vacuum pumps, trees and shrubs, a concrete planter. Photograph 1 shows typical conditions in exterior portions of the AOI.

Photograph 1. A portion of the area of interest, view to the southeast. The south end of the carwash is present on the left side of the photograph and a landscaped area with trees, shrubs, and concrete planter are present in the center of the photograph.

The geophysical survey was conducted using time domain electromagnetic induction metal detection (EM61), ground penetrating radar (GPR), and precision utility location (PUL) methods. The EM61 data were acquired at approximately 8-inch intervals along lines spaced 5 feet apart across the accessible portions of AOI. The EM61 survey detects buried metal. However, the EM method cannot provide information on the type of objects causing an EM anomaly.

GPR data were acquired along traverses oriented in two mutually perpendicular directions, with lines spaced 5 feet apart. The GPR method can detect both metal and nonmetal objects.

The PUL method was used to search for subsurface utilities in the AOI by passively searching for signals from active electric lines and by actively tracing signals applied by direct connections to accessible utility structures such as conduits, valves, and other exposed pipes in the area of interest.

Local survey grids were established in the AOIs for the acquisition of the geophysical data. The locations of some utilities detected at the time of the survey were marked on site and their locations were recorded for inclusion on the site plan. The geophysical data were reviewed in the office and additional utility segments and other structures were identified, and their locations are shown on the plan included in this report.

EQUIPMENT

EM61. The EM survey was conducted using a Geonics EM61-MK2 time domain electromagnetic induction metal detector. The EM61-MK2 instrument was designed specifically for detecting buried metal objects such as utilities, underground storage tanks (USTs), and drums. An air-cored transmitter coil generates a pulsed primary magnetic field in the earth, thereby inducing eddy currents in nearby metal objects. The eddy current produces a secondary magnetic field that is sensed by two receiver coils, one coincident with the transmitter and one positioned 40 cm above the main coil. By measuring the secondary magnetic field after the current in the ground has dissipated but before the current in metal objects has dissipated, the instrument responds only to the secondary magnetic field produced by metal objects. Four channels of secondary response are measured in mV and are recorded on a digital data logger. The system is generally operated by pushing the coils configured as a wagon with an odometer mounted on the axle to trigger the data logger automatically at approximately 8-inch intervals.

GPR. The GPR survey was conducted using a GSSI UtilityScan subsurface imaging radar system with a 350HS MHz antenna. The system includes a survey wheel that triggers the recording of the data at fixed intervals, thereby increasing the accuracy of the locations of features detected along the survey lines.

GPR uses a high-frequency electromagnetic pulse (referred to herein as “radar signal”) transmitted from a radar antenna to probe the subsurface. The transmitted radar signals are reflected from subsurface interfaces of materials with contrasting electrical properties. Travel times of the radar signal can be converted to approximate depth below the surface by correlation with targets of known depths and by a curve matching routine. We monitor the acquisition of GPR data in the field and record the GPR data digitally for subsequent processing. Interpretation of the records is based on the nature and intensity of the reflected signals and on the resulting patterns.
Data from the GPR survey were processed using RADAN 7.6 GPR processing software from Geophysical Survey Systems, Inc. We reviewed profile images of the GPR data. Interpretation of

the records is based on the nature and intensity of the reflected signals and on the resulting patterns.

PUL. The PUL survey was conducted using a Radiodetection RD 8000 series PUL instrument. The RD 8000 series consists of separate transmitter and receiver. The system can be used in "passive" and "active" modes to locate buried pipes by detecting electromagnetic signals carried by the pipes. In the "passive" mode, only the receiver unit is used to detect signals carried by the pipe from nearby power lines, live signals transmitted along underground power cables, or very low frequency radio signals resulting from long wave radio transmissions that flow along buried conductors. In the "active" mode of operation, the transmitter is used to induce a signal on a target pipe, and the receiver is used to trace the signal along the length of the pipe. Our system uses a 10W transmitter.

LIMITATIONS OF THE METHODS

> HRGS MAKES NO GUARANTEE THAT ALL TARGETS WERE DETECTED IN THIS SURVEY. HRGS IS NOT RESPONSIBLE FOR DETECTING TARGETS THAT CANNOT BE DETECTED BY THE METHODS EMPLOYED OR BECAUSE OF SITE CONDITIONS. GPR SIGNAL PENETRATION MIGHT NOT BE SUFFICIENT TO DETECT ALL TARGETS.

Field mark-outs. Utilities detected by the PUL method at the time of the survey are marked in the field. Adverse weather and site conditions (rain, uneven surfaces, high traffic, etc.) can hamper in-field interpretation. Mark-outs made on wet pavement, sand, or gravel surfaces, or in active construction zones may not last. HRGS is not responsible for maintaining utility mark-outs after leaving the work area.

EM61. The EM61 cannot detect non-metallic objects. The data from an EM61 survey are adversely affected by surface metal. The EM61 has a depth sensitivity limited to about 12 feet. The instrument is relatively cumbersome and works best where the transmit and receive coils can be hand pushed in a small wagon.

Detection and identification should be clearly differentiated. Detection is the recognition of the presence of a metal object, and the electromagnetic method is excellent for such purposes. Identification, on the other hand, is determination of the nature of the causative body (i.e., what is the body -- a cache of drums, UST, automobile, white goods, etc.?). Although the EM data cannot be used to identify all buried metal objects, they provide excellent guides to the identification of some objects. For example, buried metal utilities produce anomalies with lengths many times their widths.

GPR. There are limitations of the GPR technique as used to detect and/or locate targets such as those of the objectives of this survey. Limitations include: (1) surface conditions, (2) electrical conductivity of the ground, (3) contrast of the electrical properties of the target and the

surrounding soil, and (4) spacing of the traverses. Of these restrictions, only the last is controllable by us.

The condition of the ground surface can affect the quality of the GPR data and the depth of penetration of the GPR signal. Sites covered with high grass, bushes, landscape structures, debris, obstacles, soil mounds, etc. limit the survey access and the coupling of the GPR antenna with the ground. In many cases, the GPR signal will not penetrate below concrete pavement, especially inside buildings, and a target may not be detectable. The GPR method also commonly does not provide useful data under canopies found at some facilities. For this site the ground surface was asphalt, gravel, and grassy area.

The electrical conductivity of the ground determines the attenuation of the GPR signal and thereby limits the maximum depth of exploration. For example, the GPR signal does not penetrate clay-rich soils, and targets buried in clay might not be detected.

A definite contrast in the electrical conductivities of the surrounding ground and the target material is required to obtain a reflection of the GPR signal. If the contrast is too small, possibly due to construction details or deeply corroded metal in the target, then the reflection may be too weak to recognize, and the target can be missed. Typically, metallic pipes produce strong GPR reflectors while unreinforced concrete, vitrified clay, transite, plastic, or PVC pipes produce weak GPR reflectors.

With GPR method, when multiple utilities are near each other, or one below the other, usually the shallowest utility will be detected, and the deeper utility may be hidden by the shallow utility.

Spacing of the traverses is limited by access at many sites, but where flexibility of traverse spacing is possible, the spacing is adjusted to the size of the target. The GPR operator controls the spacing between lines, and the design of the survey is based on the dimensions of the smallest feature of interest. Targets with dimensions smaller than the spacing between GPR survey lines can be missed.

PUL. The PUL equipment cannot detect non-metallic utilities, such as pipes constructed of vitrified clay, transite, plastic, PVC, and unreinforced concrete, when used in passive mode alone. Such pipes can be detected if a wire tracer is installed with access to such tracer for transmission of a signal or where access (such as floor drains and clean-outs) permits insertion of a device on which a signal can be transmitted. In some, but not all cases, the subsurface utility designation equipment cannot detect metal utilities reliably under reinforced concrete because the signal couples onto the metal reinforcing in the concrete. Similarly, the method commonly cannot be used adjacent to grounded metal structures such as chain link fences and metal guardrails. In congested areas, where several utilities are bundled or located within a short distance of each other, the signal transmitted on one utility can couple onto adjacent utilities, and the accuracy of the location indicated by the instrument decreases.

RESULTS

General. The geophysical survey was conducted using the EM61, GPR, and PUL methods across the accessible portions of the AOI to detect subsurface utilities and other features of interest. Figure 2 shows a color contour plot of the EM61 data and Figure 3 shows the results of the GPR survey along with the integrated interpretation of the geophysical data for the area of interest.

EM61. The EM61 data were acquired at approximately 8-inch intervals along survey lines spaced 5 feet apart across the accessible portions of the AOI. As indicated above, the results of the EM61 survey are shown in color contour form in Figure 2. Interpretation of EM61 data is based on the relative response of the instrument in millivolts to local conditions. The instrument is not calibrated to provide an absolute measure of a particular property, such as the conductivity of the soil or the strength of the earth's magnetic field. Subsurface metal objects produce sharply defined positive anomalies when the EM61 is positioned directly over them. Acquiring data at short intervals along closely spaced lines, as was done at the subject site, provides high spatial resolution of the location and footprint of the targets. Thus, buried metal is recognized in contour plots of EM61 data by positive anomalies with spatial dimensions roughly corresponding to the dimensions of the buried metal.

Abundant moderate- to high-amplitude EM anomalies (green to red areas) are evident in the color contour plot shown in Figure 2 for the AOI. Many such anomalies are attributed to surface features such as vacuum pump islands, reinforced concrete pads, and a concrete planter. The locations of anomalies attributed to surface metal objects are depicted as blue hatched areas in the integrated interpretation plot shown in Figure 3. We note that the presence or absence of subsurface metal in such areas cannot be determined based on the EM data alone because of the anomalies caused by the surface metal objects.

Multiple moderate- to high-amplitude EM anomalies (green to red areas) not attributable to surface metal are evident in the AOI and are attributed to buried metal. In two locations, the elevated EM response not caused by surface metal is attributed to a buried object based on the GPR data (see below), and their locations are shown as black rectangles in Figure 3. The remainder of the EM anomalies not caused by surface metal are attributed to unidentified areas of buried metal, and their locations are shown as red cross-hatched areas in Figure 3.

GPR Survey and Integrated Interpretation. Apparent GPR signal penetration was variable at the site. In most areas surveyed, GPR signal penetration was fair, with two-way travel time reflections received from 20 to 50 ns of the 73 ns acquired for the 350 MHz Hyperstacking antenna. Based upon site-specific time-to-depth conversions for the GPR signal, the GPR signal penetration in areas with fair GPR signal penetration is estimated to have been about 3 to 8 feet. In portions of the site, GPR signal penetration was limited to no more than about 15 ns, or about 2 feet. Areas of limited GPR signal penetration are shown as stippled areas in Plate 2.

The locations of electric lines and an unidentified line were detected and marked on the ground at the time of the survey using the PUL and GPR equipment, and their locations are shown in Figure 3. The locations of gas and water lines on the east side of the carwash, just outside of the AOI, were verified, and their locations are shown in Figure 3.

Additional unidentified utility segments were detected on the basis of the office review of the GPR and EM61 data, and their locations are shown as dark brown dashed lines in Figure 3. The locations of several possible unidentified utilities detected by the 2016 geophysical survey are shown as lighter brown dot-dash lines in Figure 3.

GZA was interested in determining whether foundations for a former gas holder are present in the survey area. Based on information provided by GZA, the gas holder would have had a diameter of approximately 65 or 70 feet and occupied the central portion of the AOI (with the eastern portion overlapping with the footprint of the current-day carwash). We did not detect GPR reflections or a pattern of EM response consistent with those expected for a gas holder foundation.

Reflections typical of buried objects with dimensions of approximately 3 feet by 3 feet were detected in the AOI that also are associated with elevated EM responses, we infer that the objects contain metal. The location of the possible metallic buried objects are shown as black rectangles in Figure 3. In addition, several possible small buried objects not associated with an EM response were detected on the basis of the GPR data, and such buried non-metallic objects are shown as crossed boxes in Figure 3.

CONCLUSIONS

Based upon the geophysical survey conducted by HRGS at a former manufactured gas plant (MGP) site located at 284 Winter Street in Haverhill, Massachusetts in August 2022, we conclude:

- Electric lines and unidentified lines were detected in the area of interest (AOI) at the site
- The locations of gas and water lines outside of the AOI were verified
- The foundations for a possible former gas holder were not detected in the AOI
- Small buried metallic and nonmetallic objects were detected in the AOI
- Areas of unidentified buried metal were detected in the AOI

LIMITATIONS ON USE OF THIS REPORT

This letter report was prepared for the exclusive use of GZA (Client). No other party shall be entitled to rely on this Report, or any information, documents, records, data, interpretations, advice, or opinions given to Client by Hager-Richter Geoscience, Inc. (HRGS) in the performance of its work. The Report relates solely to the specific project for which HRGS has been retained and shall not be used or relied upon by Client or any third party for any variation or extension of this project, any other project, or any other purpose without the express written permission of HRGS. Any unpermitted use by Client or any third party shall be at Client's or such third party's own risk and without any liability to HRGS.

HRGS has used reasonable care, skill, competence and judgment in the performance of' its services for this project consistent with professional standards for those providing similar services at the same time, in the same locale, and under like circumstances. Unless otherwise stated, the work performed by HRGS should be understood to be exploratory and interpretational in character and any results, findings or recommendations contained in this Report or resulting from the work proposed may include decisions which are judgmental in nature and not necessarily based solely on pure science or engineering. It should be noted that our conclusions might be modified if subsurface conditions were better delineated with additional subsurface exploration including, but not limited to, test pits, soil borings with collection of soil and water samples, and laboratory testing.

