Known for excellence.
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REVISED PHASE III REMEDIAL ACTION PLAN & PHASE IV REMEDY IMPLEMENTATION PLAN SELECTED APPENDICES
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

GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue | Norwood, MA 02062
781-278-3700

Offices Nationwide
www.gza.com

APPENDIX G - SOIL ANALYTICAL DATA

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: 284 Winter St, Haverhill MA (01.0172397.10)
ESS Laboratory Work Order Number: 24C1015

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 1:35 pm, Apr 05, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24C1015

SAMPLE RECEIPT

The following samples were received on March 29, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24C1015-01	B208-D_S7_21-23	Soil	MA-VPH-2.1
24C1015-02	B208-D_S16_39-41	Soil	MA-VPH-2.1
24C1015-03	B208-D_S18_43-45	Soil	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24C1015

PROJECT NARRATIVE

MADEP-VPH Volatile Petroleum Hydrocarbon

24C1015-02 **Elevated Method Reporting Limits due to sample matrix (EL).**
C9-C12 Aliphatics2,3

24C1015-03 **Surrogate recovery(ies) above upper control limit (S+).**
2,5-Dibromotoluene - PID (139% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24C1015

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24C1015

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24C1015-01 through 24C1015-03**

Matrices: ( ) Ground Water/Surface Water (x) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(x) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (x) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (x) No ( )
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 (x) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (x) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (x) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (x) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes ( ) No (x)*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (x)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (x) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: April 05, 2024

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208-D_S7_21-23
Date Sampled: 03/27/24 10:10
Percent Solids: 75
Initial Volume: 33.4g
Final Volume: 15ml
Extraction Method: 5035
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24C1015
ESS Laboratory Sample ID: 24C1015-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**1130** (9.40)		MA-VPH-2.1		1	04/01/24 15:45	D4D0030	DD40125
C5-C8 Aliphatics1,2	**629** (18.8)		MA-VPH-2.1		50	04/02/24 8:45		[CALC]
C9-C12 Aliphatics2,3	**217** (37.6)		MA-VPH-2.1		50	04/02/24 8:45		[CALC]
Benzene	**350** (4.70)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
Ethylbenzene	**167** (4.70)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
Methyl tert-Butyl Ether	ND (0.05)		MA-VPH-2.1		1	04/01/24 15:45	D4D0030	DD40125
Naphthalene	**1070** (4.70)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
Toluene	**100** (4.70)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
Xylene O	**99.8** (4.70)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
Xylene P,M	**182** (9.40)		MA-VPH-2.1		50	04/02/24 8:45	D4D0030	DD40125
1:1 Methanol/Soil Ratio %D	**120** (N/A)		MA-VPH-2.1			04/01/24 8:00		DD40125
Preservative:	**MeOH - covered**		MA-VPH-2.1					DD40125

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*121 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*108 %*		*70-130*
Surrogate: Trifluorotoluene - FID	*112 %*		*70-130*
Surrogate: Trifluorotoluene - PID	*122 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208-D_S16_39-41
Date Sampled: 03/27/24 13:45
Percent Solids: 89
Initial Volume: 25.7g
Final Volume: 15ml
Extraction Method: 5035
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24C1015
ESS Laboratory Sample ID: 24C1015-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**611** (7.79)		MA-VPH-2.1		1	04/01/24 16:17	D4D0030	DD40125
C5-C8 Aliphatics1,2	**27.8** (8.14)		MA-VPH-2.1		1	04/01/24 16:17		[CALC]
C9-C12 Aliphatics2,3	**EL** ND (31.2)		MA-VPH-2.1		50	04/02/24 8:13		[CALC]
Benzene	**1.30** (0.16)		MA-VPH-2.1		1	04/01/24 16:17	D4D0030	DD40125
Ethylbenzene	**48.4** (3.90)		MA-VPH-2.1		50	04/02/24 8:13	D4D0030	DD40125
Methyl tert-Butyl Ether	ND (0.04)		MA-VPH-2.1		1	04/01/24 16:17	D4D0030	DD40125
Naphthalene	**738** (3.90)		MA-VPH-2.1		50	04/02/24 8:13	D4D0030	DD40125
Toluene	**15.7** (0.16)		MA-VPH-2.1		1	04/01/24 16:17	D4D0030	DD40125
Xylene O	**33.4** (3.90)		MA-VPH-2.1		50	04/02/24 8:13	D4D0030	DD40125
Xylene P,M	**70.4** (7.79)		MA-VPH-2.1		50	04/02/24 8:13	D4D0030	DD40125
1:1 Methanol/Soil Ratio %D	**71** (N/A)		MA-VPH-2.1			04/01/24 8:00		DD40125
Preservative:	**MeOH - covered**		MA-VPH-2.1					DD40125

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*97 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*93 %*		*70-130*
Surrogate: Trifluorotoluene - FID	*87 %*		*70-130*
Surrogate: Trifluorotoluene - PID	*97 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208-D_S18_43-45
Date Sampled: 03/27/24 14:40
Percent Solids: 90
Initial Volume: 26.7g
Final Volume: 15ml
Extraction Method: 5035
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24C1015
ESS Laboratory Sample ID: 24C1015-03
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (7.35)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
C5-C8 Aliphatics1,2	ND (7.68)		MA-VPH-2.1		1	04/01/24 15:14		[CALC]
C9-C12 Aliphatics2,3	ND (15.3)		MA-VPH-2.1		1	04/01/24 15:14		[CALC]
Benzene	ND (0.15)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Ethylbenzene	ND (0.15)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Methyl tert-Butyl Ether	ND (0.04)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Naphthalene	**1.54** (0.15)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Toluene	ND (0.15)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Xylene O	ND (0.15)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
Xylene P,M	ND (0.29)		MA-VPH-2.1		1	04/01/24 15:14	D4D0030	DD40125
1:1 Methanol/Soil Ratio %D	**78** (N/A)		MA-VPH-2.1			04/01/24 8:00		DD40125
Preservative:	**MeOH - covered**		MA-VPH-2.1					DD40125

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*127 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*139 %*	*S+*	*70-130*
Surrogate: Trifluorotoluene - FID	*100 %*		*70-130*
Surrogate: Trifluorotoluene - PID	*107 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA

ESS Laboratory Work Order: 24C1015

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD40125 - 5035										
Blank										
Benzene	ND	0.20	mg/kg wet							
C5-C8 Unadjusted Aliphatics	ND	10.0	mg/kg wet							
C9-C10 Aromatics	ND	10.0	mg/kg wet							
C9-C12 Unadjusted Aliphatics	ND	10.0	mg/kg wet							
Ethylbenzene	ND	0.20	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.05	mg/kg wet							
Naphthalene	ND	0.20	mg/kg wet							
Toluene	ND	0.20	mg/kg wet							
Xylene O	ND	0.20	mg/kg wet							
Xylene P,M	ND	0.40	mg/kg wet							
Surrogate: 2,5-Dibromotoluene - FID	*4.41*		mg/kg wet	*5.000*		*88*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*4.67*		mg/kg wet	*5.000*		*93*	*70-130*			
Surrogate: Trifluorotoluene - FID	*4.69*		mg/kg wet	*5.333*		*88*	*70-130*			
Surrogate: Trifluorotoluene - PID	*5.06*		mg/kg wet	*5.333*		*95*	*70-130*			
LCS										
Benzene	5.07	0.20	mg/kg wet	5.000		101	70-130			
C5-C8 Unadjusted Aliphatics	45.0	10.0	mg/kg wet	40.00		113	70-130			
C9-C10 Aromatics	9.28	10.0	mg/kg wet	10.00		93	70-130			
C9-C12 Unadjusted Aliphatics	22.2	10.0	mg/kg wet	30.00		74	70-130			
Ethylbenzene	5.03	0.20	mg/kg wet	5.000		101	70-130			
Methyl tert-Butyl Ether	14.8	0.05	mg/kg wet	15.00		99	70-130			
Naphthalene	7.51	0.20	mg/kg wet	10.00		75	70-130			
Toluene	14.7	0.20	mg/kg wet	15.00		98	70-130			
Xylene O	9.67	0.20	mg/kg wet	10.00		97	70-130			
Xylene P,M	19.6	0.40	mg/kg wet	20.00		98	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*5.35*		mg/kg wet	*5.000*		*107*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*5.81*		mg/kg wet	*5.000*		*116*	*70-130*			
Surrogate: Trifluorotoluene - FID	*4.59*		mg/kg wet	*5.333*		*86*	*70-130*			
Surrogate: Trifluorotoluene - PID	*5.16*		mg/kg wet	*5.333*		*97*	*70-130*			
LCS Dup										
Benzene	5.20	0.20	mg/kg wet	5.000		104	70-130	3	25	
C5-C8 Unadjusted Aliphatics	47.1	10.0	mg/kg wet	40.00		118	70-130	4	25	
C9-C10 Aromatics	9.00	10.0	mg/kg wet	10.00		90	70-130	3	25	
C9-C12 Unadjusted Aliphatics	23.0	10.0	mg/kg wet	30.00		77	70-130	4	25	
Ethylbenzene	4.61	0.20	mg/kg wet	5.000		92	70-130	9	25	
Methyl tert-Butyl Ether	14.8	0.05	mg/kg wet	15.00		99	70-130	0.3	25	
Naphthalene	7.29	0.20	mg/kg wet	10.00		73	70-130	3	25	
Toluene	15.0	0.20	mg/kg wet	15.00		100	70-130	2	25	
Xylene O	9.61	0.20	mg/kg wet	10.00		96	70-130	0.7	25	
Xylene P,M	19.6	0.40	mg/kg wet	20.00		98	70-130	0.3	25	
Surrogate: 2,5-Dibromotoluene - FID	*5.22*		mg/kg wet	*5.000*		*104*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*5.76*		mg/kg wet	*5.000*		*115*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24C1015

Notes and Definitions

Z-04	MeOH - covered
U	Analyte included in the analysis, but not detected
S+	Surrogate recovery(ies) above upper control limit (S+).
EL	Elevated Method Reporting Limits due to sample matrix (EL).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA

ESS Laboratory Work Order: 24C1015

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24C1015
Date Received: 3/29/2024
Project Due Date: 4/5/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.6 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? No
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

See attached

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	533842	Yes	N/A	Yes	VOA Vial	MeOH	
1	533845	Yes	N/A	Yes	4 oz. Jar	NP	
2	533843	Yes	N/A	Yes	VOA Vial	MeOH	
2	533846	Yes	N/A	Yes	4 oz. Jar	NP	
3	533844	Yes	N/A	Yes	VOA Vial	MeOH	
3	533847	Yes	N/A	Yes	4 oz. Jar	NP	

2nd Review

Initials

Were all containers scanned into storage/lab? Yes / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 3/29/24 1622
Reviewed By: Date & Time: 3/29/24 1659

CHAIN OF CUSTODY

ESS LABORATORY
185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

ESS Lab # 24C1015 | Page 1 of 1

Turn Time: ☐ >5 ☑ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day
Regulatory State: MA Criteria: CAM
Is this project for any of the following?: ☐ CT RCP ☑ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☑ EQuIS
☑ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt Ave
Norwood, MA 02062
Phone: 781-278-3700
Email Distribution List: charles.lindberg@gza.com
justin.ivas@gza.com, matthew.dias@gza.com
vijay.radis@gza.com

PROJECT INFORMATION

Project Name: 284 WATER ST, HAVERHILL, MA
Project Location: HAVERHILL, MA
Project Number: 01.0172397.10
Project Manager: JUSTIN IVAS
Bill to: GZA
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	TCLP	Total Number of Bottles
1	3/27/24	1010	G	S	B208(D)_S7_21-23	X	
2	3/27/24	1345	G	S	B208(D)_S16_39-41	X	
3	3/27/24	1440	G	S	B208(D)_S18_43-45	X	

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Sampled by: JUSTIN IVAS

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 2.6 / 1C

Comments: * Please specify "Other" preservative and containers types in this space

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
[signature]	3/28/24	1700	[signature]	[signature]	3/29/24		[signature] 3/29/24 13:39
[signature]	3/29/24	18:05	[signature]				

Rec'd the following not on COC:

- B 208 (D) S1 9-11 @ 3/27 0905
- S1 14-16 @ 3/28 1340
- S2 11-13 @ 3/27 0910
- S3 13-15 @ 3/27 0920
- S4 15-17 @ 3/27 (no time)
- S5 17-19 @ 3/27 0945
- S6 19-21 @ 3/27 0955
- S11 29-31 @ 3/27 1120
- S12 31-33 @ 3/27 (no time)
- S13 33-35 @ 3/27 1150
- S14 35-37 @ 3/27 1255
- S15 37-39 @ 3/27 1310
- S17 41-43 @ 3/27 1400
- S19 45-47 @ 3/27 1515
- S20 47-49 @ 3/28 0900

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: NGrid Haverhill (01.0172397.10)
ESS Laboratory Work Order Number: 24D0344

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 6:15 pm, Apr 16, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

SAMPLE RECEIPT

The following samples were received on April 10, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24D0344-01	AS-1-31-33 bgs	Soil	MA-VPH-2.1
24D0344-02	B302-27-29 bgs	Soil	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

PROJECT NARRATIVE

MADEP-VPH Volatile Petroleum Hydrocarbon
D4D0317-CCV1 **Surrogate recovery(ies) above upper control limit (S+).**
2,5-Dibromotoluene - PID (121% @ 80-120%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24D0344-01 through 24D0344-02**

Matrices: ( ) Ground Water/Surface Water (x) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(x) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (x) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (x) No ( )
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 (x) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (x) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (x) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (x) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (x) No ( )*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (x)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (x) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: April 16, 2024

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill
Client Sample ID: AS-1-31-33 bgs
Date Sampled: 04/09/24 12:40
Percent Solids: 85
Initial Volume: 24g
Final Volume: 15ml
Extraction Method: 5035
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0344
ESS Laboratory Sample ID: 24D0344-01
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**2930** (9.01)		MA-VPH-2.1		1	04/11/24 17:13	D4D0263	DD41127
C5-C8 Aliphatics1,2	**1050** (27.1)		MA-VPH-2.1		100	04/15/24 16:41		[CALC]
C9-C12 Aliphatics2,3	**1820** (54.0)		MA-VPH-2.1		100	04/15/24 16:41		[CALC]
Benzene	**75.3** (9.01)		MA-VPH-2.1		100	04/15/24 16:41	D4D0263	DD41127
Ethylbenzene	**430** (9.01)		MA-VPH-2.1		100	04/15/24 16:41	D4D0263	DD41127
Methyl tert-Butyl Ether	ND (0.05)		MA-VPH-2.1		1	04/11/24 17:13	D4D0263	DD41127
Naphthalene	**2510** (45.0)		MA-VPH-2.1		500	04/16/24 8:02	D4D0263	DD41127
Toluene	**397** (9.01)		MA-VPH-2.1		100	04/15/24 16:41	D4D0263	DD41127
Xylene O	**232** (9.01)		MA-VPH-2.1		100	04/15/24 16:41	D4D0263	DD41127
Xylene P,M	**455** (18.0)		MA-VPH-2.1		100	04/15/24 16:41	D4D0263	DD41127
1:1 Methanol/Soil Ratio %D	**60** (N/A)		MA-VPH-2.1			04/11/24 8:00		DD41127
Preservative:	**MeOH - covered**		MA-VPH-2.1					DD41127

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*84 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*81 %*		*70-130*
Surrogate: Trifluorotoluene - FID	*96 %*		*70-130*
Surrogate: Trifluorotoluene - PID	*104 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill
Client Sample ID: B302-27-29 bgs
Date Sampled: 04/09/24 12:40
Percent Solids: 87
Initial Volume: 26.2g
Final Volume: 15ml
Extraction Method: 5035
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0344
ESS Laboratory Sample ID: 24D0344-02
Sample Matrix: Soil
Units: mg/kg dry
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**1310** (8.17)		MA-VPH-2.1		1	04/11/24 16:41	D4D0263	DD41127
C5-C8 Aliphatics1,2	**136** (8.54)		MA-VPH-2.1		1	04/11/24 16:41		[CALC]
C9-C12 Aliphatics2,3	**373** (49.0)		MA-VPH-2.1		100	04/15/24 16:10		[CALC]
Benzene	**2.31** (0.16)		MA-VPH-2.1		1	04/11/24 16:41	D4D0263	DD41127
Ethylbenzene	**127** (8.17)		MA-VPH-2.1		100	04/15/24 16:10	D4D0263	DD41127
Methyl tert-Butyl Ether	ND (0.04)		MA-VPH-2.1		1	04/11/24 16:41	D4D0263	DD41127
Naphthalene	**1010** (8.17)		MA-VPH-2.1		100	04/15/24 16:10	D4D0263	DD41127
Toluene	**6.00** (0.16)		MA-VPH-2.1		1	04/11/24 16:41	D4D0263	DD41127
Xylene O	**77.4** (8.17)		MA-VPH-2.1		100	04/15/24 16:10	D4D0263	DD41127
Xylene P,M	**73.3** (16.3)		MA-VPH-2.1		100	04/15/24 16:10	D4D0263	DD41127
1:1 Methanol/Soil Ratio %D	**75** (N/A)		MA-VPH-2.1			04/11/24 8:00		DD41127
Preservative:	**MeOH - covered**		MA-VPH-2.1					DD41127

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*107 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*86 %*		*70-130*
Surrogate: Trifluorotoluene - FID	*110 %*		*70-130*
Surrogate: Trifluorotoluene - PID	*124 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD41127 - 5035										
Blank										
Benzene	ND	0.20	mg/kg wet							
C5-C8 Unadjusted Aliphatics	ND	10.0	mg/kg wet							
C9-C10 Aromatics	ND	10.0	mg/kg wet							
C9-C12 Unadjusted Aliphatics	ND	10.0	mg/kg wet							
Ethylbenzene	ND	0.20	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.05	mg/kg wet							
Naphthalene	ND	0.20	mg/kg wet							
Toluene	ND	0.20	mg/kg wet							
Xylene O	ND	0.20	mg/kg wet							
Xylene P,M	ND	0.40	mg/kg wet							
Surrogate: 2,5-Dibromotoluene - FID	*4.41*		mg/kg wet	*5.000*		*88*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*4.89*		mg/kg wet	*5.000*		*98*	*70-130*			
Surrogate: Trifluorotoluene - FID	*4.88*		mg/kg wet	*5.333*		*92*	*70-130*			
Surrogate: Trifluorotoluene - PID	*5.32*		mg/kg wet	*5.333*		*100*	*70-130*			
LCS										
Benzene	5.22	0.20	mg/kg wet	5.000		104	70-130			
C5-C8 Unadjusted Aliphatics	42.2	10.0	mg/kg wet	40.00		105	70-130			
C9-C10 Aromatics	9.47	10.0	mg/kg wet	10.00		95	70-130			
C9-C12 Unadjusted Aliphatics	23.8	10.0	mg/kg wet	30.00		79	70-130			
Ethylbenzene	5.14	0.20	mg/kg wet	5.000		103	70-130			
Methyl tert-Butyl Ether	15.2	0.05	mg/kg wet	15.00		101	70-130			
Naphthalene	8.21	0.20	mg/kg wet	10.00		82	70-130			
Toluene	15.0	0.20	mg/kg wet	15.00		100	70-130			
Xylene O	9.90	0.20	mg/kg wet	10.00		99	70-130			
Xylene P,M	20.0	0.40	mg/kg wet	20.00		100	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*5.15*		mg/kg wet	*5.000*		*103*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*5.62*		mg/kg wet	*5.000*		*112*	*70-130*			
Surrogate: Trifluorotoluene - FID	*4.73*		mg/kg wet	*5.333*		*89*	*70-130*			
Surrogate: Trifluorotoluene - PID	*5.30*		mg/kg wet	*5.333*		*99*	*70-130*			
LCS Dup										
Benzene	5.13	0.20	mg/kg wet	5.000		103	70-130	2	25	
C5-C8 Unadjusted Aliphatics	42.2	10.0	mg/kg wet	40.00		106	70-130	0.2	25	
C9-C10 Aromatics	9.39	10.0	mg/kg wet	10.00		94	70-130	0.9	25	
C9-C12 Unadjusted Aliphatics	23.7	10.0	mg/kg wet	30.00		79	70-130	0.2	25	
Ethylbenzene	5.07	0.20	mg/kg wet	5.000		101	70-130	1	25	
Methyl tert-Butyl Ether	15.1	0.05	mg/kg wet	15.00		100	70-130	0.9	25	
Naphthalene	8.36	0.20	mg/kg wet	10.00		84	70-130	2	25	
Toluene	14.8	0.20	mg/kg wet	15.00		99	70-130	1	25	
Xylene O	9.79	0.20	mg/kg wet	10.00		98	70-130	1	25	
Xylene P,M	19.7	0.40	mg/kg wet	20.00		99	70-130	1	25	
Surrogate: 2,5-Dibromotoluene - FID	*5.43*		mg/kg wet	*5.000*		*109*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*5.85*		mg/kg wet	*5.000*		*117*	*70-130*			
Surrogate: Trifluorotoluene - FID	*4.88*		mg/kg wet	*5.333*		*91*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD41127 - 5035										
Surrogate: Trifluorotoluene - PID	*5.36*		mg/kg wet	*5.333*		*100*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

Notes and Definitions

Z-04	MeOH - covered
U	Analyte included in the analysis, but not detected
S+	Surrogate recovery(ies) above upper control limit (S+).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: NGrid Haverhill ESS Laboratory Work Order: 24D0344

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24D0344
Date Received: 4/10/2024
Project Due Date: 4/17/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 2.9 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? (Yes) / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	536851	Yes	N/A	Yes	VOA Vial	MeOH	
1	536853	Yes	N/A	Yes	4 oz. Jar	NP	
2	536852	Yes	N/A	Yes	VOA Vial	MeOH	
2	536854	Yes	N/A	Yes	4 oz. Jar	NP	

2nd Review
Were all containers scanned into storage/lab? Initials BB Yes / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 4/10/24 15:52
Reviewed By: Date & Time: 4/10/24 1553

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02910
Phone: 401-461-7181
Fax: 401-461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 24D0344 | Page 1 of 1

Turn Time (Days): (STANDARD) ☒ 5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria:

Is this project for any of the following?: ☐ CT RCP ☒ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☒ EQuIS
☒ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☒ Other (Specify) → PDF

CLIENT INFORMATION

Client: GZA
Address: 249 Vanderbilt Ave
Norwood, MA 02062
Phone: (781) 278-3700
Email: charles.linberg@gza.com
Distribution List: matthew.dion@gza.com, Justin.Ivas@gza.com

PROJECT INFORMATION

Project Name: NGrid Haverhill
Project Location: 294 Winter St. Haverhill, MA
Project Number: 172397.10
Project Manager: Justin Ivas / Matt Dion
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH																		Total Number of Bottles
1	4/9/24	1240	GRAB	Soil	AS-1-31-33bgs	X																		2
2	4/9/24	1240	GRAB	Soil	B302-27-29bgs	X																		2

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — VOA AG
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7 9
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 6 1

Total Number of Bottles: 4

Sampled by: Olivia Burglieri

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 2.1 / ice

Comments: * Please specify "Other" preservative and containers types in this space

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
	4/9/24	1730	4/10/24 14:08		4/10/24	15:38	
Relinquished by (Signature)	**Date**	**Time**	**Received by (Signature)**	**Relinquished by (Signature)**	**Date**	**Time**	**Received by (Signature)**

APPENDIX H - NAPL FLUID PROPERTIES RESULTS & TRANSMISSIVITY CALCULATIONS

CERTIFICATE OF ANALYSIS

Mike Gray
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 22J0662

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 1:21 pm, Oct 31, 2022

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

Triton Analytics Corp - Houston, TX	API Density at 60F, Density, Subcontract Laboratory Shipping Fee, Viscosity, Viscosity (Subcontracted)

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

SAMPLE RECEIPT

The following samples were received on October 19, 2022 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
22J0662-01	B206-MW	Oil	SUB

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

Subcontracted Analysis

Client Sample ID: B206-MW
Date Sampled: 10/12/22 13:00

ESS Laboratory Sample ID: 22J0662-01
Sample Matrix: Oil

Analyte	Results	Units	MRL	Method	DF	Analyst	Analyzed	I/V	F/V
Density	**See Attached**								
Viscosity	**See Attached**								

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

Notes and Definitions

Z-08	See Attached
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 22J0662

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Triton Analytics Corp.
16840 Barker Springs, #302
Houston, TX 77084
(281) 578-2289

TAC Reference: 11917
Requested By: H. Masse / ESS Labs
22J0662
Date: 10/31/2022

Certificate of Analysis

		Sample Name:	**22J0662-01 B206-MW**
Density @ 60 F, (g/cm3)			1.0922
API Gravity @ 60 F	ASTM D4052		-2.07
Specific Gravity @ 60 F			1.0933
Dynamic Visc @ 70F, (mPa-s)			154
Kinematic Visc @ 70F, (mm2/s)	ASTM D7042		142
Density @ 70F, (g/cm3)			1.0883
Dynamic Visc @ 100F, (mPa-s)			52.1
Kinematic Visc @ 100F, (mm2/s)	ASTM D7042		48.4
Density @ 100F, (g/cm3)			1.0765
Dynamic Visc @ 130F, (mPa-s)			23.0
Kinematic Visc @ 130F, (mm2/s)	ASTM D7042		21.6
Density @ 130F, (g/cm3)			1.0648

Notes:
1. Sample contained water. Sample centrifuged and water layer removed.
2. Samples were acquired from center of oil layer.
3. Sample was volatile at 130 F.

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 22J0662
Date Received: 10/19/2022
Project Due Date: 10/26/2022
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 4.4 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs: 1
    Analysis: Density, viscosity
    TAT: 5 day
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	354892	Yes	N/A	Yes	VOA Vial	NP	

2nd Review
Were all containers scanned into storage/lab? Initials TB
Are barcode labels on correct containers? Yes / No
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Lauren Davis Date & Time: 10/19/22, 1936
Reviewed By: Date & Time: 10/19/22 1954

CHAIN OF CUSTODY

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

ESS LAB PROJECT ID: 22J0602

Reporting Limits -

Turn Time ___X___ Standard Rush_____ Approved By: _____

State where samples were collected: **MA RI CT NH NJ NY ME** Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other____

Electronic Deliverable Yes_X_ No____
Format: Excel_X_ Access___ PDF_X_ EQuIS__X__

GZA Project Manager: Mike Gray
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10

Project Name: Haverhill Former MGP

Contract Pricing _____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	Analysis: # of Containers	Density/Specific Gravity by ASTM 1481 and API RP40	Dynamic 3 temp. Viscosity by ASTM Method D445							Comment #
1	12-Oct-22	13:00	G	O	B206-MW	1	X	X							1.
							1 AG	1 AG							

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes ____ No

Seals Intact ____ Yes ____ No NA: ____

Cooler Temperature: 4.4 19

Sampled by : Justin Ivas

Comments: 1) 3-point temps: 70F, 100F, 130F

Relinquished by: (Signature)	Date/Time 10/18/22 1300	Received by: (Signature) GZA Sample Receiving	Relinquished by: (Signature) GZA Sample Receiving	Date/Time	Received by: (Signature) 10/18/22 11:40
Relinquished by: (Signature) 10/18/22	Date/Time 10/18/22	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

B206-MW NAPL Transmissivity Calculation

$$T_n = K_w * (\mu_w / \mu_n) * (\rho_n / \rho_w) * b * f$$

Paramter	Description	Available Value	Units	Temp.	Calculation Units	Conversion	Calculation Value	Source
K_w	Hydraulic Conductivity (field test)	2.12E-04	cm/sec	NA	ft/day	1 cm/sec = 2834.65 ft/day	0.60	Maximum K measured in silty sand at site
μ_w	dynamic viscosity of water (literature)	0.9737	mPa*s	70°F	mPa*s	NA	0.9737	https://www.engineeringtoolbox.com/water-dynamic-kinematic-viscosity-d_596.html
μ_n	dynamic viscosity of NAPL (lab test)	154.00	mPa*s	70°F	mPa*s	NA	154.00	Lab Report
ρ_n	density of NAPL (lab test)	1.0883	g/cc	70°F	g/cc	NA	1.0883	Lab Report
ρ_w	density of water (literature)	0.99796	g/cc	70°F	g/cc	NA	0.998	http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html
b_n	NAPL thickness (field)	2.21	ft	NA	ft	NA	2.21	Site data - Maximum DNAPL thickness measured.
f	residual NAPL f factor	1	NA	NA	NA	NA	1	Conservative Assumption

Tn (ft^2/day)	9.14E-03

Notes

1. As a conservative approach, F (the fractional competition for soil pores between water, air, and NAPL) is assumed to equal 1. Tn calculated values should be considered estimates of the upper bound of the NAPL transmissivity. http://www.api.org/~/media/Files/EHS/Clean_Water/Ground_Water_Quality/LNAPL/4760-v1.pdf
2. Conservatively assumes that the formation is fully saturated by NAPL.

CERTIFICATE OF ANALYSIS

Mike Gray
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 23A0600

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:37 pm, Jan 26, 2023

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

Subcontracted Analyses

Triton Analytics Corp - Houston, TX	Density, Viscosity

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23A0600

SAMPLE RECEIPT

The following samples were received on January 19, 2023 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
23A0600-01	B208-MW	Oil	SUB

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23A0600

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23A0600

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 01/18/23 11:30

ESS Laboratory Work Order: 23A0600
ESS Laboratory Sample ID: 23A0600-01
Sample Matrix: Oil

Subcontracted Analysis

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Units	Batch
Density	**See Attached** (N/A)								
Viscosity	**See Attached** (N/A)								

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23A0600

Notes and Definitions

Z-08	See Attached
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23A0600

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

Triton Analytics Corp.
16840 Barker Springs, #302
Houston, TX 77084
(281) 578-2289

TAC Reference: 12012
Requested By: H. Masse | ESS Laboratory
Project Reference: 23A0600
Date: 01/23/2023

Certificate of Analysis

Sample Name	23A0600-1	
Dynamic Visc @ 70 F, (mPa-s)	**214**	
Kinematic Visc @ 70 F, (mm2/s)	**200**	±0.4%
Density @ 70 F, (g/cm3)	**1.0707**	
Dynamic Visc @ 100 F, (mPa-s)	**67.9**	
Kinematic Visc @ 100 F, (mm2/s)	**64.1**	±0.7%
Density @ 100 F, (g/cm3)	**1.0598**	
Dynamic Visc @ 130 F, (mPa-s)	**25.3**	
Kinematic Visc @ 130 F, (mm2/s)	**24.1**	
Density @ 130 F, (g/cm3)	**1.0502**	
Density @ 60 F, (g/cm3)	**1.0742**	
API Gravity @ 60 F	**0.09**	
Specific Gravity @ 60 F	**1.0753**	

Note: sample was volatile high temperature, and results were unstable as a result.

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 23A0600
Date Received: 1/19/2023
Project Due Date: 1/26/2023
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 1.2 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? (Yes) / No
    ESS Sample IDs: 1
    Analysis: **Density, viscosity**
    TAT: **5 day**
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / (No)
    a. If metals preserved upon receipt: Date: _____ Time: _____ By/Acid Lot#: _____
    b. Low Level VOA vials frozen: Date: _____ Time: _____ By: _____

Sample Receiving Notes:

14. Was there a need to contact Project Manager? (Yes) / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? _____ Date: _____ Time: _____ By: _____

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	389882	Yes	N/A	Yes	VOA Vial	NP	
1	389883	Yes	N/A	Yes	VOA Vial	NP	

2nd Review

Were all containers scanned into storage/lab? Initials TD (Yes) / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: _____ Date & Time: 1/19/23 1613.
Reviewed By: _____ Date & Time: 1/19/23 1615

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF COUNTODY

ESS LAB PROJECT ID: 23A0600

Reporting Limits -

Turn Time __X__ Standard Rush_______ Approved By: __________

State where samples were collected: **MA** RI CT NH NJ NY ME Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other___

Electronic Deliverable Yes_X_ No___
Format: Excel_X_ Access___ PDF_X_ EQuIS__X__

GZA Project Manager: Mike Gray
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10

Project Name: Haverhill Former MGP

Contract Pricing _____

Special Pricing WO#: __________

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	Density/Specific Gravity by ASTM 1481 and API RP40	Dynamic 3 temp. Viscosity by ASTM Method D445							Comment #
1	18-Jan-23	11:30	G	O	B208-MW	2	X	X							1.
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							1	1							
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							AG	AG							

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes _____ No

Seals Intact _____ Yes _____ No NA: _____

Cooler Temperature: 1.2 1C

Sampled by : Olivia Baglieri

Comments: 1) 3-point temps: 70F, 100F, 130F

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	1/16/23 @1500	[signature] 1/18/23 11:24	[signature] 1/18/23	15:46	[signature]
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

Page 1 of 1

B208-MW NAPL Transmissivity Calculation

$$T_n = K_w * (\mu_w / \mu_n) * (\rho_n / \rho_w) * b * f$$

Paramter	Description	Available Value	Units	Temp.	Calculation Units	Conversion	Calculation Value	Source
K_w	Hydraulic Conductivity (field test)	2.12E-03	cm/sec	NA	ft/day	1 cm/sec = 2834.65 ft/day	0.60	Maximum K measured in silty sand at site
μ_w	dynamic viscosity of water (literature)	0.9737	mPa*s	70°F	mPa*s	NA	0.9737	https://www.engineeringtoolbox.com/water-dynamic-kinematic-viscosity-d_596.html
μ_n	dynamic viscosity of NAPL (lab test)	214.00	mPa*s	70°F	mPa*s	NA	214.00	Lab Report
ρ_n	density of NAPL (lab test)	1.0707	g/cc	70°F	g/cc	NA	1.0707	Lab Report
ρ_w	density of water (literature)	0.99796	g/cc	70°F	g/cc	NA	0.998	http://www.engineeringtoolbox.com/water-density-specific-weight-d_595.html
b_n	NAPL thickness (field)	2.50	ft	NA	ft/day	NA	2.5	Site data - Maximum DNAPL thickness measured.
f	residual NAPL f factor	1	NA	NA	NA	NA	1	Conservative Assumption

Tn (ft^2/day)	7.32E-03

Notes

1. As a conservative approach, F (the fractional competition for soil pores between water, air, and NAPL) is assumed to equal 1. Tn calculated values should be considered estimates of the upper bound of the NAPL transmissivity. http://www.api.org/~/media/Files/EHS/Clean_Water/Ground_Water_Quality/LNAPL/4760-v1.pdf
2. Conservatively assumes that the formation is fully saturated by NAPL.

APPENDIX I - GROUNDWATER AND NAPL ANALYTICAL DATA

Groundwater Analytical Data

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 23C0579

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:46 pm, Mar 24, 2023

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

SAMPLE RECEIPT

The following samples were received on March 20, 2023 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for SVOC were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
23C0579-01	B212-MW	Ground Water	8260B, 8270D SIM PAH
23C0579-02	B205-MW	Ground Water	8260B, 8270D SIM PAH
23C0579-03	B206-MW	Ground Water	8260B, 8270D SIM PAH

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

PROJECT NARRATIVE

8260B Volatile Organic Compounds

D3C0343-CCV1	**Calibration required quadratic regression (Q).**
	Bromoform (98% @ 80-120%)
D3C0343-CCV1	**Continuing Calibration %Diff/Drift is above control limit (CD+).**
	Chloromethane (26% @ 20%)
D3C0343-CCV1	**Continuing Calibration %Diff/Drift is below control limit (CD-).**
	Tetrachloroethene (21% @ 20%)
D3C0362-CCV1	**Calibration required quadratic regression (Q).**
	Bromoform (100% @ 80-120%), Dibromochloromethane (102% @ 80-120%)
D3C0362-CCV1	**Continuing Calibration %Diff/Drift is below control limit (CD-).**
	Tetrachloroethene (27% @ 20%)

8270D(SIM) Polynuclear Aromatic Hydrocarbon

23C0579-01	**Internal Standard(s) outside of criteria due to matrix (UCM/coelution is present) (IM).**
	Naphthalene-d8 (35% @ 50-200%)
23C0579-03	**Internal Standard(s) outside of criteria due to matrix (UCM/coelution is present) (IM).**
	Acenaphthene-d10 (286% @ 50-200%), Naphthalene-d8 (36% @ 50-200%)
23C0579-03	**Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).**
	2-Fluorobiphenyl (28% @ 30-130%)
DC32139-BSD1	**Relative percent difference for duplicate is outside of criteria (D+).**
	2-Methylnaphthalene (32% @ 20%), Acenaphthylene (29% @ 20%), Naphthalene (25% @ 20%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **23C0579-01 through 23C0579-03**

Matrices: (x) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(x) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(x) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (x) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (x) No ( )
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 (x) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (x) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (x) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (x) No ( )*
	***Data User Note:* Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (x)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (x)*

All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard Date: March 24, 2023

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B212-MW
Date Sampled: 03/17/23 11:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1,1-Trichloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1,2-Trichloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1-Dichloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,1-Dichloropropene	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2,3-Trichloropropane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2,4-Trimethylbenzene	**244** (100)		8260B		100	03/22/23 12:43	D3C0343	DC32110
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2-Dibromoethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2-Dichlorobenzene	**10.7** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2-Dichloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,3,5-Trimethylbenzene	**66.4** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,3-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,3-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,4-Dichlorobenzene	**2.2** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
1,4-Dioxane - Screen	ND (500)		8260B		1	03/21/23 21:45	D3C0343	DC32110
2,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
2-Butanone	ND (10.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
2-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
2-Hexanone	ND (10.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
4-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
4-Isopropyltoluene	**10.0** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Acetone	ND (10.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Benzene	**33.3** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Bromobenzene	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Bromochloromethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B212-MW
Date Sampled: 03/17/23 11:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Bromoform	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Bromomethane	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Carbon Disulfide	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Carbon Tetrachloride	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Chlorobenzene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Chloroethane	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Chloroform	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Chloromethane	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Dibromochloromethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Dibromomethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Dichlorodifluoromethane	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Diethyl Ether	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Di-isopropyl ether	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Ethylbenzene	**425** (100)		8260B		100	03/22/23 12:43	D3C0343	DC32110
Hexachlorobutadiene	ND (0.6)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Hexachloroethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Isopropylbenzene	**77.5** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Methyl tert-Butyl Ether	**1.8** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Methylene Chloride	ND (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Naphthalene	**2680** (100)		8260B		100	03/22/23 12:43	D3C0343	DC32110
n-Butylbenzene	**9.1** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
n-Propylbenzene	**45.8** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
sec-Butylbenzene	**1.1** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Styrene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
tert-Butylbenzene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Tetrachloroethene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Tetrahydrofuran	ND (5.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B212-MW
Date Sampled: 03/17/23 11:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	**16.1** (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Trichloroethene	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Trichlorofluoromethane	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Vinyl Chloride	ND (1.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Xylene O	**228** (100)		8260B		100	03/22/23 12:43	D3C0343	DC32110
Xylene P,M	**160** (2.0)		8260B		1	03/21/23 21:45	D3C0343	DC32110
Xylenes (Total)	**388** (100)		8260B		100	03/22/23 12:43		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*104 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*104 %*		*70-130*
Surrogate: Dibromofluoromethane	*99 %*		*70-130*
Surrogate: Toluene-d8	*100 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B212-MW
Date Sampled: 03/17/23 11:30
Percent Solids: N/A
Initial Volume: 1070ml
Final Volume: 0.25ml
Extraction Method: 3510C

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: TJ
Prepared: 3/21/23 15:30

8270D(SIM) Polynuclear Aromatic Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
2-Methylnaphthalene	**298** (18.7)		8270D SIM PAH		100	03/22/23 17:20	D3C0351	DC32139
Acenaphthene	**68.0** (1.87)		8270D SIM PAH		10	03/22/23 16:18	D3C0351	DC32139
Acenaphthylene	**3.75** (0.19)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Anthracene	**3.35** (0.19)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Benzo(a)anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Benzo(a)pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Benzo(b)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Benzo(g,h,i)perylene	ND (0.19)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Benzo(k)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Chrysene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Dibenzo(a,h)Anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Fluoranthene	**0.75** (0.19)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Fluorene	**32.7** (1.87)		8270D SIM PAH		10	03/22/23 16:18	D3C0351	DC32139
Indeno(1,2,3-cd)Pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139
Naphthalene	**1680** (187)		8270D SIM PAH		1000	03/22/23 18:21	D3C0351	DC32139
Phenanthrene	**32.7** (1.87)		8270D SIM PAH		10	03/22/23 16:18	D3C0351	DC32139
Pyrene	**1.06** (0.19)		8270D SIM PAH		1	03/21/23 19:36	D3C0351	DC32139

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*45 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*30 %*		*30-130*
Surrogate: Nitrobenzene-d5	*108 %*		*30-130*
Surrogate: p-Terphenyl-d14	*64 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B205-MW
Date Sampled: 03/17/23 12:45
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1,1-Trichloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1,2-Trichloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1-Dichloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,1-Dichloropropene	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2,3-Trichloropropane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2,4-Trimethylbenzene	**29.9** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2-Dibromoethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2-Dichloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,3,5-Trimethylbenzene	**3.0** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,3-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,3-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,4-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
1,4-Dioxane - Screen	ND (500)		8260B		1	03/21/23 21:19	D3C0343	DC32110
2,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
2-Butanone	ND (10.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
2-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
2-Hexanone	ND (10.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
4-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
4-Isopropyltoluene	**1.6** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Acetone	ND (10.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Benzene	**199** (10.0)		8260B		10	03/22/23 12:16	D3C0343	DC32110
Bromobenzene	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Bromochloromethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B205-MW
Date Sampled: 03/17/23 12:45
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Bromoform	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Bromomethane	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Carbon Disulfide	**3.4** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Carbon Tetrachloride	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Chlorobenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Chloroethane	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Chloroform	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Chloromethane	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Dibromochloromethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Dibromomethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Dichlorodifluoromethane	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Diethyl Ether	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Di-isopropyl ether	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Ethylbenzene	**90.2** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Hexachlorobutadiene	ND (0.6)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Hexachloroethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Isopropylbenzene	**3.4** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Methylene Chloride	ND (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Naphthalene	**372** (10.0)		8260B		10	03/22/23 12:16	D3C0343	DC32110
n-Butylbenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
n-Propylbenzene	**1.7** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
sec-Butylbenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Styrene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
tert-Butylbenzene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Tetrachloroethene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Tetrahydrofuran	ND (5.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B205-MW
Date Sampled: 03/17/23 12:45
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	**1.5** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Trichloroethene	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Trichlorofluoromethane	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Vinyl Chloride	ND (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Xylene O	**41.8** (1.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Xylene P,M	**13.8** (2.0)		8260B		1	03/21/23 21:19	D3C0343	DC32110
Xylenes (Total)	**55.6** (2.00)		8260B		1	03/21/23 21:19		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*107 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*103 %*		*70-130*
Surrogate: Dibromofluoromethane	*101 %*		*70-130*
Surrogate: Toluene-d8	*99 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B205-MW
Date Sampled: 03/17/23 12:45
Percent Solids: N/A
Initial Volume: 1070ml
Final Volume: 0.25ml
Extraction Method: 3510C

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: TJ
Prepared: 3/21/23 15:30

8270D(SIM) Polynuclear Aromatic Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
2-Methylnaphthalene	**59.9** (1.87)		8270D SIM PAH		10	03/22/23 16:39	D3C0351	DC32139
Acenaphthene	**4.85** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Acenaphthylene	**0.66** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Anthracene	**1.18** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Benzo(a)anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Benzo(a)pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Benzo(b)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Benzo(g,h,i)perylene	ND (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Benzo(k)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Chrysene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Dibenzo(a,h)Anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Fluoranthene	**0.49** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Fluorene	**4.56** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Indeno(1,2,3-cd)Pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Naphthalene	**228** (18.7)		8270D SIM PAH		100	03/22/23 17:40	D3C0351	DC32139
Phenanthrene	**7.78** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139
Pyrene	**0.78** (0.19)		8270D SIM PAH		1	03/21/23 19:56	D3C0351	DC32139

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*56 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*38 %*		*30-130*
Surrogate: Nitrobenzene-d5	*78 %*		*30-130*
Surrogate: p-Terphenyl-d14	*60 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B206-MW
Date Sampled: 03/17/23 14:00
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1,1-Trichloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1,2-Trichloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1-Dichloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1-Dichloroethene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,1-Dichloropropene	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2,3-Trichloropropane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2,4-Trimethylbenzene	**401** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2-Dibromoethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2-Dichloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,3,5-Trimethylbenzene	**102** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
1,3-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,3-Dichloropropane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,4-Dichlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
1,4-Dioxane - Screen	ND (500)		8260B		1	03/21/23 22:10	D3C0343	DC32110
2,2-Dichloropropane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
2-Butanone	ND (10.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
2-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
2-Hexanone	ND (10.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
4-Chlorotoluene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
4-Isopropyltoluene	**3.5** (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Acetone	ND (10.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Benzene	**6150** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
Bromobenzene	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Bromochloromethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B206-MW
Date Sampled: 03/17/23 14:00
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromodichloromethane	ND (0.6)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Bromoform	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Bromomethane	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Carbon Disulfide	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Carbon Tetrachloride	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Chlorobenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Chloroethane	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Chloroform	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Chloromethane	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Dibromochloromethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Dibromomethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Dichlorodifluoromethane	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Diethyl Ether	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Di-isopropyl ether	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Ethylbenzene	**1470** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
Hexachlorobutadiene	ND (0.6)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Hexachloroethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Isopropylbenzene	**39.7** (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Methyl tert-Butyl Ether	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Methylene Chloride	ND (2.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Naphthalene	**5120** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
n-Butylbenzene	**3.3** (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
n-Propylbenzene	**18.3** (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
sec-Butylbenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Styrene	**9.6** (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
tert-Butylbenzene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Tetrachloroethene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Tetrahydrofuran	ND (5.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B206-MW
Date Sampled: 03/17/23 14:00
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Toluene	**234** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Trichloroethene	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Trichlorofluoromethane	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Vinyl Chloride	ND (1.0)		8260B		1	03/21/23 22:10	D3C0343	DC32110
Xylene O	**1010** (100)		8260B		100	03/22/23 13:10	D3C0343	DC32110
Xylene P,M	**1630** (200)		8260B		100	03/22/23 13:10	D3C0343	DC32110
Xylenes (Total)	**2640** (200)		8260B		100	03/22/23 13:10		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*107 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*105 %*		*70-130*
Surrogate: Dibromofluoromethane	*99 %*		*70-130*
Surrogate: Toluene-d8	*100 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B206-MW
Date Sampled: 03/17/23 14:00
Percent Solids: N/A
Initial Volume: 1070ml
Final Volume: 0.25ml
Extraction Method: 3510C

ESS Laboratory Work Order: 23C0579
ESS Laboratory Sample ID: 23C0579-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: TJ
Prepared: 3/21/23 15:30

8270D(SIM) Polynuclear Aromatic Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
2-Methylnaphthalene	**728** (18.7)		8270D SIM PAH		100	03/22/23 18:01	D3C0351	DC32139
Acenaphthene	**8.42** (0.19)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Acenaphthylene	**97.8** (1.87)		8270D SIM PAH		10	03/22/23 16:59	D3C0351	DC32139
Anthracene	**2.19** (0.19)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Benzo(a)anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Benzo(a)pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Benzo(b)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Benzo(g,h,i)perylene	ND (0.19)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Benzo(k)fluoranthene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Chrysene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Dibenzo(a,h)Anthracene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Fluoranthene	ND (0.19)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Fluorene	**28.1** (1.87)		8270D SIM PAH		10	03/22/23 16:59	D3C0351	DC32139
Indeno(1,2,3-cd)Pyrene	ND (0.05)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139
Naphthalene	**3320** (187)		8270D SIM PAH		1000	03/22/23 18:41	D3C0351	DC32139
Phenanthrene	**29.6** (1.87)		8270D SIM PAH		10	03/22/23 16:59	D3C0351	DC32139
Pyrene	ND (0.19)		8270D SIM PAH		1	03/21/23 20:17	D3C0351	DC32139

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*33 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*28 %*	*SM*	*30-130*
Surrogate: Nitrobenzene-d5	*74 %*		*30-130*
Surrogate: p-Terphenyl-d14	*32 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
Blank										
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L							
1,1,1-Trichloroethane	ND	1.0	ug/L							
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	1.0	ug/L							
1,1-Dichloroethane	ND	1.0	ug/L							
1,1-Dichloroethene	ND	1.0	ug/L							
1,1-Dichloropropene	ND	2.0	ug/L							
1,2,3-Trichlorobenzene	ND	1.0	ug/L							
1,2,3-Trichloropropane	ND	1.0	ug/L							
1,2,4-Trichlorobenzene	ND	1.0	ug/L							
1,2,4-Trimethylbenzene	ND	1.0	ug/L							
1,2-Dibromo-3-Chloropropane	ND	5.0	ug/L							
1,2-Dibromoethane	ND	1.0	ug/L							
1,2-Dichlorobenzene	ND	1.0	ug/L							
1,2-Dichloroethane	ND	1.0	ug/L							
1,2-Dichloropropane	ND	1.0	ug/L							
1,3,5-Trimethylbenzene	ND	1.0	ug/L							
1,3-Dichlorobenzene	ND	1.0	ug/L							
1,3-Dichloropropane	ND	1.0	ug/L							
1,4-Dichlorobenzene	ND	1.0	ug/L							
1,4-Dioxane - Screen	ND	500	ug/L							
2,2-Dichloropropane	ND	1.0	ug/L							
2-Butanone	ND	10.0	ug/L							
2-Chlorotoluene	ND	1.0	ug/L							
2-Hexanone	ND	10.0	ug/L							
4-Chlorotoluene	ND	1.0	ug/L							
4-Isopropyltoluene	ND	1.0	ug/L							
4-Methyl-2-Pentanone	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.0	ug/L							
Bromobenzene	ND	2.0	ug/L							
Bromochloromethane	ND	1.0	ug/L							
Bromodichloromethane	ND	0.6	ug/L							
Bromoform	ND	1.0	ug/L							
Bromomethane	ND	2.0	ug/L							
Carbon Disulfide	ND	1.0	ug/L							
Carbon Tetrachloride	ND	1.0	ug/L							
Chlorobenzene	ND	1.0	ug/L							
Chloroethane	ND	2.0	ug/L							
Chloroform	ND	1.0	ug/L							
Chloromethane	ND	2.0	ug/L							
cis-1,2-Dichloroethene	ND	1.0	ug/L							
cis-1,3-Dichloropropene	ND	0.4	ug/L							
Dibromochloromethane	ND	1.0	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
Dibromomethane	ND	1.0	ug/L							
Dichlorodifluoromethane	ND	2.0	ug/L							
Diethyl Ether	ND	1.0	ug/L							
Di-isopropyl ether	ND	1.0	ug/L							
Ethyl tertiary-butyl ether	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Hexachlorobutadiene	ND	0.6	ug/L							
Hexachloroethane	ND	1.0	ug/L							
Isopropylbenzene	ND	1.0	ug/L							
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Methylene Chloride	ND	2.0	ug/L							
Naphthalene	ND	1.0	ug/L							
n-Butylbenzene	ND	1.0	ug/L							
n-Propylbenzene	ND	1.0	ug/L							
sec-Butylbenzene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
tert-Butylbenzene	ND	1.0	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tetrachloroethene	ND	1.0	ug/L							
Tetrahydrofuran	ND	5.0	ug/L							
Toluene	ND	1.0	ug/L							
trans-1,2-Dichloroethene	ND	1.0	ug/L							
trans-1,3-Dichloropropene	ND	0.4	ug/L							
Trichloroethene	ND	1.0	ug/L							
Trichlorofluoromethane	ND	1.0	ug/L							
Vinyl Chloride	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Surrogate: 1,2-Dichloroethane-d4	*25.9*		ug/L	*25.00*		*103*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*24.5*		ug/L	*25.00*		*98*	*70-130*			
Surrogate: Dibromofluoromethane	*25.3*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Toluene-d8	*24.9*		ug/L	*25.00*		*100*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	9.2	1.0	ug/L	10.00		92	70-130			
1,1,1-Trichloroethane	9.1	1.0	ug/L	10.00		91	70-130			
1,1,2,2-Tetrachloroethane	9.7	0.5	ug/L	10.00		97	70-130			
1,1,2-Trichloroethane	9.1	1.0	ug/L	10.00		91	70-130			
1,1-Dichloroethane	8.9	1.0	ug/L	10.00		89	70-130			
1,1-Dichloroethene	9.6	1.0	ug/L	10.00		96	70-130			
1,1-Dichloropropene	9.8	2.0	ug/L	10.00		98	70-130			
1,2,3-Trichlorobenzene	10.3	1.0	ug/L	10.00		103	70-130			
1,2,3-Trichloropropane	9.0	1.0	ug/L	10.00		90	70-130			
1,2,4-Trichlorobenzene	9.9	1.0	ug/L	10.00		99	70-130			
1,2,4-Trimethylbenzene	9.0	1.0	ug/L	10.00		90	70-130			
1,2-Dibromo-3-Chloropropane	8.1	5.0	ug/L	10.00		81	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
1,2-Dibromoethane	9.1	1.0	ug/L	10.00		91	70-130			
1,2-Dichlorobenzene	8.8	1.0	ug/L	10.00		88	70-130			
1,2-Dichloroethane	9.1	1.0	ug/L	10.00		91	70-130			
1,2-Dichloropropane	9.4	1.0	ug/L	10.00		94	70-130			
1,3,5-Trimethylbenzene	9.3	1.0	ug/L	10.00		93	70-130			
1,3-Dichlorobenzene	9.0	1.0	ug/L	10.00		90	70-130			
1,3-Dichloropropane	9.6	1.0	ug/L	10.00		96	70-130			
1,4-Dichlorobenzene	9.4	1.0	ug/L	10.00		94	70-130			
1,4-Dioxane - Screen	197	500	ug/L	200.0		98	0-332			
2,2-Dichloropropane	9.7	1.0	ug/L	10.00		97	70-130			
2-Butanone	53.4	10.0	ug/L	50.00		107	70-130			
2-Chlorotoluene	9.0	1.0	ug/L	10.00		90	70-130			
2-Hexanone	58.3	10.0	ug/L	50.00		117	70-130			
4-Chlorotoluene	9.0	1.0	ug/L	10.00		90	70-130			
4-Isopropyltoluene	9.0	1.0	ug/L	10.00		90	70-130			
4-Methyl-2-Pentanone	50.5	10.0	ug/L	50.00		101	70-130			
Acetone	60.0	10.0	ug/L	50.00		120	70-130			
Benzene	9.4	1.0	ug/L	10.00		94	70-130			
Bromobenzene	8.9	2.0	ug/L	10.00		89	70-130			
Bromochloromethane	9.1	1.0	ug/L	10.00		91	70-130			
Bromodichloromethane	9.4	0.6	ug/L	10.00		94	70-130			
Bromoform	8.3	1.0	ug/L	10.00		83	70-130			
Bromomethane	11.0	2.0	ug/L	10.00		110	70-130			
Carbon Disulfide	10.1	1.0	ug/L	10.00		101	70-130			
Carbon Tetrachloride	9.1	1.0	ug/L	10.00		91	70-130			
Chlorobenzene	8.9	1.0	ug/L	10.00		89	70-130			
Chloroethane	9.5	2.0	ug/L	10.00		95	70-130			
Chloroform	9.1	1.0	ug/L	10.00		91	70-130			
Chloromethane	11.4	2.0	ug/L	10.00		114	70-130			
cis-1,2-Dichloroethene	9.2	1.0	ug/L	10.00		92	70-130			
cis-1,3-Dichloropropene	9.0	0.4	ug/L	10.00		90	70-130			
Dibromochloromethane	9.0	1.0	ug/L	10.00		90	70-130			
Dibromomethane	9.3	1.0	ug/L	10.00		93	70-130			
Dichlorodifluoromethane	8.1	2.0	ug/L	10.00		81	70-130			
Diethyl Ether	9.6	1.0	ug/L	10.00		96	70-130			
Di-isopropyl ether	10.0	1.0	ug/L	10.00		100	70-130			
Ethyl tertiary-butyl ether	9.8	1.0	ug/L	10.00		98	70-130			
Ethylbenzene	9.1	1.0	ug/L	10.00		91	70-130			
Hexachlorobutadiene	10.4	0.6	ug/L	10.00		104	70-130			
Hexachloroethane	9.9	1.0	ug/L	10.00		99	70-130			
Isopropylbenzene	9.1	1.0	ug/L	10.00		91	70-130			
Methyl tert-Butyl Ether	9.3	1.0	ug/L	10.00		93	70-130			
Methylene Chloride	9.8	2.0	ug/L	10.00		98	70-130			
Naphthalene	9.8	1.0	ug/L	10.00		98	70-130			
n-Butylbenzene	9.5	1.0	ug/L	10.00		95	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
n-Propylbenzene	9.0	1.0	ug/L	10.00		90	70-130			
sec-Butylbenzene	8.7	1.0	ug/L	10.00		87	70-130			
Styrene	9.2	1.0	ug/L	10.00		92	70-130			
tert-Butylbenzene	8.9	1.0	ug/L	10.00		89	70-130			
Tertiary-amyl methyl ether	9.8	1.0	ug/L	10.00		98	70-130			
Tetrachloroethene	7.3	1.0	ug/L	10.00		73	70-130			
Tetrahydrofuran	10.0	5.0	ug/L	10.00		100	70-130			
Toluene	9.3	1.0	ug/L	10.00		93	70-130			
trans-1,2-Dichloroethene	9.3	1.0	ug/L	10.00		93	70-130			
trans-1,3-Dichloropropene	8.6	0.4	ug/L	10.00		86	70-130			
Trichloroethene	8.5	1.0	ug/L	10.00		85	70-130			
Trichlorofluoromethane	9.2	1.0	ug/L	10.00		92	70-130			
Vinyl Chloride	9.4	1.0	ug/L	10.00		94	70-130			
Xylene O	9.3	1.0	ug/L	10.00		93	70-130			
Xylene P,M	18.6	2.0	ug/L	20.00		93	70-130			
Surrogate: 1,2-Dichloroethane-d4	*25.8*		ug/L	*25.00*		*103*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.3*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*25.5*		ug/L	*25.00*		*102*	*70-130*			
Surrogate: Toluene-d8	*24.6*		ug/L	*25.00*		*98*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	9.6	1.0	ug/L	10.00		96	70-130	4	20	
1,1,1-Trichloroethane	9.5	1.0	ug/L	10.00		95	70-130	4	20	
1,1,2,2-Tetrachloroethane	9.6	0.5	ug/L	10.00		96	70-130	0.7	20	
1,1,2-Trichloroethane	9.3	1.0	ug/L	10.00		93	70-130	3	20	
1,1-Dichloroethane	9.5	1.0	ug/L	10.00		95	70-130	6	20	
1,1-Dichloroethene	9.5	1.0	ug/L	10.00		95	70-130	0.4	20	
1,1-Dichloropropene	10.0	2.0	ug/L	10.00		100	70-130	1	20	
1,2,3-Trichlorobenzene	10.4	1.0	ug/L	10.00		104	70-130	0.8	20	
1,2,3-Trichloropropane	9.3	1.0	ug/L	10.00		93	70-130	3	20	
1,2,4-Trichlorobenzene	10.2	1.0	ug/L	10.00		102	70-130	3	20	
1,2,4-Trimethylbenzene	9.1	1.0	ug/L	10.00		91	70-130	2	20	
1,2-Dibromo-3-Chloropropane	8.2	5.0	ug/L	10.00		82	70-130	2	20	
1,2-Dibromoethane	9.3	1.0	ug/L	10.00		93	70-130	3	20	
1,2-Dichlorobenzene	8.8	1.0	ug/L	10.00		88	70-130	0.2	20	
1,2-Dichloroethane	9.4	1.0	ug/L	10.00		94	70-130	2	20	
1,2-Dichloropropane	9.4	1.0	ug/L	10.00		94	70-130	0.3	20	
1,3,5-Trimethylbenzene	9.5	1.0	ug/L	10.00		95	70-130	2	20	
1,3-Dichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
1,3-Dichloropropane	9.8	1.0	ug/L	10.00		98	70-130	2	20	
1,4-Dichlorobenzene	9.6	1.0	ug/L	10.00		96	70-130	3	20	
1,4-Dioxane - Screen	210	500	ug/L	200.0		105	0-332	6	200	
2,2-Dichloropropane	10.0	1.0	ug/L	10.00		100	70-130	3	20	
2-Butanone	55.6	10.0	ug/L	50.00		111	70-130	4	20	
2-Chlorotoluene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
2-Hexanone	60.9	10.0	ug/L	50.00		122	70-130	4	20	

CERTIFICATE OF ANALYSIS

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ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
4-Chlorotoluene	9.3	1.0	ug/L	10.00		93	70-130	2	20	
4-Isopropyltoluene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
4-Methyl-2-Pentanone	52.8	10.0	ug/L	50.00		106	70-130	4	20	
Acetone	61.4	10.0	ug/L	50.00		123	70-130	2	20	
Benzene	9.6	1.0	ug/L	10.00		96	70-130	2	20	
Bromobenzene	9.3	2.0	ug/L	10.00		93	70-130	4	20	
Bromochloromethane	9.3	1.0	ug/L	10.00		93	70-130	3	20	
Bromodichloromethane	9.3	0.6	ug/L	10.00		93	70-130	1	20	
Bromoform	8.4	1.0	ug/L	10.00		84	70-130	1	20	
Bromomethane	11.8	2.0	ug/L	10.00		118	70-130	7	20	
Carbon Disulfide	10.2	1.0	ug/L	10.00		102	70-130	0.7	20	
Carbon Tetrachloride	9.5	1.0	ug/L	10.00		95	70-130	4	20	
Chlorobenzene	9.1	1.0	ug/L	10.00		91	70-130	1	20	
Chloroethane	9.8	2.0	ug/L	10.00		98	70-130	3	20	
Chloroform	9.3	1.0	ug/L	10.00		93	70-130	3	20	
Chloromethane	11.2	2.0	ug/L	10.00		112	70-130	2	20	
cis-1,2-Dichloroethene	9.4	1.0	ug/L	10.00		94	70-130	3	20	
cis-1,3-Dichloropropene	9.3	0.4	ug/L	10.00		93	70-130	3	20	
Dibromochloromethane	9.0	1.0	ug/L	10.00		90	70-130	0.6	20	
Dibromomethane	9.4	1.0	ug/L	10.00		94	70-130	1	20	
Dichlorodifluoromethane	7.9	2.0	ug/L	10.00		79	70-130	2	20	
Diethyl Ether	10.4	1.0	ug/L	10.00		104	70-130	8	20	
Di-isopropyl ether	10.1	1.0	ug/L	10.00		101	70-130	0.6	20	
Ethyl tertiary-butyl ether	10.3	1.0	ug/L	10.00		103	70-130	5	20	
Ethylbenzene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
Hexachlorobutadiene	10.3	0.6	ug/L	10.00		103	70-130	0.7	20	
Hexachloroethane	10.2	1.0	ug/L	10.00		102	70-130	3	20	
Isopropylbenzene	9.3	1.0	ug/L	10.00		93	70-130	2	20	
Methyl tert-Butyl Ether	10.0	1.0	ug/L	10.00		100	70-130	7	20	
Methylene Chloride	9.3	2.0	ug/L	10.00		93	70-130	5	20	
Naphthalene	10.1	1.0	ug/L	10.00		101	70-130	2	20	
n-Butylbenzene	9.7	1.0	ug/L	10.00		97	70-130	3	20	
n-Propylbenzene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
sec-Butylbenzene	9.0	1.0	ug/L	10.00		90	70-130	3	20	
Styrene	9.5	1.0	ug/L	10.00		95	70-130	3	20	
tert-Butylbenzene	9.2	1.0	ug/L	10.00		92	70-130	3	20	
Tertiary-amyl methyl ether	9.8	1.0	ug/L	10.00		98	70-130	0.2	20	
Tetrachloroethene	8.6	1.0	ug/L	10.00		86	70-130	17	20	
Tetrahydrofuran	10.4	5.0	ug/L	10.00		104	70-130	4	20	
Toluene	9.4	1.0	ug/L	10.00		94	70-130	2	20	
trans-1,2-Dichloroethene	9.8	1.0	ug/L	10.00		98	70-130	6	20	
trans-1,3-Dichloropropene	8.8	0.4	ug/L	10.00		88	70-130	3	20	
Trichloroethene	8.8	1.0	ug/L	10.00		88	70-130	3	20	
Trichlorofluoromethane	8.8	1.0	ug/L	10.00		88	70-130	5	20	
Vinyl Chloride	9.3	1.0	ug/L	10.00		93	70-130	1	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23C0579

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DC32110 - 5030B										
Xylene O	9.5	1.0	ug/L	10.00		95	70-130	2	20	
Xylene P,M	18.9	2.0	ug/L	20.00		95	70-130	2	20	
Surrogate: 1,2-Dichloroethane-d4	*26.1*		ug/L	*25.00*		*104*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.4*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*25.7*		ug/L	*25.00*		*103*	*70-130*			
Surrogate: Toluene-d8	*25.0*		ug/L	*25.00*		*100*	*70-130*			
8270D(SIM) Polynuclear Aromatic Hydrocarbon										
Batch DC32139 - 3510C										
Blank										
2-Methylnaphthalene	ND	0.20	ug/L							
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.05	ug/L							
Benzo(a)pyrene	ND	0.05	ug/L							
Benzo(b)fluoranthene	ND	0.05	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.05	ug/L							
Chrysene	ND	0.05	ug/L							
Dibenzo(a,h)Anthracene	ND	0.05	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.05	ug/L							
Naphthalene	0.38	0.20	ug/L							
Phenanthrene	ND	0.20	ug/L							
Pyrene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*1.36*		ug/L	*2.500*		*54*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.47*		ug/L	*2.500*		*59*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.78*		ug/L	*2.500*		*71*	*30-130*			
Surrogate: p-Terphenyl-d14	*2.12*		ug/L	*2.500*		*85*	*30-130*			
LCS										
2-Methylnaphthalene	2.19	0.20	ug/L	4.000		55	40-140			
Acenaphthene	2.18	0.20	ug/L	4.000		55	40-140			
Acenaphthylene	2.41	0.20	ug/L	4.000		60	40-140			
Anthracene	2.37	0.20	ug/L	4.000		59	40-140			
Benzo(a)anthracene	2.77	0.05	ug/L	4.000		69	40-140			
Benzo(a)pyrene	2.85	0.05	ug/L	4.000		71	40-140			
Benzo(b)fluoranthene	3.06	0.05	ug/L	4.000		76	40-140			
Benzo(g,h,i)perylene	3.02	0.20	ug/L	4.000		76	40-140			
Benzo(k)fluoranthene	2.86	0.05	ug/L	4.000		72	40-140			
Chrysene	2.72	0.05	ug/L	4.000		68	40-140			
Dibenzo(a,h)Anthracene	3.16	0.05	ug/L	4.000		79	40-140			
Fluoranthene	2.85	0.20	ug/L	4.000		71	40-140			
Fluorene	2.53	0.20	ug/L	4.000		63	40-140			

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Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Polynuclear Aromatic Hydrocarbon										
Batch DC32139 - 3510C										
Indeno(1,2,3-cd)Pyrene	2.99	0.05	ug/L	4.000		75	40-140			
Naphthalene	2.80	0.20	ug/L	4.000		70	40-140			
Phenanthrene	2.56	0.20	ug/L	4.000		64	40-140			
Pyrene	2.81	0.20	ug/L	4.000		70	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.21*		ug/L	*2.500*		*48*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.87*		ug/L	*2.500*		*75*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.15*		ug/L	*2.500*		*46*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.64*		ug/L	*2.500*		*65*	*30-130*			
LCS Dup										
2-Methylnaphthalene	3.02	0.20	ug/L	4.000		76	40-140	32	20	D+
Acenaphthene	2.34	0.20	ug/L	4.000		59	40-140	7	20	
Acenaphthylene	1.79	0.20	ug/L	4.000		45	40-140	29	20	D+
Anthracene	2.42	0.20	ug/L	4.000		60	40-140	2	20	
Benzo(a)anthracene	2.70	0.05	ug/L	4.000		68	40-140	3	20	
Benzo(a)pyrene	2.81	0.05	ug/L	4.000		70	40-140	1	20	
Benzo(b)fluoranthene	2.93	0.05	ug/L	4.000		73	40-140	4	20	
Benzo(g,h,i)perylene	2.91	0.20	ug/L	4.000		73	40-140	4	20	
Benzo(k)fluoranthene	2.85	0.05	ug/L	4.000		71	40-140	0.5	20	
Chrysene	2.65	0.05	ug/L	4.000		66	40-140	3	20	
Dibenzo(a,h)Anthracene	3.00	0.05	ug/L	4.000		75	40-140	6	20	
Fluoranthene	2.83	0.20	ug/L	4.000		71	40-140	0.5	20	
Fluorene	2.73	0.20	ug/L	4.000		68	40-140	8	20	
Indeno(1,2,3-cd)Pyrene	2.92	0.05	ug/L	4.000		73	40-140	2	20	
Naphthalene	3.58	0.20	ug/L	4.000		90	40-140	25	20	D+
Phenanthrene	2.60	0.20	ug/L	4.000		65	40-140	1	20	
Pyrene	2.70	0.20	ug/L	4.000		68	40-140	4	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.22*		ug/L	*2.500*		*49*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.44*		ug/L	*2.500*		*58*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.98*		ug/L	*2.500*		*79*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.65*		ug/L	*2.500*		*66*	*30-130*			

CERTIFICATE OF ANALYSIS

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ESS Laboratory Work Order: 23C0579

Notes and Definitions

U	Analyte included in the analysis, but not detected
SM	Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).
Q	Calibration required quadratic regression (Q).
IM	Internal Standard(s) outside of criteria due to matrix (UCM/coelution is present) (IM).
D+	Relative percent difference for duplicate is outside of criteria (D+).
D	Diluted.
CD+	Continuing Calibration %Diff/Drift is above control limit (CD+).
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

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ESS Laboratory Work Order: 23C0579

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 23C0579
Date Received: 3/20/2023
Project Due Date: 3/27/2023
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.5 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / (NA)

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	408700	Yes	N/A	Yes	1L Amber	HCl	
1	408701	Yes	N/A	Yes	1L Amber	HCl	
1	408706	Yes	No	Yes	VOA Vial	HCl	
1	408707	Yes	No	Yes	VOA Vial	HCl	
1	408708	Yes	No	Yes	VOA Vial	HCl	
2	408702	Yes	N/A	Yes	1L Amber	HCl	
2	408703	Yes	N/A	Yes	1L Amber	HCl	
2	408709	Yes	No	Yes	VOA Vial	HCl	
2	408710	Yes	No	Yes	VOA Vial	HCl	
2	408711	Yes	No	Yes	VOA Vial	HCl	
3	408704	Yes	N/A	Yes	1L Amber	HCl	
3	408705	Yes	N/A	Yes	1L Amber	HCl	
3	408712	Yes	No	Yes	VOA Vial	HCl	
3	408713	Yes	No	Yes	VOA Vial	HCl	
3	408714	Yes	No	Yes	VOA Vial	HCl	

2nd Review

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 23C0579
Date Received: 3/20/2023
Project Due Date: 3/27/2023
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.5 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / (NA)

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	408700	Yes	N/A	Yes	1L Amber	HCl	
1	408701	Yes	N/A	Yes	1L Amber	HCl	
1	408706	Yes	No	Yes	VOA Vial	HCl	
1	408707	Yes	No	Yes	VOA Vial	HCl	
1	408708	Yes	No	Yes	VOA Vial	HCl	
2	408702	Yes	N/A	Yes	1L Amber	HCl	
2	408703	Yes	N/A	Yes	1L Amber	HCl	
2	408709	Yes	No	Yes	VOA Vial	HCl	
2	408710	Yes	No	Yes	VOA Vial	HCl	
2	408711	Yes	No	Yes	VOA Vial	HCl	
3	408704	Yes	N/A	Yes	1L Amber	HCl	
3	408705	Yes	N/A	Yes	1L Amber	HCl	
3	408712	Yes	No	Yes	VOA Vial	HCl	
3	408713	Yes	No	Yes	VOA Vial	HCl	
3	408714	Yes	No	Yes	VOA Vial	HCl	

2nd Review

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

ESS Project ID: 23C0579
Date Received: 3/20/2023

Initials: BB

Were all containers scanned into storage/lab?	Yes / No
Are barcode labels on correct containers?	Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled?	Yes / No / NA
Are all Hex Chrome stickers attached?	Yes / No / NA
Are all QC stickers attached?	Yes / No / NA
Are VOA stickers attached if bubbles noted?	

Completed By: _____ Date & Time: 3/20/23 15:07

Reviewed By: _____ Date & Time: 3/20/23 1606

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 2305579

Turn Time _____ Standard Rush: 4-Day Approved By: _____

Reporting Limits -

State where samples were collected: **MA** RI CT NH NJ NY ME Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other____

Electonic Deliverable Yes____ No____
Format: Excel___ Access___ PDF___ Other_____

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing _____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	MCP VOCs by 8260D	MCP PAHs by 8270E-SIM									Comment #
						Analysis											
1	3/17/2023	11:30	G	GW	B212-MW	5	X	X									1.
2	3/17/2023	12:45	G	GW	B205-MW	5	X	X									1.
3	3/17/2023	14:00	G	GW	B206-MW	5	X	X									1.

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes _____ No

Seals Intact _____ Yes _____ No NA: _____

Cooler Temperature: 3.5 I/a

Sampled by : Justin Ivas

Comments: 1. MCP PAHs: Napththalene, 2-Methylnaphthalene, 2-Chloronaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)Pyrene, Dibenz(a,h,)anthracene, Benzo(ghi)perylene

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	3/17/23 1700	3/20/23 10:45	3/20/23	14:40	

Please E-mail all changes to Chain of Custody in writing.

Page 1 of 1

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 2305579

Turn Time _____ Standard Rush: 4-Day Approved By: _____

Reporting Limits -

State where samples were collected: **MA** RI CT NH NJ NY ME Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other____

Electonic Deliverable Yes____ No____
Format: Excel___ Access___ PDF___ Other_____

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing _____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	MCP VOCs by 8260D	MCP PAHs by 8270E-SIM									Comment #
						Analysis											
1	3/17/2023	11:30	G	GW	B212-MW	5	X	X									1.
2	3/17/2023	12:45	G	GW	B205-MW	5	X	X									1.
3	3/17/2023	14:00	G	GW	B206-MW	5	X	X									1.