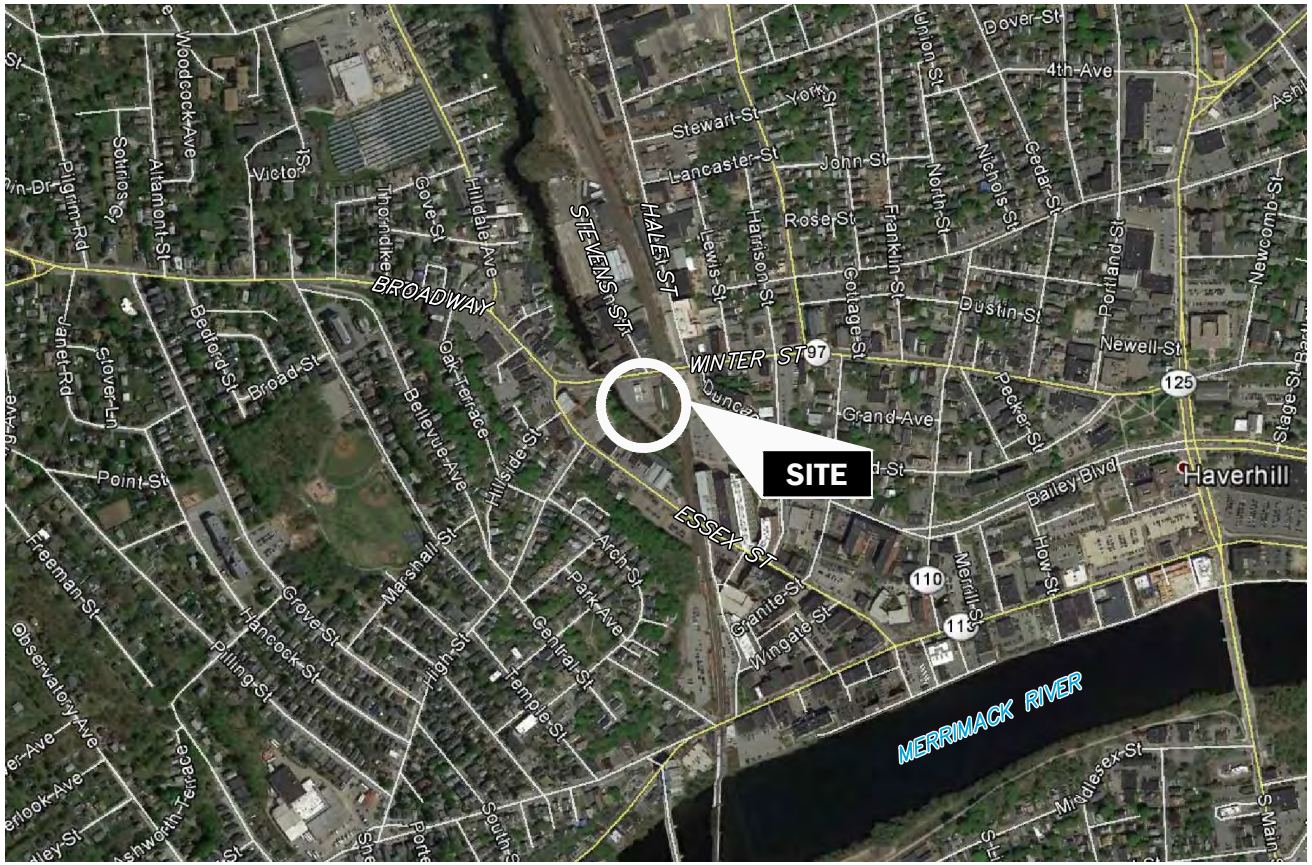
Except as expressly provided in this limitations section, HRGS makes no other representation or warranty of any kind whatsoever, oral or written, expressed or implied; and all implied warranties of merchantability and fitness for a particular purpose, are hereby disclaimed. If you have any questions or comments on this letter report, please contact us at your convenience. It has been a pleasure to work with you on this project. We look forward to working with you again in the future.

Sincerely,
HAGER-RICHTER GEOSCIENCE, INC.

Steven Grant, P.G.
Senior Geophysicist

Jeffrey Reid, P.G.
Owner / Principal Geophysicist

Attachments: Figures 1 – 3



N

APPROXIMATE SCALE (feet)

0 1000 2000

MASS

LOCATION

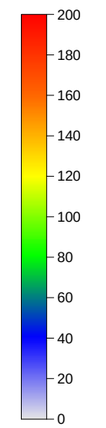
NOTE:

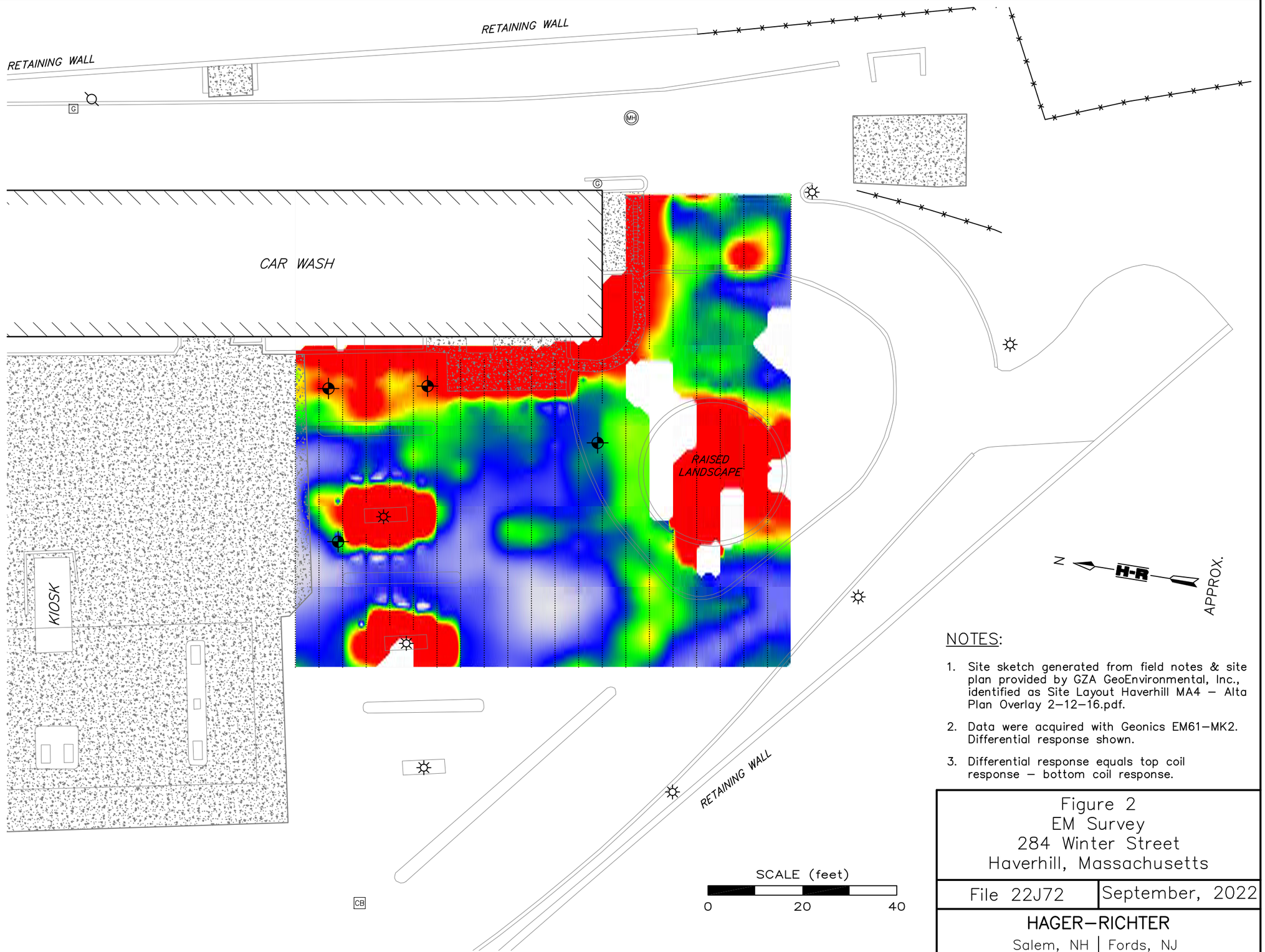
Modified from Google Earth Pro aerial photograph.

Figure 1
General Site Location
284 Winter Street
Haverhill, Massachusetts

File 22J72	September, 2022

HAGER–RICHTER
Salem, NH | Fords, NJ





LEGEND

- DATA STATIONS
- GAS METER
- GAS VALVE
- UTILITY POLE
- LIGHT POLE
- MANHOLE
- CATCH BASIN
- PROPOSED BORING
- CONCRETE PAD
- FENCE

NOTES:

1. Site sketch generated from field notes & site plan provided by GZA GeoEnvironmental, Inc., identified as Site Layout Haverhill MA4 – Alta Plan Overlay 2–12–16.pdf.
2. Data were acquired with Geonics EM61–MK2. Differential response shown.
3. Differential response equals top coil response – bottom coil response.

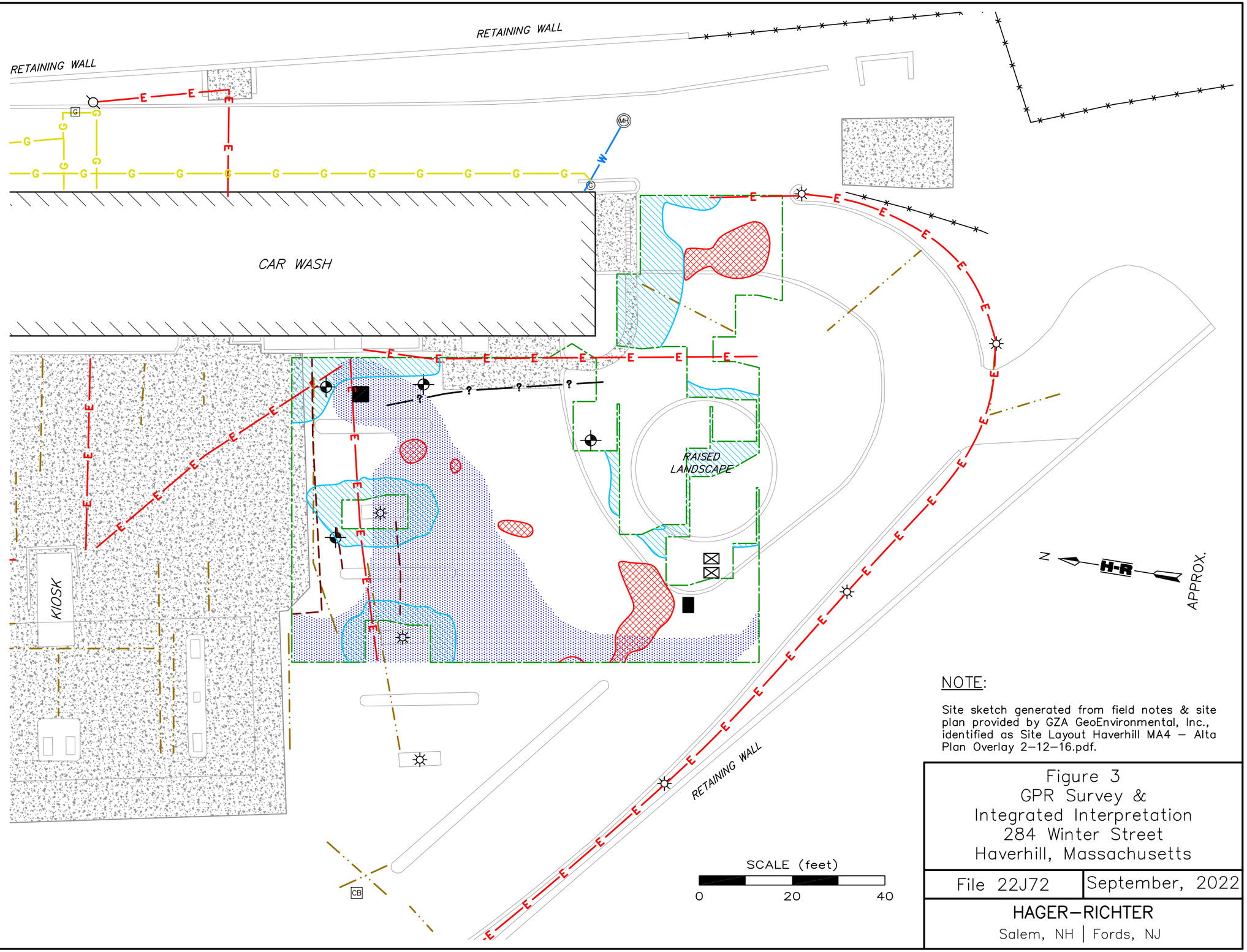
Figure 2
EM Survey
284 Winter Street
Haverhill, Massachusetts

File 22J72	September, 2022

HAGER–RICHTER
Salem, NH | Fords, NJ

LEGEND

- APPROXIMATE LIMITS OF EM SURVEY AREA
- GPR TRAVERSE
- AREA OF POSSIBLE BURIED METAL
- UNIDENTIFIED BURIED METAL OBJECT
- GAS LINE
- ELECTRIC LINE
- WATER LINE
- POSSIBLE UTILITY – MARKED IN FIELD
- POSSIBLE UTILITY – NOT MARKED IN FIELD (2022SURVEY)
- POSSIBLE UTILITY – NOT MARKED IN FIELD (2016 SURVEY)
- UNIDENTIFIED BURIED NON–METAL OBJECT
- AREA OF LIMITED GPR SIGNAL PENETRATION (SEE TEXT)
- EM ANOMALY ATTRIBUTED TO EFFECTS OF SURFACE OBJECTS. THE PRESENCE OR ABSENCE OF BURIED METAL WITHIN THIS AREA CANNOT BE DETERMINED ON THE BASIS OF THE EM61 DATA ALONE.
- GAS METER
- GAS VALVE
- UTILITY POLE
- LIGHT POLE
- MANHOLE
- CATCH BASIN
- PROPOSED BORING
- CONCRETE PAD
- FENCE



NOTE:

Site sketch generated from field notes & site plan provided by GZA GeoEnvironmental, Inc., identified as Site Layout Haverhill MA4 – Alta Plan Overlay 2–12–16.pdf.

Figure 3
GPR Survey &
Integrated Interpretation
284 Winter Street
Haverhill, Massachusetts

File 22J72 | September, 2022

HAGER–RICHTER
Salem, NH | Fords, NJ

APPENDIX E - VACUUM EXCAVATION LOGS

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-4
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Justin I./Olivia B.	**Contractor**	GeoSearch	**Date**	9/20/2022
		Operator	Ken B.	**Ground Elev.**	
Weather	50-60s, cloudy, mist	**Make**	Vacmaster	**Model** 4000	**Time Started**
		Capacity		**Reach** ft.	**Time Completed**

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
		Top 3" - Mulch; Peastone - 0.25-0.5'				
1'		Medium SAND: 0.5-1'				
		Moist, brown, fine to coarse SAND, some Silt, trace Gravel (1-1.5')	1	ND	E	
2'		Electrical line encountered at 1.5 feet (Bottom of test pit)	2			
3'						
4'						-
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. Field testing results represent organic vapor levels referenced to a benzene standard, measured in the headspace of sealed sample jars using an Ion Science Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmV). ND indicates not detected above instrument detection limit (<0.1 ppm).
2. 1" Electrical line at ~1.5' BGS

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-5
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Justin I./Olivia B.	**Contractor**	GeoSearch	**Date**	9/20/2022
		Operator	Ken B.	**Ground Elev.**	
Weather	50-60s, cloudy, mist	**Make**	Vacmaster **Model** 4000	**Time Started**	
		Capacity	**Reach** ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'		Top 3" - Mulch Moist to wet, light brown, fine to coarse SAND, some Silt, trace Gravel (0.25-1.5')	1	ND	E	
2'		Electrical Line at 1.5' (Bottom of Test Pit)				-
3'						
4'						
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes: 1. See note 1 on VE-4 log for field testing results explanation

.

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-6
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Justin I./Olivia B.	**Contractor**	GeoSearch	**Date**	9/20/2022
		Operator	Ken B.	**Ground Elev.**	
Weather	50-60s, cloudy, mist	**Make**	Vacmaster	**Model** 4000	**Time Started**
		Capacity		**Reach** ft.	**Time Completed**

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
		Top 6" - Asphalt				
1'					E	
		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel (0.5-1.3')	1	ND		
2'		Electrical line at 1.3' (Bottom of Test Pit)	2			-
3'						
4'						
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. Electrical line ~1.3' BGS

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-7
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Justin I./Olivia B.	**Contractor**	GeoSearch	**Date**	9/20/2022
		Operator	Ken B.	**Ground Elev.**	
Weather	50-60s, cloudy, mist	**Make**	Vacmaster	**Model** 4000	**Time Started**
		Capacity		**Reach** ft.	**Time Completed**

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'		Top 6" - Asphalt				
2'		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel (0.5-2.3')	1	ND	E	-
3'		6-inch diameter cast iron pipe at 2.3' (Bottom of test pit)	2			
4'						
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. ~6" Cast iron pipe ~2.3' BGS

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-8
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Olivia Baglieri	**Contractor**	GeoSearch	**Date**	12/16/2022
		Operator	Josh	**Ground Elev.**	
Weather	40s, Rainy, Cloudy	**Make**	Vacmaster **Model #** 4000	**Time Started**	
		Capacity	**Reach** ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'						
2'			1			
		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel	2	ND	E	
3'			3			
		Concrete at 3' (Bottom of Exploration)	4			
4'						
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. Large concrete obstruction at 3'.
3. Wall encountered along W edge of boring.
4. Offset 5' NE for next vac attempt to avoid wall.

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-9
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Olivia Baglieri	**Contractor**	GeoSearch	**Date**	12/16/2022
		Operator	Josh	**Ground Elev.**	
Weather	40s, Rainy, Cloudy	**Make**	Vacmaster **Model #** 4000	**Time Started**	
		Capacity	**Reach** ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'						
2'						
3'		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel	1 2	ND	E	
4'		Concrete at 3' (Bottom of Exploration)				
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. Large concrete pad obstruction at 3', no wall encountered. Offset 5' SW for next vac attempt

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Depth to Ground water
Encountered	
Not Encountered	

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-10
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Olivia Baglieri	**Contractor**	GeoSearch	**Date**	12/16/2022
		Operator	Josh	**Ground Elev.**	
Weather	40s, Rainy, Cloudy	**Make**	Vacmaster	**Model #**	4000	**Time Started**	
		Capacity		**Reach**	ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'						
2'						
3'		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel	1 2	ND	E	
4'		Concrete at 3' (Bottom of Exploration)				
5'						
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. Large concrete pad obstruction at 3', no wall encountered. Offset 5' SE for next vac attempt.

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Depth to Ground water
Encountered	
Not Encountered	

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-11
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	CAL

GZA Rep.	Olivia Baglieri	**Contractor**	GeoSearch	**Date**	12/16/2022
		Operator	Josh	**Ground Elev.**	
Weather	40s, Rainy, Cloudy	**Make**	Vacmaster **Model #** 4000	**Time Started**	
		Capacity	**Reach** ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'						
2'						
3'		Moist, light brown, fine to coarse SAND, some Silt, trace Gravel	1		E	
4'		Moist, dark brown, fine to medium SAND, some Silt, some Roots, trace Gravel, Brick, and metal Pipes	2 3	ND	M	
5'		Concrete at 4' (Bottom of exploration)				
6'						
7'						
8'						
9'						
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.
2. Large concrete obstruction at 4'. Recovered small disconnected metal pipes.
3. Offset 7' E for next vac attempt

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Depth to Ground water
Encountered	
Not Encountered	

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

TEST PIT LOG

GZA GeoEnvironmental, Inc.
Engineers/Scientists

Malden Former MGP
284 Winter Street, Haverhill, MA

TEST PIT NO.:	VE-12
SHEET:	1 of 1
PROJECT NO:	01.0172397.10
REVIEWED BY:	

GZA Rep.	Olivia Baglieri	**Contractor**	GeoSearch	**Date**	12/16/2022
		Operator	Josh	**Ground Elev.**	
Weather	40s, Rainy, Cloudy	**Make**	Vacmaster	**Model #**	4000	**Time Started**	
		Capacity		**Reach**	ft.	**Time Completed**	

Depth (ft)	Sample No.	Soil Description	Remark	PID Reading (ppm)	Excav. Effort	Boulders: Count/Class
1'						
2'						
3'		Moist, light brown fine to coarse SAND, some Silt, trace Gravel			E	
4'						
5'						
6'						
7'		Moist, dark brown, fine to medium SAND, some Silt, some Brick and Concrete, trace Gravel	1	ND	M	
8'						
9'		Bottom of Exploration at 8.0'				
10'						
11'						
12'						
13'						
14'						
15'						

Notes:

1. See note 1 on VE-4 log for field testing results explanation.

Test Pit Plan

NORTH ↑

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" and Larger

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Excavation Effort

E - Easy M - Moderate D - Difficult

Abbreviations

F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

Groundwater

Elapsed Time to Reading (Hours)	Encountered: Depth to Ground water	Not Encountered: Depth to Ground water

Stratification lines represent approximate boundaries between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to factors other than those present at the time measurements were made.

APPENDIX F - B200 & 300 SERIES EXPLORATION LOGS

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B201
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 14
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Stratum Description Elev. (ft)	Equipment Installed
									1				No Equipment Installed
									2				
		S-1	2-2					S-1: Moist, black stained, fine to coarse SAND and SILT, some Gravel, trace Wood chips.	3	8.8			
5		S-2	4-4					S-2: Moist, black stained, fine to coarse SAND, some Silt, little Gravel, trace Wood fiber, faint oil-like odor.	4	4.9			
		S-3	6-8	24	7	13 40 17 13	57	S-3: Moist, dense, dark brown, fine to coarse SAND, some Silt, trace Gravel.	5	2.6	FILL		
		S-4	8-10	24	7	6 14 20 10	34	S-4: Moist, dense, dark brown, fine to coarse SAND, some Silt, some Gravel, trace Brick.		55.1			
10		S-5	10-12	13	9	7 30 120R		S-5A: (Top 3") Wet, medium dense, black, fine to coarse SAND and SILT, trace Gravel, Brick, and Coal tar.		97.6 49.1			
		S-6	12-14	24	14	13 15 17 13	32	S-5B: Moist, medium dense, gray, fine to medium SAND, little Silt, trace Gravel.	6	974			
								S-6: Wet, medium dense, black stained, medium to coarse SAND, some Silt, trace Gravel and Coal tar.	7		13.5'		
									8		14' CONCRETE		
15													
20													
25													
30													

Bottom of boring at 14 feet.

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Large concrete obstruction ~4', offset 5' East
5. Bottom 2" Brick
6. Observed blebs of product
7. Bottom 6" - concrete (apparent refusal).
8. Boring backfilled with drill cuttings and sand with occasional bentonite layers.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B201

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B202
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 20
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Stratum Description Elev. (ft)	Equipment Installed
									1				No Equipment Installed
									2				
		S-1	2-2					S-1: Moist, dark-gray brown, fine to coarse SAND, some Silt, trace Gravel, faint coal tar-like odor.	3	0.8			
									4				
5		S-2	4-4					S-2: Moist, black stained, fine to coarse SAND, some SILT, little Gravel, trace Brick, faint coal tar-like odor.	5	8.1			
									6				
		S-3	6-8	24		4 4 / 4 4	8	S-3: Moist, loose, dark brown to black coated, fine SAND and Silt, trace Gravel.		157			
		S-4	8-10	24	18	3 4 / 6 6	10	S-4: Moist, loose, black to gray, fine SAND and SILT, lenses of Silty Clay, trace Gravel, faint to moderate coal tar-like odor.		485	FILL		
10		S-5	10-12	24	23	6 4 / 4 5	8	S-5: Moist, loose, black coal tar-coated, fine SAND and SILT, trace Gravel and Brick, faint to moderate coal tar-like odor.		461			
		S-6	12-14	24	16	3 4 / 3 7	7	S-6: Moist, loose, dark brown to black coal tar-coated, fine SAND and SILT, lenses of gray fine Sand, trace Brick, moderate coal tar-like odor.		488			
15		S-7	14-16	24	14	6 4 / 4 5	8	S-7: Moist, loose, black coal tar-coated, fine SAND and SILT, trace Brick, moderate coal tar-like odor.		343			
		S-8	16-18	24	16	4 6 / 8 12	14	S-8: Moist to wet, medium dense, black stained, fine SAND and SILT, trace Gravel, moderate coal tar-like odor.		433	16'	'	
		S-9	18-20	24	16	3 6 / 11 11	17	S-9: Moist to wet, medium dense, black stained, fine SAND and SILT, trace Gravel, moderate coal tar-like odor.		553	SAND AND SILT		
20									7		20'	'	
25								Bottom of boring at 20 feet.					
30													

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 4.5 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Large obstruction 3', offset 3' South
5. Brick obstruction ~4.5', marked for driller
6. Oil-like staining on gloves
7. Boring backfilled with drill cuttings and sand with occasional bentonite layers.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B202

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B203
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-75
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 14.9
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
									1					No Equipment Installed
									2					
		S-1	2-2					S-1: Moist, brown, fine to coarse SAND, little Silt, trace Gravel.	3	ND				
									4					
5									5					
		S-2	6-6	24	6	3 4	7	S-2: Wet, black stained, organic SILT, trace Gravel, moderate coal tar-like odor.		2.5		FILL		
		S-3	6-8			3 3				120				
		S-4	8-10	24	7	11 5 2 2	7	S-3: Moist to wet, loose, black coal tar-coated, fine to coarse SAND, some Silt, trace Coal tar and Gravel.	6	67.3				
10		S-5	10-12	24		5 5 8 4	13	S-4: Wet, loose, dark brown, fine to coarse SAND, some Silt, little Brick, trace Gravel.	7	1002				
		S-6	12-14	24	7	2 1 1 1	2	S-5: Wet, medium dense, black GRAVEL, some fine to coarse Sand, coal tar saturated and strong coal-tar-like odor.		932				
15		S-7	14-14.9					S-6: Wet, medium dense, black GRAVEL, some fine to coarse Sand, little Brick, trace Wood, coal tar saturated and strong coal-tar-like odor.	8		14.9'		'	
20								S-7: COAL TAR, trace Sand and Gravel.						
								Bottom of boring at 14.9 feet.						
25														
30														

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Large concrete obstruction ~4', offset 2' SW
5. Encountered water ~3-4'
6. Little blebs of product
7. Apparent holder bottom encountered at 14.9'.
8. Boring backfilled with drill cuttings and sand with occasional bentonite layers.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B203

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B204
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.): 25.97
Final Boring Depth (ft.): 24
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/20/22		15	24	5 min