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes _____ No

Seals Intact _____ Yes _____ No NA: _____

Cooler Temperature: 3.5 I/C

Sampled by : Justin Ivas

Comments: 1. MCP PAHs: Napththalene, 2-Methylnaphthalene, 2-Chloronaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)Pyrene, Dibenz(a,h,)anthracene, Benzo(ghi)perylene

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	3/17/23 1700	3/17/23 17:15	3/20/23	14:40	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

Page 1 of 1

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 23D0279

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 3:35 pm, Apr 14, 2023

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

SAMPLE RECEIPT

The following samples were received on April 10, 2023 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for SVOC were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
23D0279-01	B208-MW	Ground Water	8260B, 8270D SIM PAH

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 23D0279

PROJECT NARRATIVE

8270D(SIM) Polynuclear Aromatic Hydrocarbon
D3D0233-TUN1 **Benzidine tailing factor >2.**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **23D0279-01**

Matrices: (x) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(x) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
(x) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (x) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (x) No ( )
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 (x) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (x) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (x) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (x) No ( )*
	***Data User Note:* Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (x) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: April 14, 2023

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 04/07/23 12:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23D0279
ESS Laboratory Sample ID: 23D0279-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
1,1,1,2-Tetrachloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1,1-Trichloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1,2,2-Tetrachloroethane	ND (0.5)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1,2-Trichloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1-Dichloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1-Dichloroethene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,1-Dichloropropene	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2,3-Trichlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2,3-Trichloropropane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2,4-Trichlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2,4-Trimethylbenzene	**410** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
1,2-Dibromo-3-Chloropropane	ND (5.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2-Dibromoethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2-Dichlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2-Dichloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,2-Dichloropropane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,3,5-Trimethylbenzene	**100** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
1,3-Dichlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,3-Dichloropropane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,4-Dichlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
1,4-Dioxane - Screen	ND (500)		8260B		1	04/13/23 3:37	D3D0244	DD31311
2,2-Dichloropropane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
2-Butanone	ND (10.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
2-Chlorotoluene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
2-Hexanone	ND (10.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
4-Chlorotoluene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
4-Isopropyltoluene	**10.8** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
4-Methyl-2-Pentanone	ND (10.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Acetone	ND (10.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Benzene	**5720** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
Bromobenzene	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 04/07/23 12:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23D0279
ESS Laboratory Sample ID: 23D0279-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Bromochloromethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Bromodichloromethane	ND (0.6)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Bromoform	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Bromomethane	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Carbon Disulfide	**1.1** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Carbon Tetrachloride	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Chlorobenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Chloroethane	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Chloroform	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Chloromethane	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
cis-1,2-Dichloroethene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
cis-1,3-Dichloropropene	ND (0.4)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Dibromochloromethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Dibromomethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Dichlorodifluoromethane	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Diethyl Ether	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Di-isopropyl ether	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Ethyl tertiary-butyl ether	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Ethylbenzene	**2070** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
Hexachlorobutadiene	ND (0.6)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Hexachloroethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Isopropylbenzene	**84.2** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Methyl tert-Butyl Ether	**6.6** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Methylene Chloride	ND (2.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Naphthalene	**7450** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
n-Butylbenzene	**7.2** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
n-Propylbenzene	**23.8** (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
sec-Butylbenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Styrene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
tert-Butylbenzene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Tertiary-amyl methyl ether	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 04/07/23 12:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 23D0279
ESS Laboratory Sample ID: 23D0279-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD

8260B Volatile Organic Compounds

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
Tetrachloroethene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Tetrahydrofuran	ND (5.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Toluene	**250** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
trans-1,2-Dichloroethene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
trans-1,3-Dichloropropene	ND (0.4)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Trichloroethene	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Trichlorofluoromethane	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Vinyl Chloride	ND (1.0)		8260B		1	04/13/23 3:37	D3D0244	DD31311
Xylene O	**1070** (100)		8260B		100	04/13/23 14:00	D3D0244	DD31311
Xylene P,M	**1420** (200)		8260B		100	04/13/23 14:00	D3D0244	DD31311
Xylenes (Total)	**2490** (200)		8260B		100	04/13/23 14:00		[CALC]

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*106 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*102 %*		*70-130*
Surrogate: Dibromofluoromethane	*99 %*		*70-130*
Surrogate: Toluene-d8	*97 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 04/07/23 12:15
Percent Solids: N/A
Initial Volume: 1070ml
Final Volume: 0.25ml
Extraction Method: 3510C

ESS Laboratory Work Order: 23D0279
ESS Laboratory Sample ID: 23D0279-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: TJ
Prepared: 4/12/23 14:30

8270D(SIM) Polynuclear Aromatic Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
2-Methylnaphthalene	**469** (74.8)		8270D SIM PAH		400	04/12/23 21:52	D3D0233	DD31226
Acenaphthene	**48.4** (7.48)		8270D SIM PAH		40	04/12/23 21:32	D3D0233	DD31226
Acenaphthylene	**2.30** (0.19)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Anthracene	**2.49** (0.19)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Benzo(a)anthracene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Benzo(a)pyrene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Benzo(b)fluoranthene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Benzo(g,h,i)perylene	ND (0.19)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Benzo(k)fluoranthene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Chrysene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Dibenzo(a,h)Anthracene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Fluoranthene	**0.77** (0.19)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Fluorene	**23.7** (0.75)		8270D SIM PAH		4	04/12/23 21:11	D3D0233	DD31226
Indeno(1,2,3-cd)Pyrene	ND (0.05)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226
Naphthalene	**3380** (74.8)		8270D SIM PAH		400	04/12/23 21:52	D3D0233	DD31226
Phenanthrene	**22.1** (0.75)		8270D SIM PAH		4	04/12/23 21:11	D3D0233	DD31226
Pyrene	**0.60** (0.19)		8270D SIM PAH		1	04/12/23 20:09	D3D0233	DD31226

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichlorobenzene-d4	*99 %*		*30-130*
Surrogate: 2-Fluorobiphenyl	*43 %*		*30-130*
Surrogate: Nitrobenzene-d5	*38 %*		*30-130*
Surrogate: p-Terphenyl-d14	*65 %*		*30-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
Blank										
1,1,1,2-Tetrachloroethane	ND	1.0	ug/L							
1,1,1-Trichloroethane	ND	1.0	ug/L							
1,1,2,2-Tetrachloroethane	ND	0.5	ug/L							
1,1,2-Trichloroethane	ND	1.0	ug/L							
1,1-Dichloroethane	ND	1.0	ug/L							
1,1-Dichloroethene	ND	1.0	ug/L							
1,1-Dichloropropene	ND	2.0	ug/L							
1,2,3-Trichlorobenzene	ND	1.0	ug/L							
1,2,3-Trichloropropane	ND	1.0	ug/L							
1,2,4-Trichlorobenzene	ND	1.0	ug/L							
1,2,4-Trimethylbenzene	ND	1.0	ug/L							
1,2-Dibromo-3-Chloropropane	ND	5.0	ug/L							
1,2-Dibromoethane	ND	1.0	ug/L							
1,2-Dichlorobenzene	ND	1.0	ug/L							
1,2-Dichloroethane	ND	1.0	ug/L							
1,2-Dichloropropane	ND	1.0	ug/L							
1,3,5-Trimethylbenzene	ND	1.0	ug/L							
1,3-Dichlorobenzene	ND	1.0	ug/L							
1,3-Dichloropropane	ND	1.0	ug/L							
1,4-Dichlorobenzene	ND	1.0	ug/L							
1,4-Dioxane - Screen	ND	500	ug/L							
2,2-Dichloropropane	ND	1.0	ug/L							
2-Butanone	ND	10.0	ug/L							
2-Chlorotoluene	ND	1.0	ug/L							
2-Hexanone	ND	10.0	ug/L							
4-Chlorotoluene	ND	1.0	ug/L							
4-Isopropyltoluene	ND	1.0	ug/L							
4-Methyl-2-Pentanone	ND	10.0	ug/L							
Acetone	ND	10.0	ug/L							
Benzene	ND	1.0	ug/L							
Bromobenzene	ND	2.0	ug/L							
Bromochloromethane	ND	1.0	ug/L							
Bromodichloromethane	ND	0.6	ug/L							
Bromoform	ND	1.0	ug/L							
Bromomethane	ND	2.0	ug/L							
Carbon Disulfide	ND	1.0	ug/L							
Carbon Tetrachloride	ND	1.0	ug/L							
Chlorobenzene	ND	1.0	ug/L							
Chloroethane	ND	2.0	ug/L							
Chloroform	ND	1.0	ug/L							
Chloromethane	ND	2.0	ug/L							
cis-1,2-Dichloroethene	ND	1.0	ug/L							
cis-1,3-Dichloropropene	ND	0.4	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
Dibromochloromethane	ND	1.0	ug/L							
Dibromomethane	ND	1.0	ug/L							
Dichlorodifluoromethane	ND	2.0	ug/L							
Diethyl Ether	ND	1.0	ug/L							
Di-isopropyl ether	ND	1.0	ug/L							
Ethyl tertiary-butyl ether	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Hexachlorobutadiene	ND	0.6	ug/L							
Hexachloroethane	ND	1.0	ug/L							
Isopropylbenzene	ND	1.0	ug/L							
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Methylene Chloride	ND	2.0	ug/L							
Naphthalene	ND	1.0	ug/L							
n-Butylbenzene	ND	1.0	ug/L							
n-Propylbenzene	ND	1.0	ug/L							
sec-Butylbenzene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
tert-Butylbenzene	ND	1.0	ug/L							
Tertiary-amyl methyl ether	ND	1.0	ug/L							
Tetrachloroethene	ND	1.0	ug/L							
Tetrahydrofuran	ND	5.0	ug/L							
Toluene	ND	1.0	ug/L							
trans-1,2-Dichloroethene	ND	1.0	ug/L							
trans-1,3-Dichloropropene	ND	0.4	ug/L							
Trichloroethene	ND	1.0	ug/L							
Trichlorofluoromethane	ND	1.0	ug/L							
Vinyl Chloride	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Surrogate: 1,2-Dichloroethane-d4	*25.9*		ug/L	*25.00*		*104*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*24.6*		ug/L	*25.00*		*98*	*70-130*			
Surrogate: Dibromofluoromethane	*24.2*		ug/L	*25.00*		*97*	*70-130*			
Surrogate: Toluene-d8	*24.8*		ug/L	*25.00*		*99*	*70-130*			
LCS										
1,1,1,2-Tetrachloroethane	9.4	1.0	ug/L	10.00		94	70-130			
1,1,1-Trichloroethane	9.5	1.0	ug/L	10.00		95	70-130			
1,1,2,2-Tetrachloroethane	9.0	0.5	ug/L	10.00		90	70-130			
1,1,2-Trichloroethane	9.1	1.0	ug/L	10.00		91	70-130			
1,1-Dichloroethane	9.3	1.0	ug/L	10.00		93	70-130			
1,1-Dichloroethene	9.0	1.0	ug/L	10.00		90	70-130			
1,1-Dichloropropene	9.6	2.0	ug/L	10.00		96	70-130			
1,2,3-Trichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130			
1,2,3-Trichloropropane	9.0	1.0	ug/L	10.00		90	70-130			
1,2,4-Trichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
1,2,4-Trimethylbenzene	8.9	1.0	ug/L	10.00		89	70-130			
1,2-Dibromo-3-Chloropropane	8.8	5.0	ug/L	10.00		88	70-130			
1,2-Dibromoethane	9.2	1.0	ug/L	10.00		92	70-130			
1,2-Dichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130			
1,2-Dichloroethane	9.8	1.0	ug/L	10.00		98	70-130			
1,2-Dichloropropane	9.0	1.0	ug/L	10.00		90	70-130			
1,3,5-Trimethylbenzene	9.3	1.0	ug/L	10.00		93	70-130			
1,3-Dichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130			
1,3-Dichloropropane	9.8	1.0	ug/L	10.00		98	70-130			
1,4-Dichlorobenzene	9.8	1.0	ug/L	10.00		98	70-130			
1,4-Dioxane - Screen	212	500	ug/L	200.0		106	0-332			
2,2-Dichloropropane	8.5	1.0	ug/L	10.00		85	70-130			
2-Butanone	60.1	10.0	ug/L	50.00		120	70-130			
2-Chlorotoluene	9.3	1.0	ug/L	10.00		93	70-130			
2-Hexanone	60.2	10.0	ug/L	50.00		120	70-130			
4-Chlorotoluene	9.3	1.0	ug/L	10.00		93	70-130			
4-Isopropyltoluene	9.0	1.0	ug/L	10.00		90	70-130			
4-Methyl-2-Pentanone	51.8	10.0	ug/L	50.00		104	70-130			
Acetone	59.1	10.0	ug/L	50.00		118	70-130			
Benzene	9.2	1.0	ug/L	10.00		92	70-130			
Bromobenzene	9.5	2.0	ug/L	10.00		95	70-130			
Bromochloromethane	9.2	1.0	ug/L	10.00		92	70-130			
Bromodichloromethane	9.2	0.6	ug/L	10.00		92	70-130			
Bromoform	8.7	1.0	ug/L	10.00		87	70-130			
Bromomethane	8.7	2.0	ug/L	10.00		87	70-130			
Carbon Disulfide	10.1	1.0	ug/L	10.00		101	70-130			
Carbon Tetrachloride	9.4	1.0	ug/L	10.00		94	70-130			
Chlorobenzene	9.2	1.0	ug/L	10.00		92	70-130			
Chloroethane	9.5	2.0	ug/L	10.00		95	70-130			
Chloroform	9.6	1.0	ug/L	10.00		96	70-130			
Chloromethane	8.3	2.0	ug/L	10.00		83	70-130			
cis-1,2-Dichloroethene	9.8	1.0	ug/L	10.00		98	70-130			
cis-1,3-Dichloropropene	8.8	0.4	ug/L	10.00		88	70-130			
Dibromochloromethane	8.7	1.0	ug/L	10.00		87	70-130			
Dibromomethane	9.1	1.0	ug/L	10.00		91	70-130			
Dichlorodifluoromethane	8.5	2.0	ug/L	10.00		85	70-130			
Diethyl Ether	9.8	1.0	ug/L	10.00		98	70-130			
Di-isopropyl ether	10.7	1.0	ug/L	10.00		107	70-130			
Ethyl tertiary-butyl ether	10.2	1.0	ug/L	10.00		102	70-130			
Ethylbenzene	9.1	1.0	ug/L	10.00		91	70-130			
Hexachlorobutadiene	9.1	0.6	ug/L	10.00		91	70-130			
Hexachloroethane	8.8	1.0	ug/L	10.00		88	70-130			
Isopropylbenzene	9.2	1.0	ug/L	10.00		92	70-130			
Methyl tert-Butyl Ether	9.5	1.0	ug/L	10.00		95	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
Methylene Chloride	9.6	2.0	ug/L	10.00		96	70-130			
Naphthalene	9.0	1.0	ug/L	10.00		90	70-130			
n-Butylbenzene	9.2	1.0	ug/L	10.00		92	70-130			
n-Propylbenzene	9.2	1.0	ug/L	10.00		92	70-130			
sec-Butylbenzene	8.9	1.0	ug/L	10.00		89	70-130			
Styrene	9.0	1.0	ug/L	10.00		90	70-130			
tert-Butylbenzene	9.4	1.0	ug/L	10.00		94	70-130			
Tertiary-amyl methyl ether	9.9	1.0	ug/L	10.00		99	70-130			
Tetrachloroethene	10.8	1.0	ug/L	10.00		108	70-130			
Tetrahydrofuran	10.8	5.0	ug/L	10.00		108	70-130			
Toluene	9.1	1.0	ug/L	10.00		91	70-130			
trans-1,2-Dichloroethene	8.5	1.0	ug/L	10.00		85	70-130			
trans-1,3-Dichloropropene	7.8	0.4	ug/L	10.00		78	70-130			
Trichloroethene	9.6	1.0	ug/L	10.00		96	70-130			
Trichlorofluoromethane	9.5	1.0	ug/L	10.00		95	70-130			
Vinyl Chloride	8.1	1.0	ug/L	10.00		81	70-130			
Xylene O	9.2	1.0	ug/L	10.00		92	70-130			
Xylene P,M	19.2	2.0	ug/L	20.00		96	70-130			
Surrogate: 1,2-Dichloroethane-d4	*26.2*		ug/L	*25.00*		*105*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.0*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: Dibromofluoromethane	*25.0*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: Toluene-d8	*24.4*		ug/L	*25.00*		*98*	*70-130*			
LCS Dup										
1,1,1,2-Tetrachloroethane	9.6	1.0	ug/L	10.00		96	70-130	2	20	
1,1,1-Trichloroethane	9.8	1.0	ug/L	10.00		98	70-130	3	20	
1,1,2,2-Tetrachloroethane	8.8	0.5	ug/L	10.00		88	70-130	2	20	
1,1,2-Trichloroethane	9.3	1.0	ug/L	10.00		93	70-130	2	20	
1,1-Dichloroethane	9.7	1.0	ug/L	10.00		97	70-130	4	20	
1,1-Dichloroethene	9.2	1.0	ug/L	10.00		92	70-130	1	20	
1,1-Dichloropropene	9.8	2.0	ug/L	10.00		98	70-130	2	20	
1,2,3-Trichlorobenzene	9.1	1.0	ug/L	10.00		91	70-130	0.3	20	
1,2,3-Trichloropropane	9.0	1.0	ug/L	10.00		90	70-130	0.1	20	
1,2,4-Trichlorobenzene	9.3	1.0	ug/L	10.00		93	70-130	1	20	
1,2,4-Trimethylbenzene	8.9	1.0	ug/L	10.00		89	70-130	0.2	20	
1,2-Dibromo-3-Chloropropane	8.5	5.0	ug/L	10.00		85	70-130	4	20	
1,2-Dibromoethane	9.4	1.0	ug/L	10.00		94	70-130	1	20	
1,2-Dichlorobenzene	9.2	1.0	ug/L	10.00		92	70-130	0.2	20	
1,2-Dichloroethane	9.8	1.0	ug/L	10.00		98	70-130	0.6	20	
1,2-Dichloropropane	9.4	1.0	ug/L	10.00		94	70-130	3	20	
1,3,5-Trimethylbenzene	9.4	1.0	ug/L	10.00		94	70-130	1	20	
1,3-Dichlorobenzene	9.4	1.0	ug/L	10.00		94	70-130	2	20	
1,3-Dichloropropane	10.0	1.0	ug/L	10.00		100	70-130	2	20	
1,4-Dichlorobenzene	9.9	1.0	ug/L	10.00		99	70-130	1	20	
1,4-Dioxane - Screen	211	500	ug/L	200.0		106	0-332	0.4	200	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
2,2-Dichloropropane	8.7	1.0	ug/L	10.00		87	70-130	3	20	
2-Butanone	60.2	10.0	ug/L	50.00		120	70-130	0.1	20	
2-Chlorotoluene	9.5	1.0	ug/L	10.00		95	70-130	2	20	
2-Hexanone	60.4	10.0	ug/L	50.00		121	70-130	0.4	20	
4-Chlorotoluene	9.5	1.0	ug/L	10.00		95	70-130	2	20	
4-Isopropyltoluene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
4-Methyl-2-Pentanone	51.8	10.0	ug/L	50.00		104	70-130	0.1	20	
Acetone	56.1	10.0	ug/L	50.00		112	70-130	5	20	
Benzene	9.6	1.0	ug/L	10.00		96	70-130	5	20	
Bromobenzene	9.5	2.0	ug/L	10.00		95	70-130	0.2	20	
Bromochloromethane	9.5	1.0	ug/L	10.00		95	70-130	3	20	
Bromodichloromethane	9.1	0.6	ug/L	10.00		91	70-130	1	20	
Bromoform	8.6	1.0	ug/L	10.00		86	70-130	2	20	
Bromomethane	8.9	2.0	ug/L	10.00		89	70-130	3	20	
Carbon Disulfide	9.8	1.0	ug/L	10.00		98	70-130	3	20	
Carbon Tetrachloride	9.6	1.0	ug/L	10.00		96	70-130	2	20	
Chlorobenzene	9.3	1.0	ug/L	10.00		93	70-130	2	20	
Chloroethane	9.4	2.0	ug/L	10.00		94	70-130	1	20	
Chloroform	9.9	1.0	ug/L	10.00		99	70-130	2	20	
Chloromethane	8.5	2.0	ug/L	10.00		85	70-130	3	20	
cis-1,2-Dichloroethene	9.9	1.0	ug/L	10.00		99	70-130	0.8	20	
cis-1,3-Dichloropropene	8.9	0.4	ug/L	10.00		89	70-130	2	20	
Dibromochloromethane	8.9	1.0	ug/L	10.00		89	70-130	2	20	
Dibromomethane	9.5	1.0	ug/L	10.00		95	70-130	4	20	
Dichlorodifluoromethane	8.6	2.0	ug/L	10.00		86	70-130	0.5	20	
Diethyl Ether	9.5	1.0	ug/L	10.00		95	70-130	4	20	
Di-isopropyl ether	10.6	1.0	ug/L	10.00		106	70-130	0.4	20	
Ethyl tertiary-butyl ether	10.3	1.0	ug/L	10.00		103	70-130	0.5	20	
Ethylbenzene	9.4	1.0	ug/L	10.00		94	70-130	3	20	
Hexachlorobutadiene	9.0	0.6	ug/L	10.00		90	70-130	0.9	20	
Hexachloroethane	9.2	1.0	ug/L	10.00		92	70-130	4	20	
Isopropylbenzene	9.5	1.0	ug/L	10.00		95	70-130	2	20	
Methyl tert-Butyl Ether	10.3	1.0	ug/L	10.00		103	70-130	7	20	
Methylene Chloride	9.9	2.0	ug/L	10.00		99	70-130	3	20	
Naphthalene	8.9	1.0	ug/L	10.00		89	70-130	1	20	
n-Butylbenzene	9.2	1.0	ug/L	10.00		92	70-130	0.4	20	
n-Propylbenzene	9.4	1.0	ug/L	10.00		94	70-130	1	20	
sec-Butylbenzene	9.0	1.0	ug/L	10.00		90	70-130	2	20	
Styrene	9.2	1.0	ug/L	10.00		92	70-130	2	20	
tert-Butylbenzene	9.4	1.0	ug/L	10.00		94	70-130	1	20	
Tertiary-amyl methyl ether	10.1	1.0	ug/L	10.00		101	70-130	3	20	
Tetrachloroethene	11.3	1.0	ug/L	10.00		113	70-130	4	20	
Tetrahydrofuran	10.8	5.0	ug/L	10.00		108	70-130	0.3	20	
Toluene	9.3	1.0	ug/L	10.00		93	70-130	2	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8260B Volatile Organic Compounds										
Batch DD31311 - 5030B										
trans-1,2-Dichloroethene	9.8	1.0	ug/L	10.00		98	70-130	14	20	
trans-1,3-Dichloropropene	7.8	0.4	ug/L	10.00		78	70-130	0.4	20	
Trichloroethene	9.6	1.0	ug/L	10.00		96	70-130	0	20	
Trichlorofluoromethane	9.6	1.0	ug/L	10.00		96	70-130	0.4	20	
Vinyl Chloride	8.6	1.0	ug/L	10.00		86	70-130	6	20	
Xylene O	9.5	1.0	ug/L	10.00		95	70-130	3	20	
Xylene P,M	19.5	2.0	ug/L	20.00		98	70-130	2	20	
Surrogate: 1,2-Dichloroethane-d4	*26.7*		ug/L	*25.00*		*107*	*70-130*			
Surrogate: 4-Bromofluorobenzene	*25.1*		ug/L	*25.00*		*101*	*70-130*			
Surrogate: Dibromofluoromethane	*25.1*		ug/L	*25.00*		*100*	*70-130*			
Surrogate: Toluene-d8	*24.8*		ug/L	*25.00*		*99*	*70-130*			
8270D(SIM) Polynuclear Aromatic Hydrocarbon										
Batch DD31226 - 3510C										
Blank										
2-Methylnaphthalene	ND	0.20	ug/L							
Acenaphthene	ND	0.20	ug/L							
Acenaphthylene	ND	0.20	ug/L							
Anthracene	ND	0.20	ug/L							
Benzo(a)anthracene	ND	0.05	ug/L							
Benzo(a)pyrene	ND	0.05	ug/L							
Benzo(b)fluoranthene	0.06	0.05	ug/L							
Benzo(g,h,i)perylene	ND	0.20	ug/L							
Benzo(k)fluoranthene	ND	0.05	ug/L							
Chrysene	0.06	0.05	ug/L							
Dibenzo(a,h)Anthracene	ND	0.05	ug/L							
Fluoranthene	ND	0.20	ug/L							
Fluorene	ND	0.20	ug/L							
Indeno(1,2,3-cd)Pyrene	ND	0.05	ug/L							
Naphthalene	ND	0.20	ug/L							
Phenanthrene	ND	0.20	ug/L							
Pyrene	ND	0.20	ug/L							
Surrogate: 1,2-Dichlorobenzene-d4	*1.48*		ug/L	*2.500*		*59*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.53*		ug/L	*2.500*		*61*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.82*		ug/L	*2.500*		*73*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.73*		ug/L	*2.500*		*69*	*30-130*			
LCS										
2-Methylnaphthalene	2.37	0.20	ug/L	4.000		59	40-140			
Acenaphthene	2.43	0.20	ug/L	4.000		61	40-140			
Acenaphthylene	2.55	0.20	ug/L	4.000		64	40-140			
Anthracene	2.53	0.20	ug/L	4.000		63	40-140			
Benzo(a)anthracene	2.53	0.05	ug/L	4.000		63	40-140			
Benzo(a)pyrene	2.79	0.05	ug/L	4.000		70	40-140			
Benzo(b)fluoranthene	2.35	0.05	ug/L	4.000		59	40-140			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
8270D(SIM) Polynuclear Aromatic Hydrocarbon										
Batch DD31226 - 3510C										
Benzo(g,h,i)perylene	2.48	0.20	ug/L	4.000		62	40-140			
Benzo(k)fluoranthene	2.44	0.05	ug/L	4.000		61	40-140			
Chrysene	2.66	0.05	ug/L	4.000		66	40-140			
Dibenzo(a,h)Anthracene	2.49	0.05	ug/L	4.000		62	40-140			
Fluoranthene	2.65	0.20	ug/L	4.000		66	40-140			
Fluorene	2.60	0.20	ug/L	4.000		65	40-140			
Indeno(1,2,3-cd)Pyrene	2.55	0.05	ug/L	4.000		64	40-140			
Naphthalene	2.82	0.20	ug/L	4.000		71	40-140			
Phenanthrene	2.45	0.20	ug/L	4.000		61	40-140			
Pyrene	2.39	0.20	ug/L	4.000		60	40-140			
Surrogate: 1,2-Dichlorobenzene-d4	*1.18*		ug/L	*2.500*		*47*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.36*		ug/L	*2.500*		*54*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.64*		ug/L	*2.500*		*66*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.58*		ug/L	*2.500*		*63*	*30-130*			
LCS Dup										
2-Methylnaphthalene	2.79	0.20	ug/L	4.000		70	40-140	16	20	
Acenaphthene	2.95	0.20	ug/L	4.000		74	40-140	19	20	
Acenaphthylene	3.10	0.20	ug/L	4.000		78	40-140	19	20	
Anthracene	2.94	0.20	ug/L	4.000		74	40-140	15	20	
Benzo(a)anthracene	2.94	0.05	ug/L	4.000		74	40-140	15	20	
Benzo(a)pyrene	3.20	0.05	ug/L	4.000		80	40-140	14	20	
Benzo(b)fluoranthene	2.78	0.05	ug/L	4.000		70	40-140	17	20	
Benzo(g,h,i)perylene	2.90	0.20	ug/L	4.000		72	40-140	16	20	
Benzo(k)fluoranthene	2.86	0.05	ug/L	4.000		71	40-140	16	20	
Chrysene	3.11	0.05	ug/L	4.000		78	40-140	16	20	
Dibenzo(a,h)Anthracene	2.98	0.05	ug/L	4.000		74	40-140	18	20	
Fluoranthene	2.94	0.20	ug/L	4.000		73	40-140	10	20	
Fluorene	3.15	0.20	ug/L	4.000		79	40-140	19	20	
Indeno(1,2,3-cd)Pyrene	3.02	0.05	ug/L	4.000		75	40-140	17	20	
Naphthalene	3.02	0.20	ug/L	4.000		76	40-140	7	20	
Phenanthrene	2.91	0.20	ug/L	4.000		73	40-140	17	20	
Pyrene	2.81	0.20	ug/L	4.000		70	40-140	16	20	
Surrogate: 1,2-Dichlorobenzene-d4	*1.35*		ug/L	*2.500*		*54*	*30-130*			
Surrogate: 2-Fluorobiphenyl	*1.58*		ug/L	*2.500*		*63*	*30-130*			
Surrogate: Nitrobenzene-d5	*1.93*		ug/L	*2.500*		*77*	*30-130*			
Surrogate: p-Terphenyl-d14	*1.95*		ug/L	*2.500*		*78*	*30-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 23D0279

Notes and Definitions

U	Analyte included in the analysis, but not detected
D	Diluted.
BT	Benzidine tailing factor >2.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 23D0279

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZATB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 23D0279
Date Received: 4/10/2023
Project Due Date: 4/14/2023
Days for Project: 4 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.8 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / (NA)

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	417055	Yes	No	Yes	VOA Vial	HCl	
1	417056	Yes	No	Yes	VOA Vial	HCl	
1	417057	Yes	No	Yes	VOA Vial	HCl	
1	417058	Yes	N/A	Yes	1L Amber	HCl	
1	417059	Yes	N/A	Yes	1L Amber	HCl	

2nd Review
Were all containers scanned into storage/lab? Initials BB
Are barcode labels on correct containers? (Yes) / No
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 4/10/23 14:25
Reviewed By: Date & Time: 4/10/23 1436

ESS Laboratory
Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 2300279

Turn Time _____ Standard Rush: 4-Day Approved By: _____

Reporting Limits -

State where samples were collected: **MA** RI CT NH NJ NY ME Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other____

Electonic Deliverable Yes____ No____
Format: Excel___ Access___ PDF___ Other_____

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing _____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	Analysis: # of Containers	MCP VOCs by 8260D	MCP PAHs by 8270E-SIM	Comment #
	4/7/2023	12:15	G	GW	B208-MW	5	X	X	1.

Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____

Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ✓ Yes _____ No

Seals Intact _____ Yes _____ No NA: _____

Cooler Temperature: 3.8 °C

Sampled by : Justin Ivas

Comments: 1. MCP PAHs: Napththalene, 2-Methylnaphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)Pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Justin Ivas 4/7/23 @1630	4/7/23@1630	4/10/23 9:59	4/10/23	1427	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

Page 1 of 1

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 24B0717

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 6:49 pm, Feb 27, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

SAMPLE RECEIPT

The following samples were received on February 23, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Question I: All samples for VOA were analyzed for a subset of the required MCP list per the client's request.

Lab Number	Sample Name	Matrix	Analysis
24B0717-01	B206-Water	Ground Water	8260D
24B0717-02	NFSB-02-Water	Ground Water	8260D
24B0717-03	B208-Water	Ground Water	8260D

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

PROJECT NARRATIVE

Volatile Organics

24B0717-01	**Elevated Method Reporting Limits due to sample matrix (EL).**
24B0717-02	**Elevated Method Reporting Limits due to sample matrix (EL).**
24B0717-03	**Elevated Method Reporting Limits due to sample matrix (EL).**

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24B0717-01 through 24B0717-03**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:*** ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	Yes ( ) No (X)*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the informati Laura L Stadler ***analytical report is, to the best of my knowledge and belief, accurate and complete.***

Signature: _____ Date: February 27, 2024

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B206-Water
Date Sampled: 02/22/24 12:05
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 24B0717
ESS Laboratory Sample ID: 24B0717-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD
Prepared: 2/27/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**11100** (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Ethylbenzene	**1810** (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Methyl tert-Butyl Ether	ND (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Naphthalene	**6850** (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Styrene	ND (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Toluene	ND (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Xylene O	**1280** (500)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Xylene P,M	**1870** (1000)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718
Xylenes (Total)	**3150** (1000)		8260D		500	MD	02/27/24 13:53	D4B0520	DB42718

	%Recovery	Qualifier	Limits
Surrogate: Toluene-d8	*98 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-Water
Date Sampled: 02/22/24 13:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 24B0717
ESS Laboratory Sample ID: 24B0717-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD
Prepared: 2/26/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**2180** (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Ethylbenzene	**221** (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Methyl tert-Butyl Ether	ND (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Naphthalene	**1460** (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Styrene	ND (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Toluene	ND (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Xylene O	**162** (100)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Xylene P,M	ND (200)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624
Xylenes (Total)	**330** (200)		8260D		100	MD	02/26/24 16:37	D4B0486	DB42624

	%Recovery	Qualifier	Limits
Surrogate: Toluene-d8	*98 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-Water
Date Sampled: 02/22/24 13:55
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B

ESS Laboratory Work Order: 24B0717
ESS Laboratory Sample ID: 24B0717-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MD
Prepared: 2/27/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**12500** (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Ethylbenzene	**2300** (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Methyl tert-Butyl Ether	ND (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Naphthalene	**9200** (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Styrene	ND (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Toluene	**825** (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Xylene O	**1300** (500)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Xylene P,M	**1820** (1000)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718
Xylenes (Total)	**3120** (1000)		8260D		500	MD	02/27/24 14:20	D4B0520	DB42718

	%Recovery	*Qualifier*	*Limits*
Surrogate: Toluene-d8	*101 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0717

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
				Volatile Organics						
Batch DB42624 - 5030B										
Blank										
Benzene	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Naphthalene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
Toluene	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Xylenes (Total)	ND	2.0	ug/L							
LCS										
Benzene	9.8	1.0	ug/L	10.00		98	70-130			
Ethylbenzene	9.7	1.0	ug/L	10.00		97	70-130			
Methyl tert-Butyl Ether	9.9	1.0	ug/L	10.00		99	70-130			
Naphthalene	10.8	1.0	ug/L	10.00		108	40-160			
Styrene	9.5	1.0	ug/L	10.00		95	40-160			
Toluene	10.0	1.0	ug/L	10.00		100	70-130			
Xylene O	9.5	1.0	ug/L	10.00		95	70-130			
Xylene P,M	18.7	2.0	ug/L	20.00		93	70-130			
Xylenes (Total)	28.2	2.0	ug/L	30.00		94	70-130			
LCS Dup										
Benzene	10.2	1.0	ug/L	10.00		102	70-130	5	20	
Ethylbenzene	10.1	1.0	ug/L	10.00		101	70-130	4	20	
Methyl tert-Butyl Ether	9.9	1.0	ug/L	10.00		99	70-130	0.1	20	
Naphthalene	10.6	1.0	ug/L	10.00		106	40-160	2	20	
Styrene	9.5	1.0	ug/L	10.00		95	40-160	0.3	20	
Toluene	9.8	1.0	ug/L	10.00		98	70-130	2	20	
Xylene O	9.6	1.0	ug/L	10.00		96	70-130	2	20	
Xylene P,M	19.4	2.0	ug/L	20.00		97	70-130	4	20	
Xylenes (Total)	29.0	2.0	ug/L	30.00		97	70-130	3	20	
Batch DB42718 - 5030B										
Blank										
Benzene	ND	1.0	ug/L							
Ethylbenzene	ND	1.0	ug/L							
Methyl tert-Butyl Ether	ND	1.0	ug/L							
Naphthalene	ND	1.0	ug/L							
Styrene	ND	1.0	ug/L							
Toluene	ND	1.0	ug/L							
Xylene O	ND	1.0	ug/L							
Xylene P,M	ND	2.0	ug/L							
Xylenes (Total)	ND	2.0	ug/L							
LCS										
Benzene	10.6	1.0	ug/L	10.00		106	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42718 - 5030B										
Ethylbenzene	10.1	1.0	ug/L	10.00		101	70-130			
Methyl tert-Butyl Ether	10.2	1.0	ug/L	10.00		102	70-130			
Naphthalene	11.7	1.0	ug/L	10.00		117	40-160			
Styrene	10.2	1.0	ug/L	10.00		102	40-160			
Toluene	10.6	1.0	ug/L	10.00		106	70-130			
Xylene O	10.0	1.0	ug/L	10.00		100	70-130			
Xylene P,M	20.1	2.0	ug/L	20.00		100	70-130			
Xylenes (Total)	30.0	2.0	ug/L	30.00		100	70-130			
LCS Dup										
Benzene	11.0	1.0	ug/L	10.00		110	70-130	4	20	
Ethylbenzene	10.6	1.0	ug/L	10.00		106	70-130	4	20	
Methyl tert-Butyl Ether	10.2	1.0	ug/L	10.00		102	70-130	0.1	20	
Naphthalene	10.8	1.0	ug/L	10.00		108	40-160	8	20	
Styrene	10.4	1.0	ug/L	10.00		104	40-160	3	20	
Toluene	10.6	1.0	ug/L	10.00		106	70-130	0.09	20	
Xylene O	10.0	1.0	ug/L	10.00		100	70-130	0.3	20	
Xylene P,M	20.2	2.0	ug/L	20.00		101	70-130	0.5	20	
Xylenes (Total)	30.2	2.0	ug/L	30.00		101	70-130	0.5	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

Notes and Definitions

U	Analyte included in the analysis, but not detected
EL	Elevated Method Reporting Limits due to sample matrix (EL).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0717

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

ESS Project ID: 24B0717
Date Received: 2/23/2024
Project Due Date: 2/27/2024
Days for Project: 2 Day

Shipped/Delivered Via: ESS Courier

Air bill manifest present? No
Air No.: NA

Were custody seals present? No

Is radiation count <100 CPM? Yes

Is a Cooler Present? Yes
Temp: 3.4 Iced with: Ice

Was COC signed and dated by client? No

6. Does COC match bottles? Yes

7. Is COC complete and correct? Yes

8. Were samples received intact? Yes

9. **Were labs informed about short holds & rushes?** Yes / No / NA

10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
ESS Sample IDs:
Analysis:
TAT:

12. Were VOAs received? Yes / No
a. Air bubbles in aqueous VOAs? Yes / No
b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? Yes / No
a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

Missing client relinquish signature.

14. Was there a need to contact Project Manager? Yes / No
a. Was there a need to contact the client? Yes / No
Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	522024	Yes	No	Yes	VOA Vial	HCl	
1	522025	Yes	No	Yes	VOA Vial	HCl	
1	522026	Yes	No	Yes	VOA Vial	HCl	
2	522030	Yes	No	Yes	VOA Vial	HCl	
2	522031	Yes	No	Yes	VOA Vial	HCl	
2	522032	Yes	No	Yes	VOA Vial	HCl	

2nd Review
Were all containers scanned into storage/lab? Initials: Yes / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 2/23/24 1022
Reviewed

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

By: [signature]

Date & Time: 2/23/24 1654

ESS Project ID: 24B0717

Date Received: 2/23/2024

GW samples

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: 2480717 Rev.

Turn Time __Standard Rush___3-day (8260)___ Approved By: Eric B.

Reporting Limits -

State where samples were collected: **MA RI CT NH NJ NY ME** Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other___

Electronic Deliverable Yes_X_ No___
Format: Excel_X_ Access___ PDF_X_ EQuIS__X__

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing ____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	Analysis: 8260	Analysis: 8260 (oil)	Analysis: Benzene Equilibrium Study						Comment #
1	22-Feb-24	12:05	G	GW	B206-Water	3	X								1,4
—	22-Feb-24	12:30	G	O	B208-DNAPL	2		X	X						4
—	22-Feb-24	13:05	G	O/GW	NFSB-02-LNAPL	2		X	X						2,3,4
2	22-Feb-24	13:15	G	GW	NFSB-02-Water	3	X								1,4
3	22-Feb-24	13:55	G	GW	B208-Water	3	X								1,4
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							2	1	1						
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							V	G	G						

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present _____Yes _____No

Seals Intact _____ Yes _____No NA: _____

Cooler Temperature: _____

Sampled by : Justin Ivas

Comments: 1) Trace blebs of oil were observed in sample B206-Water. NAPL was not observed in NFSB-02-Water or B208-Water, but may be present in trace quantities.
2) Sample NFSB-02-LNAPL: please run 8260 analysis on oil phase if possible
3) Prioritize 8260 analysis for sample NFSB-02-LNAPL; if enough material left over, please run Benzene Equilibrium Study as well.
4) Sample containers may indicate VPH analysis, please run 8260 analysis as per this CoC.
5) Email distribution list: Charles.Lindberg@gza.com; Vijay.Radics@gza.com; Matthew.Dion@gza.com; Justin.Ivas@gza.com

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

CoC Revised 2/23
Justin Ivas

Page 1 of 1

185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

CHAIN OF CUSTODY

ASAP - preliminary call

ESS Lab # 24B0717 | Page 1 of 1

Turn Time: ☐ >5 ☐ 5 ☐ 4 ☐ 3 ☒ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria:

Is this project for any of the following?: ☐ CT RCP ☒ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)

☐ Limit Checker ☐ State Forms ☒ EQuIS EQEDD
☒ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt
Norwood MA 02062
Phone: 781.278.3700
Email Distribution List: justin.ivas@gza.com
charles.lindberg@gza.com

PROJECT INFORMATION

Project Name: Haverhill Former MGP
Project Location: Haverhill MA
Project Number: 01.0172397.10
Project Manager: Justin Ivas
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH	VPH (oil)	Hold for analysis	Hold for analysis (oil)	Total Number of Bottles
1	2/22/24	12:05	Grab	GW	B206-Water	X				3
	2/22/24	12:30	Grab	Oil	B208-DNAPL		X		X	2
	2/22/24	13:05	Grab	Oil/water mix	NFSB-02-LNAPL		X			2
2	2/22/24	13:15	Grab	GW	NFSB-02-Water	X				3
	2/22/24	13:55	Grab	GW	B208-Water			X	X	3
	1									

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V V V V
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7 11 7 11
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2 1 2 1

Sampled by : Justin Ivas

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only

Temperature (°C): 3.4
1 Cu

Comments: * Please specify "Other" preservative and containers types in this space
1. Other container type = 20ml vial
Sample B206-water may contain trace blebs of oil
Sample NFSB-02-LNAPL: run analysis on oil phase if possible

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration: ☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
			2/23/24 11:40		2/23/24	15:50	Taylor Davis
Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

ESS LABORATORY
185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

CHAIN OF CUSTODY

ASAP - Pending soil

ESS Lab # 717 | Page 1 of 1

Turn Time: ☐ >5 ☐ 5 ☐ 4 ☐ 3 ☑ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria:

Is this project for any of the following?: ☐ CT RCP ☑ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF): ☐ Limit Checker ☐ State Forms ☑ EQuIS EQEDD ☑ Excel ☐ Hard Copy ☐ Enviro Data ☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderhill
Norwood MA 02062
Phone: 781.278.3700
Email Distribution List: justin.ives@gza.com
charles.lindberg@gza.com

PROJECT INFORMATION

Project Name: Haverhill Former MGP
Project Location: Haverhill MA
Project Number: 01.0172397.10
Project Manager: Justin Ives
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH	VPH (oil)	Hold for analysis	Hold for analysis (oil)	Total Number of Bottles
1	2/22/24	12:05	Grab	GW	B206-Water	X				3
—	2/22/24	12:30	Grab	Oil	B208-DNAPL		X		X	2
2	2/22/24	13:05	Grab	Oil/water mix	NFSB-02-LNAPL		X			2
3	2/22/24	13:15	Grab	GW	NFSB-02-Water	X				3
—	2/22/24	13:55	Grab	GW	B208-Water			X	[illegible]	3

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V V V V

Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7 11 7 11

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2 1 2 1

Sampled by: Justin Ives

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only

Cooler Temperature (°C):

Comments: * Please specify "Other" preservative and containers types in this space
Other container type = 2oz vial
Sample B206-water may contain trace blebs of oil
Sample NFSB-02-LNAPL: perform analysis on oil phase if possible

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration ☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
			[signature] 2/23/24 11:40				

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: 284 Winter St, Haverhill MA (01.0172397.10)
ESS Laboratory Work Order Number: 24D0067

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 12:49 pm, Apr 04, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

SAMPLE RECEIPT

The following samples were received on April 02, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24D0067-01	B208 S - MW	Ground Water	MA-VPH-2.1
24D0067-02	B208 D - MW	Ground Water	MA-VPH-2.1
24D0067-03	B208 - MW	Ground Water	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

PROJECT NARRATIVE

MADEP-VPH Volatile Petroleum Hydrocarbon
24D0067-01 **Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).**
2,5-Dibromotoluene - PID (133% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24D0067-01 through 24D0067-03**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	***Data User Note:** Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.*	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: April 04, 2024
Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208 S - MW
Date Sampled: 04/02/24 09:55
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0067
ESS Laboratory Sample ID: 24D0067-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**2870** (100)		MA-VPH-2.1		1	04/03/24 21:14	D4D0090	DD40325
C5-C8 Aliphatics1,2	**6700** (282)		MA-VPH-2.1		50	04/04/24 8:04		[CALC]
C9-C12 Aliphatics2,3	**1580** (635)		MA-VPH-2.1		50	04/04/24 8:04		[CALC]
Benzene	**7030** (125)		MA-VPH-2.1		50	04/04/24 8:04	D4D0090	DD40325
Ethylbenzene	**1310** (125)		MA-VPH-2.1		50	04/04/24 8:04	D4D0090	DD40325
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/03/24 21:14	D4D0090	DD40325
Naphthalene	**1990** (125)		MA-VPH-2.1		50	04/04/24 8:04	D4D0090	DD40325
Toluene	**47.1** (5.0)		MA-VPH-2.1		1	04/03/24 21:14	D4D0090	DD40325
Xylene O	**340** (250)		MA-VPH-2.1		50	04/04/24 8:04	D4D0090	DD40325
Xylene P,M	**572** (10.0)		MA-VPH-2.1		1	04/03/24 21:14	D4D0090	DD40325
Preservative:	**pH <= 2**		MA-VPH-2.1					DD40325

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*124 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*133 %*	*SM*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208 D - MW
Date Sampled: 04/02/24 11:11
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0067
ESS Laboratory Sample ID: 24D0067-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (100)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
C5-C8 Aliphatics1,2	ND (158)		MA-VPH-2.1		1	04/03/24 16:39		[CALC]
C9-C12 Aliphatics2,3	ND (270)		MA-VPH-2.1		1	04/03/24 16:39		[CALC]
Benzene	ND (1.5)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Ethylbenzene	ND (5.0)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Naphthalene	**7.7** (5.0)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Toluene	ND (5.0)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Xylene O	ND (5.0)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Xylene P,M	ND (10.0)		MA-VPH-2.1		1	04/03/24 16:39	D4D0090	DD40325
Preservative:	**pH <= 2**		MA-VPH-2.1					DD40325

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*104 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*105 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B208 - MW
Date Sampled: 04/02/24 12:45
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0067
ESS Laboratory Sample ID: 24D0067-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6540** (100)		MA-VPH-2.1		1	04/03/24 21:48	D4D0090	DD40325
C5-C8 Aliphatics1,2	**5170** (282)		MA-VPH-2.1		50	04/04/24 8:39		[CALC]
C9-C12 Aliphatics2,3	**2880** (750)		MA-VPH-2.1		50	04/04/24 8:39		[CALC]
Benzene	**3970** (125)		MA-VPH-2.1		50	04/04/24 8:39	D4D0090	DD40325
Ethylbenzene	**2300** (125)		MA-VPH-2.1		50	04/04/24 8:39	D4D0090	DD40325
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/03/24 21:48	D4D0090	DD40325
Naphthalene	**7430** (125)		MA-VPH-2.1		50	04/04/24 8:39	D4D0090	DD40325
Toluene	**284** (5.0)		MA-VPH-2.1		1	04/03/24 21:48	D4D0090	DD40325
Xylene O	**1090** (125)		MA-VPH-2.1		50	04/04/24 8:39	D4D0090	DD40325
Xylene P,M	**1380** (250)		MA-VPH-2.1		50	04/04/24 8:39	D4D0090	DD40325
Preservative:	**pH <= 2**		MA-VPH-2.1					DD40325

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*105 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*99 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA

ESS Laboratory Work Order: 24D0067

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD40325 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
LCS										
Benzene	52.2	1.5	ug/L	50.00		104	70-130			
C5-C8 Unadjusted Aliphatics	441	150	ug/L	400.0		110	70-130			
C9-C10 Aromatics	88.7	100	ug/L	100.0		89	70-130			
C9-C12 Unadjusted Aliphatics	294	150	ug/L	300.0		98	70-130			
Ethylbenzene	48.5	5.0	ug/L	50.00		97	70-130			
Methyl tert-Butyl Ether	151	1.5	ug/L	150.0		101	70-130			
Naphthalene	80.6	5.0	ug/L	100.0		81	70-130			
Toluene	144	5.0	ug/L	150.0		96	70-130			
Xylene O	91.6	5.0	ug/L	100.0		92	70-130			
Xylene P,M	191	10.0	ug/L	200.0		96	70-130			
LCS Dup										
Benzene	51.3	1.5	ug/L	50.00		103	70-130	2	25	
C5-C8 Unadjusted Aliphatics	424	150	ug/L	400.0		106	70-130	4	25	
C9-C10 Aromatics	86.7	100	ug/L	100.0		87	70-130	2	25	
C9-C12 Unadjusted Aliphatics	284	150	ug/L	300.0		95	70-130	4	25	
Ethylbenzene	46.1	5.0	ug/L	50.00		92	70-130	5	25	
Methyl tert-Butyl Ether	153	1.5	ug/L	150.0		102	70-130	2	25	
Naphthalene	82.9	5.0	ug/L	100.0		83	70-130	3	25	
Toluene	142	5.0	ug/L	150.0		94	70-130	2	25	
Xylene O	89.7	5.0	ug/L	100.0		90	70-130	2	25	
Xylene P,M	187	10.0	ug/L	200.0		93	70-130	2	25	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
SM	Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0067

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

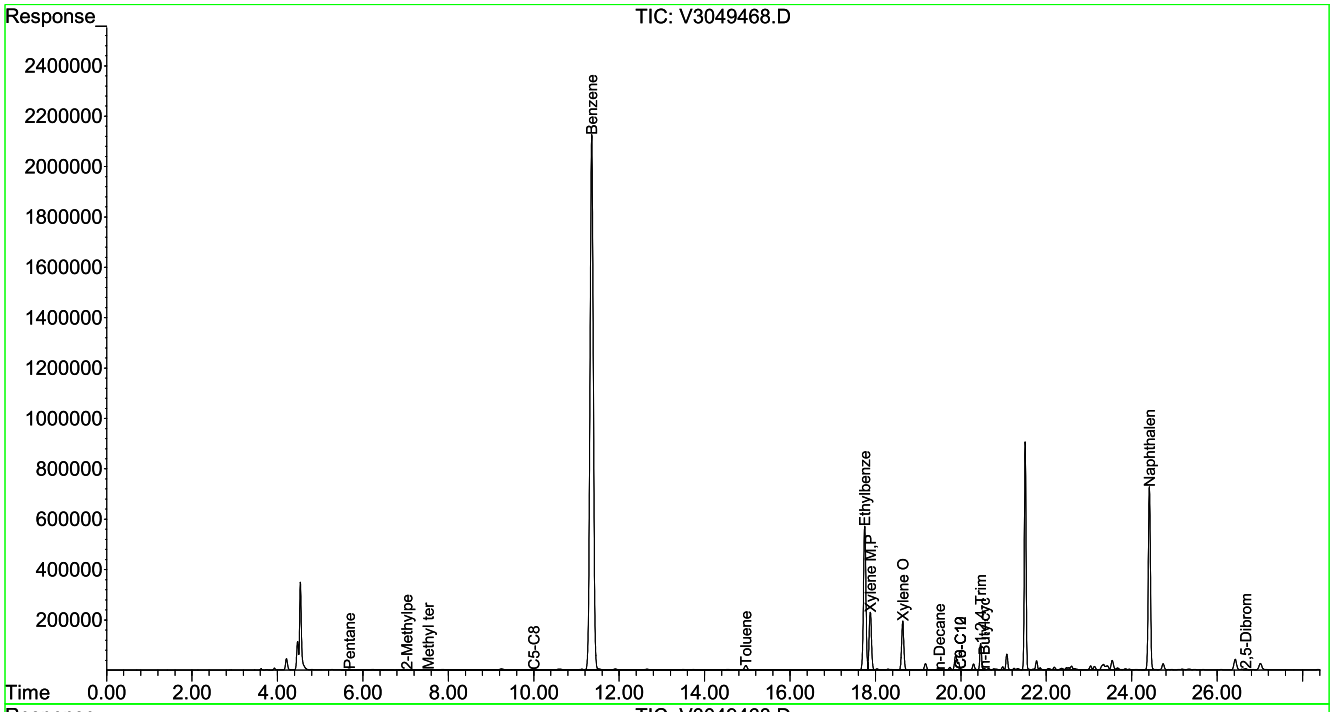
Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

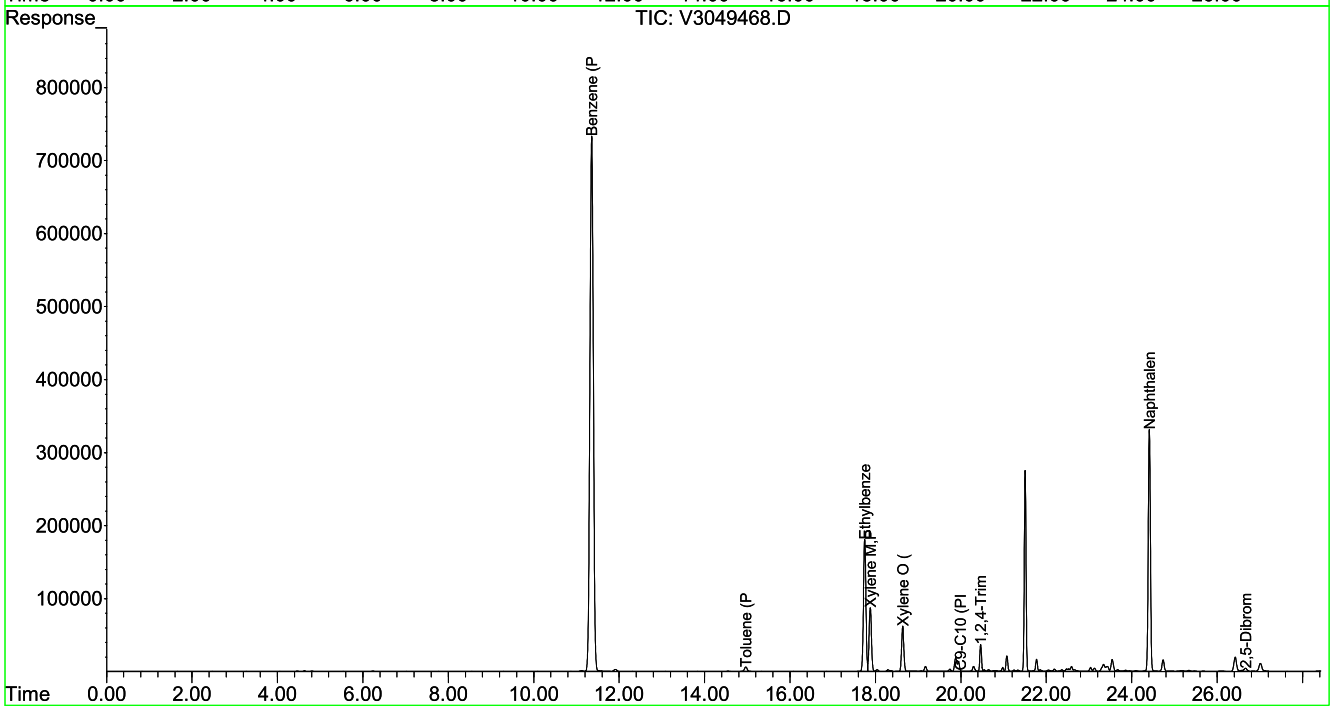
Quantitation Report (QT Reviewed)

Data Path : Q:\VOA\Gc3 voa\Gc0424\Gc040324\
Data File : V3049468.D
Signal(s) : Signal #1: FID1A.CH Signal #2: FID2B.CH
Acq On : 3 Apr 2024 9:14 pm
Operator : MEK
Sample : 24D0067-01
Misc :
InstName : VGC3
ALS Vial : 25 Sample Multiplier: 1

Integration File signal 1: EVENTS.E
Integration File signal 2: EVENTS2.E
Quant Time: Apr 04 06:57:55 2024
Quant Method : Q:\VOA\Gc3 voa\Methods\V3031224.M
Quant Title : VPH AQ:2403057 VPH SOIL:2403058
QLast Update : Wed Mar 13 08:45:31 2024
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24D0067
Date Received: 4/2/2024
Project Due Date: 4/4/2024
Days for Project: 2 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 0.9 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / (NA)
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	534393	Yes	No	Yes	VOA Vial	HCl	
1	534394	Yes	No	Yes	VOA Vial	HCl	
1	534395	Yes	No	Yes	VOA Vial	HCl	
2	534396	Yes	No	Yes	VOA Vial	HCl	
2	534397	Yes	No	Yes	VOA Vial	HCl	
2	534398	Yes	No	Yes	VOA Vial	HCl	
3	534399	Yes	No	Yes	VOA Vial	HCl	
3	534400	Yes	No	Yes	VOA Vial	HCl	
3	534401	Yes	No	Yes	VOA Vial	HCl	

2nd Review
Were all containers scanned into storage/lab? Initials BB (Yes) / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Reviewed By: Date & Time: 4/2/24 16:11

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

By: Taylor Davis

ESS Project ID: 24D0067

Date Received: 4/2/2024

Date & Time: 4/2/24 1021

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

CHAIN OF CUSTODY

48 hour TOT

ESS Lab # 2400067 | Page 1 of 1

Turn Time: ☐ >5 ☐ 5 ☐ 4 ☐ 3 ☑ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria: CAM

Is this project for any of the following?: ☐ CT RCP ☑ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☑ EQuIS
☑ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☐ Other (Specify) →

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 vanderBilt Ave,
Norwood MA 02062
Phone: 781-278-3700
Email Distribution List: charles.lindberg@gza.com
Justin.IVAS@gza.com, matthew.dion@gza.com,
wiley.radics@gza.com

PROJECT INFORMATION

Project Name: 284 winter st, Haverhill MA
Project Location: Haverhill, MA
Project Number: 01.0172397.10
Project Manager: Justin IVAS
Bill to: GZA
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VOH														Total Number of Bottles
1	4/2/24	0955	GRAB	GW	B208(S)-MW	X														3
2	4/2/24	1111	↓	↓	B208(D)-MW	X														3
3	4/2/24	1245	↓	↓	B208-MW	X														3

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2

Sampled by: Kasey Corrado

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 0.9
ODC ICE

Comments: * Please specify "Other" preservative and containers types in this space
*48Hour TOT

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Kasey Corrado	4/2/24	1456	AO	4/2/24 1456 AO	4/2/24	1559	

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: 284 Winter St, Haverhill MA (01.0172397.10)
ESS Laboratory Work Order Number: 24D0705

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 2:23 pm, Apr 26, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

SAMPLE RECEIPT

The following samples were received on April 19, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24D0705-01	B304-MW	Ground Water	MA-VPH-2.1
24D0705-02	B305-MW	Ground Water	MA-VPH-2.1
24D0705-03	B306-MW	Ground Water	MA-VPH-2.1
24D0705-04	B307-MW	Ground Water	MA-VPH-2.1
24D0705-05	PZ-1 - 0	Ground Water	MA-VPH-2.1
24D0705-06	PZ-2 - 0	Ground Water	MA-VPH-2.1
24D0705-07	PZ-3 - 0	Ground Water	MA-VPH-2.1
24D0705-08	PZ-4 - 0	Ground Water	MA-VPH-2.1
24D0705-09	PZ-5 - 0	Ground Water	MA-VPH-2.1
24D0705-10	AS-1	Ground Water	MA-VPH-2.1
24D0705-11	B301-MW	Ground Water	MA-VPH-2.1
24D0705-12	B302-MW	Ground Water	MA-VPH-2.1
24D0705-13	B303 - S - MW	Ground Water	MA-VPH-2.1
24D0705-14	B303 - D - MW	Ground Water	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

PROJECT NARRATIVE

MADEP-VPH Volatile Petroleum Hydrocarbon

24D0705-03 **Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).**
2,5-Dibromotoluene - FID (135% @ 70-130%), 2,5-Dibromotoluene - PID (132% @ 70-130%)

24D0705-09 **Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).**
2,5-Dibromotoluene - FID (142% @ 70-130%), 2,5-Dibromotoluene - PID (144% @ 70-130%)

No other observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24D0705-01 through 24D0705-14**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	***Data User Note:** Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.*	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: April 26, 2024
Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B304-MW
Date Sampled: 04/11/24 15:40
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3750** (100)		MA-VPH-2.1		1	04/22/24 18:02	D4D0451	DD42226
C5-C8 Aliphatics1,2	**12000** (314)		MA-VPH-2.1		50	04/23/24 20:39		[CALC]
C9-C12 Aliphatics2,3	**1760** (750)		MA-VPH-2.1		50	04/23/24 20:39		[CALC]
Benzene	**10400** (37.5)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Ethylbenzene	**564** (125)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Methyl tert-Butyl Ether	**3.1** (1.5)		MA-VPH-2.1		1	04/22/24 18:02	D4D0451	DD42226
Naphthalene	**7000** (125)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Toluene	**2990** (125)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Xylene O	**1370** (125)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Xylene P,M	**2460** (250)		MA-VPH-2.1		50	04/23/24 20:39	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*118 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*119 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B305-MW
Date Sampled: 04/16/24 12:19
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**1180** (100)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
C5-C8 Aliphatics1,2	ND (158)		MA-VPH-2.1		1	04/23/24 17:47		[CALC]
C9-C12 Aliphatics2,3	**279** (270)		MA-VPH-2.1		1	04/23/24 17:47		[CALC]
Benzene	**4.9** (1.5)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Ethylbenzene	**82.9** (5.0)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Naphthalene	**351** (25.0)		MA-VPH-2.1		10	04/25/24 8:27	D4D0500	DD42324
Toluene	**9.0** (5.0)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Xylene O	**76.8** (5.0)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Xylene P,M	**89.6** (10.0)		MA-VPH-2.1		1	04/23/24 17:47	D4D0500	DD42324
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42324

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*114 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*116 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B306-MW
Date Sampled: 04/16/24 14:56
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**1780** (100)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
C5-C8 Aliphatics1,2	**493** (158)		MA-VPH-2.1		1	04/22/24 19:11		[CALC]
C9-C12 Aliphatics2,3	**729** (290)		MA-VPH-2.1		10	04/23/24 20:05		[CALC]
Benzene	**166** (1.5)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
Ethylbenzene	**521** (25.0)		MA-VPH-2.1		10	04/23/24 20:05	D4D0451	DD42226
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
Naphthalene	**964** (25.0)		MA-VPH-2.1		10	04/23/24 20:05	D4D0451	DD42226
Toluene	**115** (5.0)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
Xylene O	**194** (5.0)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
Xylene P,M	**299** (10.0)		MA-VPH-2.1		1	04/22/24 19:11	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*135 %*	*SM*	*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*132 %*	*SM*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B307-MW
Date Sampled: 04/12/24 14:40
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-04
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**1260** (100)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
C5-C8 Aliphatics1,2	**397** (164)		MA-VPH-2.1		10	04/23/24 19:31		[CALC]
C9-C12 Aliphatics2,3	**384** (270)		MA-VPH-2.1		1	04/22/24 19:45		[CALC]
Benzene	**319** (7.5)		MA-VPH-2.1		10	04/23/24 19:31	D4D0451	DD42226
Ethylbenzene	**190** (5.0)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
Naphthalene	**950** (25.0)		MA-VPH-2.1		10	04/23/24 19:31	D4D0451	DD42226
Toluene	**13.7** (5.0)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
Xylene O	**97.7** (5.0)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
Xylene P,M	**146** (10.0)		MA-VPH-2.1		1	04/22/24 19:45	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*120 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*118 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: PZ-1 - 0
Date Sampled: 04/17/24 13:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-05
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3700** (100)		MA-VPH-2.1		1	04/22/24 20:54	D4D0451	DD42226
C5-C8 Aliphatics1,2	**15700** (232)		MA-VPH-2.1		100	04/23/24 18:22		[CALC]
C9-C12 Aliphatics2,3	**1790** (1250)		MA-VPH-2.1		100	04/23/24 18:22		[CALC]
Benzene	**15600** (75.0)		MA-VPH-2.1		100	04/23/24 18:22	D4D0451	DD42226
Ethylbenzene	**1530** (250)		MA-VPH-2.1		100	04/23/24 18:22	D4D0451	DD42226
Methyl tert-Butyl Ether	**68.9** (1.5)		MA-VPH-2.1		1	04/22/24 20:54	D4D0451	DD42226
Naphthalene	**5160** (250)		MA-VPH-2.1		100	04/23/24 18:22	D4D0451	DD42226
Toluene	**188** (5.0)		MA-VPH-2.1		1	04/22/24 20:54	D4D0451	DD42226
Xylene O	**838** (250)		MA-VPH-2.1		100	04/23/24 18:22	D4D0451	DD42226
Xylene P,M	**1010** (500)		MA-VPH-2.1		100	04/23/24 18:22	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*100 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*118 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: PZ-2 - 0
Date Sampled: 04/17/24 15:25
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-06
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**5020** (100)		MA-VPH-2.1		1	04/22/24 21:28	D4D0451	DD42226
C5-C8 Aliphatics1,2	**3580** (194)		MA-VPH-2.1		50	04/23/24 21:14		[CALC]
C9-C12 Aliphatics2,3	**1930** (750)		MA-VPH-2.1		50	04/23/24 21:14		[CALC]
Benzene	**2280** (37.5)		MA-VPH-2.1		50	04/23/24 21:14	D4D0451	DD42226
Ethylbenzene	**1700** (125)		MA-VPH-2.1		50	04/23/24 21:14	D4D0451	DD42226
Methyl tert-Butyl Ether	**161** (1.5)		MA-VPH-2.1		1	04/22/24 21:28	D4D0451	DD42226
Naphthalene	**6040** (125)		MA-VPH-2.1		50	04/23/24 21:14	D4D0451	DD42226
Toluene	**286** (5.0)		MA-VPH-2.1		1	04/22/24 21:28	D4D0451	DD42226
Xylene O	**816** (125)		MA-VPH-2.1		50	04/23/24 21:14	D4D0451	DD42226
Xylene P,M	**899** (250)		MA-VPH-2.1		50	04/23/24 21:14	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*86 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*110 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: PZ-3 - 0
Date Sampled: 04/17/24 14:41
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-07
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**5720** (100)		MA-VPH-2.1		1	04/22/24 22:02	D4D0451	DD42226
C5-C8 Aliphatics1,2	**3740** (314)		MA-VPH-2.1		50	04/23/24 21:48		[CALC]
C9-C12 Aliphatics2,3	**1730** (510)		MA-VPH-2.1		50	04/23/24 21:48		[CALC]
Benzene	**2620** (37.5)		MA-VPH-2.1		50	04/23/24 21:48	D4D0451	DD42226
Ethylbenzene	**2660** (125)		MA-VPH-2.1		50	04/23/24 21:48	D4D0451	DD42226
Methyl tert-Butyl Ether	**37.1** (1.5)		MA-VPH-2.1		1	04/22/24 22:02	D4D0451	DD42226
Naphthalene	**7410** (125)		MA-VPH-2.1		50	04/23/24 21:48	D4D0451	DD42226
Toluene	**456** (125)		MA-VPH-2.1		50	04/23/24 21:48	D4D0451	DD42226
Xylene O	**813** (125)		MA-VPH-2.1		50	04/23/24 21:48	D4D0451	DD42226
Xylene P,M	**495** (10.0)		MA-VPH-2.1		1	04/22/24 22:02	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*90 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*106 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: PZ-4 - 0
Date Sampled: 04/18/24 11:05
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-08
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6790** (100)		MA-VPH-2.1		1	04/22/24 23:46	D4D0451	DD42226
C5-C8 Aliphatics1,2	**3490** (314)		MA-VPH-2.1		50	04/24/24 15:12		[CALC]
C9-C12 Aliphatics2,3	**3440** (750)		MA-VPH-2.1		50	04/24/24 15:12		[CALC]
Benzene	**1690** (37.5)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Ethylbenzene	**2080** (125)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Methyl tert-Butyl Ether	**36.6** (1.5)		MA-VPH-2.1		1	04/22/24 23:46	D4D0451	DD42226
Naphthalene	**8920** (125)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Toluene	**1030** (125)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Xylene O	**1290** (125)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Xylene P,M	**2650** (250)		MA-VPH-2.1		50	04/24/24 15:12	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*106 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*120 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: PZ-5 - 0
Date Sampled: 04/18/24 12:50
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-09
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6260** (100)		MA-VPH-2.1		1	04/22/24 13:28	D4D0451	DD42226
C5-C8 Aliphatics1,2	**1490** (158)		MA-VPH-2.1		1	04/22/24 13:28		[CALC]
C9-C12 Aliphatics2,3	**1370** (750)		MA-VPH-2.1		50	04/23/24 18:56		[CALC]
Benzene	**141** (1.5)		MA-VPH-2.1		1	04/22/24 13:28	D4D0451	DD42226
Ethylbenzene	**820** (125)		MA-VPH-2.1		50	04/23/24 18:56	D4D0451	DD42226
Methyl tert-Butyl Ether	**6.2** (1.5)		MA-VPH-2.1		1	04/22/24 13:28	D4D0451	DD42226
Naphthalene	**4660** (125)		MA-VPH-2.1		50	04/23/24 18:56	D4D0451	DD42226
Toluene	**97.8** (5.0)		MA-VPH-2.1		1	04/22/24 13:28	D4D0451	DD42226
Xylene O	**787** (125)		MA-VPH-2.1		50	04/23/24 18:56	D4D0451	DD42226
Xylene P,M	**929** (250)		MA-VPH-2.1		50	04/23/24 18:56	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*142 %*	*SM*	*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*144 %*	*SM*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: AS-1
Date Sampled: 04/18/24 16:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-10
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**5520** (100)		MA-VPH-2.1		1	04/22/24 22:37	D4D0451	DD42226
C5-C8 Aliphatics1,2	**1510** (314)		MA-VPH-2.1		50	04/24/24 14:03		[CALC]
C9-C12 Aliphatics2,3	**2180** (750)		MA-VPH-2.1		50	04/24/24 14:03		[CALC]
Benzene	**728** (37.5)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Ethylbenzene	**1170** (125)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/22/24 22:37	D4D0451	DD42226
Naphthalene	**5320** (125)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Toluene	**780** (125)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Xylene O	**696** (125)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Xylene P,M	**1270** (250)		MA-VPH-2.1		50	04/24/24 14:03	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*103 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*114 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B301-MW
Date Sampled: 04/18/24 15:05
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-11
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**7120** (100)		MA-VPH-2.1		1	04/22/24 23:11	D4D0451	DD42226
C5-C8 Aliphatics1,2	**1150** (158)		MA-VPH-2.1		1	04/22/24 23:11		[CALC]
C9-C12 Aliphatics2,3	**1320** (750)		MA-VPH-2.1		50	04/24/24 14:37		[CALC]
Benzene	**143** (1.5)		MA-VPH-2.1		1	04/22/24 23:11	D4D0451	DD42226
Ethylbenzene	**894** (125)		MA-VPH-2.1		50	04/24/24 14:37	D4D0451	DD42226
Methyl tert-Butyl Ether	**5.0** (1.5)		MA-VPH-2.1		1	04/22/24 23:11	D4D0451	DD42226
Naphthalene	**5230** (125)		MA-VPH-2.1		50	04/24/24 14:37	D4D0451	DD42226
Toluene	**114** (5.0)		MA-VPH-2.1		1	04/22/24 23:11	D4D0451	DD42226
Xylene O	**908** (125)		MA-VPH-2.1		50	04/24/24 14:37	D4D0451	DD42226
Xylene P,M	**1080** (250)		MA-VPH-2.1		50	04/24/24 14:37	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*114 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*124 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B302-MW
Date Sampled: 04/17/24 12:06
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-12
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**406** (100)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
C5-C8 Aliphatics1,2	**207** (158)		MA-VPH-2.1		1	04/22/24 17:28		[CALC]
C9-C12 Aliphatics2,3	ND (270)		MA-VPH-2.1		1	04/22/24 17:28		[CALC]
Benzene	**21.4** (1.5)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Ethylbenzene	**54.3** (5.0)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Naphthalene	**214** (5.0)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Toluene	**7.2** (5.0)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Xylene O	**63.9** (5.0)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Xylene P,M	**37.9** (10.0)		MA-VPH-2.1		1	04/22/24 17:28	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*112 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*114 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B303 - S - MW
Date Sampled: 04/17/24 14:00
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-13
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6080** (100)		MA-VPH-2.1		1	04/23/24 0:20	D4D0451	DD42226
C5-C8 Aliphatics1,2	**16100** (476)		MA-VPH-2.1		100	04/24/24 15:46		[CALC]
C9-C12 Aliphatics2,3	**1480** (1250)		MA-VPH-2.1		100	04/24/24 15:46		[CALC]
Benzene	**14300** (75.0)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Ethylbenzene	**1140** (250)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Methyl tert-Butyl Ether	**20.3** (1.5)		MA-VPH-2.1		1	04/23/24 0:20	D4D0451	DD42226
Naphthalene	**5790** (250)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Toluene	**1910** (250)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Xylene O	**822** (250)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Xylene P,M	**1050** (500)		MA-VPH-2.1		100	04/24/24 15:46	D4D0451	DD42226
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42226

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*95 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*112 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA
Client Sample ID: B303 - D - MW
Date Sampled: 04/17/24 12:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24D0705
ESS Laboratory Sample ID: 24D0705-14
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**335** (100)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
C5-C8 Aliphatics1,2	ND (158)		MA-VPH-2.1		1	04/23/24 17:13		[CALC]
C9-C12 Aliphatics2,3	ND (270)		MA-VPH-2.1		1	04/23/24 17:13		[CALC]
Benzene	**7.6** (1.5)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Ethylbenzene	**12.6** (5.0)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Methyl tert-Butyl Ether	ND (1.5)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Naphthalene	**85.5** (5.0)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Toluene	ND (5.0)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Xylene O	ND (5.0)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Xylene P,M	ND (10.0)		MA-VPH-2.1		1	04/23/24 17:13	D4D0500	DD42324
Preservative:	**pH <= 2**		MA-VPH-2.1					DD42324

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*109 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*117 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA

ESS Laboratory Work Order: 24D0705

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD42226 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*50.2*		ug/L	*50.00*		*100*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*51.4*		ug/L	*50.00*		*103*	*70-130*			
LCS										
Benzene	52.5	1.5	ug/L	50.00		105	70-130			
C5-C8 Unadjusted Aliphatics	454	150	ug/L	400.0		113	70-130			
C9-C10 Aromatics	91.9	100	ug/L	100.0		92	70-130			
C9-C12 Unadjusted Aliphatics	313	150	ug/L	300.0		104	70-130			
Ethylbenzene	49.5	5.0	ug/L	50.00		99	70-130			
Methyl tert-Butyl Ether	153	1.5	ug/L	150.0		102	70-130			
Naphthalene	84.3	5.0	ug/L	100.0		84	70-130			
Toluene	147	5.0	ug/L	150.0		98	70-130			
Xylene O	93.9	5.0	ug/L	100.0		94	70-130			
Xylene P,M	195	10.0	ug/L	200.0		98	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*54.9*		ug/L	*50.00*		*110*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*56.9*		ug/L	*50.00*		*114*	*70-130*			
LCS Dup										
Benzene	53.2	1.5	ug/L	50.00		106	70-130	1	25	
C5-C8 Unadjusted Aliphatics	453	150	ug/L	400.0		113	70-130	0.2	25	
C9-C10 Aromatics	92.4	100	ug/L	100.0		92	70-130	0.5	25	
C9-C12 Unadjusted Aliphatics	315	150	ug/L	300.0		105	70-130	0.7	25	
Ethylbenzene	48.7	5.0	ug/L	50.00		97	70-130	2	25	
Methyl tert-Butyl Ether	158	1.5	ug/L	150.0		105	70-130	3	25	
Naphthalene	86.6	5.0	ug/L	100.0		87	70-130	3	25	
Toluene	148	5.0	ug/L	150.0		99	70-130	1	25	
Xylene O	94.3	5.0	ug/L	100.0		94	70-130	0.4	25	
Xylene P,M	196	10.0	ug/L	200.0		98	70-130	0.5	25	
Surrogate: 2,5-Dibromotoluene - FID	*55.4*		ug/L	*50.00*		*111*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*55.0*		ug/L	*50.00*		*110*	*70-130*			
Batch DD42324 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DD42324 - 5030B										
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*47.5*		ug/L	*50.00*		*95*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*48.9*		ug/L	*50.00*		*98*	*70-130*			
LCS										
Benzene	52.8	1.5	ug/L	50.00		106	70-130			
C5-C8 Unadjusted Aliphatics	445	150	ug/L	400.0		111	70-130			
C9-C10 Aromatics	91.1	100	ug/L	100.0		91	70-130			
C9-C12 Unadjusted Aliphatics	315	150	ug/L	300.0		105	70-130			
Ethylbenzene	49.7	5.0	ug/L	50.00		99	70-130			
Methyl tert-Butyl Ether	153	1.5	ug/L	150.0		102	70-130			
Naphthalene	85.8	5.0	ug/L	100.0		86	70-130			
Toluene	146	5.0	ug/L	150.0		97	70-130			
Xylene O	93.2	5.0	ug/L	100.0		93	70-130			
Xylene P,M	195	10.0	ug/L	200.0		97	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*54.6*		ug/L	*50.00*		*109*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*53.0*		ug/L	*50.00*		*106*	*70-130*			
LCS Dup										
Benzene	53.5	1.5	ug/L	50.00		107	70-130	1	25	
C5-C8 Unadjusted Aliphatics	445	150	ug/L	400.0		111	70-130	0.09	25	
C9-C10 Aromatics	92.3	100	ug/L	100.0		92	70-130	1	25	
C9-C12 Unadjusted Aliphatics	315	150	ug/L	300.0		105	70-130	0.08	25	
Ethylbenzene	48.3	5.0	ug/L	50.00		97	70-130	3	25	
Methyl tert-Butyl Ether	155	1.5	ug/L	150.0		103	70-130	0.9	25	
Naphthalene	86.0	5.0	ug/L	100.0		86	70-130	0.2	25	
Toluene	148	5.0	ug/L	150.0		99	70-130	2	25	
Xylene O	94.8	5.0	ug/L	100.0		95	70-130	2	25	
Xylene P,M	197	10.0	ug/L	200.0		99	70-130	1	25	
Surrogate: 2,5-Dibromotoluene - FID	*52.3*		ug/L	*50.00*		*105*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*50.1*		ug/L	*50.00*		*100*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
SM	Surrogate recovery(ies) outside of criteria due to matrix (UCM/coelution/matrix is present) (SM).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: 284 Winter St, Haverhill MA ESS Laboratory Work Order: 24D0705

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

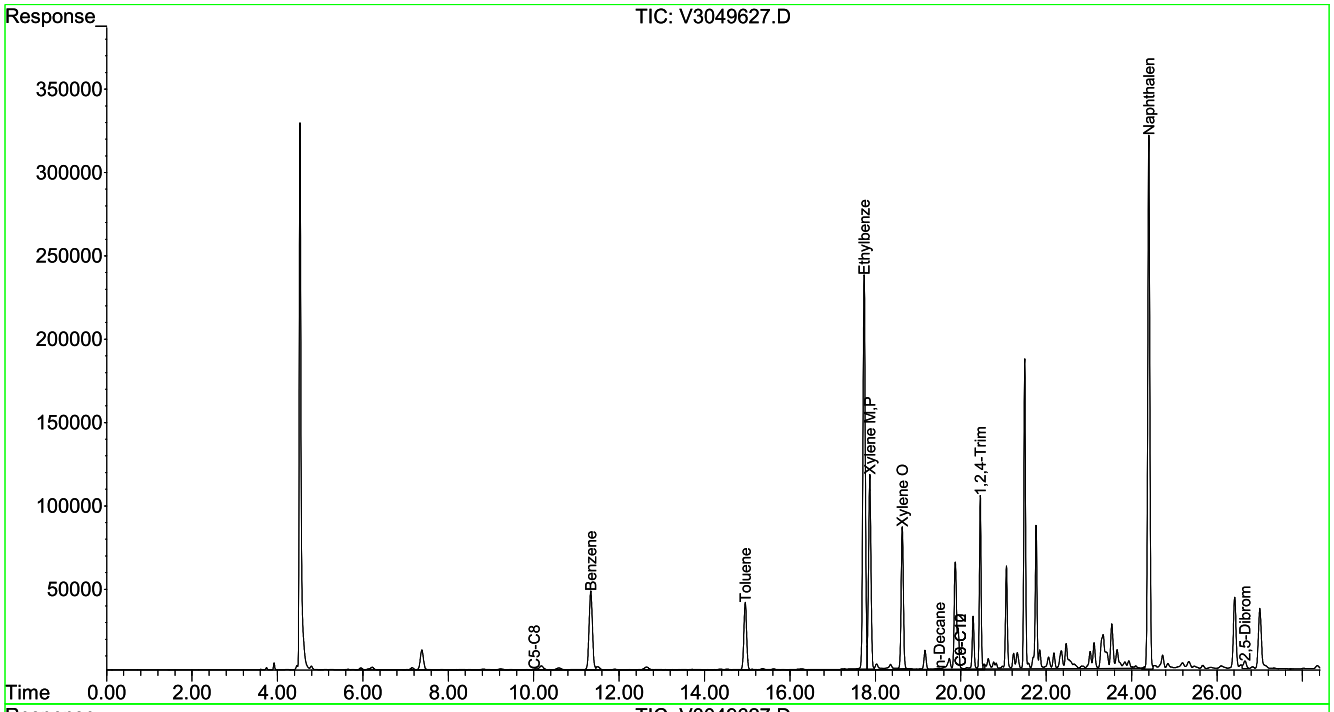
Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

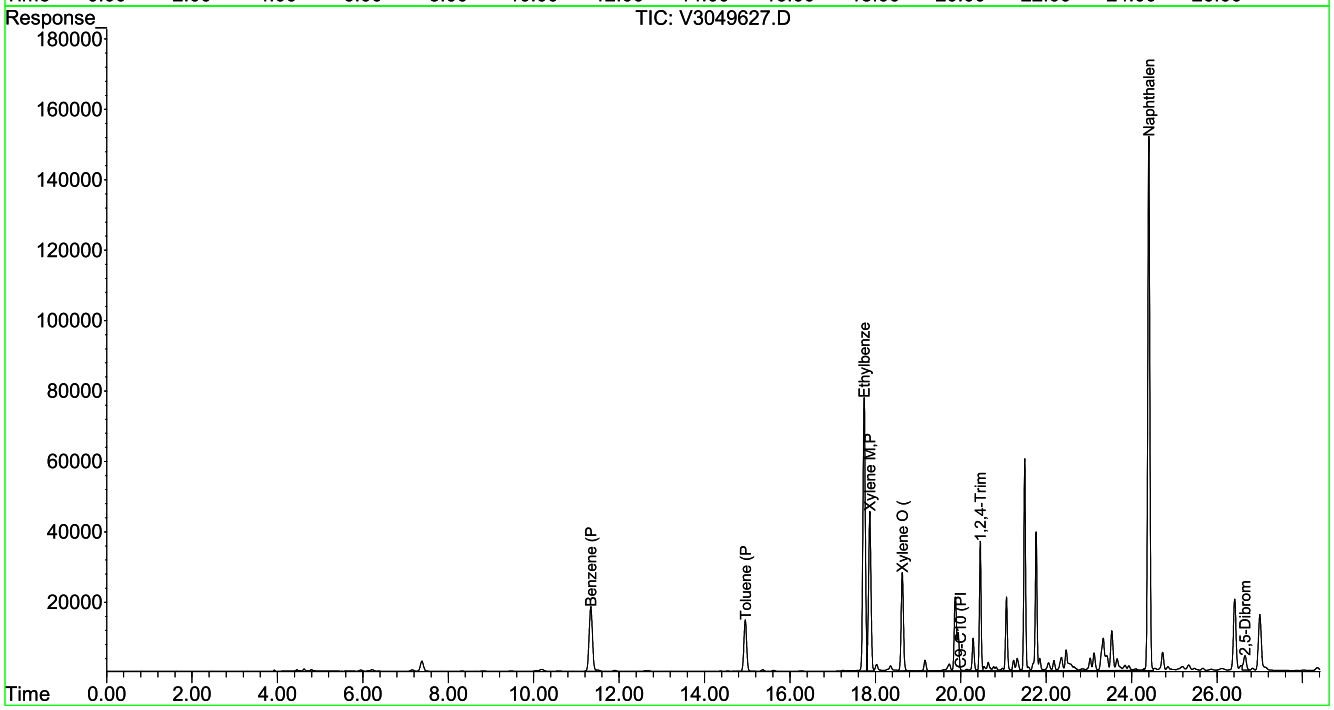
Quantitation Report (QT Reviewed)

Data Path : Q:\VOA\VGC3\Gc0424\Gc042224\
Data File : V3049627.D
Signal(s) : Signal #1: FID1A.CH Signal #2: FID2B.CH
Acq On : 22 Apr 2024 7:11 pm
Operator : MEK
Sample : 24D0705-03
Misc :
InstName : VGC3
ALS Vial : 21 Sample Multiplier: 1

Integration File signal 1: EVENTS.E
Integration File signal 2: EVENTS2.E
Quant Time: Apr 23 11:47:36 2024
Quant Method : Q:\VOA\VGC3\Methods\V3031224.M
Quant Title : VPH AQ:2403057 VPH SOIL:2403058
QLast Update : Wed Mar 13 08:45:31 2024
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :



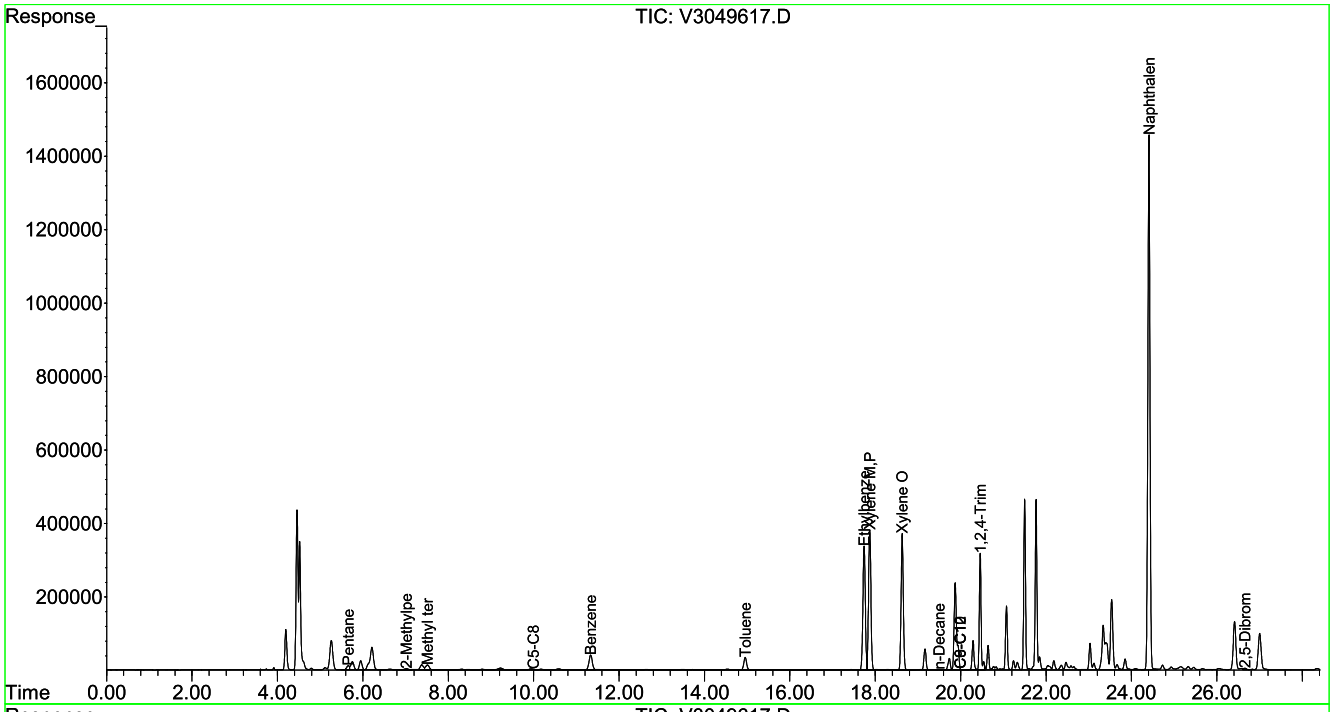


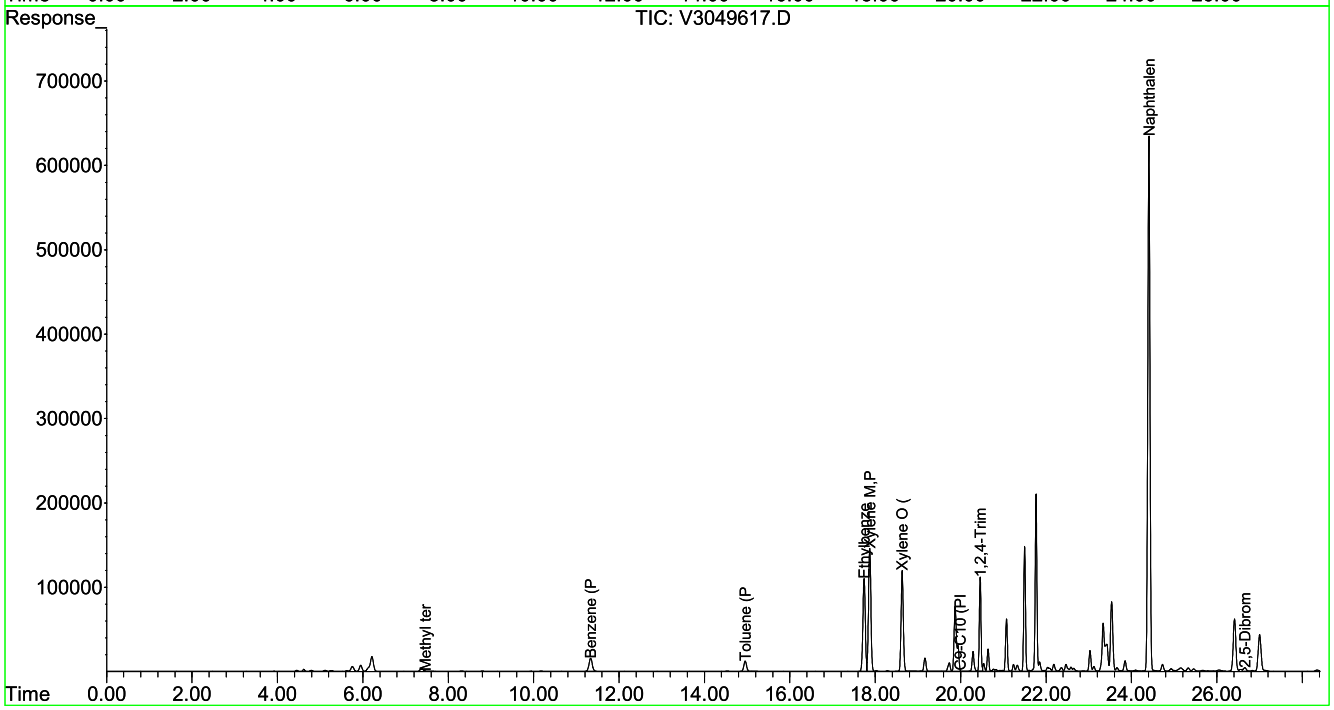
Quantitation Report (QT Reviewed)

Data Path : Q:\VOA\VGC3\Gc0424\Gc042224\
Data File : V3049617.D
Signal(s) : Signal #1: FID1A.CH Signal #2: FID2B.CH
Acq On : 22 Apr 2024 1:28 pm
Operator : MEK
Sample : 24D0705-09
Misc :
InstName : VGC3
ALS Vial : 11 Sample Multiplier: 1

Integration File signal 1: EVENTS.E
Integration File signal 2: EVENTS2.E
Quant Time: Apr 23 10:09:42 2024
Quant Method : Q:\VOA\VGC3\Methods\V3031224.M
Quant Title : VPH AQ:2403057 VPH SOIL:2403058
QLast Update : Wed Mar 13 08:45:31 2024
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. :
Signal #1 Phase : Signal #2 Phase:
Signal #1 Info : Signal #2 Info :





ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24D0705
Date Received: 4/19/2024
Project Due Date: 4/26/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.3 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / NA
10. Were any analyses received outside of hold time? Yes / No

11. Any Subcontracting needed? Yes / No
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? Yes / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / No
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	539875	Yes	No	Yes	VOA Vial	HCl	
1	539876	Yes	No	Yes	VOA Vial	HCl	
1	539877	Yes	No	Yes	VOA Vial	HCl	
2	539878	Yes	No	Yes	VOA Vial	HCl	
2	539879	Yes	No	Yes	VOA Vial	HCl	
2	539880	Yes	No	Yes	VOA Vial	HCl	
3	539881	Yes	No	Yes	VOA Vial	HCl	
3	539882	Yes	No	Yes	VOA Vial	HCl	
3	539883	Yes	No	Yes	VOA Vial	HCl	
4	539884	Yes	No	Yes	VOA Vial	HCl	
4	539885	Yes	No	Yes	VOA Vial	HCl	
4	539886	Yes	No	Yes	VOA Vial	HCl	
5	539887	Yes	No	Yes	VOA Vial	HCl	
5	539888	Yes	No	Yes	VOA Vial	HCl	
5	539889	Yes	No	Yes	VOA Vial	HCl	
6	539890	Yes	No	Yes	VOA Vial	HCl	
6	539891	Yes	No	Yes	VOA Vial	HCl	
6	539892	Yes	No	Yes	VOA Vial	HCl	
7	539893	Yes	No	Yes	VOA Vial	HCl	
7	539894	Yes	No	Yes	VOA Vial	HCl	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

ESS Project ID: 24D0705
Date Received: 4/19/2024

7	539895	Yes	No	Yes	VOA Vial	HCl
8	539896	Yes	No	Yes	VOA Vial	HCl
8	539897	Yes	No	Yes	VOA Vial	HCl
8	539898	Yes	No	Yes	VOA Vial	HCl
9	539899	Yes	No	Yes	VOA Vial	HCl
9	539900	Yes	No	Yes	VOA Vial	HCl
9	539901	Yes	No	Yes	VOA Vial	HCl
10	539902	Yes	No	Yes	VOA Vial	HCl
10	539903	Yes	No	Yes	VOA Vial	HCl
10	539904	Yes	No	Yes	VOA Vial	HCl
11	539905	Yes	No	Yes	VOA Vial	HCl
11	539906	Yes	No	Yes	VOA Vial	HCl
11	539907	Yes	No	Yes	VOA Vial	HCl
12	539908	Yes	No	Yes	VOA Vial	HCl
12	539909	Yes	No	Yes	VOA Vial	HCl
12	539910	Yes	No	Yes	VOA Vial	HCl
13	539911	Yes	No	Yes	VOA Vial	HCl
13	539912	Yes	No	Yes	VOA Vial	HCl
13	539913	Yes	No	Yes	VOA Vial	HCl
14	539914	Yes	No	Yes	VOA Vial	HCl
14	539915	Yes	No	Yes	VOA Vial	HCl
14	539916	Yes	No	Yes	VOA Vial	HCl

2nd Review

Were all containers scanned into storage/lab? Initials TD

Are barcode labels on correct containers? (Yes) / No

Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA

Are all Hex Chrome stickers attached? Yes / No / NA

Are all QC stickers attached? Yes / No / NA

Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: [signature] Date & Time: 4/19/24 1528

Reviewed By: [signature] Date & Time: 4/19/24 15:40

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02910
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

Standard TAT

CHAIN OF CUSTODY

ESS Lab # 7400705 | Page 1 of 2 + att

Turn Time (Days): ☒ > 5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria: CAM

Is this project for any of the following?:
☐ CT RCP ☒ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☒ EQuIS
☒ Excel ☐ State Upload ☐ Enviro Data
☐ CLP-Like Package ☒ Other (Specify) → PDF

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt Ave. Norwood, MA 02062
Phone: 781-278-5843
Email Distribution List: Justin.Ivas@gza.com; Charles.Lindberg@gza.com; Matthew.Dion@gza.com; Nicholas.Loden@gza.com

PROJECT INFORMATION

Project Name: 284 Winter St.
Project Location: Haverhill MA
Project Number: 172397.10
Project Manager: Justin Ivas
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH	Total Number of Bottles
1	4/11/24	1540	Grab	Groundwater	B304-MW	X	3
2	4/16/24	1219			B305-MW	X	3
3	4/16/24	1456			B306-MW	X	3
4	4/12/24	1440	↓	↓	B307-MW	X	3
5	4/17/24	1330	Grab	Groundwater	PZ-1(D)	X	3
6	4/17/24	1525	Grab	Groundwater	PZ-2(D)	X	3
7	4/17/24	1441	Grab	Groundwater	PZ-3(D)	X	3
8	4/18/24	1105	Grab	Groundwater	PZ-4(D)	X	3
9	4/18/24	1250	Grab	Groundwater	PZ-5(D)	X	3
10	4/18/24	1630	Grab	Groundwater	AS-1	X	3
						V	
						7	
						2	

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial

Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other*

Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other*

Sampled by : Nicholas Loden & Victoria Rouleau

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 3.3 / 1 Cl

Comments: * Please specify "Other" preservative and containers types in this space
other Sampler Name; Kasey Corrodo

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Nicholas Loden			4/19/24 16:54		4/19/24	15:12	
Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02910
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

Standard TAT

CHAIN OF CUSTODY

ESS Lab # 2400705 | Page 2 rev of 2 rev

Turn Time (Days): ☒ >5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria: CAM

Is this project for any of the following?:

☐ CT RCP ☒ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)

☐ Limit Checker ☐ State Forms ☒ EQuIS
☒ Excel ☐ State Upload ☐ Enviro Data
☐ CLP-Like Package ☒ Other (Specify) → PDF

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt ave. Norwood, MA 02062
Phone: 781-278-5843
Email Distribution List: Justin.Ivas@gza.com charles.lindberg@gza.com matthew.idion@gza.com nicholas.loden@gza.com

PROJECT INFORMATION

Project Name: 294 Winter St.
Project Location: Haverhill, MA
Project Number: 172397.10
Project Manager: Justin Ivas
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH																Total Number of Bottles
11	4/18/24	1505	Grab	Ground water	B3~~MW~~ 301-MW	X																3
12	4/17/24	1206	Grab	Groundwater	B302-MW	X																3
13	4/17/24	1400	Grab	Groundwater	B303(S)-MW	X																3
14	4/17/24	1230	Grab	Groundwater	B303(D)-MW	X																3

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAcc, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2

Sampled by: Nicholas Loden & Kasey Corrado

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only

Cooler Temperature (°C): 3.3 1Q

Comments: * Please specify "Other" preservative and containers types in this space

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration

☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Nicholas Loden			4/19/24 12:58		4/19/24	15:13	Taylor Davis
Relinquished by (Signature)	**Date**	**Time**	**Received by (Signature)**	**Relinquished by (Signature)**	**Date**	**Time**	**Received by (Signature)**

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 24E0141

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 5:41 pm, May 10, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

SAMPLE RECEIPT

The following samples were received on May 03, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24E0141-01	PZ-1 D	Ground Water	MA-VPH-2.1
24E0141-02	PZ-3 D	Ground Water	MA-VPH-2.1
24E0141-03	PZ-4 D	Ground Water	MA-VPH-2.1
24E0141-04	B208 D - MW	Ground Water	MA-VPH-2.1
24E0141-05	B208 S - MW	Ground Water	MA-VPH-2.1
24E0141-06	B212-MW	Ground Water	MA-VPH-2.1
24E0141-07	ENV-3MW	Ground Water	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24E0141-01 through 24E0141-07**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes (X) No ( )*
	***Data User Note:* Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.**	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

All negative responses must be addressed in an attached laboratory narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: May 10, 2024
Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: PZ-1 D
Date Sampled: 05/02/24 09:20
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3800** (100)	---	MA-VPH-2.1	---	1	05/07/24 19:04	D4E0123	DE40718
C5-C8 Aliphatics1,2	**18600** (232)	---	MA-VPH-2.1	---	100	05/09/24 13:05	---	[CALC]
C9-C12 Aliphatics2,3	**2090** (1250)	---	MA-VPH-2.1	---	100	05/09/24 13:05	---	[CALC]
Benzene	**16600** (75.0)	---	MA-VPH-2.1	---	100	05/09/24 13:05	D4E0123	DE40718
Ethylbenzene	**1680** (250)	---	MA-VPH-2.1	---	100	05/09/24 13:05	D4E0123	DE40718
Methyl tert-Butyl Ether	**66.4** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 19:04	D4E0123	DE40718
Naphthalene	**4530** (250)	---	MA-VPH-2.1	---	100	05/09/24 13:05	D4E0123	DE40718
Toluene	**223** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 19:04	D4E0123	DE40718
Xylene O	**959** (250)	---	MA-VPH-2.1	---	100	05/09/24 13:05	D4E0123	DE40718
Xylene P,M	**1230** (500)	---	MA-VPH-2.1	---	100	05/09/24 13:05	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*92 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*111 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: PZ-3 D
Date Sampled: 05/02/24 10:35
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3630** (100)	---	MA-VPH-2.1	---	1	05/07/24 20:47	D4E0123	DE40718
C5-C8 Aliphatics1,2	**696** (194)	---	MA-VPH-2.1	---	50	05/09/24 15:23	---	[CALC]
C9-C12 Aliphatics2,3	**881** (510)	---	MA-VPH-2.1	---	50	05/09/24 15:23	---	[CALC]
Benzene	**879** (37.5)	---	MA-VPH-2.1	---	50	05/09/24 15:23	D4E0123	DE40718
Ethylbenzene	**731** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:23	D4E0123	DE40718
Methyl tert-Butyl Ether	**39.9** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 20:47	D4E0123	DE40718
Naphthalene	**6870** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:23	D4E0123	DE40718
Toluene	**120** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 20:47	D4E0123	DE40718
Xylene O	**311** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:23	D4E0123	DE40718
Xylene P,M	**150** (10.0)	---	MA-VPH-2.1	---	1	05/07/24 20:47	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*91 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*120 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: PZ-4 D
Date Sampled: 05/02/24 11:55
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6140** (100)	---	MA-VPH-2.1	---	1	05/07/24 21:22	D4E0123	DE40718
C5-C8 Aliphatics1,2	**6550** (314)	---	MA-VPH-2.1	---	50	05/09/24 15:57	---	[CALC]
C9-C12 Aliphatics2,3	**3660** (750)	---	MA-VPH-2.1	---	50	05/09/24 15:57	---	[CALC]
Benzene	**3240** (37.5)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Ethylbenzene	**2090** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Methyl tert-Butyl Ether	**46.5** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 21:22	D4E0123	DE40718
Naphthalene	**8160** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Toluene	**2340** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Xylene O	**1240** (125)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Xylene P,M	**2530** (250)	---	MA-VPH-2.1	---	50	05/09/24 15:57	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*115 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*119 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208 D - MW
Date Sampled: 05/02/24 12:20
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-04
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	ND (100)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
C5-C8 Aliphatics1,2	ND (158)	---	MA-VPH-2.1	---	1	05/07/24 16:46	---	[CALC]
C9-C12 Aliphatics2,3	ND (270)	---	MA-VPH-2.1	---	1	05/07/24 16:46	---	[CALC]
Benzene	ND (1.5)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Ethylbenzene	ND (5.0)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Methyl tert-Butyl Ether	ND (1.5)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Naphthalene	ND (5.0)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Toluene	ND (5.0)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Xylene O	ND (5.0)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Xylene P,M	ND (10.0)	---	MA-VPH-2.1	---	1	05/07/24 16:46	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*94 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*95 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208 S - MW
Date Sampled: 05/02/24 09:58
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-05
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3320** (100)	---	MA-VPH-2.1	---	1	05/07/24 17:55	D4E0123	DE40718
C5-C8 Aliphatics1,2	**3320** (194)	---	MA-VPH-2.1	---	50	05/09/24 13:40	---	[CALC]
C9-C12 Aliphatics2,3	**1890** (510)	---	MA-VPH-2.1	---	50	05/09/24 13:40	---	[CALC]
Benzene	**3240** (37.5)	---	MA-VPH-2.1	---	50	05/09/24 13:40	D4E0123	DE40718
Ethylbenzene	**1430** (125)	---	MA-VPH-2.1	---	50	05/09/24 13:40	D4E0123	DE40718
Methyl tert-Butyl Ether	ND (1.5)	---	MA-VPH-2.1	---	1	05/07/24 17:55	D4E0123	DE40718
Naphthalene	**1960** (125)	---	MA-VPH-2.1	---	50	05/09/24 13:40	D4E0123	DE40718
Toluene	**32.4** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 17:55	D4E0123	DE40718
Xylene O	**434** (125)	---	MA-VPH-2.1	---	50	05/09/24 13:40	D4E0123	DE40718
Xylene P,M	**234** (10.0)	---	MA-VPH-2.1	---	1	05/07/24 17:55	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*115 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*116 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B212-MW
Date Sampled: 05/02/24 13:45
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-06
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3290** (100)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
C5-C8 Aliphatics1,2	**732** (158)	---	MA-VPH-2.1	---	1	05/07/24 20:13	---	[CALC]
C9-C12 Aliphatics2,3	**1200** (390)	---	MA-VPH-2.1	---	50	05/09/24 12:31	---	[CALC]
Benzene	**159** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
Ethylbenzene	**693** (125)	---	MA-VPH-2.1	---	50	05/09/24 12:31	D4E0123	DE40718
Methyl tert-Butyl Ether	**25.8** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
Naphthalene	**1900** (125)	---	MA-VPH-2.1	---	50	05/09/24 12:31	D4E0123	DE40718
Toluene	**33.7** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
Xylene O	**260** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
Xylene P,M	**179** (10.0)	---	MA-VPH-2.1	---	1	05/07/24 20:13	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	*Qualifier*	*Limits*
Surrogate: 2,5-Dibromotoluene - FID	*121 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*121 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: ENV-3MW
Date Sampled: 05/02/24 14:15
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0141
ESS Laboratory Sample ID: 24E0141-07
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**5530** (100)	---	MA-VPH-2.1	---	1	05/07/24 19:38	D4E0123	DE40718
C5-C8 Aliphatics1,2	**6820** (194)	---	MA-VPH-2.1	---	50	05/09/24 14:48	---	[CALC]
C9-C12 Aliphatics2,3	**3050** (750)	---	MA-VPH-2.1	---	50	05/09/24 14:48	---	[CALC]
Benzene	**6960** (37.5)	---	MA-VPH-2.1	---	50	05/09/24 14:48	D4E0123	DE40718
Ethylbenzene	**2150** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:48	D4E0123	DE40718
Methyl tert-Butyl Ether	**74.4** (1.5)	---	MA-VPH-2.1	---	1	05/07/24 19:38	D4E0123	DE40718
Naphthalene	**5290** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:48	D4E0123	DE40718
Toluene	**67.7** (5.0)	---	MA-VPH-2.1	---	1	05/07/24 19:38	D4E0123	DE40718
Xylene O	**1170** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:48	D4E0123	DE40718
Xylene P,M	**857** (250)	---	MA-VPH-2.1	---	50	05/09/24 14:48	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*111 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*121 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24E0141

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DE40718 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*50.5*		ug/L	*50.00*		*101*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*49.1*		ug/L	*50.00*		*98*	*70-130*			
LCS										
Benzene	50.9	1.5	ug/L	50.00		102	70-130			
C5-C8 Unadjusted Aliphatics	448	150	ug/L	400.0		112	70-130			
C9-C10 Aromatics	87.7	100	ug/L	100.0		88	70-130			
C9-C12 Unadjusted Aliphatics	290	150	ug/L	300.0		97	70-130			
Ethylbenzene	47.6	5.0	ug/L	50.00		95	70-130			
Methyl tert-Butyl Ether	149	1.5	ug/L	150.0		99	70-130			
Naphthalene	93.1	5.0	ug/L	100.0		93	70-130			
Toluene	141	5.0	ug/L	150.0		94	70-130			
Xylene O	89.8	5.0	ug/L	100.0		90	70-130			
Xylene P,M	187	10.0	ug/L	200.0		94	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*59.8*		ug/L	*50.00*		*120*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*58.7*		ug/L	*50.00*		*117*	*70-130*			
LCS Dup										
Benzene	53.0	1.5	ug/L	50.00		106	70-130	4	25	
C5-C8 Unadjusted Aliphatics	469	150	ug/L	400.0		117	70-130	5	25	
C9-C10 Aromatics	91.4	100	ug/L	100.0		91	70-130	4	25	
C9-C12 Unadjusted Aliphatics	338	150	ug/L	300.0		113	70-130	15	25	
Ethylbenzene	50.1	5.0	ug/L	50.00		100	70-130	5	25	
Methyl tert-Butyl Ether	156	1.5	ug/L	150.0		104	70-130	5	25	
Naphthalene	94.1	5.0	ug/L	100.0		94	70-130	1	25	
Toluene	147	5.0	ug/L	150.0		98	70-130	4	25	
Xylene O	93.7	5.0	ug/L	100.0		94	70-130	4	25	
Xylene P,M	195	10.0	ug/L	200.0		97	70-130	4	25	
Surrogate: 2,5-Dibromotoluene - FID	*55.1*		ug/L	*50.00*		*110*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*54.9*		ug/L	*50.00*		*110*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0141

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24E0141
Date Received: 5/3/2024
Project Due Date: 5/10/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.7 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	544818	Yes	No	Yes	VOA Vial	HCl	
1	544819	Yes	No	Yes	VOA Vial	HCl	
1	544820	Yes	No	Yes	VOA Vial	HCl	
2	544821	Yes	No	Yes	VOA Vial	HCl	
2	544822	Yes	No	Yes	VOA Vial	HCl	
2	544823	Yes	No	Yes	VOA Vial	HCl	
3	544824	Yes	No	Yes	VOA Vial	HCl	
3	544825	Yes	No	Yes	VOA Vial	HCl	
3	544826	Yes	No	Yes	VOA Vial	HCl	
4	544827	Yes	No	Yes	VOA Vial	HCl	
4	544828	Yes	No	Yes	VOA Vial	HCl	
4	544829	Yes	No	Yes	VOA Vial	HCl	
5	544830	Yes	No	Yes	VOA Vial	HCl	
5	544831	Yes	No	Yes	VOA Vial	HCl	
5	544832	Yes	No	Yes	VOA Vial	HCl	
6	544833	Yes	No	Yes	VOA Vial	HCl	
6	544834	Yes	No	Yes	VOA Vial	HCl	
6	544835	Yes	No	Yes	VOA Vial	HCl	
7	544836	Yes	No	Yes	VOA Vial	HCl	
7	544837	Yes	No	Yes	VOA Vial	HCl	

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

ESS Project ID: 24E0141
Date Received: 5/3/2024

7	544838	Yes	No	Yes	VOA Vial	HCl

2nd Review

Were all containers scanned into storage/lab? Initials TO

Are barcode labels on correct containers? Yes / No
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: [signature] Date & Time: 5/3/24 1751

Reviewed By: [signature] Date & Time: 5/3/24 1857

CHAIN OF CUSTODY

ESS Lab # 24E0141 | Page of

185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

Turn Time: ☒ >5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day
Regulatory State: MA Criteria: CAM
Is this project for any of the following?: ☐ CT RCP ☐ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)
☐ Limit Checker ☐ State Forms ☒ EQuIS
☒ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☒ Other (Specify) → PDF

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt ave.
Norwood MA 02062
Phone: 781-278-5843
Email Distribution List: Justin.Ivas@gza.com, matthew.dion@gza.com, charlie.finnberg@gza.com, Nicholas.Loden@gza.com

PROJECT INFORMATION

Project Name: Haverhill former MGP
Project Location: 284 Winter St.
Project Number: 172397.10
Project Manager: Justin Ivas
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH														Total Number of Bottles
1	5/2/24	0920	Grab	GW	PZ-1(D)	X														3
2	5/2/24	1035	Grab	GW	PZ-~~1~~ 3(D)	X														3
3	5/2/24	1155	Grab	GW	PZ-4(D)	X														3
4	5/2/24	1220	Grab	GW	B208(D)-MW	X														3
5	5/2/24	0958	Grab	GW	B208(S)-MW	X														3
6	5/2/24	1345	Grab	GW	B212-MW	X														3
7	5/2/24	1415	Grab	GW	ENV-3MW	X														3

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2

Sampled by: Nick Loden & Kasey Corrado

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 3.7 1C

Comments: * Please specify "Other" preservative and containers types in this space

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration
☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Nicholas Loden			5/3/24 17:0		5/3/24	17:24	
Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 24E0264

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 9:09 am, May 15, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

SAMPLE RECEIPT

The following samples were received on May 07, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Lab Number	Sample Name	Matrix	Analysis
24E0264-01	ENV-5MW	Ground Water	MA-VPH-2.1
24E0264-02	AS-1	Ground Water	MA-VPH-2.1
24E0264-03	B208-MW	Ground Water	MA-VPH-2.1

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

PROJECT NARRATIVE

No unusual observations noted.

End of Project Narrative.

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010D - ICP
6020B - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260D - VOA
8270E - SVOA
8270E SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 19-2.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24E0264-01 through 24E0264-03**

Matrices: (X) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air ( ) Other:_____

CAM Protocol (check all that apply below):

( ) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	(X) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes (X) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for '"Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)? ***Data User Note:** Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.*	Yes (X) No ( )*
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes (X) No ( )*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes (X) No ( )*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: _____ Date: May 15, 2024
Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: ENV-5MW
Date Sampled: 05/06/24 11:25
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0264
ESS Laboratory Sample ID: 24E0264-01
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**3260** (100)	---	MA-VPH-2.1	---	1	05/08/24 9:06	D4E0123	DE40718
C5-C8 Aliphatics1,2	**7330** (194)	---	MA-VPH-2.1	---	50	05/09/24 14:14	---	[CALC]
C9-C12 Aliphatics2,3	**1390** (750)	---	MA-VPH-2.1	---	50	05/09/24 14:14	---	[CALC]
Benzene	**7560** (37.5)	---	MA-VPH-2.1	---	50	05/09/24 14:14	D4E0123	DE40718
Ethylbenzene	**1030** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:14	D4E0123	DE40718
Methyl tert-Butyl Ether	**2.8** (1.5)	---	MA-VPH-2.1	---	1	05/08/24 9:06	D4E0123	DE40718
Naphthalene	**2630** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:14	D4E0123	DE40718
Toluene	**144** (5.0)	---	MA-VPH-2.1	---	1	05/08/24 9:06	D4E0123	DE40718
Xylene O	**622** (125)	---	MA-VPH-2.1	---	50	05/09/24 14:14	D4E0123	DE40718
Xylene P,M	**581** (250)	---	MA-VPH-2.1	---	50	05/09/24 14:14	D4E0123	DE40718
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40718

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*109 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*129 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: AS-1
Date Sampled: 05/06/24 13:10
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0264
ESS Laboratory Sample ID: 24E0264-02
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**5020** (100)	---	MA-VPH-2.1	---	1	05/09/24 16:31	D4E0182	DE40925
C5-C8 Aliphatics1,2	**1160** (314)	---	MA-VPH-2.1	---	50	05/12/24 15:44	---	[CALC]
C9-C12 Aliphatics2,3	**1960** (750)	---	MA-VPH-2.1	---	50	05/12/24 15:44	---	[CALC]
Benzene	**420** (37.5)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Ethylbenzene	**910** (125)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Methyl tert-Butyl Ether	ND (1.5)	---	MA-VPH-2.1	---	1	05/09/24 16:31	D4E0182	DE40925
Naphthalene	**5260** (125)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Toluene	**722** (125)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Xylene O	**569** (125)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Xylene P,M	**998** (250)	---	MA-VPH-2.1	---	50	05/12/24 15:44	D4E0182	DE40925
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40925

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*101 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*108 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-MW
Date Sampled: 05/06/24 15:30
Percent Solids: N/A
Initial Volume: 5ml
Final Volume: 5ml
Extraction Method: 5030B
Column Type: Restek RTX-502.2 - 3µ film thickness 0.53mm X 105m

ESS Laboratory Work Order: 24E0264
ESS Laboratory Sample ID: 24E0264-03
Sample Matrix: Ground Water
Units: ug/L
Analyst: MEK
Trap Type: Supelco K Vocarb 3000 Trap

MADEP-VPH Volatile Petroleum Hydrocarbon

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyzed	Sequence	Batch
C9-C10 Aromatics	**6300** (100)	---	MA-VPH-2.1	---	1	05/09/24 17:06	D4E0182	DE40925
C5-C8 Aliphatics1,2	**8110** (314)	---	MA-VPH-2.1	---	50	05/12/24 16:18	---	[CALC]
C9-C12 Aliphatics2,3	**3280** (750)	---	MA-VPH-2.1	---	50	05/12/24 16:18	---	[CALC]
Benzene	**6030** (37.5)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Ethylbenzene	**2280** (125)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Methyl tert-Butyl Ether	**40.9** (1.5)	---	MA-VPH-2.1	---	1	05/09/24 17:06	D4E0182	DE40925
Naphthalene	**7600** (125)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Toluene	**488** (125)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Xylene O	**1110** (125)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Xylene P,M	**1450** (250)	---	MA-VPH-2.1	---	50	05/12/24 16:18	D4E0182	DE40925
Preservative:	**pH <= 2**	---	MA-VPH-2.1	---			---	DE40925

	%Recovery	Qualifier	Limits
Surrogate: 2,5-Dibromotoluene - FID	*92 %*		*70-130*
Surrogate: 2,5-Dibromotoluene - PID	*88 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DE40718 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*50.5*		ug/L	*50.00*		*101*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*49.1*		ug/L	*50.00*		*98*	*70-130*			
LCS										
Benzene	50.9	1.5	ug/L	50.00		102	70-130			
C5-C8 Unadjusted Aliphatics	448	150	ug/L	400.0		112	70-130			
C9-C10 Aromatics	87.7	100	ug/L	100.0		88	70-130			
C9-C12 Unadjusted Aliphatics	290	150	ug/L	300.0		97	70-130			
Ethylbenzene	47.6	5.0	ug/L	50.00		95	70-130			
Methyl tert-Butyl Ether	149	1.5	ug/L	150.0		99	70-130			
Naphthalene	93.1	5.0	ug/L	100.0		93	70-130			
Toluene	141	5.0	ug/L	150.0		94	70-130			
Xylene O	89.8	5.0	ug/L	100.0		90	70-130			
Xylene P,M	187	10.0	ug/L	200.0		94	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*59.8*		ug/L	*50.00*		*120*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*58.7*		ug/L	*50.00*		*117*	*70-130*			
LCS Dup										
Benzene	53.0	1.5	ug/L	50.00		106	70-130	4	25	
C5-C8 Unadjusted Aliphatics	469	150	ug/L	400.0		117	70-130	5	25	
C9-C10 Aromatics	91.4	100	ug/L	100.0		91	70-130	4	25	
C9-C12 Unadjusted Aliphatics	338	150	ug/L	300.0		113	70-130	15	25	
Ethylbenzene	50.1	5.0	ug/L	50.00		100	70-130	5	25	
Methyl tert-Butyl Ether	156	1.5	ug/L	150.0		104	70-130	5	25	
Naphthalene	94.1	5.0	ug/L	100.0		94	70-130	1	25	
Toluene	147	5.0	ug/L	150.0		98	70-130	4	25	
Xylene O	93.7	5.0	ug/L	100.0		94	70-130	4	25	
Xylene P,M	195	10.0	ug/L	200.0		97	70-130	4	25	
Surrogate: 2,5-Dibromotoluene - FID	*55.1*		ug/L	*50.00*		*110*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*54.9*		ug/L	*50.00*		*110*	*70-130*			
Batch DE40925 - 5030B										
Blank										
Benzene	ND	1.5	ug/L							
C5-C8 Unadjusted Aliphatics	ND	150	ug/L							
C9-C10 Aromatics	ND	100	ug/L							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
MADEP-VPH Volatile Petroleum Hydrocarbon										
Batch DE40925 - 5030B										
C9-C12 Unadjusted Aliphatics	ND	150	ug/L							
Ethylbenzene	ND	5.0	ug/L							
Methyl tert-Butyl Ether	ND	1.5	ug/L							
Naphthalene	ND	5.0	ug/L							
Toluene	ND	5.0	ug/L							
Xylene O	ND	5.0	ug/L							
Xylene P,M	ND	10.0	ug/L							
Surrogate: 2,5-Dibromotoluene - FID	*49.4*		ug/L	*50.00*		*99*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*48.4*		ug/L	*50.00*		*97*	*70-130*			
LCS										
Benzene	50.6	1.5	ug/L	50.00		101	70-130			
C5-C8 Unadjusted Aliphatics	434	150	ug/L	400.0		108	70-130			
C9-C10 Aromatics	86.3	100	ug/L	100.0		86	70-130			
C9-C12 Unadjusted Aliphatics	287	150	ug/L	300.0		96	70-130			
Ethylbenzene	46.7	5.0	ug/L	50.00		93	70-130			
Methyl tert-Butyl Ether	146	1.5	ug/L	150.0		98	70-130			
Naphthalene	85.6	5.0	ug/L	100.0		86	70-130			
Toluene	139	5.0	ug/L	150.0		93	70-130			
Xylene O	88.5	5.0	ug/L	100.0		89	70-130			
Xylene P,M	184	10.0	ug/L	200.0		92	70-130			
Surrogate: 2,5-Dibromotoluene - FID	*48.7*		ug/L	*50.00*		*97*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*49.1*		ug/L	*50.00*		*98*	*70-130*			
LCS Dup										
Benzene	52.8	1.5	ug/L	50.00		106	70-130	4	25	
C5-C8 Unadjusted Aliphatics	462	150	ug/L	400.0		115	70-130	6	25	
C9-C10 Aromatics	90.6	100	ug/L	100.0		91	70-130	5	25	
C9-C12 Unadjusted Aliphatics	329	150	ug/L	300.0		110	70-130	13	25	
Ethylbenzene	50.0	5.0	ug/L	50.00		100	70-130	7	25	
Methyl tert-Butyl Ether	157	1.5	ug/L	150.0		105	70-130	7	25	
Naphthalene	92.1	5.0	ug/L	100.0		92	70-130	7	25	
Toluene	146	5.0	ug/L	150.0		97	70-130	5	25	
Xylene O	93.2	5.0	ug/L	100.0		93	70-130	5	25	
Xylene P,M	194	10.0	ug/L	200.0		97	70-130	5	25	
Surrogate: 2,5-Dibromotoluene - FID	*49.5*		ug/L	*50.00*		*99*	*70-130*			
Surrogate: 2,5-Dibromotoluene - PID	*49.7*		ug/L	*50.00*		*99*	*70-130*			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

Notes and Definitions

Z-06	pH <= 2
U	Analyte included in the analysis, but not detected
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24E0264

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24E0264
Date Received: 5/7/2024
Project Due Date: 5/14/2024
Days for Project: 5 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 4.3 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** Yes / No / (NA)
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / (No)
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. If dissolved metals are requested, are they: Yes / No Field Filtered — Yes / No To Be Lab Filtered
    c. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	546012	Yes	No	Yes	VOA Vial	HCl	
1	546013	Yes	No	Yes	VOA Vial	HCl	
1	546014	Yes	No	Yes	VOA Vial	HCl	
2	546015	Yes	No	Yes	VOA Vial	HCl	
2	546016	Yes	No	Yes	VOA Vial	HCl	
2	546017	Yes	No	Yes	VOA Vial	HCl	
3	546018	Yes	No	Yes	VOA Vial	HCl	
3	546019	Yes	No	Yes	VOA Vial	HCl	
3	546020	Yes	No	Yes	VOA Vial	HCl	

2nd Review

Were all containers scanned into storage/lab? Initials: (Yes) / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 5/7/24 1653
Reviewed

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

By: [signature] Date & Time: 5/7/24 1657

ESS Project ID: 24E0264

Date Received: 5/7/2024

ESS LABORATORY

185 Frances Avenue
Cranston, RI 02921
Phone: 401-461-7181
[redacted]
www.esslaboratory.com

CHAIN OF CUSTODY

ESS Lab # 24E0264 | Page of

Turn Time: ☒ >5 ☐ 5 ☐ 4 ☐ 3 ☐ 2 ☐ 1 ☐ Same Day

Regulatory State: MA Criteria: CAM

Is this project for any of the following?: ☐ CT RCP ☐ MA MCP ☐ RGP ☐ Permit ☐ 401 WQ

ELECTRONIC DELIVERABLES (Final Reports are PDF)

☐ Limit Checker ☐ State Forms ☒ EQuIS
☒ Excel ☐ Hard Copy ☐ Enviro Data
☐ CLP-Like Package ☒ Other (Specify) → PDF

CLIENT INFORMATION

Client: GZA GeoEnvironmental
Address: 249 Vanderbilt Ave.
Norwood, MA 02062
Phone: 781-278-5843
Email Distribution List: Justin.Ivas@gza.com
Matthew.D.[illegible]@gza.com nicholas.loden@gza.com
charlie.lindberg@gza.com

PROJECT INFORMATION

Project Name: Haverhill former MGP
Project Location: 284 Winter St.
Project Number: 01.0172397.10
Project Manager: Justin Ivas
Bill to:
PO#:
Quote#:

Client acknowledges that sampling is compliant with all EPA / State regulatory programs

REQUESTED ANALYSES

ESS Lab ID	Collection Date	Collection Time	Sample Type	Sample Matrix	Sample ID	VPH														Total Number of Bottles
1	5/6/24	1125	Grab	GW	ENV-SMW	X														3
2	5/6/24	1310	Grab	GW	AS-1	X														3
3	5/6/24	1530	Grab	GW	B208-MW	X														3

Container Type: AC-Air Cassette AG-Amber Glass B-BOD Bottle C-Cubitainer J-Jar O-Other P-Poly S-Sterile V-Vial — V
Container Volume: 1-100 mL 2-2.5 gal 3-250 mL 4-300 mL 5-500 mL 6-1L 7-VOA 8-2 oz 9-4 oz 10-8 oz 11-Other* — 7
Preservation Code: 1-Non Preserved 2-HCl 3-H2SO4 4-HNO3 5-NaOH 6-Methanol 7-Na2S2O3 8-ZnAce, NaOH 9-NH4Cl 10-DI H2O 11-Other* — 2

Sampled by: Nick Loden

Chain needs to be filled out neatly and completely for on time delivery.

Laboratory Use Only
Cooler Temperature (°C): 4.3 / 1 Cx

Comments: * Please specify "Other" preservative and containers types in this space

All samples submitted are subject to ESS Laboratory's payment terms and conditions.

Dissolved Filtration: ☐ Lab Filter

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Nicholas Loden			5/7/24		5/7/24	16:47	
Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)

NAPL Analytical Results

ESS Laboratory
DIVISION OF THE RISE GROUP
BAL Laboratory Analytical Balance

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: 24B0744

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 7:28 pm, Mar 25, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

SAMPLE RECEIPT

The following samples were received on February 23, 2024 for the analyses specified on the enclosed Chain of Custody Record.

To achieve CAM compliance for MCP data, ESS Laboratory has reviewed all QA/QC Requirements and Performance Standards listed in each method. Holding times and preservation have also been reviewed. All CAM requirements have been performed and achieved unless noted in the project narrative.

Each method has been set-up in the laboratory to reach required MCP standards. The methods for aqueous VOA and Soil Methanol VOA have known limitations for certain analytes. The regulatory standards may not be achieved due to these limitations. In addition, for all methods, matrix interferences, dilutions, and %Solids may elevate method reporting limits above regulatory standards. ESS Laboratory can provide, upon request, a Limit Checker (regulatory standard comparison spreadsheet) electronic deliverable which will highlight these exceedances.

Revision 1 February 29, 2024: This report has been revised to include corrected units for 24B0744-01.

VOA NAPL analysis:

DNAPL data:
The vial of DNAPL contained a thick, viscous liquid. After settling, the DNAPL sample did not form a visible layer in the vial.
For the initial 8260 analysis (24B0744-02), the vial was mixed and 1g was diluted in MeOH. Reanalysis of the diluted sample (-02RE1) produced similar results.
When the sample was reanalyzed as ESS# 24B744-04, the contents of the vial were allowed to settle, the vial was not mixed, 0.2g was taken from the top of the sample, diluted in methanol and analyzed.

LNAPL data:
The vial of LNAPL was mostly water. After settling, the LNAPL sample produced a small visible top layer of oil in the vial.
For the initial 8260 analysis (24B0744-01), the vial was mixed and 1g was diluted in MeOH. Reanalysis of the diluted sample (-01RE1) produced similar results.
When the sample was reanalyzed as ESS# 24B0744-03, the contents of the vial were allowed to settle, the vial was not mixed, 0.17g was taken from the top oil layer, diluted in methanol and analyzed.

Revision 2 March 25, 2024: This report has been revised to include VOA reruns used to confirm results.

Lab Number	Sample Name	Matrix	Analysis
24B0744-01	NFSB-02-LNAPL (Mixed)	Oil	8260D
24B0744-02	B208-DNAPL (Mixed)	Oil	8260D

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

24B0744-03	NFSB-02-LNAPL (Top Layer)	Oil	8260D
24B0744-04	B208-DNAPL (Top Layer)	Oil	8260D

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

PROJECT NARRATIVE

Volatile Organics

24B0744-01	**Sample preserved in the laboratory.**
24B0744-01RE1	**Estimated value. Sample hold times were exceeded (H).**
24B0744-01RE1	**Sample preserved in the laboratory**
24B0744-02	**Reported above the quantitation limit; Estimated value (E).** Naphthalene
24B0744-02	**Sample preserved in the laboratory**
24B0744-02	**Surrogate recovery(ies) diluted below the MRL (SD).** 1,2-Dichloroethane-d4 (138% @ 70-130%), 4-Bromofluorobenzene (149% @ 70-130%), Dibromofluoromethane (130% @ 70-130%), Toluene-d8 (142% @ 70-130%)
24B0744-02RE1	**Estimated value. Sample hold times were exceeded (H).**
24B0744-02RE1	**Reported above the quantitation limit; Estimated value (E).** Naphthalene
24B0744-02RE1	**Sample preserved in the laboratory**
24B0744-02RE1	**Surrogate recovery(ies) diluted below the MRL (SD).** 1,2-Dichloroethane-d4 (86% @ 70-130%), 4-Bromofluorobenzene (98% @ 70-130%), Dibromofluoromethane (87% @ 70-130%), Toluene-d8 (86% @ 70-130%)
24B0744-03	**Estimated value. Sample hold times were exceeded (H).**
24B0744-03	**Sample preserved in the laboratory**
24B0744-04	**Estimated value. Sample hold times were exceeded (H).**
24B0744-04	**Sample preserved in the laboratory**
24B0744-04	**Surrogate recovery(ies) diluted below the MRL (SD).** 1,2-Dichloroethane-d4 (90% @ 70-130%), 4-Bromofluorobenzene (93% @ 70-130%), Dibromofluoromethane (86% @ 70-130%), Toluene-d8 (90% @ 70-130%)
D4B0521-CCV1	**Calibration required quadratic regression (Q).** Bromoform (93% @ 40-160%)
D4B0521-CCV1	**Continuing Calibration %Diff/Drift is below control limit (CD-).** Tetrachloroethene (22% @ 20%)
D4C0369-CCV1	**Continuing Calibration %Diff/Drift is below control limit (CD-).** Tetrachloroethene (22% @ 20%)

No other observations noted.

End of Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

DATA USABILITY LINKS

To ensure you are viewing the most current version of the documents below, please clear your internet cookies for www.ESSLaboratory.com. Consult your IT Support personnel for information on how to clear your internet cookies.

Definitions of Quality Control Parameters

Semivolatile Organics Internal Standard Information

Semivolatile Organics Surrogate Information

Volatile Organics Internal Standard Information

Volatile Organics Surrogate Information

EPH and VPH Alkane Lists

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH
MADEP 18-2.1 - VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035A - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

MassDEP Analytical Protocol Certification Form

MADEP RTN: _____

This form provides certification for the following data set: **24B0744-01 through 24B0744-02**

Matrices: ( ) Ground Water/Surface Water ( ) Soil/Sediment ( ) Drinking Water ( ) Air (X) Other: Oil

CAM Protocol (check all that apply below):

(X) 8260 VOC CAM II A	( ) 7470/7471 Hg CAM III B	( ) MassDEP VPH (GC/PID/FID) CAM IV A	( ) 8082 PCB CAM V A	( ) 9014 Total Cyanide/PAC CAM VI A	( ) 6860 Perchlorate CAM VIII B
( ) 8270 SVOC CAM II B	( ) 7010 Metals CAM III C	( ) MassDEP VPH (GC/MS) CAM IV C	( ) 8081 Pesticides CAM V B	( ) 7196 Hex Cr CAM VI B	( ) MassDEP APH CAM IX A
( ) 6010 Metals CAM III A	( ) 6020 Metals CAM III D	( ) MassDEP EPH CAM IV B	( ) 8151 Herbicides CAM V C	( ) Explosives CAM VIII A	( ) TO-15 VOC CAM IX B

Affirmative responses to questions A through F are 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 (X) No ( )
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	Yes (X) No ( )
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 (X) No ( )
D	Does the laboratory report comply with all the reporting requirements specified in the CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data"?	Yes (X) No ( )
E	VPH, EPH, APH and TO-15 only: a. Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	Yes ( ) No ( )
	b. APH and TO-15 Methods only: Was the complete analyte list reported for each method?	Yes ( ) No ( )
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 (X) No ( )

Responses to Questions G, H and I below are required for "'Presumptive Certainty" status

G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocols(s)?	Yes ( ) No (X)*
	Data User Note: ***Data that achieve "Presumptive Certainty" status may not necessarily meet the data usability and representativeness requirements described in 310 CMR 40. 1056 (2)(k) and WSC-07-350.***	
H	Were **all** QC performance standards specified in the CAM protocol(s) achieved?	Yes ( ) No (X)*
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	Yes ( ) No (X)*

****All negative responses must be addressed in an attached laboratory narrative.***

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Laurel Stoddard Date: February 29, 2024

Printed Name: Laurel Stoddard Position: Laboratory Director

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-LNAPL (Mixed)
Date Sampled: 02/22/24 13:05
Percent Solids: N/A
Initial Volume: 1g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-01
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 2/27/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**3.84** (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Ethylbenzene	**13.3** (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Methyl tert-Butyl Ether	ND (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Naphthalene	**228** (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Styrene	ND (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Toluene	ND (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Xylene O	**10.8** (3.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Xylene P,M	**13.0** (6.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719
Xylenes (Total)	**23.8** (6.00)		8260D		1	MD	02/27/24 13:34	D4B0521	DB42719

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*88 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*100 %*		*70-130*
Surrogate: Dibromofluoromethane	*93 %*		*70-130*
Surrogate: Toluene-d8	*95 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-LNAPL (Mixed)
Date Sampled: 02/22/24 13:05
Percent Solids: N/A
Initial Volume: 1g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-01RE1
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 3/15/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**3.69** (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Ethylbenzene	**12.6** (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Methyl tert-Butyl Ether	ND (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Naphthalene	**231** (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Styrene	ND (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Toluene	ND (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Xylene O	**10.3** (3.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Xylene P,M	**12.0** (6.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526
Xylenes (Total)	**22.4** (6.00)		8260D		1	MD	03/15/24 16:50	D4C0369	DC41526

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*89 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*94 %*		*70-130*
Surrogate: Dibromofluoromethane	*90 %*		*70-130*
Surrogate: Toluene-d8	*88 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-DNAPL (Mixed)
Date Sampled: 02/22/24 12:30
Percent Solids: N/A
Initial Volume: 1g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-02
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 2/27/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**622** (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Ethylbenzene	**2410** (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Methyl tert-Butyl Ether	ND (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Naphthalene	**E 31100** (300)		8260D		100	MD	02/27/24 12:43	D4B0521	DB42719
Styrene	ND (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Toluene	**1210** (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Xylene O	**1300** (30.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Xylene P,M	**2780** (60.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719
Xylenes (Total)	**4080** (60.0)		8260D		10	MD	02/27/24 13:59	D4B0521	DB42719

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*138 %*	*SD*	*70-130*
Surrogate: 4-Bromofluorobenzene	*149 %*	*SD*	*70-130*
Surrogate: Dibromofluoromethane	*130 %*	*SD*	*70-130*
Surrogate: Toluene-d8	*142 %*	*SD*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-DNAPL (Mixed)
Date Sampled: 02/22/24 12:30
Percent Solids: N/A
Initial Volume: 1g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-02RE1
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 3/15/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**590** (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Ethylbenzene	**2500** (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Methyl tert-Butyl Ether	ND (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Naphthalene	**E 15800** (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Styrene	ND (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Toluene	**1170** (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Xylene O	**1470** (30.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Xylene P,M	**2930** (60.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526
Xylenes (Total)	**4390** (60.0)		8260D		10	MD	03/15/24 17:15	D4C0369	DC41526

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*86 %*	*SD*	*70-130*
Surrogate: 4-Bromofluorobenzene	*98 %*	*SD*	*70-130*
Surrogate: Dibromofluoromethane	*87 %*	*SD*	*70-130*
Surrogate: Toluene-d8	*86 %*	*SD*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-LNAPL (Top Layer)
Date Sampled: 02/22/24 13:05
Percent Solids: N/A
Initial Volume: 0.17g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-03
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 3/15/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**156** (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Ethylbenzene	**451** (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Methyl tert-Butyl Ether	ND (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Naphthalene	**12800** (176)		8260D		10	MD	03/15/24 17:40	D4C0369	DC41526
Styrene	ND (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Toluene	**34.6** (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Xylene O	**631** (17.6)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Xylene P,M	**738** (35.3)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526
Xylenes (Total)	**1370** (35.3)		8260D		1	MD	03/15/24 18:31	D4C0369	DC41526

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*93 %*		*70-130*
Surrogate: 4-Bromofluorobenzene	*104 %*		*70-130*
Surrogate: Dibromofluoromethane	*96 %*		*70-130*
Surrogate: Toluene-d8	*96 %*		*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-DNAPL (Top Layer)
Date Sampled: 02/22/24 12:30
Percent Solids: N/A
Initial Volume: 0.2g
Final Volume: 15ml
Extraction Method: 5035

ESS Laboratory Work Order: 24B0744
ESS Laboratory Sample ID: 24B0744-04
Sample Matrix: Oil
Units: mg/kg wet
Analyst: MD
Prepared: 3/15/24 8:00

Volatile Organics

Analyte	Results (MRL)	MDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**1430** (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Ethylbenzene	**5910** (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Methyl tert-Butyl Ether	ND (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Naphthalene	**53900** (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Styrene	ND (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Toluene	**2810** (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Xylene O	**3400** (150)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Xylene P,M	**6870** (300)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526
Xylenes (Total)	**10300** (300)		8260D		10	MD	03/15/24 18:06	D4C0369	DC41526

	%Recovery	Qualifier	Limits
Surrogate: 1,2-Dichloroethane-d4	*90 %*	*SD*	*70-130*
Surrogate: 4-Bromofluorobenzene	*93 %*	*SD*	*70-130*
Surrogate: Dibromofluoromethane	*86 %*	*SD*	*70-130*
Surrogate: Toluene-d8	*90 %*	*SD*	*70-130*

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42719 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.200	mg/kg wet							
1,1,1-Trichloroethane	ND	0.200	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.200	mg/kg wet							
1,1,2-Trichloroethane	ND	0.200	mg/kg wet							
1,1-Dichloroethane	ND	0.200	mg/kg wet							
1,1-Dichloroethene	ND	0.200	mg/kg wet							
1,1-Dichloropropene	ND	0.400	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.200	mg/kg wet							
1,2,3-Trichloropropane	ND	0.200	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.200	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.200	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	1.00	mg/kg wet							
1,2-Dibromoethane	ND	0.200	mg/kg wet							
1,2-Dichlorobenzene	ND	0.200	mg/kg wet							
1,2-Dichloroethane	ND	0.200	mg/kg wet							
1,2-Dichloropropane	ND	0.200	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.200	mg/kg wet							
1,3-Dichlorobenzene	ND	0.200	mg/kg wet							
1,3-Dichloropropane	ND	0.200	mg/kg wet							
1,4-Dichlorobenzene	ND	0.200	mg/kg wet							
1,4-Dioxane - Screen	ND	20.0	mg/kg wet							
2,2-Dichloropropane	ND	0.200	mg/kg wet							
2-Butanone	ND	1.00	mg/kg wet							
2-Chlorotoluene	ND	0.200	mg/kg wet							
2-Hexanone	ND	1.00	mg/kg wet							
4-Chlorotoluene	ND	0.200	mg/kg wet							
4-Isopropyltoluene	ND	0.200	mg/kg wet							
4-Methyl-2-Pentanone	ND	1.00	mg/kg wet							
Acetone	ND	1.00	mg/kg wet							
Benzene	ND	0.200	mg/kg wet							
Bromobenzene	ND	0.200	mg/kg wet							
Bromochloromethane	ND	0.200	mg/kg wet							
Bromodichloromethane	ND	0.200	mg/kg wet							
Bromoform	ND	0.200	mg/kg wet							
Bromomethane	ND	0.200	mg/kg wet							
Carbon Disulfide	ND	0.200	mg/kg wet							
Carbon Tetrachloride	ND	0.200	mg/kg wet							
Chlorobenzene	ND	0.200	mg/kg wet							
Chloroethane	ND	0.200	mg/kg wet							
Chloroform	ND	0.200	mg/kg wet							
Chloromethane	ND	0.200	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.200	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.200	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42719 - 5035										
Dibromochloromethane	ND	0.200	mg/kg wet							
Dibromomethane	ND	0.200	mg/kg wet							
Dichlorodifluoromethane	ND	0.200	mg/kg wet							
Diethyl Ether	ND	0.200	mg/kg wet							
Di-isopropyl ether	ND	0.200	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.200	mg/kg wet							
Ethylbenzene	ND	0.200	mg/kg wet							
Hexachlorobutadiene	ND	0.200	mg/kg wet							
Hexachloroethane	ND	0.200	mg/kg wet							
Isopropylbenzene	ND	0.200	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.200	mg/kg wet							
Methylene Chloride	ND	0.400	mg/kg wet							
Naphthalene	ND	0.200	mg/kg wet							
n-Butylbenzene	ND	0.200	mg/kg wet							
n-Propylbenzene	ND	0.200	mg/kg wet							
sec-Butylbenzene	ND	0.200	mg/kg wet							
Styrene	ND	0.200	mg/kg wet							
tert-Butylbenzene	ND	0.200	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.200	mg/kg wet							
Tetrachloroethene	ND	0.200	mg/kg wet							
Tetrahydrofuran	ND	1.00	mg/kg wet							
Toluene	ND	0.200	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.200	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.200	mg/kg wet							
Trichloroethene	ND	0.200	mg/kg wet							
Trichlorofluoromethane	ND	0.200	mg/kg wet							
Vinyl Chloride	ND	0.200	mg/kg wet							
Xylene O	ND	0.200	mg/kg wet							
Xylene P,M	ND	0.400	mg/kg wet							
Xylenes (Total)	ND	0.400	mg/kg wet							
LCS										
1,1,1,2-Tetrachloroethane	1.79	0.200	mg/kg wet	2.000		89	70-130			
1,1,1-Trichloroethane	1.90	0.200	mg/kg wet	2.000		95	70-130			
1,1,2,2-Tetrachloroethane	1.51	0.200	mg/kg wet	2.000		75	40-160			
1,1,2-Trichloroethane	1.87	0.200	mg/kg wet	2.000		93	70-130			
1,1-Dichloroethane	2.02	0.200	mg/kg wet	2.000		101	70-130			
1,1-Dichloroethene	2.21	0.200	mg/kg wet	2.000		110	70-130			
1,1-Dichloropropene	2.00	0.400	mg/kg wet	2.000		100	70-130			
1,2,3-Trichlorobenzene	1.72	0.200	mg/kg wet	2.000		86	70-130			
1,2,3-Trichloropropane	1.51	0.200	mg/kg wet	2.000		76	70-130			
1,2,4-Trichlorobenzene	1.71	0.200	mg/kg wet	2.000		86	70-130			
1,2,4-Trimethylbenzene	1.85	0.200	mg/kg wet	2.000		92	70-130			
1,2-Dibromo-3-Chloropropane	1.40	1.00	mg/kg wet	2.000		70	70-130			
1,2-Dibromoethane	1.75	0.200	mg/kg wet	2.000		88	70-130			
1,2-Dichlorobenzene	1.76	0.200	mg/kg wet	2.000		88	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42719 - 5035										
1,2-Dichloroethane	1.92	0.200	mg/kg wet	2.000		96	70-130			
1,2-Dichloropropane	1.95	0.200	mg/kg wet	2.000		98	70-130			
1,3,5-Trimethylbenzene	1.83	0.200	mg/kg wet	2.000		92	70-130			
1,3-Dichlorobenzene	1.75	0.200	mg/kg wet	2.000		88	70-130			
1,3-Dichloropropane	1.79	0.200	mg/kg wet	2.000		90	70-130			
1,4-Dichlorobenzene	1.75	0.200	mg/kg wet	2.000		87	70-130			
1,4-Dioxane - Screen	34.4	20.0	mg/kg wet	40.00		86	40-160			
2,2-Dichloropropane	2.08	0.200	mg/kg wet	2.000		104	70-130			
2-Butanone	9.36	1.00	mg/kg wet	10.00		94	40-160			
2-Chlorotoluene	1.78	0.200	mg/kg wet	2.000		89	70-130			
2-Hexanone	8.27	1.00	mg/kg wet	10.00		83	40-160			
4-Chlorotoluene	1.80	0.200	mg/kg wet	2.000		90	70-130			
4-Isopropyltoluene	1.72	0.200	mg/kg wet	2.000		86	70-130			
4-Methyl-2-Pentanone	8.32	1.00	mg/kg wet	10.00		83	40-160			
Acetone	9.62	1.00	mg/kg wet	10.00		96	40-160			
Benzene	1.95	0.200	mg/kg wet	2.000		97	70-130			
Bromobenzene	1.75	0.200	mg/kg wet	2.000		88	70-130			
Bromochloromethane	2.07	0.200	mg/kg wet	2.000		103	70-130			
Bromodichloromethane	2.03	0.200	mg/kg wet	2.000		102	70-130			
Bromoform	1.54	0.200	mg/kg wet	2.000		77	40-160			
Bromomethane	2.10	0.200	mg/kg wet	2.000		105	40-160			
Carbon Disulfide	1.99	0.200	mg/kg wet	2.000		100	70-130			
Carbon Tetrachloride	1.99	0.200	mg/kg wet	2.000		100	70-130			
Chlorobenzene	1.78	0.200	mg/kg wet	2.000		89	70-130			
Chloroethane	1.98	0.200	mg/kg wet	2.000		99	40-160			
Chloroform	1.92	0.200	mg/kg wet	2.000		96	70-130			
Chloromethane	1.79	0.200	mg/kg wet	2.000		90	40-160			
cis-1,2-Dichloroethene	2.12	0.200	mg/kg wet	2.000		106	70-130			
cis-1,3-Dichloropropene	2.00	0.200	mg/kg wet	2.000		100	40-160			
Dibromochloromethane	1.78	0.200	mg/kg wet	2.000		89	40-160			
Dibromomethane	1.98	0.200	mg/kg wet	2.000		99	70-130			
Dichlorodifluoromethane	1.35	0.200	mg/kg wet	2.000		67	40-160			
Diethyl Ether	1.96	0.200	mg/kg wet	2.000		98	70-130			
Di-isopropyl ether	2.03	0.200	mg/kg wet	2.000		101	70-130			
Ethyl tertiary-butyl ether	1.98	0.200	mg/kg wet	2.000		99	70-130			
Ethylbenzene	1.80	0.200	mg/kg wet	2.000		90	70-130			
Hexachlorobutadiene	1.81	0.200	mg/kg wet	2.000		90	40-160			
Hexachloroethane	1.83	0.200	mg/kg wet	2.000		92	70-130			
Isopropylbenzene	1.93	0.200	mg/kg wet	2.000		97	70-130			
Methyl tert-Butyl Ether	1.82	0.200	mg/kg wet	2.000		91	70-130			
Methylene Chloride	1.95	0.400	mg/kg wet	2.000		98	70-130			
Naphthalene	1.59	0.200	mg/kg wet	2.000		79	40-160			
n-Butylbenzene	1.79	0.200	mg/kg wet	2.000		90	70-130			
n-Propylbenzene	1.82	0.200	mg/kg wet	2.000		91	70-130			
sec-Butylbenzene	1.76	0.200	mg/kg wet	2.000		88	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42719 - 5035										
Styrene	1.74	0.200	mg/kg wet	2.000		87	40-160			
tert-Butylbenzene	1.83	0.200	mg/kg wet	2.000		92	70-130			
Tertiary-amyl methyl ether	1.88	0.200	mg/kg wet	2.000		94	70-130			
Tetrachloroethene	1.60	0.200	mg/kg wet	2.000		80	70-130			
Tetrahydrofuran	1.69	1.00	mg/kg wet	2.000		85	70-130			
Toluene	1.95	0.200	mg/kg wet	2.000		98	70-130			
trans-1,2-Dichloroethene	2.37	0.200	mg/kg wet	2.000		119	70-130			
trans-1,3-Dichloropropene	1.86	0.200	mg/kg wet	2.000		93	70-130			
Trichloroethene	1.93	0.200	mg/kg wet	2.000		97	70-130			
Trichlorofluoromethane	1.74	0.200	mg/kg wet	2.000		87	40-160			
Vinyl Chloride	1.76	0.200	mg/kg wet	2.000		88	70-130			
Xylene O	1.84	0.200	mg/kg wet	2.000		92	70-130			
Xylene P,M	3.69	0.400	mg/kg wet	4.000		92	70-130			
Xylenes (Total)	5.53	0.400	mg/kg wet	6.000		92	70-130			
LCS Dup										
1,1,1,2-Tetrachloroethane	1.86	0.200	mg/kg wet	2.000		93	70-130	4	20	
1,1,1-Trichloroethane	2.00	0.200	mg/kg wet	2.000		100	70-130	5	20	
1,1,2,2-Tetrachloroethane	1.65	0.200	mg/kg wet	2.000		82	40-160	9	20	
1,1,2-Trichloroethane	1.98	0.200	mg/kg wet	2.000		99	70-130	6	20	
1,1-Dichloroethane	2.10	0.200	mg/kg wet	2.000		105	70-130	4	20	
1,1-Dichloroethene	2.34	0.200	mg/kg wet	2.000		117	70-130	6	20	
1,1-Dichloropropene	2.01	0.400	mg/kg wet	2.000		101	70-130	0.4	20	
1,2,3-Trichlorobenzene	1.81	0.200	mg/kg wet	2.000		90	70-130	5	20	
1,2,3-Trichloropropane	1.66	0.200	mg/kg wet	2.000		83	70-130	9	20	
1,2,4-Trichlorobenzene	1.81	0.200	mg/kg wet	2.000		90	70-130	5	20	
1,2,4-Trimethylbenzene	1.94	0.200	mg/kg wet	2.000		97	70-130	5	20	
1,2-Dibromo-3-Chloropropane	1.57	1.00	mg/kg wet	2.000		78	70-130	12	20	
1,2-Dibromoethane	1.88	0.200	mg/kg wet	2.000		94	70-130	7	20	
1,2-Dichlorobenzene	1.81	0.200	mg/kg wet	2.000		91	70-130	3	20	
1,2-Dichloroethane	1.95	0.200	mg/kg wet	2.000		97	70-130	1	20	
1,2-Dichloropropane	2.01	0.200	mg/kg wet	2.000		101	70-130	3	20	
1,3,5-Trimethylbenzene	1.92	0.200	mg/kg wet	2.000		96	70-130	5	20	
1,3-Dichlorobenzene	1.81	0.200	mg/kg wet	2.000		90	70-130	3	20	
1,3-Dichloropropane	1.89	0.200	mg/kg wet	2.000		95	70-130	5	20	
1,4-Dichlorobenzene	1.82	0.200	mg/kg wet	2.000		91	70-130	4	20	
1,4-Dioxane - Screen	38.8	20.0	mg/kg wet	40.00		97	40-160	12	20	
2,2-Dichloropropane	2.10	0.200	mg/kg wet	2.000		105	70-130	0.9	20	
2-Butanone	10.5	1.00	mg/kg wet	10.00		105	40-160	12	20	
2-Chlorotoluene	1.87	0.200	mg/kg wet	2.000		93	70-130	5	20	
2-Hexanone	9.70	1.00	mg/kg wet	10.00		97	40-160	16	20	
4-Chlorotoluene	1.85	0.200	mg/kg wet	2.000		92	70-130	3	20	
4-Isopropyltoluene	1.78	0.200	mg/kg wet	2.000		89	70-130	4	20	
4-Methyl-2-Pentanone	9.56	1.00	mg/kg wet	10.00		96	40-160	14	20	
Acetone	11.3	1.00	mg/kg wet	10.00		113	40-160	16	20	
Benzene	2.02	0.200	mg/kg wet	2.000		101	70-130	4	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DB42719 - 5035										
Bromobenzene	1.82	0.200	mg/kg wet	2.000		91	70-130	4	20	
Bromochloromethane	2.17	0.200	mg/kg wet	2.000		109	70-130	5	20	
Bromodichloromethane	2.07	0.200	mg/kg wet	2.000		104	70-130	2	20	
Bromoform	1.67	0.200	mg/kg wet	2.000		84	40-160	8	20	
Bromomethane	2.16	0.200	mg/kg wet	2.000		108	40-160	3	20	
Carbon Disulfide	1.97	0.200	mg/kg wet	2.000		99	70-130	1	20	
Carbon Tetrachloride	2.07	0.200	mg/kg wet	2.000		104	70-130	4	20	
Chlorobenzene	1.83	0.200	mg/kg wet	2.000		92	70-130	3	20	
Chloroethane	2.10	0.200	mg/kg wet	2.000		105	40-160	6	20	
Chloroform	1.99	0.200	mg/kg wet	2.000		100	70-130	4	20	
Chloromethane	1.92	0.200	mg/kg wet	2.000		96	40-160	7	20	
cis-1,2-Dichloroethene	2.14	0.200	mg/kg wet	2.000		107	70-130	1	20	
cis-1,3-Dichloropropene	2.11	0.200	mg/kg wet	2.000		105	40-160	5	20	
Dibromochloromethane	1.88	0.200	mg/kg wet	2.000		94	40-160	5	20	
Dibromomethane	2.04	0.200	mg/kg wet	2.000		102	70-130	3	20	
Dichlorodifluoromethane	1.43	0.200	mg/kg wet	2.000		71	40-160	6	20	
Diethyl Ether	2.13	0.200	mg/kg wet	2.000		106	70-130	8	20	
Di-isopropyl ether	2.12	0.200	mg/kg wet	2.000		106	70-130	4	20	
Ethyl tertiary-butyl ether	2.05	0.200	mg/kg wet	2.000		103	70-130	4	20	
Ethylbenzene	1.87	0.200	mg/kg wet	2.000		93	70-130	3	20	
Hexachlorobutadiene	1.79	0.200	mg/kg wet	2.000		90	40-160	0.7	20	
Hexachloroethane	1.87	0.200	mg/kg wet	2.000		94	70-130	2	20	
Isopropylbenzene	2.02	0.200	mg/kg wet	2.000		101	70-130	4	20	
Methyl tert-Butyl Ether	1.94	0.200	mg/kg wet	2.000		97	70-130	6	20	
Methylene Chloride	1.93	0.400	mg/kg wet	2.000		96	70-130	1	20	
Naphthalene	1.74	0.200	mg/kg wet	2.000		87	40-160	9	20	
n-Butylbenzene	1.86	0.200	mg/kg wet	2.000		93	70-130	4	20	
n-Propylbenzene	1.90	0.200	mg/kg wet	2.000		95	70-130	4	20	
sec-Butylbenzene	1.81	0.200	mg/kg wet	2.000		91	70-130	3	20	
Styrene	1.82	0.200	mg/kg wet	2.000		91	40-160	5	20	
tert-Butylbenzene	1.91	0.200	mg/kg wet	2.000		96	70-130	4	20	
Tertiary-amyl methyl ether	1.97	0.200	mg/kg wet	2.000		98	70-130	4	20	
Tetrachloroethene	1.84	0.200	mg/kg wet	2.000		92	70-130	14	20	
Tetrahydrofuran	1.94	1.00	mg/kg wet	2.000		97	70-130	14	20	
Toluene	2.03	0.200	mg/kg wet	2.000		102	70-130	4	20	
trans-1,2-Dichloroethene	2.43	0.200	mg/kg wet	2.000		121	70-130	2	20	
trans-1,3-Dichloropropene	1.95	0.200	mg/kg wet	2.000		98	70-130	5	20	
Trichloroethene	2.01	0.200	mg/kg wet	2.000		101	70-130	4	20	
Trichlorofluoromethane	1.92	0.200	mg/kg wet	2.000		96	40-160	10	20	
Vinyl Chloride	1.79	0.200	mg/kg wet	2.000		90	70-130	2	20	
Xylene O	1.91	0.200	mg/kg wet	2.000		95	70-130	4	20	
Xylene P,M	3.84	0.400	mg/kg wet	4.000		96	70-130	4	20	
Xylenes (Total)	5.75	0.400	mg/kg wet	6.000		96	70-130	4	20	
Batch DC41526 - 5035										