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Elev. (ft)	Equipment Installed
									1				No Equipment Installed
									2				
		S-1	2-2					S-1: Moist, light brown fine to medium SAND, trace Gravel.	3	ND			
5		S-2	4-4					S-2: Moist, light brown fine to medium SAND, trace Gravel.		ND			
		S-3	6-8					S-3: Moist, dark brown, fine to coarse SAND and SILT, trace Gravel and wood debris, faint coal tar-like odor.		0.1			
		S-4	8-10	24	13	0 1 1 1	2	S-4: Moist, dark brown to stained black, fine SAND and SILT, little Gravel, faint coal tar-like odor.		8.2	FILL		
10		S-5	10-12	24	11	0 2 1 3	3	S-5: Moist, very loose, brown, fine to coarse SAND, some Silt, little Gravel.	4	6.3			
		S-6	12-14	24	7	5 3 2 2	5	S-6: Moist, loose, black stained GRAVEL, some Silt, little fine Sand, moderate coal tar-like odor.		5.6			
15		S-7	14-16	24	23	0 0 0 0	0	S-7: Wet, very loose, black stained SILT, some fine Sand, moderate coal tar-like odor.		20.9			
											16'	10.0'	
		S-8	16-18	24	22	0 0 0 1	0	S-8: Wet, very loose, black stained SILT, some fine Sand, moderate coal tar-like odor, lens of Wood fibers approximately halfway in recovery, trace Peat.		65.8	SILT		
		S-9	18-20	24	14	2 5 6 6	11			72.1	18.5'	7.5'	
20		S-10	20-22	24	12	2 3 9 11	12	S-9A: (Top 4") Wet, very loose, black stained SILT, some fine Sand, moderate coal tar-like odor, lens of Wood fibers approximately halfway in recovery, trace Peat.		79.1	FINE SAND AND SILT		
		S-11	22-24	24	14	5 7 8 10	15			7.8			
									5		24'	2.0'	
25								S-9B: Wet, loose, gray fine SAND, trace Silt, faint naphthalene-like odor. S-10: Wet, medium dense, dark gray stained, fine SAND, some Silt, little Gravel. S-11: Wet, medium dense, light brown SILT, some fine Sand, trace Iron stained lenses, very faint					
30													

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 8 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Bottom 6" stained black, black coated wood fibers with moderate coal tar-like odor
5. Boring backfilled with drill cuttings and sand with occasional bentonite layers.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B204

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B204
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								naphthalene-like odor.						
								Bottom of boring at 24 feet.						
35														
40														
45														
50														
55														
60														
65														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B204

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B205
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 22
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/20/22		15.9	OW	5 min
10/4/22		15.9	OW	14 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value
		S-1	2-2				
5		S-2	4-4				
		S-3	6-6	24	12	8 10	21
		S-4	6.01-8			11 14	
		S-5	8-10	24	12	5 4 5 5	9
10		S-6	10-12	12	9	6 22 11R	
		S-7	12-14	24	14	3 2 2 1	4
15		S-8	14-16	24	23	0 0 0 0	0
		S-9	16-18	24	23	0 0 0 3	0
		S-10	18-20	24	14	0 12 16 17	28
20		S-11	20-22	24	15	4 8 10 10	18
25							
30							

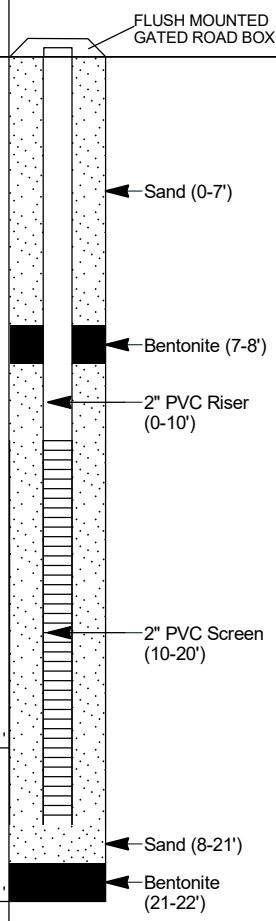
Sample Description Modified Burmister

S-1: Moist, dark brown and black stained fine to coarse SAND and SILT, trace Gravel, faint coal tar-like odor.
S-2: Moist, brown, fine to coarse SAND and SILT, trace Gravel, faint coal tar-like odor.
S-3: Moist, gray-black stained, fine to coarse SAND and SILT, trace Silty Clay and Gravel, faint coal tar-like odor.
S-4: Moist, medium dense, gray-black stained, fine to coarse SAND and SILT, trace Concrete and Brick.
S-5A: Top half Moist, medium dense, gray-black stained, fine to coarse SAND and SILT, trace Concrete and Brick.
S-5B: Wet, medium dense, black, fine to coarse SAND and SILT, little coated Wood fibers, trace Slag, faint-moderate coal tar-like odor.
S-6: (Top half) Wet, medium dense, black stained, SILT, some Sand, trace Slag and Wood fibers.
S-6: (Bottom half) Dry, medium dense, black stained SLAG and hardened TAR, some fine to coarse Sand, some Silt.
S-7: Moist, very loose, light brown, fine to coarse SAND, some Silt.
S-8: Coal tar-coated to saturated, very loose, dark gray to brown SILT, some fine Sand, moderate oil-like odor.
S-9: Coal tar-coated to saturated, very loose, dark gray to brown SILT, some fine Sand, moderate oil-like odor.
S-10: Wet, medium dense, gray, SILT, some fine Sand, trace Gravel and Plant fibers, moderate oil-like odor
S-11A: (Top 5") S-10: Wet, medium

Remark	Field Test Data
1	
2	
3	0.2
4	
	0.4
	4.8
	13.3
	16.6
	13.2
	122
	60.4
	87.7

Stratum Description	Depth (ft)	Elev. (ft)
FILL	0'	
SILT AND SAND	18'	
	22'	

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-3 collected with hand auger in advance of vacuum excavator.
4. Trace gray sheen in water in spoon, possible trace blebs

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B205

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B205
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								dense, gray, SILT, some fine Sand, trace Gravel and Plant fibers, moderate oil-like odor. S-11B: (Bottom 10") Wet, medium dense, light brown, fine SAND, trace Silt.						
35								Bottom of boring at 22 feet.						
40														
45														
50														
55														
60														
65														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B205

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B206
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 34
Date Start - Finish: 9/20/2022 - 9/20/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

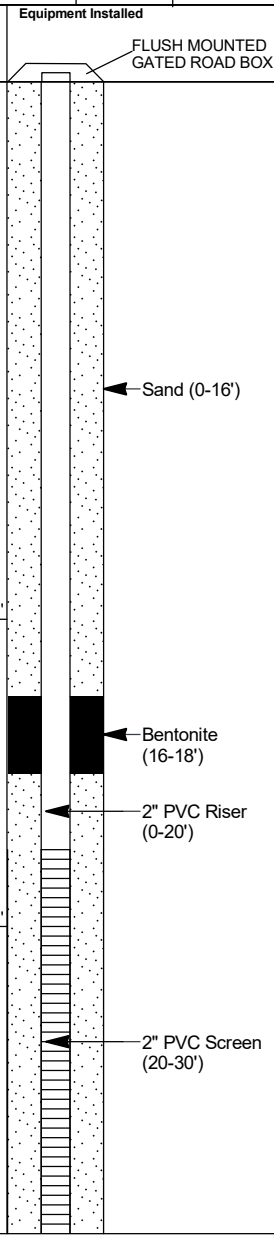
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
9/20/22		15.3		5 min
10/4/22		15.4	OW	14 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
		S-1	2-2					S-1: Moist, light brown, fine to coarse SAND and SILT, trace Gravel.	3	ND
5		S-2	4-4					S-2: Wet to moist, brown, fine to coarse SAND, some Silt, trace Gravel, faint coal tar-like odor.		0.3
		S-3	6-8	8	5	2 120R		S-3: Coal tar coated black GRAVEL and WOOD, some fine to coarse Sand, some Silt, moderate coal-tar-like odor.	4	5.1
		S-4	8-10	24	9	6 6 4 4	10	S-4A: Top 3", wet, brown, fine to coarse SAND, some Silt, trace Wood, faint to moderate coal-tar-like odor.	5	4.6 0.3
10		S-5	10-12	24	14	4 6 8 6	14	S-4B: Moist, brown, fine to coarse SAND, some Silt, little Gravel, trace Brick.		0.1
		S-6	12-14	24	16	3 6 5 4	11	S-5: Moist, brown, medium dense, fine to coarse SAND, little Gravel, little Brick, little Silt.		ND 65.5
15		S-7	14-16	24	20	2 1 1 1	2	S-6A: Moist, loose, tan, fine to medium SAND, some Silt.		106
		S-8	16-18	24	19	0 0 0 0	0	S-6B: Moist, medium dense, brown, fine SAND, some Silt, faint solvent-like odor.		2.1 4.3
		S-9	18-20	24	18	1 1 2 1	3	S-7: Wet, very loose, black stained to coated, fine SAND and SILT, faint coal tar-like odor.		13.1
20		S-10	20-22	24	15	0 0 2 12	2	S-8A: Wet, very loose, black stained SILT, some fine to coarse Sand, little Gravel, moderate coal tar-like odor.	6	11.7
		S-11	22-24	24	10	0 2 5 7	7	S-8B: Wet, very loose, gray SILT, trace fine Sand, faint coal tar-like odor.	7	15.1
25		S-12	24-26	24	12	2 5 7 9	12	S-9: Moist, very loose, gray SILT, some fine Sand, trace Plant fibers.		69.5
		S-13	26-28	24		7 10 9 10	19	S-10: Moist, very loose, gray SILT, some fine Sand, trace Plant fibers, faint coal tar-like and H2S-like odor.		100 373
		S-14	28-30	24	13	3 3 4 7	7	S-11: Wet, loose, gray to light brown, fine SAND, little Silt, lenses of medium		322
30										

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
14'	SILT AND SAND	
22'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Large concrete obstruction ~6', marked for driller
5. Hardened tar in bottom of spoon
6. Bottom 1" sand
7. Observed lenses of medium sand and silt
8. Trace blebs observed

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B206

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B206
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
		S-15	30-32	24	12	2 5 8 7	13	Sand. S-12: Coal tar coated, gray to brown, fine to medium SAND, some Silt, moderate coal-tar-like odor.	8	29.4				Sand (18-31')
		S-16	32-34	24	8	27 25 10 10	35	S-13A: Top half recovery: Wet, medium dense, black coal tar coated, fine to coarse SAND, little Gravel, trace Silt. S-13B: Layers of black coal tar saturated fine SAND and gray to brown SILT. S-14: Wet loose, gray, fine SAND and SILT, with several layers of brown-black coal tar saturated fine SAND. S-15: Wet, medium dense, gray SILT and fine SAND, trace Gravel in bottom 4". S-16: Wet, dense, gray to brown, fine to coarse SAND and GRAVEL, little Silt, very faint coal tar-like odor.		22.9				Bentonite (31-34')
35														
40														
45								Bottom of boring at 34 feet.						
50														
55														
60														
65														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B206

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B207
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 29
Date Start - Finish: 9/21/2022 - 9/21/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Stratum Description Elev. (ft)	Equipment Installed
									1				No Equipment Installed
									2				
		S-1	2-2					S-1: Moist, brown and gray stained fine to coarse SAND and SILT, trace Gravel, trace wood, faint coal tar-like odor .	3 4	ND			
5													
		S-2	6-6					S-2: Wet, black stained PEAT(?), some Silt, trace Gravel, moderate coal tar-like odor.	5	2.5	FILL		
10		S-3	10-12	22	16	15 38 77 58R	R	S-3A: Top half of recovery: wet, dark brown, fine to coarse SAND and GRAVEL, some Silt, faint coal tar-like odor. S-3B: Pulverized concrete.		0.2			
15		S-4	15-17	24	19	0 1 1 1	2	S-4: Wet, coal tar-coated, black to gray fine SAND, trace Silt, trace Plant fibers, moderate H2S and oil-like odor		9.1	15'	'	
20		S-5	20-22	24	24	0 2 2 2	4	S-5A: Top half: Moist, very loose, gray to black coal tar-coated, fine SAND, some Silt, moderate to strong coal tar-like odor. S-5B: Moist, dark brown SILT, lenses of brown saturated fine to medium Sand, little Plant fibers.	6	93 162	SAND AND SILT		
25		S-6	25-27	24	16	4 10 22 15	32	S-6A: (Top 10") Wet, medium dense, black stained, fine to coarse SAND and SILT, some Wood fibers, very faint oil-like odor. S-6B: (Bottom 6") Moist brown to gray, dense, medium to coarse SAND, some	7 8	21 79	29'	'	
30													

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.
4. Large obstruction ~3-4', offset directly NE, possibly exisitng foundation
5. Water encountered at 6'
6. Wood fragment stuck in tip of spoon
7. Auger and spoon refusal at 29'
8. Boring backfilled with drill cuttings and sand with occasional bentonite layers.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B207

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B207
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								Silt, some Gravel, little Wood fibers.						
								Bottom of boring at 29 feet.						
35														
40														
45														
50														
55														
60														
65														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B207

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B208
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-85
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.): 24.71
Final Boring Depth (ft.): 37
Date Start - Finish: 9/21/2022 - 9/21/2022

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4" / 6.5"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