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DC41526 - 5035										
Blank										
1,1,1,2-Tetrachloroethane	ND	0.200	mg/kg wet							
1,1,1-Trichloroethane	ND	0.200	mg/kg wet							
1,1,2,2-Tetrachloroethane	ND	0.200	mg/kg wet							
1,1,2-Trichloroethane	ND	0.200	mg/kg wet							
1,1-Dichloroethane	ND	0.200	mg/kg wet							
1,1-Dichloroethene	ND	0.200	mg/kg wet							
1,1-Dichloropropene	ND	0.400	mg/kg wet							
1,2,3-Trichlorobenzene	ND	0.200	mg/kg wet							
1,2,3-Trichloropropane	ND	0.200	mg/kg wet							
1,2,4-Trichlorobenzene	ND	0.200	mg/kg wet							
1,2,4-Trimethylbenzene	ND	0.200	mg/kg wet							
1,2-Dibromo-3-Chloropropane	ND	1.00	mg/kg wet							
1,2-Dibromoethane	ND	0.200	mg/kg wet							
1,2-Dichlorobenzene	ND	0.200	mg/kg wet							
1,2-Dichloroethane	ND	0.200	mg/kg wet							
1,2-Dichloropropane	ND	0.200	mg/kg wet							
1,3,5-Trimethylbenzene	ND	0.200	mg/kg wet							
1,3-Dichlorobenzene	ND	0.200	mg/kg wet							
1,3-Dichloropropane	ND	0.200	mg/kg wet							
1,4-Dichlorobenzene	ND	0.200	mg/kg wet							
1,4-Dioxane - Screen	ND	20.0	mg/kg wet							
2,2-Dichloropropane	ND	0.200	mg/kg wet							
2-Butanone	ND	1.00	mg/kg wet							
2-Chlorotoluene	ND	0.200	mg/kg wet							
2-Hexanone	ND	1.00	mg/kg wet							
4-Chlorotoluene	ND	0.200	mg/kg wet							
4-Isopropyltoluene	ND	0.200	mg/kg wet							
4-Methyl-2-Pentanone	ND	1.00	mg/kg wet							
Acetone	ND	1.00	mg/kg wet							
Benzene	ND	0.200	mg/kg wet							
Bromobenzene	ND	0.200	mg/kg wet							
Bromochloromethane	ND	0.200	mg/kg wet							
Bromodichloromethane	ND	0.200	mg/kg wet							
Bromoform	ND	0.200	mg/kg wet							
Bromomethane	ND	0.200	mg/kg wet							
Carbon Disulfide	ND	0.200	mg/kg wet							
Carbon Tetrachloride	ND	0.200	mg/kg wet							
Chlorobenzene	ND	0.200	mg/kg wet							
Chloroethane	ND	0.200	mg/kg wet							
Chloroform	ND	0.200	mg/kg wet							
Chloromethane	ND	0.200	mg/kg wet							
cis-1,2-Dichloroethene	ND	0.200	mg/kg wet							
cis-1,3-Dichloropropene	ND	0.200	mg/kg wet							
Dibromochloromethane	ND	0.200	mg/kg wet							

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DC41526 - 5035										
Dibromomethane	ND	0.200	mg/kg wet							
Dichlorodifluoromethane	ND	0.200	mg/kg wet							
Diethyl Ether	ND	0.200	mg/kg wet							
Di-isopropyl ether	ND	0.200	mg/kg wet							
Ethyl tertiary-butyl ether	ND	0.200	mg/kg wet							
Ethylbenzene	ND	0.200	mg/kg wet							
Hexachlorobutadiene	ND	0.200	mg/kg wet							
Hexachloroethane	ND	0.200	mg/kg wet							
Isopropylbenzene	ND	0.200	mg/kg wet							
Methyl tert-Butyl Ether	ND	0.200	mg/kg wet							
Methylene Chloride	ND	0.400	mg/kg wet							
Naphthalene	ND	0.200	mg/kg wet							
n-Butylbenzene	ND	0.200	mg/kg wet							
n-Propylbenzene	ND	0.200	mg/kg wet							
sec-Butylbenzene	ND	0.200	mg/kg wet							
Styrene	ND	0.200	mg/kg wet							
tert-Butylbenzene	ND	0.200	mg/kg wet							
Tertiary-amyl methyl ether	ND	0.200	mg/kg wet							
Tetrachloroethene	ND	0.200	mg/kg wet							
Tetrahydrofuran	ND	1.00	mg/kg wet							
Toluene	ND	0.200	mg/kg wet							
trans-1,2-Dichloroethene	ND	0.200	mg/kg wet							
trans-1,3-Dichloropropene	ND	0.200	mg/kg wet							
Trichloroethene	ND	0.200	mg/kg wet							
Trichlorofluoromethane	ND	0.200	mg/kg wet							
Vinyl Chloride	ND	0.200	mg/kg wet							
Xylene O	ND	0.200	mg/kg wet							
Xylene P,M	ND	0.400	mg/kg wet							
Xylenes (Total)	ND	0.400	mg/kg wet							
LCS										
1,1,1,2-Tetrachloroethane	1.80	0.200	mg/kg wet	2.000		90	70-130			
1,1,1-Trichloroethane	1.78	0.200	mg/kg wet	2.000		89	70-130			
1,1,2,2-Tetrachloroethane	1.90	0.200	mg/kg wet	2.000		95	40-160			
1,1,2-Trichloroethane	1.79	0.200	mg/kg wet	2.000		89	70-130			
1,1-Dichloroethane	1.83	0.200	mg/kg wet	2.000		91	70-130			
1,1-Dichloroethene	1.99	0.200	mg/kg wet	2.000		100	70-130			
1,1-Dichloropropene	1.86	0.400	mg/kg wet	2.000		93	70-130			
1,2,3-Trichlorobenzene	1.91	0.200	mg/kg wet	2.000		96	70-130			
1,2,3-Trichloropropane	1.70	0.200	mg/kg wet	2.000		85	70-130			
1,2,4-Trichlorobenzene	1.95	0.200	mg/kg wet	2.000		97	70-130			
1,2,4-Trimethylbenzene	1.90	0.200	mg/kg wet	2.000		95	70-130			
1,2-Dibromo-3-Chloropropane	1.77	1.00	mg/kg wet	2.000		89	70-130			
1,2-Dibromoethane	1.80	0.200	mg/kg wet	2.000		90	70-130			
1,2-Dichlorobenzene	1.85	0.200	mg/kg wet	2.000		92	70-130			
1,2-Dichloroethane	1.79	0.200	mg/kg wet	2.000		89	70-130			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DC41526 - 5035										
1,2-Dichloropropane	1.78	0.200	mg/kg wet	2.000		89	70-130			
1,3,5-Trimethylbenzene	1.90	0.200	mg/kg wet	2.000		95	70-130			
1,3-Dichlorobenzene	1.83	0.200	mg/kg wet	2.000		92	70-130			
1,3-Dichloropropane	1.84	0.200	mg/kg wet	2.000		92	70-130			
1,4-Dichlorobenzene	1.81	0.200	mg/kg wet	2.000		90	70-130			
1,4-Dioxane - Screen	40.5	20.0	mg/kg wet	40.00		101	40-160			
2,2-Dichloropropane	1.93	0.200	mg/kg wet	2.000		96	70-130			
2-Butanone	9.66	1.00	mg/kg wet	10.00		97	40-160			
2-Chlorotoluene	1.82	0.200	mg/kg wet	2.000		91	70-130			
2-Hexanone	10.5	1.00	mg/kg wet	10.00		105	40-160			
4-Chlorotoluene	1.82	0.200	mg/kg wet	2.000		91	70-130			
4-Isopropyltoluene	1.80	0.200	mg/kg wet	2.000		90	70-130			
4-Methyl-2-Pentanone	9.02	1.00	mg/kg wet	10.00		90	40-160			
Acetone	11.4	1.00	mg/kg wet	10.00		114	40-160			
Benzene	1.79	0.200	mg/kg wet	2.000		90	70-130			
Bromobenzene	1.81	0.200	mg/kg wet	2.000		90	70-130			
Bromochloromethane	1.83	0.200	mg/kg wet	2.000		92	70-130			
Bromodichloromethane	1.96	0.200	mg/kg wet	2.000		98	70-130			
Bromoform	1.86	0.200	mg/kg wet	2.000		93	40-160			
Bromomethane	1.78	0.200	mg/kg wet	2.000		89	40-160			
Carbon Disulfide	1.80	0.200	mg/kg wet	2.000		90	70-130			
Carbon Tetrachloride	1.89	0.200	mg/kg wet	2.000		95	70-130			
Chlorobenzene	1.76	0.200	mg/kg wet	2.000		88	70-130			
Chloroethane	1.78	0.200	mg/kg wet	2.000		89	40-160			
Chloroform	1.79	0.200	mg/kg wet	2.000		89	70-130			
Chloromethane	1.64	0.200	mg/kg wet	2.000		82	40-160			
cis-1,2-Dichloroethene	1.88	0.200	mg/kg wet	2.000		94	70-130			
cis-1,3-Dichloropropene	1.93	0.200	mg/kg wet	2.000		96	40-160			
Dibromochloromethane	1.93	0.200	mg/kg wet	2.000		96	40-160			
Dibromomethane	1.85	0.200	mg/kg wet	2.000		92	70-130			
Dichlorodifluoromethane	1.31	0.200	mg/kg wet	2.000		66	40-160			
Diethyl Ether	1.82	0.200	mg/kg wet	2.000		91	70-130			
Di-isopropyl ether	1.86	0.200	mg/kg wet	2.000		93	70-130			
Ethyl tertiary-butyl ether	1.87	0.200	mg/kg wet	2.000		93	70-130			
Ethylbenzene	1.79	0.200	mg/kg wet	2.000		90	70-130			
Hexachlorobutadiene	1.97	0.200	mg/kg wet	2.000		99	40-160			
Hexachloroethane	1.86	0.200	mg/kg wet	2.000		93	70-130			
Isopropylbenzene	1.99	0.200	mg/kg wet	2.000		100	70-130			
Methyl tert-Butyl Ether	1.83	0.200	mg/kg wet	2.000		91	70-130			
Methylene Chloride	1.82	0.400	mg/kg wet	2.000		91	70-130			
Naphthalene	1.91	0.200	mg/kg wet	2.000		96	40-160			
n-Butylbenzene	1.91	0.200	mg/kg wet	2.000		95	70-130			
n-Propylbenzene	1.89	0.200	mg/kg wet	2.000		94	70-130			
sec-Butylbenzene	1.80	0.200	mg/kg wet	2.000		90	70-130			
Styrene	1.84	0.200	mg/kg wet	2.000		92	40-160			

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DC41526 - 5035										
tert-Butylbenzene	1.88	0.200	mg/kg wet	2.000		94	70-130			
Tertiary-amyl methyl ether	1.83	0.200	mg/kg wet	2.000		92	70-130			
Tetrachloroethene	1.70	0.200	mg/kg wet	2.000		85	70-130			
Tetrahydrofuran	1.81	1.00	mg/kg wet	2.000		90	70-130			
Toluene	1.79	0.200	mg/kg wet	2.000		89	70-130			
trans-1,2-Dichloroethene	1.87	0.200	mg/kg wet	2.000		94	70-130			
trans-1,3-Dichloropropene	1.82	0.200	mg/kg wet	2.000		91	70-130			
Trichloroethene	1.76	0.200	mg/kg wet	2.000		88	70-130			
Trichlorofluoromethane	1.82	0.200	mg/kg wet	2.000		91	40-160			
Vinyl Chloride	1.70	0.200	mg/kg wet	2.000		85	70-130			
Xylene O	1.79	0.200	mg/kg wet	2.000		89	70-130			
Xylene P,M	3.60	0.400	mg/kg wet	4.000		90	70-130			
Xylenes (Total)	5.39	0.400	mg/kg wet	6.000		90	70-130			
LCS Dup										
1,1,1,2-Tetrachloroethane	1.82	0.200	mg/kg wet	2.000		91	70-130	1	20	
1,1,1-Trichloroethane	1.85	0.200	mg/kg wet	2.000		93	70-130	4	20	
1,1,2,2-Tetrachloroethane	1.84	0.200	mg/kg wet	2.000		92	40-160	3	20	
1,1,2-Trichloroethane	1.81	0.200	mg/kg wet	2.000		90	70-130	1	20	
1,1-Dichloroethane	1.86	0.200	mg/kg wet	2.000		93	70-130	2	20	
1,1-Dichloroethene	2.13	0.200	mg/kg wet	2.000		106	70-130	7	20	
1,1-Dichloropropene	1.89	0.400	mg/kg wet	2.000		94	70-130	2	20	
1,2,3-Trichlorobenzene	1.88	0.200	mg/kg wet	2.000		94	70-130	2	20	
1,2,3-Trichloropropane	1.66	0.200	mg/kg wet	2.000		83	70-130	3	20	
1,2,4-Trichlorobenzene	1.93	0.200	mg/kg wet	2.000		96	70-130	0.8	20	
1,2,4-Trimethylbenzene	1.92	0.200	mg/kg wet	2.000		96	70-130	1	20	
1,2-Dibromo-3-Chloropropane	1.69	1.00	mg/kg wet	2.000		84	70-130	5	20	
1,2-Dibromoethane	1.80	0.200	mg/kg wet	2.000		90	70-130	0.1	20	
1,2-Dichlorobenzene	1.86	0.200	mg/kg wet	2.000		93	70-130	0.4	20	
1,2-Dichloroethane	1.79	0.200	mg/kg wet	2.000		90	70-130	0.2	20	
1,2-Dichloropropane	1.79	0.200	mg/kg wet	2.000		90	70-130	0.6	20	
1,3,5-Trimethylbenzene	1.91	0.200	mg/kg wet	2.000		96	70-130	0.6	20	
1,3-Dichlorobenzene	1.82	0.200	mg/kg wet	2.000		91	70-130	0.4	20	
1,3-Dichloropropane	1.86	0.200	mg/kg wet	2.000		93	70-130	1	20	
1,4-Dichlorobenzene	1.83	0.200	mg/kg wet	2.000		92	70-130	1	20	
1,4-Dioxane - Screen	38.7	20.0	mg/kg wet	40.00		97	40-160	5	20	
2,2-Dichloropropane	1.93	0.200	mg/kg wet	2.000		96	70-130	0.1	20	
2-Butanone	9.48	1.00	mg/kg wet	10.00		95	40-160	2	20	
2-Chlorotoluene	1.85	0.200	mg/kg wet	2.000		93	70-130	2	20	
2-Hexanone	10.1	1.00	mg/kg wet	10.00		101	40-160	5	20	
4-Chlorotoluene	1.85	0.200	mg/kg wet	2.000		92	70-130	1	20	
4-Isopropyltoluene	1.81	0.200	mg/kg wet	2.000		90	70-130	0.2	20	
4-Methyl-2-Pentanone	8.73	1.00	mg/kg wet	10.00		87	40-160	3	20	
Acetone	10.7	1.00	mg/kg wet	10.00		107	40-160	6	20	
Benzene	1.82	0.200	mg/kg wet	2.000		91	70-130	1	20	
Bromobenzene	1.87	0.200	mg/kg wet	2.000		93	70-130	3	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: 24B0744

Quality Control Data

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Volatile Organics										
Batch DC41526 - 5035										
Bromochloromethane	1.84	0.200	mg/kg wet	2.000		92	70-130	0.2	20	
Bromodichloromethane	1.98	0.200	mg/kg wet	2.000		99	70-130	1	20	
Bromoform	1.72	0.200	mg/kg wet	2.000		86	40-160	7	20	
Bromomethane	1.78	0.200	mg/kg wet	2.000		89	40-160	0	20	
Carbon Disulfide	1.82	0.200	mg/kg wet	2.000		91	70-130	1	20	
Carbon Tetrachloride	1.89	0.200	mg/kg wet	2.000		95	70-130	0.1	20	
Chlorobenzene	1.79	0.200	mg/kg wet	2.000		90	70-130	2	20	
Chloroethane	1.73	0.200	mg/kg wet	2.000		87	40-160	3	20	
Chloroform	1.82	0.200	mg/kg wet	2.000		91	70-130	2	20	
Chloromethane	1.74	0.200	mg/kg wet	2.000		87	40-160	6	20	
cis-1,2-Dichloroethene	1.92	0.200	mg/kg wet	2.000		96	70-130	2	20	
cis-1,3-Dichloropropene	1.92	0.200	mg/kg wet	2.000		96	40-160	0.1	20	
Dibromochloromethane	1.92	0.200	mg/kg wet	2.000		96	40-160	0.3	20	
Dibromomethane	1.83	0.200	mg/kg wet	2.000		92	70-130	0.9	20	
Dichlorodifluoromethane	1.26	0.200	mg/kg wet	2.000		63	40-160	4	20	
Diethyl Ether	1.82	0.200	mg/kg wet	2.000		91	70-130	0.3	20	
Di-isopropyl ether	1.87	0.200	mg/kg wet	2.000		93	70-130	0.3	20	
Ethyl tertiary-butyl ether	1.87	0.200	mg/kg wet	2.000		94	70-130	0.3	20	
Ethylbenzene	1.82	0.200	mg/kg wet	2.000		91	70-130	1	20	
Hexachlorobutadiene	1.87	0.200	mg/kg wet	2.000		93	40-160	5	20	
Hexachloroethane	1.87	0.200	mg/kg wet	2.000		94	70-130	0.8	20	
Isopropylbenzene	2.02	0.200	mg/kg wet	2.000		101	70-130	1	20	
Methyl tert-Butyl Ether	1.81	0.200	mg/kg wet	2.000		90	70-130	1	20	
Methylene Chloride	1.83	0.400	mg/kg wet	2.000		92	70-130	0.5	20	
Naphthalene	1.83	0.200	mg/kg wet	2.000		92	40-160	4	20	
n-Butylbenzene	1.90	0.200	mg/kg wet	2.000		95	70-130	0.4	20	
n-Propylbenzene	1.90	0.200	mg/kg wet	2.000		95	70-130	0.5	20	
sec-Butylbenzene	1.82	0.200	mg/kg wet	2.000		91	70-130	1	20	
Styrene	1.82	0.200	mg/kg wet	2.000		91	40-160	1	20	
tert-Butylbenzene	1.89	0.200	mg/kg wet	2.000		95	70-130	0.8	20	
Tertiary-amyl methyl ether	1.83	0.200	mg/kg wet	2.000		92	70-130	0	20	
Tetrachloroethene	1.77	0.200	mg/kg wet	2.000		88	70-130	4	20	
Tetrahydrofuran	1.84	1.00	mg/kg wet	2.000		92	70-130	2	20	
Toluene	1.81	0.200	mg/kg wet	2.000		91	70-130	1	20	
trans-1,2-Dichloroethene	1.87	0.200	mg/kg wet	2.000		94	70-130	0.1	20	
trans-1,3-Dichloropropene	1.80	0.200	mg/kg wet	2.000		90	70-130	1	20	
Trichloroethene	1.76	0.200	mg/kg wet	2.000		88	70-130	0.2	20	
Trichlorofluoromethane	1.81	0.200	mg/kg wet	2.000		90	40-160	0.3	20	
Vinyl Chloride	1.81	0.200	mg/kg wet	2.000		90	70-130	6	20	
Xylene O	1.84	0.200	mg/kg wet	2.000		92	70-130	3	20	
Xylene P,M	3.66	0.400	mg/kg wet	4.000		91	70-130	2	20	
Xylenes (Total)	5.49	0.400	mg/kg wet	6.000		92	70-130	2	20	

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

Notes and Definitions

X*a	Sample preserved in the laboratory.
X*	Sample preserved in the laboratory
U	Analyte included in the analysis, but not detected
SD	Surrogate recovery(ies) diluted below the MRL (SD).
Q	Calibration required quadratic regression (Q).
H	Estimated value. Sample hold times were exceeded (H).
E	Reported above the quantitation limit; Estimated value (E).
D	Diluted.
CD-	Continuing Calibration %Diff/Drift is below control limit (CD-).
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit
MF	Membrane Filtration
MPN	Most Probable Number
TNTC	Too numerous to Count
CFU	Colony Forming Units

CERTIFICATE OF ANALYSIS

Client Name: GZA GeoEnvironmental, Inc.
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: 24B0744

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA - Norwood, MA - GZA/TB

Shipped/Delivered Via: ESS Courier

ESS Project ID: 24B0744
Date Received: 2/23/2024
Project Due Date: 2/27/2024
Days for Project: 2 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.4 Iced with: Ice
5. Was COC signed and dated by client? No
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? (Yes) / No
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA
13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

Missing client relinquish signature.

14. Was there a need to contact Project Manager? (Yes) / No
    a. Was there a need to contact the client? Yes / (No)
    Who was contacted: Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	522198	Yes	N/A	Yes	VOA Vial	NP	
1	522199	Yes	N/A	Yes	VOA Vial	NP	

2nd Review
Were all containers scanned into storage/lab? Initials ID — (Yes) / No
Are barcode labels on correct containers? Yes / No / NA
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: [signature] Date & Time: 2/23/24 1628
Reviewed By: [signature] Date & Time: 2/23/24 1651

GW samples *

24B0744

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

ESS LAB PROJECT ID: ~~24B0717~~ * Rev.

Turn Time __Standard Rush___3-day (8260)___ Approved By: Eric B.

Reporting Limits -

State where samples were collected: **MA RI CT NH NJ NY ME** Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other___

Electronic Deliverable Yes_X_ No____
Format: Excel_X_ Access___ PDF_X_ EQuIS__X__

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing ____
Special Pricing WO#: _____

* ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	# of Containers	Analysis: 8260	Analysis: 8260 (oil)	Analysis: Benzene Equilibrium Study						Comment #
~~1~~	22-Feb-24	12:05	G	GW	B206-Water	3	X								1,4
*02 ___	22-Feb-24	12:30	G	O	B208-DNAPL	2		X	X						4
*01 ___	22-Feb-24	13:05	G	O/GW	NFSB-02-LNAPL	2		X	X						2,3,4
~~2~~	~~22-Feb-24~~	~~13:15~~	G	GW	~~NFSB-02-Water~~	3	X		*						1,4
~~3~~	22-Feb-24	13:55	G	GW	B208-Water	3	X								1,4
					*EO 02/27/2024										
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							2	1	1						
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							V	G	G						

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present _____Yes _____No
Seals Intact _____ Yes _____No NA: _____
Cooler Temperature: _____

Sampled by : Justin Ivas

Comments: 1) Trace blebs of oil were observed in sample B206-Water. NAPL was not observed in NFSB-02-Water or B208-Water, but may be present in trace quantities.
2) Sample NFSB-02-LNAPL: please run 8260 analysis on oil phase if possible
3) Prioritize 8260 analysis for sample NFSB-02-LNAPL; if enough material left over, please run Benzene Equilibrium Study as well.
4) Sample containers may indicate VPH analysis, please run 8260 analysis as per this CoC.
5) Email distribution list: Charles.Lindberg@gza.com; Vijay.Radics@gza.com; Matthew.Dion@gza.com; Justin.Ivas@gza.com

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

CoC Revised 2/23
Justin Ivas

CERTIFICATE OF ANALYSIS

Justin Ivas
GZA
249 Vanderbilt Ave.
Norwood, MA 02062

RE: Haverhill Former MGP (01.0172397.10)
ESS Laboratory Work Order Number: F240007

This signed Certificate of Analysis is our approved release of your analytical results. These results are only representative of sample aliquots received at the laboratory. ESS Laboratory expects its clients to follow all regulatory sampling guidelines. Beginning with this page, the entire report has been paginated. This report should not be copied except in full without the approval of the laboratory. Samples will be disposed of thirty days after the final report has been delivered. If you have any questions or concerns, please feel free to call our Customer Service Department.

Laurel Stoddard
Laboratory Director

REVIEWED
By ESS Laboratory at 4:10 pm, Mar 12, 2024

Analytical Summary
The project as described above has been analyzed in accordance with the ESS Quality Assurance Plan. This plan utilizes the following methodologies: US EPA SW-846, US EPA Methods for Chemical Analysis of Water and Wastes per 40 CFR Part 136, APHA Standard Methods for the Examination of Water and Wastewater, American Society for Testing and Materials (ASTM), and other recognized methodologies. The analyses with these noted observations are in conformance to the Quality Assurance Plan. In chromatographic analysis, manual integration is frequently used instead of automated integration because it produces more accurate results.

The test results present in this report are in compliance with TNI and relative state standards, and/or client Quality Assurance Project Plans (QAPP). The laboratory has reviewed the following: Sample Preservations, Hold Times, Initial Calibrations, Continuing Calibrations, Method Blanks, Blank Spikes, Blank Spike Duplicates, Duplicates, Matrix Spikes, Matrix Spike Duplicates, Surrogates and Internal Standards. Any results which were found to be outside of the recommended ranges stated in our SOPs will be noted in the Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

SAMPLE RECEIPT

The following samples were received on February 26, 2024 for the analyses specified on the enclosed Chain of Custody Record.

Lab Number	Sample Name	Matrix	Analysis
F240007-01	NFSB-02-LNAPL	Oil	8270 Mod
F240007-02	B208-DNAPL	Oil	8270 Mod
F240007-03	NFSB-02-LNAPL-EQ	Aqueous	8270 Mod
F240007-04	B208-DNAPL-EQ	Aqueous	8270 Mod

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

PROJECT NARRATIVE

Alkylated PAHs and Benzenes
FC40601-DUP1 **Relative percent difference for duplicate is outside of criteria (D+).**
Benzene (31% @ 30%)

No other observations noted.

End of Project Narrative.

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

CURRENT SW-846 METHODOLOGY VERSIONS

Analytical Methods

1010A - Flashpoint
6010C - ICP
6020A - ICP MS
7010 - Graphite Furnace
7196A - Hexavalent Chromium
7470A - Aqueous Mercury
7471B - Solid Mercury
8011 - EDB/DBCP/TCP
8015B Mod - TPH by GCFID
8015C - GRO/DRO
8081B - Pesticides
8082A - PCB
8100M - TPH
8151A - Herbicides
8260B - VOA
8270D - SVOA
8270D Mod - Alkylated PAHs and Benzenes
8270D SIM - SVOA Low Level
9014 - Cyanide
9038 - Sulfate
9040C - Aqueous pH
9045D - Solid pH (Corrosivity)
9050A - Specific Conductance
9056A - Anions (IC)
9060A - TOC
9095B - Paint Filter
MADEP 04-1.1 - EPH / VPH

Prep Methods

3005A - Aqueous ICP Digestion
3020A - Aqueous Graphite Furnace / ICP MS Digestion
3050B - Solid ICP / Graphite Furnace / ICP MS Digestion
3060A - Solid Hexavalent Chromium Digestion
3510C - Separatory Funnel Extraction
3511 - Microsolvent Extraction Aqueous
3520C - Liquid / Liquid Extraction
3540C - Manual Soxhlet Extraction
3541 - Automated Soxhlet Extraction
3546 - Microwave Extraction
3570 - Microsolvent Extraction Soild
3580A - Waste Dilution
5030B - Aqueous Purge and Trap
5030C - Aqueous Purge and Trap
5035 - Solid Purge and Trap

SW846 Reactivity Methods 7.3.3.2 (Reactive Cyanide) and 7.3.4.1 (Reactive Sulfide) have been withdrawn by EPA. These methods are reported per client request and are not NELAP accredited.

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-LNAPL
Date Sampled: 02/22/24 13:05
Percent Solids: N/A
Initial Volume: 0.0154
Final Volume: 2
Extraction Method: 3580

ESS Laboratory Work Order: F240007
ESS Laboratory Sample ID: F240007-01
Sample Matrix: Oil
Units: mg/Kg
Analyst: NXL
Prepared: 2/28/24 12:30

Alkylated PAHs and Benzenes

Analyte	Results (RL)	EDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**180** (1.30)	0.649	8270 Mod		1	NXL	03/08/24 10:17	F4C0004	FB42802

	%Recovery	Qualifier	Limits
Surrogate: Naphthalene-d8	*82 %*		*50-120*
Surrogate: Toluene-D8	*73 %*		*50-120*

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-DNAPL
Date Sampled: 02/22/24 12:30
Percent Solids: N/A
Initial Volume: 0.0147
Final Volume: 2
Extraction Method: 3580

ESS Laboratory Work Order: F240007
ESS Laboratory Sample ID: F240007-02
Sample Matrix: Oil
Units: mg/Kg
Analyst: NXL
Prepared: 2/28/24 12:30

Alkylated PAHs and Benzenes

Analyte	Results (RL)	EDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**860** (1.36)	0.680	8270 Mod		1	NXL	03/08/24 14:22	F4C0004	FB42802

	%Recovery	Qualifier	Limits
Surrogate: Naphthalene-d8	*87 %*		*50-120*
Surrogate: Toluene-D8	*73 %*		*50-120*

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP
Client Sample ID: NFSB-02-LNAPL-EQ
Date Sampled: 02/22/24 13:05
Percent Solids: N/A
Initial Volume: 34.41
Final Volume: 2
Extraction Method: 3511

ESS Laboratory Work Order: F240007
ESS Laboratory Sample ID: F240007-03
Sample Matrix: Aqueous
Units: ug/L
Analyst: NXL
Prepared: 3/6/24 11:45

Alkylated PAHs and Benzenes

Analyte	Results (RL)	EDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**1200** (11.6)	5.82	8270 Mod		20	NXL	03/09/24 2:31	F4C0001	FC40601

	%Recovery	Qualifier	Limits
Surrogate: Naphthalene-d8	*100 %*		*50-120*
Surrogate: Toluene-D8	*112 %*		*50-120*

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP
Client Sample ID: B208-DNAPL-EQ
Date Sampled: 02/22/24 12:30
Percent Solids: N/A
Initial Volume: 35.24
Final Volume: 2
Extraction Method: 3511

ESS Laboratory Work Order: F240007
ESS Laboratory Sample ID: F240007-04
Sample Matrix: Aqueous
Units: ug/L
Analyst: NXL
Prepared: 3/6/24 11:45

Alkylated PAHs and Benzenes

Analyte	Results (RL)	EDL	Method	Limit	DF	Analyst	Analyzed	Sequence	Batch
Benzene	**6540** (11.4)	5.68	8270 Mod		20	NXL	03/09/24 5:11	F4C0001	FC40601

	%Recovery	Qualifier	Limits
Surrogate: Naphthalene-d8	*101 %*		*50-120*
Surrogate: Toluene-D8	*108 %*		*50-120*

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FB42802 - 3580

Blank

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	ND	2.00	mg/Kg							
Surrogate: Naphthalene-d8	*172*		mg/Kg	*200.0*		*86*	*50-120*			
Surrogate: Toluene-D8	*197*		mg/Kg	*200.0*		*98*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FB42802 - 3580

LCS

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	150	2.00	mg/Kg	200.0		75	50-130			
Surrogate: Naphthalene-d8	*169*		mg/Kg	*200.0*		*84*	*50-120*			
Surrogate: Toluene-D8	*164*		mg/Kg	*200.0*		*82*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FB42802 - 3580

Duplicate **Source: F240007-02**

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	946	1.35	mg/Kg		860			10	20	
Surrogate: Naphthalene-d8	*123*		mg/Kg	*135.1*		*91*	*50-120*			
Surrogate: Toluene-D8	*111*		mg/Kg	*135.1*		*82*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FC40601 - 3511

Blank

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	1.18	0.571	ug/L							
Surrogate: Naphthalene-d8	*52.2*		ug/L	*57.14*		*91*	*50-120*			
Surrogate: Toluene-D8	*66.9*		ug/L	*57.14*		*117*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FC40601 - 3511

LCS

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	62.6	0.571	ug/L	57.14		110	60-130			
Surrogate: Naphthalene-d8	*52.6*		ug/L	*57.14*		*92*	*50-120*			
Surrogate: Toluene-D8	*62.4*		ug/L	*57.14*		*109*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FC40601 - 3511

Duplicate **Source: F240007-03**

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	884	11.3	ug/L		1200			31	30	D+
Surrogate: Naphthalene-d8	*60.7*		ug/L	*56.45*		*108*	*50-120*			
Surrogate: Toluene-D8	*66.6*		ug/L	*56.45*		*118*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

Quality Control Data

Alkylated PAHs and Benzenes

Batch FC40601 - 3511

Duplicate **Source: F240007-04**

Analyte	Result	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Benzene	6150	11.5	ug/L		6540			6	30	
Surrogate: Naphthalene-d8	*57.6*		ug/L	*57.47*		*100*	*50-120*			
Surrogate: Toluene-D8	*61.5*		ug/L	*57.47*		*107*	*50-120*			

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP ESS Laboratory Work Order: F240007

Notes and Definitions

U	Analyte included in the analysis, but not detected
D+	Relative percent difference for duplicate is outside of criteria (D+).
D	Diluted.
ND	Analyte NOT DETECTED at or above the MRL (LOQ), LOD for DoD Reports, MDL for J-Flagged Analytes
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
MDL	Method Detection Limit
MRL	Method Reporting Limit
LOD	Limit of Detection
LOQ	Limit of Quantitation
DL	Detection Limit
I/V	Initial Volume
F/V	Final Volume
§	Subcontracted analysis; see attached report
1	Range result excludes concentrations of surrogates and/or internal standards eluting in that range.
2	Range result excludes concentrations of target analytes eluting in that range.
3	Range result excludes the concentration of the C9-C10 aromatic range.
Avg	Results reported as a mathematical average.
NR	No Recovery
[CALC]	Calculated Analyte
SUB	Subcontracted analysis; see attached report
RL	Reporting Limit
EDL	Estimated Detection Limit

CERTIFICATE OF ANALYSIS

Client Name: GZA
Client Project ID: Haverhill Former MGP

ESS Laboratory Work Order: F240007

ESS LABORATORY CERTIFICATIONS AND ACCREDITATIONS

ENVIRONMENTAL

Rhode Island Potable and Non Potable Water: LAI00179
http://www.health.ri.gov/find/labs/analytical/ESS.pdf

Connecticut Potable and Non Potable Water, Solid and Hazardous Waste: PH-0750
http://www.ct.gov/dph/lib/dph/environmental_health/environmental_laboratories/pdf/OutofStateCommercialLaboratories.pdf

Maine Potable and Non Potable Water, and Solid and Hazardous Waste: RI00002
http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/partners/labCert.shtml

Massachusetts Potable and Non Potable Water: M-RI002
http://public.dep.state.ma.us/Labcert/Labcert.aspx

New Hampshire (NELAP accredited) Potable and Non Potable Water, Solid and Hazardous Waste: 2424
http://des.nh.gov/organization/divisions/water/dwgb/nhelap/index.htm

New York (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: 11313
http://www.wadsworth.org/labcert/elap/comm.html

New Jersey (NELAP accredited) Non Potable Water, Solid and Hazardous Waste: RI006
http://datamine2.state.nj.us/DEP_OPRA/OpraMain/pi_main?mode=pi_by_site&sort_order=PI_NAMEA&Select+a+Site:=58715

United States Department of Agriculture Soil Permit: P330-12-00139

Pennsylvania: 68-01752
http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx

ESS Organic Preparation Logbook

Analysis:

Batch ID: FB42801

Extr. Method: NA

Surrogate ID	
A	NA
B	NA
C	NA

Matrix Spike ID	
A	NA
B	NA
C	NA

Sample Matrix: NAPL

BATCH START DATE: 2/28/2024

BATCH START TIME: 12:00

ESS ID	Wt.(g)	DI Water Vol (ml)	Equilibrate Start Date	Equilibrate Start Time	Equilibrate End Date	Equilibrate End Time	Transfer Volume mL	Transfer Date	Comments (Include pH adjustments, observations)	1st Rvw Init.	Witness Init.
FB42801-BLK1	2.000	60	2/28/2024	12:00	3/4/24	12:00	>40	03/04/24		NL	N/A
F240007-01	1.000	60	2/28/2024	12:00	3/4/24	12:00	>40	03/04/24	LNAPL; Limited Volume*	NL	N/A
F240007-01D	0.700	60	2/28/2024	12:00	3/4/24	12:00	>40	03/04/24	LNAPL; Limited Volume*	NL	N/A
F240007-02	2.300	60	2/28/2024	12:00	3/4/24	12:00	>40	03/04/24	DNAPL**	NL	N/A
F240007-02D	2.300	60	2/28/2024	12:00	3/4/24	12:00	>40	03/04/24	DNAPL**	NL	N/A
									*RELOGGED AS -03		
									**RELOGGED AS -04		

**Check off column if entire sample used and bottle discarded.

Prepared By: NL

Reviewed By:

Control # 50.0001-SVOA

F240007

ESS LAB PROJECT ID 245744

ESS Laboratory

Division of Thielsch Engineering, Inc.
185 Frances Avenue, Cranston, RI 02910-2211
Tel. (401) 461-7181 Fax (401) 461-4486
www.esslaboratory.com

CHAIN OF CUSTODY

Turn Time __Standard Rush___3-day (8260)___ Approved By: Eric B.

Reporting Limits -

State where samples were collected: MA RI CT NH NJ NY ME Other_____

Is this project for any of the following: (please circle)
MA-MCP CT-RCP NJ-DKQP RGP DOD Other___

Electronic Deliverable Yes_X_ No___
Format: Excel_X_ Access___ PDF_X_ EQuIS_X_

GZA Project Manager: Justin Ivas
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, MA 02062
(781) 278-3700
PRESUMPTIVE CERTAINTY REQUIRED

Project No.: 01.0172397.10
Project Name: Haverhill Former MGP
Contract Pricing ____
Special Pricing WO#: _____

ESS Lab Sample ID	Date	Collection Time	Grab -G Composite-C	Matrix	Sample Identification	Analysis / # of Containers	8260	8260 (oil)	Benzene Equilibrium Study						Comment #
	22-Feb-24	12:05	G	GW	B206-Water	3	X	X							1,4
12	22-Feb-24	12:30	G	O	B208-DNAPL	2		X	X						4
21	22-Feb-24	13:05	G	O/GW	NFSB-02-LNAPL	2		X	X						2,3,4
5	22-Feb-24	13:15	G	GW	NFSB-02-Water	3	X								1,4
	22-Feb-24	13:55	G	GW	B208-Water	3	X	X							1,4
Preservation Code: 1-NP, 2-HCl, 3-H2SO4, 4-HNO3, 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZnAct, 9-_____							2	1	1						
Container Type: P-Poly G-Glass AG-Amber Glass S-Sterile V-VOA							V	G	G						

Matrix: S-Soil SD-Solid D-Sludge WW-Wastewater GW-Groundwater SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filter

Cooler Present ____Yes ____No
Seals Intact ____ Yes ____No NA: ____
Cooler Temperature: _____

Sampled by : Justin Ivas

Comments: 1) Trace blebs of oil were observed in sample B206-Water. NAPL was not observed in NFSB-02-Water or B208-Water, but may be present in trace quantities.
2) Sample NFSB-02-LNAPL: please run 8260 analysis on oil phase if possible
3) Prioritize 8260 analysis for sample NFSB-02-LNAPL; if enough material left over, please run Benzene Equilibrium Study as well.
4) Sample containers may indicate VPH analysis, please run 8260 analysis as per this CoC.
5) Email distribution list: Charles.Lindberg@gza.com; Vijay.Radics@gza.com; Matthew.Dion@gza.com; Justin.Ivas@gza.com

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)

Please E-mail all changes to Chain of Custody in writing.

CoC Revised 2/23
Justin Ivas

ESS Laboratory Sample and Cooler Receipt Checklist

Client: GZA-MA

Shipped/Delivered Via: ESS Courier

ESS Project ID: F240007
Date Received: 2/26/2024
Project Due Date: 2/29/2024
Days for Project: 3 Day

1. Air bill manifest present? No
   Air No.: NA
2. Were custody seals present? No
3. Is radiation count <100 CPM? Yes
4. Is a Cooler Present? Yes
   Temp: 3.4 Iced with: Ice
5. Was COC signed and dated by client? Yes
6. Does COC match bottles? Yes
7. Is COC complete and correct? Yes
8. Were samples received intact? Yes
9. **Were labs informed about short holds & rushes?** (Yes) / No / NA
10. Were any analyses received outside of hold time? Yes / (No)

11. Any Subcontracting needed? Yes / (No)
    ESS Sample IDs:
    Analysis:
    TAT:
12. Were VOAs received? Yes / (No)
    a. Air bubbles in aqueous VOAs? Yes / No
    b. Does methanol cover soil completely? Yes / No / NA

13. Are the samples properly preserved? (Yes) / No
    a. If metals preserved upon receipt: Date: Time: By/Acid Lot#:
    b. Low Level VOA vials frozen: Date: Time: By:

Sample Receiving Notes:

14. Was there a need to contact Project Manager? Yes / (No)
    a. Was there a need to contact the client? Yes / No
    Who was contacted? Date: Time: By:

Resolution:

Sample Number	Container ID	Proper Container	Air Bubbles Present	Sufficient Volume	Container Type	Preservative	Record pH (Cyanide and 608 Pesticides)
1	613	Yes	N/A	Yes	Other Glass	NP	
1	614	Yes	N/A	Yes	Other Glass	NP	
2	615	Yes	N/A	Yes	Other Glass	NP	
2	616	Yes	N/A	Yes	Other Glass	NP	

2nd Review

Were all containers scanned into storage/lab? Initials FD
Are barcode labels on correct containers? Yes / No
Are all Flashpoint stickers attached/container ID # circled? Yes / No / NA
Are all Hex Chrome stickers attached? Yes / No / NA
Are all QC stickers attached? Yes / No / NA
Are VOA stickers attached if bubbles noted? Yes / No / NA

Completed By: Date & Time: 2/26/24 11:11
Reviewed By: Date & Time: 2/26/24 11:20

APPENDIX J - AIR SPARGING/SOIL VAPOR EXTRACTION PILOT TEST DATA

Table J-1
Monitoring Well Screening

284 Winter Street
Haverhill, Massachusetts

Location	Time	Well Diameter (inches)	Screen Interval (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Depth to DNAPL (ft)	Depth to Bottom (ft)	Vacuum (inches of H_2O)	Pressure (inches of H_2O)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	LEL (%)	TVOC (ppmv)	DO (mg/l)	ORP (mV)
April 22, 2024 - Pre Soil Vapor Extraction Pilot Test (Baseline)																
SVE-1	8:23 to 10:54	4"	4-14'	-	-	-	14.00	0.000	-	17.4	1.9	0.0	0	45	-	-
AS-1		1"	30-35'	12.72	ND	37.35	37.52	-	-	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.52	ND	ND	19.84	0.000	-	19.7	1.1	0.0	0	31	-	-
B208-MW		2"	22-32'	13.72	ND	29.51	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	11.89	ND	ND	44.85	-	-	-	-	-	-	-	-	-
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.000	-	19.5	1.1	0.0	0	7	-	-
PZ-1(D)		2"	20-25'	13.68	ND	ND	24.27	-	-	-	-	-	-	-	-	-
PZ-2(S)		1"	8-13'	12.57	ND	ND	12.82	0.000	-	17.4	1.3	0.3	6	1,470*	-	-
PZ-2(D)		2"	20-25'	13.23	ND	ND	24.22	-	-	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	12.12	ND	ND	12.99	0.000	-	0.5	0.8	20.0	> 100	2,100*	-	-
PZ-3(D)		2"	20-25'	12.67	ND	ND	24.36	-	-	-	-	-	-	-	-	-
PZ-4(S)		1"	8-13'	ND	ND	ND	12.84	0.000	-	5.0	6.8	0.3	6	260*	-	-
PZ-4(D)		2"	20-25'	12.70	ND [(2)]	ND	24.55	-	-	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.57	ND	ND	12.87	0.000	-	11.3	6.9	0.0	0	130*	-	-
PZ-5(D)		2"	20-25'	12.72	ND	ND	24.72	-	-	-	-	-	-	-	-	-
B302-MW		2"	27-32'	12.48	ND	ND	31.95	-	-	-	-	-	-	-	-	-
NFSB-02(MW)		1.5"	12-22'	12.58	12.56	ND	17.68	0.000	-	17.3	1.4	0.5	10	125	-	-
B303(S)-MW		2"	13-23'	13.70	ND	ND	22.70	0.000	-	17.5	3.2	0.2	4	100	-	-
B303(D)-MW		2"	30-35'	13.53	ND	ND	33.05	-	-	-	-	-	-	-	-	-
ENV-3MW		1.5"	10-20'	12.72	ND	ND	17.67	0.000	-	17.7	2.1	0.0	0	11	-	-
B301-MW		2"	25-30'	12.92	ND	ND	29.95	-	-	-	-	-	-	-	-	-
B212-MW		2"	14-24'	-	-	-	24.73	-	-	-	-	-	-	-	-	-
April 22, 2024 - During Soil Vapor Extraction Pilot Test at SVE-1																
SVE-1	13:52 to 14:35	4"	4-14'	-	-	-	14.00	41.2	-	-	-	-	-	-	-	-
AS-1		1"	30-35'	-	-	-	37.52	-	-	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	-	-	-	19.84	0.040	-	20.8	0.1	0.0	0	0.4	-	-
B208-MW		2"	22-32'	-	-	-	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	-	-	-	44.85	-	-	-	-	-	-	-	-	-
PZ-1(S)		1"	8-13'	-	-	-	13.00	0.059	-	20.8	0.1	0.0	0	< 0.1	-	-
PZ-1(D)		2"	20-25'	-	-	-	24.27	-	-	-	-	-	-	-	-	-
PZ-2(S)		1"	8-13'	-	-	-	12.82	0.110	-	20.8	0.1	0.0	0	3.0	-	-
PZ-2(D)		2"	20-25'	-	-	-	24.22	-	-	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	-	-	-	12.99	0.480	-	20.8	0.1	0.0	0	5.0	-	-
PZ-3(D)		2"	20-25'	-	-	-	24.36	-	-	-	-	-	-	-	-	-
PZ-4(S)		1"	8-13'	-	-	-	12.84	0.036	-	20.8	0.1	0.0	0	3.0	-	-
PZ-4(D)		2"	20-25'	-	-	-	24.55	-	-	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	-	-	-	12.87	0.000	-	18.4	2.3	0.0	0	9.2	-	-
PZ-5(D)		2"	20-25'	-	-	-	24.72	-	-	-	-	-	-	-	-	-
B302-MW		2"	27-32'	-	-	-	31.95	-	-	-	-	-	-	-	-	-
NFSB-02(MW)		1.5"	12-22'	-	-	-	17.68	0.000	-	19.0	0.9	0.2	4	82	-	-
B303(S)-MW		2"	13-23'	-	-	-	22.70	0.000	-	20.6	0.2	0.0	0	10	-	-
B303(D)-MW		2"	30-35'	-	-	-	33.05	-	-	-	-	-	-	-	-	-
ENV-3MW		1.5"	10-20'	-	-	-	17.67	0.029	-	20.8	0.1	0.0	0	< 0.1	-	-
B301-MW		2"	25-30'	-	-	-	29.95	-	-	-	-	-	-	-	-	-
B212-MW		2"	14-24'	-	-	-	24.73	-	-	-	-	-	-	-	-	-

Table J-1
Monitoring Well Screening

284 Winter Street
Haverhill, Massachusetts

Location	Time	Well Diameter (inches)	Screen Interval (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Depth to DNAPL (ft)	Depth to Bottom (ft)	Vacuum (inches of H_2O)	Pressure (inches of H_2O)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	LEL (%)	TVOC (ppmv)	DO (mg/l)	ORP (mV)
April 23, 2024 - Pre Soil Vapor Extraction (SVE-1) & Pre Air Sparge (AS-1) Pilot Test (Baseline)																
SVE-1	7:57 to 10:15	4"	4-14'	13.04	ND	ND	14.00	0.000	-	20.3	0.3	0.2	6	6.0	-	-
AS-1		1"	30-35'	12.80	ND	37.38	37.52	-	-	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.58	ND	ND	19.84	0.000	-	20.3	0.2	0.0	0	8.0	0.38	-34
B208-MW		2"	22-32'	13.83	ND	29.97 (3)	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	11.93	ND	ND	44.85	-	-	-	-	-	-	-	0.36	-41
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.000	-	20.2	0.6	0.0	0	3.0	-	-
PZ-1(D)		2"	20-25'	13.75	ND	ND	24.27	-	-	-	-	-	-	-	0.87	-40
PZ-2(S)		1"	8-13'	12.65	ND	ND	12.82	0.000	-	5.9	2.7	3.5	70	960*	-	-
PZ-2(D)		2"	20-25'	13.32	ND	ND	24.22	-	-	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	12.21	ND	ND	12.99	0.000	-	2.8	3.1	7.3	> 100	2,240*	-	-
PZ-3(D)		2"	20-25'	12.73	ND	ND	24.36	-	-	-	-	-	-	-	0.96	-17
PZ-4(S)		1"	8-13'	12.53	ND	ND	12.84	0.000	-	10.9	3.0	0.0	0	260*	-	-
PZ-4(D)		2"	20-25'	12.76	12.75	ND	24.55	-	-	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.67	ND	ND	12.87	0.000	-	13.2	5.7	0.0	0	180*	-	-
PZ-5(D)		2"	20-25'	12.79	ND	ND	24.72	-	-	-	-	-	-	-	1.75	-26
B302-MW		2"	27-32'	12.47	ND	ND	31.95	-	-	-	-	-	-	-	1.96	-17
NFSB-02(MW)		1.5"	12-22'	12.61	12.60	ND	17.68	0.000	-	18.3	0.9	0.5	10	91	-	-
B303(S)-MW		2"	13-23'	13.75	ND	ND	22.70	0.000	-	18.1	1.8	0.1	2	58	0.41	-11
B303(D)-MW		2"	30-35'	13.59	ND	ND	33.05	-	-	-	-	-	-	-	3.72	-31
ENV-3MW		1.5"	10-20'	12.79	ND	ND	17.67	0.000	-	8.6	6.9	0.0	0	50*	-	-
B301-MW		2"	25-30'	13.00	ND	ND	29.95	-	-	-	-	-	-	-	0.82	-31
B212-MW		2"	14-24'	12.88	ND	ND	24.73	-	-	-	-	-	-	-	0.85	-5
April 23, 2024 - During Soil Vapor Extraction (SVE-1) & Air Sparge (AS-1) Pilot Test																
SVE-1	12:03 to 13:42	4"	4-14'	-	-	-	14.00	29.7	-	-	-	-	-	-	-	-
AS-1		1"	30-35'	-	-	-	37.52	-	13.0 psi	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.20	ND	ND	19.84	0.020	-	20.8	0.1	0.0	0	35	0.35	-32
B208-MW		2"	22-32'	11.90	ND	30.65	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	11.44	ND	ND	44.85	-	0.066	-	-	-	-	-	0.61	-42
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.052	-	20.7	0.1	0.0	0	13	-	-
PZ-1(D)		2"	20-25'	11.60	ND	ND	24.27	-	0.064	-	-	-	-	-	0.88	-42
PZ-2(S)		1"	8-13'	12.81	ND	ND	12.82	0.073	-	20.7	0.1	0.0	0	12	-	-
PZ-2(D)		2"	20-25'	9.06	ND	ND	24.22	-	0.679	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	12.35	ND	ND	12.99	0.291	-	20.7	0.1	0.0	0	10	-	-
PZ-3(D)		2"	20-25'	4.84	ND	ND	24.36	-	35.7	-	-	-	-	780	9.84	-52
PZ-4(S)		1"	8-13'	12.50	ND	ND	12.84	0.020	-	20.8	0.1	0.0	0	11	-	-
PZ-4(D)		2"	20-25'	11.41	ND	ND	24.55	-	0.148	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.61	ND	ND	12.87	0.000	-	18.0	2.6	0.0	0	16	-	-
PZ-5(D)		2"	20-25'	12.11	ND	ND	24.72	-	0.070	-	-	-	-	-	2.27	-65
B302-MW		2"	27-32'	10.85	ND	ND	31.95	-	0.151	-	-	-	-	-	2.19	-32
NFSB-02(MW)		1.5"	12-22'	10.62	10.61	ND	17.68	-	-	-	-	-	-	-	-	-
B303(S)-MW		2"	13-23'	12.94	ND	ND	22.70	-	-	-	-	-	-	-	0.60	-9
B303(D)-MW		2"	30-35'	12.95	ND	ND	33.05	-	1.38	-	-	-	-	-	3.93	-59
ENV-3MW		1.5"	10-20'	12.64	ND	ND	17.67	0.038	-	20.8	0.1	0.0	0	5.5	-	-
B301-MW		2"	25-30'	12.47	ND	ND	29.95	-	0.040	-	-	-	-	-	1.16	-48
B212-MW		2"	14-24'	12.47	ND	ND	24.73	-	-	-	-	-	-	-	-	-

Table J-1
Monitoring Well Screening

284 Winter Street
Haverhill, Massachusetts

Location	Time	Well Diameter (inches)	Screen Interval (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Depth to DNAPL (ft)	Depth to Bottom (ft)	Vacuum (inches of H_2O)	Pressure (inches of H_2O)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	LEL (%)	TVOC (ppmv)	DO (mg/l)	ORP (mV)
April 23, 2024 - During Soil Vapor Extraction (SVE-1) & Air Sparge (AS-1) Pilot Test																
SVE-1	15:15 to 16:22	4"	4-14'	-	-	-	14.00	29.7	-	-	-	-	-	-	-	-
AS-1		1"	30-35'	-	-	-	37.52	-	12.0 psi	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.00	ND	ND	19.84	0.020	-	20.8	0.1	0.0	0	12	0.92	19
B208-MW		2"	22-32'	13.06	ND	30.55	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	11.78	ND	ND	44.85	-	-	-	-	-	-	-	0.75	19
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.051	-	20.5	0.2	0.6	12	8	-	-
PZ-1(D)		2"	20-25'	12.74	ND	ND	24.27	-	-	-	-	-	-	-	1.55	7
PZ-2(S)		1"	8-13'	12.38	ND	ND	12.82	0.048	-	20.7	0.1	0.0	0	205	-	-
PZ-2(D)		2"	20-25'	11.06	ND	ND	24.22	-	-	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	11.93	ND	ND	12.99	0.117	-	20.7	0.1	0.2	4	135	-	-
PZ-3(D)		2"	20-25'	5.03	ND	ND	24.36	-	-	-	-	-	-	-	10.95	-19
PZ-4(S)		1"	8-13'	12.39	ND	ND	12.84	0.019	-	20.8	0.1	0.0	0	5	-	-
PZ-4(D)		2"	20-25'	11.87	ND	ND	24.55	-	-	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.54	ND	ND	12.87	0.000	-	13.5	5.0	0.0	0	14	-	-
PZ-5(D)		2"	20-25'	12.36	ND	ND	24.72	-	-	-	-	-	-	-	2.28	-28
B302-MW		2"	27-32'	11.32	ND	ND	31.95	-	-	-	-	-	-	-	2.06	-34
NFSB-02(MW)		1.5"	12-22'	10.59	10.58	ND	17.68	-	-	-	-	-	-	-	-	-
B303(S)-MW		2"	13-23'	12.75	ND	ND	22.70	-	-	-	-	-	-	-	0.64	-14
B303(D)-MW		2"	30-35'	13.08	ND	ND	33.05	-	-	-	-	-	-	-	3.96	-37
ENV-3MW		1.5"	10-20'	12.52	ND	ND	17.67	0.020	-	20.8	0.1	0.0	0	3.9	-	-
B301-MW		2"	25-30'	12.68	ND	ND	29.95	-	-	-	-	-	-	-	1.01	-17
B212-MW		2"	14-24'	12.62	ND	ND	24.73	-	-	-	-	-	-	-	0.51	-30
April 24, 2024 - Pre Soil Vapor Extraction (SVE-1) & Pre Air Sparge (SG-3(D)) Pilot Test (Baseline)																
SVE-1	7:32 to 10:05	4"	4-14'	12.97	ND	ND	14.00	0.000	-	17.0	1.5	0.7	14	112.0	-	-
AS-1		1"	30-35'	13.64	ND	37.49	37.52	-	0.067	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.51	ND	ND	19.84	0.000	-	14.2	1.4	8.5	> 100	1,060*	0.65	-55
B208-MW		2"	22-32'	13.86	ND	30.40	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	12.19	ND	ND	44.85	-	0.063	-	-	-	-	-	0.66	-62
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.000	-	20.6	0.4	0.1	2	85.0	-	-
PZ-1(D)		2"	20-25'	13.85	ND	ND	24.27	-	0.109	-	-	-	-	-	0.78	87
PZ-2(S)		1"	8-13'	12.48	ND	ND	12.82	0.000	-	0.2	3.8	22.0	> 100	2,150*	-	-
PZ-2(D)		2"	20-25'	13.40	ND	ND	24.22	-	0.031	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	12.05	ND	ND	12.99	0.000	-	2.2	2.3	21.4	> 100	1,940*	-	-
PZ-3(D)		2"	20-25'	12.83	ND	ND	24.36	-	0.126	-	-	-	-	-	0.67	-9
PZ-4(S)		1"	8-13'	12.44	ND	ND	12.84	0.000	-	8.5	3.0	0.1	2	2,550*	-	-
PZ-4(D)		2"	20-25'	12.50	ND	ND	24.55	-	0.027	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.66	ND	ND	12.87	0.000	-	11.1	7.4	0.0	0	65*	-	-
PZ-5(D)		2"	20-25'	12.88	ND	ND	24.72	-	0.125	-	-	-	-	-	1.74	-38
B302-MW		2"	27-32'	12.50	ND	ND	31.95	-	0.014	-	-	-	-	-	2.29	92
NFSB-02(MW)		1.5"	12-22'	11.70	ND	ND	17.68	0.000	-	16.4	2.2	1.9	38	120	-	-
B303(S)-MW		2"	13-23'	13.80	ND	ND	22.70	0.000	-	18.5	2.0	0.4	8	115	0.94	-14
B303(D)-MW		2"	30-35'	13.62	ND	ND	33.05	-	0.068	-	-	-	-	-	4.24	-21
ENV-3MW		1.5"	10-20'	12.79	ND	ND	17.67	0.000	-	7.1	8.1	0.1	2	44*	-	-
B301-MW		2"	25-30'	13.08	ND	ND	29.95	-	0.026	-	-	-	-	-	0.52	-24
B212-MW		2"	14-24'	12.94	ND	ND	24.73	-	-	-	-	-	-	-	0.36	-32

Table J-1
Monitoring Well Screening

284 Winter Street
Haverhill, Massachusetts

Location	Time	Well Diameter (inches)	Screen Interval (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	Depth to DNAPL (ft)	Depth to Bottom (ft)	Vacuum (inches of H_2O)	Pressure (inches of H_2O)	Oxygen (%)	Carbon Dioxide (%)	Methane (%)	LEL (%)	TVOC (ppmv)	DO (mg/l)	ORP (mV)
April 24, 2024 - During Soil Vapor Extraction (SVE-1) & Air Sparge (SG-3(D)) Pilot Test																
SVE-1	12:30 to 13:51	4"	4-14'	-	-	-	14.00	38.2	-	18.2	0.8	0.1	2	63	-	-
AS-1		1"	30-35'	11.30	ND	37.50	37.52	-	0.054	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.16	ND	ND	19.84	0.000	-	20.8	0.1	0.0	0	78	0.80	33
B208-MW		2"	22-32'	12.96	ND	30.38	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	11.47	ND	ND	44.85	-	0.062	-	-	-	-	-	0.63	37
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.068	-	20.6	0.2	0.0	0	0.5	-	-
PZ-1(D)		2"	20-25'	11.80	ND	ND	24.27	-	0.222	-	-	-	-	-	0.80	-11
PZ-2(S)		1"	8-13'	12.37	ND	ND	12.82	0.054	-	20.6	0.2	0.0	0	3.3	-	-
PZ-2(D)		2"	20-25'	9.85	ND	ND	24.22	-	4.52	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	11.45	ND	ND	12.99	0.036	-	20.7	0.1	0.0	0	0.5	-	-
PZ-3(D)		2"	20-25'	-	-	-	24.36	-	9.5 psi	-	-	-	-	-	-	-
PZ-4(S)		1"	8-13'	12.36	ND	ND	12.84	0.030	-	20.7	0.1	0.0	0	0.9	-	-
PZ-4(D)		2"	20-25'	11.25	ND	ND	24.55	-	1.20	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.58	ND	ND	12.87	0.000	-	20.7	0.1	0.0	0	0.9	-	-
PZ-5(D)		2"	20-25'	12.28	ND	ND	24.72	-	0.108	-	-	-	-	-	2.01	-9
B302-MW		2"	27-32'	10.57	ND	ND	31.95	-	0.218	-	-	-	-	-	1.99	-16
NFSB-02(MW)		1.5"	12-22'	9.69	ND	ND	17.68	-	-	-	-	-	-	-	-	-
B303(S)-MW		2"	13-23'	12.29	ND	ND	22.70	-	2.30	-	-	-	-	-	0.320	-20
B303(D)-MW		2"	30-35'	12.87	ND	ND	33.05	-	0.085	-	-	-	-	-	3.94	-30
ENV-3MW		1.5"	10-20'	12.61	ND	ND	17.67	0.017	-	20.8	0.1	0.0	0	6.1	-	-
B301-MW		2"	25-30'	12.63	ND	ND	29.95	-	0.107	-	-	-	-	-	0.840	-5
B212-MW		2"	14-24'	12.59	ND	ND	24.73	-	-	-	-	-	-	-	1.18	-25
April 25, 2024 - Post Pilot Test																
SVE-1	8:45 to 10:30	4"	4-14'	13.13	ND	ND	14.00	0.000	-	19.3	0.8	0.1	2	56.0	-	-
AS-1		1"	30-35'	12.89	ND	37.48	37.52	-	0.063	-	-	-	-	-	-	-
B208(S)-MW		2"	5-20'	13.59	ND	ND	19.84	0.000	-	16.8	1.1	2.6	52	800*	1.10	-17
B208-MW		2"	22-32'	13.89	ND	30.31	31.81	-	-	-	-	-	-	-	-	-
B208(D)-MW		2"	40-45'	12.22	ND	ND	44.85	-	0.056	-	-	-	-	-	0.66	-28
PZ-1(S)		1"	8-13'	ND	ND	ND	13.00	0.000	-	19.9	0.5	0.0	0	11	-	-
PZ-1(D)		2"	20-25'	13.89	ND	ND	24.27	-	0.123	-	-	-	-	-	0.60	-36
PZ-2(S)		1"	8-13'	12.64	ND	ND	12.82	0.000	-	1.3	4.2	28.2	> 100	1,880*	-	-
PZ-2(D)		2"	20-25'	13.48	ND	ND	24.22	-	0.024	-	-	-	-	-	-	-
PZ-3(S)		1"	8-13'	12.34	ND	ND	12.99	0.000	-	1.6	2.6	24.5	> 100	2,040*	-	-
PZ-3(D)		2"	20-25'	12.88	ND	ND	24.36	-	0.058	-	-	-	-	-	0.45	-16
PZ-4(S)		1"	8-13'	12.62	ND	ND	12.84	0.000	-	11.5	2.4	0.0	0	23.0	-	-
PZ-4(D)		2"	20-25'	12.87	ND	ND [2]	24.55	-	0.040	-	-	-	-	-	-	-
PZ-5(S)		1"	8-13'	12.77	ND	ND	12.87	0.000	-	15.5	5.1	0.0	0	800*	-	-
PZ-5(D)		2"	20-25'	12.91	ND	ND	24.72	-	0.035	-	-	-	-	-	1.12	-21
B302-MW		2"	27-32'	12.58	ND	ND	31.95	-	0.015	-	-	-	-	-	0.96	-26
NFSB-02(MW)		1.5"	12-22'	12.75	ND	ND	17.68	0.000	-	14.2	2.7	9.1	> 100	860*	-	-
B303(S)-MW		2"	13-23'	13.87	ND	ND	22.70	0.000	-	14.8	4.7	4.3	86	720*	0.40	-37
B303(D)-MW		2"	30-35'	13.68	ND	ND	33.05	-	0.035	-	-	-	-	-	3.54	-28
ENV-3MW		1.5"	10-20'	12.89	ND	ND	17.67	0.000	-	8.6	7.2	0.1	2	130*	-	-
B301-MW		2"	25-30'	13.12	ND	ND	29.95	-	0.019	-	-	-	-	-	0.46	-21
B212-MW		2"	14-24'	12.99	ND	ND	24.73	-	-	-	-	-	-	-	0.45	-31

Notes: 1. Equipment Utilized: Landtec Model GEM 5000 Landfill Gas Meter, MiniRAE 3000 PID w/ 10.6 eV lamp, Dwyer Digital Manometer Series 475, 1/8 Hp GAST Air Pump, Solonist Water Level Meter, and Down-the-hole Dissolved Oxygen Meter YSI 650 MDS.

* TVOC readings are based on dilutions due to elevated CO_2 and/or CH_4.

2. No measurable LNAPL, but NAPL staining on tape and probe.

3. Recovered approx. 2 gallons of NAPL/water mixture. Post recovery DNAPL thickness of 0.8 feet.

Table J-2
Vent Pilot Test

284 Winter Street
Haverhill, Massachusetts

Date	Well I.D.	Time	Wellhead Vacuum (inches of H2O)	Vacuum Diff. (inches of H2O)	Flow (CFM)	TVOC (ppmv)	O_2 %	CO_2 %	LEL %	CH_4 %	H_2S (ppm)	Notes
4/22/2024	SVE-1	11:35	44.5	4.5	33.8	-	-	-	-	-	-	SVE Start-up. Oriface Plate #80153
		12:00	41.5	4.5	33.9	69	18.1	2.2	10	0.5	-	
		12:40	41.1	4.7	34.0	50	19.0	1.7	8	0.4	10	
		13:26	41.2	4.5	34.0	51	19.3	1.5	6	0.3	8	
		15:27	40.5	4.5	34.0	50	19.4	1.4	4	0.2	6	
		16:24	-	-	-	-	-	-	-	-	-	Summa Canister sample TO-15 & APH.
		17:00	-	-	-	-	-	-	-	-	-	VGAC Effluent = <0.1 ppmv. SVE-1 Pilot Test Shutdown.
4/23/2024	SVE-1	10:20	30.0	5.0	36.3	-	-	-	-	-	-	SVE Start-up. Oriface Plate #80153
		10:36	29.6	5.0	36.4	62	19.2	1.3	6	0.3	-	
		10:44	-	-	-	-	-	-	-	-	-	AS-1 Start-up @ 2.7 to 3.6 scfm
		10:57	29.4	5.0	36.4	65	18.6	1.2	4	0.2	2	
		12:02	29.5	5.2	36.9	55	18.2	1.0	2	0.1	2	
		15:17	29.7	5.3	37.4	58	19.5	0.8	6	0.3	2	
		16:46	-	-	-	-	-	-	-	-	-	Summa Canister sample TO-15 & APH.
		16:56	29.7	5.3	37.4	56	19.7	0.8	6	0.3		
		17:10	-	-	-	-	-	-	-	-	-	VGAC Effluent = <0.1 ppmv. SVE-1 & AS-1 Pilot Test Shutdown.
4/24/2024	SVE-1	10:25	40.0	5.0	35.7	-	-	-	-	-	-	SVE Start-up. Oriface Plate #80153
		10:36	39.6	4.5	34.2	90	19.0	1.2	8	0.4	1	
		10:43	-	-	-	-	-	-	-	-	-	PZ-3(D) Start-up @ 3.3 to 3.5 scfm
		12:23	38.2	4.5	34.3	72	19.3	1.0	6	0.3	2	
		14:37	-	-	-	-	-	-	-	-	-	Summa Canister sample TO-15 & APH.
		14:40	-	-	-	-	-	-	-	-	-	VGAC Effluent = <0.1 ppmv. SVE-1 & PZ-3(D) Pilot Test Shutdown.

Notes: 1. SVE Air Flow measurements made through Oriface #80153 (Pipe ID: 1.939", Bore: 1.100").
2. Equipment Utilized: Landtec Model GEM 5000 Landfill Gas Meter, MiniRAE 3000 PID w/ 10.6 eV lamp, Dwyer Digital Manometer Series 475 and 1/8 Hp GAST Air Pump.

Table J-3
Radius of Influence Data
April 22, 2024

284 Winter Street
Haverhill, Massachusetts

Monitoring Wells				SVE Pilot Test		
Vent Well Operating	Well I.D.	Distance From Vent Well (ft)	Vacuum (inches of H2O)	Vacuum (inches of H2O)	Vacuum Diff. (inches of H2O)	Flow (CFM)
SVE-1	B208(S)-MW	6.0	0.040	41.2	4.5	34.0
	PZ-1(S)	14.5	0.059			
	PZ-3(S)	16.5	0.480			
	PZ-2(S)	19.5	0.110			
	PZ-4(S)	24.0	0.036			
	ENV-3MW	36.5	0.029			
	PZ-5(S)	38.0	0.000			
SVE-1	B208(S)-MW	6.0	0.028	28.4	2.5	25.8
	PZ-1(S)	14.5	0.055			
	PZ-3(S)	16.5	0.345			
	PZ-2(S)	19.5	0.079			
	PZ-4(S)	24.0	0.050			
	ENV-3MW	36.5	0.025			
	PZ-5(S)	38.0	0.000			
SVE-1	B208(S)-MW	6.0	0.019	20.4	1.5	20.2
	PZ-1(S)	14.5	0.030			
	PZ-3(S)	16.5	0.185			
	PZ-2(S)	19.5	0.060			
	PZ-4(S)	24.0	0.019			
	ENV-3MW	36.5	0.000			
	PZ-5(S)	38.0	0.000			
SVE-1	B208(S)-MW	6.0	0.015	14.0	0.82	15.1
	PZ-1(S)	14.5	0.017			
	PZ-3(S)	16.5	0.026			
	PZ-2(S)	19.5	0.045			
	PZ-4(S)	24.0	0.000			
	ENV-3MW	36.5	0.000			
	PZ-5(S)	38.0	0.000			

Note: 1. Equipment Utilized: Dwyer Digital Manometer Series 475.

Table J-4
Air Sparge Pilot Test

284 Winter Street
Haverhill, Massachusetts

Date	Time	Air Sparge @ AS-1				SVE-1			Notes
		Compressor Pressure (psi)	Vacuum Diff. (inch of wc)	Air Flow (scfm)	Well Head Air Pressure (psi)	Vacuum (inches of H2O)	Vacuum Diff. (inches of H2O)	Air Flow (scfm)	
04/23/24	10:44	17.0	0.25" @ 16.5 psi	2.8	16.5	29.6	5.0	36.4	Oriface Plate AS #93179 & SVE #80153
	10:47	15.0	0.25" @ 14.5 psi	2.7	14.5	29.4	5.0	36.4	
	11:02	14.0	0.40" @ 13.5 psi	3.3	13.5	29.4	5.0	36.4	
	11:15	13.5	0.45" @ 13.0 psi	3.5	13.0	29.4	5.0	36.4	
	11:31	13.5	0.44" @ 13.0 psi	3.5	13.0	29.4	5.0	36.4	
	12:02	13.0	0.36" @ 13.0 psi	3.1	12.5	29.5	5.2	36.9	
	15:18	12.5	0.47" @ 12.0 psi	3.5	12.0	29.7	5.3	37.4	
	16:50	12.5	0.49" @ 12.0 psi	3.6	12.0	29.7	5.3	37.4	
	17:10	-	-	-	-	-	-	-	SVE-1 & AS-1 Pilot Test Shutdown.

Date	Time	Air Sparge @ PZ-3(D)				SVE-1			Notes
		Compressor Pressure (psi)	Vacuum Diff. (inch of wc)	Air Flow (scfm)	Well Head Air Pressure (psi)	Vacuum (inches of H2O)	Vacuum Diff. (inches of H2O)	Air Flow (scfm)	
04/24/24	10:43	14.0	0.44" @ 14.0 psi	3.5	13.5	39.6	4.5	34.2	Oriface Plate AS #93179 & SVE #80153
	10:58	13.0	0.44" @ 13.0 psi	3.5	13.0	39.6	4.5	34.2	
	11:46	11.5	0.44" @ 11.5 psi	3.4	11.5	39.6	4.5	34.2	
	12:31	10.5	0.45" @ 10.5 psi	3.3	10.8	38.2	4.5	34.3	
	14:08	8.0	0.53" @ 8.0 psi	3.4	8.0	38.2	4.5	34.3	
	14:40	-	-	-	-	-	-	-	SVE-1 & PZ-3(D) Pilot Test Shutdown.

Note: 1. Air Flow measurements made through Air Sparge #93179 (Pipe ID: 1.000", Bore: 0.520") and SVE #80153 (Pipe ID: 1.939", Bore: 1.100").

TABLE J-5
SOIL VAPOR ANALYTICAL DATA TABLE
284 Winter Street
Haverhill, Massachusetts

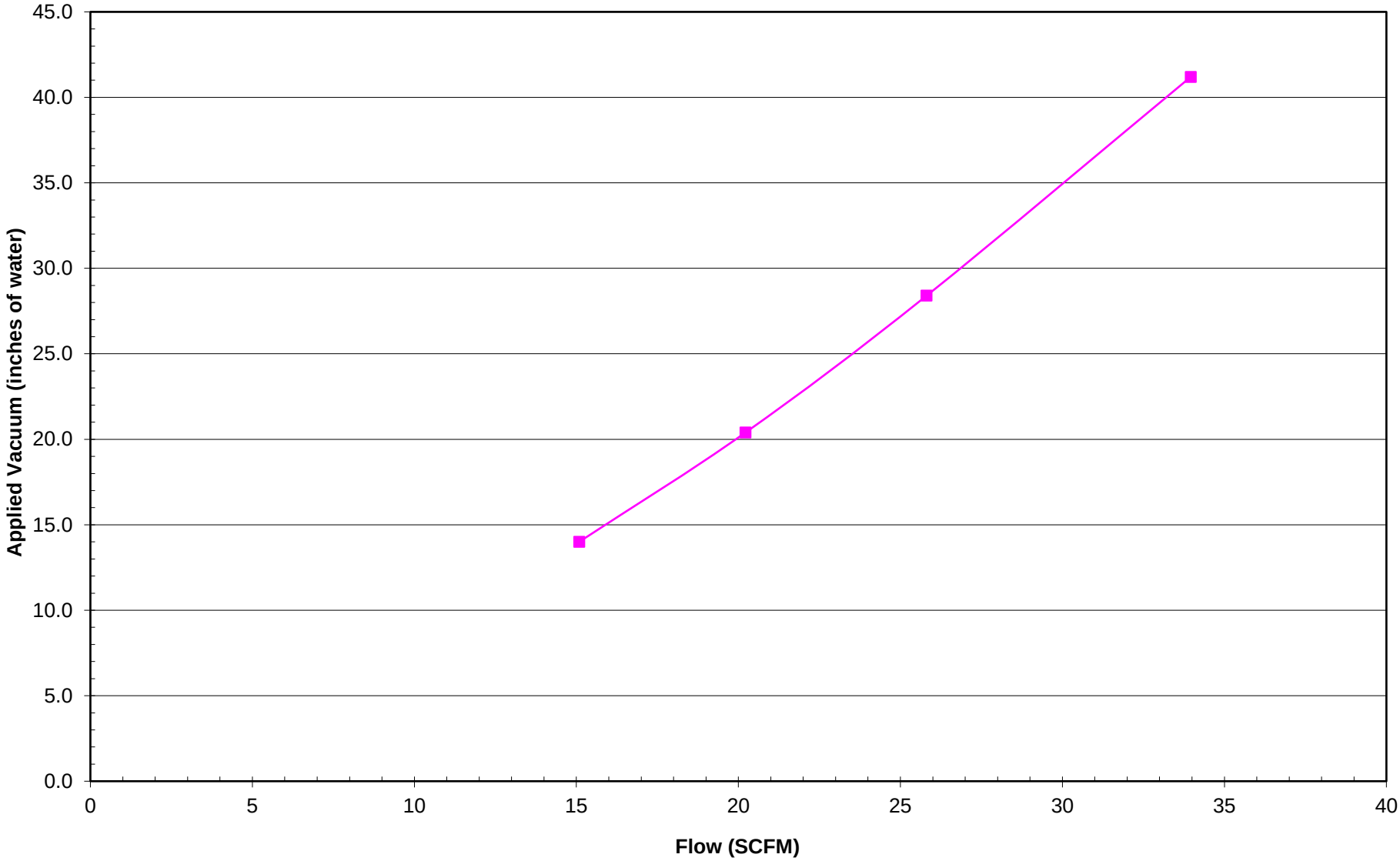
Sample ID	PZ-2S	SVE-1	SVE-1	SVE-1
Laboratory Sample ID	L2423233-03	L2423233-01	L2423233-02	L2423233-04
Sample Date	4/24/2024	4/22/2024	4/23/2024	4/24/2024
Air Petroleum Hydrocarbons (MADEPAPH)				
Ethylbenzene	**520**	< 65	< 73	< 90
1,3-Butadiene	< 270	< 36	< 40	< 50
Toluene	**790**	< 65	**150**	**250**
Methyl-t-butyl ether (MTBE)	< 380	< 50	< 57	< 70
m+p-Xylenes	< 490	< 65	< 73	< 90
Benzene	**150000**	**16000**	**17000**	**23000**
Naphthalene	< 590	< 79	< 89	< 110
o-Xylene	< 490	< 65	< 73	< 90
C5-C8 Petroleum Hydrocarbons, Aliphatic (Adjusted)	**1100000**	**64000**	**64000**	**87000**
C9-C10 Petroleum Hydrocarbons, Aromatic	< 5400	< 720	< 810	< 1000
C9-C12 Petroleum Hydrocarbons, Aliphatic(Adjusted)	< 5400	**1600**	**1500**	**1900**
Volatile Organic Compounds in Air by EPA Method TO15				
Ethylbenzene	**669**	< 62.5	< 70.4	< 92.1
Styrene	< 464	< 61.3	< 69	< 90.3
cis-1,3-Dichloropropene	< 495	< 65.4	< 73.5	< 96.2
trans-1,3-Dichloropropene	< 495	< 65.4	< 73.5	< 96.2
1,4-Dichlorobenzene	< 655	< 86.6	< 97.4	< 127
1,2-Dibromoethane (EDB)	< 838	< 111	< 124	< 163
1,2-Dichloroethane	< 441	< 58.3	< 65.6	< 85.8
4-Methyl-2-pentanone (MIBK)	< 1110	< 147	< 166	< 217
Toluene	**987**	< 54.3	**185**	**332**
Chlorobenzene	< 502	< 66.3	< 74.6	< 97.6
1,2,4-Trichlorobenzene	< 809	< 107	< 120	< 157
1,4-Dioxane	< 393	< 51.9	< 58.4	< 76.4
Dibromochloromethane	< 929	< 123	< 138	< 181
Tetrachloroethene (PCE)	< 739	< 97.6	< 110	< 144
Xylenes (Total)	< 473	< 62.5	< 70.4	< 92.1
cis-1,2-Dichloroethene	< 432	< 57.1	< 64.2	< 84.1
trans-1,2-Dichloroethene	< 432	< 57.1	< 64.2	< 84.1
Methyl-t-butyl ether (MTBE)	< 393	< 51.9	< 58.4	< 76.4
m+p-Xylenes	< 943	< 125	< 141	< 184
1,3-Dichlorobenzene	< 655	< 86.6	< 97.4	< 127
Carbon tetrachloride	< 686	< 90.6	< 102	< 133
Acetone	< 1290	< 171	< 192	< 252
Chloroform	< 532	< 70.3	< 79.1	< 104
Benzene	**163000**	**16900**	**18100**	**26300**
1,1,1-Trichloroethane	< 595	< 78.6	< 88.4	< 116
Bromomethane	< 423	< 55.9	< 62.9	< 82.3
Vinyl chloride	< 279	< 36.8	< 41.4	< 54.2
Methylene chloride	< 945	< 125	< 140	< 184
Bromoform	< 1130	< 149	< 167	< 219
Bromodichloromethane	< 730	< 96.5	< 109	< 142
1,1-Dichloroethane	< 441	< 58.3	< 65.6	< 85.8
1,1-Dichloroethene	< 432	< 57.1	< 64.2	< 84.1
1,2-Dichloropropane	< 504	< 66.6	< 74.9	< 98
2-Butanone (MEK)	< 802	< 106	< 119	< 156
1,1,2-Trichloroethane	< 595	< 78.6	< 88.4	< 116
Trichloroethene (TCE)	< 586	**124**	< 87.1	< 114
1,1,2,2-Tetrachloroethane	< 749	< 98.9	< 111	< 146
Hexachlorobutadiene	< 1160	< 154	< 173	< 226
Naphthalene	< 572	< 75.5	< 84.9	< 111
o-Xylene	< 473	< 62.5	< 70.4	< 92.1
1,2-Dichlorobenzene	< 655	< 86.6	< 97.4	< 127

Notes

1. Results are reported in units of micrograms per cubic meter (ug/m^3).

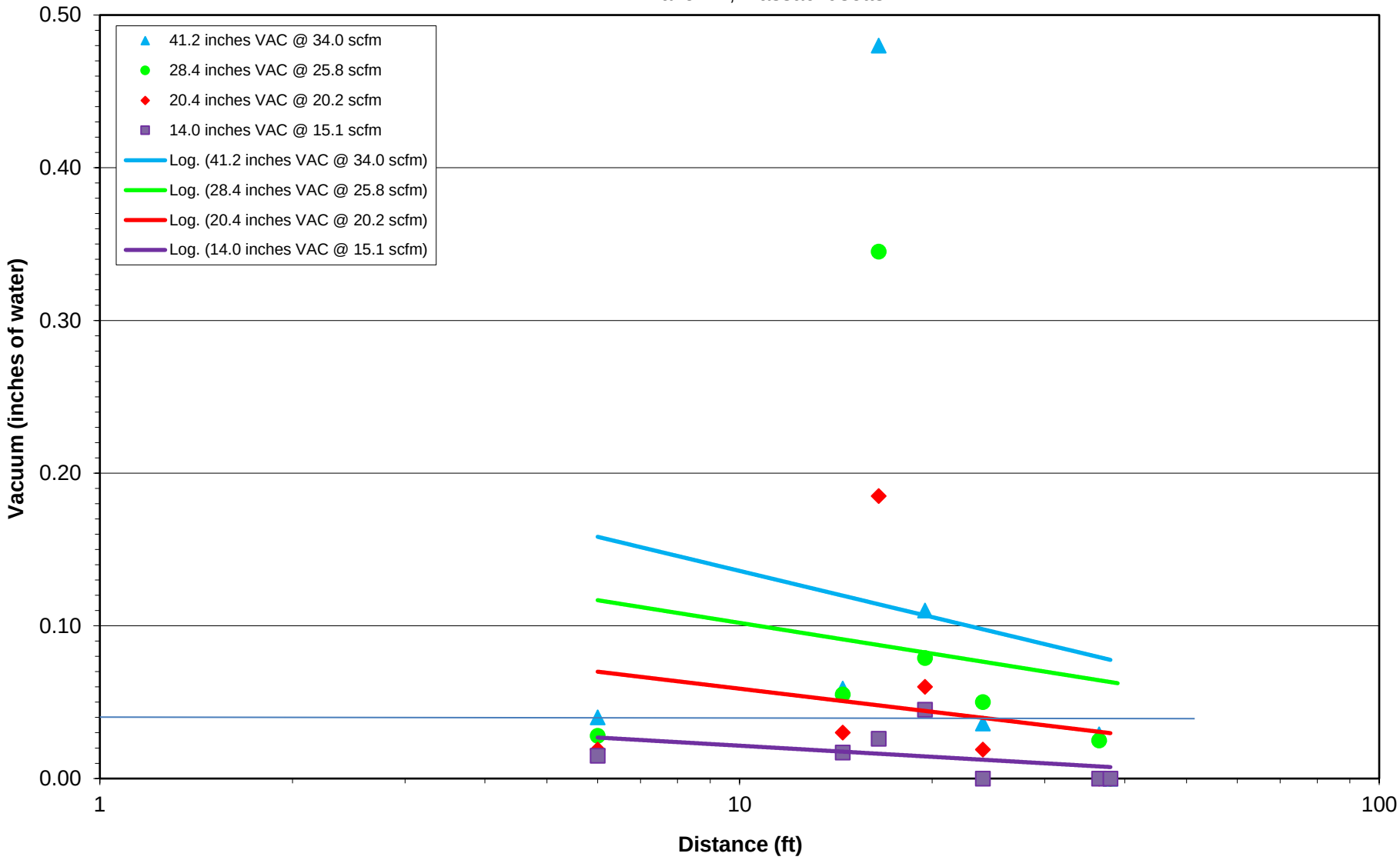
Plot J-1
Flow Curve (SVE-1)
April 22, 2024

284 Winter Street
Haverhill, Massachusetts



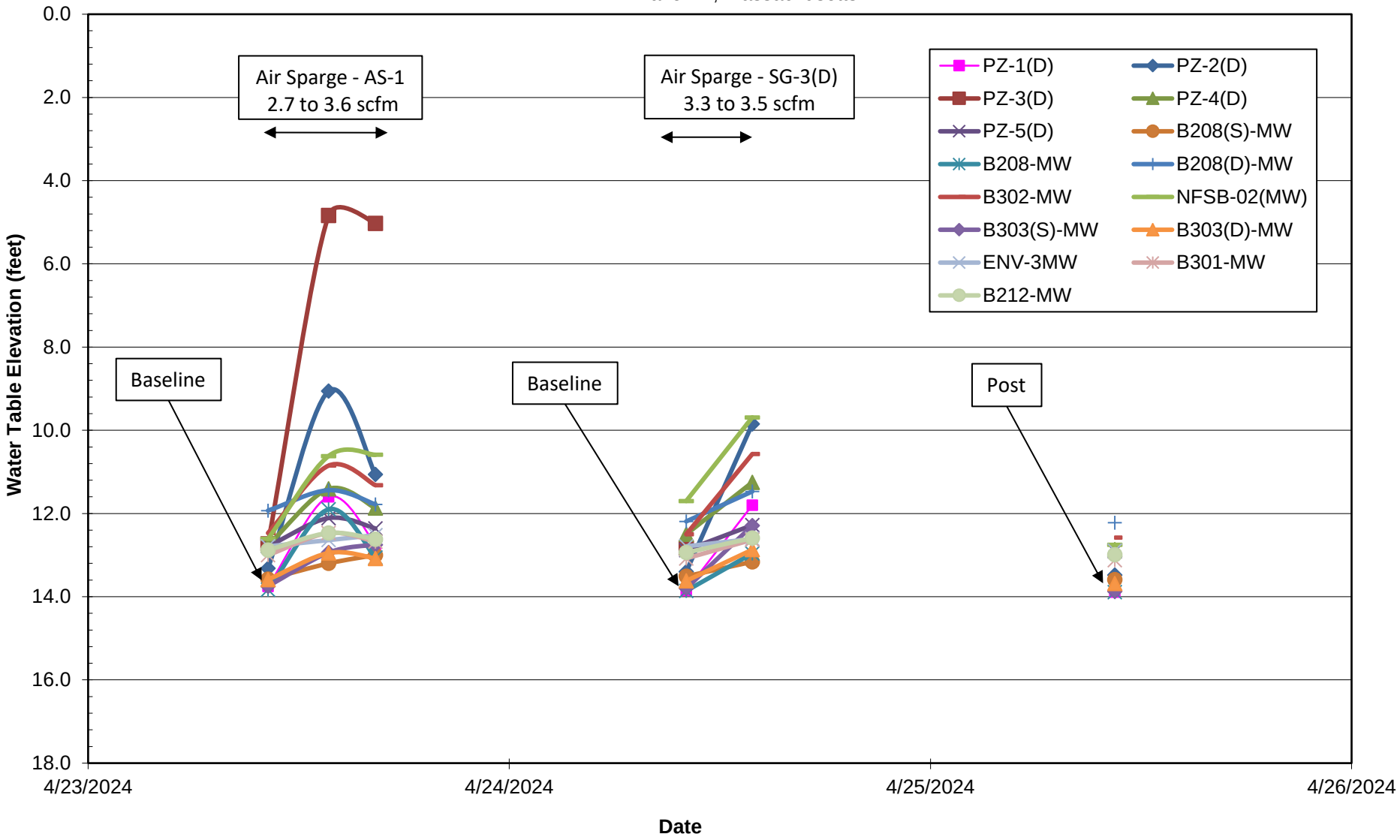
Plot J-2
Radius of Influence (SVE-1)
April 22, 2024

284 Winter Street
Haverhill, Massachusetts



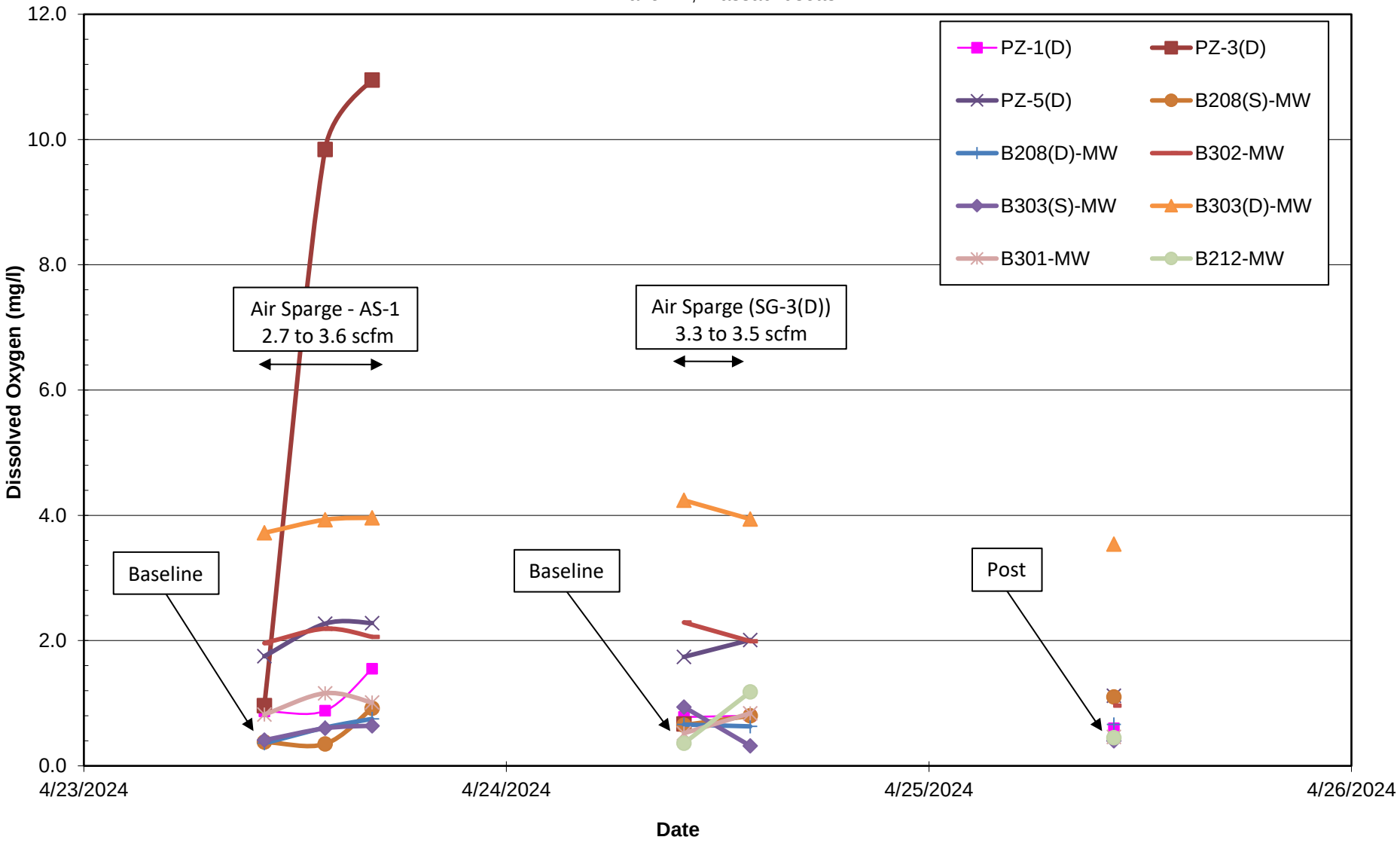
Plot J-3
Water Table Elevation Change
April 23-25, 2024

284 Winter Street
Haverhill, Massachusetts



Plot J-4
Dissolved Oxygen Change
April 23-25, 2024

284 Winter Street
Haverhill, Massachusetts



ANALYTICAL REPORT

Lab Number:	L2423233
Client:	GZA GeoEnvironmental, Inc. 249 Vanderbilt Ave. Norwood, MA 02062
ATTN:	Justin Ivas
Phone:	(781) 278-5843
Project Name:	284 WINTER ST
Project Number:	01.0173297.10 TASK19
Report Date:	05/10/24

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: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2423233-01	SVE-1	SOIL_VAPOR	HAVERHILL, MA	04/22/24 16:24	04/26/24
L2423233-02	SVE-1	SOIL_VAPOR	HAVERHILL, MA	04/23/24 16:46	04/26/24
L2423233-03	PZ-2S	SOIL_VAPOR	HAVERHILL, MA	04/24/24 10:12	04/26/24
L2423233-04	SVE-1	SOIL_VAPOR	HAVERHILL, MA	04/24/24 14:36	04/26/24

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

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).	YES
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	YES
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:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

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:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

Case Narrative (continued)

MCP Related Narratives

Canisters were released from the laboratory on April 18, 2024. The canister certification data is provided as an addendum.

MCP Volatile Organics in Air

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

In reference to question H:

The WG1919204-3 LCS recovery for dibromochloromethane (131%) and bromoform (139%), associated with L2423233-01D, -02D, -03D, and -04D, is above the upper 130% acceptance limit. All samples associated with this LCS do not have reportable amounts of this analyte.

L2423233-01D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2423233-04D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

Petroleum Hydrocarbons in Air

L2423233-01D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2423233-02D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

Case Narrative (continued)

L2423233-02D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2423233-03D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2423233-03D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

L2423233-04D: The sample has elevated detection limits due to the dilution required by the elevated concentrations of target compounds in the sample.

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: Christopher J. Anderson

Title: Technical Director/Representative Date: 05/10/24

QC OUTLIER SUMMARY REPORT

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
MCP Volatile Organics in Air - Mansfield Lab								
TO-15	Batch QC	WG1919204-3	Dibromochloromethane	LCS	131	70-130	01-04	potential high bias
TO-15	Batch QC	WG1919204-3	Bromoform	LCS	139	70-130	01-04	potential high bias

AIR

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-01 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/22/24 16:24
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Anaytical Method: 101,TO-15
Analytical Date: 05/10/24 03:59
Analyst: RAY

	ppbV			ug/m3				
Parameter	Results	RL	MDL	Results	RL	MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Vinyl chloride	ND	14.4	--	ND	36.8	--		71.84
Bromomethane	ND	14.4	--	ND	55.9	--		71.84
Acetone	ND	71.8	--	ND	171	--		71.84
1,1-Dichloroethene	ND	14.4	--	ND	57.1	--		71.84
Methylene chloride	ND	35.9	--	ND	125	--		71.84
trans-1,2-Dichloroethene	ND	14.4	--	ND	57.1	--		71.84
1,1-Dichloroethane	ND	14.4	--	ND	58.3	--		71.84
Methyl tert butyl ether	ND	14.4	--	ND	51.9	--		71.84
2-Butanone	ND	35.9	--	ND	106	--		71.84
cis-1,2-Dichloroethene	ND	14.4	--	ND	57.1	--		71.84
Chloroform	ND	14.4	--	ND	70.3	--		71.84
1,2-Dichloroethane	ND	14.4	--	ND	58.3	--		71.84
1,1,1-Trichloroethane	ND	14.4	--	ND	78.6	--		71.84
Benzene	5280	14.4	--	16900	46.0	--		71.84
Carbon tetrachloride	ND	14.4	--	ND	90.6	--		71.84
1,2-Dichloropropane	ND	14.4	--	ND	66.6	--		71.84
Bromodichloromethane	ND	14.4	--	ND	96.5	--		71.84
1,4-Dioxane	ND	14.4	--	ND	51.9	--		71.84
Trichloroethene	23.1	14.4	--	124	77.4	--		71.84
cis-1,3-Dichloropropene	ND	14.4	--	ND	65.4	--		71.84
4-Methyl-2-pentanone	ND	35.9	--	ND	147	--		71.84
trans-1,3-Dichloropropene	ND	14.4	--	ND	65.4	--		71.84
1,1,2-Trichloroethane	ND	14.4	--	ND	78.6	--		71.84

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-01 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/22/24 16:24
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Toluene	ND	14.4	--	ND	54.3	--		71.84
Dibromochloromethane	ND	14.4	--	ND	123	--		71.84
1,2-Dibromoethane	ND	14.4	--	ND	111	--		71.84
Tetrachloroethene	ND	14.4	--	ND	97.6	--		71.84
Chlorobenzene	ND	14.4	--	ND	66.3	--		71.84
Ethylbenzene	ND	14.4	--	ND	62.5	--		71.84
p/m-Xylene	ND	28.7	--	ND	125	--		71.84
Bromoform	ND	14.4	--	ND	149	--		71.84
Styrene	ND	14.4	--	ND	61.3	--		71.84
1,1,2,2-Tetrachloroethane	ND	14.4	--	ND	98.9	--		71.84
Xylenes, Total	ND	14.4	--	ND	62.5	--		71.84
o-Xylene	ND	14.4	--	ND	62.5	--		71.84
1,3-Dichlorobenzene	ND	14.4	--	ND	86.6	--		71.84
1,4-Dichlorobenzene	ND	14.4	--	ND	86.6	--		71.84
1,2-Dichlorobenzene	ND	14.4	--	ND	86.6	--		71.84
1,2,4-Trichlorobenzene	ND	14.4	--	ND	107	--		71.84
Naphthalene	ND	14.4	--	ND	75.5	--		71.84
Hexachlorobutadiene	ND	14.4	--	ND	154	--		71.84

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	97		60-140
Bromochloromethane	95		60-140
chlorobenzene-d5	97		60-140

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-02 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/23/24 16:46
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Anaytical Method: 101,TO-15
Analytical Date: 05/10/24 04:37
Analyst: RAY

	ppbV			ug/m3				
Parameter	Results	RL	MDL	Results	RL	MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Vinyl chloride	ND	16.2	--	ND	41.4	--		80.91
Bromomethane	ND	16.2	--	ND	62.9	--		80.91
Acetone	ND	80.9	--	ND	192	--		80.91
1,1-Dichloroethene	ND	16.2	--	ND	64.2	--		80.91
Methylene chloride	ND	40.4	--	ND	140	--		80.91
trans-1,2-Dichloroethene	ND	16.2	--	ND	64.2	--		80.91
1,1-Dichloroethane	ND	16.2	--	ND	65.6	--		80.91
Methyl tert butyl ether	ND	16.2	--	ND	58.4	--		80.91
2-Butanone	ND	40.4	--	ND	119	--		80.91
cis-1,2-Dichloroethene	ND	16.2	--	ND	64.2	--		80.91
Chloroform	ND	16.2	--	ND	79.1	--		80.91
1,2-Dichloroethane	ND	16.2	--	ND	65.6	--		80.91
1,1,1-Trichloroethane	ND	16.2	--	ND	88.4	--		80.91
Benzene	5660	16.2	--	18100	51.8	--		80.91
Carbon tetrachloride	ND	16.2	--	ND	102	--		80.91
1,2-Dichloropropane	ND	16.2	--	ND	74.9	--		80.91
Bromodichloromethane	ND	16.2	--	ND	109	--		80.91
1,4-Dioxane	ND	16.2	--	ND	58.4	--		80.91
Trichloroethene	ND	16.2	--	ND	87.1	--		80.91
cis-1,3-Dichloropropene	ND	16.2	--	ND	73.5	--		80.91
4-Methyl-2-pentanone	ND	40.4	--	ND	166	--		80.91
trans-1,3-Dichloropropene	ND	16.2	--	ND	73.5	--		80.91
1,1,2-Trichloroethane	ND	16.2	--	ND	88.4	--		80.91

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-02 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/23/24 16:46
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Toluene	49.0	16.2	--	185	61.0	--		80.91
Dibromochloromethane	ND	16.2	--	ND	138	--		80.91
1,2-Dibromoethane	ND	16.2	--	ND	124	--		80.91
Tetrachloroethene	ND	16.2	--	ND	110	--		80.91
Chlorobenzene	ND	16.2	--	ND	74.6	--		80.91
Ethylbenzene	ND	16.2	--	ND	70.4	--		80.91
p/m-Xylene	ND	32.4	--	ND	141	--		80.91
Bromoform	ND	16.2	--	ND	167	--		80.91
Styrene	ND	16.2	--	ND	69.0	--		80.91
1,1,2,2-Tetrachloroethane	ND	16.2	--	ND	111	--		80.91
Xylenes, Total	ND	16.2	--	ND	70.4	--		80.91
o-Xylene	ND	16.2	--	ND	70.4	--		80.91
1,3-Dichlorobenzene	ND	16.2	--	ND	97.4	--		80.91
1,4-Dichlorobenzene	ND	16.2	--	ND	97.4	--		80.91
1,2-Dichlorobenzene	ND	16.2	--	ND	97.4	--		80.91
1,2,4-Trichlorobenzene	ND	16.2	--	ND	120	--		80.91
Naphthalene	ND	16.2	--	ND	84.9	--		80.91
Hexachlorobutadiene	ND	16.2	--	ND	173	--		80.91

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	99		60-140
Bromochloromethane	98		60-140
chlorobenzene-d5	98		60-140

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-03 D
Client ID: PZ-2S
Sample Location: HAVERHILL, MA

Date Collected: 04/24/24 10:12
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Anaytical Method: 101,TO-15
Analytical Date: 05/10/24 05:13
Analyst: RAY

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
MCP Volatile Organics in Air - Mansfield Lab								
Vinyl chloride	ND	109.	--	ND	279	--		543.5
Bromomethane	ND	109.	--	ND	423	--		543.5
Acetone	ND	544.	--	ND	1290	--		543.5
1,1-Dichloroethene	ND	109.	--	ND	432	--		543.5
Methylene chloride	ND	272	--	ND	945	--		543.5
trans-1,2-Dichloroethene	ND	109.	--	ND	432	--		543.5
1,1-Dichloroethane	ND	109.	--	ND	441	--		543.5
Methyl tert butyl ether	ND	109.	--	ND	393	--		543.5
2-Butanone	ND	272.	--	ND	802	--		543.5
cis-1,2-Dichloroethene	ND	109.	--	ND	432	--		543.5
Chloroform	ND	109.	--	ND	532	--		543.5
1,2-Dichloroethane	ND	109.	--	ND	441	--		543.5
1,1,1-Trichloroethane	ND	109.	--	ND	595	--		543.5
Benzene	51000	109	--	163000	348	--		543.5
Carbon tetrachloride	ND	109.	--	ND	686	--		543.5
1,2-Dichloropropane	ND	109.	--	ND	504	--		543.5
Bromodichloromethane	ND	109.	--	ND	730	--		543.5
1,4-Dioxane	ND	109.	--	ND	393	--		543.5
Trichloroethene	ND	109.	--	ND	586	--		543.5
cis-1,3-Dichloropropene	ND	109.	--	ND	495	--		543.5
4-Methyl-2-pentanone	ND	272.	--	ND	1110	--		543.5
trans-1,3-Dichloropropene	ND	109.	--	ND	495	--		543.5
1,1,2-Trichloroethane	ND	109.	--	ND	595	--		543.5

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-03 D
Client ID: PZ-2S
Sample Location: HAVERHILL, MA

Date Collected: 04/24/24 10:12
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Toluene	262	109	--	987	411	--		543.5
Dibromochloromethane	ND	109.	--	ND	929	--		543.5
1,2-Dibromoethane	ND	109.	--	ND	838	--		543.5
Tetrachloroethene	ND	109.	--	ND	739	--		543.5
Chlorobenzene	ND	109.	--	ND	502	--		543.5
Ethylbenzene	154	109	--	669	473	--		543.5
p/m-Xylene	ND	217.	--	ND	943	--		543.5
Bromoform	ND	109.	--	ND	1130	--		543.5
Styrene	ND	109.	--	ND	464	--		543.5
1,1,2,2-Tetrachloroethane	ND	109.	--	ND	749	--		543.5
Xylenes, Total	ND	109.	--	ND	473	--		543.5
o-Xylene	ND	109	--	ND	473	--		543.5
1,3-Dichlorobenzene	ND	109.	--	ND	655	--		543.5
1,4-Dichlorobenzene	ND	109.	--	ND	655	--		543.5
1,2-Dichlorobenzene	ND	109.	--	ND	655	--		543.5
1,2,4-Trichlorobenzene	ND	109.	--	ND	809	--		543.5
Naphthalene	ND	109.	--	ND	572	--		543.5
Hexachlorobutadiene	ND	109.	--	ND	1160	--		543.5

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	100		60-140
Bromochloromethane	97		60-140
chlorobenzene-d5	100		60-140

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-04 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/24/24 14:36
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Anaytical Method: 101,TO-15
Analytical Date: 05/10/24 05:51
Analyst: RAY

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
MCP Volatile Organics in Air - Mansfield Lab								
Vinyl chloride	ND	21.2	--	ND	54.2	--		105.9
Bromomethane	ND	21.2	--	ND	82.3	--		105.9
Acetone	ND	106.	--	ND	252	--		105.9
1,1-Dichloroethene	ND	21.2	--	ND	84.1	--		105.9
Methylene chloride	ND	53.0	--	ND	184	--		105.9
trans-1,2-Dichloroethene	ND	21.2	--	ND	84.1	--		105.9
1,1-Dichloroethane	ND	21.2	--	ND	85.8	--		105.9
Methyl tert butyl ether	ND	21.2	--	ND	76.4	--		105.9
2-Butanone	ND	53.0	--	ND	156	--		105.9
cis-1,2-Dichloroethene	ND	21.2	--	ND	84.1	--		105.9
Chloroform	ND	21.2	--	ND	104	--		105.9
1,2-Dichloroethane	ND	21.2	--	ND	85.8	--		105.9
1,1,1-Trichloroethane	ND	21.2	--	ND	116	--		105.9
Benzene	8240	21.2	--	26300	67.7	--		105.9
Carbon tetrachloride	ND	21.2	--	ND	133	--		105.9
1,2-Dichloropropane	ND	21.2	--	ND	98.0	--		105.9
Bromodichloromethane	ND	21.2	--	ND	142	--		105.9
1,4-Dioxane	ND	21.2	--	ND	76.4	--		105.9
Trichloroethene	ND	21.2	--	ND	114	--		105.9
cis-1,3-Dichloropropene	ND	21.2	--	ND	96.2	--		105.9
4-Methyl-2-pentanone	ND	53.0	--	ND	217	--		105.9
trans-1,3-Dichloropropene	ND	21.2	--	ND	96.2	--		105.9
1,1,2-Trichloroethane	ND	21.2	--	ND	116	--		105.9

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-04 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/24/24 14:36
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab								
Toluene	88.0	21.2	--	332	79.9	--		105.9
Dibromochloromethane	ND	21.2	--	ND	181	--		105.9
1,2-Dibromoethane	ND	21.2	--	ND	163	--		105.9
Tetrachloroethene	ND	21.2	--	ND	144	--		105.9
Chlorobenzene	ND	21.2	--	ND	97.6	--		105.9
Ethylbenzene	ND	21.2	--	ND	92.1	--		105.9
p/m-Xylene	ND	42.4	--	ND	184	--		105.9
Bromoform	ND	21.2	--	ND	219	--		105.9
Styrene	ND	21.2	--	ND	90.3	--		105.9
1,1,2,2-Tetrachloroethane	ND	21.2	--	ND	146	--		105.9
Xylenes, Total	ND	21.2	--	ND	92.1	--		105.9
o-Xylene	ND	21.2	--	ND	92.1	--		105.9
1,3-Dichlorobenzene	ND	21.2	--	ND	127	--		105.9
1,4-Dichlorobenzene	ND	21.2	--	ND	127	--		105.9
1,2-Dichlorobenzene	ND	21.2	--	ND	127	--		105.9
1,2,4-Trichlorobenzene	ND	21.2	--	ND	157	--		105.9
Naphthalene	ND	21.2	--	ND	111	--		105.9
Hexachlorobutadiene	ND	21.2	--	ND	226	--		105.9

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		60-140
Bromochloromethane	96		60-140
chlorobenzene-d5	98		60-140

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 101,TO-15
Analytical Date: 05/09/24 14:40

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab for sample(s): 01-04 Batch: WG1919204-4								
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Xylenes, Total	ND	0.200	--	ND	0.869	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 101,TO-15
Analytical Date: 05/09/24 14:40

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
MCP Volatile Organics in Air - Mansfield Lab for sample(s): 01-04 Batch: WG1919204-4								
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Lab Control Sample Analysis
Batch Quality Control

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG1919204-3								
Vinyl chloride	93		-		70-130	-		
Bromomethane	98		-		70-130	-		
Acetone	103		-		50-150	-		
1,1-Dichloroethene	109		-		70-130	-		
Methylene chloride	98		-		70-130	-		
trans-1,2-Dichloroethene	102		-		70-130	-		
1,1-Dichloroethane	106		-		70-130	-		
Methyl tert butyl ether	111		-		70-130	-		
2-Butanone	109		-		70-130	-		
cis-1,2-Dichloroethene	106		-		70-130	-		
Chloroform	113		-		70-130	-		
1,2-Dichloroethane	108		-		70-130	-		
1,1,1-Trichloroethane	117		-		70-130	-		
Benzene	103		-		70-130	-		
Carbon tetrachloride	126		-		70-130	-		
1,2-Dichloropropane	107		-		70-130	-		
Bromodichloromethane	123		-		70-130	-		
1,4-Dioxane	108		-		50-150	-		
Trichloroethene	112		-		70-130	-		
cis-1,3-Dichloropropene	123		-		70-130	-		
4-Methyl-2-pentanone	122		-		70-130	-		
trans-1,3-Dichloropropene	122		-		70-130	-		
1,1,2-Trichloroethane	116		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
MCP Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG1919204-3								
Toluene	99		-		70-130	-		
Dibromochloromethane	**131**	Q	-		70-130	-		
1,2-Dibromoethane	125		-		70-130	-		
Tetrachloroethene	114		-		70-130	-		
Chlorobenzene	115		-		70-130	-		
Ethylbenzene	106		-		70-130	-		
p/m-Xylene	111		-		70-130	-		
Bromoform	**139**	Q	-		70-130	-		
Styrene	120		-		70-130	-		
1,1,2,2-Tetrachloroethane	116		-		70-130	-		
o-Xylene	114		-		70-130	-		
1,3-Dichlorobenzene	124		-		70-130	-		
1,4-Dichlorobenzene	123		-		70-130	-		
1,2-Dichlorobenzene	123		-		70-130	-		
1,2,4-Trichlorobenzene	117		-		50-150	-		
Naphthalene	98		-		50-150	-		
Hexachlorobutadiene	120		-		50-150	-		

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-01 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/22/24 16:24
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Analytical Method: 96,APH
Analytical Date: 05/10/24 03:59
Analyst: RAY

Quality Control Information

Sample Type:	Composite
Sample Container Type:	Canister - 6.0 Liter
Sampling Flow Controller:	Mechanical
Sampling Zone:	Unknown
Sampling Flow Meter RPD of pre & post-sampling calibration check:	<=20%
Were all QA/QC procedures REQUIRED by the method followed?	Yes
Were all performance/acceptance standards for the required procedures achieved?	Yes
Were significant modifications made to the method as specified in Sect 11.1.2?	No

Petroleum Hydrocarbons in Air - Mansfield Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,3-Butadiene	ND		ug/m3	36	--	72
Methyl tert butyl ether	ND		ug/m3	50	--	72
Benzene	16000		ug/m3	43	--	72
C5-C8 Aliphatics, Adjusted	64000		ug/m3	720	--	72
Toluene	ND		ug/m3	65	--	72
Ethylbenzene	ND		ug/m3	65	--	72
p/m-Xylene	ND		ug/m3	65	--	72
o-Xylene	ND		ug/m3	65	--	72
Naphthalene	ND		ug/m3	79	--	72
C9-C12 Aliphatics, Adjusted	1600		ug/m3	720	--	72
C9-C10 Aromatics Total	ND		ug/m3	720	--	72

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		50-200
Bromochloromethane	99		50-200
Chlorobenzene-d5	98		50-200

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-02 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA

Date Collected: 04/23/24 16:46
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Analytical Method: 96,APH
Analytical Date: 05/10/24 04:37
Analyst: RAY

Quality Control Information

Sample Type:	Composite
Sample Container Type:	Canister - 6.0 Liter
Sampling Flow Controller:	Mechanical
Sampling Zone:	Unknown
Sampling Flow Meter RPD of pre & post-sampling calibration check:	<=20%
Were all QA/QC procedures REQUIRED by the method followed?	Yes
Were all performance/acceptance standards for the required procedures achieved?	Yes
Were significant modifications made to the method as specified in Sect 11.1.2?	No

Petroleum Hydrocarbons in Air - Mansfield Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,3-Butadiene	ND		ug/m3	40	--	81
Methyl tert butyl ether	ND		ug/m3	57	--	81
Benzene	17000		ug/m3	49	--	81
C5-C8 Aliphatics, Adjusted	64000		ug/m3	810	--	81
Toluene	150		ug/m3	73	--	81
Ethylbenzene	ND		ug/m3	73	--	81
p/m-Xylene	ND		ug/m3	73	--	81
o-Xylene	ND		ug/m3	73	--	81
Naphthalene	ND		ug/m3	89	--	81
C9-C12 Aliphatics, Adjusted	1500		ug/m3	810	--	81
C9-C10 Aromatics Total	ND		ug/m3	810	--	81

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	100		50-200
Bromochloromethane	101		50-200
Chlorobenzene-d5	100		50-200

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-03 D
Client ID: PZ-2S
Sample Location: HAVERHILL, MA

Date Collected: 04/24/24 10:12
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Analytical Method: 96,APH
Analytical Date: 05/10/24 05:13
Analyst: RAY

Quality Control Information

Sample Type:	Composite
Sample Container Type:	Canister - 6.0 Liter
Sampling Flow Controller:	Mechanical
Sampling Zone:	Unknown
Sampling Flow Meter RPD of pre & post-sampling calibration check:	<=20%
Were all QA/QC procedures REQUIRED by the method followed?	Yes
Were all performance/acceptance standards for the required procedures achieved?	Yes
Were significant modifications made to the method as specified in Sect 11.1.2?	No

Petroleum Hydrocarbons in Air - Mansfield Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,3-Butadiene	ND		ug/m3	270	--	540
Methyl tert butyl ether	ND		ug/m3	380	--	540
Benzene	150000		ug/m3	320	--	540
C5-C8 Aliphatics, Adjusted	1100000		ug/m3	5400	--	540
Toluene	790		ug/m3	490	--	540
Ethylbenzene	520		ug/m3	490	--	540
p/m-Xylene	ND		ug/m3	490	--	540
o-Xylene	ND		ug/m3	490	--	540
Naphthalene	ND		ug/m3	590	--	540
C9-C12 Aliphatics, Adjusted	ND		ug/m3	5400	--	540
C9-C10 Aromatics Total	ND		ug/m3	5400	--	540

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	101		50-200
Bromochloromethane	102		50-200
Chlorobenzene-d5	102		50-200

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

SAMPLE RESULTS

Lab ID: L2423233-04 D
Client ID: SVE-1
Sample Location: HAVERHILL, MA
Date Collected: 04/24/24 14:36
Date Received: 04/26/24
Field Prep: Not Specified

Sample Depth:
Matrix: Soil_Vapor
Analytical Method: 96,APH
Analytical Date: 05/10/24 05:51
Analyst: RAY

Quality Control Information

Sample Type:	Composite
Sample Container Type:	Canister - 6.0 Liter
Sampling Flow Controller:	Mechanical
Sampling Zone:	Unknown
Sampling Flow Meter RPD of pre & post-sampling calibration check:	<=20%
Were all QA/QC procedures REQUIRED by the method followed?	Yes
Were all performance/acceptance standards for the required procedures achieved?	Yes
Were significant modifications made to the method as specified in Sect 11.1.2?	No

Petroleum Hydrocarbons in Air - Mansfield Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
1,3-Butadiene	ND		ug/m3	50	--	100
Methyl tert butyl ether	ND		ug/m3	70	--	100
Benzene	23000		ug/m3	60	--	100
C5-C8 Aliphatics, Adjusted	87000		ug/m3	1000	--	100
Toluene	250		ug/m3	90	--	100
Ethylbenzene	ND		ug/m3	90	--	100
p/m-Xylene	ND		ug/m3	90	--	100
o-Xylene	ND		ug/m3	90	--	100
Naphthalene	ND		ug/m3	110	--	100
C9-C12 Aliphatics, Adjusted	1900		ug/m3	1000	--	100
C9-C10 Aromatics Total	ND		ug/m3	1000	--	100

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	99		50-200
Bromochloromethane	100		50-200
Chlorobenzene-d5	100		50-200

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19
Lab Number: L2423233
Report Date: 05/10/24

Method Blank Analysis
Batch Quality Control

Analytical Method: 96,APH
Analytical Date: 05/09/24 14:40
Analyst: RAY

Parameter	Result	Qualifier	Units	RL	MDL
Petroleum Hydrocarbons in Air - Mansfield Lab for sample(s): 01-04 Batch: WG1919205-4					
1,3-Butadiene	ND		ug/m3	0.50	--
Methyl tert butyl ether	ND		ug/m3	0.70	--
Benzene	ND		ug/m3	0.60	--
C5-C8 Aliphatics, Adjusted	ND		ug/m3	10	--
Toluene	ND		ug/m3	0.90	--
Ethylbenzene	ND		ug/m3	0.90	--
p/m-Xylene	ND		ug/m3	0.90	--
o-Xylene	ND		ug/m3	0.90	--
Naphthalene	ND		ug/m3	1.1	--
C9-C12 Aliphatics, Adjusted	ND		ug/m3	10	--
C9-C10 Aromatics Total	ND		ug/m3	10	--

Lab Control Sample Analysis
Batch Quality Control

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Petroleum Hydrocarbons in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG1919205-3								
1,3-Butadiene	90		-		70-130	-		
Methyl tert butyl ether	90		-		70-130	-		
Benzene	96		-		70-130	-		
C5-C8 Aliphatics, Adjusted	85		-		70-130	-		
Toluene	79		-		70-130	-		
Ethylbenzene	82		-		70-130	-		
p/m-Xylene	83		-		70-130	-		
o-Xylene	82		-		70-130	-		
Naphthalene	102		-		50-150	-		
C9-C12 Aliphatics, Adjusted	91		-		70-130	-		
C9-C10 Aromatics Total	75		-		70-130	-		

Project Name: 284 WINTER ST

Lab Number: L2423233

Project Number: 01.0173297.10 TASK19

Report Date: 05/10/24

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Date Prepared	Bottle Order	Cleaning Batch ID	Can Leak Check	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Controler Leak Chk	Flow Out mL/min	Flow In mL/min	% RPD
L2423233-01	SVE-1	01384	Flow 3	04/18/24	459842		-	-	-	Pass	160	167	4
L2423233-01	SVE-1	697	6.0L Can	04/18/24	459842	L2416003-08	Pass	-29.2	-5.0	-	-	-	-
L2423233-02	SVE-1	0444	Flow 3	04/18/24	459842		-	-	-	Pass	160	181	12
L2423233-02	SVE-1	2274	6.0L Can	04/18/24	459842	L2416003-08	Pass	-29.2	-6.9	-	-	-	-
L2423233-03	PZ-2S	0030	Flow 4	04/18/24	459842		-	-	-	Pass	160	177	10
L2423233-03	PZ-2S	601	6.0L Can	04/18/24	459842	L2416003-08	Pass	-29.3	-4.6	-	-	-	-
L2423233-04	SVE-1	01749	Flow 3	04/18/24	459842		-	-	-	Pass	160	184	14
L2423233-04	SVE-1	3476	6.0L Can	04/18/24	459842	L2416003-08	Pass	-29.3	-5.7	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 03/25/24 21:14
Analyst: JFI

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.861	--		1
Propane	ND	0.500	--	ND	0.902	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Methanol	ND	5.00	--	ND	6.55	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Butane	ND	0.200	--	ND	0.475	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	5.00	--	ND	9.42	--		1
Dichlorofluoromethane	ND	0.200	--	ND	0.842	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acrolein	ND	0.500	--	ND	1.15	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Acetonitrile	ND	0.200	--	ND	0.336	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
Pentane	ND	0.200	--	ND	0.590	--		1
Ethyl ether	ND	0.200	--	ND	0.606	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	1.00	--	ND	3.52	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
Xylenes, total	ND	0.600	--	ND	0.869	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.500	--	ND	1.47	--		1
2,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
Diisopropyl ether	ND	0.200	--	ND	0.836	--		1
tert-Butyl Ethyl Ether	ND	0.200	--	ND	0.836	--		1
1,2-Dichloroethene (total)	ND	1.00	--	ND	1.00	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
1,1-Dichloropropene	ND	0.200	--	ND	0.908	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
tert-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L2416003

Project Number: CANISTER QC BAT **Report Date:** 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Dibromomethane	ND	0.200	--	ND	1.42	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Methyl Methacrylate	ND	0.500	--	ND	2.05	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
1,3-Dichloropropane	ND	0.200	--	ND	0.924	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Butyl acetate	ND	0.500	--	ND	2.38	--		1
Octane	ND	0.200	--	ND	0.934	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
1,1,1,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
o-Xylene	ND	0.200	--	ND	0.869	--		1
1,2,3-Trichloropropane	ND	0.200	--	ND	1.21	--		1
Nonane	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
4-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
tert-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Decane	ND	0.200	--	ND	1.16	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2-Dibromo-3-chloropropane	ND	0.200	--	ND	1.93	--		1
Undecane	ND	0.200	--	ND	1.28	--		1
Dodecane	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
1,2,3-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					

No Tentatively Identified Compounds

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	84		60-140
Bromochloromethane	88		60-140
chlorobenzene-d5	87		60-140

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:
Matrix: Air
Anaytical Method: 48,TO-15-SIM
Analytical Date: 03/25/24 21:14
Analyst: JFI

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.050	--	ND	0.349	--		1
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,3-Butadiene	ND	0.020	--	ND	0.044	--		1
Bromomethane	ND	0.020	--	ND	0.078	--		1
Chloroethane	ND	0.100	--	ND	0.264	--		1
Acrolein	ND	0.050	--	ND	0.115	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.050	--	ND	0.281	--		1
Acrylonitrile	ND	0.500	--	ND	1.09	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Methylene chloride	ND	0.500	--	ND	1.74	--		1
Freon-113	ND	0.050	--	ND	0.383	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Chloroform	ND	0.020	--	ND	0.098	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Benzene	ND	0.100	--	ND	0.319	--		1
Carbon tetrachloride	ND	0.020	--	ND	0.126	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
1,2-Dichloropropane	ND	0.020	--	ND	0.092	--		1
Bromodichloromethane	ND	0.020	--	ND	0.134	--		1
1,4-Dioxane	ND	0.100	--	ND	0.360	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
cis-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
1,1,2-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Toluene	ND	0.100	--	ND	0.377	--		1
Dibromochloromethane	ND	0.020	--	ND	0.170	--		1
1,2-Dibromoethane	ND	0.020	--	ND	0.154	--		1
Tetrachloroethene	ND	0.020	--	ND	0.136	--		1
1,1,1,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
Chlorobenzene	ND	0.100	--	ND	0.461	--		1
Ethylbenzene	ND	0.020	--	ND	0.087	--		1
p/m-Xylene	ND	0.040	--	ND	0.174	--		1
Bromoform	ND	0.020	--	ND	0.207	--		1
Styrene	ND	0.020	--	ND	0.085	--		1
1,1,2,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
o-Xylene	ND	0.020	--	ND	0.087	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
4-Ethyltoluene	ND	0.020	--	ND	0.098	--		1
1,3,5-Trimethybenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
Benzyl chloride	ND	0.100	--	ND	0.518	--		1
1,3-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
1,4-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1

Project Name: BATCH CANISTER CERTIFICATION
Project Number: CANISTER QC BAT
Lab Number: L2416003
Report Date: 05/10/24

Air Canister Certification Results

Lab ID: L2416003-08
Client ID: CAN 3068 SHELF 54
Sample Location:

Date Collected: 03/25/24 11:00
Date Received: 03/25/24
Field Prep: Not Specified

Sample Depth:

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Naphthalene	ND	0.050	--	ND	0.262	--		1
1,2,3-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Hexachlorobutadiene	ND	0.050	--	ND	0.533	--		1

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-difluorobenzene	81		60-140
bromochloromethane	85		60-140
chlorobenzene-d5	88		60-140

AIR Petro Can Certification

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L2416003

Project Number: CANISTER QC BAT **Report Date:** 05/10/24

AIR CAN CERTIFICATION RESULTS

Lab ID:	L2416003-08	Date Collected:	03/25/24 11:00
Client ID:	CAN 3068 SHELF 54	Date Received:	03/25/24
Sample Location:	Not Specified	Field Prep:	Not Specified
Matrix:	Air		
Analytical Method:	96,APH		
Analytical Date:	03/25/24 21:14		
Analyst:	JFI		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Petroleum Hydrocarbons in Air						
1,3-Butadiene	ND		ug/m3	0.50	--	1
Methyl tert butyl ether	ND		ug/m3	0.70	--	1
Benzene	ND		ug/m3	0.60	--	1
C5-C8 Aliphatics, Adjusted	ND		ug/m3	10	--	1
Toluene	ND		ug/m3	0.90	--	1
Ethylbenzene	ND		ug/m3	0.90	--	1
p/m-Xylene	ND		ug/m3	0.90	--	1
o-Xylene	ND		ug/m3	0.90	--	1
Naphthalene	ND		ug/m3	1.1	--	1
C9-C12 Aliphatics, Adjusted	ND		ug/m3	10	--	1
C9-C10 Aromatics Total	ND		ug/m3	10	--	1

Project Name: 284 WINTER ST
Project Number: 01.0173297.10 TASK19

Lab Number: L2423233
Report Date: 05/10/24

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
NA	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2423233-01A	Canister - 2.7L (Batch Certified)	NA	NA			Y	Absent		MCP-TO15(30),APH-10(30)
L2423233-02A	Canister - 2.7L (Batch Certified)	NA	NA			Y	Absent		APH-10(30),MCP-TO15(30)
L2423233-03A	Canister - 2.7L (Batch Certified)	NA	NA			Y	Absent		MCP-TO15(30),APH-10(30)
L2423233-04A	Canister - 2.7L (Batch Certified)	NA	NA			Y	Absent		APH-10(30),MCP-TO15(30)

*Values in parentheses indicate holding time in days

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

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: Data Usability Report

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

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. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

Report Format: Data Usability Report

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

Data Qualifiers

ND - Not detected at the reporting limit (RL) for the sample.

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: Data Usability Report

Project Name:	284 WINTER ST	**Lab Number:**	L2423233
Project Number:	01.0173297.10 TASK19	**Report Date:**	05/10/24

REFERENCES

96 Method for the Determination of Air-Phase Petroleum Hydrocarbons (APH), MassDEP, December 2009, Revision 1 with QC Requirements & Performance Standards for the Analysis of APH by GC/MS under the Massachusetts Contingency Plan, WSC-CAM-IXA, July 2010.

101 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA/625/R-96/010b:January 1999) with QC Requirements & Performance Standards for the Analysis of TO-15 under the Massachusetts Contingency Plan, WSC-CAM-IXB, July 2010.

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.

AIR ANALYSIS

PAGE 1 OF 1

ALPHA ANALYTICAL — CHAIN OF CUSTODY

320 Forbes Blvd, Mansfield, MA 02048
TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 4/26/24

ALPHA Job #: L2423233

Client Information

Client: GZA

Address: 249 VANDERBILT AVE
NORWOOD, MA

Phone:

Fax:

Email: justin.ivas@gza.com
charles.lindberg@gza.com

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: 284 HUNTER ST

Project Location: HAVERHILL MA

Project #: 01.0193297.10 Task 19

Project Manager: JUSTIN IVAS

ALPHA Quote #:

Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

Report Information - Data Deliverables

☐ FAX
☐ ADEx
Criteria Checker:
(Default based on Regulatory Criteria Indicated)
Other Formats:
☑ EMAIL (standard pdf report)
☐ Additional Deliverables:

Report to: (if different than Project Manager)
Matthew.din@gza.ca

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State/Fed	Program	Res / Comm
MA	MCP	Comm

Other Project Specific Requirements/Comments:

Project-Specific Target Compound List: ☐

ANALYSIS

All Columns Below Must Be Filled Out

ALPHA Lab ID (Lab Use Only)	Sample ID	COLLECTION End Date	Start Time	End Time	Initial Vacuum	Final Vacuum	Sample Matrix*	Sampler's Initials	Can Size	I D Can	I D - Flow Controller	TO-15	TO-15 SIM	APH (Subset Non-petroleum HCs)	Fixed Gases	Sulfides & Mercaptans by TO-15	☐	Sample Comments (i.e. PID)
23233-01	SVE-1	4-22-24	15:43	16:24	-29.9	-5.8	SV	MDD	6L	697	0134	X	X					
-02	SVE-1	4/23/24	16:17	16:46	-27.4	-5.8	SV	MDD	6L	2274	0444	X	X					
-03	PZ-2S	4/24/24	9:44	10:12	-29.8	-5.4	SV	AIF	6L	601	0030	X	X					
-04	SVE-1	4/24/24	13:57	14:36	-29.7	-5.4	SV	AIF	6L	3476	1249	X	X					

*SAMPLE MATRIX CODES

AA = Ambient Air (Indoor/Outdoor)
SV = Soil Vapor/Landfill Gas/SVE
Other = Please Specify

Container Type

Relinquished By:	Date/Time	Received By:	Date/Time:
AAL	4/24/24 14:57	AA	4/26/24 14:05
AAL	4/26/24 16:50		4/26/24 16:50
AAL	4/26/24 19:30	AAL	4/26/24 19:30
	4/26/24 20:40		

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

APPENDIX K - PUBLIC NOTIFICATION LETTERS AND DATA TRANSMITTALS

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F: 781.278.5702
www.gza.com

June 13, 2024
GZA File No. 01.0172397.10

The Honorable Melinda E. Barrett
Mayor of Haverhill
Haverhill City Hall
4 Summer Street, Room 100
Haverhill, MA 01830

Peter Carbone, Chairperson
Haverhill Board of Health
4 Summer Street, Room 210
Haverhill, MA 01830

Re: Revised Phase III Remedial Action Plan and
Phase IV Remedy Implementation Plan
284 Winter Street, Haverhill, Massachusetts
Release Tracking Number (RTN) 3-32792

To Whom It May Concern:

On behalf of Boston Gas Company d/b/a National Grid, GZA GeoEnvironmental, Inc. (GZA) is providing notification in accordance with 310 CMR 40.1403(3)(e) of the Massachusetts Contingency Plan (MCP) that a Revised Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan for the above-referenced Site is being submitted to the Massachusetts Department of Environmental Protection (MassDEP). As required by the MCP, relevant excerpts from the revised Phase III RAP and Phase IV RIP are attached.

A copy of the submittal can be viewed under RTN 3-32792 at the MassDEP website: http://eeaonline.eea.state.ma.us/DEP/wsc_viewer/main.aspx. Copies of the report can also be obtained by contacting Jesse Edmands of National Grid at (781) 906-3987 / jesse.edmands@nationalgrid.com or the undersigned at 781-278-3700 or Charles.lindberg@gza.com.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles Lindberg, LSP
Senior Principal

cc: Jesse Edmands, National Grid
Robert E. Moore, Jr., Haverhill Conservation Commission
MassDEP, NERO (via eDEP Upload)

Attachments: Revised Phase III & Phase IV Excerpts

J:\170,000-179,999\172397\172397-10.KM\Revised Phase III-Phase IV\App K - Public Notices\Winter St Phase III-IV City Notice 6-24.docx

SUMMARY OF FINDINGS – REVISED PHASE III REMEDIAL ACTION PLAN & PHASE IV REMEDY IMPLEMENTATION PLAN
284 Winter Street,
Haverhill, Massachusetts
MassDEP Release Tracking Numbers 3--32792 and 3-32875

On behalf of Boston Gas Company d/b/a National Grid (National Grid), GZA GeoEnvironmental, Inc. (GZA) has prepared a 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.

The Revised Phase III RIP and Phase IV RIP was prepared in accordance with Sections 310 CMR 40.0861 and 310 CMR 40.0874 of the Massachusetts Contingency Plan (MCP) to document the selection, design and implementation of the comprehensive remedial alternative to achieve a Permanent Solution (PS) at the Site. The relevant excerpts from the report in accordance with 310 CMR 14.1403(3)(e) follow.

REMEDIAL ACTION ALTERNATIVE SELECTION

Air sparge/soil vapor extraction (AS/SVE) has been selected as a technically and economically feasible component of the Comprehensive Remedial Alternative (CRA) to achieve a Permanent Solution at the 284 Winter Street Site. It will be coupled with institutional controls in the form of an Activity and Use Limitation (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 the Revised Phase III RIP and Phase IV RIP. The other elements of the upland and Little River remedy were documented in the July 2022 Phase III RAP and remain unchanged.

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 a pilot study described in the Revised Phase III RIP and Phase IV RIP. 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. 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 specifications included in the Revised Phase III RIP and Phase IV RIP, 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 below ground surface (bgs). 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 design figures included as an appendix to the Revised Phase III RIP and Phase IV RIP. 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 the design plans. (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 regenerative design blower for SVE;
- A vapor liquid separator tank and transfer pump for condensate separation prior to the inlet of the SVE blower;
- Two, 2,000-pound vapor-phase granular activated carbon (VGAC) vessels plumbed in series;
- One rotary claw air compressor for AS;
- 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 the Revised Phase III RIP and Phase IV RIP 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 the Revised Phase III RIP and Phase IV RIP, 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 constituents of concern. The sparge wells would be operated in a pulsed mode, with monitoring of river conditions.

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www.gza.com

February 17, 2023
File No. 01.0172397.10

HEG 284 Winter Street LLC
c/o Matthew LaLone
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

Dear Mr. 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 recent sampling is in support 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).

GZA collected samples of Non-Aqueous Phase Liquids (NAPLs) from monitoring wells on HRT property on October 12, 2022, and January 18, 2023, and submitted them to ESS Laboratory of Cranston, Rhode Island, for analysis of density and viscosity by the relevant American Society for Testing and Materials (ASTM) methods. Copies of the analytical laboratory reports are attached to this letter; the results will be summarized and discussed in a Phase IV RIP report that will be provided to you. We have also enclosed a copy of the MassDEP transmittal form (BWSC123).

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.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles A. Lindberg

Charles A. Lindberg, LSP
Senior Principal

Attachments: BWSC123 Form
Site Plan
Laboratory Reports (Work Order Nos. 22J0662 and 23A0600)

cc: Jesse Edmands (National Grid)
Robin Main and Christine Dieter (Hinckley Allen)

\\gzanor\jobs\170,000-179,999\172397\172397-10.KM\Data Transmittals\No. 7 - NAPL Sampling\Haverhill Winter St_HEG_Phase IV Data Transmittal 02-23.docx

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: Matthew LaLone, HEG 284 Winter Street LLC
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.

Non-aqueous phase liquid (NAPL) samples from two monitoring wells (B206-OW, B208-OW) at 284 Winter Street, Haverhill, for analysis of density and viscosity.

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

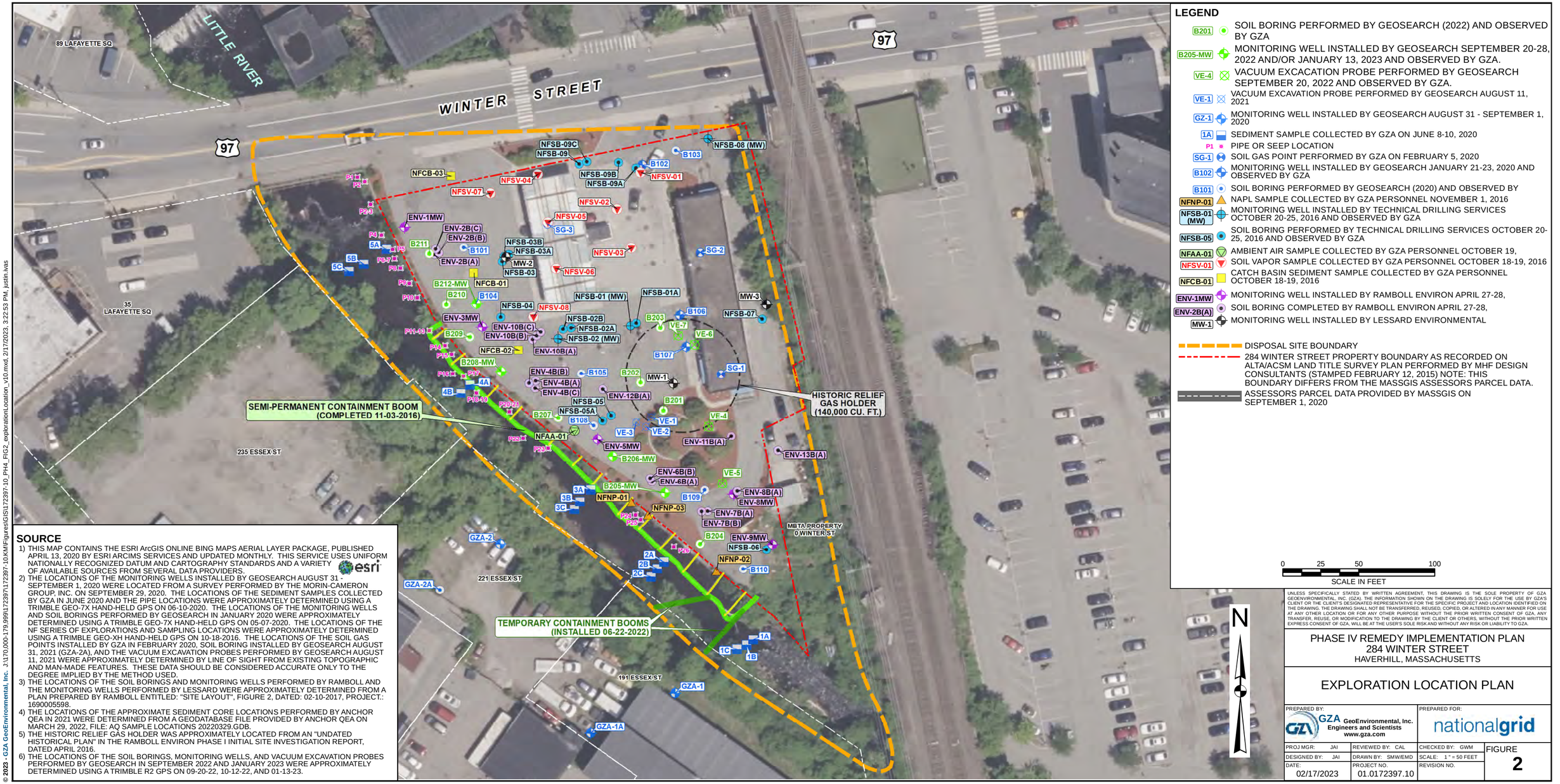
When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed 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.



SOURCE

1) THIS MAP CONTAINS THE ESRI ArcGIS ONLINE BING MAPS AERIAL LAYER PACKAGE, PUBLISHED APRIL 13, 2020 BY ESRI ARCIMS SERVICES AND UPDATED MONTHLY. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.
2) 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.
3) 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.: 1690005598.
4) 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.
5) 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.
6) THE LOCATIONS OF THE SOIL BORINGS, MONITORING WELLS, AND VACUUM EXCAVATION PROBES PERFORMED BY GEOSEARCH IN SEPTEMBER 2022 AND JANUARY 2023 WERE APPROXIMATELY DETERMINED USING A TRIMBLE R2 GPS ON 09-20-22, 10-12-22, AND 01-13-23.

LEGEND

- B201 — SOIL BORING PERFORMED BY GEOSEARCH (2022) AND OBSERVED BY GZA
- B205-MW — MONITORING WELL INSTALLED BY GEOSEARCH SEPTEMBER 20-28, 2022 AND/OR JANUARY 13, 2023 AND OBSERVED BY GZA.
- VE-4 — VACUUM EXCACATION PROBE PERFORMED BY GEOSEARCH SEPTEMBER 20, 2022 AND OBSERVED BY GZA.
- VE-1 — VACUUM EXCAVATION PROBE PERFORMED BY GEOSEARCH AUGUST 11, 2021
- GZ-1 — MONITORING WELL INSTALLED BY GEOSEARCH AUGUST 31 - SEPTEMBER 1, 2020
- 1A — SEDIMENT SAMPLE COLLECTED BY GZA ON JUNE 8-10, 2020
- P1 — PIPE OR SEEP LOCATION
- SG-1 — SOIL GAS POINT PERFORMED BY GZA ON FEBRUARY 5, 2020
- B102 — MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA
- B101 — SOIL BORING PERFORMED BY GEOSEARCH (2020) AND OBSERVED BY
- NFNP-01 — NAPL SAMPLE COLLECTED BY GZA PERSONNEL NOVEMBER 1, 2016
- NFSB-01 (MW) — MONITORING WELL INSTALLED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- NFSB-05 — SOIL BORING PERFORMED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- NFAA-01 — AMBIENT AIR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 19,
- NFSV-01 — SOIL VAPOR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- NFCB-01 — CATCH BASIN SEDIMENT SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- ENV-1MW — MONITORING WELL INSTALLED BY RAMBOLL ENVIRON APRIL 27-28,
- ENV-2B(A) — SOIL BORING COMPLETED BY RAMBOLL ENVIRON APRIL 27-28,
- MW-1 — 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.

ASSESSORS PARCEL DATA PROVIDED BY MASSGIS ON SEPTEMBER 1, 2020

0 25 50 100
SCALE IN FEET

N

PHASE IV REMEDY IMPLEMENTATION PLAN
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

EXPLORATION LOCATION PLAN

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

PREPARED FOR: nationalgrid

PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: GWM	FIGURE 2
DESIGNED BY: JAI	DRAWN BY: SMW/EMD	SCALE: 1 " = 50 FEET	
DATE: 02/17/2023	PROJECT NO. 01.0172397.10	REVISION NO.	

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F: 781.278.5702
www.gza.com

April 21, 2023
File No. 01.0172397.10

HEG 284 Winter Street LLC
c/o Matthew LaLone
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

Dear Mr. 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 recent sampling is in support 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).

GZA collected groundwater samples from monitoring wells on HEG property on March 17, and April 7, 2023, and submitted them to ESS Laboratory of Cranston, Rhode Island, for analysis of Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons by the US Environmental Protection Agency (EPA) methods 8260 and 8270, respectively. Copies of the analytical laboratory reports are attached to this letter; the results will be summarized and discussed in a Phase IV RIP report that will be provided to you. We have also enclosed a copy of the MassDEP transmittal form (BWSC123).

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.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles A. Lindberg

Charles A. Lindberg, LSP
Senior Principal

Attachments: BWSC123 Form
Site Plan
Laboratory Reports (Work Order Nos. 23C0579 and 23D0279)

cc: Jesse Edmands (National Grid)
Robin Main and Christine Dieter (Hinckley Allen)

\\gzanor\jobs\170,000-179,999\172397\172397-10.KM\Data Transmittals\No. 7 - NAPL Sampling\Haverhill Winter St_HEG_Phase IV Data Transmittal 02-23.docx

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April 19, 2024
File No. 01.0172397.10

HEG 284 Winter Street LLC
c/o Matthew LaLone
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

Dear Mr. 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]). Recent sampling has been conducted at the 284 Winter Street property in support of a Revised Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan (Phase IV RIP) that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

GZA collected groundwater, non-aqueous phase liquid (NAPL), soil and investigation-derived waste samples from various locations on the 284 Winter Street property between February 22 and April 5, 2024, and submitted them to ESS Laboratory of Cranston, Rhode Island. Specific analyses included Volatile Organic Compounds (VOCs) by the US Environmental Protection Agency (EPA) methods 8260 and 8270, Volatile Petroleum Hydrocarbons (VPH) and Toxicity Characteristic Leaching Procedure (TCLP) benzene. Copies of the analytical laboratory reports are attached to this letter; the results will be summarized and discussed in a revised Phase III RAP/Phase IV RIP report that will be provided to you. We have also enclosed a copy of the MassDEP transmittal form (BWSC123).

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.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles A. Lindberg

Charles A. Lindberg, LSP
Senior Principal

Attachments: BWSC123 Form
Site Plan
Laboratory Reports (8)

cc: Jesse Edmands (National Grid)
Robin Main (Hinckley Allen)

J:\170,000-179,999\172397\172397-10.KM\Data Transmittals\No. 9 - February-April 2024\Haverhill Winter St_HEG_Phase IV Data Transmittal 4-24.docx

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: Matthew LaLone, HEG 284 Winter Street LLC

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.

Groundwater, non-aqueous phase liquid (NAPL), soil and investigation-derived waste samples from various locations at 284 Winter Street, Haverhill, for laboratory analysis.

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

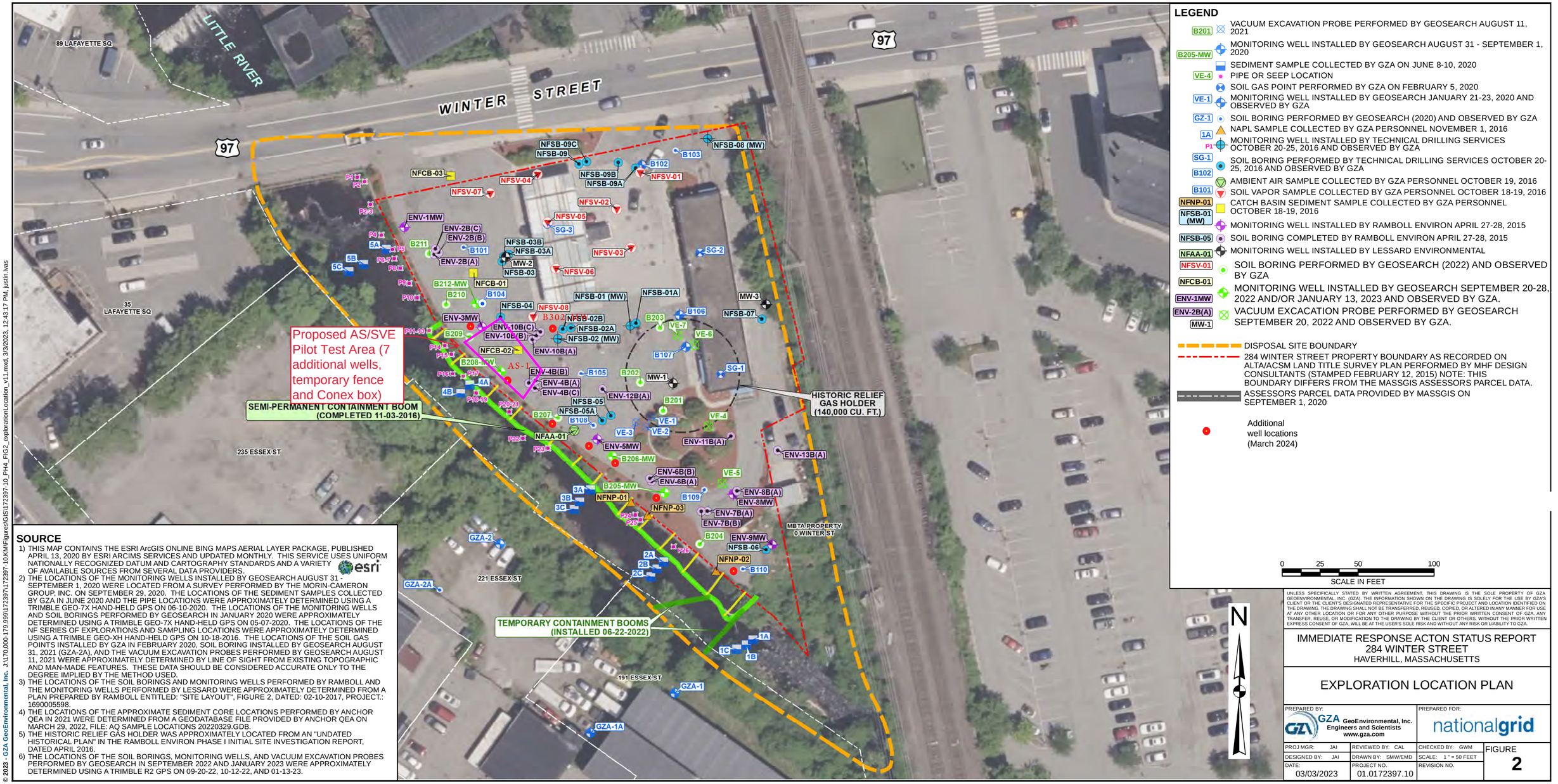
When environmental samples are taken as part of an investigation of a release for which a notification to MassDEP has been made under the Massachusetts Contingency Plan (310 CMR 40.0300) on behalf of someone other than the owner of the property, the regulations require that the property owner (listed 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.



SOURCE

1) THIS MAP CONTAINS THE ESRI ArcGIS ONLINE BING MAPS AERIAL LAYER PACKAGE, PUBLISHED APRIL 13, 2020 BY ESRI ARCIMS SERVICES AND UPDATED MONTHLY. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.
2) 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.
3) 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.: 1690005598.
4) 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.
5) 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.
6) THE LOCATIONS OF THE SOIL BORINGS, MONITORING WELLS, AND VACUUM EXCAVATION PROBES PERFORMED BY GEOSEARCH IN SEPTEMBER 2022 AND JANUARY 2023 WERE APPROXIMATELY DETERMINED USING A TRIMBLE R2 GPS ON 09-20-22, 10-12-22, AND 01-13-23.

LEGEND

- B201 — VACUUM EXCAVATION PROBE PERFORMED BY GEOSEARCH AUGUST 11, 2021
- B205-MW — MONITORING WELL INSTALLED BY GEOSEARCH AUGUST 31 - SEPTEMBER 1, 2020
- SEDIMENT SAMPLE COLLECTED BY GZA ON JUNE 8-10, 2020
- VE-4 — PIPE OR SEEP LOCATION
- SOIL GAS POINT PERFORMED BY GZA ON FEBRUARY 5, 2020
- VE-1 — MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA
- GZ-1 — SOIL BORING PERFORMED BY GEOSEARCH (2020) AND OBSERVED BY GZA
- 1A — NAPL SAMPLE COLLECTED BY GZA PERSONNEL NOVEMBER 1, 2016
- P1 — MONITORING WELL INSTALLED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- SG-1 — SOIL BORING PERFORMED BY TECHNICAL DRILLING SERVICES OCTOBER 20-25, 2016 AND OBSERVED BY GZA
- B102 — AMBIENT AIR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 19, 2016
- B101 — SOIL VAPOR SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- NFNP-01 — CATCH BASIN SEDIMENT SAMPLE COLLECTED BY GZA PERSONNEL OCTOBER 18-19, 2016
- NFSB-01 (MW) — MONITORING WELL INSTALLED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- NFSB-05 — SOIL BORING COMPLETED BY RAMBOLL ENVIRON APRIL 27-28, 2015
- NFAA-01 — MONITORING WELL INSTALLED BY LESSARD ENVIRONMENTAL
- NFSV-01 — SOIL BORING PERFORMED BY GEOSEARCH (2022) AND OBSERVED BY GZA
- NFCB-01 — MONITORING WELL INSTALLED BY GEOSEARCH SEPTEMBER 20-28, 2022 AND/OR JANUARY 13, 2023 AND OBSERVED BY GZA.
- ENV-1MW — VACUUM EXCACATION PROBE PERFORMED BY GEOSEARCH SEPTEMBER 20, 2022 AND OBSERVED BY GZA.
- ENV-2B(A)
- MW-1

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 SEPTEMBER 1, 2020

Additional well locations (March 2024)

0 25 50 100
SCALE IN FEET

IMMEDIATE RESPONSE ACTON STATUS REPORT
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: GWM	FIGURE 2
DESIGNED BY: JAI	DRAWN BY: SMW/EMD	SCALE: 1 " = 50 FEET	
DATE: 03/03/2023	PROJECT NO. 01.0172397.10	REVISION NO.	