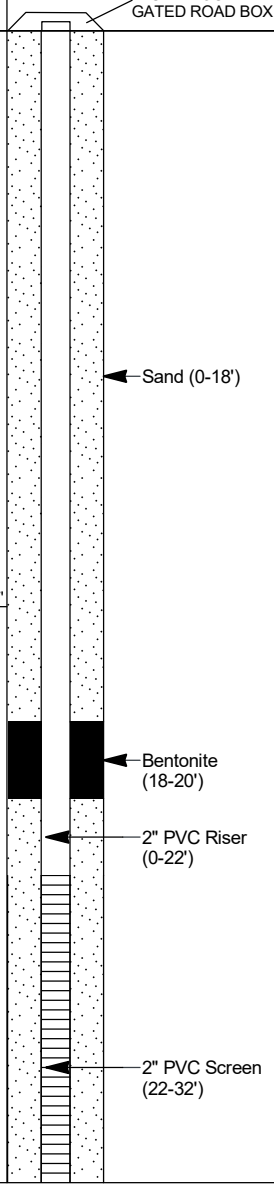
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
10/4/22		15.3	OW	13 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
		S-1	2-2					S-1: Moist, brown, fine to coarse SAND, some Silt, trace Gravel.	3	ND
5		S-2	4-4					S-2: Moist, dark brown, fine to coarse SAND, some Silt, some Gravel.		ND
		S-3	6-8	24	7	1 1 1 1	2	S-3: Moist, very loose, dark brown, fine to coarse SAND, some Silt, trace Gravel, very faint coal tar-like odor.		0.3
10		S-4	10-12	24	8	1 1 3 4	4	S-4: Moist, very loose, dark brown, fine to coarse SAND, some Silt, some Gravel.		0.9
15		S-5	15-17	24	24	0 0 0 0	0	S-5: Moist to wet, very loose gray stained, fine SAND and SILT, trace Plant fibers, faint to moderate coal tar-like odors.		55.3
20		S-6	20-22	24	17	1 1 1 2	2	S-6A: (Top 10") Moist, loose dark brown to black coal tar-coated, fine to coarse SAND, some Silt, some Wood fibers, moderate coal tar-like odor. S-6B: Moist, loose, brown, fine to coarse SAND, some Silt, some Wood.		786 622
25		S-7	25-27	24	7	1 6 9 11	15	S-7: Moist, medium dense, gray, fine to coarse SAND, some Silt, lenses of black coal tar-coated fine to coarse Sand, faint to moderate coal tar-like odor.		167
30										

Stratum Description	Depth (ft)	Elev. (ft)
FILL		
SAND AND SILT	15'	9.7'

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs). Samples S-1 to S-2 collected with hand auger in advance of vacuum excavator.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B208

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B208
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Stratum Description Elev. (ft)	Equipment Installed
		S-8	30-32	24	8	4 5 6 7	11	S-8: Moist, medium dense, black coal tar-coated, fine to coarse SAND and SILT, some Silty Clay, trace Gravel, moderate coal tar-like odor.		259	SAND AND SILT		Sand (20-32') Bentonite (32-34')
35		S-9	35-37	24	24	19 16 24 26	40	S-9: Moist, dense, gray, fine SAND and SILT, trace Gravel, lenses of black stained Sand, moderate coal tar-like odor.		147	37'	-12.3'	
								Bottom of boring at 37 feet.					
40													
45													
50													
55													
60													
65													

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B208

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B209
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: VacMaster
Rig Model: Model 4000
Drilling Method: Vacuum

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 2
Date Start - Finish: 9/21/2022 - 9/21/2022

H. Datum:
V. Datum:

Auger/Casing Type:
I.D./O.D. (in.): None
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Hand Auger
I.D./O.D (in.):
Sampler Hmr Wt (lb.):
Sampler Hmr Fall (in.):
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
									1					No Equipment Installed
									2		2'	FILL	'	
		S-1	2-2					S-1: Moist, dark brown, fine to coarse SAND, some Silt, trace Gravel and Brick.	3	ND				
									4					
5								Bottom of boring at 2 feet.	5					
10														
15														
20														
25														
30														

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 2 feet below ground surface (bgs). Sample S-1 collected with hand auger in advance of vacuum excavator.
4. Large concerete obstruction, offset 2' E
5. Large concrete obstruction in offset

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B209

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B210
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: VacMaster
Rig Model: Model 4000
Drilling Method: Vacuum

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 2
Date Start - Finish: 9/21/2022 - 9/21/2022

H. Datum:
V. Datum:

Auger/Casing Type:
I.D./O.D. (in.): None"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Hand Auger
I.D./O.D (in.):
Sampler Hmr Wt (lb.):
Sampler Hmr Fall (in.):
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								No Samples Collected.	1 2					No Equipment Installed
								Bottom of boring at 2 feet.						
5														
10														
15														
20														
25														
30														

REMARKS

1. Large concrete obstruction, originally offset by 2' E for drill rig, moved back to original marking
2. Large concrete obstruction in offset

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B210

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B211
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Chris Stamer
Logged By: Olivia Baglieri

Type of Rig: VacMaster
Rig Model: Model 4000
Drilling Method: Vacuum

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 3
Date Start - Finish: 9/21/2022 - 9/21/2022

H. Datum:
V. Datum:

Auger/Casing Type:
I.D./O.D. (in.): None
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Hand Auger
I.D./O.D (in.):
Sampler Hmr Wt (lb.):
Sampler Hmr Fall (in.):
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
		S-1	2-2					S-1: Moist, brown, fine to coarse SAND, some Silt, trace Gravel.	1 2 3 4	ND				No Equipment Installed
								Bottom of boring at 3 feet.	5 6					
5														
10														
15														
20														
25														
30														

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 3 feet below ground surface (bgs). Sample S-1 collected with hand auger in advance of vacuum excavator.
4. Large concrete obstruction ~3', offset to the N
5. Large concrete obstruction ~3', offset 5' E
6. Large concerete obstruction ~3' deep

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B211

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 1/9/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B212
SHEET: 1 of 2
PROJECT NO: 01.0172397.10 REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Ken B.
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME-75
Drilling Method: Hollow Stem Auger

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 30
Date Start - Finish: 1/13/2023 - 1/13/2023

H. Datum:
V. Datum:

Auger/Casing Type: Steel (HSA)
I.D./O.D. (in.): 4.25" / 8"
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375" / 2"
Sampler Hmr Wt (lb.): 140
Sampler Hmr Fall (in.): 30
Other:

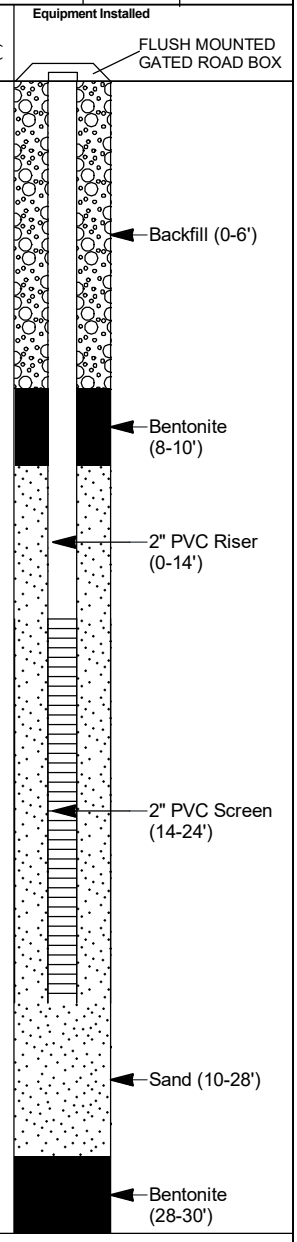
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
1/13/23	1000	13		< 1 hr
2/2/23		12.83		20 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
5									3	
		S-1	8-10	24	21	3 2 2 2	4	S-1A: (Top 3") Dry to moist, loose, brown to dark brown, fine to coarse SAND, some Silt, trace Gravel, trace Brick.		0.1
10		S-2	10-12	24	17	0 1 2 1	3	S-1B: (Next 4") Dry, loose, light brown, fine to coarse SAND, some Gravel, some Pulverized Concrete.		2.2
		S-3	12-14	24	17	2 1 1 1	2	S-1C: (Next 8") Moist, loose, light brown and gray, fine to medium SAND, some Silt, some iron staining.		230
15		S-4	14-16	24	2	0 0 0 0	0	S-1D: (Bottom 2") Moist, loose, light brown, fine to coarse SAND, some Silt.		
		S-5	16-18	24	20	0 0 0 0	0	S-2A: (Top 1") Moist, Pulverized CONCRETE, some fine to coarse Sand, some Silt, some Gravel.	4	167
		S-6	18-20	24	17	0 0 0 0	0	S-2B: (Next 3") Moist, very loose, gray, fine to medium SAND, some Silt, some iron staining.		147
20		S-7	20-22	24	12	WOH WOH	0	S-2C: (Next 3") Moist, very loose, orange brown, fine to coarse SAND, some Silt.		180
		S-8	22-24	24	24	WOH WOR	1	S-2D: (Bottom 8") Moist, very loose, light brown, fine to medium SAND, some Silt.		137
25		S-9	24-26	24	15	WOR 1 1	0	S-3A: (Top 3") Moist, very loose, light brown, fine to medium SAND, some Silt.		79
		S-10	26-28	24	22	WOH WOH	0	S-3B: (Next 6") Moist, very loose, light brown, fine to coarse SAND, some Silt, faint coal tar-like odor.		58
30		S-11	28-30	24	24	WOH WOH	6	S-3C: (Next 3") Moist, very loose, dark brown and dark gray, fine to medium SAND, some Silt, coal tar-like odor.		2.2

Stratum Description (Depth (ft), Elev. (ft))

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 8 feet below ground surface (bgs). See log for VE-12 for soil descriptions in this interval.
4. Trace blebs observed.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B212

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 2/24/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B212
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY:

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
						WOH 1 3 3 3 4		S-3D: (Bottom 6") Moist to wet, very loose, dark brown to black stained, fine to coarse SAND, some Silt, trace Gravel, moderate coal-tar like odor. S-4: Moist, very loose, light brown, fine to coarse SAND, some Silt, trace Gravel. S-5: Wet, very loose, dark brown to black coated, fine to medium SAND, some Silt, trace Gravel. S-6A: (Top 3") Moist, very loose, dark brown, fine to coarse SAND, some Silt, trace Gravel. S-6B: (Bottom 14") Wet, very loose, dark gray to black coated, fine to medium SAND, some Silt. S-7: Wet, very loose, dark gray and black coated, fine to coarse SAND, some Silt. S-8: Wet, very loose, dark gray to black coated, fine to coarse SAND, some Silt, moderate coal tar-like odor. S-9A: (Top 9") Wet, very loose, dark gray to black, fine to medium SAND, some Silt, moderate coal-tar like odor. S-9B: (Bottom 6") Wet, very loose, dark brown to black coated, fine to coarse SAND, some Silt, moderate coal-tar like odor. S-10A: (Top 20") Wet, very loose, dark gray, fine to medium SAND, some Silt. S-10B: Light gray, very loose, fine to coarse SAND, some Silt. S-11A: (Top 21") Wet, loose, dark gray, fine to coarse SAND, some Silt. S-11B: (Bottom 3") Wet, loose, light brown to gray, fine to medium SAND, some Silt.					
35														
40														
45														
50														
55														
60														
65														

Bottom of boring at 30 feet.

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B212

172397.00 NGRID 284 WINTER STREET.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 2/24/2023

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: AS-1
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 38
Date Start - Finish: 4/8/2024 - 4/8/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.50	Well	9 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
5									1	
									2	
									3	
10									4	
15										
20										
25										
30		S-1	31-33	24	16	4 4 8 11	12	S-1: Brown to black, coal-tar coated, fine to medium SAND, some Silt.		239.5
		S-2	33-35	24	10	17 22 17 21	39	Moderate naphthalene-like odor. S-2: Brown, fine to medium SAND and SILT, little Gravel.		26.2
35		S-3	35-37	24	22	28 28 28 40	56	S-3: Brown, fine to coarse SAND, some Silt, little Gravel, trace Crushed Rock.		23.8
40								Bottom of boring at 38 feet.		