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ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

249 Vanderbilt Avenue
Norwood, MA 02062
T: 781.278.3700
F: 781.278.5701
F: 781.278.5702
www.gza.com

May 23, 2024
File No. 01.0172397.10

HEG 284 Winter Street LLC
c/o Matthew LaLone
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

Dear Mr. 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]). Recent sampling has been conducted at the 284 Winter Street property in support of a Revised Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan (Phase IV RIP) that is being completed by Boston Gas Company d/b/a National Grid (National Grid).

GZA collected groundwater and soil vapor samples from various locations and a sample of activated carbon from the drums used for vapor treatment during the recent pilot testing at the 284 Winter Street property between April 11 and May 6, 2024. These samples were submitted to ESS Laboratory of Cranston, Rhode Island and Alpha Analytical of Mansfield, Massachusetts. Specific analyses included Volatile Petroleum Hydrocarbons (VPH), Toxicity Characteristic Leaching Procedure (TCLP) Volatile Organic Compounds (VOCs), VOCs by US Environmental Protection Agency (EPA) Method TO-15 and Massachusetts Department of Environmental Protection's (MassDEP's) Air-Phase Petroleum Hydrocarbons (APH). Copies of the analytical laboratory reports are attached to this letter; the results will be summarized and discussed in a revised Phase III RAP/Phase IV RIP report that will be provided to you. We have also enclosed a copy of the MassDEP transmittal form (BWSC123).

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.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Charles A. Lindberg, LSP
Senior Principal

Attachments: BWSC123 Form
Site Plan
Laboratory Reports (5)

cc: Jesse Edmands (National Grid)
Robin Main (Hinckley Allen)

\\GZANOR\Jobs\170,000-179,999\172397\172397-10.KM\Data Transmittals\No. 10 - May 2024\Haverhill Winter St_HEG_Phase IV Data Transmittal 5-24.docx

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: Matthew LaLone, HEG 284 Winter Street LLC

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.

Groundwater and soil vapor from various locations at 284 Winter Street, Haverhill and activated carbon from drums used for vapor treatment.

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.

J:\170,000-179,999\172397\172397-10.KMl\Figures\GIS\172397-10_SiteWells_TLC_locations.mxd, April 19, 2024 - 12:26:13 PM, justin.vas

LEGEND

- MONITORING WELL INSTALLED BY GEOSEARCH APRIL 2024.
- AIR SPARGE WELL INSTALLED BY GEOSEARCH APRIL 2024.
- PIEZOMETER COUPLET INSTALLED BY GEOSEARCH APRIL 2024.
- SOIL VAPOR EXTRACTION POINT INSTALLED BY GEOSEARCH APRIL 2024.
- DISPOSAL SITE BOUNDARY
- PROPERTY BOUNDARY AS RECORDED ON ALTA/ACSM LAND TITLE SURVEY PLAN PERFORMED BY MHF DESIGN CONSULTANTS FEBRUARY 12, 2015

SOURCE

1) THIS MAP CONTAINS THE 2021 AERIAL IMAGERY MAP SERVICE DISTRIBUTED BY MASSGIS ON JANUARY 26, 2022. THE PLANNING, ACQUISITION, PROCESSING, AND CREATION OF DERIVATIVE PRODUCTS BY MASSGIS AND NV5 GEOSPATIAL OF LEXINGTON, KY. THE IMAGERY WAS ACQUIRED BETWEEN MARCH 17 AND APRIL 24, 2021.

0 12.5 25 50

SCALE IN FEET

284 WINTER STREET
HAVERHILL, MASSACHUSETTS

EXPLORATION LOCATION PLAN
EXISTING SITE WELLS

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: MDD	FIGURE S1
DESIGNED BY: AF/MDD	DRAWN BY: DRN	SCALE: 1 " = 25 FEET	
DATE: 04/19/2024	PROJECT NO: 01.0172397.10	REVISION NO:	

APPENDIX L - AS/SVE SYSTEM PLANS AND SPECIFICATIONS

SUMMARY OF WORK
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET, HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Site Location and Description

C. Utility Location and Protection

D. Retaining Wall Protection

E. Subsurface Conditions

F. Environmental Conditions

G. Site Access and Use

H. Permits

I. Description of Work

J. Submittals

K. References and Standards

1.2 RELATED SECTIONS

A. Health and Safety Specification

B. Well Construction Specification

C. Piping Specification

D. Trenching and Backfilling Specification

E. Asphalt Paving Specification

1.3 SITE LOCATION AND DESCRIPTION

A. The Work is to be performed at a property located at 284 Winter Street in Haverhill, Massachusetts (Property), which is currently occupied by a gasoline service station and car wash, and at an adjacent vacant property to the southeast, and a portion of the Little River that flows along the Property's western boundary. The Work area lies within a Disposal Site (Site) regulated by the Massachusetts Department of Environmental Protection (MassDEP).

B. 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 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.

C. A Manufactured Gas Plant (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.

D. Remnants of the MGP foundations and infrastructure remain in place in areas of the Property. A plan showing the locations of various structures associated historical operations at the facility is included in the Attachments to these Specifications.

E. Contractor may encounter obstructions below ground surface, including but not limited to former MGP infrastructure. During past explorations, obstructions including concrete slabs have been encountered at depths up to 18 feet below ground surface. Contractor shall notify Engineer's on-site representative if obstructions are encountered during the Work prior to disturbing or removing the obstruction.

1.4 UTILITY LOCATION AND PROTECTION

A. Active and inactive utilities are known to be present at the Site. These include both aboveground and below-ground utilities.

B. Ground penetrating radar (GPR), time domain electromagnetic induction metal detection (EM 61), and Precision Utility Locating (PUL) surveys have been conducted at the Property on three occasions. These have included a March-April 2015 survey by Geophysical Applications, Inc. and surveys by Hager-Richter Geoscience, Inc. (HRGS)in September 2016 and August 2022. The three geophysical survey reports are included in the Attachments to these Specifications.

C. The locations of any utilities shown on the Drawings and Attachments/Appendices are approximate and shall be verified in the field by Contractor prior to initiation of Work. .

1. Contractor shall exercise care to avoid disturbing or damaging any utilities and structures which exist at the Site and are to remain in service during and at the completion of the Work.

2. Contractor shall contact Dig Safe, all other utility companies not covered by Dig Safe notification, and Engineer, 72 hours prior to the initiation of excavation activities. The Contractor shall verify clearances for work proximate to overhead utilities.

3. Excavation in certain areas will be required as part of this Work as shown on the Drawings. If excavating in proximity to known or suspected subsurface utilities, Contractor shall perform test pits or probes to confirm the location of the utilities. . If Contractor encounters any unexpected utilities during excavation, Contractor shall inform Engineer's on-site representative immediately.

4. If utilities are encountered during excavation, Contractor shall provide adequate means of protecting active utilities during the performance of the Work.

D. Contractor shall repair any utility damaged as a result of the Work to the satisfaction of and at no additional cost to Engineer or National Grid.

1.5 RETAINING WALL PROTECTION

A. An approximately 400 foot-long, 15- to 20-foot-tall gravity retaining wall supports the upland area of the Site along the Little River. The wall system is constructed primarily of mortared stone with occasional brick and reinforced concrete wall sections (possible remnants of old building foundation walls) built on top of stone wall sections. Based on the history of the property, it appears the wall or portions of the wall were constructed during operation of the MGP. The configuration of the wall system and potential foundations supporting the wall are unknown.

1. Contractor shall be responsible for protection and preservation of the wall system including miscellaneous railing, fencing and other landscaped features to remain. Contractor shall be responsible for the repair of any damage to the wall system or other features as a result of his/her operations to the satisfaction of the Owner at no additional cost to the Owner.

1.6 SUBSURFACE CONDITIONS

A. The Property is underlain by a fill layer of varying thickness and composition which overlies a fine-grained deposit consisting of silt or silty sand.

1. The fill underlying the 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.

2. Remnants of former structures were encountered at a number of locations during subsurface explorations at the Property.

3. A silty sand/silt deposit was encountered below the fill and ranged 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.

4. Cross-sections depicting Site stratigraphy are included in the Attachments to these Specifications.

5. Groundwater flow at the Property is generally toward the west/southwest, with the Little River as the main discharge point.

1.7 ENVIRONMENTAL CONDITIONS

A. Petroleum and MGP-related constituents including naphthalene, other polycyclic aromatic hydrocarbons (PAHs), extractable petroleum hydrocarbon (EPH), volatile petroleum hydrocarbon (VPH) fractions, and aromatic volatile organic compounds (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.

B. Both light (floating) and dense (sinking) non-aqueous phase liquid (NAPL) has been observed in monitoring wells at the Property, including in the Work area.

C. 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.

D. MGP impacts have been observed in the sediments beneath the Little River adjacent to the Property, including visible oil and/or tar (VOT).

E. Additional information relative to existing environmental conditions is provided in the Attachments to these Specifications.

F. A semi-permanent boom system is attached to the retaining wall to control sheens within the Little River adjacent to the Site. Contractor shall protect the boom system throughout the Work, and shall install additional sheen controls as described in these Drawings and Specifications or as directed by Engineer.

1.8 SITE ACCESS AND USE

A. ACCESS TO PROPERTY

1. All Work shall be confined to the Limits of Work and completed to the lines, grades, and dimensions called for on the 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.

2. Work hours for this project will be between 7:00 AM to 5:00 PM, Monday through Friday (except for locally and nationally recognized holidays) unless otherwise authorized by Engineer and in accordance with local ordinances. Contractor shall provide Engineer a minimum 72-hour notice for work requests outside the days and hours specified.

3. Except as specified below, Contractor shall perform Work in a manner that will allow the gas station and car wash operations to continue throughout the duration of the project.

   a. Contractor will have uninterrupted access to the roadway leading to the car wash for up to two weeks to complete well construction, trenching, backfill, and restoration activities in that area. Contractor shall notify Owner a minimum of 10 working days in advance of the start of this two-week period, and shall be subject to damages if the work is not completed within the two-week period.

4. Contractor shall plan and schedule any in-water Work to comply with Time-of-Year Restrictions imposed by the Haverhill Conservation Commission and Massachusetts Division of Marine Fisheries.

   a. No in-water work shall occur during March 1 to June 30 of each project year for the purpose of minimizing impacts to diadromous fish resources in the adjacent Merrimack River from sedimentation and turbidity.

   b. In-water work shall be sequenced to occur during periods of low flow stream conditions in Little River (i.e., July 1 to October 31).

B. TEMPORARY FACILITIES

1. Contractor is responsible for providing electrical power, water, and sanitary services required to perform the Work.

2. Contractor is responsible for verifying the location and capacity of services available on-Site for their use.

3. Contractor is responsible for disposal of all solid waste generated as part of their work. The Site shall be cleaned of all waste daily and waste shall be properly containerized at the end of each workday. The waste shall be containerized, secured, and properly disposed of at a permitted facility approved by Engineer and National Grid. Contractor is responsible for all costs including dumpster delivery, rental, and pickup and disposal fees.

C. SITE SECURITY

1. Contractor shall install temporary fencing, cones, barricades, or other protective measures as necessary to protect their workers from ongoing operations at the Property, and to protect all Property users from the Work.

a. Fencing shall be limited to the smallest footprint necessary for Work at any time, and shall be removed or re-located once Work in an area has been completed.

b. Contractor's equipment and materials shall only be stored within on-Site areas pre-approved by Engineer's on-site representative prior to the start of Work.

c. Contractor shall be responsible for the security of their equipment and materials during all working and non-working hours.

D. ACCESS LIMITATIONS

1. Certain trenching and/or piping and manifold locations may require adjustment during the work due to the presence of underground/overhead utilities, obstructions encountered during excavation, and/or other restrictions. Contractor shall receive approval from Engineer's on-site representative prior to making any such adjustments.

1.9 PERMITS

A. Owner will prepare and submit the following permit applications:

1. A WPA Notice of Intent (NOI) or Request for Determination of Applicability (RDA)to the City of Haverhill Conservation Commission.

2. A Chapter 91 Maintenance Request for work associated with additional sheen controls in the Little River.

B. The permits, and associated responses and requirements from the regulatory agencies, shall become part of the Contract Documents.

C. 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. Contractor shall be responsible for permit fees. These Contractor-obtained permits may include, but are not limited to:

1. Dig Safe.

2. City of Haverhill Hydrant Permit.

3. Applicable Building Permit from the City of Haverhill.

4. Trench Permit from the City of Haverhill, required for work on public and private property.

5. Electrical Permit – for installation of electric utilities and connections.

6. Plumbing Permit – as necessary for installation of plumbing utilities and connections.

7. Dumpster Permit.

1.10 DESCRIPTION OF WORK

A. Contractor shall furnish all labor, materials, services, insurance, tools, equipment, temporary facilities (if required), decontamination facilities, and incidentals to perform the following activities, referred to as "the Work":

1. Obtain, pay for, and maintain any local, state, and federal permits/approvals necessary to complete the Work described herein including DigSafe clearance.

2. Provide the submittals outlined in the Bid Package for review and approval prior to the start of the Work.

3. Attend and participate in a weekly construction meeting to be held at the Site.

4. Install erosion and sedimentation controls around Work areas.

5. Furnish, install and test all components of a soil vapor extraction (SVE)/air sparge (AS) treatment system at the Property per the Drawings and Specifications.

a. Install soil vapor extraction and air sparge wells in accordance with these Drawings and Specifications.

b. Retrofit existing monitoring wellheads as specified.

c. Sawcut asphalt and excavate soil within the trenched areas to the design depths shown on the Drawings.

d. Provide, install, and test all piping and fittings necessary to connect the AS/SVE Wells to the remediation unit.

e. Import, place, and compact clean sand fill, then restore trenched areas to match existing conditions.

f. Provide and install remediation unit components within the Treatment Enclosure.

g. Connect SVE and AS header pipe to the remediation unit.

6. Manage all materials generated during the Work in accordance with these Specifications.

a. Pre-characterize material at the Site and make arrangements for live-loading of impacted and unsuitable soils to limit on-site stockpiling.

b. Provide a loader to load impacted soil stockpiles generated during trench excavations and other construction activities (as applicable).

c. Live-load soil piles for transport to a National Grid-approved disposal facility under bill-of-lading or manifest.

d. Submit weight slips for materials imported to Site, and weight slips for materials taken off Site for recycling or disposal.

7. Repair/replace as necessary to preconstruction conditions any utilities, fencing, building components, and surfaces (including asphalt and concrete) damaged during the performance of the Work.

8. Upon completion of the Work and acceptance by Engineer and National Grid, remove all temporary construction materials and properly dispose of solid waste and debris. Perform final cleaning and demobilization of personnel, equipment, and materials from the Site.

B. The Specifications and Drawings establish the performance, quality requirements, location and general arrangement of materials and equipment, and establish the minimum standards for quality of workmanship and appearance. Direct any questions concerning the applicability or interpretation of the Specifications or Drawings to Engineer.

1.11 SUBMITTALS

A. Contractor shall provide the following submittals to Engineer for review and approval at least 7 days prior to the start of the Work:

1. Copies of any permits required to complete the Work, including DigSafe clearance number.

2. The Contractor's Site-Specific Health and Safety Plan.

3. Training certificates documenting that all Site personnel have received health and safety training in compliance with OSHA regulations as required by these Specifications.

4. Proposed off-Site disposal/recycling facilities.

5. Material packing slips or cut sheets for any proposed alternate equivalent materials.

B. Contractor shall submit copies of all weight slips for material imported or delivered to the Site within three (3) days following delivery to the Site. The weight slips shall indicate the amount and type of material transported to the Site.

C. Contractor shall submit copies of all weight slips for materials disposed or recycled off-Site within three (3) days following delivery to the off-Site receiving disposal or recycling facility. The weight slips shall indicate the amount and type of material transported from the Site and the time of delivery to the receiving facility.

1.12 REFERENCES AND STANDARDS

A. All work performed by Contractor shall be accomplished in accordance with all regulations and laws of local, State, and Federal agencies and utility companies.

B. Federal Occupational Health and Safety 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.

C. MassDEP: 310 CMR 40.0000, Massachusetts Contingency Plan

D. MassDEP: 310 CMR 19.00, Solid Waste Regulations

E. Health and Safety Procedures outlined in 310 CMR 40.0018 of the Massachusetts Contingency Plan (MCP).

F. City of Haverhill ordinances for noise, working hours, etc. as outlined in the City of Haverhill Code.

PART 2 PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SECTION INCLUDES

A. Coordination

B. Protection of Existing Services and Structures

C. Materials Management

D. Decontamination Requirements

E. Final Cleaning

3.2 COORDINATION

A. Contractor shall coordinate all Site work with Engineer to allow for coordination of construction activities and Engineer oversight of field activities. Contractor shall provide at least 72 hours' notice to Engineer prior to starting any field work.

B. Contractor shall facilitate access to the Site by representatives of National Grid, Engineer, and regulatory agencies at all times throughout the work.

C. Contractor shall work harmoniously with Engineer, property owner, and all entities engaged by Engineer necessary to complete the Work. Contractor and their subcontractors shall coordinate their efforts with those of other entities engaged by Engineer who may be providing services in the same Work area.

D. Contractor shall perform Work in a manner that will allow property owner to maintain normal activities, unless otherwise specified in Paragraph 1.8. Contractor shall also ensure that neighboring operations or activities are not disturbed, interrupted, or prohibited as a result of Work.

E. Contractor shall not block traffic along any public street or private access driveways and parking lots. The Contractor shall execute the Work so that no damage occurs to adjacent utilities, structures, property, or any other installation located in or adjacent to the Site. Damage to any of the aforementioned items shall be repaired with similar or better materials of the same size and to the requirements of Engineer at no additional cost.

3.3 PROTECTION OF EXISTING SERVICES AND STRUCTURES

A. Any disturbance to existing asphalt, concrete, utilities, landscaping, or structures (except as specifically called for in the Drawings and Specifications) shall be repaired/restored to the satisfaction of Engineer by the Contractor at no additional cost.

B. Existing groundwater monitoring wells, AS Wells, SVE Wells, and piezometers to be protected by Contractor are shown on the Drawings. The locations of all wells shall be verified in the field by Contractor prior to initiation of Work.

C. Contractor shall field-locate and protect existing monitoring, AS, and SVE Wells and piezometers at the Site.

D. Contractor shall take care to prevent the introduction of particulates, pipe shavings, or other debris from entering the AS and SVE Wells during the piping work.

E. If the AS and SVE Wells are damaged, accidently filled, or otherwise impacted by the Contractor, Contractor shall perform any repairs to these wells, including re-installation if necessary, at no additional cost to Engineer.

F. Contractor shall barricade open excavations as part of this work and post with warning signs and lights in accordance with 520 CMR 14.00.

3.4 MATERIALS MANAGEMENT

A. Subsurface soils excavated from the Site are anticipated to be contaminated and must be segregated from other materials for disposal.

1. There is limited stockpiling area available; therefore, Contractor shall minimize on-Site stockpiles and shall live-load excess material to the maximum extent possible.

    a. Soil that is temporarily shall be placed on a minimum of 2 layers of 6-mil polyethylene sheeting and covered with minimum 6-mil polyethylene sheeting, secured with sandbags or other measures to prevent exposure to wind and precipitation. Alternatively, soil can be stored in roll-off containers which shall be covered to prevent exposure to wind and precipitation.

    b. Stockpiles shall be maintained to ensure the cover material is not damaged or dislodged by wind.

    c. Contractor shall be responsible for construction, protection, movement and maintenance of stockpiles and roll-off containers for the duration of the Work or until directed otherwise by Engineer.

2. Off-Site transportation and disposal of these soils under bill-of-lading will be coordinated by Engineer; however, Contractor shall provide labor and materials to load soils for transportation and disposal. Contractor shall remove debris and sweep the stockpile area following load-out.

B. All loading shall occur on asphalt pavement areas.

C. Contractor shall conduct the transfer of materials from excavations to the stockpile areas, and from stockpiles to trucks or roll-off containers, in such a manner as to prevent loss of or spread of contaminated materials across the Site. Any contamination caused by Contractor's mismanagement of materials shall be cleaned up consistent with all applicable laws and regulations at no additional expense to Engineer.

D. Contractor shall be responsible for disposal of materials generated during the Work, including but not limited to asphalt, brick and/or concrete (ABC), and solid waste.

    1. Contractor shall segregate concrete from other materials and stockpile it with other ABC materials.

    2. All materials removed from the Site for off-Site disposal or recycling shall be disposed/recycled at permitted facilities pre-approved by Engineer and National Grid.

E. All off-Site transport and disposal/recycling shall be performed in accordance with local, state, and federal laws and regulations. Contractor shall be responsible for complying with all transport requirements including licensing, labeling, placarding, and marking.

3.5 DECONTAMINATION REQUIREMENTS

A. Personnel decontamination procedures shall be followed by Contractor as specified in their HASP.

B. All wash water from decontamination of equipment, vehicles, and personnel shall be collected, contained, and handled by Contractor in accordance with all applicable federal and state hazardous waste regulations and policies.

C. Decontamination wastes, including personal protective equipment (PPE) shall be placed in secured DOT-approved 55-gallon drums for proper off-Site disposal.

3.6 FINAL CLEANING

A. Final cleaning shall include the removal of all project-related waste materials, equipment, and excess materials from the Property and work area.

END OF SECTION

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HEALTH AND SAFETY SPECIFICATION
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Description of Section

C. References and Standards

D. Health and Safety Requirements

E. Submittals

F. Responsibilities of Contractor and Additional Subcontractors

G. Stop Work Authority

H. Employee Training

I. Hazard Communication

J. Site Access and Controls

K. Air Monitoring - General Requirements

1.2 RELATED SECTIONS

A. The information provided in this section applies to all Work performed under the Contract and is inherently made a part of each Specification Section.

1.3 DESCRIPTION OF SECTION

A. This Section includes:

1. Contractor requirements for creating a Site-specific Health and Safety Plan (HASP) necessary to conduct the Work.

2. Contractor requirements for implementing the HASP.

3. Contractor requirements for responding to threshold exceedances.

B. The Work covered by this Section includes, but is not limited to, all labor, materials, equipment, and services necessary and incidental to develop and adhere to the requirements of a Health and Safety Plan during execution of the Work as shown on the Drawings and as specified herein.

C. Contractor shall implement health and safety procedures designed to protect health, safety, public welfare, and the environment during the performance of all 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 mobilization; Site preparation; traffic control; Site security; dust, noise, odor, vibration, and vapor, control; health and safety measures; drilling and installation of soil vapor extraction (SVE) and air sparge (AS) wells; SVE and AS piping installation; removal of contaminated soil; utility protection; loading of excess soil for transportation and disposal; Site restoration; final Site cleaning; and demobilization.

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 EPA, hazardous materials as defined by United States Department of Transportation (DOT), and/or hazardous substances as defined by the Occupational Safety and Health Act of 1970 (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, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and/or odors above threshold values within the Work Zones or Site perimeter.

5. Measures necessary to contain hazardous materials during the performance of the Work, including:

    a. Measures to control fugitive dust and other environmental media.

    b. Measures to decontaminate personnel, vehicles, and equipment to prevent the spread of impacted soil/sediment, and impacted debris from the Work areas.

    c. Measures to secure excavations and temporary stockpiles of impacted materials.

    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.

D. If required, Contractor shall establish and maintain Support, Contamination Reduction and Exclusion Zones at the Site in accordance with OSHA 29 Code of Federal Regulations (CFR) 1910.120.

E. Contractor shall provide all required personnel decontamination equipment and materials in accordance with OSHA 29 CFR 1910.120.

F. Contractor shall manage all personal protective equipment (PPE) used by Contractor’s employees, subcontractors, Engineer, and/or any other Site visitors in accordance with all applicable regulations and these Specifications.

G. The Contractor’s Site–specific Health and Safety Plan (HASP) for their workers, including subcontractors, 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 the trespassers from potential physical and chemical hazards encountered during the Work.

H. The HASP shall specifically address all engagement in all activities including, but not limited to Work where exposure to crystalline silica, soil or groundwater is possible. The nature of potential impacted materials may require the use of monitoring equipment, special personal protective clothing, and respiratory protection.

I. 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 during all activities conducted on-Site where a potential exists for exposure to potentially hazardous materials, including but not limited to crystalline silica, volatile organic compounds (VOCs), PAHs, and other Site constituents in soil, 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.

J. 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. 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 pre-construction health and safety coordination, then amendments to the HASP shall be made and documented and workers shall be notified of the changes.

K. Contractor shall provide all necessary health and safety equipment, including, but not limited to, PPE, respiratory equipment, and monitoring instruments.

L. Contractor shall ensure that decontamination of heavy construction equipment, materials, and tools utilized in the Work is accomplished prior to removal from the Site.

M. 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.

N. 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.

O. The HASP shall contain provisions for maintaining the health and safety of the public as it relates to the Work.

P. Refer to the Summary of Work Specification Section and Attachments for a description of Environmental Conditions at the Site.

1.4 REFERENCES AND STANDARDS

A. Federal Occupational Health and Safety 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.

5. OSHA Respirable Crystalline Silica Regulation 29 CFR 1926.1153.

B. Health and Safety Procedures outlined in CMR 40.0018 of the Massachusetts Contingency Plan (MCP).

C. Massachusetts Department of Environmental Protection (MassDEP) Air Pollution Control Regulation 310 CMR 7.00

D. Massachusetts Noise Regulations 310 CMR 7.10.

E. National Fire Protection Association (NFPA) 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations 2009 Edition.

F. Massachusetts Hazardous Waste Regulation 310 CMR 30.00.

G. Massachusetts Department of Public Safety – Excavation and Trenching Safety (520 CMR 14.00).

H. City of Haverhill Ordinances, latest edition.

I. National Grid Safety Procedures – Contractor Safety Requirements.

1.5 HEALTH AND SAFETY REQUIREMENTS

A. Contractor shall at all times be solely responsible for exercising reasonable precautions 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 Drawings. Contractor shall comply with all applicable provisions of federal, State and local health and safety and occupational health and safety statutes and codes.

B. Contractor shall also comply with conditions contained in Site-specific permits or licenses obtained by Engineer. Contractor shall make every effort to comply with requests from Engineer.

C. Contractor shall be responsible for full compliance with the regulations established under OSHA, including agreements with the U.S. Department of Labor and the Commonwealth of Massachusetts and any applicable amendments or revisions thereof, whether associated with the furnishing of equipment and or systems, the furnishing and installation of equipment and/or systems, the construction of facilities, the performance of services or any other similar contractual relation.

1. Contractor shall be responsible for any violations of the 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 Engineer or National Grid.

2. Contractor shall comply with applicable requirements of labor laws and regulations of the Commonwealth of Massachusetts applicable to safety and the authorities having jurisdiction over same.

3. Contractor shall maintain adequate protection against damage to life and property involved in the Work and shall provide all necessary, protective devices until completion and final acceptance of project by Engineer.

4. 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 Engineer. In the case of such an event, Contractor shall notify Engineer 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. Daily Health and Safety briefings shall be conducted prior to each day's Work and documented in the Daily Activity Reports (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 impacted materials. Workers who are potentially in direct contact with crystalline silica dust, impacted soil, groundwater, and debris, 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.

F. Contractor shall designate a Site Safety and Health Officer (SSHO) who shall be responsible for the day to day implementation and enforcement of the HASP. The SSHO shall be present on Site whenever Work is occurring and 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 SSHO shall be submitted to Engineer for approval prior to their engagement on the project. Substitution of the project assigned SSHO shall not be allowed unless there has been a pre-approved (by Engineer) and qualified substitute. The qualifications of the SSHO shall include:

1. A minimum of five (5) 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, demolition, and environmental remediation.

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 be Supervisory trained in accordance with OSHA 29 CFR 1926.65 and 1910.120.

G. Contractor shall comply with the Site-specific air monitoring requirements as outlined in their HASP. Engineer may require more stringent air monitoring requirements based on its review of the Contractor HASP. 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 should 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, PAHs, odors, noise, and vibration during construction. Engineer will be responsible for conducting perimeter air monitoring.

H. 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 and elsewhere in these Specifications. Requirements for Contractor to monitor ambient air for dust near excavations, demolition, and remediation are included below. Contractor will be required to carefully cover and monitor the integrity of all soil and 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.

I. Opinions of Engineer regarding expected Site conditions do not relieve Contractor of their responsibility to protect the health and safety of their 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 immediately. The verbal notification of any environmental releases, injuries, near misses or OSHA reportable events shall be reported to Engineer 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 in accordance with the submittal requirements in Section 1.6 of this specification section. Contractor shall cooperate with any follow up investigations conducted by Engineer of a reportable condition or other incident.

J. Carabiners are prohibited from use as part of any lifting device.

K. Drive thru or back-in parking shall be utilized by all vehicles on-Site. When back-in or drive thru parking is not feasible, a spotter must be utilized for backing up of all vehicles.

1.6 SUBMITTALS

A. With Bid: Qualifications and experience of the assigned SSHO.

B. Within 7 days of Notice to Proceed, Contractor shall submit a Site-specific Health and Safety Plan (HASP).

1. The HASP 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.

2. The HASP shall address all drilling, excavation, piping installation, backfilling, restoration, material handling, transportation, relevant general construction hazards, and other Work specific hazards, and shall include provisions for intended methods of sloping and shoring (if applicable), as required by OSHA 29 CFR 1926.650-652. The Contractor's HASP shall also address employee hazard control procedures for all contaminated soil handling and management.

3. At a minimum the HASP shall include:

    a. Specific provisions for Stop Work authority consistent with this Section.

    b. Specific provisions for stopping Work and re-evaluating safety procedures and equipment in the event an unanticipated Work scope is required.

    c. Site description and hazard evaluation.

    d. Names of key personnel and alternate responsible for Site safety and health (responsibilities and chain of command).

    e. Safety and health hazard assessment and risk analysis for each Site task and operation, including physical, chemical and biological hazards.

    f. 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.

    g. Work task-specific levels of protection and a description of health and safety equipment including protective clothing, respiratory equipment and monitoring instruments.

    h. Medical Surveillance in accordance with applicable federal, State, and local regulations.

    i. 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:

        i. Contractor work area monitoring procedures, personnel, equipment, and documentation.

        ii. Corrective action trigger levels for Work Zone dust, respirable crystalline silica, VOCs, and odors (monitoring to be conducted by Contractor).

        iii. Corrective actions to be completed for on-Site dust, respirable crystalline silica, VOC, or odor action level exceedances (monitoring to be conducted by Contractor).

iv. Air Monitoring Response Plan that outlines corrective actions to be completed following dust, VOC, odor, action level exceedances detected by the Perimeter Air Monitoring program or through complaints from the public (perimeter monitoring to be completed by others).

v. Equipment and materials to be used during corrective actions.

j. Standard Operating Procedures for Engineering Controls for dust, odors, vapors, vibration and noise, and Work practices.

k. Site Control Measures (Work Zones, Communications and Security) including a map indicating route to hospital for emergency medical care.

l. Personnel Hygiene and Decontamination.

m. Equipment Decontamination.

n. Logs, Reports and Recordkeeping.

o. Emergency Response Plan.

p. Emergency procedures for occurrences such as personal injury, fire, spills, and exposure to toxic substances.

q. Emergency contact information.

r. Contingency Measures.

s. Task-specific Job Safety Analysis (JSA) for each component of Work anticipated for the Project, including but not limited to:

i. Mobilization Operations

ii. Housekeeping

iii. General Labor

iv. Utility Clearance, Identification and Protection

v. Unloading of Equipment and Materials

vi. Hot Work

vii. Cold/Hot Weather Work

viii. Drilling

ix. Trenching and Excavation.

x. Heavy Equipment Operation

xi. Ladders/Scaffolding

xii. Manlift Operation

xiii. Piping Installation

xiv. Decontamination.

xv. Fencing and Barriers

xvi. Loading of Site Materials for Off-Site Disposal/Recycling

xvii. Demobilization Operations.

t. In the event a change in Work scope occurs, that requires a new JSA be prepared, such Work shall not be performed until Contractor submits the JSA for review and comment by Engineer.

u. The HASP shall include a respiratory protection plan to protect workers based on a review of the available analytical data.

v. The HASP shall contain provisions for maintaining the health and safety of the public as it relates to the Work.

w. HASP approvals by appropriate and qualified Contractor personnel for review and approval by Engineer.

C. Within 7 days of Notice to Proceed, Contractor shall submit the following to Engineer:

1. Documentation of medical monitoring for all on-Site workers anticipated to start the project, including but not limited to:

a. Project Site Superintendent;

b. Project SSHO;

c. Project laborers and operators; and

d. Subcontractors.

2. 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).

3. Documentation of personnel respirator qualification and fit testing.

4. Documentation must be maintained on the Site at all times by Contractor.

D. Contractor shall submit documentation requested in 1.6.C to Engineer for each proposed on-Site worker no less than seven (7) days prior to the worker's mobilization to the Site.

E. During Construction Activities:

1. All required forms and OSHA records shall be maintained on the Site by Contractor as applicable.

F. Work Zone and Work Zone Boundary Monitoring Results:

1. Monitoring Results: Work Zone and Work Zone Boundary monitoring results shall be continuously reviewed by Contractor. Contractor shall notify Engineer immediately of

concentrations above established action levels. Contractor must keep records of all monitoring results and will provide recorded data in their daily field reports.

G. In the event of a safety incident, including injuries and “near-misses” and vehicle accidents occurring during the performance of the Work, the SSHO shall provide details of the incident to Contractor and Engineer as soon as possible and, at a minimum, verbally within 1 hour of the incident and shall follow up with a draft email summary or Incident Report within 4 hours, and a final written Incident Report within 24 hours.

1.7 RESPONSIBILITIES OF CONTRACTOR AND ADDITIONAL SUB-CONTRACTORS

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 daily as part of their daily field report. 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 and/or groundwater and respirable crystalline silica 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.

D. Health and Safety Oversight

1. Overall responsibility for implementation of the HASP shall be the responsibility of the SSHO, who shall be assigned to the Site at all times during all stages of Site Work. The SSHO 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 personal protective clothing and equipment (PPE).

2. 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 who will be

working in or near impacted soil or groundwater. New employees and visitors to the Site work areas shall be informed of the Site conditions and safety requirements by Contractor's SSHO.

3. 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.

   Contractor's SSHO shall attend all weekly construction meetings and shall provide update on matters related to Site health and safety.

4. Contractor shall also be responsible for implementation of the HASP by all other Subcontractors.

E. It shall be Contractor's responsibility to notify Engineer 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 the Contractor's HASP.

1.8 STOP WORK AUTHORITY

A. Should any unforeseen safety-related factor, hazard, or condition which 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 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. The incident report shall be provided as soon as possible but, at a minimum, by 10 a.m. the next day. Contractor shall conduct an investigation and provide a written report incorporating results of the investigation if directed to do so by Engineer.

C. Contractor shall not charge standby time during Stop Work directives initiated by Engineer, 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.

1.9 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 who have the potential to encounter or are working in the vicinity of environmentally impacted Site material shall consist of a minimum of forty (40) hours of health and

safety training, twenty-four (24) hours of "on the job" training, and eight (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 eight (8) hours additional specialized training for managing hazardous waste operations in compliance with OSHA 29 CFR 1926.65/1910/120e.

B. Prior to the initiation of the Work, the 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, training on the hazards of respirable crystalline silica, as described in 29 CFR 1926.1153.

C. 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. Medical monitoring may be required in compliance with 29 CFR 1926.1153. Contractor shall determine, within 30 days of beginning work involving silica on the Site, whether such medical surveillance is required, and if so, submit medical clearance letters for all affected contractor and subcontractor personnel at least 30 days before beginning work involving silica.

D. 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.

E. Contractor and any Subcontractors shall comply with the following additional requirements. Hazard Communication, Respiratory Protection, Emergency Response procedures, Site orientation, daily toolbox meetings, weekly safety meeting, and all other training as required by other applicable regulations within OSHA 29 CFR 1926 and 1910.

1.10 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 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 Engineer upon request.

1.11 SITE ACCESS AND CONTROLS

A. The Contractor's HASP shall include Site access provisions which 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. As appropriate, 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 in order 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 excavation, stockpiling, and soil handling. The level of Personal Protective Equipment required in the Exclusion Zone shall be in accordance with Contractor's approved HASP as determined by the SSHO.

b. The Contamination Reduction Zone shall be located at the interface of the Exclusion and Support Zone. The function of the Contamination Reduction Zone is to provide:

   i. An area to decontaminate personnel, equipment, and vehicles prior to entering the Support Zone from the Exclusion Zone.

   ii. 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:

   i. An entry for personnel, materials, and equipment to the Exclusion Zone of Site operations.

   ii. An exit area for decontaminated personnel, materials and equipment from the Exclusion Zone of Site operations.

   iii. Location for support facilities.

   iv. A storage area for clean work equipment.

C. Contractor shall change 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 environmentally impacted Site materials.

E. No smoking is allowed on-Site.

F. Contractor shall be required to make provisions for pedestrian and other Site worker traffic control as necessary.

G. Contractor shall provide and maintain clear access to all buildings on adjacent properties at all times.

H. 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.

I. Contractor must limit the extent of open excavation areas within the work limits and must comply with 520 CMR 14.00 (Massachusetts Department of Public Safety – Excavation and Trench Safety). Access to unattended excavation or trenches shall be restricted with properly designed, installed, and maintained barricades or covers.

1.12 AIR MONITORING - GENERAL REQUIREMENTS

A. Contractor shall be responsible for establishing an air monitoring program to monitor organic vapors, odors, respirable crystalline silica 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, respirable crystalline silica, and dust designed to be protective of worker health and safety, compliant with the applicable federal, State, and local requirements.

C. The air monitoring program shall include descriptions of organic vapor, odor, respirable crystalline silica, 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 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 United States Environmental Protection Agency (EPA). 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 SSHO and shall be provided to Engineer as part of their daily field reports.

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 or 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 the Contractor's record documents.

H. The SSHO shall be responsible for operating all air monitoring equipment.

PART 2 PRODUCTS

2.1 SECTION INCLUDES

A. MATERIALS

B. INSTRUMENTS

2.2 MATERIALS

A. Contractor and all subcontractors shall provide on-Site personnel, when required by the Contractor’s HASP, with the appropriate PPE and shall ensure that all PPE is kept clean and well maintained.

B. Minimum PPE to be worn in the Work area include hard hats, steel toed work boots, reflective safety vests, safety glasses, and standard work clothes.

C. All health and safety materials and equipment shall conform, at a minimum, to OSHA, NIOSH and American National Standards Institute (ANSI), and American Society of Testing and Materials (ASTM) standards and requirements.

D. Clothing and Equipment: Generally, protective clothing is considered disposable, but respiratory equipment may be reusable. Based on the limited subsurface work anticipated for the project, Level D Protection will be the minimum PPE required. If action levels require upgrading PPE, additional levels of protection may apply as follows. The items to be furnished by Contractor under different levels of protection for their own personnel and subcontractor's personnel may include, but are not limited to, the following:

1. Level D Protection

    a. Coveralls (cotton) or work clothes.

    b. Safety boots/shoes.

    c. Safety glasses.

    d. Hard hat with optional face shield.

    e. Reflective Safety Vest.

2. Level C Protection

    a. Tyvek coveralls - or poly-coated Tyvek coveralls - or chemical protective overalls and long-sleeved jacket (rain suit).

    b. Gloves, inner (disposable surgical type).

    c. Gloves, outer (Neoprene, Nitrile, Viton or Butyl).

    d. Boots, chemical protective, steel toe and shank (Neoprene or Nitrile) - or safety boots with chemical protective boot covers (e.g., disposable PVC).

    e. Full or half facepiece, air-purifying respirator (MSA Ultra-twin or equal).

    f. Hard hat.

    g. Face shield (optional).

3. Contractor shall notify Engineer in advance of deploying Level C PPE on the Site, as public and or regulatory notifications of upgrades will be necessary.

4. Levels B and A, as described in the Reference Standards, represent increased levels of protection that are not anticipated to be necessary for the Work on this project.

E. Contractor shall supply eyewash stations, first aid supplies and fire extinguishers at each Work area for the period of the Work.

F. Contractor shall supply any additional PPE or safety equipment for the period of construction as required by the Contractor’s HASP or OSHA.

2.3 INSTRUMENTS

A. Dust Meter

1. 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/m3.

2. Dust meter shall be a Model pDR-1000AN personal DataRam manufactured by Thermo Scientific or Engineer-approved equivalent.

B. Organic Vapor Meter

1. Contractor shall provide organic vapor monitoring equipment. Organic Vapor Meter shall consist of a hand held photoionization detector (PID) equipped with a 10.6 eV lamp and a range of 0 to 15,000 parts per million.

2. Organic Vapor Meter shall be a MiniRae 3000 PID manufactured by RAE Systems or Engineer-approved equivalent.

PART 3 EXECUTION

3.1 SECTION INCLUDES

A. IMPLEMENTATION AND GENERAL REQUIREMENTS

B. EMERGENCY/CONTINGENCY PLANNING

C. LOGS, REPORTS, AND RECORD KEEPING

D. DECONTAMINATION

E. INCIDENT REPORTING PROCEDURES

3.2 IMPLEMENTATION AND GENERAL REQUIREMENTS

A. It is Contractor's responsibility to ensure compliance with the HASP by all on-Site personnel. Modifications to the Contractor's HASP shall be made 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 majority of the Work will require personal protection provided by Level D. Upgrading the level of the protection shall be the sole responsibility of Contractor. The Contractor shall notify Engineer immediately of the need to upgrade levels of protection.

3.3 EMERGENCY/CONTINGENCY PLANNING

A. At a minimum, the Contractor’s HASP shall include emergency procedures for occurrences such as personal injury, fire, and exposure to hazardous 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, muster points, 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 the Contractor's HASP and shall be posted by Contractor in accessible areas near the Work.

D. If 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. Containment shall include the use of absorbent pads or materials, diking with soils, covering and/or diverting spills from sewers, drains, surface water bodies, etc. For any spill, the SSHO or designee shall secure the area and initially notify the Engineer. Following that, Contractor shall notify the necessary personnel including, but not limited to Engineer, State environmental personnel, the City of Haverhill, the MassDEP and a designated hazardous materials cleanup sub-contractor trained in compliance with the emergency response training requirements of 1926.65 and 1910.120. 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 Contractor's responsibility to bring such to the attention of Engineer immediately both verbally and in writing. Resolution of the matter shall come through Engineer. In the interim, the Contractor shall take prudent action to establish and maintain safe working conditions and to safeguard all Site personnel, the public, and the environment.

3.4 LOGS, REPORTS AND RECORD KEEPING

A. The SSHO shall maintain daily logs and reports covering the implementation of the HASP including the Air Monitoring Program and daily safety meetings and shall provide Engineer with copies of all logs and reports as requested.

B. The SSHO shall provide Engineer with minutes of safety meetings, including topics discussed and attendance sheets, daily. Contractor shall document the performance of the safety meeting and safety topic discussed in the Daily Field Reports.

C. Contractor shall be solely responsible for compliance with all federal laws (such as OSHA 29 CFR 1926.33/1910.1020) which 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.

3.5 DECONTAMINATION

A. The Contractor's HASP shall specify equipment and vehicle decontamination procedures to minimize the tracking of contaminants from the Site.

B. Contractor's HASP shall specify personnel decontamination procedures prior to leaving Exclusion Zones.

C. Contractor shall be responsible for the collection and storage of all used PPE in labeled, secured drums for future disposal by Others.

3.6 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 SSHO shall provide details of the incident to Contractor and Engineer as soon as possible and, at a minimum, verbally within 1 hour of the incident and shall follow up with a draft email summary or Incident Report within 4 hours, and a final written incident report within 24 hours.

B. 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?

C. All injuries, accidents and illnesses occurring as a result of or during on-Site work must be recorded on the Contractor's or affected Subcontractor's OSHA 300 and 301 or equivalent forms. These forms shall be forwarded to Engineer. Contractor shall report all injuries to the appropriate authorities, including OSHA if necessary, and to Engineer immediately.

D. 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. Engineer will not furnish any emergency medical treatment.

END OF SECTION

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WELL CONSTRUCTION SPECIFICATION
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET, HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Description

C. References And Standards

D. Submittals

1.2 RELATED SECTIONS

A. Health and Safety Specification

B. Summary of Work Specification

C. Piping Specification

D. Trenching and Backfilling Specification

1.3 DESCRIPTION

A. This Section includes furnishing all materials, labor, equipment, and incidentals necessary to install Air Sparge (AS) and Soil Vapor Extraction (SVE) wells as described in these Specifications and as shown on the Drawings in accordance with all applicable local, state, and federal laws and regulations.

B. Contractor shall locate the horizontal location and the vertical elevation of the top of casing and the adjacent ground surface of each well.

C. Contractor shall examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Section including, but not limited to, information related to subsurface conditions provided in the Attachments to the Specifications.

1.4 REFERENCES

A. WSC-310-91 Standard References for Monitoring Wells – Massachusetts Department of Environmental Resources, Bureau of Waste Site Cleanup.

B. Standard Practices for Design and Installation of Groundwater Monitoring Wells in Aquifers, ASTM D5092-02.

1.5 SUBMITTALS

A. Informational Submittals:

1. With Bid:

a. Name and license number of the Massachusetts Registered Well Driller who will perform the Work described in this Section.

B. Action Submittals:

1. Within 21 days of the Notice to Proceed, Contractor shall prepare and submit a Well Installation Plan to Engineer for review. The Well Installation Plan shall describe the materials, equipment, and procedures to be used and, at a minimum, include the following:

a. Drilling equipment to be used, including rig and casing sizes.

b. A written description of proposed well installation procedures and how the work will be sequenced with trenching, piping, and backfilling operations at the Site.

c. A complete list of all materials to be used to construct the wells, including the name of the manufacturer and the model number of each component.

d. Well completion procedures.

e. Drill cuttings and liquid management procedures.

C. Closeout Submittals:

1. Within 7 days of receiving request from Owner to submit closeout submittals, unless otherwise agreed to by Owner, submit the following:

a. Provide Record Drawings of the installed wells.

b. Provide well installation logs in accordance with this Section.

PART 2 PRODUCTS

2.1 SECTION INCLUDES

A. Materials

2.2 MATERIALS

A. Air Sparge Wells

1. AS Wells shall consist of various lengths of Well Riser Pipe as shown on the Drawings, various lengths of Well Screen as shown on Drawings; a Sump with bottom cap, and Polypropylene quick-disconnect locking cap.

a. Well Riser Pipe shall consist of 1-inch-diameter, Schedule 40 PVC casing as manufactured by Johnson Screens®, or Engineer-approved equivalent.

b. Well Screen shall consist of 1-inch-diameter, 0.01-inch, Schedule 40 PVC screen as manufactured by Johnson Screens®, or Engineer-approved equivalent.

c. Sump section shall consist of 2-foot-long, 1-inch-diameter, solid Schedule 40 PVC installed at the bottom of the well with a threaded end cap.

d. Polypropylene quick-disconnect locking cap or Engineer-approved equivalent.

B. Soil Vapor Extraction Wells

1. SVE Wells shall consist of various lengths of Well Riser Pipe as shown on the Drawings; various lengths of Well Screen as shown on the Drawings; and an Expandable Plug.

a. Well Riser Pipe shall consist of 4-inch-diameter, Schedule 40 PVC casing as manufactured by Johnson Screens® or Engineer-approved equivalent.

b. Well Screen shall consist of 4-inch-diameter, 0.02-inch, Schedule 40 PVC screen as manufactured by Johnson Screens® or Engineer-approved equivalent.

c. Expandable Plug manufactured by Johnsons Screens® or Engineer-approved equivalent.

C. Filter Sand

1. Filter Sand shall be a clean, chemically inert, well rounded and well sorted silica-based sand of uniform grain size.

2. Filter Sand for AS wells shall be #00 Sand or Engineer-approved equivalent.

3. Filter Sand for SVE wells shall be #2 Sand or Engineer-approved equivalent.

D. Bentonite – SVE Wells

1. Bentonite Chips shall consist of medium (i.e., ¼-inch to 3/8-inch) chemically unaltered natural sodium bentonite or Engineer-approved equivalent.

E. Cement-bentonite grout – AS Wells

1. Cement-bentonite grout shall consist of 30 gallons of water per 94 lbs of cement plus up to 25 lbs of bentonite.

2. Mix the water and cement in a high shear mixer and then add the bentonite to the mix.

3. Adjust the amount of bentonite to produce a grout with the consistency of heavy cream.

F. Sand Fill – SVE Wells

1. Sand Fill shall conform to Massachusetts Highway Department Specification for "Sand *Bo*rrow" (M1.04.0 Type a) and 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 D422 shall not exceed 10% by weight, and the maximum particle size shall be ¼-inch.

PART 3 - EXECUTION

3.1 SECTION INCLUDES

A. General

B. Pre-Clearing

C. Drilling

D. AS Well Installations

E. SVE Well Installations

F. Materials Management

G. Well Installation Logs

3.2 GENERAL

A. Work will encounter subsurface contamination, including residual coal tar and coal-tar related compounds as described in the Summary of Work Specification Section. Work shall be performed in accordance with the Health and Safety requirements and environmental procedures in these Drawings and Specifications.

B. Obstructions are anticipated below ground surface within the Limits of Work. Contractor is responsible for removal of, or to otherwise penetrate, all obstructions encountered as necessary to complete the Work.

C. Contractor shall be responsible for performing all appropriate subsurface utilities mark outs prior to performing any intrusive Work and shall provide sufficient notification to DigSafe as required by the Commonwealth of Massachusetts. Contractor shall provide DigSafe notification number to Engineer along with documentation of clearance at least 5 days prior to the performance of intrusive activities.

D. Work shall be carried out in such manner as to prevent undermining or disturbing any existing utilities, catch basins, culverts, buildings, fences, or other structures at or adjacent to the Site (unless otherwise scheduled to be removed, capped, altered, and/or replaced as part of the Work). Contractor shall be responsible for the repair of any damage to existing utilities or other features as a result of his/her operations at no additional cost to Owner.

E. Inspect all drilling equipment at the start of each day for evidence of damaged or inoperable components. Repair or replace any identified damaged or inoperable components prior to the start of the Work.

F. Work cooperatively with Engineer while drilling the borehole and installing and developing the wells.

G. Install AS and SVE Wells within 1 foot of the locations depicted on the Drawings unless there are utility interferences. If utility interferences are present, move well location a sufficient distance to avoid utility, as approved by Engineer.

H. Sequence the Work so that the well locations are accessible by the drilling equipment.

I. Decontaminate well drilling and sampling equipment between locations if directed to do so by the Engineer in accordance with these Specifications.

3.3 PRE-CLEARING

A. Prior to initiation of Work at the Site, Contractor shall contact Dig Safe® and the appropriate municipal agencies to identify underground utilities at the Site.

B. Contractor shall pre-cut existing asphalt surfaces at each AS and SVE Well location.

1. Each opening shall be a two-foot square area unless otherwise specified by Engineer.

2. The Contractor shall stockpile excess asphalt in a pre-approved area for off-Site disposal.

C. Each SVE and AS Well location shall be pre-cleared for the presence of utilities to a minimum depth of 5 feet below ground surface (bgs) utilizing an air knife and vacuum excavation methods.

1. Engineer may require Contractor to collect soil samples from the vacuum holes for screening and/or classification purposes. Contractor shall provide a hand auger and appropriate extensions for sampling the vacuum holes between 0 and 8 feet bgs.

2. If obstructions are encountered within the top 8 feet of ground surface that impede advancement of the soil boring using vacuum methods, Engineer will evaluate if re-location of the exploration is required or if other clearance techniques will be employed.

3. This Work may also require Contractor to employ hand or mechanical obstruction removal methods to clear larger rocks, metal, or other large materials from the borehole.

D. Contractor may propose an alternate method for advancing holes for the initial 5 feet bgs that does not involve vacuum excavation for approval by Engineer. Contractor shall be responsible for the repair of any damage to existing utilities or other features caused by the drilling operation.

3.4 DRILLING

A. Boreholes for AS well installation shall be drilled using drive and wash casing, or sonic drilling techniques or Engineer-approved equivalent. SVE boreholes shall be advanced using hollow stem auger, drive and wash casing or sonic techniques or Engineer-approved equivalent. Direct push drilling will not be allowed.

B. Borehole diameter for the AS Wells shall be a minimum of 4 inches.

C. Borehole diameter for the SVE Wells shall be a minimum of 6 inches.

3.5 AS WELL INSTALLATIONS

A. Boreholes shall be advanced via drilling to the depths indicated on the Drawings and Table 1 in this Specification Section. Actual depths may be adjusted as directed by Engineer based on field conditions encountered.

B. At each AS Well location, a solid Schedule 40 PVC sump section shall be installed at the bottom of the well with a threaded end cap, such that bottom of the sump is installed at the base of the borehole.

C. The sump section shall be threaded to a slotted Schedule 40 PVC well screen per the Drawings and Specifications. Centralizers shall be used above and below the well screen section to center the well screen within the four-inch borehole.

D. A solid Schedule 40 PVC riser pipe shall be threaded to the well screen.

E. A minimum two-foot-thick hydrated bentonite seal shall be placed at the bottom of the borehole, and Filter Sand shall be installed above the seal via tremie pipe methods. Filter Sand shall extend a minimum of 1 foot above the top of the Well Screen.

F. A minimum two-foot-thick hydrated bentonite seal shall be placed above the filter sand and the remainder of the boring shall be tremie-grouted with a cement-bentonite grout to the depth shown on the Drawings. The cement-bentonite grout shall be installed to a depth of 4 feet below grade to accommodate later trenching and piping connections.

G. A running record of volumes of Filter Sand and Bentonite Chips added per foot of borehole shall be maintained for each well installation.

H. The surface of the Filter Sand and the Bentonite Chips shall be routinely tamped with a weight or rod during installation to monitor depth and eliminate bridging in borehole.

I. A polypropylene quick-disconnect locking cap or Engineer-approved equivalent shall be installed, and the well shall be protected pending connection to the remediation system.

3.6 SVE WELL INSTALLATIONS

A. Boreholes shall be advanced via drilling to the depths indicated on the Drawings and Specifications. Actual depths may be adjusted as directed by Engineer based on field conditions encountered.

B. At each SVE Well location, slotted Schedule 40 PVC well screen shall be installed per these Drawings and Specifications.

C. A solid Schedule 40 PVC riser pipe shall be threaded to the well screen.

D. Filter Sand shall be installed via tremie pipe methods. Filter Sand shall extend a minimum of 1 foot above the top of the Well Screen.

E. A minimum two-foot-thick hydrated bentonite seal shall be placed above the filter sand and the remainder of the boring shall be backfilled with Sand Fill or Filter Sand to the depth shown on the Drawings.

F. A running record of volumes of Filter Sand and Bentonite Chips added per foot of borehole shall be maintained for each well installation.

G. The surface of the Filter Sand and the Bentonite Chips shall be routinely tamped with a weight or rod during installation to monitor depth and eliminate bridging in borehole.

H. An Expandable Plug manufactured by Johnsons Screens® or Engineer-approved equivalent shall be installed, and the well shall be protected pending connection to the remediation system.

3.7 MATERIALS MANAGEMENT

A. All excess solids from the well installations shall be classified as Impacted Soils and consolidated with Impacted Soils generated in other portions of the Site. Contractor shall be responsible for the management, handling, transportation, and off-Site disposal of Impacted Soils in accordance with these Specifications.

B. Well drilling fluids and liquids from well development shall be containerized within 55-gallon, steel, open-top drums or temporary holding tanks. Contractor shall be responsible for the management, handling, transportation, and off-Site disposal of these liquids in accordance with these Specifications.

C. No materials (liquids or solids) from the borehole shall come into contact with the ground surface.

3.8 WELL INSTALLATION LOGS

A. Contractor shall prepare and provide a well installation log for each well. At a minimum, each log shall include the name of the driller, equipment used, description of the types of materials encountered, total depth of the borehole, well installation details including depth of screen, thickness of Filter Sand, and thickness of Bentonite layer, and details of the surface completion.

Table 1 – AS/SVE Well Construction

Well ID	Total depth (feet bgs)	Sump? Y/N	Screened interval (feet bgs)
AS-2	37	Y	30-35
AS-3	37	Y	30-35
AS-4	37	Y	30-35
AS-5	32	Y	25-30
SVE-2 through SVE-9	15’	No	5-15

END OF SECTION

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PIPING SPECIFICATION
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET, HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Definitions and Acronyms

C. Description

D. Quality Assurance

E. Submittals

F. References and Standards

1.2 RELATED SECTIONS

A. Health and Safety Specification

B. Summary of Work Specification

C. Well Construction Specification

D. Trenching and Backfilling Specification

1.3 DEFINITIONS AND ACRONYMS:

A. SVE – Soil Vapor Extraction

B. AS – Air Sparge

1.4 DESCRIPTION

A. This section includes specifications of piping and instrumentation to be installed.

B. Each SVE and AS Well shall be piped to a manifold within the treatment system enclosure as shown on the Drawings, and the manifolds shall be connected to the applicable blower/compressor. Contractor shall furnish all labor, materials, and equipment to install piping between the wells and the manifold within the treatment system enclosure as shown on the Drawings.

1. All piping shall be installed and supported such that it is sloped back toward the SVE & AS Wells.

2. Piping shall be installed below-ground as shown on the Drawings and in accordance with the Trenching and Backfilling Specification.

C. Contractor shall perform pipe integrity testing for all pipes, fittings, valves, etc. installed during the Work.

D. Contractor shall furnish and install nameplates, valve tags, valve charts, and pipe markers on all piping, valves, and equipment installed during the Work.

1.5 QUALITY ASSURANCE

A. Contractor shall inspect all materials prior to installation. Any materials that are defective, deteriorated, damaged or inconsistent with these Specifications or Drawings shall be replaced by Contractor at no additional cost to Engineer or National Grid.

B. Engineer will perform certain testing and inspections in the field to check compliance of the Work and materials with the Specifications. In the event these tests or inspections indicate non-compliance, Contractor shall be responsible for correcting, repairing, or replacing the deficiency at no additional cost to Engineer or National Grid.

C. Neither the presence of Engineer, nor any observations and testing performed by Engineer, nor failure to give notice shall excuse Contractor from defects discovered in Contractor's work.

1.6 SUBMITTALS

A. Product Data: Provide manufacturer product data (e.g., cut sheets, product data sheet, technical data sheet, order sheets, packing slips, etc.) submittals describing all materials specified in Part 2 of this Section to Engineer at least 10 days prior to performing that phase of the Work. Identify applicable products, models, size, options, and other data to communicate the product. As necessary supplement manufacturers' standard product data to provide information specific to this project.

B. Product Data: For each instrument indicated, provide product data, product certificates as applicable, spare parts information, calibration requirements, and operation and maintenance data.

C. Drawings: Provide as-built record drawings of all installed piping.

D. Product Data: For piping, valve, and instrument identification for the AS and SVE system. Provide product data on each type of identification material and include a listing of all pipes, valves, and instruments to be labeled. Identify the color, letter type and size, and frequency of labels.

E. Test Reports: Provide written results of pipe integrity testing of the SVE and AS pipelines. The reports shall document the pipelines tested, date and time tested, duration of test, and beginning and ending pressures or vacuums.

1.7 REFERENCES AND STANDARDS

A. The International Building Code with Massachusetts State Building Code amendments, 780 CMR, latest edition.

B. Code of the City of Haverhill, Chapter 120 (Building Construction).

C. Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926 - Occupational Safety and Health.

D. Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.)

E. NSF International/American National Standards Institute 14: Plastics Piping System Components and Related Materials.

F. Canadian Standards Association (CSA) B137 Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications.

G. Latest version of the American Society for Testing and Materials (ASTM) standards:

1. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

2. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

3. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

4. ASTM D2672 – Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement

5. ASTM D2665 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings

6. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems

7. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets.

8. ASTM D3965 - Standard Classification System and Basis for Specifications for Rigid Acrylonitrile-Butadiene-Styrene (ABS) Materials for Pipe and Fittings

PART 2 MATERIALS

2.1 SECTION INCLUDES

A. PVC Piping and Fittings – SVE System

B. ABS Piping and Fittings – AS System

C. Identification for Pipes, Valves, Instruments, and Equipment

2.2 PVC PIPING AND FITTINGS – SOIL VAPOR EXTRACTION SYSTEM

A. Piping and fittings for the SVE system shall be rigid 2-inch, 3-inch, 4-inch, and/or 6-inch interior diameter, Schedule 40 PVC as shown on the Drawings.

B. PVC pipe and fittings shall be constructed of rigid polyvinyl chloride compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784.

C. PVC Schedule 40 pipe and fittings shall be manufactured in strict accordance to the requirements of ASTM D1785 for physical dimensions and tolerances. PVC Schedule 40 pipe sizes 1-1/2" through 24" diameters shall also meet the requirements of ASTM D2665 Standard Specification for PVC plastic drain, waste and vent (DWV) pipe and shall be dual marked as such. Each production run of pipe manufactured in compliance to the standard, shall also meet or exceed the test requirements for materials, workmanship, burst pressure, flattening, and extrusion quality defined in ASTM D1785 and ASTM D2665 as applicable. All belled-end pipes shall have tapered sockets to create an interference-type fit, which meet or exceed the dimensional requirements and the minimum socket length for pressure-type sockets as defined in ASTM D2672. All PVC Schedule 40 pipe must also meet the requirements of NSF Standard 14 and CSA Standard B137.3 rigid PVC pipe for pressure applications and shall bear the mark of these Listing agencies.

D. PVC primer and glue shall be professional grade products compatible with the pipe and fittings and ASTM D2564. The primer shall be industrial grade designed to remove dirt, grease, grim, as well as soften the pipe surface to allow a fast, secure solvent weld. The glue shall be industrial grade and shall be designed to remove dirt, grease, grim, as well as soften the pipe surface to allow a fast, secure solvent weld.

2.3 ABS PIPING AND FITTINGS – AIR SPARGE SYSTEM

A. Sub-grade piping and fittings for the AS system shall be rigid 1-inch, 2-inch, or 3-inch interior diameter, Schedule 40 PVC as shown on the Drawings.

B. Above-ground piping and fittings for the AS system shall be rigid, 1-inch, 2-inch, or 3-inch diameter Duraplus Acrylonitrile Butadiene Styrene (ABS) pipe manufactured by IPEX USA. The pipe shall be Class D (180 psi at 73°F) or higher.

1. ABS pipe and fittings shall be manufactured from a copolymeric material conforming to a 43232 cell classification in accordance with ASTM D3965

2. Fittings shall be of the socket type, Class E (230 PSI at 73°F), designed for solvent welding as manufactured by IPEX. Fittings shall be designed and manufactured so that they withstand the continuous pressures applicable to the maximum pressure of the pipe.

3. All joints shall be made with Gray Duraplus ABS solvent cement and industrial MEK cleaner as manufactured by IPEX. The solvent cement shall be designed to withstand continuous applied pressures up to 230 psi at 73°F.

4. To ensure the full integrity of the completed system, all components shall be manufactured by IPEX.

C. Contractor's base bid shall include costs for all piping sizes, lengths, and required fittings per these Specifications and Drawings.

1. However, Contractor may provide an alternate bid with the use of alternate materials for the AS piping.

2. Any such alternate bid shall include all piping, coupling, fittings, etc. necessary to connect to 1-inch Schedule 40 PVC AS Wells. The bid shall provide sufficient information for Engineer to evaluate the material's ability to withstand pressure during AS system operation, and shall

describe the methods for pipe installation and joining. Alternate bids shall also include Contractor's experience with the material being proposed.

2.4 IDENTIFICATION FOR PIPES, VALVES, INSTRUMENTS, AND EQUIPMENT

A. Acceptable manufactures include Seton, Brady Corporation, and other as approved by Engineer.

B. Identification for Valves, Instruments, and Equipment Provided by Contractor:

1. Nameplates shall be 3" x 5" long, engraved plastic nameplates, 1/16" thick with a black background with white engraved letters similar to Seton Style JS0120. Nameplate shall have holes and/or pressure sensitive taped backing.

2. Nameplate shall contain the unit or equipment designation (valve ID, instrument name, etc.) and area or system served.

C. Identification for Piping Provided by Contractor:

1. Underground pipe markers: Install utility warning tape for all underground piping per the Trenching and Backfilling specification.

PART 3 EXECUTION

3.1 SECTION INCLUDES

A. General

B. Pipe Inspection

C. Below-Ground Pipe Installation

D. Above-Ground Pipe Installation

E. Pipe Integrity Testing

F. Identification For Pipes, Valves, Instruments, And Equipment

3.2 GENERAL

A. This section provides minimum requirements for pipe installation and testing.

B. All materials and/or equipment shall be installed per manufacturer's recommendations and instructions.

C. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, blower sizing, and other design considerations. Install piping as indicated on the Drawings unless deviations to layout are approved by Engineer.

D. Install piping such that any equipment connected to piping may be removed by disconnecting two (2) flanges or unions and removing only one or two pipe sections. All equipment shall have bolted or screwed flanges or unions at pipe connections.

E. Provide proper access to materials and equipment that require inspection, repair, service, or maintenance.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Clean piping (interior and exterior) of all cutting and trimming shavings, and other debris to ensure a clean finished piping system.

J. Cap and plug all openings in pipes during construction with suitable metal plugs or cap to keep out dirt and rubbish until equipment is connected.

K. Do not place plastic piping systems alongside steam or other high temperature pipelines or other high temperature objects.

L. Do not use unglued slip-fit fittings, because the pressure may cause the fittings to loosen.

M. Install piping without 90-degree elbows. For example, use two 45-degree elbows or four 22.5-degree elbows to make a 90-degree turn.

3.3 PIPE INSPECTION

A. Contractor is responsible for inspection of all pipe and fittings for defects prior to installation. Defective material shall not be utilized.

B. Contractor shall remove any section(s) of pipe placed, which are found to be out of alignment, defective, or damaged, and replace with no additional cost to Engineer or National Grid.

C. Pipe is to remain uncovered until inspected by Engineer.

3.4 BELOW-GROUND PIPING INSTALLATION

A. Lay pipes on uniform grades unless noted otherwise by Engineer.

B. Lay gravity flow pipe upgrade beginning at the lowest grade point.

C. Prevent pipe bedding and groundwater, surface water, backfill, or other debris from entering piping. Cap or temporarily cover open pipe ends and fittings during installation within trenches.

D. Install piping in suitable conditions. Pipe shall not be installed when trench conditions are unsuitable (i.e. water present in trench).

E. Use only approved cutting machine or cutting tool as recommended by the pipe manufacturer.

F. Install piping so that pipe deflection from line and grade shall not exceed deflection as allowed by the manufacturer and per the Drawings.

G. Join pipe in accordance with manufacturer's recommendation and ASTM standards and consistent with the specifications for above-ground pipe installation (see below).

H. Joined pipe shall be placed directly on the bedding as shown on the Drawings. Provide proper equipment and facilities per manufacturer's recommendations for lifting and lowering pipe sections into trench. Pipe shall not be dumped, pushed, dropped, or rolled into the trench.

3.5 ABOVE-GROUND PIPE INSTALLATION

A. Install piping so that pipe deflection from line and grade shall not exceed deflection as allowed by the manufacturer and per the Drawings.

B. Use only approved cutting machine or cutting tool as recommended by the pipe manufacturer.

C. Join pipe in accordance with manufacturer's recommendation and ASTM standards.

D. PVC Piping (SVE)

1. PVC joints shall be solvent cemented after cleaning with a PVC primer. PVC cement and primer shall be appropriate for the pipe and weather conditions.

2. All SVE piping shall be installed so that any condensate/water in the pipes returns to the SVE Wells.

a. In no case shall SVE piping have traps or bends that would allow water to accumulate and block air flow, nor shall it slope down from the well stick-up to the control header manifold.

E. ABS Piping (AS)

1. ABS piping and fittings shall be solvent cemented after cleaning the joining surfaces with the cleaner specified by the manufacturer.

2. Contractor shall not use solvent cement to join the Duraplus ABS to PVC. Where necessary, this transition shall be made through the use of flanges or threaded couplings, or as shown on the Drawings.

3. AS piping shall be installed level, or sloped toward the AS Wells.

F. Contractor shall provide adequate support and bracing on all above-ground piping to prevent bending, movement and/or low spots in the piping that can accumulate water and thereby restrict air flow.

1. At a minimum, one pipe support/hanger shall be installed for every 7 linear feet of piping.

2. Pipe shall also be supported at all branch ends and at all changes of direction.

3. Concentrated loads (i.e., valves and other appurtenances) shall be supported directly so as to eliminate high stress concentrations. Should this be impractical, then the pipe shall be supported immediately adjacent to the load.

4. Pipe hangers for interior horizontal header piping (between the control header manifolds and the remediation unit) shall provide as much bearing surface as possible.

G. Vertical piping shall be supported as shown on the Drawings to maintain correct pipe alignment and to prevent sagging or grade reversal.

3.6 PIPE INTEGRITY TESTING

A. This section describes Performance Testing, which shall be conducted on all installed piping in accordance with these Specifications, as well as Proof Testing, which may be conducted by the Contractor to confirm that joints are properly made. Proof Testing of sections of piping will not be accepted as a substitute for properly conducted Performance Testing of the entire line.

B. Performance Testing and Proof Testing must be witnessed by Engineer.

C. Contractor shall witness and verify all testing, and shall provide written documentation of Proof Testing and Performance Testing for each pipe to Engineer within two days of testing.

D. Piping shall not be handled or backfilled nor shall personnel be in close proximity to piping during pipe integrity testing.

E. Any and all piping, joints, valves, or fittings found defective during testing shall be repaired or replaced by the Contractor at no additional cost to Engineer.

F. Piping shall remain exposed to the extent practical until pipe integrity testing is completed.

G. Performance Testing of Schedule 40 PVC SVE Piping

1. Pipes to be tested shall be capped or plugged to permit leak testing. Ball valves shall be installed proximate to each SVE Well head (see Drawings) to facilitate Performance Testing of the SVE line to those points. A pressure-rated ball valve (e.g. brass) that can be closed to hold pressure in the line(s) being tested shall be installed in the discharge side of the test blower.

2. Pipe shall be pressurized with clean air. A pressure of 50 inches of water column (inches w.c.) shall be applied to each SVE line.

3. A minimum of one pressure gauge of appropriate range (e.g. 0-100 inches w.c.) shall be utilized.

4. Pipe shall be considered tight if there is less than 1 inch of w.c. of pressure drop after 30 minutes.

H. Performance Testing of ABS AS Piping

1. Pipes to be tested shall be capped or plugged to permit pressure testing. Ball valves shall be installed proximate to each AS Well head (see Drawings) to facilitate Performance Testing of the AS line to those points. A pressure-rated ball valve (e.g. brass) that can be closed to hold pressure in the line(s) being tested shall be installed in the discharge side of the test blower.

2. Pipe shall be pressurized with clean air. A pressure of 25 pounds per square inch (psi) shall be applied to each AS line.

3. A minimum of one pressure gauge of appropriate range (e.g., 0-50 psi) shall be utilized.

4. Pipe shall be considered tight if there is less than 1 psi pressure drop after 30 minutes.

I. Proof Testing of Piping

1. Proof Testing may be conducted on portions of piping primarily to confirm that joints are properly made.

2. For pipes that are to be buried, it is required that Proof Testing be performed prior to backfilling. Proof Testing may be completed in sections to permit backfilling. However, a complete line Performance Test must be performed for the line to be considered fully tested.

3. Proof Testing may be conducted under vacuum or pressure (at 50 inches w.c. for the SVE lines and at 25 psi for the AS lines).

4. Pipe shall be considered tight it there is less than 1 inch w.c. drop after 30 minutes for the SVE lines and less than 1 psi drop after 30 minutes for the AS lines.

3.7 IDENTIFICATION FOR PIPES, VALVES, INSTRUMENTS, AND EQUIPMENT

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion.

B. Install plastic pipe markers in accordance with manufacturer's Instructions.

C. Install plastic tape markers complete around pipe in accordance with manufacturer's instructions.

D. Install underground plastic pipe markers 6 to 8 inches below finished grade, and in horizontal alignment above buried pipe.

END OF SECTION

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TRENCHING AND BACKFILLING
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET, HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Related Sections

B. Description

C. Quality Assurance

D. Submittals

E. References and Standards

1.2 RELATED SECTIONS

A. Health and Safety Specification

B. Summary of Work Specification

C. Well Construction Specification

D. Piping Specification

E. Asphalt Paving Specification

1.3 DESCRIPTION

A. This section describes requirements for trenching and backfilling for Soil Vapor Extraction (SVE)/Air Sparge (AS) piping installation as shown on the Drawings, and restoration of the trenched areas. It also describes requirements for connection of SVE and AS Wells, and retrofitting of monitoring wells that were installed by Others.

1.4 QUALITY ASSURANCE

A. Engineer may perform testing and inspections in the field to check compliance of the Work and materials with the Specifications. In the event these tests or inspections indicate non-compliance, Contractor shall be responsible for correcting, repairing, or replacing the deficiency at no additional cost to Engineer or National Grid.

B. Contractor shall not place any fill or prepare any subgrades unless Engineer is present.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer product data (e.g., cut sheets, product data sheet, technical data sheet, order sheets, packing slips, etc.) submittals describing all materials specified in Part 2 of this

Section to Engineer at least 10 days prior to performing that phase of the Work. Identify applicable products, models, size, options, and other data to describe the product. As necessary, supplement manufacturers' standard product data to provide information specific to this project.

B. Imported Material: For each material specified below in Section 2, Contractor shall submit the following prior to delivery of any imported 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 imported material does not contain oil or hazardous material.

3. For sand fill, the certification shall include representative chemical testing data, no older than 6 months, for the following compounds:

a. Volatile organic compounds

b. Semi-volatile organic compounds

c. Petroleum Hydrocarbons

d. Pesticides and PCBs; and

e. Priority Pollutant Metals.

f. Chemical results on the imported materials shall meet the requirements of 310 CMR 40.1600. Specifically, concentrations of chemicals within the imported soils must be below the Reportable Concentrations of S1 (RCS1) soils. For 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 off-Site by Contractor at no cost to Engineer or National Grid.

g. Any on-Site materials or Work adversely impacted by the presence of contaminated imported materials shall be removed, replaced or repaired by Contractor at no cost to Engineer or National Grid.

4. Physical testing data shall also be provided for each imported material. Physical testing shall consist of the following:

a. The results of a grain-size analysis in accordance with ASTM D422 and a material classification in accordance with ASTM D2487.

1.6 REFERENCES AND STANDARDS

A. All work performed by Contractor shall be accomplished in accordance with all regulations and laws of local, State, and Federal agencies and utility companies.

B. The International Building Code with Massachusetts State Building Code amendments, 780 CMR, latest edition.

C. The Massachusetts Contingency Plan (MCP; 310 CMR 40.0000).

D. Occupational Safety and Health Administration (OSHA) Regulation 29 CFR Part 1926 - Occupational Safety and Health.

E. Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations" (Chapter 454 CMR 10.00 et. seq.)

F. Massachusetts Department of Public Safety – Excavation and Trenching Safety (520 CMR 14.00).

G. Code of the City of Haverhill, Chapter 120 (Building Construction) and Chapter 253 (Wetlands)

H. City of Haverhill Trench Permit requirements.

PART 2 MATERIALS

2.1 SECTION INCLUDES

A. Bedding and Backfill Materials

B. Utility Warning Tape

C. Concrete

2.2 BEDDING AND BACKFILL MATERIAL

A. Material excavated from the trenches is not expected to be suitable for reuse for bedding of piping. Some excavated material may be suitable for reuse as general trench backfill, with approval by Engineer.

B. Bedding and trench backfill shall be Sand Fill, which shall consist of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam or clay, surface coatings and deleterious materials. Sand fill shall conform to the gradation requirements provided in the MassHighway/MassDOT M1.04.0, Type a, as follows:

Sieve Size	Percent Passing by Weight
½ in.	100
¼ in.	90-100
No. 200	0-10

C. Material specifications and certificates, including results of geochemical testing, shall be submitted to Engineer for approval before use.

2.3 UTILITY WARNING TAPE

A. Permanent, detectable, colored, continuous-printed, vinyl tape.

B. Not less than 6 inches wide by 4 mils thick.

C. Manufactured for permanent direct-burial service.

D. Embedded continuous metallic strip or core.

E. Color and Wording: Blue tape with white lettering saying “Air Sparge” and Orange with black lettering saying “Soil Vapor Extraction” manufactured by Seton or approved alternative.

2.4 CONCRETE MIX

A. Concrete conforming to ASTM C94/C94M, having a minimum compressive strength of 4,000 PSI at 28 days.

2.5 ROAD BOXES

A. 12-inch diameter, bolt-down, flush-mounted road box.

PART 3 - EXECUTION

3.1 SECTION INCLUDES

A. General

B. Trenching

C. Material Stockpiling and Handling

D. Backfilling

E. Air Sparge Wellhead Completions

F. Soil Vapor Extraction Wellhead Completions

G. Monitoring Well Retrofitting

H. Restoration

3.2 GENERAL

A. Visit the Site to review all details of the Work and working conditions and to verify dimensions in the field including headroom and interferences from adjacent structures. Notify Engineer in writing of any discrepancy before performing any Work.