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
15'	SAND AND SILT	
38'		

Equipment Installed

REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5 feet below ground surface (bgs).
4. No samples collected from 0 to 31 feet bgs. Stratum descriptions from B-208 log.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: AS-1

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-208 (D) - MW
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Justin Ivas

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 49
Date Start - Finish: 3/27/2024 - 3/27/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

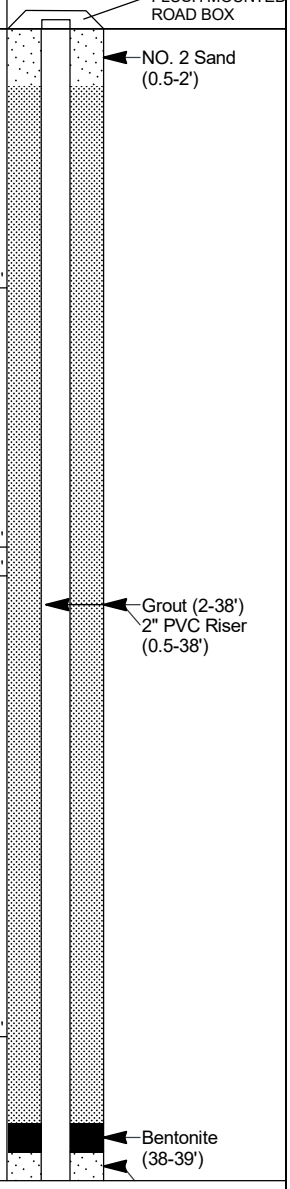
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/1/24		11.4	Well	4 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
10		S-1	9-11	24	15	5 2 / 2 2	4	S-1: Moist, loose, brown, fine to medium SAND, little Silt, trace Gravel.		0.1
		S-2	11-13	24	11	2 2 / 1 1	3	S-2: Moist, loose, brown, fine to medium SAND, some Silt.		0.4
15		S-3	13-15	24	8	2 1 / 1 1	2	S-3: Moist, loose, brown to black-stained fine SAND and SILT, moderate naphthalene-like odor, rainbow sheen on exterior of soil core.		88.4
		S-4	15-17	24	18	3 1 / 1 5	2			60.4
		S-5	17-19	24	20	2 1 / 2 3	3	S-4: Wet, loose, gray stained fine SAND, some Silt, trace root fibers, moderate naphthalene-like odor.		96
20		S-6	19-21	24	14	3 2 / 5 4	7			294.2
		S-7	21-23	24	18	5 3 / 3 3	6	S-5A (Top 4"): Wet, loose, black/gray-stained fine to coarse SAND, little Silt.		371.4
		S-8	23-25	24	0	15 11 / 11 10	22	S-5B" (Bottom 16"): Wet, soft, gray Silty CLAY, moderate naphthalene-like odor.		N/A
25		S-9	25-27	24	0	7 6 / 6 7	12			N/A
		S-10	27-29	24	<1	15 10 / 12 13	22	S-6: Wet, loose, black-stained, fine to coarse SAND, some Silt, trace fibers, trace wood, moderate naphthalene-like odor.		N/A
30		S-11	29-31	24	16	7 6 / 7 9	13		6	67.4
		S-12	31-33	24	17	5 7 / 10 17	17	S-7A (Top half): Wet, loose, black-stained medium to coarse SAND, little Silt, trace fibers, moderate naphthalene-like odor.	7 / 8	65.7
		S-13	33-35	24	13	4 39 / 25 19	64		9	120.2
35		S-14	35-37	24	14	30 23 / 21 18	44	S-7B (Bottom half): Wet, loose, gray fine to medium SAND, some Silt. 1/4" seam of coal tar-saturated SAND ~3" from bottom of recovery. Strong naphthalene-like odor.	10	83.5
		S-15	37-39	24	15	24 24 / 22 35	46			52.7
40		S-16	39-41	24	10	18 19	41	S-8: No recovery.	11	138.1

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
9'	SILTY SAND	
18'	SILTY CLAY	
19'	SILTY SAND	
35'	SAND AND GRAVEL	

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.5 feet below ground surface (bgs).
4. Shallow obstruction encountered in first vacuum-excavation borehole. Borehole offset ~3' east. Obstruction observed in second borehole at ~4 feet bgs; second borehole widened to get past obstruction.
5. Stratum descriptions above 9 feet bgs were taken from the nearby B208-MW boring. Refer to the B208-MW boring log.
6. Switch to firmer baskets in sample spoons.
7. 2-inch layer of coal tar-saturated medium SAND at top of S-11 recovery.
8. Two layers (1" & 1/4") of medium Sand near top of recovery.
9. Several intersitital lenses (<1/4") of coal tar-saturated dark brown, medium SAND in top 4 inches of S-13 recovery.
10. Some brown coal tar-like staining/coating near top of S-14 recovery.
11. Rock chips observed in tip of S-16 sample spoon.
12. Some brown/black staining observed throughout sample S-16.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-208 (D) - MW

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

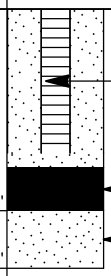
GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-208 (D) - MW
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
						22 62		S-9: No recovery.	12	
		S-17	41-43	24	16	38 29	57	S-10: Wet, gray, coarse SAND, faint naphthalene-like odor. Rainbow sheen in sample spoon. Rock lodged in tip of sample spoon.	13	91.3
						28 29				
		S-18	43-45	24	17	45 55	R		14	15.4
45						62 80				
		S-19	45-47	21	14	28 24	73	S-11: Wet, black and brown, fine SAND and SILT, moderate napthalene-like odor.		13.2
						49 50/3"				
		S-20	47-49	24	15				15	4.6
50								S-12: Wet, gray-stained to tan fine SAND, some Silt, faint to moderate naphthalene-like odor. Sheen observed in sample spoon.		
55								S-13: Moist, gray, very dense Fine SAND, little Silt, trace Gravel, moderate naphthalene-like odor.		
								S-14: Wet, dense, tan/gray fine to medium SAND and GRAVEL, little Silt, faint to moderate naphthalene like odor.		
60								S-15: Wet, dense, gray/tan medium to coarse SAND and GRAVEL, little Silt, faint to moderate naphthalene-like odor.		
65								S-16: Wet, dense, gray/tan fine to coarse SAND and GRAVEL, little Silt, moderate naphthalene-like odor.		
								S17: Moist, gray, very dense fine to coarse SAND and GRAVEL, some Silt, moderate naphthalene-like odor.		
70								S-18: Moist, very dense, gray, brown, and orange, fine to coarse SAND and GRAVEL, some Silt, faint naphthalene-like odor.		
75								S-19: Moist, gray, very dense, fine to coarse SAND, some Gravel, trace Silt.		
								S-20: Moist, very dense, gray-brown, fine to coarse SAND, little Gravel, little Silt.		
80								Bottom of boring at 49 feet.		
85										

Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)
	SAND AND GRAVEL	
47'	SAND	
49'		



REMARKS

13. Lens of coal-tar-like oil observed in fractured gravel in sample S-17.
14. Trace blebs observed at top of S-18 recovery.
15. Blow counts not recorded for sample S-20; at least 40 blows over each 6 inches were reported by the driller.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-208 (D) - MW

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-208 (S) (MW)
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Justin Ivas

Type of Rig: Truck Mounted
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 20
Date Start - Finish: 3/28/2024 - 3/28/2024

H. Datum:
V. Datum:

Auger/Casing Type: Auger
I.D./O.D.(in): 4.25/8.25
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

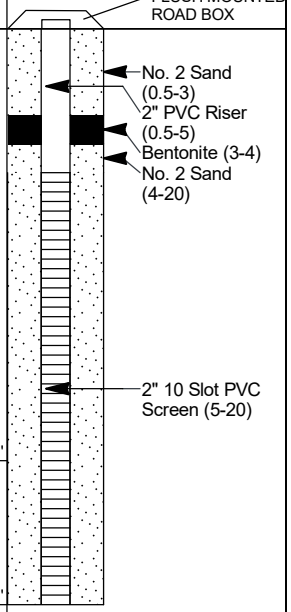
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/1/24		13.04	Well	3 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Depth (ft)	Stratum Description	Elev. (ft)
									1				
									2				
									3				
									4				
5									5				
									6				
												FILL	
10													
15											15'		
												SAND AND SILT	
20											20'		
25													
30													
35													
40													

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 6 feet below ground surface (bgs).
4. Soil samples were not collected during the installation of this well. Refer to the boring log for B208-MW.
5. Stratum descriptions were taken from the nearby boring B208-MW. Refer to the B208-MW boring log.
6. Broken piece of pipe noted in vacuum excavation at 4 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-208 (S) (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-301 (MW)
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Justin Ivas

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 31
Date Start - Finish: 4/1/2024 - 4/1/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

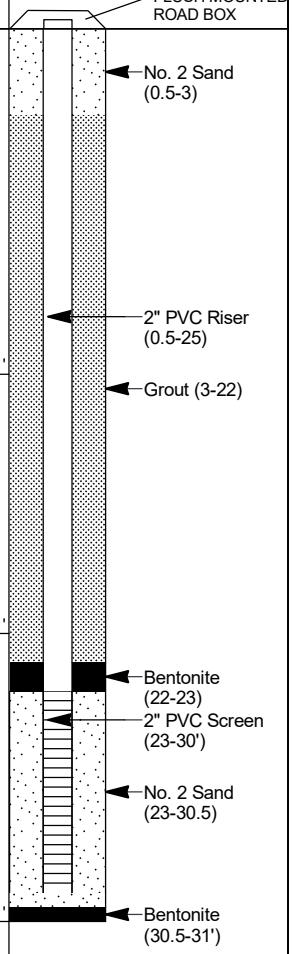
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.75	Well	16 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
10										
15										
		S-1	17-19	24	17	15 6 5 9	11	S-1: Wet, black, medium dense, oil-coated fine SAND and SILT, little Plant Fibers, moderate naphthalene-like odor.	6	132.6
20		S-2	19-21	24	13	6 10 15 12	25			229.3
		S-3	21-23	24	15	4 7 4 4	11	S-2: Wet, black, medium dense, coal tar-saturated Fine SAND, some Silt, little Gravel, strong naphthalene like odor. Sheen observed in spoon.		121
		S-4	23-25	24	10	7 4 2 3	6			48.6
25		S-5	25-27	24	14	5 8 7 7	15	S-3A (Top 4"): Wet, black, medium dense, coal tar-coated SAND & GRAVEL, moderate naphthalene-like odor.		70.2
		S-6	27-29	36	18				7	15.9
30		S-7	29-31	24	0	10 8 10 13	18	S-3B (Bottom 11"): Wet, medium dense, gray & tan fine SAND, some Silt, little Peat Fibers, faint naphthalene-like odor.	8	
35								S-4: Wet, loose, black (coal tar-coated) to gray (stained) fine SAND, some Silt, little Gravel, strong naphthalene-like odor.		
40								S-5: Wet, medium dense, black, coal tar-coated fine SAND, some Silt, moderate naphthalene-like odor.		

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
12'	SILTY SAND	
21'	SAND	
31'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.5 feet below ground surface (bgs).
4. Ten-inch layer of hardened tar purifier-box-waste-like material observed between 2 to 3 feet bgs in vacuum excavation.
5. Stratum descriptions above 17 feet bgs were taken from the nearby boring B212-MW. Refer to the B212-MW boring log.
6. Gravel and trace brick at top of recovery.
7. Possible borehole collapse, sample spoon driven 36 inches from 26 to 29 feet bgs.
8. Driller thinks material between 29 and 31 feet bgs likely cohesive/clayey and may have slid out of the sample spoon.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-301 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-301 (MW)
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								S-6: Wet, gray & tan, fine to medium SAND, little Silt, some interstitial Silty/Clayey lenses, faint naphthalene-like odor.						
45								S-7: No Recovery						
								Bottom of boring at 31 feet.						
50														
55														
60														
65														
70														
75														
80														
85														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-301 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-302 (MW)
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 35
Date Start - Finish: 4/9/2024 - 4/9/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

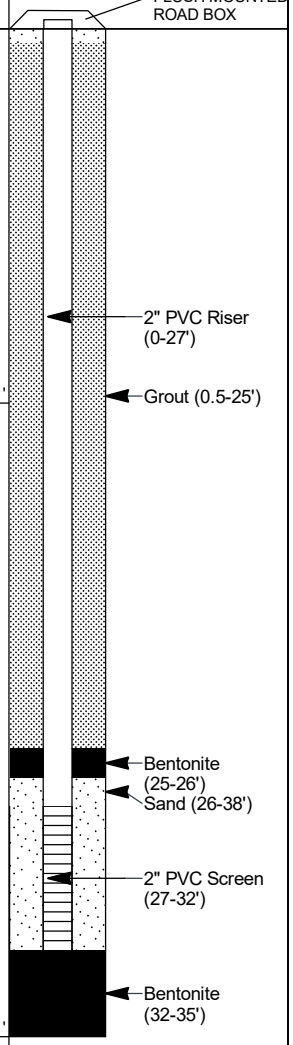
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		13.18	Well	8 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5										
10										
15										
20										
25		S-1	25-27	24	11	4 4 6 7	10	S-1: Brown/gray, coal tar-coated, fine to medium SAND, some Silt. Faint to moderate naphthalene-like odor.		219
		S-2	27-29	24	16	5 6 8 11	14	S-2: Brown/dark gray, coal tar-saturated, fine to medium SAND, some Silt, moderate naphthalene-like odor.		437.2
30		S-3	29-31	24	15	4 6 11 17	17	S-3: Brown and black, coal tar-saturated, fine to medium SAND and SILT, moderate naphthalene-like odor.		88.3
		S-4	31-33	24	24	23 27 21 25	48	S-4: (Top 12") Dark brown and black, coal tar-saturated, fine to medium SAND, some Silt, moderate naphthalene-like odor.		144.3
35		S-5	33-35	24		37 39 27 21	66			6.6
40										

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
13'	SILTY SAND	
35'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5 feet below ground surface (bgs).
4. Obstructions encountered at 1.7 to 2.1 feet bgs in first three vacuum attempts (metal pipe, concrete, brick.) Boring offset three times to reach 5.1 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-302 (MW)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-302 (MW)
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								S-4: (Bottom 12") Brown and gray, fine to medium SAND and SILT, trace Rock. S-5: Gray and orange-brown, fine to coarse SAND and SILT, trace Gravel, faint to moderate naphthalene-like odor.						
45														
								Bottom of boring at 35 feet.						
50														
55														
60														
65														
70														
75														
80														
85														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-302 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-303(D)(MW)
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 35
Date Start - Finish: 4/5/2024 - 4/5/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

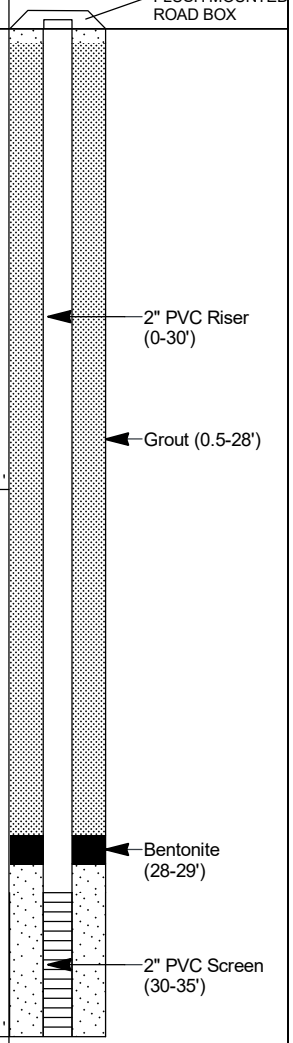
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		13.37		12 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
									6	
10										
15										
20										
25										
		S-1	27-29	24	8	14 15 19 18	34	S-1: Gray, fine to coarse SAND, some Silt, little Gravel, very faint naphthalene-like odor.		0.2
30		S-2	29-31	24	7	10 15 20 19	35	S-2: Gray, fine to coarse SAND, little Silt, some Gravel. Bottom 1" black coal tar-coated Gravel, moderate naphthalene-like odor.		8.6
		S-3	31-33	24	20	22 12 10 14	22			3.1
		S-4	33-35	24	6	23 44 23 23	67			0.1
35								S-3: (Top 9") Grayish brown, fine to coarse SAND, little Silt, some Gravel. S-3: (Next 4") Black, coal tar-coated, fine to coarse SAND, little Silt, some Gravel, moderate naphthalene-like odor.		
40										

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
16'	SAND AND SILT	
35'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5 feet below ground surface (bgs).
4. Soil samples not collected from 0 to 27 feet bgs. Stratum descriptions from adjacent boring (B-207).
5. Petroleum-like odor and staining observed at 2 feet in vacuum excavation.
6. Obstruction encountered at 6 feet bgs. Augers used to advance hole.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-303(D)(MW)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-303(D)(MW)
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								S-3: (Bottom 7") Gray, fine to medium SAND and SILT, trace Gravel. S-4 : Gray and brown, fine to medium SAND and SILT, some Crushed Stone, trace Gravel.						
45								Bottom of boring at 35 feet.						
50														
55														
60														
65														
70														
75														
80														
85														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-303(D)(MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-303(S)
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By:

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 23
Date Start - Finish: 4/1/2024 - 4/1/2024

H. Datum:
V. Datum:

Auger/Casing Type: Auger
I.D./O.D.(in): 4.25/8.25
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

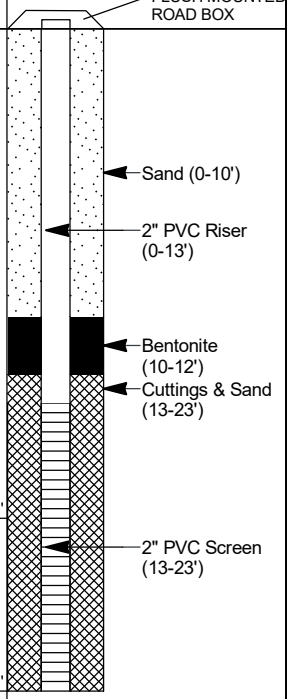
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/27		13.50		16 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5										
10										
		S-1	13-15	24	4	2 1 1 1	2	S-1: (Top 2") Dry, brown, fine to medium SAND, little Silt.		26.0
15		S-2	15-17	24	21	1 0 1 1	1	S-1: (Bottom 2") BRICK and black, coal tar-saturated, fine SAND,		32.9
		S-3	17-19	24	24	1 3 3 3	6	moderate naphthalene-like odor. S-2: Black, coal tar-saturated, fine		23.0
20		S-4	19-21	24	9	7 9 3 3	12	SAND, trace Wood, moderate naphthalene-like odor.		118
		S-5	21-23	24	24	7 7 7 7	14	S-3: (Top 15") Black, coal tar-saturated, fine SAND, sheen, moderate naphthalene-like odor, wet.		143.2
25								S-3: (Bottom 9") Brown, fine SAND, some Silt, trace Plant Debris, moist. S-4: Black, fine SAND, little Silt, Wood Debris.		
30								S-5: (Top 15") Gray and black, fine to coarse SAND, some Silt, trace Plant Debris. S-5: (Bottom 9") Black, coal tar-saturated, fine to coarse SAND, sheen, naphthalene-like odor, wet.		
35								Bottom of boring at 23 feet.		
40										

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
17'	SAND	
23'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.5 feet below ground surface (bgs).
4. Petroleum-like odor and staining observed at 2 feet bgs in vacuum excavation.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-303(S)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-304 (MW)
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 25
Date Start - Finish: 3/29/2024 - 3/29/2024

H. Datum:
V. Datum:

Auger/Casing Type: Auger
I.D./O.D.(in): 4.25/8.25
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

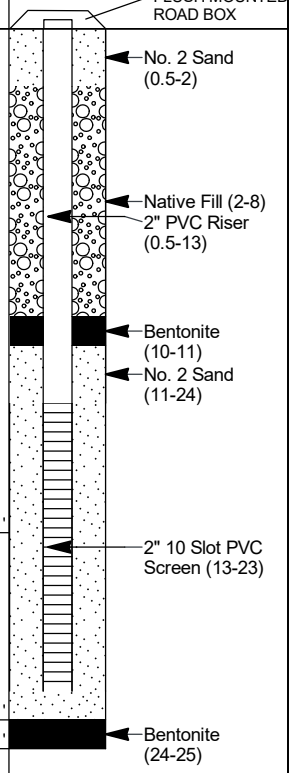
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		14.09		18 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
									6	
10										
		S-1	13-15	24	13	3 3 2 3	5	S-1: Wet, black, loose, coal tar-stained to coated GRAVEL, little fine Sand, trace silt, moderate to strong naphthalene-like odor.	7	206.3
15		S-2	15-17	24	6	2 10 3 3	13		8	148
		S-3	17-19	24	24	2 2 3 3	5	S-2: Wet, black, medium dense, stained GRAVEL, some slag, some wood, trace Silt, moderate naphthalene-like odor.		187
20		S-4	19-21	24	13	1 5 4 7	9			71.4
		S-5	21-23	24	18	8 8 9 11	17	S-3A (top 6"): Wet, black, loose, stained GRAVEL, some slag, some wood, trace Silt, moderate naphthalene-like odor.		18.4
		S-6	23-25	24	19	7 6 8 8	14			1.5
25								S-3B (Next 16"): Wet, black, loose, coal tar-saturated SILT, little organic fibers, strong naphthalene-like odor. S-3C (Bottom 2"): Wet, gray/tan, loose Fine SAND, some Silt, strong naphthalene-like odor.		
30								S-4: Wet, brown, loose, fine SAND, some Silt, with interstiitial coal tar lenses and blebs observed throughout, strong naphthalene-like odor.		
35								S-5: Wet, medium dense, tan and brown fine SAND, some Silt, coal tar-saturated layers (1/4") observed ~3" from top and 3" from bottom of		
40										

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
17.5'	SAND AND SILT	
24'	SILTY CLAY	
25'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.5 feet below ground surface (bgs).
4. No samples collected from 0 to 13 feet bgs. Stratum description from nearby logs.
5. Petroleum-like odor observed at 2 feet bgs during vacuum excavation.
6. Obstructions encountered at 3 to 4.6 feet bgs in first two vacuum attempts (metal, concrete, wood beam); boring offset twice to reach 5.5 feet bgs.
7. Concrete or large rock encountered from approx. 7 to 8 feet bgs.
8. Top 3 inches of S-1 recovery consisted of pulverized concrete.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-304 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-304 (MW)
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								recovery, moderate to strong naphthalene-like odor. S-6A (top half): Wet, medium dense, brown, orange, and gray stained fine SAND, some Silt. Coal tar-saturated lenses noted. S-6B (Bottom half): Wet, stiff, gray Silty CLAY, little fine Sand, trace Gravel.						
45														
50								Bottom of boring at 25 feet.						
55														
60														
65														
70														
75														
80														
85														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-304 (MW)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-305 (MW)
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 36
Date Start - Finish: 4/2/2023 - 4/3/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

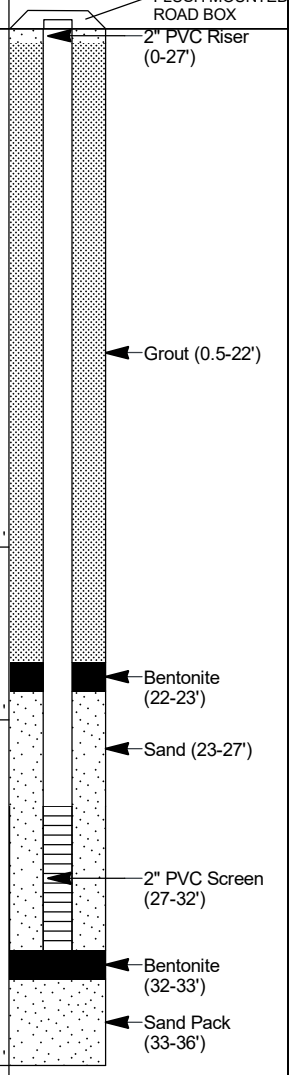
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		14.10		14 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
10										
15										
20										
		S-1	22-24	24	4	11 14 10 10	24	S-1: Brown/gray, fine to medium SAND and SILT.		2.1
25		S-2	24-26	24	10	9 7 7 8	14	S-2: Gray, fine SAND, trace Silt, faint naphthalene-like odor.		7.8
		S-3	26-28	24	12	4 7 8 10	15	S-3: Gray, fine SAND, trace Silt, faint naphthalene-like odor.		23.7
		S-4	28-30	24	10	4 6 9 11	15	S-4: Grayish brown, fine SAND, trace Silt.		2.3
30		S-5	30-32	24	10	6 7 11 15	18	S-5: Grayish brown, fine SAND, trace Silt.		0.3
		S-6	32-34	24	18	14 14 16 18	30	S-6: Grayish brown, fine SAND, trace Silt.		0.1
35		S-7	34-36	24	11	6 6 4 5	10	S-7: Gray, fine SAND, trace Silt.		0.1
40								Bottom of boring at 36 feet.		

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
18'	SAND AND SILT	
24'	SAND	
36'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.5 feet below ground surface (bgs).
4. No samples collected from 0 to 22 feet bgs; strata descriptions from nearby log (B-205).
5. Petroleum-like odor and staining noted at 3 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-305 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-306 (MW)
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Justin Ivas

Type of Rig: Truck Mounted
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 18
Date Start - Finish: 3/28/2024 - 3/28/2024

H. Datum:
V. Datum:

Auger/Casing Type: Auger
I.D./O.D.(in): 4.25/8.25
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

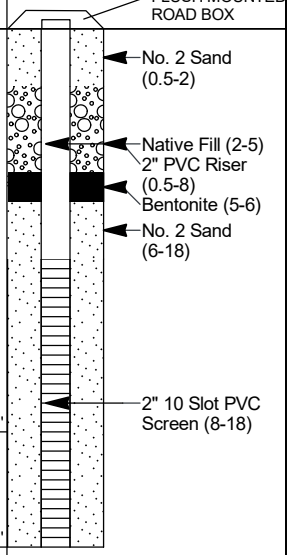
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.55		20 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
15		S-1	14-16	24	21	1 1 0 1	1	S-1: Wet, very loose, black/gray-stained SILT, some fine Sand, strong H2S-like odor, moderate naphthalene-like odor.		112
		S-2	16-18	24	19	WoH				64
20								S-2: Wet, very loose, black/gray-stained SILT, some fine Sand, strong H2S-like odor, moderate naphthalene-like odor.		
								Bottom of boring at 18 feet.		