B. Consult official records of existing utilities, both surface and subsurface, and their connection, to be fully informed on all existing conditions and limitations as they apply to this Work and its relation to other Work.

C. Field-locate and protect existing underground and overhead utilities to remain within the proposed limits of trenching. If utilities are to remain in place, provide adequate means of protection during trenching and backfilling. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Engineer immediately for direction.

D. Field-locate and protect existing monitoring wells, piezometers, and SVE/AS Wells to remain in place.

E. Unless located within a fenced and secured area that is not accessible to the public, barricade open excavations as part of this work and clearly demarcate with caution tape, cones, or other flagging as necessary.

F. Work may encounter MGP-related subsurface contamination and/or former MGP infrastructure. Contractor personnel shall meet the training requirements established by the Health and Safety Specification, and shall manage all excavated material per these Specifications. If subsurface obstructions are encountered, Contractor shall notify Engineer and, upon approval, shall remove or penetrate the obstructions as necessary to complete the Work.

G. Perform all excavation to the depths and extent indicated on the Drawings for the proper installation of the Work. Do not excavate beyond the limits necessary to complete the work shown on the Drawings unless pre-approved by Engineer.

H. Contractor shall perform the Work in a manner to maintain the stability of structures and utilities adjacent to the Work, insofar as structures or utilities may be jeopardized by excavation or associated Contractor operations. Protect structures, utilities, pavements, walls, and other facilities from damage caused by settlement, lateral movement, undermining, dust, washout and other hazards created by trenching operations. Contractor shall repair damage resulting from excavation or other construction activities in support of the Work to the original condition prior to damage, and repair to a condition approved by Engineer. Engineer and National Grid will bear no costs associated with damage to, and subsequent repair of, such structures and utilities.

I. Unless otherwise specified, all concrete and other debris resulting from work to repair damage caused by Contractor shall be removed from the site and disposed of at a permitted facility approved by Engineer and National Grid.

J. Dust control shall be provided and implemented during all saw-cutting and jackhammering activities.

3.3 TRENCHING

A. Trenches for pipes shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe.

B. In general, trenches shall be excavated a minimum of two to three inches below the bottom of the piping to accommodate bedding material.

C. If soft or unsuitable material is encountered below the normal bedding of the pipe, Engineer shall be notified to evaluate the need for over excavation to prevent settlement or for other reasons.

D. During each workday, soil from the trenches may be temporarily stockpiled on a minimum of two layers of 6-mil polyethylene sheeting in the vicinity of the trench. At the end of each workday, soil from any temporary stockpiles shall be re-located to the soil stockpile area and managed in accordance with the Summary of Work specification.

3.4 BACKFILLING

A. After pipe and fittings have been inspected, pressure tested, and approved by Engineer, sand fill shall be carefully placed and tamped in 6-inch layers under, around, and one foot over the pipe to ensure a uniform bearing surface and to prevent lateral movement of the pipe.

B. The remainder of the trench shall be backfilled to the asphalt sub-base elevation and compacted to achieve 95% standard proctor density. (Note field density testing by the Contractor is not required; field density testing may be performed by Engineer.) Backfill shall be compacted using multiple passes with a hand tamper, roller, or approved equal.

C. Utility warning tape shall be installed along centerline of all buried piping to facilitate future location of trenching and piping.

D. Any AS or SVE Wellheads located within the trenches shall be completed in accordance with the requirements of this Specification (see below) and Drawings.

3.5 AIR SPARGE WELLHEAD COMPLETION

A. One AS Well (AS-1) consisting of 1" Schedule 40 PVC has been installed by Others at the location shown on the Drawings.

1. The AS Well was installed by Others within asphalt. As needed, the asphalt around the well was cut by Others.

B. Additional AS Wells are to be installed at the locations shown on the Drawings in accordance with the Well Construction Specification.

C. Contractor shall be responsible for furnishing labor, materials, and equipment for completing each AS Wellhead and connecting the AS Well piping as shown on the Drawings.

1. Contractor shall excavate soil and cut each AS Well riser pipe as necessary to connect the AS piping material to the AS Well per the Drawings.

2. Contractor shall then fill the opening around the PVC piping with sand fill and complete with flush-mounted Road Box per these Drawings and Specifications.

3.6 SOIL VAPOR EXTRACTION WELLHEAD COMPLETION

A. One SVE Well (SVE-1) consisting of 4" Schedule 40 PVC was installed by Others at the location shown on the Drawings. In addition to connecting SVE piping to this well, Contractor shall also be responsible for furnishing labor, materials, and equipment to complete the well piping as shown on the Drawings.

1. The SVE Well was installed by Others within asphalt. As needed, the asphalt around the well was cut by Others.

2. Contractor shall verify that the bentonite seal above the well screen at SVE-1 has not been disturbed. If the bentonite seal shows signs of damage or disturbance, Contractor shall replace with a grout seal in accordance with the Well Construction specification.

B. Additional SVE Wells are to be installed at the locations shown on the Drawings in accordance with the Well Construction Specification.

C. Contractor shall be responsible for furnishing labor, materials, and equipment for completing each SVE Wellhead and connecting the SVE Well piping as shown on the Drawings.

1. Contractor shall excavate soil and cut each SVE Well riser pipe as necessary to connect the SVE piping material to the SVE Well per the Drawings.

2. Contractor shall then fill any voids around the PVC piping with sand fill and complete with flush-mounted Road Box per these Drawings and Specifications.

3.7 MONITORING WELL RETROFITTING

A. Up to 20 monitoring wells at the Site will require retrofitting to accommodate potential subsurface pressures due to operation of the AS system. Contractor shall furnish labor, new fittings, and equipment to retrofit these wells as shown below.

B. Contractor shall protect the existing wells from damage and from soil and debris entering the well while conducting modifications.

C. Contractor shall cut, as necessary, the existing well riser to accommodate the new fittings to be installed on the top of casing. The amount (length) cut from each monitoring well shall be documented (including well identification) and communicated to Engineer.

D. Contractor shall furnish and install the new fittings as shown in the Drawings.

E. Contractor shall install the replacement well cover and grout the cover frame into the existing concrete pad. The cover shall be flush with the top of the existing concrete pad.

3.8 RESTORATION

A. Contractor shall be responsible for surface restoration and, where applicable, establishment of restored surfaces (e.g., asphalt, stone, sod, plantings, etc.) once the temporary erosion and sediment controls are removed.

B. Pavement restoration shall be performed in accordance with these Specifications. Restoration of pavement areas shall be between the continuous limits of the asphalt pavement removed to accommodate the Work as shown on the Drawings. Final pavement shall be restored within these areas as well as within areas where ancillary damage has occurred to paved surfaces resulting from the Work operations. The definition of these damaged areas in need of replacement shall be at the sole discretion of the Engineer. New pavement shall match existing limits of pavement at straight seams cut perpendicular to the direction of vehicle traffic. Unless otherwise specified on the Drawings, the restored pavement surfaces shall not exceed the area of pavement currently existing within the Limits of Work.

END OF SECTION

ASPHALT PAVING
SOIL VAPOR EXTRACTION/AIR SPARGE SYSTEM INSTALLATION
284 WINTER STREET, HAVERHILL, MASSACHUSETTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Description

B. References and Standards

C. Quality Assurance

D. Submittals

E. Line and Grade Control

1.2 DESCRIPTION

A. Contractor shall supply all labor, equipment, supplies, and materials to complete the Work, including but not be limited to:

1. Installation of bituminous concrete paving as shown on the Drawings and as described herein.

2. Installation of permanent and temporary pavement markings, as shown on the Drawings and as described herein.

3. Contractor shall be responsible for the restoration of all other bituminous concrete surfaces that are damaged during the performance of the Work at no additional cost to the Owner.

1.3 REFERENCES AND STANDARDS

A. Latest version of the Commonwealth of Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

B. Asphalt Institute Publication MS-22, Construction of Hot Mix Asphalt Pavements, Chapter 5.

C. Latest version of the American Society of Testing Materials (ASTM) standards:

1. ASTM D2950 – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods.

2. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

D. Latest version of the American Association of State Highway and Transportation Officials (AASHTO) standards:

1. AASHTO M140 – Emulsified Asphalt Particle Size Analysis of Soils

2. AASHTO M156 – Requirements for Mixing Plants for Hot Mixed, Hot Laid Bituminous Paving Mixtures

3. AASHTO M173 - Standard Specification for Concrete Joint-Sealer, Hot-Poured Elastic Type

4. AASHTO T209 – Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures

5. AASHTO T245 - Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Retain services of a firm experienced in manufacturing asphalt top and binder course products.

B. Regulatory Requirements:

1. Comply with applicable provisions and recommendations of the following:

2. Commonwealth of Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges

C. Bituminous concrete materials shall not be placed until the Engineer has inspected and approved the sub-base.

D. Weather Conditions:

1. Bituminous concrete materials shall not be placed when the ambient temperature is below 40° Fahrenheit, or when there is frost in the sub-base, or at any other time when weather conditions are unsuitable.

E. Quality Assurance Testing:

1. Submit for each daily mix batch the following information:

a. Project identification name and number (if applicable).

b. Date of test report.

c. Tests of gradation for compliance with the Contract Documents.

d. Daily Plant Marshall Density Value in accordance with AASHTO T245

1.5 SUBMITTALS

A. Action Submittals:

1. Product Data:

a. No later than 30 days prior to asphalt paving work, Contactor shall submit technical information on the materials proposed for use to meet the requirements of this Section. At a minimum, the submittal shall include the following:

1) Mix design and finished thickness application for Binder Course.

2) Mix design and finished thickness application for Top Course.

3) Description of procedures for application and compaction of each course.

4) List of proposed equipment.

5) Safety Data Sheets for all chemicals.

B. Informational Submittals:

1. Qualifications Statements:

a. Testing Laboratory: With bid, submit name and qualifications of testing laboratory to be employed, and qualifications of testing laboratory's personnel that will perform quality assurance and field quality control testing required in this Section. If more than one laboratory will be employed, submit qualifications statement for each laboratory and indicate scope of testing assigned to each.

2. Source Quality Control Submittal:

a. Not less than 14 days prior to material shipment to Site, submit suppliers name, source address, and proof of MassDOT approval, as required, for each mix.

3. Delivery Tickets:

a. Submit copy of delivery ticket for each load of top course and base course delivered to the Site. Each delivery ticket shall indicate supplier’s name and source address, project name, contract number, date, material type, and quantity delivered. Include in Daily Activity Reports.

4. Pavement Markings:

a. Product Data: Not less than 30 days prior to implementation, Contractor shall submit product data on the pavement marking materials in accordance with Paragraph 2.6 of this Section.

b. Shop Drawings: Submit drawings showing planned layout of pavement markings no less than 30 days prior to implementation.

1.6 LINE AND GRADE CONTROL

A. Grade tolerances for the bituminous concrete shall be as follows:

1. Horizontal tolerance: 0.05 feet

2. Vertical tolerance: 0.01 feet

PART 2 MATERIALS

2.1 SECTION INCLUDES

A. Binder Course

B. Top Course

C. Tack Coat

D. Joint Sealant

E. Pavement Markings

2.2 BINDER COURSE

A. Coarse and fine aggregate materials shall be combined to produce the Binder Course materials.

B. Binder Course shall meet the requirements of SUPERPAVE Base Course – 19.5. The Base Course shall meet the requirements of Subsection 460 – Hot Mix Asphalt Pavement for Local Streets in MassDOT Standard Specification for Highways and Bridges.

2.3 TOP COURSE

A. Coarse and fine aggregate materials shall be combined to produce the Top Course materials.

B. Top Course shall meet the requirements of SUPERPAVE Surface Course 12.5 per Subsection 460 – Hot Mix Asphalt Pavement for Local Streets in MassDOT Standard Specification for Highways and Bridges.

2.4 TACK COAT

A. Tack Coat shall conform to the requirements of M3.03.0 of the MassDOT Standard Specification for Highways and Bridges and shall be one of the following materials:

1. Tack coat shall be Liquid Asphalt (RC-70), Grade 1 Emulsified Asphalt (RS-1) or Asphaltic Cement (AC-20).

2.5 JOINT SEALANT

A. Joint sealant for asphalt surfaces shall consist of a hot poured joint sealing compound and shall meet the requirements of M3.05.4 of the MassDOT Standard Specification for Highways and Bridges.

2.6 PAVEMENT MARKING

A. Contractor shall furnish and install pavement markings in accordance with the Commonwealth of Massachusetts, Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (2022 edition).

PART 3 EXECUTION

3.1 SECTION INCLUDES

A. Saw Cutting

B. Removal

C. Bituminous Concrete

D. Field Quality Control

E. Pavement Markings

3.2 SAW CUTTING

A. Contractor shall lay out the limits of the existing pavement, sidewalks, and curbing to be cut in the field and shall saw cut in a neat, clean, and uniform manner.

B. Jack hammer cutting is not a substitute for saw cutting.

C. Bituminous concrete shall not be placed on any wet surface, or when weather conditions otherwise prevent the proper handling or finishing of the bituminous mixtures.

3.3 REMOVAL

A. Contractor shall remove existing paving, sidewalks, and curbing as noted on the plans and within the saw cut limits. All removed materials shall be handled and disposed of in accordance with these Specifications.

B. Limits of demolition are shown on the Drawings and may be revised by the Engineer upon field review.

C. Unless prior approval is granted by the Engineer, removal beyond the limits shown on the Drawings will be considered as for the Contractor's convenience and will be at the Contractor's expense. Filling and installation of bituminous concrete paving in areas beyond limits of demolition shown on the Drawing will be done at the Contractor's expense.

3.4 BITUMINOUS CONCRETE

A. Preparation:

1. Contractor shall place MassDOT Dense Grade Crushed Stone for Sub-base (Section M2.01.7).

2. Contractor shall tack coat the vertical saw cut edge where new bituminous pavement will abut existing pavements. Tack coat shall be applied by brush or spray to contact bituminous surfaces at a rate between 0.05 and 0.15 gallons per square yard of surface.

3. After sub-base has been prepared, the Contractor shall check all frames, covers, boxes, and other miscellaneous castings located in the proposed pavement to ensure they are accurately positioned and set to the proper slope and elevation. All covers and grates shall be set flush with finished pavement surfaces.

B. Paving

1. General: Place bituminous concrete mixture on prepared surface free from standing water. The minimum surface temperature of the base shall be 60°F when only one roller is used for breakdown rolling (15 minutes) or 40°F when two rollers are used (8 minutes). Spread mixture at minimum temperature of 275°F. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and appropriate thickness to yield required minimum depth after rolling.

2. Under no circumstance shall mixture be placed on materials containing frost or that have a surface temperature less than the requirements listed above.

3. Place bituminous concrete in widest strip practical. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Courses shall be placed in approximately equal layers not exceeding 3 inches in depth after compaction. Care shall be taken to match abutting pavements in elevation and grade with a smooth transition.

4. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining Work. Construct joints to have same texture, density and smoothness as other sections of bituminous concrete course. Clean contact surfaces and apply tack coat. The longitudinal joint in one layer shall offset the joint in the layer immediately below by 12 inches.

5. Begin rolling with a steel-wheeled roller when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

6. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling with hot material.

7. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is still hot. Continue second rolling until mixture has been thoroughly compacted.

8. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent maximum density.

9. Remove and replace paving areas mixed with foreign materials or otherwise defective. Cut-out such areas and fill with fresh, hot bituminous concrete. Compact by rolling to maximum surface density and smoothness.

10. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened (minimum of 72 hours). Erect temporary barricades to protect paving from traffic until mixture has cooled enough not to become marked.

11. Apply joint sealant on all joints between existing and new pavement. Joint sealant shall be applied per manufacturer's and industry standards.

3.5 PAVEMENT MARKINGS

A. Contractor shall furnish and install pavement markings in accordance with the Commonwealth of Massachusetts, Massachusetts Department of Transportation Standard Specifications for Highways and Bridges (2022 edition).

B. Layout: Snap chalk lines for all parking stalls and crosswalks prior to painting, ensuring accuracy of layout, parallel alignment as appropriate and straight lines. Review layout with Engineer and Owner before painting.

C. Pavement markings shall be performed with materials consistent with those used on other areas of the property and the layout of pavement markings shall be consistent with pre-construction.

D. All equipment for the application pavement markings shall be of standard commercial manufacture.

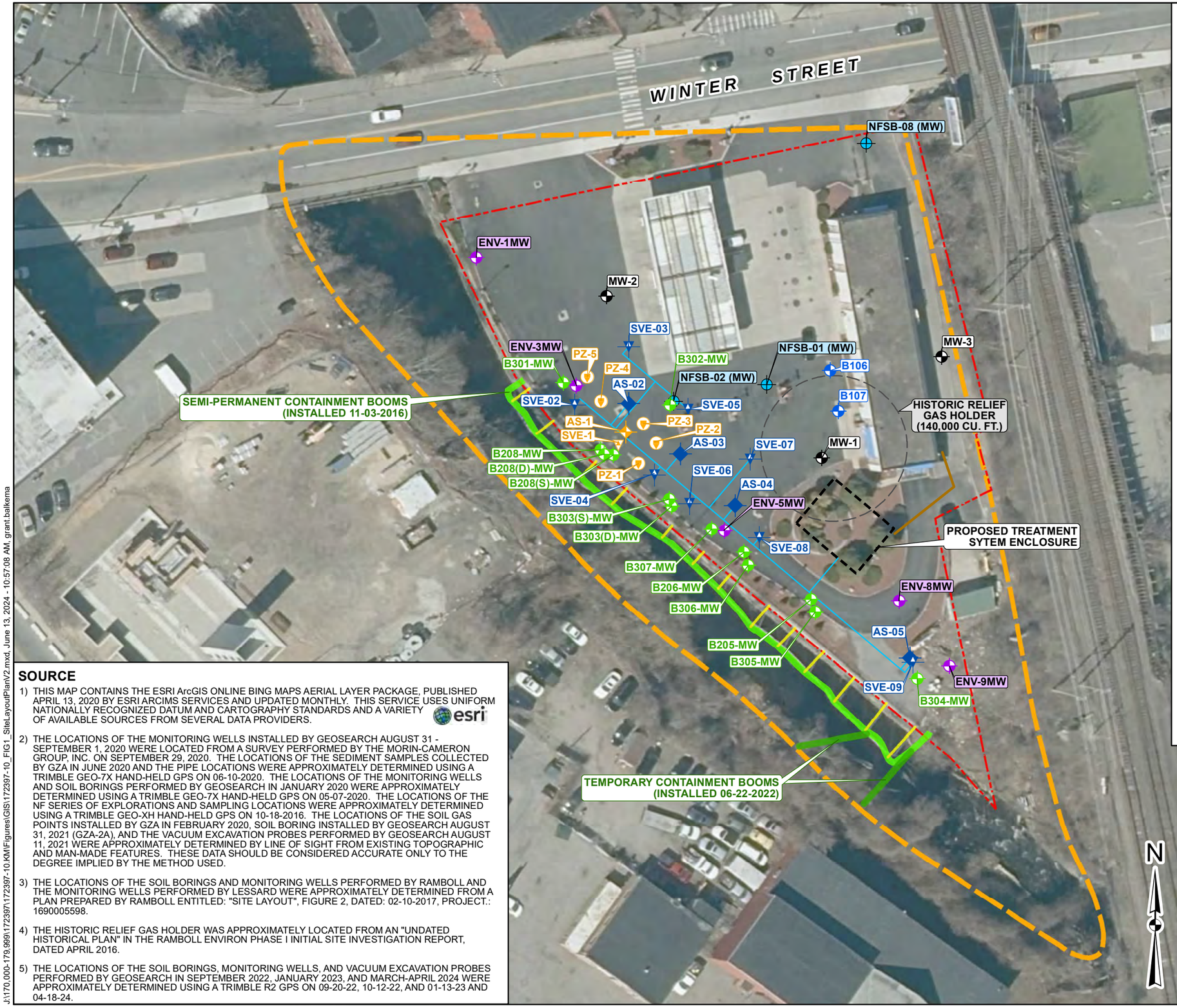
E. Thoroughly clean all surfaces to be marked before application of paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement with scrapers, wire brushings, sandblasting, or mechanical abrasion.

F. Markings shall be applied only in seasonable weather and in accordance with good painting practices and in accordance with the paint manufacturer's recommendations. Do not spray when wind will cause overspray. Correct any unacceptable line painting, as directed, providing Engineer with an appropriate solution proposal in writing for his review.

G. Markings shall remain protected until sufficiently dry.

END OF SECTION

\\GZANOR\Jobs\170,000-179,999\172397\172397-10.KM\Specifications\June 2024 Specifications\2024-06-13 aphalt paving_Haverhill.docx



SOURCE

1) THIS MAP CONTAINS THE ESRI ArcGIS ONLINE BING MAPS AERIAL LAYER PACKAGE, PUBLISHED APRIL 13, 2020 BY ESRI ARCIMS SERVICES AND UPDATED MONTHLY. THIS SERVICE USES UNIFORM NATIONALLY RECOGNIZED DATUM AND CARTOGRAPHY STANDARDS AND A VARIETY OF AVAILABLE SOURCES FROM SEVERAL DATA PROVIDERS.

2) 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.

3) 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.: 1690005598.

4) 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.

5) THE LOCATIONS OF THE SOIL BORINGS, MONITORING WELLS, AND VACUUM EXCAVATION PROBES PERFORMED BY GEOSEARCH IN SEPTEMBER 2022, JANUARY 2023, AND MARCH-APRIL 2024 WERE APPROXIMATELY DETERMINED USING A TRIMBLE R2 GPS ON 09-20-22, 10-12-22, AND 01-13-23 AND 04-18-24.

LEGEND

EXISTING EXPLORATIONS

- 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, JANUARY 13, 2023, AND MARCH-APRIL 2024 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
- MONITORING WELL INSTALLED BY GEOSEARCH JANUARY 21-23, 2020 AND OBSERVED BY GZA

PROPOSED PHASE 4 EXPLORATIONS

- AS WELL (TO BE INSTALLED)
- SVE WELL (TO BE INSTALLED)
- PROPOSED AS-SVE PIPING
- REROUTED ELECTRICAL LINE
- PROPERTY BOUNDARY AS RECORDED ON ALTA/ACSM LAND TITLE SURVEY PLAN PERFORMED BY MHF DESIGN CONSULTANTS FEBRUARY 12, 2015
- DISPOSAL SITE BOUNDARY

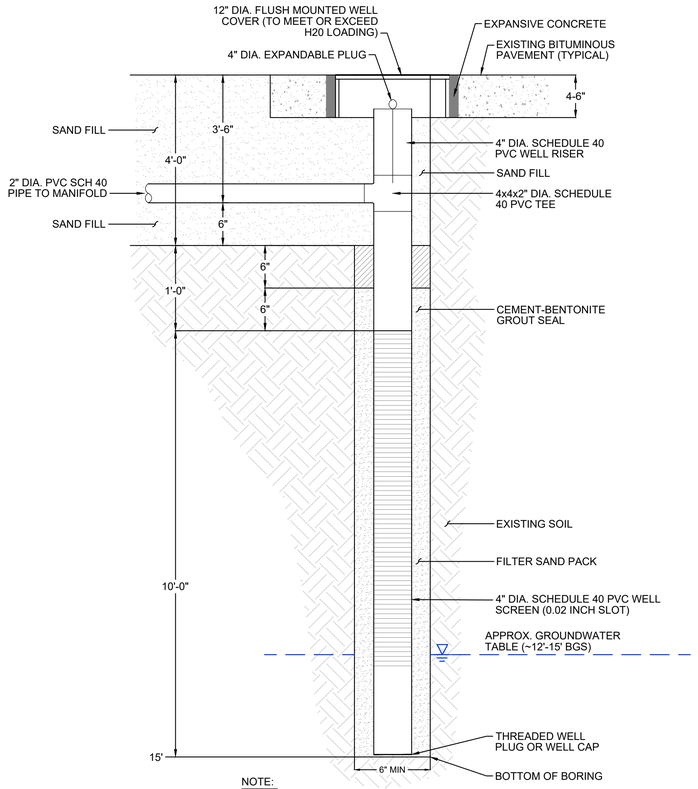
0 25 50 100
SCALE IN FEET

AIR SPARGE/SOIL VAPOR EXTRACTION SYSTEM
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

SITE LAYOUT PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: JAI	REVIEWED BY: CAL	CHECKED BY: CAL	FIGURE 1
DESIGNED BY: AIF	DRAWN BY: GWB	SCALE: 1 " = 50 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_FIG1_SiteLayoutPlanV2.mxd, June 13, 2024 - 10:57:08 AM, grant.balkema

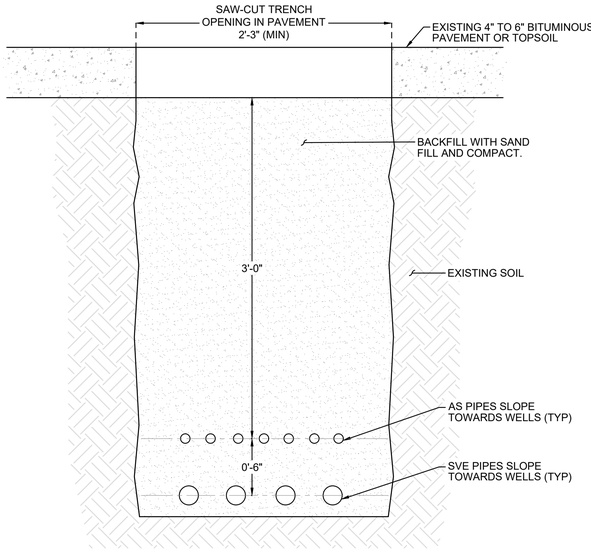


NOTE:

DEPTH OF BORING AND SCREEN INTERVAL MAY BE ADJUSTED DUE TO SOIL AND GROUNDWATER CONDITIONS ENCOUNTERED DURING INSTALLATION.

TYPICAL SVE WELL DETAIL WITH TRENCH

NOT TO SCALE

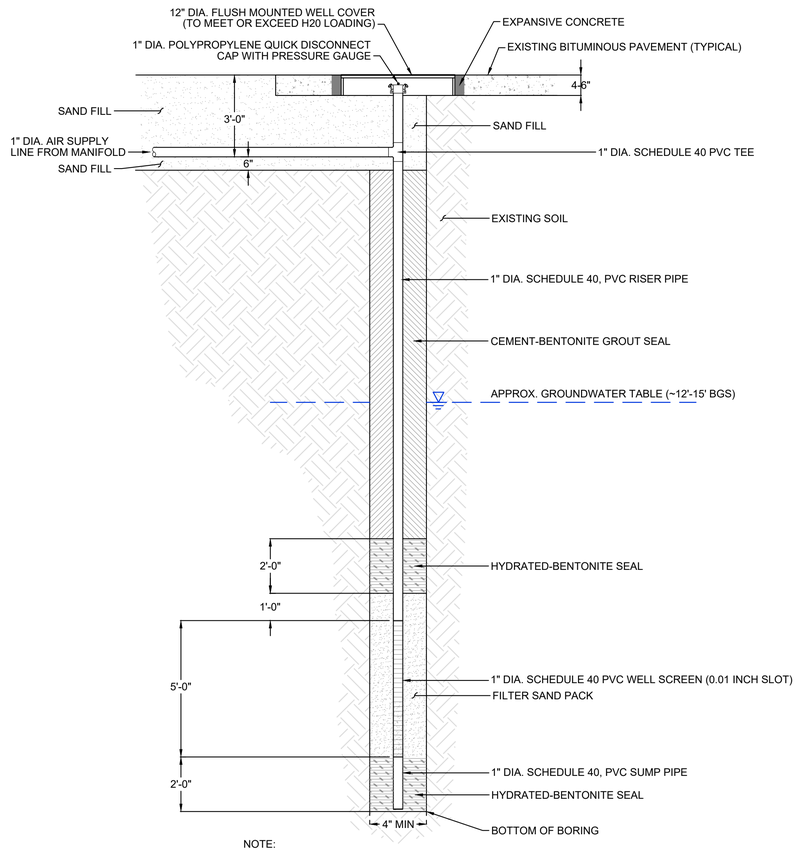


NOTES:

1. CONTRACTOR TO PROVIDE DUST AND WATER CONTROL FOR ALL SAW-CUTTING OPERATIONS.

TYPICAL TRENCH DETAIL

NOT TO SCALE

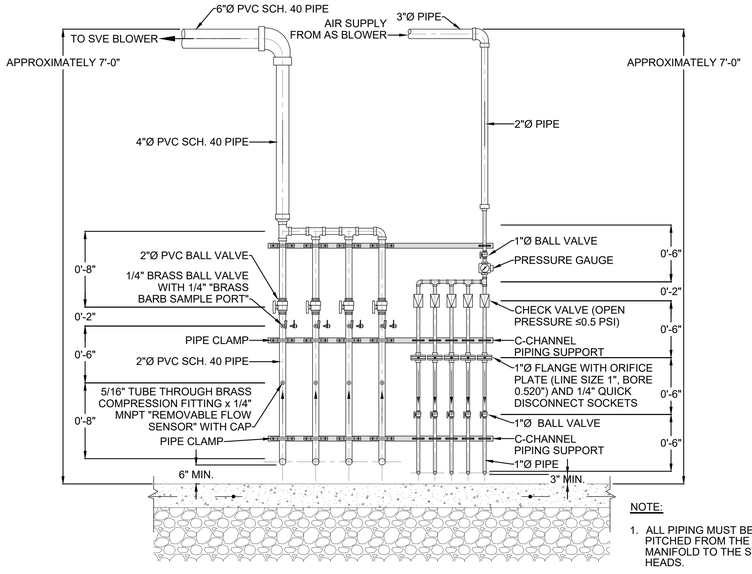


NOTE:

DEPTH OF BORING AND SCREEN INTERVAL MAY BE ADJUSTED DUE TO SOIL AND GROUNDWATER CONDITIONS ENCOUNTERED DURING INSTALLATION.

TYPICAL AS WELL DETAIL WITH TRENCH

NOT TO SCALE

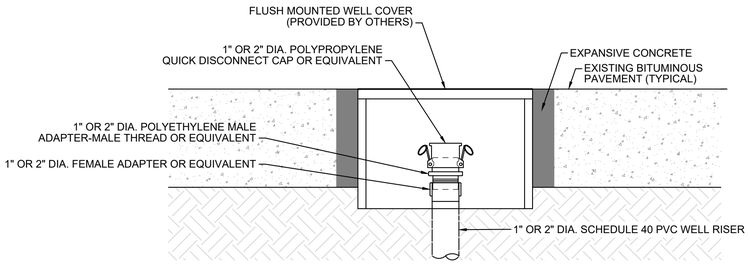


NOTE:

1. ALL PIPING MUST BE LEVEL OR PITCHED FROM THE PIPING MANIFOLD TO THE SVE/AS WELL HEADS.

TYPICAL AS/SVE PIPING MANIFOLD

NOT TO SCALE



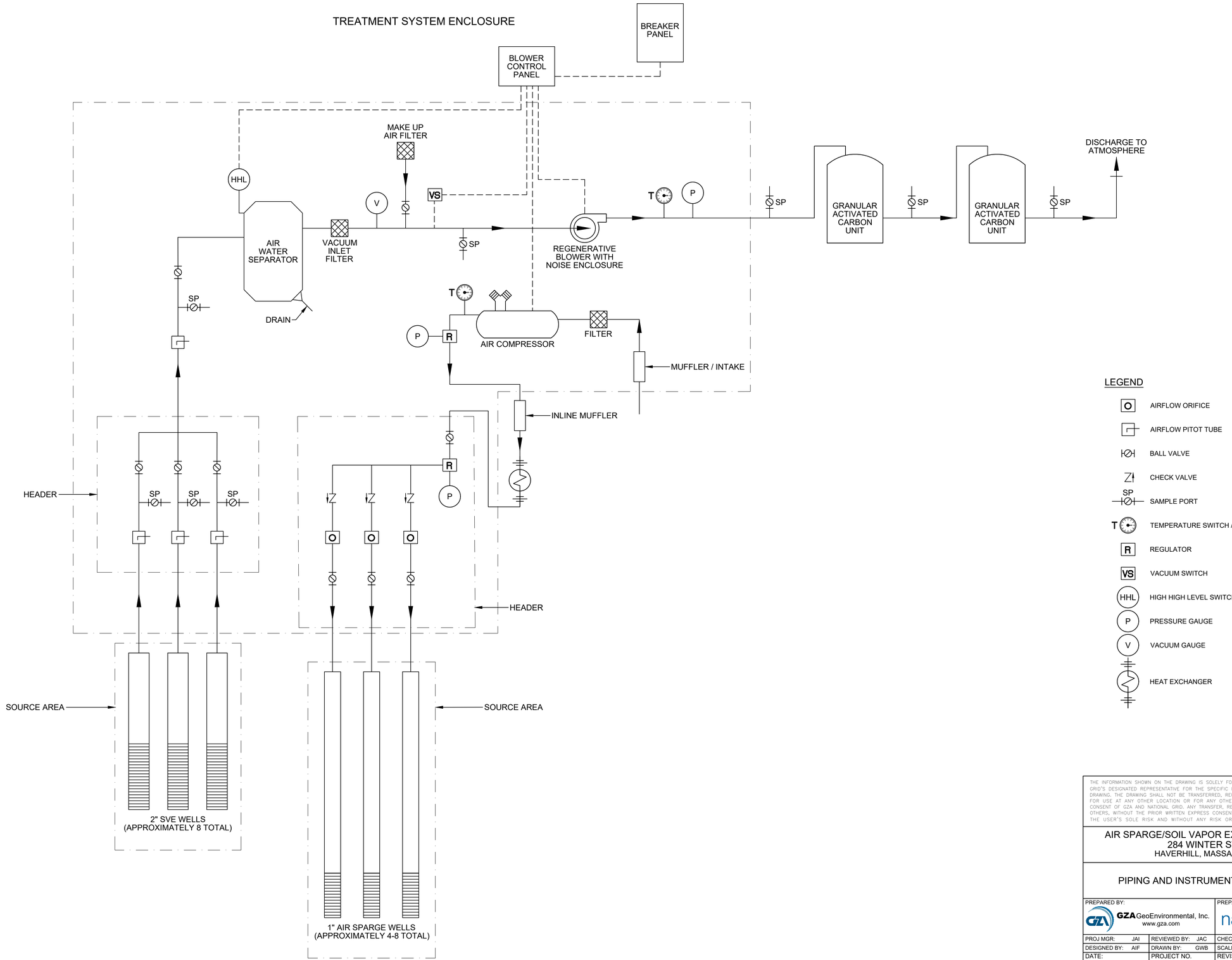
MONITORING WELL RETROFIT DETAIL

NOT TO SCALE

AIR SPARGE/SOIL VAPOR EXTRACTION SYSTEM
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

SVE/AS SYSTEM DETAILS

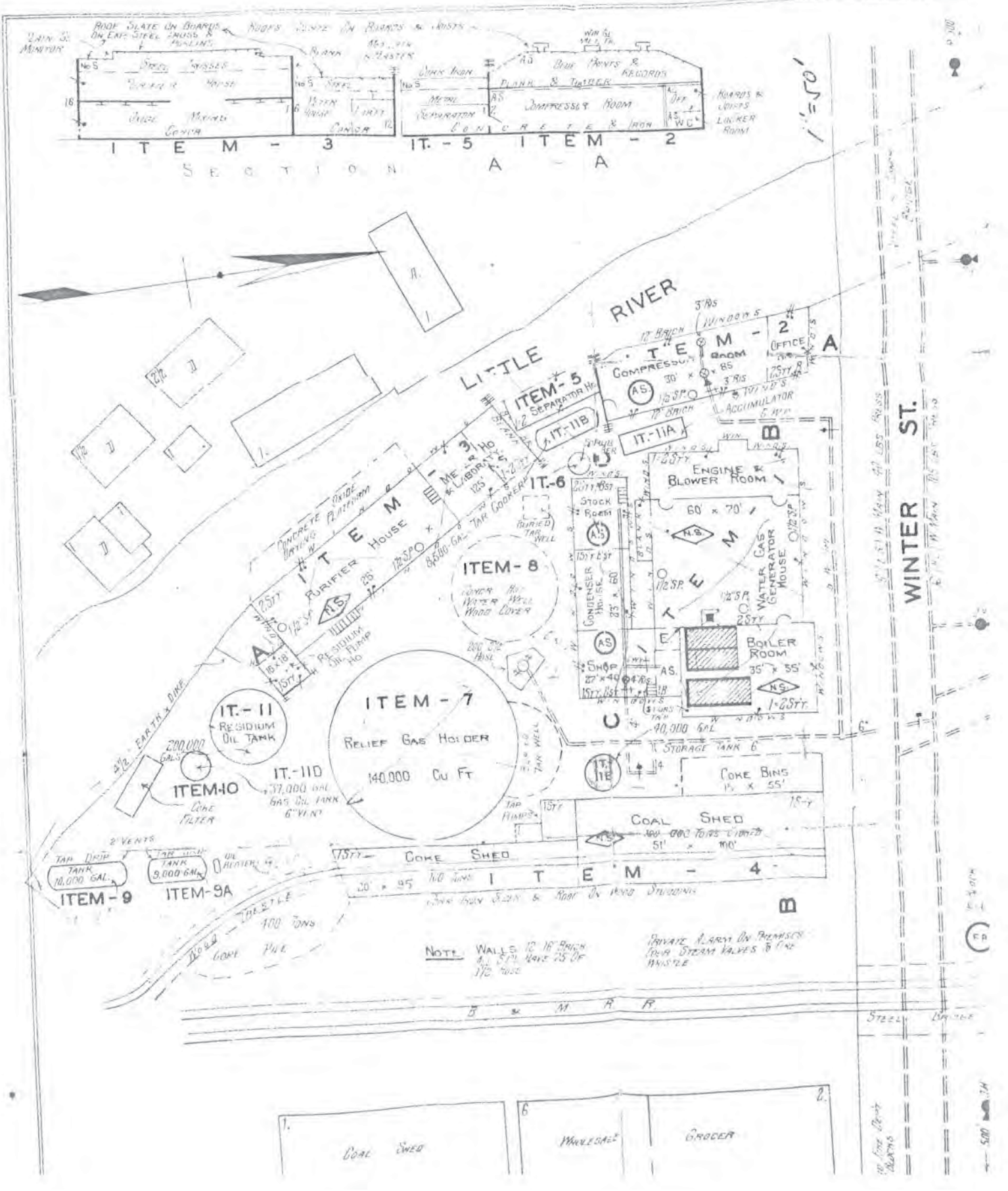
PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. www.gza.com		nationalgrid	
PROJ MGR: JAI	REVIEWED BY: JAC	CHECKED BY: CAL	FIGURE 2
DESIGNED BY: AIF	DRAWN BY: GWB	SCALE: AS SHOWN	
DATE: 06/13/2024	PROJECT NO. 01.0172397.10	REVISION NO.	



AIR SPARGE/SOIL VAPOR EXTRACTION SYSTEM
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

PIPING AND INSTRUMENTATION DIAGRAM

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: nationalgrid	
PROJ MGR: JAI	REVIEWED BY: JAC	CHECKED BY: CAL	FIGURE 3
DESIGNED BY: AIF	DRAWN BY: GWB	SCALE: NOT TO SCALE	
DATE: 06/13/2024	PROJECT NO. 01.0172397.10	REVISION NO.	


ITEM - 3
IT. - 5
ITEM - 2
SECTION A - A
1" = 50'
LITTLE RIVER
WINTER ST.
ITEM - 5
SEPARATOR Hs
IT. - 11B
IT. - 11A
ITEM - 2
OFFICE
COMPRESSOR ROOM
ACCUMULATOR
ENGINE & BLOWER ROOM
60' x 70'
STOCK ROOM
ITEM - 3
PURIFIER HOUSE
IT. - 6
BURIED TAR WELL
ITEM - 8
LOWER GAS WATER WELL WOOD COVER
WATER GAS GENERATOR HOUSE
CONDENSER HOUSE
SHOP
BOILER ROOM
35' x 55'
IT. - 11
RESIDUUM OIL TANK
200,000 GALS
ITEM - 7
RELIEF GAS HOLDER
140,000 Cu Ft
40,000 GAL
STORAGE TANK 6
IT. - 11D
37,000 GAL GAS OIL TANK
ITEM - 10
COKE FILTER
COKE BINS
COAL SHED
COKE SHED
ITEM - 4
ITEM - 9
TANK 10,000 GAL.
ITEM - 9A
TANK 9,000 GAL.
OIL HEATER
B & M R.R.
NOTE
PRIVATE ALARM ON PREMISES
FOUR STEAM VALVES & ONE WATER
COAL SHED
WHOLESALE
GROCER

HAGER-RICHTER
GEOSCIENCE, INC.

GEOPHYSICAL SURVEY
284 WINTER STREET
HAVERHILL, MASSACHUSETTS

Prepared for:

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

Prepared by:

Hager-Richter Geoscience, Inc.
8 Industrial Way - D10
Salem, New Hampshire 03079

File 16MH09
October, 2016

HAGER-RICHTER
GEOSCIENCE, INC.

CONSULTANTS IN GEOLOGY AND GEOPHYSICS
8 INDUSTRIAL WAY - D10
SALEM, NEW HAMPSHIRE 03079-5820
TELEPHONE (603) 893-9944
FAX (603) 893-8313

October 10, 2016
File 16MH09

Jason R. Chrzanowski
Project Manager
GZA GeoEnvironmental, Inc.
249 Vanderbilt Avenue
Norwood, Massachusetts 02062

Office: 781-278-5816
Direct: 781-223-0160
Email: jason.chrzanowski@gza.com

RE: Geophysical Survey
284 Winter Street
Haverhill, Massachusetts

Dear Mr. Chrzanowski:

In this report, we summarize the results of a geophysical survey conducted by Hager-Richter Geoscience, Inc. (H-R) at the above referenced site in Haverhill, Massachusetts for GZA GeoEnvironmental, Inc. (GZA) in September, 2016. The scope of the survey and the area of interest were specified by GZA.

INTRODUCTION

The site is an active Haffner's gasoline service station and car wash located at 284 Winter Street in Haverhill, Massachusetts. The general location of the site is shown on Figure 1. According to information provided by GZA, the property was formerly a MGP site from 1852 to 1975, and some of the related infrastructure could be present in the subsurface. GZA requested a geophysical survey to detect, and if detected, to locate subsurface utilities and former MGP related infrastructure in the accessible exterior portions of the site.

The area of interest (AOI) for the geophysical survey was specified by GZA to be the accessible exterior portions of the approximately 1.2 acre property. Six known underground storage tanks, pump islands, concrete pads, a fuel sales kiosk, and a car wash are currently present at the site. The ground surface was dominantly asphalt and concrete paved, with curbed landscape islands.

OBJECTIVES

The objectives of the geophysical survey were to detect, and if detected, to determine the location of: 1) possible subsurface utilities, and 2) former MGP related infrastructure that could be present in the accessible exterior portions of the Site.

THE SURVEY

Jeff Reid, P.G. and Steven Grant, P.G., of Hager-Richter conducted the geophysical survey on September 15, 2016. The project was coordinated with Mr. Jason R. Chrzanowski, of GZA. Mr. Andrew Sargent, also of GZA, was present for the field work and specified the area of interest. Photograph 1 shows representative field conditions.

Photograph 1. View to the southeast. Representative conditions at the site.

The geophysical survey was conducted using a combination of geophysical methods: time domain electromagnetic induction metal detection (EM61), ground penetrating radar (GPR), and precision utility location (PUL).

EM61 data were acquired at approximately 8-inch intervals along lines spaced 5 feet apart across the accessible portions of the AOI. The EM61 metal detection survey detects buried metal. However, the EM61 method cannot provide information on the type of objects causing an EM61 anomaly. The GPR survey was conducted along traverses oriented in two mutually perpendicular directions, with lines spaced no more than 5 feet apart across the accessible portions of the specified AOI. The GPR method is capable of detecting both metal and nonmetal objects. The PUL method was used to search for subsurface metallic utilities in the accessible portions of the specified AOI by searching for signals from active electric lines and by tracing signals induced by direct connections to accessible utility structures such as light poles and valves.

EQUIPMENT

EM61. The time domain electromagnetic induction 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 USTs, drums, and utilities. 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 Geophysical Survey Systems, Inc. UtilityScan DF digital dual-frequency system using both 300 MHz and 800 MHz antennas with 68 ns and 23 ns time windows, respectively. The UtilityScan DF system acquires data with the two antennas simultaneously, allowing for more rapid surveying without decreasing data density or quality.

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 7.4 GPR processing software from Geophysical Survey Systems, Inc. We reviewed profile images and created plan view time slice maps of the GPR data.

PUL. The PUL survey was conducted using a Radiodetection RD8000 series precision electromagnetic utility location instrument. The RD8000 series consists of a separate transmitter and receiver. The system can be used in "passive" and "active" modes to locate buried pipes by detecting radio frequency 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

HAGER-RICHTER GEOSCIENCE, INC. MAKES NO GUARANTEE THAT ALL TARGETS OF INTEREST WERE DETECTED IN THIS SURVEY. HAGER-RICHTER GEOSCIENCE, INC. 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 OF INTEREST.

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 pulled in a small trailer.

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 subject Site: (1) surface conditions, (2) electrical conductivity of the ground, (3) contrast of the electrical conductivities of the targets and the ground, and (4) spacing between lines. Of these limitations, only the fourth, line spacing, is controlled by the operator.

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 of buildings, and a target may not be detectable.

The electrical conductivity of the ground determines the attenuation of the GPR signals, and thereby limits the maximum depth of exploration. The GPR signal does not penetrate clay-rich soils, and targets buried in clay can be missed.

A definite contrast in the electrical conductivities of the ground and the target is required to obtain a reflection of the GPR signal. If the contrast is too small, possibly due to construction

details or extremely corroded conditions of metal targets, then the reflection may be too weak to recognize, and the target can be missed.

The spacing between lines is under control of the GPR operator, 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.

RESULTS

The geophysical survey was conducted using time domain electromagnetic induction metal detection (EM), ground penetrating radar, and PUL methods across the accessible exterior portions of the site. Figure 2 is a color contour plot of the EM61 data, and Figure 3 shows the integrated interpretation of the geophysical data.

General. The EM61 data were acquired at approximately 8-inch intervals along survey lines spaced 5 feet apart across the accessible exterior portions of the area of interest. 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.

Several moderate to high amplitude EM anomalies (green to red areas on Figure 2) are evident in the contour plot for the area of interest. Many of the high amplitude EM61 anomalies are attributed to metal in surface features such as buildings, pump and vacuum islands, catch basins, and reinforced concrete pads, and are shown as blue hatched areas in Figure 3. We note that the presence or absence of subsurface metal objects in such areas cannot be determined on the basis of the EM61 data alone because of the anomalies caused by the surface metal objects

Several moderate to high amplitude EM anomalies not attributable to surface metal objects are present and are attributed to buried metal. Linear EM anomalies are attributed to possible buried metallic utilities, and their locations are shown in Figure 3. Other EM anomalies not caused by surface metal are attributed to particular structures based on additional information or from other geophysical methods (e.g. EM anomaly south of pump islands related to a known UST, EM anomaly attributed to buried reinforced concrete) and are discussed below. The remainder of the moderate to high amplitude, EM anomalies not attributed to a particular feature are shown as areas of buried metal in Figure 3.

Apparent GPR signal penetration in the south portion and along the east and along the west sides of the site was generally fair to good with two-way traveltime reflections received from about 20 to 25 ns of the 70 ns time window. Based upon site-specific velocity matching calibrations made for the site, the GPR signal penetration is estimated to have been about 3 to 4 feet in such areas. GPR signal penetration was especially limited in much of the central portion of the site, with two-way traveltime reflections received from about 10 to 15 ns, or about 1 to 2 feet. The broad area of limited GPR signal penetration is shown on Figure 3.

Possible Subsurface Utilities and Known USTS. Gas, electric, water, and unidentified lines were detected at the time of the survey and their locations are shown in Figure 3. Note that water service to the site was marked by others in the sidewalk and landscaping on the north side of the site, but could not be detected by the present survey An unidentified utility that appears to continue from the south end of the water service marked by others is likely too shallow (<2 feet) to be a water line. The PUL instrument was used to locate many of the utilities by connecting the PUL transmitter to valves and conduits and the locations of some utilities were confirmed with GPR. Additional unidentified lines were detected after office review of the data and their locations are also shown in Figure 3 as black bold dashed lines because their locations were not marked in the field. *Whether additional utilities occur at a depth greater than the effective depth of penetration of the GPR signal or in areas inaccessible to the geophysical survey cannot be determined from the geophysical data.*

GPR reflections were received from portions of the six known USTs in use at the service station. GPR signal penetration in such areas was very limited, and the GPR reflections were received only for the very tops (about 2 ft depth) of the known USTs. With the exception of the southernmost known UST, it was not possible to determine the east and west ends of the known USTs. The locations of the known USTs are shown and black hatched areas in Figure 3.

Possible Former MGP Related Infrastructure. Attributing a detected feature to a former use, such as, in the present case, a MGP, is difficult unless the shape or location of such features is diagnostic. For instance, a large round area containing a high amplitude EM anomaly could be attributed to the buried foundations of a former gas holder, if such a feature is consistent with historic data. The following subsurface features detected by the geophysical survey are not identified in information provided by GZA as structures related to the current service station. It is possible that such features may be related to the former MGP.

GPR reflections consistent with two large buried objects are evident in the records for an area containing a moderate to high amplitude EM anomaly located at the northwest corner of the car wash. It is possible that such objects may be related to the former MGP, although an association with the car wash is suggested by their location. However, no structures related to

the existing service station are reported for this location. The objects are approximately 3 ft by 10 ft and size and are approximately 2.5 to 3 feet deep. The shape and size of the objects are somewhat consistent with small USTs, although it is possible that they are related to piping associated with the car wash (a former water well is located less than 10 feet from this location). The locations of the large buried objects are shown as crossed boxes in Figure 3. No other objects consistent USTs with: (1) electrical properties sufficiently contrasting with the surrounding soils to produce GPR reflections, or (2) a capacity of 500 gallons or more were detected within the effective depth of penetration of the GPR signal (see above) in the areas surveyed by GPR. *Whether a UST occurs at a depth greater than the effective depth of penetration of the GPR signal or in areas inaccessible to the geophysical survey cannot be determined from the geophysical data.*

A buried reinforced concrete structure was detected on the west edge of the site. The buried concrete structure is approximately 35 feet by 10 feet in size and the top of the structure is less than 1 foot deep. The identity of such a structure is unknown, although according to information provided by GZA, many of the structures related to the former MGP were located along the west side of the site. The location of the buried reinforced concrete structure is shown as areas stippled with black circles in Figure 3.

Large areas of buried metal are present at the site, and are especially common in the northwest portion of the site. GPR reflections from objects or structures were not received for such areas, although GPR signal penetration was limited to 1 to 2 feet for this area. Whether areas of buried metal are related to the former MGP cannot be determined on the basis of the geophysical data. Areas of buried metal are shown as red cross-hatched areas in Figure 3.

CONCLUSIONS

Based on the geophysical survey conducted by Hager-Richter Geoscience, Inc. at 284 Winter Street in Haverhill, Massachusetts for GZA in September, 2016, we conclude that:

- Utilities were detected at the site, and their locations are shown on Figure 3
- Two large buried objects are present near the northwest corner of the car wash.
- A buried reinforced concrete structure is located on the west edge of the site.
- Areas of buried metal are present and are especially common in northwest portion of the site

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. (H-R) in the performance of its work. The Report relates solely to the specific project for which H-R 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 H-R. 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 H-R.

H-R 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 H-R 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, H-R 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.

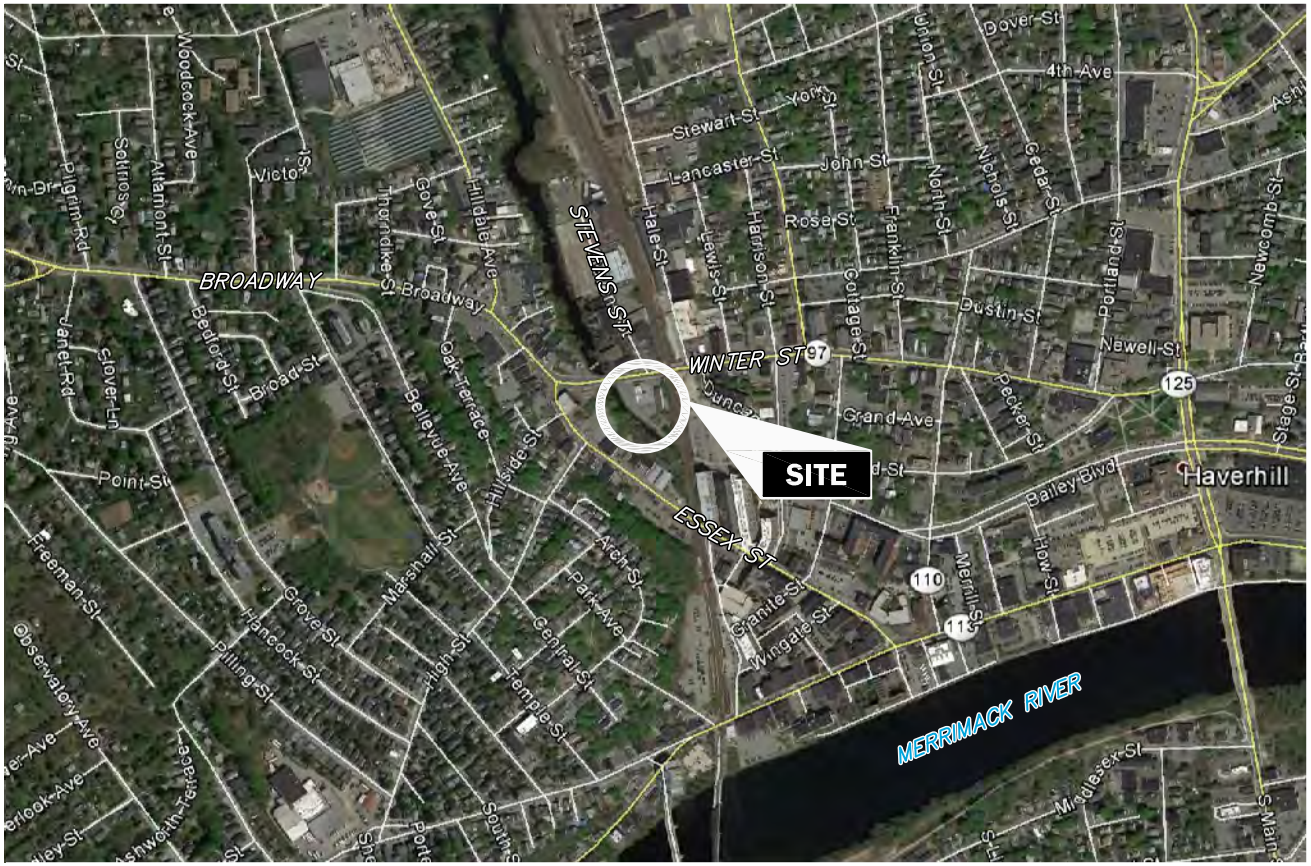
If you have any questions or comments on this letter report, please contact us at your convenience. It has been a pleasure to work with GZA on this project. We look forward to working with you again in the future.

Sincerely yours,
HAGER-RICHTER GEOSCIENCE, INC.

Steven Grant, P.G.
Senior Geophysicist

Dorothy Richter, P.G.
President

Attachments: Figures 1 - 3



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APPROXIMATE SCALE (feet)

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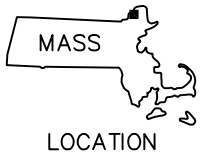


LOCATION

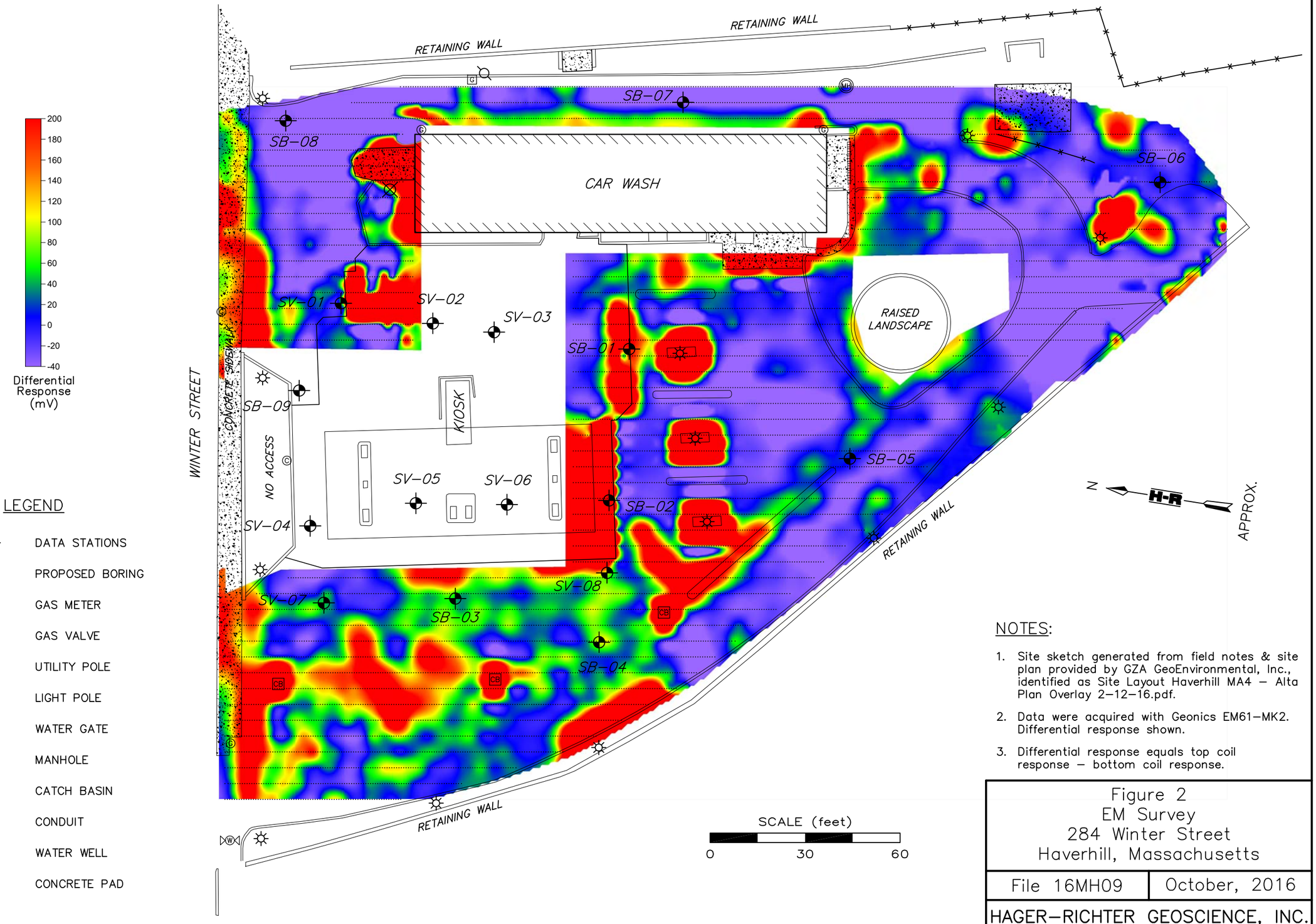
NOTE:

Modified from Google Earth Pro aerial photograph.

Figure 1
General Site Location
284 Winter Street
Haverhill, Massachusetts

File 16MH09 | October, 2016

HAGER–RICHTER GEOSCIENCE, INC.
Salem, New Hampshire



LEGEND

- DATA STATIONS
- PROPOSED BORING
- GAS METER
- GAS VALVE
- UTILITY POLE
- LIGHT POLE
- WATER GATE
- MANHOLE
- CATCH BASIN
- CONDUIT
- WATER WELL
- CONCRETE PAD

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.

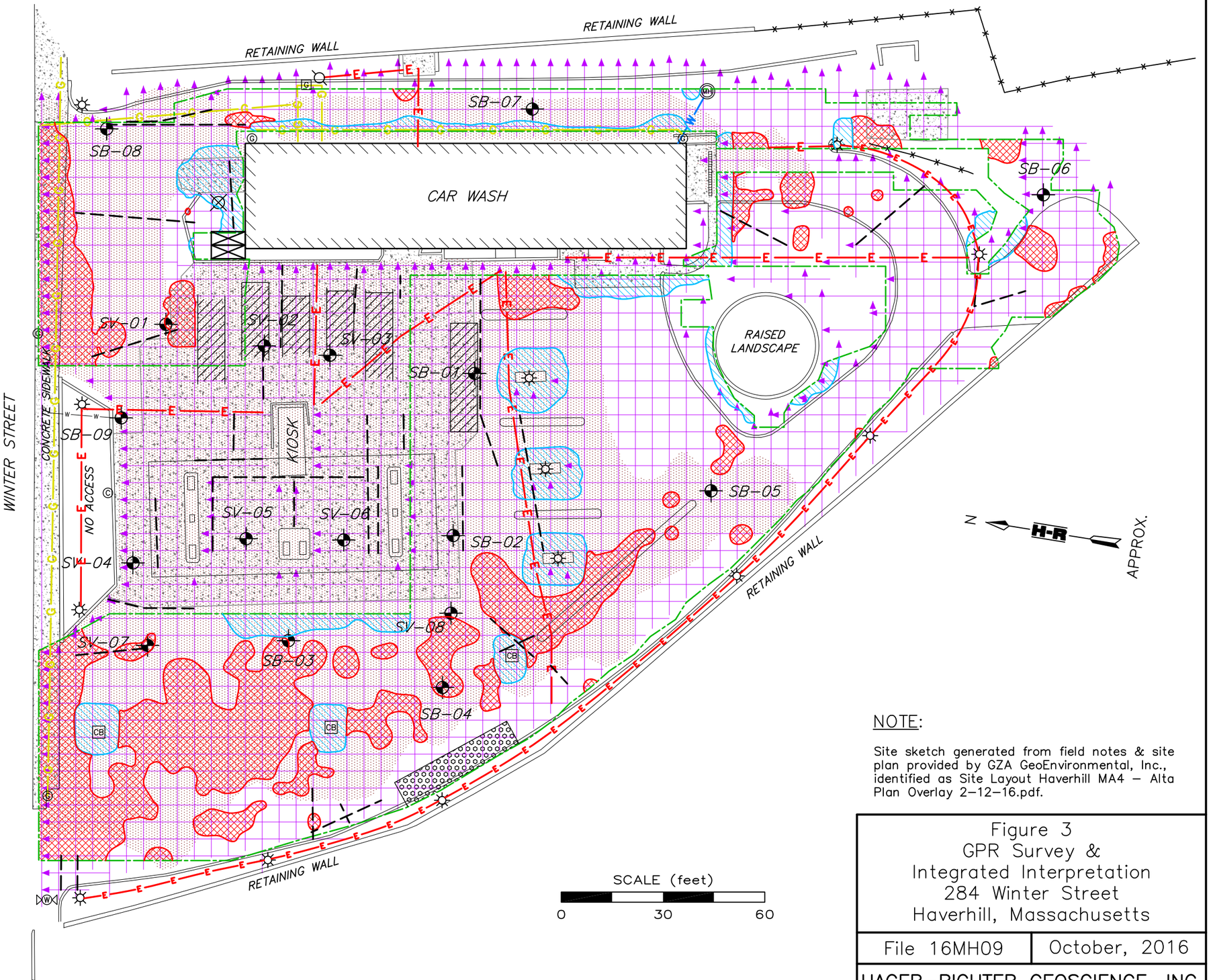
Figure 2
EM Survey
284 Winter Street
Haverhill, Massachusetts

File 16MH09 | October, 2016

HAGER–RICHTER GEOSCIENCE, INC.
Salem, New Hampshire

LEGEND

- APPROXIMATE LIMITS OF EM SURVEY AREA
- GPR TRAVERSE
- AREA OF POSSIBLE BURIED METAL
- GAS LINE
- ELECTRIC LINE
- WATER LINE – MARKED BY OTHERS
- POSSIBLE UTILITY
- UNIDENTIFIED BURIED OBJECT
- BURIED REINFORCED CONCRETE STRUCTURE
- AREA OF EXTREMELY LIMITED GPR SIGNAL PENETRATION
- 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.
- KNOWN UST
- PROPOSED BORING
- GAS METER
- GAS VALVE
- UTILITY POLE
- LIGHT POLE
- WATER GATE
- MANHOLE
- CATCH BASIN
- CONDUIT
- WATER WELL
- CONCRETE PAD



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 16MH09	October, 2016

HAGER–RICHTER GEOSCIENCE, INC.
Salem, New Hampshire

Geophysical Survey Report
Haffner's Car Wash
284 Winter Street
Haverhill, Massachusetts

prepared for
ENVIRON
April 2015

215 Hopping Brook Road • Holliston • MA • 01746
508-429-2430 • FAX 508-429-0488

GEOPHYSICAL
APPLICATIONS
INCORPORATED

April 16, 2015

Mr. John Noble
ENVIRON
3 Carlisle Road
Westford, MA 01886

phone: 978-449-0333
fax: 978-449-0301

Subject: Geophysical Survey Report
Haffner's Car Wash
284 Winter Street
Haverhill, Massachusetts

Dear Mr. Noble:

Geophysical Applications, Inc. performed a geophysical survey throughout portions of the above-noted property, formerly a manufactured gas plant (MGP) site. The survey was designed to check for possible buried utilities and other shallow obstructions surrounding thirteen proposed boring and monitoring well locations. In addition, Environ wished to check for large buried structures related to the former manufactured gas plant if possible (foundation walls, concrete slabs, underground storage tanks (USTs), etc).

Fieldwork was conducted on March 31 and April 2, 2015. Survey area limits were defined by Environ personnel prior to data acquisition. Geophysical data was subsequently acquired throughout open and accessible areas bounded by a granite curb on the west and the concrete tank pad and the car wash building on the east. The large, landscaped island near the building's southwest corner was excluded from the survey with the exception of a small area surrounding proposed boring 11B. South of the island, data was collected as far south as possible, as permitted by snow piles, trees and fences.

Survey results were provided to Environ in sections via email as they were completed. This report represents a formal summary for your files.

The geophysical survey methods were ground penetrating radar (GPR) profiling and an electromagnetic terrain conductivity meter (EM31), augmented with a pipe and cable locator. The methods, limitations, and interpreted results of this survey are described below.

METHODS OF INVESTIGATION

Survey Control

A reference grid was established prior to data acquisition. The grid was marked on the ground surface with pink spray paint dots at ten-foot intervals. The grid was referenced by taped distance measurements to the building, curbs, tank pad, and other visible objects. An AutoCAD base map was created using field measurements gathered with fiberglass and metal tape measures.

The tank pad's west edge is located along station 90E. A section of the tank pad's south edge is located along station 280N. A brick wall from the former MGP is visible on the west side of the retaining wall near Winter Street. The northernmost point on this brick wall is located at approximately coordinate 2.1E/376.5N on our grid.

Ground Penetrating Radar

GPR profiling is based on the principle that materials with contrasting electrical properties reflect radar signals back to the ground surface. Metal or concrete objects such as pipes or conduits generally produce high-amplitude GPR reflections. Plotting observed reflections on a base map typically enables an interpreter to identify a large object's lateral extent, or a pipe's trend.

GPR data were recorded using GSSI model SIR-2000 radar instruments with 400-megahertz (MHz) antennas mounted on a three-wheeled cart or dragged behind the operator. Initial test data was acquired on the first day with both 400 MHz and 200 MHz antennas to determine which antenna would yield the most useable data at this site. The 400 MHz antenna produced better resolution of GPR targets with the same signal depth penetration and was utilized for the remainder of this survey.

Radar profiles were recorded continuously along perpendicular traverses located 5 feet apart. More closely-spaced traverses were acquired surrounding the pre-marked proposed boring locations. These profiles were displayed on a color monitor for immediate inspection and preliminary interpretation. GPR data were stored digitally and downloaded to a computer and CD-ROM for archival purposes. GPR traverse locations are shown on Figure 2.

The horizontal scale on each GPR record was determined by an encoder mounted on a three-wheeled cart or by the operator pressing a marker button as the antenna passed each 10-foot grid node. The vertical scale of radar cross sections recorded during this survey was 60 nanoseconds (equivalent to approximately 10 feet in depth). This time interval was selected to maximize depth penetration while maintaining satisfactory near-surface resolution of smaller objects. Note that GPR depth penetration is site-specific, and data recorded with any radar antenna may not penetrate the full extent of the selected time window.

EM61 Survey

A metal-locating survey was performed initially throughout accessible portions of the survey area. The survey was performed using a Geonics model EM61 MK2 instrument. This device includes backpack-mounted electronics, and two receiving coils mounted on a wheeled-cart pushed by the operator along parallel traverses.

The receiving coils measure weak electric currents induced in buried metal objects by the EM61 transmitter to a depth of approximately 4 to 8 feet. EM61 values are measured in millivolts, at the upper and lower receiving coils. The EM61 is designed to be most sensitive to objects located directly below the receiver coils. This helps the EM61 emphasize buried metal objects, and minimize the risk of mis-identifying aboveground metal objects adjacent to the traverse as possible buried objects.

A digital datalogger recorded EM61 data values at approximately 8-inch intervals along each survey traverse. Small blue crosses on Figure 1 indicate these data measurement stations along each traverse. Parallel traverses were positioned 2.5 feet apart, to help assure thorough survey coverage.

Data recorded during this survey was downloaded to a computer and contoured in the field using Surfer for Windows with a Kriging grid algorithm.

Pipe Locator

A RadioDetection model RD4000 pipe- and cable-locating receiver was utilized in the passive mode to identify pipes or conduits carrying an active electric current under load. Note that metal pipes other than electrical conduits can sometimes be detected with this method (e.g. water or steam pipes) if a nearby source of electrical current is present.

The RD4000 instrument was also utilized in the induced mode to trace additional inferred buried electrical conduits. This technique induces a weak electrical current in metallic pipes or cables. Current induction was achieved by placing the transmitter on the ground surface over an inferred conduit identified in the passive mode. Signals were subsequently traced with the instrument's handheld receiver.

SURVEY LIMITATIONS

GPR signal penetration is site specific, determined by dielectric properties of the materials through which GPR signals are propagating. GPR signal-penetration depths may be significantly reduced by concrete surfaces (both visible and buried), reinforcing steel, shallow or brackish groundwater, or electrically conductive materials (e.g. clay, ash, tar or residual de-icing salts). GPR signal penetration depths are noted in the Results section. Objects deeper than the GPR signal's maximum penetration depth remain undetected.

GPR-inferred objects' approximate depths are calculated by multiplying the vertical time scale values by a selected constant. If an object of known depth is present (e.g. an exposed pipe in a storm drain), the depth scale can be calibrated to that object. In the absence of an object of known depth an averaged constant is used based on published industry standards. Interpreted depths described in this report are therefore considered approximate. A constant of 6 nanoseconds per foot was used to calculate GPR reflector depths for this survey.

A buried pipe's diameter must increase approximately one inch for every foot below ground surface in order for the GPR technique to detect that pipe. For instance, on average, a pipe buried 10 feet below ground surface must be at least 10 inches in diameter to produce a recognizable GPR reflection. In addition, GPR reflections from small pipes may be masked by reflections from rocks or boulders (common in the Northeast, especially in filled areas) or buried debris.

Note that the shallowest buried object at any given location (i.e. closest to the ground surface) is most likely to be detected, and deeper objects directly below will be more difficult to detect. Therefore, if pipes are situated on top of one another, only the shallowest may be identified unless the deeper pipe is considerably wider.

GPR interpretations are subjective, based on identifying reflection patterns that may not uniquely represent a subsurface object. Profiling along perpendicular traverses helps determine the size and shape of buried objects. GPR interpretation is more subjective than most geophysical methods, and anomaly confirmation via test pits, borings, or other direct means is strongly recommended.

Varying a GPR antenna's speed along a survey traverse can cause slight errors in horizontal distance interpolations and inferred object positions. Distance interpolation errors were minimized during this survey by using a marked ten-foot grid and a survey wheel encoder.

GPR is most likely to detect concrete or metallic objects. PVC, plastic or vitreous clay pipes, or fiberglass tanks, are less likely to be detected with GPR.

Due to the 400 MHz antenna's physical size, GPR data cannot be collected within approximately one foot of any curb or other vertical obstruction that protrudes above the ground surface (e.g. a wall, fence, raised concrete slab, lamp post, etc.). In these areas, reflections visible on GPR records near the antenna's physical limits may actually represent side reflections from objects located up to several feet from the antenna.

Aboveground ferrous metal objects located within approximately 10 feet of a survey traverse, may adversely affect EM61 data values. Anomalies caused by buried conductive objects within those regions may be difficult to distinguish from anomalies caused by aboveground objects. Visible metal objects encountered at this site included chain link fences, lamp posts, catch basins, monitoring wells, a large sign, manholes, vacuum stations, reinforced concrete pads and a building.

Pipe- and cable-locating instruments work best when linear objects being traced are separated by some distance. Closely-spaced pipes or conduits are often perceived as one linear object by a pipe locator. In addition, both induced and passive currents can "jump" to other nearby metallic pipes or objects, including other conduits, drain pipes, water or steam lines or rebar. Nearby sources of electrical interference (e.g. transformers, running machinery, or electrical panels) can prevent the use of pipe locators in some instances. Note that the actual horizontal location of energized lines detected in the passive mode may be offset approximately 1 to 1.5 feet in either direction of a marked line on the ground surface.

RESULTS

As discussed above, an AutoCAD base map was created using field measurements referenced to our marked grid. Figure 1 shows EM61 data stations and contours. Figure 2 shows GPR traverse locations and geophysical interpretations. Figure 3 shows EM61 contours superimposed on the Figure 2 interpreted results. Depths to inferred objects are noted on the figures in units of feet below ground surface.

Environ personnel marked proposed boring locations on the ground surface with white paint. Black half-filled circle symbols represent these proposed locations on the figures. GPR data was examined closely in these locations, and boring locations were shifted as necessary. Bright green circle symbols represent our suggested boring locations.

EM61 data was contoured on site, and those contour maps were examined for anomalies large enough to possibly represent linear objects such as pipes or walls, USTs or other large buried metal objects. Note that EM61 contour maps reveal areas where buried metal exists, but do not yield detailed information on the shape or depth of the objects causing many of these anomalies. GPR profiling was performed to help produce that information.

EM61 contours are shown on Figures 1 and 3. Above-ground metal objects, including catch basins, monitoring wells, lamp posts, reinforced concrete pads, manholes, a large sign and vacuum stations caused numerous EM61 anomalies. A dumpster near coordinate 238E/154N caused a large EM anomaly. Fence sections just west of the dumpster and along the retaining wall south of station 110N also caused EM anomalies. EM values were cropped for the contour map selected for this figure to avoid a solid black appearance in these areas, and to allow these objects to be visible on the figures.

Green lines on the figures represent possible buried linear objects inferred from the EM61 data. All EM61 data channels were inspected at various contour intervals, therefore not all linear trends may be obvious on any given EM contour map. The east-west trending conduit near station 260N is also visible on the EM contour maps, however this object is represented on the figures with a red line, as established with the RD4000 pipe locator.

A fairly large contour interval (50-millivolts) was selected for the EM contour maps shown on the figures. The data indicate a large amount of buried metal on the site, especially in the northern section. The high EM values could obscure the smaller responses expected from buried pipes or other linear objects, especially at depth.

GPR recordings obtained during this survey were examined with GSSI's RADAN for Windows software for reflections indicating large or laterally-extensive objects including pipes, conduits and utilities. This software can enhance faint or small reflections typical of conduits, PVC or plastic pipes. Typically, pipes or large objects produce reflections that are visible on adjacent or intersecting traverses.

GPR signals penetrated between 0 and 1 foot below ground surface throughout most of the survey region; this is due to electrically conductive materials such as clay, residual deicing salts or ash. Yellow hachures represent this area on Figure 2. GPR signals penetrated between 2 and 5.5 feet throughout the remaining asphalt-paved areas. In the site's southernmost section, GPR signals penetrated up to 9 feet beneath the asphalt turn-around (southwest of the sign), and 6 to 7 feet beneath the soil and the concrete pad near the dumpster. Note that GPR data surrounding proposed borings 1 and 2 indicates that a significant amount of rubble may be present in those areas.

Blue lines on the figures represent locations where similar GPR reflections can be traced to adjacent traverses. These lines are dashed where the interpretation is less certain. Dashed lines may represent pipe sections or other linear objects such as wall remnants, fence posts, concrete rubble, a car axle, etc. Dashed lines could also represent reflections from the sloped side of a former trench or excavation, layering changes or fill boundaries, side reflections from large buried objects, or simply several discrete objects buried at similar depths.

An orange line represents the trend of an approximately 12-inch diameter pipe visible in a catch basin near coordinate 72.5E/265.5N. According to Haffner personnel, this pipe heads to the southwest corner of the tank pad where it turns, heading under the tank pad to connect to a roof drain inside the car wash building.