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
14'	SILT	
18'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Stratum descriptions above 14 feet below ground surface (bgs) were inferred from the nearby B-206 boring. Refer to the B-206 boring log.
4. Petroleum-like odor observed during vacuum excavation at approximately 2 feet bgs.
5. Loose bricks and concrete observed during vacuum excavation at approximately 3.5 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-306 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-307 (MW)
SHEET: 1 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 36
Date Start - Finish: 4/3/2024 - 4/5/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

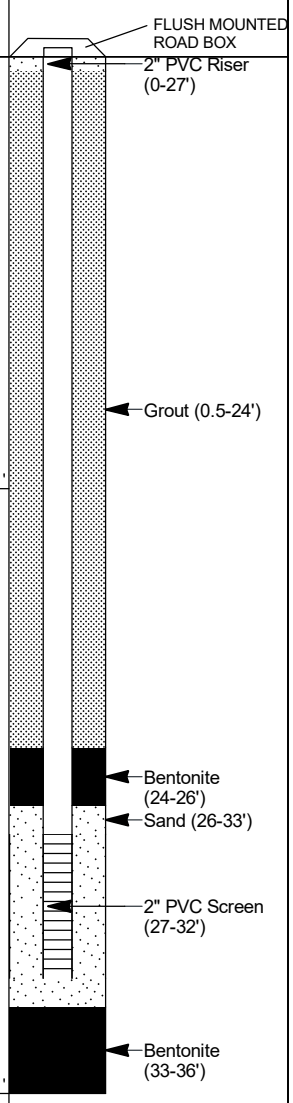
Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		13.68		12 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data
									1	
									2	
									3	
									4	
5									5	
									6	
									7	
10										
15										
20		S-1	20-22	24	24	1 0 / 2 3	2	S-1: Dark brown, fine to medium SAND and SILT, trace Wood Fibers and Plant Debris, sheen present in water, faint naphthalene-like odor.		178.1
		S-2	22-24	24	16	7 11 / 9 10	20			57.9
25		S-3	24-26	24	10	4 4 / 5 3	9	S-2: (Top 3") Dark brown, fine to medium SAND and SILT, trace Wood Fibers and Plant Debris, sheen present in water, faint naphthalene-like odor.		15.6
		S-4	26-28	24	14	8 9 / 24 21	33			16.1
		S-5	28-30	24	7	15 20 / 14 14	34			0.3
30		S-6	30-32	24	8	11 11 / 8 12	19	S-2: (Next 14") Black, coal tar-saturated, fine to coarse SAND, some Silt, trace Rock, faint petroleum/naphthalene-like odor.		0.1
		S-7	32-34	24	12	2 9 / 27 20	36			0.2
35		S-8	34-36	24		35 22 / 15 18	37	S-2: (Bottom 9") Black, coal tar-saturated, medium to coarse SAND, little Silt, moderate naphthalene-like odor.		ND
								S-3: Gray, fine to medium SAND, trace Silt, faint naphthalene-like odor.		
40								S-4: (Top 11") Gray, fine to medium		

Depth (ft)	Stratum Description	Elev. (ft)
	FILL	
15'	SAND AND SILT	
36'		

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 5 feet below ground surface (bgs).
4. Petroleum-like odor at 2 feet bgs.
5. Soil samples not collected from 0 to 20 feet bgs. Stratum descriptions from nearby borings.
6. Obstructions encountered at 2.7 to 3.7 feet bgs at first three vacuum attempts (metal and concrete.) Vacuum excavation offset three times to reach 5 feet bgs.
7. Concrete encountered at 7 to 8 feet bgs. Used auger to advance hole through concrete.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-307 (MW)

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: B-307 (MW)
SHEET: 2 of 2
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Stratum Elev. (ft)	Equipment Installed
								SAND, some Silt, trace layers of black, coal tar-coated Sand.						
45								S-4: (Bottom 3") Gray/brown, medium to coarse SAND, some Silt, trace Crushed Rock.						
								S-5: Gray, Clayey SILT, some coarse Sand, trace Crushed Rock.						
								S-6: Gray, fine to coarse SAND, some Silt, little Mica Flakes, trace Crushed Rock.						
50								S-7: Gray and brown, fine to coarse SAND, some Silt, little Crushed Rock.						
								S-8: Gray, fine to coarse SAND, some Silt, some Crushed Rock.						
55								Bottom of boring at 36 feet.						
60														
65														
70														
75														
80														
85														

REMARKS

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: B-307 (MW)

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: PZ-1
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 28
Date Start - Finish: 4/12/2024 - 4/12/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

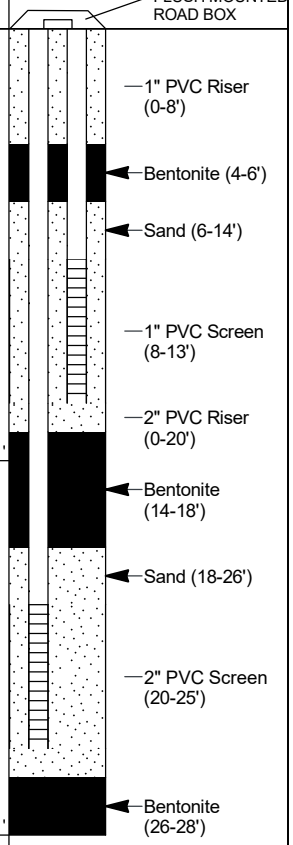
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		13.50		5 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Elev. (ft)
									1			
									2			
									3			
5												
10											FILL	
15											15'	
20											SAND AND SILT	
25											28'	
								Bottom of boring at 28 feet.				
30												
35												
40												

Equipment Installed



REMARKS

1. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.3 feet below ground surface (bgs).
2. No soil samples collected. Strata descriptions from B-208.
3. Obstructions encountered at 1.5 to 2.2 feet bgs at first four vacuum attempts (concrete, brick.) Boring offset 4 times to reach 5.3 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: PZ-1

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: PZ-2
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 28
Date Start - Finish: 4/11/2024 - 4/11/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

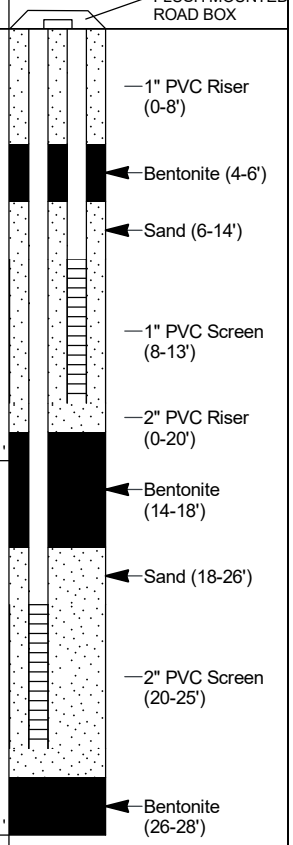
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		13.06		6 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description (Depth (ft))	Elev. (ft)
									1			
									2			
									3			
5												
											FILL	
10												
15											15'	
20									4		SAND AND SILT	
25											28'	
								Bottom of boring at 28 feet.				
30												
35												
40												

Equipment Installed



REMARKS

1. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.2 feet below ground surface (bgs).
2. No soil samples collected. Strata descriptions from B-208.
3. Obstruction encountered at 2.1 feet bgs in first vacuum attempt (brick.) Boring offset 4 feet north to reach 5.2 feet bgs.
4. Separate phase product observed while drilling at 20 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: PZ-2

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: PZ-3
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 28
Date Start - Finish: 4/11/2024 - 4/12/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

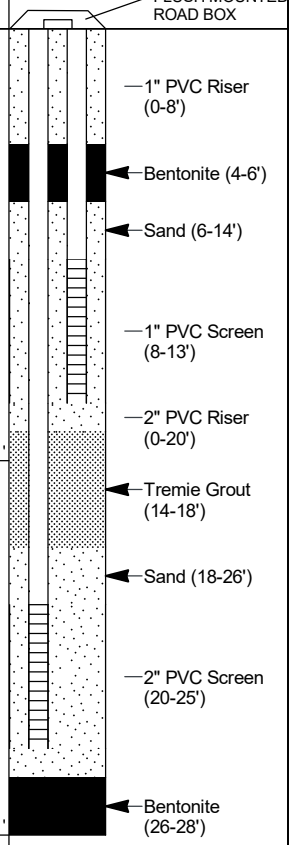
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.47		5 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Depth (ft)	Stratum Description	Elev. (ft)
									1				
									2				
									3				
									4				
5									5				
									5				
												FILL	
10													
15											15'		
												SAND AND SILT	
20													
25											28'		
								Bottom of boring at 28 feet.					
30													
35													
40													

Equipment Installed



REMARKS

1. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.2 feet below ground surface (bgs).
2. No soil samples collected. Strata descriptions from B-208.
3. Note that 2-inch screen and riser were installed on 4/11/24, tremie grouted, let set overnight.
4. Three-inch layer of possible purifier box waste or hardened tar encountered at 2 feet bgs.
5. Obstructions encountered at 2.1 to 2.5 feet bgs at first two vacuum attempts (concrete, hardened tar.) boring offset twice to reach 5.2 feet bgs.
5. Augered through obstruction at 2.5 feet bgs at final location.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: PZ-3

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: PZ-4
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 28
Date Start - Finish: 4/10/2024 - 4/10/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

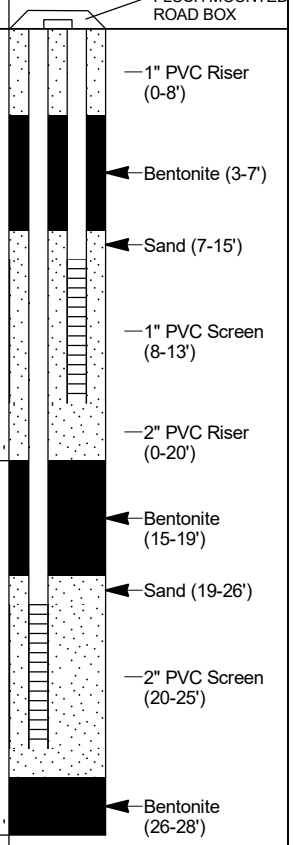
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.80		7 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Stratum Description Depth (ft)	Elev. (ft)
									1			
									2			
5												
											FILL	
10												
15											15'	
20									3			
											SAND AND SILT	
25												
											28'	
								Bottom of boring at 28 feet.				
30												
35												
40												

Equipment Installed



REMARKS

1. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.4 feet below ground surface (bgs).
2. No soil samples collected. Strata descriptions from B-208.
3. Separate phase product observed in drill return water at 20 feet bgs.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: PZ-4

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: PZ-5
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Olivia Baglieri

Type of Rig: Truck Mounted
Rig Model: CME55
Drilling Method: Drive & Wash

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 28
Date Start - Finish: 4/10/2024 - 4/10/2024

H. Datum:
V. Datum:

Auger/Casing Type: Steel
I.D./O.D.(in): 4/4.5
Hmr Weight (lb.): 140
Hmr Fall (in.): 30
Other:

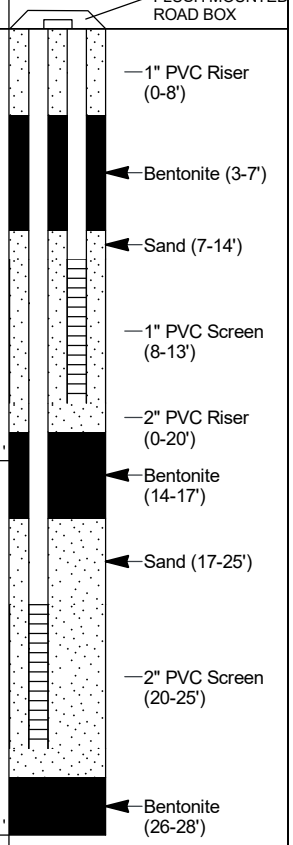
Sampler Type: Split Spoon
I.D./O.D (in.): 1.375/2
Sampler Hmr Wt (lb): 140
Sampler Hmr Fall (in): 30
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.53		7 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Depth (ft)	Stratum Description	Elev. (ft)
									1				
									2				
5													
10												FILL	
15											15'		
20												SAND AND SILT	
25											28'		
								Bottom of boring at 28 feet.					
30													
35													
40													

Equipment Installed



REMARKS

1. Borehole initiated via vacuum excavation techniques to an approximate depth of 5.3 feet below ground surface (bgs).
2. No soil samples collected. Strata descriptions from B-104 and B-212.

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: PZ-5

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

284 Winter Street
Haverhill, Massachusetts

BORING NO.: SVE-1
SHEET: 1 of 1
PROJECT NO: 01.0172397.10
REVIEWED BY: CAL

Drilling Co.: Geosearch, Inc.
Foreman: Rodney Dean
Logged By: Justin Ivas

Type of Rig: Truck Mounted
Rig Model: CME-55
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.):
Final Boring Depth (ft.): 15
Date Start - Finish: 3/29/2024 - 3/29/2024

H. Datum:
V. Datum:

Auger/Casing Type: Auger
I.D./O.D.(in): 6.25/10.25
Hmr Weight (lb.):
Hmr Fall (in.):
Other:

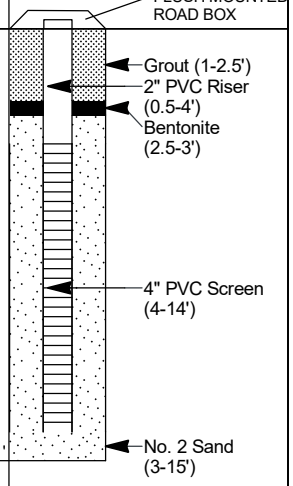
Sampler Type: N/A
I.D./O.D (in.):
Sampler Hmr Wt (lb):
Sampler Hmr Fall (in):
Other:

Groundwater Depth (ft.)

Date	Time	Water Depth	Casing	Stab. Time
4/17/24		12.78		19 days

Depth (ft)	Casing Blows/ Core Rate Min/ft	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description Modified Burmister	Remark	Field Test Data	Depth (ft)	Stratum Description	Elev. (ft)
									1				
									2				
									3				
									3				
5									4				
									5				
												FILL	
10													
15											15'		
								Bottom of boring at 15 feet.					
20													
25													
30													
35													
40													

Equipment Installed



REMARKS

1. Field testing results represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using a Ion Science Phocheck Tiger organic vapor meter equipped with a photoionization detector (PID) and 10.6eV lamp. Results in parts per million by volume (ppmv). ND indicates non-detected (<0.1 ppmv).
2. Photographic logs of each soil sample were taken in the field and are on file in the GZA electronic file directory.
3. Borehole initiated via vacuum excavation techniques to an approximate depth of 15 feet below ground surface (bgs).
3. Petroleum-like odor observed around 2 to 3 feet bgs.
4. Obstruction encountered during vacuum excavation at 4 feet bgs. Borehole offset 3 feet northwest and cleared to 5 feet bgs. Wood and reinforcing rods observed in fill.
5. Stratum descriptions taken from the nearby B-208 (MW) boring. Refer to the B-208 (MW) boring log..

See log key for explanation of sample descriptions and identification procedures. Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual. Water level readings have been made at the times and under the conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the times the measurements were made.

Boring No.: SVE-1

172397.10 284 WINTER ST HAVERHILL MA.GPJ; STANDARD BORING W/E W/O SMP 2PG2; 5/1/2024