Many small, discrete reflections were identified during the GPR survey. Only the largest are indicated on the attached figures with magenta dots or bars. They may represent larger rocks, pipe segments, changes in subsurface layering, or other discrete buried objects.

Purple hachures and bars represent GPR reflections resembling possible buried flat surfaces such as concrete slabs, or vertical objects that resemble wall sections. Alternatively, these reflections may represent layering changes or other discrete buried objects.

Red hachures represent a possible buried underground storage tank (UST) approximately 2.5 feet deep. An EM61 anomaly is present in this location, indicating a significant amount of buried metal. GPR records in this area display reflections resembling a fairly wide, laterally-extensive object. Alternatively, the reflections may represent one or more large-diameter closely-spaced metal pipes or other linear metal object. This area is

located near a feature labeled Separation House on a plan map of the former MGP site provided by Environ.

As discussed above, the RadioDetection RD400 instrument was utilized in both the passive and induced modes throughout the survey area to look for underground conduits. Thin red lines represent the linear trends identified with this instrument. Red spray paint marks were placed on the ground surface along these alignments during the fieldwork.

Due to the reduced signal penetration depths that characterize most of the GPR data, few former MGP structures (as shown on the plan map provided) can be inferred from the data set. The linear EM61 anomaly trending from approximately coordinate 80E/260N toward 130E/202N may be located near the expected position of the east wall for the former Purifier House and Meter House. Due to its shape, the slightly curved linear anomaly between coordinates 82.5E/260N and 100E/272N may be associated with a former water well, however the EM anomaly is located slightly further west than would be expected.

* * * * *

Please call the undersigned at 508/429-2430 if you have questions regarding our report. We appreciate this opportunity to provide geophysical services to Environ and we welcome inquiries regarding this project or future surveys.

Regards,

GEOPHYSICAL APPLICATIONS, INC.

C. V. Sullivan	P. Giger cvs	M. Blackey
Charlene V. Sullivan	Peter Giger	Mark E. Blackey
Geophysicist	Geophysicist	Principal and Geophysicist

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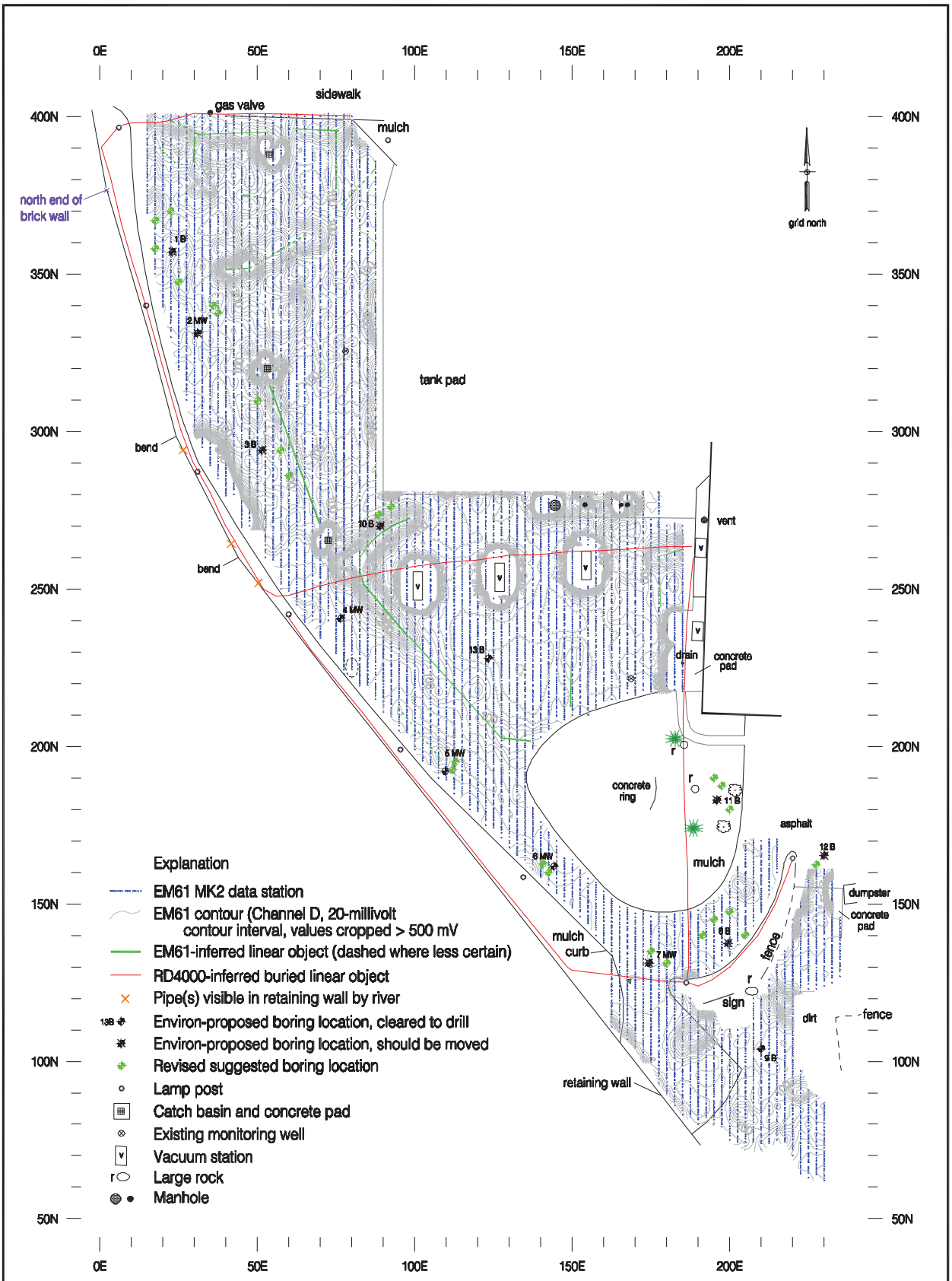

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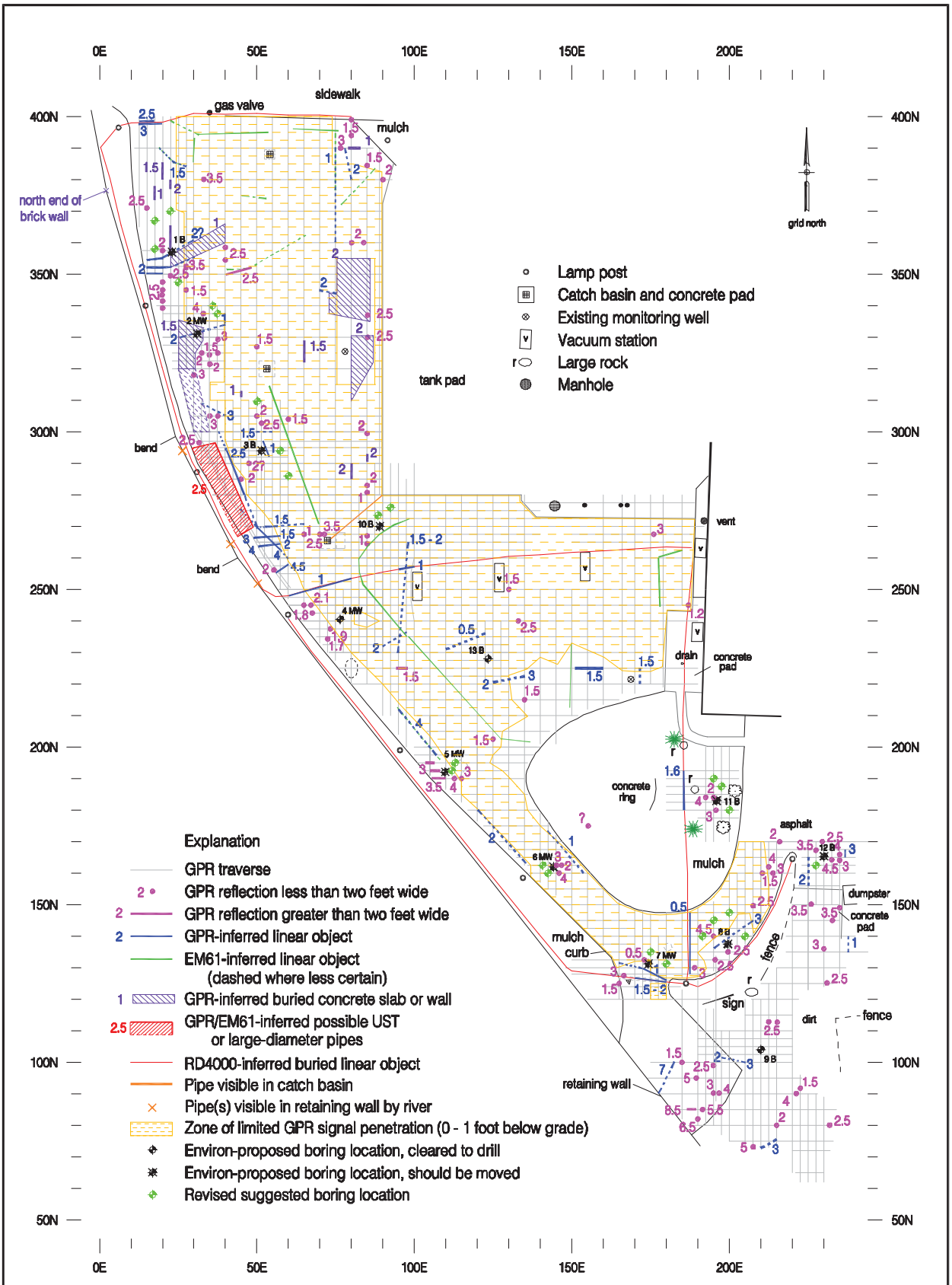
last modified 4/16/15

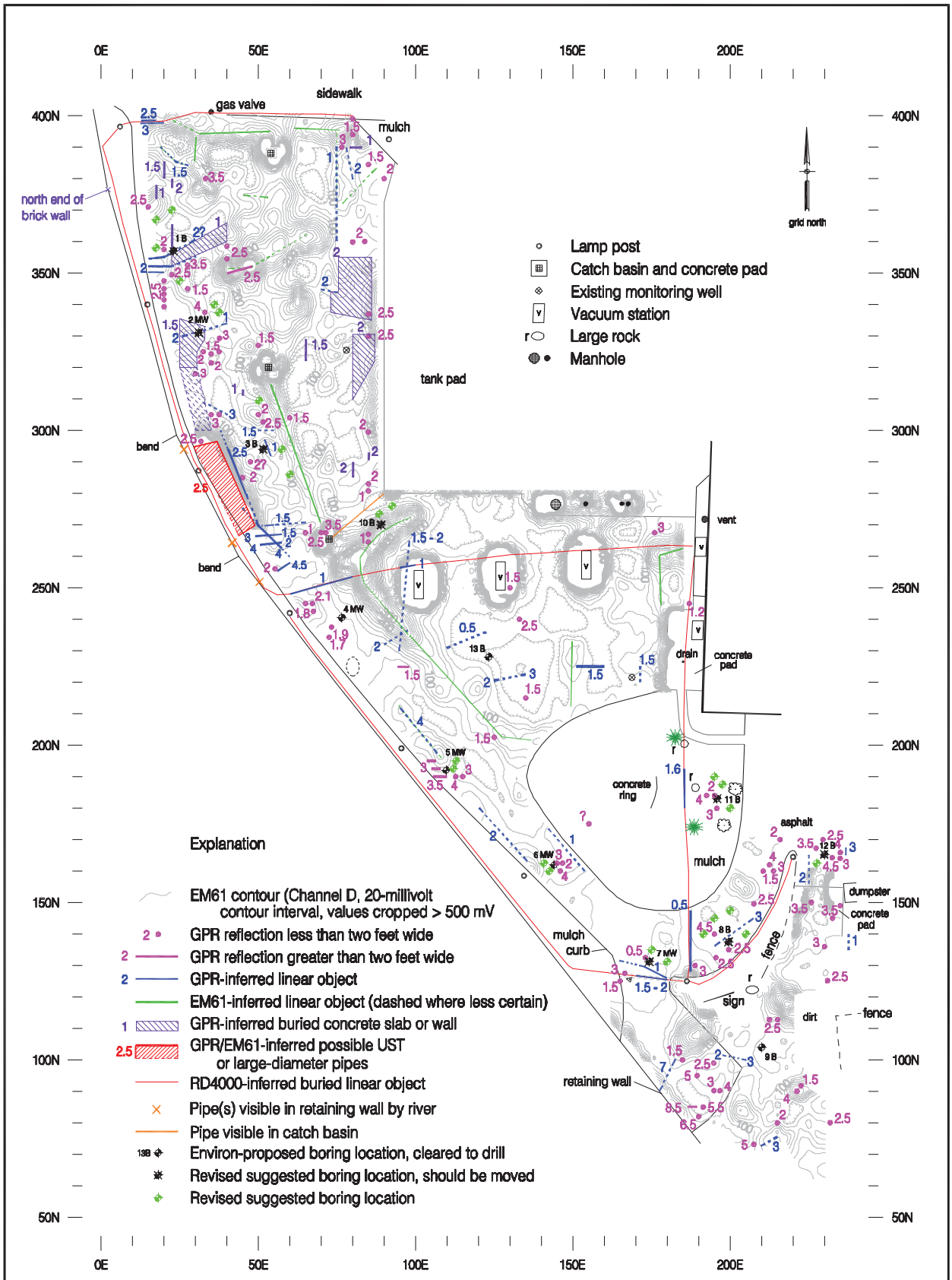
GEOPHYSICAL APPLICATIONS INCORPORATED

Figure 1
EM61 MK2 Data Stations and Contours
Haffner's Car Wash
284 Winter Street
Haverhill, Massachusetts
prepared for
ENVIRON



GEOPHYSICAL APPLICATIONS INCORPORATED

Figure 2
GPR Traverses and Interpretations
Haffner's Car Wash
284 Winter Street
Haverhill, Massachusetts
prepared for
ENVIRON



GEOPHYSICAL APPLICATIONS INCORPORATED

Figure 3
GPR Interpretations and EM61 Contours
Haffner's Car Wash
284 Winter Street
Haverhill, Massachusetts
prepared for
ENVIRON

HAGER-RICHTER
GEOSCIENCE, INC.

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

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

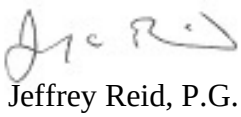
This letter report was prepared for the exclusive use of GZA (Client). No other party shall be entitled to rely on this Report, or any information, documents, records, data, interpretations, advice, or opinions given to Client by Hager-Richter Geoscience, Inc. (HRGS) in the performance of its work. The 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.

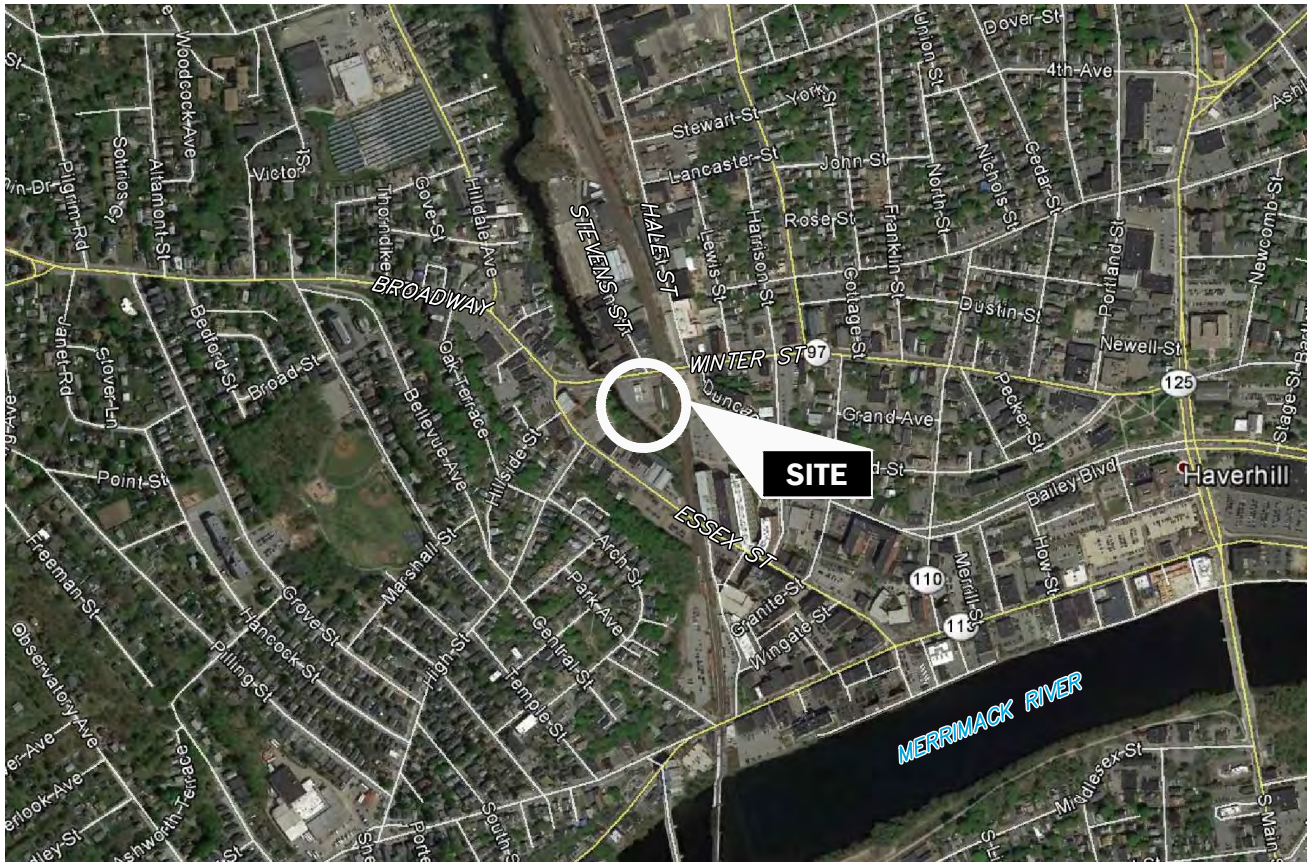
Sincerely,
HAGER-RICHTER GEOSCIENCE, INC.

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

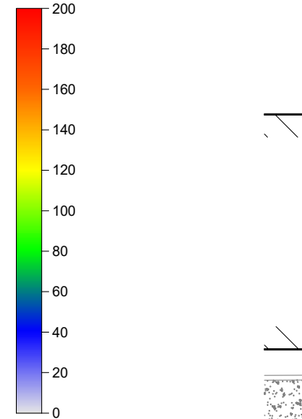
NOTE:

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



RETAINING WALL

RETAINING WALL

CAR WASH

KIOSK

RAISED LANDSCAPE

RETAINING WALL

APPROX.

LEGEND

- DATA STATIONS
- GAS METER
- GAS VALVE
- UTILITY POLE
- LIGHT POLE
- MANHOLE
- CATCH BASIN
- PROPOSED BORING
- CONCRETE PAD
- FENCE

SCALE (feet)

0 20 40

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.

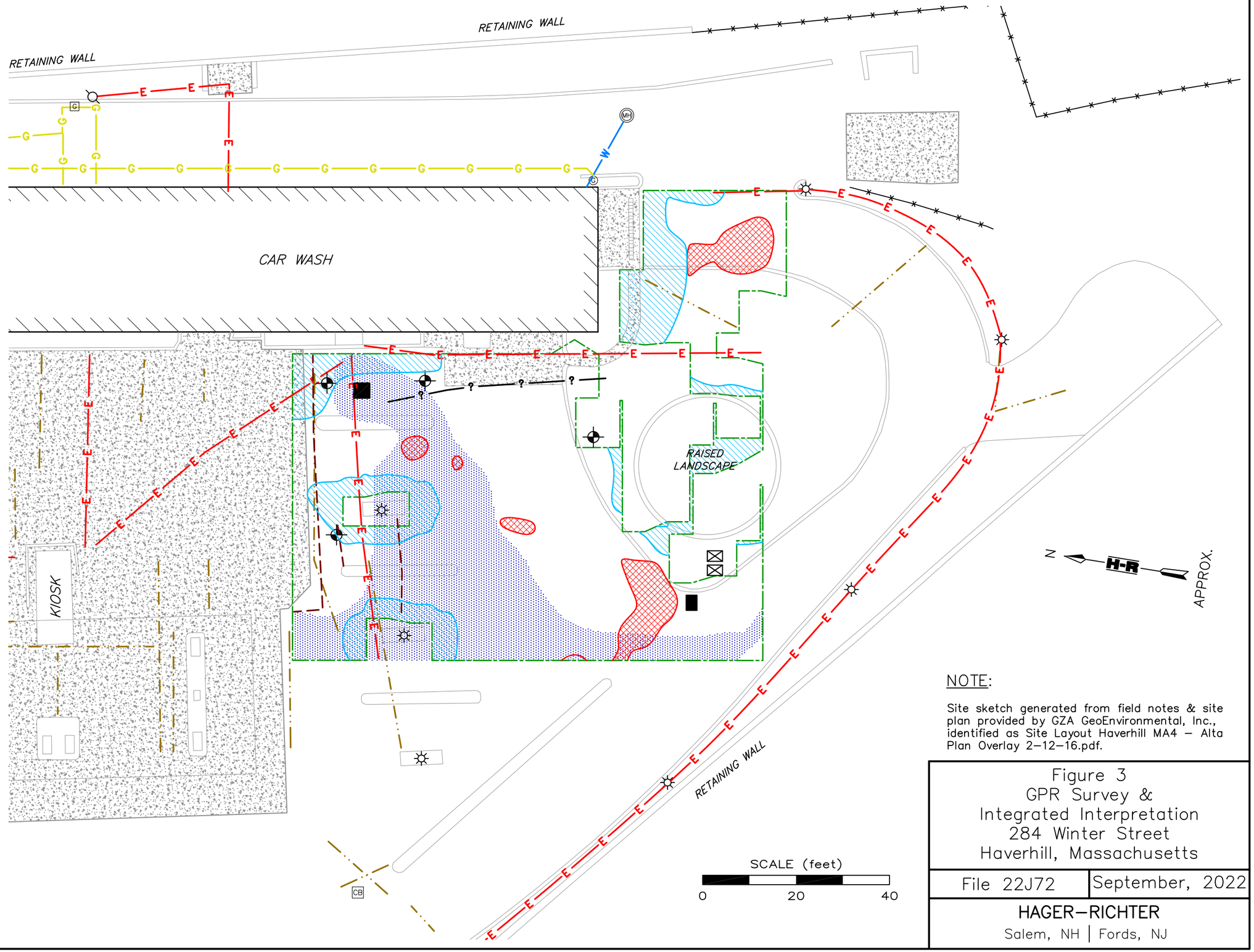
Figure 2
EM Survey
284 Winter Street
Haverhill, Massachusetts

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
- G — GAS LINE
- E — ELECTRIC LINE
- W — 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.
- G — GAS METER
- G — GAS VALVE
- UTILITY POLE
- LIGHT POLE
- MH — MANHOLE
- CB — 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

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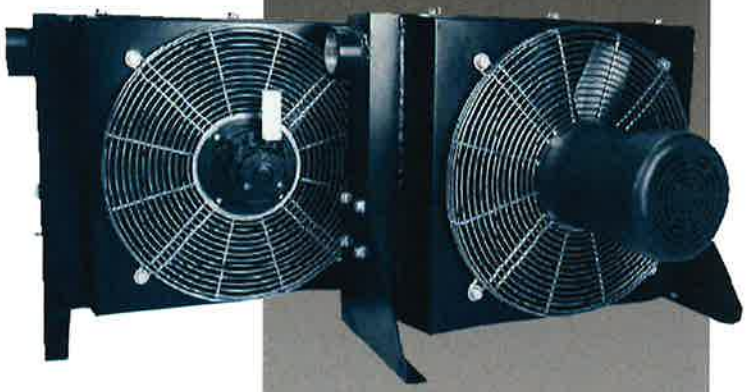

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BULLETIN CCB-3

Performance

AFTERCOOLERS

The CC Series is a complete aftercooler package designed to work on most models of rotary and piston air compressors. To select the appropriate model, simply determine compressor horsepower, and select the model from the chart.

Rotary Compresser

Air Compressor Horsepower	Internal Airflow Maximun CFM	Recommended CC Series Model Number
20 HP	113	CC100
25-40 HP	245	CC200
50-75 HP	539	CC450
100-125 HP	785	CC600
150-200 HP	1,569	CC1000
225-350 HP	2,300	CC1600
400-500 HP	3,016	CC2000
550-700 HP	4,316	CC2500
750-1000 HP	4,800	CC3500

Piston Compressor

Air Compressor Horsepower	Internal Airflow Maximum CFM	Recommended CC Series Model Number
20 HP	83	CC100
25-30 HP	181	CC200
40-70 HP	432	CC450
75-100 HP	638	CC600
125-200 HP	1,256	CC1000
225-300 HP	2,133	CC1600
350-400 HP	2,400	CC2000
500-600 HP	3,458	CC2500
700-850 HP	4,800	CC3500

Sizing Notes, Recommendations Are Based On The Following:

Heat Removal: Aftercooler=Compressor horsepower x 1.15 (motor service factor) x .17 (this assumes 17% of input horsepower is rejected to heat)

15°F Approach Temperature: Compressor air outlet temperature - ambient air temperature

Temperatures: Ambient Air Temperature + 15° F = Compressed Air Outlet Temperature

Flows: Compressor Horsepower x 4.5 = SCFM Air Flow

All flow rates are based on less than a 4 PSI pressure drop @ 100 PSI operating & 100° F ambient and 50% relative humidity

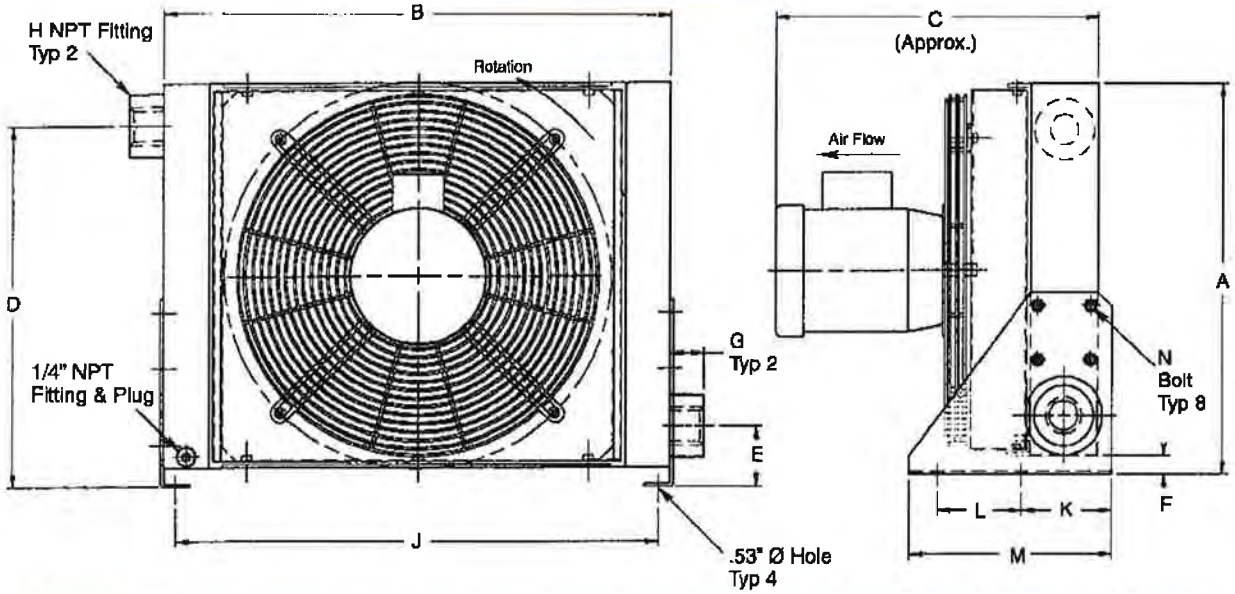
SEPARATORS

Aftercooler	Separator	Separator Maximum Capacity
CC100	MS300E	375 CFM
CC200	MS300G	375 CFM
CC450	MS750H	925 CFM
CC600	MS750H	925 CFM
CC1000	MS1700I	2100 CFM
CC1600	MS1700J	2100 CFM
CC2000	CONSULT FACTORY	
CC2500	CONSULT FACTORY	
CC3500	CONSULT FACTORY	

Pressure drop is 1.0 PSI at the above flow rates. Reference Bulletin #MSB-2 For additional details.

Dimensions

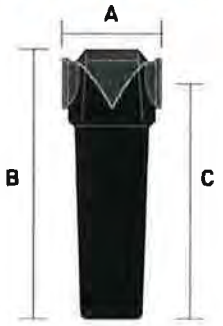
AFTERCOOLERS



MODEL SIZE	A	B	C Approx.	D	E	F	G	H (NPT)	J	K	L	M	N	Approx. NET	Weights Shipping
CC100	12.64	15.94	14.72	10.86	2.52	0.75	1.18	1.00	14.65	3.94	3.50	8.19	M8x10 Bolt	30	40
CC200	16.30	19.88	15.59	14.53	2.52	0.75	1.77	1.50	18.66	3.94	3.50	8.19	M8x10 Bolt	50	60
CC450	21.00	26.38	17.75	18.81	3.15	1.00	1.77	2.00	25.19	4.92	4.53	10.98	M10x20 Bolt	95	137
CC600	23.19	30.31	18.74	21.02	3.15	1.00	1.77	2.00	29.13	4.92	4.53	10.98	M10x20 Bolt	125	163
CC1000	27.72	37.00	22.60	25.23	4.33	1.85	1.77	2.50	37.80	5.91	7.87	16.00	M12x20 Bolt	195	240
CC1600	35.90	40.94	24.76	30.83	4.33	1.85	1.77	3.00	37.80	5.91	7.87	16.00	M12x20 Bolt	296	350
CC2000	37.44	42.91	29.84	30.55	10.91	2.08	1.77	4.00	43.62	5.39	7.87	15.47	M12x20 Bolt	320	380
CC2500	44.25	48.82	30.28	34.25	11.57	1.57	1.77	4.00	49.29	5.39	7.87	15.47	M12x20 Bolt	440	505
CC3500	57.87	52.76	33.82	43.98	17.56	3.35	2	4.00*	50.55	7.80	10.00	20.00	¾x1½ Bolt	550	645

* SAE 4-BOLT FLANGES MAY BE CONVERTED TO NPT BY ADDING "- AD" TO THE END OF THE MODEL CODE
* Dimensions in inches. *Weights in pounds. * Air connections my be reversed. * We reserve the right to make reasonable changes without notice.

Moisture Separators



MODEL	PIPE SIZE	A	B	C	WEIGHTS (LBS)
MS 85C	½" NPT	3.8	9.3	7.9	3
MS 300D	¾" NPT	5.1	10.8	9.2	7
MS 300E	1" NPT				
MS 300G	1½" NPT				
MS 750H	2" NPT	6.7	17	15	15
MS 1700I	2½" NPT	8.1	19.9	17.5	25
MS 1700J	3" NPT				

- Dimensions are in inches.
- We reserve the right to make reasonable design changes without notice.

Motor Specifications

ELECTRIC MOTOR DATA

Model Size	HP RPM	Motor Frame	SINGLE PHASE			THREE PHASE		
			Voltage	Hz	Full Load Amps 230 V	Voltage	Hz	Full Load Amps 230 V.
CC100	1/3 3450	IEC 63	115/230	60	2.6	208-230/460 190/380	60 50	1.1
CC200	1/2 3450	IEC 71			3.5	208-230/460 190/380	60 50	1.6
CC450	1/2 1725	NEMA 56C	115-230/460	60	4.0	208-230/460	60*	2.0
CC600	1 1725	NEMA 56C	115-230/460	60	6.4	208-230/460	60*	3.8
CC1000	2 1725	NEMA 56C	115/230	60	9.2	208-230/460	60*	6.2
CC1600	5 1725	NEMA 184TC	230	60	23	208-230/460	60*	13.2
CC2000	7.5 1725	NEMA 213TC	CONSULT FACTORY			208-230/460	60*	19.6
CC2500	7.5 1725	NEMA 213TC				208-230/460	60*	19.6
CC3500	10 1725	NEMA 213TC				208-230/460	60*	26.0

*Electric motors are TEFC and are not thermally protected.
*Actual rating may vary with motor brand. Check motor nameplate for actual rating.
*Motor RPM is reduced by 1/6 for 50 Hz service.
* - 3 Phase motors available in 50 Hz.

AIR MOTOR DATA

Model Number	Air Pressure To Motor (PSI)	Motor Air Consumption (CFM)	Air Motor Connection Size	FAN RPM
CC100	30	10	1/4" NPT	3450
CC200	60	17	1/4" NPT	3450
CC450	40	25	1/4" NPT	1725
CC600	40	25	1/4" NPT	1725
CC1000	50	70	1/2" NPT	1725
CC1600	60	150	1 1/4" NPT	1725
CC2000	80	200	1 1/4" NPT	1725
CC2500	80	200	1 1/4" NPT	1725
CC3500	100	240	1 1/4" NPT	1725

*Air pressure to motor ***Must*** be regulated and lubricated.
****Do Not Exceed*** fan RPM listed above.
*Mufflers are included with all motors.

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Storage Containers

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10’

External Dimensions	Internal Dimensions
Length: 10’	Length: 9’ 4”
Width: 8’	Width: 7’ 8”
Height: 8’ 6”	Height: 7’ 9-7/8”

Cubic Capacity: 561 Cubic Feet
Approximate Weight: 2,932 lbs

20’

External Dimensions	Internal Dimensions
Length: 20’	Length: 19’ 5-1/2”
Width: 8’	Width: 7’ 8”
Height: 8’ 6”	Height: 7’ 9-7/8”

Cubic Capacity: 1,173 Cubic Feet
Approximate Weight: 5,500 lbs

40’

External Dimensions	Internal Dimensions
Length: 40’	Length: 39’ 5-1/2”
Width: 8’	Width: 7’ 8”
Height: 8’ 6”	Height: 7’ 9-7/8”

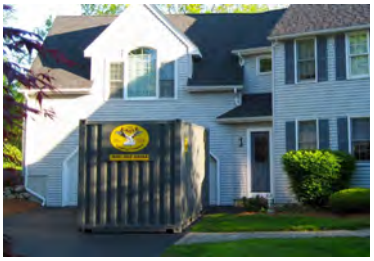
Cubic Capacity: 2,389 Cubic Feet
Approximate Weight: 8,891 lbs

40’ High Cube (extra 1’ of height!)

External Dimensions	Internal Dimensions
Length: 40’	Length: 39’ 5-1/2”
Width: 8’	Width: 7’ 8”
Height: **9’ 6”**	Height: **8’ 9-7/8”**

Cubic Capacity: 2,694 Cubic Feet
Approximate Weight: 9,648 lbs

* Photos are representational. Specifications may vary from those shown.



Accessories

- Locks
- Dolly Ramps
- Shelves
- Forklift Ramps
- Pipe Racks
- Contents Insurance

eagleleasing.com/storage-containers

The Eagle Leasing Company
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Orange, CT – Southborough, MA – Oxford, MA – Northborough, MA

FPZ BLOWER TECHNOLOGY

REGENERATIVE BLOWERS VACUUM

SCL K07 / K08 / K09 / K10 / K11 / K12

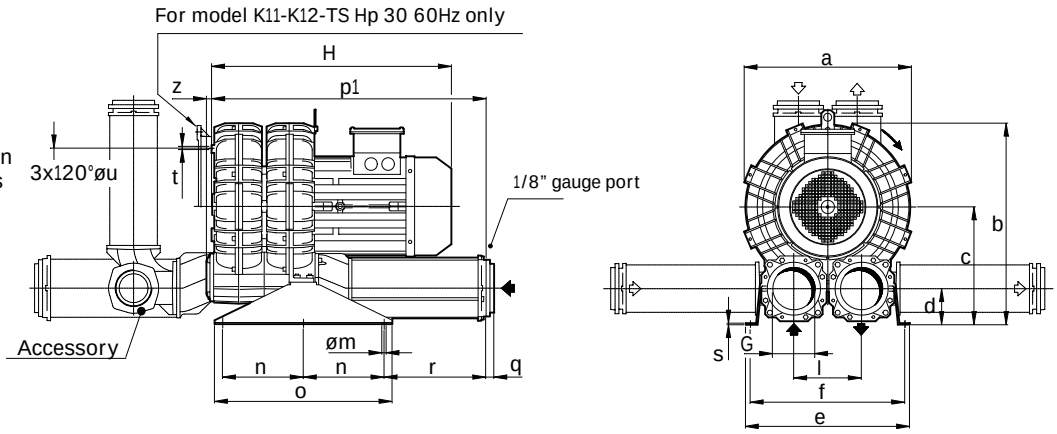
TS SERIES

SN 1826-14B

TECHNICAL CHARACTERISTICS
- Aluminium alloy construction
- Smooth operation
- High efficiency impeller
- Maintenance free
- Mountable in any position
- Recognized TEFC-cURus motor
- G1/8" female thread on both suction and discharge silencer port flanges

OPTIONS
- Special voltages (IEC 38)
- Surface treatments

ACCESSORIES
- Inlet and/or inline filters
- Additional inlet/outlet silencers
- Safety valves
- Flow converting device
- Optional connectors



Dimensions in inches.
Dimension for reference only.

Model	a	b	c	d	e	f	G	l	m	n	o	p1	q	r	s	t	u	z
K07-TS	16.69	20.91	12.56	3.86	18.50	17.24	4" NPT	7.17	0.51	9.84	21.65	31.57	0.98	11.77	0.20	M8	11.61	0.63
K08-TS	17.99	21.57	12.56	3.86	18.90	17.64	4" NPT	7.17	0.51	9.84	21.65	31.57	0.98	11.77	0.20	M8	12.20	0.63
K09-TS	19.37	24.02	14.37	4.41	20.08	18.82	5" NPT	8.27	0.51	9.84	21.65	33.46	1.38	12.40	0.20	M8	14.17	0.63
K10-TS	20.31	24.53	14.37	4.41	20.08	18.82	5" NPT	8.27	0.51	9.84	21.65	33.46	1.38	12.40	0.20	M8	14.17	0.63
K11-TS	21.34	25.59	14.96	4.17	21.26	20.00	5" NPT	8.98	0.51	9.84	21.65	34.25	1.38	12.60	0.20	M8	15.35	0.63
K12-TS	21.57	25.71	14.96	4.17	21.26	20.00	5" NPT	8.98	0.51	9.84	21.65	34.8	1.38	12.60	0.20	M8	15.4	0.63

Model	Maximum flow cfm		Installed power Hp		Maximum diff erential pressure Δp (In Hg)		Noise level Lp dB (A) (1)		Overall dimensions H Inches	Weight Lbs
	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm	60 Hz 3500 rpm	50 Hz 2900 rpm		
K07-TS	588	487	7 ½	7 ½	2.6	4.4	83.9	81.9	23.0	218.3
			10	10	4.4	6.6	84.2	82.2	24.5	230.4
			15	15	8.1	8.1	84.8	82.8	24.5	243.7
K08-TS	715	592	15	15	4.4	6.4	83.3	81.3	24.5	256.0
K09-TS	941	780	20	20	5.9	7.4	85.0	83.0	31.0	422.0
			25	25	8.1	8.8	87.0	85.0	31.0	432.0
K10-TS	1093	906	20	20	4.4	5.9	88.1	86.1	31.0	429.0
			25	25	5.9	7.4	88.4	86.4	31.0	439.0
K11-TS	1254	1039	25	25	3.4	6.6	89.4	87.4	31.5	469.0
			30	30	5.1	8.1	90.0	88.0	31.5	475.0
K12-TS	1410	1168	30	30	3.3	5.9	90.6	88.6	32.0	475.0

(1) Noise measured at 1 m distance with inlet and outlet ports piped, in accordance to ISO 3744.
(2) K11-K12-TS Hp 30 vertical assembly only.

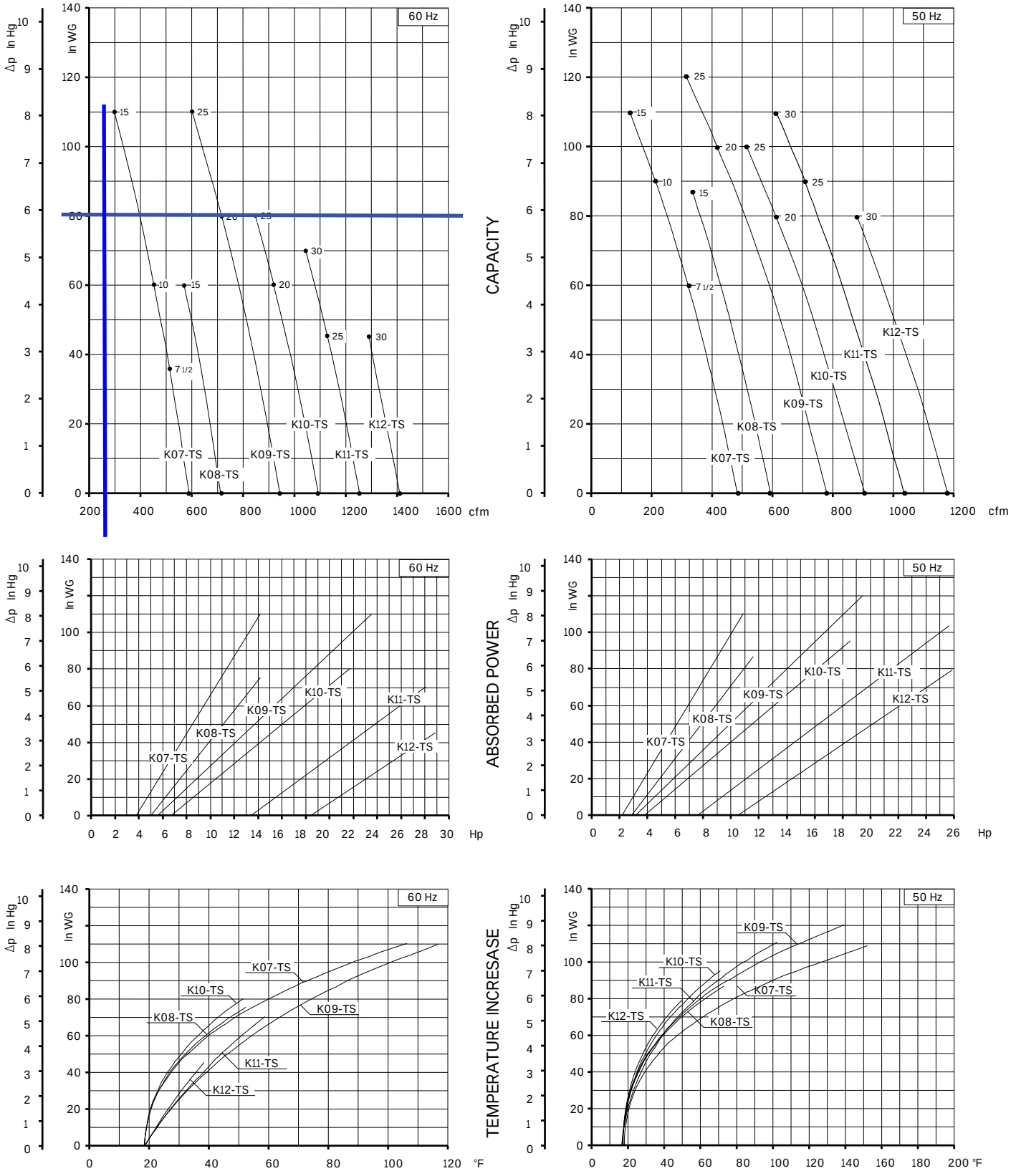
- For proper use, the blower should be equipped with inlet filter and safety valve; other accessories available on request.
- Ambient temperature from +5° to +104°F.
- Specifications subject to change without notice.

FPZ, Inc. 150 N. Progress Drive Saukville, WI 53080 USA Tel. (262) 268-0180 usa@fpz.com www.fpz.com

SCL K07 / K08 / K09 / K10 / K11 / K12

TS SERIES

SN 1826-14B



Curves refer to air at 68° F temperature, measured at inlet port and 29.92 In Hg atmospheric backpressure (abs).
Values for flow, power consumption and temperature rise: +/-10% tolerance.
Data subject to change without notice.

MOISTURE SEPARATOR

GENERAL THEORY

The moisture separator removes liquids from the process stream in soil venting applications to help protect the blower from corrosion and mineral deposits caused by water.

DESIGN INFORMATION

NES moisture separators operate on the principles of cyclonic section aided by velocity reduction. The moisture separator inlet pipe is set tangential to the tank wall, a stringer pipe extends down past the separator inlet is placed in the center of the tank. The moisture laden air stream is forced into a cyclonic rotation. The centrifugal force produced throws the water droplets to the outer wall of the separator where they fall and collect at the bottom. Additional efficiency is produced when the velocity is reduced to values between 1500 fpm and 6000 fpm. For a separator of this type, moisture separation efficiency is typically 95% or greater for moisture droplets greater than 10 micron.

CONSTRUCTION

NES moisture separators are constructed of carbon steel with bronze drain valves, removable lid with EPDM gasket, mechanical ball and float assembly standard for drum style separators. Sight glass, emergency high-level switch and pump out switches are optional. Tank style separators are standard with carbon steel construction, bronze drain valves, flanged clean-out port, sight glass and emergency high level switch. Pump-out switches and mist eliminator are optional. All separators are primed and coated with a rust inhibitor to prevent corrosion.

National Environmental Systems
Phone 508-226-1100 Fax 508-226)-1180 84 Dunham Street Attleboro, MA 02703
www.nes-inc.biz

Tank Style Moisture Separator

*___ gallon total capacity
* Carbon Steel construction, exterior primed & painted
* 4" MNPT Tangential Inlet - Vapor
* Demister
* 4" FNPT Outlet - Vapor
* 2" Clear PVC Sight Glass
* Clean-out Man-way
* 1" Ball drain valve
* 2" MPT Pump Out - Liquid
* (3) Position High Level Switch

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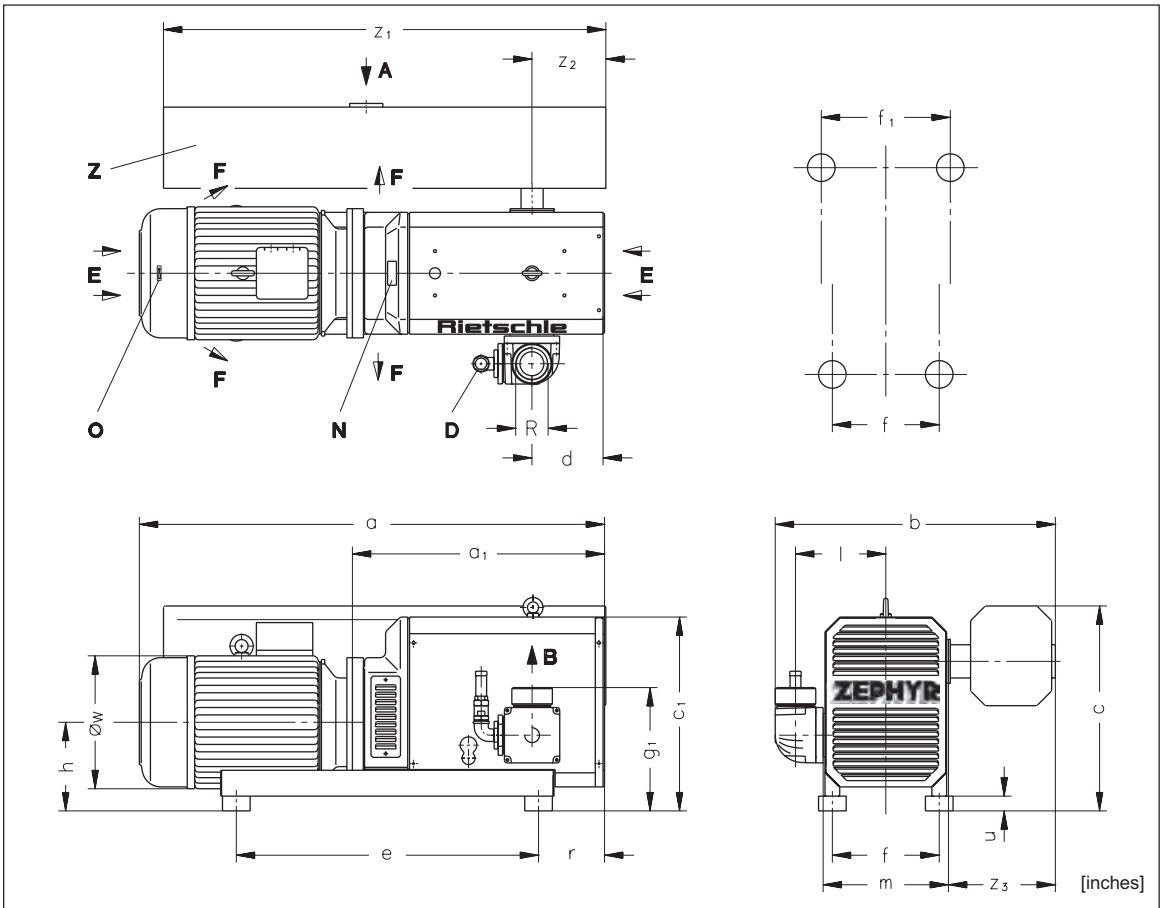
DLR

ZEPHYR

DLR 100
DLR 250
DLR 300
DLR 400
DLR 500



A	Suction	Succión	Aspiration	Sucção
B	Pressure connection	Conexión presión	Raccord surpression	Conexão da pressão
D	Pressure regulating valve	Válvula reguladora de presión	Valve de réglage pression	Válvula de regulagem da pressão
E	Cooling air entry	Entrada aire refrigerante	Entrée air refroidissement	Entrada do ar refrigerante
F	Cooling air exit	Salida aire refrigerante	Sortie air refroidissement	Saída do ar refrigerante
N	Data plate	Placa fecha	Etiquette caractéristique	Placa da data
O	Rotation arrow	Dirección de rotación	Flèche sens rotation	Direção da rotação
Z	Inlet silencer	Silenciador entrada	Silencieux d'aspiration	Silenciador de entrada

DLR		100			250			300			400				500			
kW	50 Hz	3.0	4.0	5.5	7.5	11	-	7.5	11	15	11	15	18.5	22	15	18.5	22	30
hp	60 Hz	5.0	7.5	10	10	15	20	15	20	25	20	25	30	-	-	30	-	40
[inches] a	50 Hz	27.36	28.03	32.17	36.26	40.67	-	36.26	40.67	40.67	47.36	47.36	47.36	49.76	47.36	47.36	49.76	54.09
	60 Hz	31.49	33.07	33.07	37.79	38.85	38.85	38.85	38.85	46.01	45.47	52.70	52.70	-	-	53.21	-	54.85
a_1	50 Hz	15.43	15.43	16.22	20.31	20.31	-	20.31	20.31	20.31	27.01	27.01	27.01	27.01	27.01	27.01	27.01	29.37
	60 Hz	17.56	17.56	17.56	22.28	22.28	22.28	22.28	22.28	22.62	28.90	29.31	29.31	-	-	29.82	-	29.82
b		21.26			28.43			28.43			29.29				30.08			
c / c_1		14.76 / 14.17			21.06 / 20.67			21.06 / 20.67			21.06 / 20.67				21.85 / 20.67			
d		3.62			3.94			3.39			7.76				7.76			
e		17.32			28.35			28.35			32.28				32.28			36.22
f		8.66			11.42			11.42			11.42				11.42			11.42
f_1		-			-			-			-				-			13.78
g_1		8.23			11.54			11.54			13.07				13.07			
h		5.91			9.45			9.45			9.45				9.45			
l		7.17			9.25			9.25			9.65				9.65			
m		10.24			13.39			13.39			13.39				13.39			
r		3.03			4.37			4.37			7.05				7.05			
u		5.91			1.57			1.57			1.57				1.57			
øw	50 Hz	7.72	8.66	9.69	9.69	12.28		9.69	12.28		12.28				12.28		14.17	
	60 Hz	7.88	9.57	9.57	9.57	11.47		11.47	11.47	15.30	11.47	15.30		-	-	15.30	-	16.88
z_1 / z_2 / z_3		25.59 / 3.94 / 7.68			39.37 / 3.15 / 10.63			39.37 / 3.15 / 10.63			39.37 / 3.15 / 10.63				47.24 / 7.87 / 11.42			
R		1 1/2" NPT			2" NPT			2" NPT			3" NPT				3" NPT			

DA 881

2.1.2002

Rietschle Inc.
7222 Parkway Drive
Hanover, MD 21076 USA
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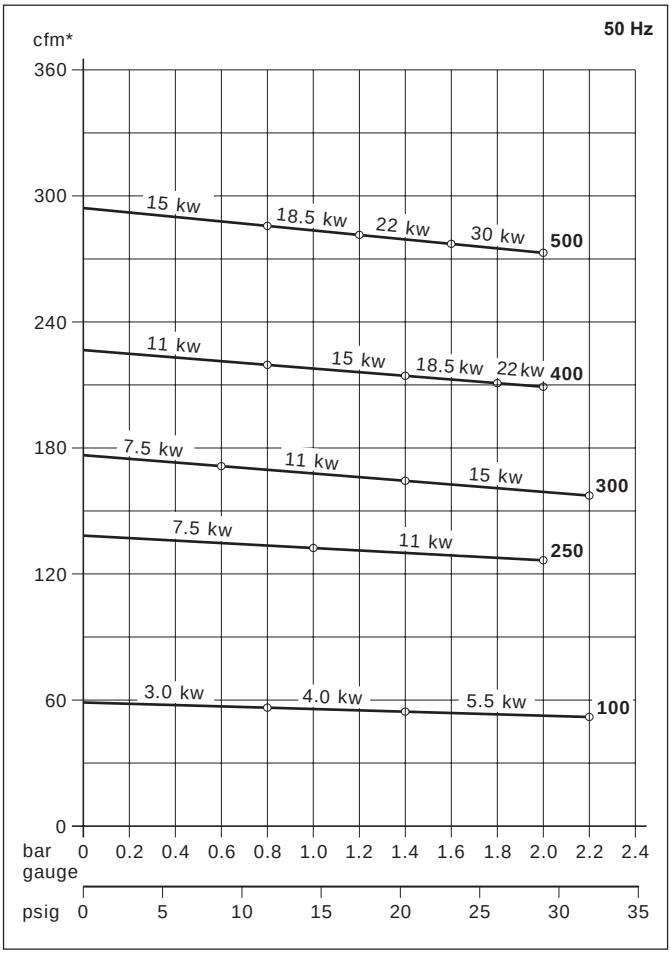
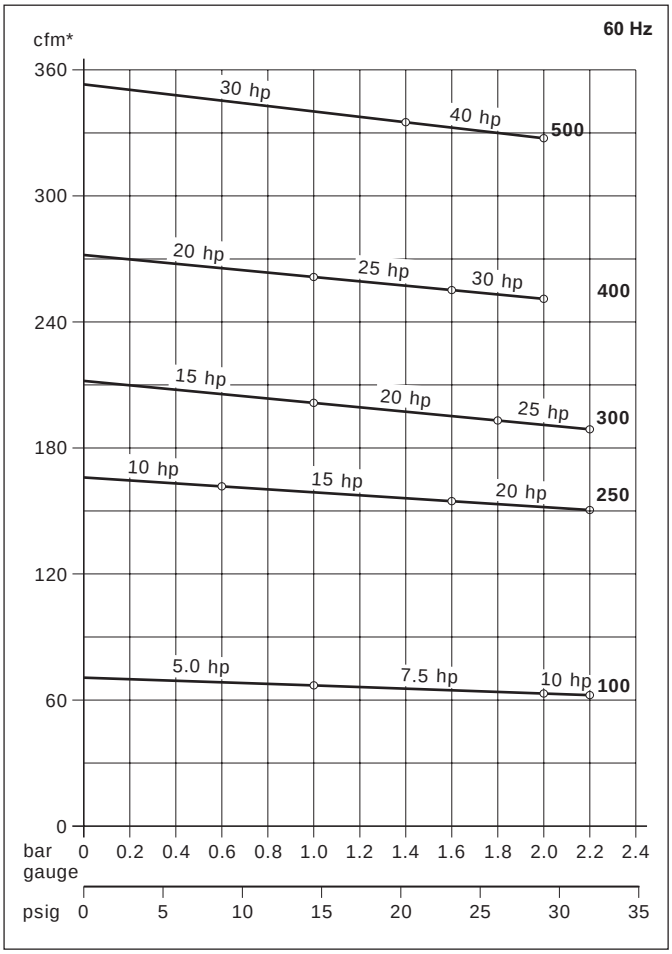
E-Mail:
info@rietschleusa.com
http://
www.rietschleusa.com

DLR		100			250			300			400				500			
cfm	50 Hz	58.9			138			177			227				294			
	60 Hz	70.6			166			212			272				353			
psig	50 Hz	11.6	20.3	31.9	14.5	29.0	-	8.7	20.3	31.9	11.6	20.3	26.1	29.0	11.6	17.4	23.2	29.0
	60 Hz	14.5	29.0	31.9	8.7	23.2	31.9	14.5	26.1	31.9	14.5	23.2	29.0	-	-	20.3	-	29.0
3~	50 Hz	230/400V ± 10%			400/690V ± 10%													
	60 Hz	208-230/460V ± 10%						230/460V ± 10%										
kw	50 Hz	3.0	4.0	5.5	7.5	11	-	7.5	11	15	11	15	18.5	22	15	18.5	22	30
hp	60 Hz	5.0	7.5	10	10	15	20	15	20	25	20	25	30	-	-	30	-	40
rpm	50 Hz	2850																
	60 Hz	3450																
dB(A)	50 Hz	79			81			82			82				82			
	60 Hz	83			85			85			85				85			
lbs	50 Hz	232	243	287	503	562	-	560	621	653	712	747	783	831	759	794	908	1213
	60 Hz	259	307	328	517	595	593	652	650	790	743	883	929	-	-	940	-	1044
l		0.5			0.9			0.9			0.9				0.9			

ZRK	40 (03)	50 (03)	50 (03)	80 (03)	80 (03)
ZAF	40 (00)	50 (00)	50 (00)	80 (00)	80 (00)
ZDR	#	#	#	#	#
ZPD	#	#	#	#	#
ZMS / ZAD	#	#	#	#	#

cfm	Capacity	Capacidad	Volume engendré	Capacidade
psig	Excess pressure	Exceso de presión	Surpression	Pressão excessiva
3~	Motor version	Versión motor	Exécution moteur	Versão do motor
kw / hp	Motor rating	Datos motor	Puissance moteur	Potência do motor
rpm	Speed	Velocidad	Vitesse rotation	Velocidade
dB(A)	Average noise level	Nivel de ruido medio	Niveau sonore moyen	Nível médio de ruído
lbs	Weight	Peso	Poids	Peso
l	Oil capacity (Gear)	Instrumentos capacidad aceite	Charge d'huile (Engrenage)	Engrenagem da capacidade do óleo
	Accessories	Accesorios	Accessoires	Acessórios
ZRK	Non return valve	Válvula retención	Clapet anti-retour	Válvula sem retorno
ZAF	Suction filter	Filtro succión	Filtre d'aspiration	Filtro de sucção
ZDR	Pressure regulating valve	Válvula reguladora de presión	Valve de réglage pression	Válvula de regulagem da pressão
ZPD	Pulsation silencer	Silenciador de pulsación	Absorbeur de pulsations	Silenciador de pulsação
ZMS	Motor starter	Arranque motor	Disjoncteur moteur	Arranque do motor
ZAD	Soft starter	Soft starter	Démarrage progressif	Soft starter





* Capacity refers to free air at 1 standard atmosphere and 20° C (68° F)./ La capacidad se refiere al aire libre a 1 atmosfera estandár de presión y a 20° C (68° F) de temperatura./ Le débit est mesuré à l'atmosphère de 1 bar (abs.) à 20° C (68° F)./ A capacidade refere-se ao ar livre a uma atmosfera padrão 1 e a 20° C (68° F).

Curves and tables refer to compressor at normal operating temperature./ Las curvas y las tablas se refieran al compresor a la temperatura normal de operación./ Les courbes et tableaux sont établies, compresseur à température de functionnement./ As curvas e tabelas referem-se ao compressor a temperatura normal de operação.

Technical information is subject to change without notice!/ La información técnica está sujeta a cambios sin previo aviso!/ Sous réserve de modification technique./ A informação técnica está sujeita a mudança sem aviso prévio!

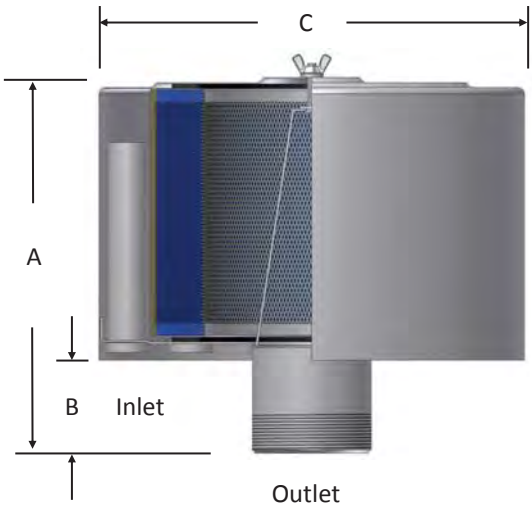
The listed values for a, ø w and full load amperage may vary because of different motor manufacturers./ Los valores listados para a, ø w y para el amperaje de carga completa pueden variar para distintos fabicantes de motores./ Les dimensions a et ø w ainsi que l'ampérage peuvent différer des données indiquées ci-dessus, selon le fabricant du moteur./ Como variam os fabricantes de motores, poderá haver variação dos valores indicados para a, ø w e para uma amperagem da carga total.

on request # on pedido # sur demande # a pedido

Compact Filter Silencers
FS Series 1/2”-6”MPT, 4”-6”FLG

Features

- Fully drawn weatherhood
- Tubular silencing design - tubes are positioned to maximize attenuation and air flow while minimizing pressure drop
- Corrosion resistant carbon steel construction
- Powder coat finish



Technical Specifications

- Temp (continuous): min -15°F (-26°C) max 220°F (104°C)
- Filter change out differential: 15-20” H2O over initial Δ P
- Pressure drop graphs available upon request
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron

Options

ATEX Available

- Tap holes available
- Pressure drop indicator (See page 3-12)
- Various media for different environments
- Stainless steel construction
- Various nonstandard finishes and connection styles
- Side Access Silencer Filters (LQB Series) for space restricted enclosures (select models)

Tidbit: Charlie Solberg Sr. “Senior” designed our first filter silencer in 1966. The FS-15 size filter was created for small air compressors.

www.solbergmfg.com • sales@solbergmfg.com • Sales: 630.773.1363 • Fax: 630.773.0727

MPT Outlet Assemblies

MPT Outlet	Assembly SCFM Rating	Assembly Part Number Polyester	Assembly Part Number Paper	Dimensions - inches A	B	C	No. of Silencing Tubes	Approx. Wt. lbs	Replacement Element Part No. Polyester	Replacement Element Part No. Paper	Element SCFM Rating
1/2"	10	FS-15-050	FS-14-050	3 7/16	1	6	1	2	15	14	35
3/4"	25	FS-15-075	FS-14-075	4	1 1/4	6	2	2	15	14	35
1"	35	FS-15-100	FS-14-100	4	1 5/16	6	3	2	15	14	35
1"	55	FS-19P-100	FS-18P-100	6 3/8	1 4/16	6	3	3	19P	18P	100
1 1/4"	70	FS-19P-125	FS-18P-125	6 3/4	1 5/8	6	5	3	19P	18P	100
1 1/2"	85	FS-19P-150	FS-18P-150	6 3/4	1 5/8	6	5	4	19P	18P	100
2"	135	FS-31P-200	FS-30P-200	7 1/2	2 3/8	10	5	8	31P	30P	195
2"	135	FS-231P-200	FS-230P-200	12	2 3/8	10	5	14	231P	230P	300
2 1/2"	195	FS-31P-250	FS-30P-250	7 1/2	2 1/2	10	5	8	31P	30P	195
2 1/2"	195	FS-231P-250	FS-230P-250	12 3/8	2 5/8	10	9	15	231P	230P	300
3"	300	FS-231P-300	FS-230P-300	12 3/4	3 1/8	10 1/4	9	15	231P	230P	300
3"	300	FS(12)-235P-300	FS(12)-234P-300	12 7/8	2 11/16	12 1/4	3	29	235P	234P	570
3"	300	FS-275P-300	FS-274P-300	13	3	16	9	33	275P	274P	1100
4"	520	FS(12)-235P-400	FS(12)-234P-400	13 7/8	3 11/16	12 1/4	6	29	235P	234P	570
4"	520	FS-275P-400	FS-274P-400	14	4	16	9	34	275P	274P	1100
5"	800	FS-245P-500	FS-244P-500	14	4 1/8	16	14	33	245P	244P	880
5"	800	FS-275P-500	FS-274P-500	14	4 1/8	16	14	36	275P	274P	1100
6"	1100	FS-275P-600	FS-274P-600	15	5 1/8	16	18	38	275P	274P	1100

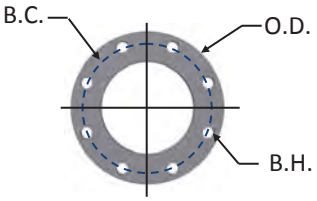
See Filter Silencer Technical Data section for sizing guidelines.

Flange Outlet Assemblies

Flange Outlet	Assembly SCFM Rating	Assembly Part Number Polyester	Assembly Part Number Paper	Dimensions - inches A	B	C	No. of Silencing Tubes	Approx. Wt. lbs	Replacement Element Part No. Polyester	Replacement Element Part No. Paper	Element SCFM Rating
4"	520	FS(12)-235P-400F	FS(12)-234P-400F	13 7/8	3 11/16	12 1/4	6	32	235P	234P	570
4"	520	FS-275P-400F	FS-274P-400F	14	4	16	9	39	275P	274P	1100
5"	800	FS-245P-500F	FS-244P-500F	14	4 1/8	16	14	38	245P	244P	880
5"	800	FS-275P-500F	FS-274P-500F	14	4 1/8	16	14	41	275P	274P	1100
6"	1100	FS-275P-600F	FS-274P-600F	15	5 1/8	16	18	42	275P	274P	1100

See Filter Silencer Technical Data section for sizing guidelines.

125/150# Pattern Flg	Dimensions - inches O.D.	B.C.	B.H.	No. of Holes	Flange Thickness
4"	9	7 1/2	0.75	8	0.5
5"	10	8 1/2	0.88	8	0.5
6"	11	9 1/2	0.88	8	0.5



O.D.: Outside Diameter
B.C.: Bolt Circle
B.H.: Bolt Hole

Note: Model offerings and design parameters may change without notice. See www.solbergmfg.com for most current offering.

SOLBERG
Filtration & Separation

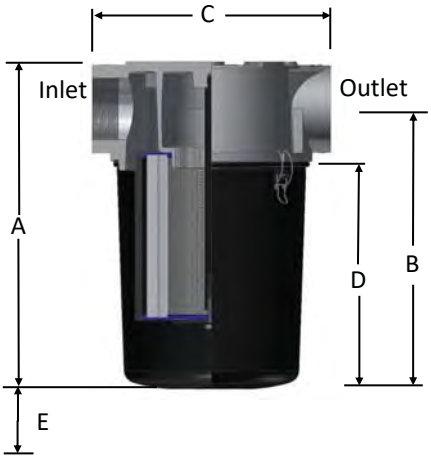
"T" Style Vacuum Filters

CT Series 1" – 6"

Features

- Compact design for space restrictions; min. service area
- Inlet above element for extended element life & maintenance intervals
- Cast, corrosion resistant aluminum top with machined connections and integrated baffle design
- 4 taps for mounting brackets:
  - 2", 2 ½", 6" connections: M12x1.75 taps
  - 3" to 4" connections: 1/2"-13 taps
- "T" style design minimizes piping requirements
- Black powder coat carbon steel drop down bucket
- Clip release shell for easy maintenance
- Swing bolts standard on 6" housings
- Drill points for additional taps: 1", 1 ¼", 1 ½", 3", 4" (gauge or bracket)
- 1/4" FPT inlet/outlet taps for gauges: 2", 2 ½", & 6"

Technical Specifications



- Vacuum Rating: Medium vacuum service*
- Filter change out differential: 15-20" H_2O over initial Δ P
- Polyester: 99%+ removal efficiency standard to 5 micron
- Paper: 99%+ removal efficiency standard to 2 micron

*See Vacuum Filter Technical Data for vacuum service data.

Options

ATEX Available

- Swing bolts for heavy duty environments
- Drain ports
- Extended bucket (select models)
- Various nonstandard finishes
- Reverse pulse configuration
- See-through bucket (select models)

Inlet/Outlet Size	Type	Assembly SCFM Rating	Assembly Part Number Polyester	Paper	Dimensions - inches A	B	C	D	Suggested Service HT. E	Approx. Weight (lbs)	Replacement Element Part No. Polyester	Paper	Element SCFM Rating
1"	NPSC	40	CT-897-100C	CT-896-100C	13 ⅛	11 11/16	7	10 ⅛	9	12	897	896	80
1 ¼"	NPSC	60	CT-897-125C	CT-896-125C	13 ⅛	11 11/16	7	10 ⅛	9	12	897	896	80
1 ½"	NPSC	80	CT-897-150C	CT-896-150C	13 ⅛	11 11/16	7	10 ⅛	9	11	897	896	80
2"	NPSC	175	CT-851-200C	CT-850-200C	12 13/16	10 13/16	9	9	9	16	851	850	290
2 ½"	FPT	210	CT-851-250C	CT-850-250C	12 13/16	10 13/16	9	9	9	15	851	850	290
3"	FPT	300	CT-235P-300C	CT-234P-300C	18 ⅝	16	13 ½	13	9	30	235P	234P	570
4"	FPT	520	CT-235P-400C	CT-234P-400C	18 ⅝	16	13 ½	13	9	26	235P	234P	570
6"	FPT	1100	CT-275P-600C	CT-274P-600C	18 ¼	14 5/16	19	9 13/16	10	45	275P	274P	1100

Note: CT 2" & 2 ½" models: Element seals on the base of the housing. See Vacuum Filter Technical Data section for sizing guidelines.

Rev: CT-US1808K

Sales/Service: 630.773.1363
sales@solbergmfg.com

www.solbergmfg.com

Bulletin “D”

Stoddard Silencers

Specialists in Industrial Silencing

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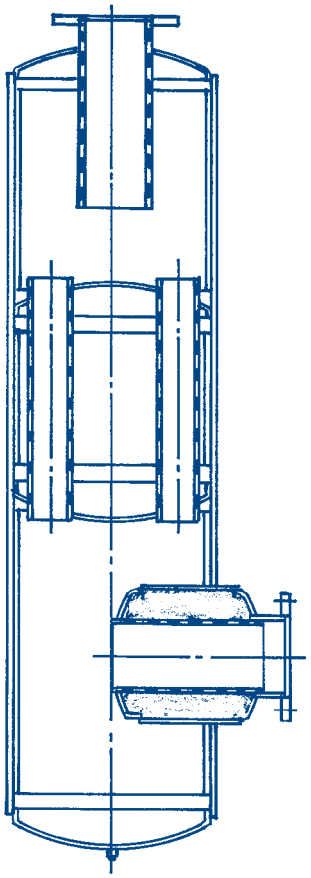
E-Mail - info @ stoddardsilencersinc.com
Web page - www.stoddardsilencersinc.com

ROTARY BLOWER DISCHARGE SILENCERS



Stoddard Silencers

Series "D"

Rotary Blower Discharge Silencers

Discharge silencers are essential to good system performance on all rotary blower systems. The belief that the discharge creates less noise than the inlet is erroneous because the discharge pulsations and noise are normally contained in a closed system.

The rotary positive blower does not compress the air as it moves from the blower inlet to the blower discharge. Compression takes place when line pressure backs up into the open port — thus compressed air is then pushed out into the line. This action takes place in a very short period of time and produces steep wave forms that can be destructive to piping and other equipment unless properly treated.

Blower displacement and speed are the major parameters in designing discharge silencers that perform their assigned function and will live throughout the useful life of the blower. Normally for good silencing the discharge silencer should have an internal volume to blower displacement ratio of 18 to 1.

Blower speed dictates the model used. When the blower speed is below the transition speed the multi-chamber type is recommended to properly treat the noise emitted from the blower discharge. When the blower speed is above the transition speed, the intensity of the high frequencies is increased, requiring a modified design incorporating acoustic materials to absorb these frequencies. Normally acceptable discharge silencer pressure drop is in the range of 3 to 12 inches of water.

Discharge Silencer Size Selection Chart

Discharge Silencer Size	ICFM Range at Blower Inlet					
	4 PSIG 112° F	6 PSIG 134° F	8 PSIG 156° F	10 PSIG 178° F	12 PSIG 200° F	15 PSIG 233° F
1	0 - 38	0 - 40	0 - 42	0 - 44	0 - 46	0 - 49
1½	39 - 89	41 - 95	43 - 101	45 - 106	47 - 110	50 - 117
2	90 - 148	96 - 158	102 - 167	107 - 175	111 - 183	118 - 194
2½	149 - 210	159 - 224	168 - 237	176 - 249	184 - 260	195 - 275
3	211 - 325	225 - 347	238 - 367	250 - 385	261 - 402	276 - 426
4	326 - 564	348 - 601	368 - 636	386 - 667	403 - 697	427 - 738
5	565 - 881	602 - 939	637 - 994	668 - 1042	698 - 1090	739 - 1153
6	882 - 1265	940 - 1348	995 - 1427	1043 - 1497	1091 - 1565	1154 - 1656
8	1266 - 2204	1349 - 2349	1428 - 2486	1498 - 2608	1566 - 2726	1657 - 2885
10	2205 - 3474	2350 - 3702	2487 - 3918	2609 - 4110	2727 - 4296	2886 - 4548
12	3475 - 4983	3703 - 5301	3919 - 5619	4111 - 5895	4297 - 6162	4549 - 6523
14	4984 - 6421	5302 - 6842	5620 - 7241	5896 - 7596	6163 - 7941	6524 - 8405
16	6422 - 8452	6843 - 9006	7242 - 9531	7597 - 9998	7942 - 10451	8406 - 11063
18	8453 - 10749	9007 - 11453	9532 - 12121	9999 - 12716	10452 - 13292	11064 - 14070
20	10750 - 13769	11454 - 14671	12122 - 15526	12717 - 16288	13293 - 17026	14071 - 18022
22	13770 - 16186	14672 - 17246	15527 - 18252	16289 - 19147	17027 - 20015	18023 - 21186
24	16187 - 19313	17247 - 20579	18253 - 21779	19148 - 22847	20016 - 23883	21187 - 25280

Discharge Silencer Model Selection Chart

Blower Gear Size	Discharge Transition Speed - RPM (2700 FPM)*	Below Transition Speed		Above Transition Speed	
		Standard Silencing	High Degree Silencing	Standard Silencing	High Degree Silencing
2 2½ 3	5152 4125 3435	D12	D13	D32	D71 D33
3½ 4 5	2945 2580 2060				
6 7 8	1720 1470 1285				
10 12 14	1030 860 735				
16 18 20	645 573 515				

*Transition speeds shown are for two lobe rotary blowers. For three lobe blowers use 67% of the rpm shown.

Discharge Silencer Pressure Drop Calculations

Tabulated Pressure Drop in Inches of Water for Various Velocities Thru Silencer - Models D12, D13, D32, D33

Blower Discharge		Silencer Discharge Velocity - FPM						
PSIG	°F	3000	3500	4000	4500	5000	5500	6000
4	112	2.77	3.78	4.95	6.24	7.70	9.33	11.09
5	123	2.87	3.90	5.12	6.45	7.97	9.64	11.47
6	134	2.96	4.03	5.28	6.65	8.22	9.94	11.83
7	145	3.04	4.14	5.43	6.85	8.46	10.23	12.18
8	156	3.13	4.26	5.58	7.04	8.69	10.51	12.51
9	167	3.21	4.37	5.72	7.22	8.91	10.78	12.83
10	178	3.29	4.47	5.86	7.39	9.13	11.04	13.14
11	189	3.36	4.57	5.99	7.56	9.34	11.30	13.44
12	200	3.43	4.67	6.13	7.72	9.54	11.54	13.73
13	211	3.50	4.77	6.25	7.88	9.73	11.78	14.01
14	222	3.57	4.86	6.37	8.04	9.92	12.00	14.29
15	233	3.64	4.95	6.49	8.18	10.10	12.23	14.55

Discharge Silencer Pressure Drop Calculations
(Data Required - Blower ICFM, Discharge Pressure & Temperature)

1. Determine Discharge velocity in feet per minute for silencer size selected from sizing chart.

$$\text{Discharge Velocity} = \frac{5.17 \times \text{ICFM} \times (460 + \text{Discharge Temp. °F})}{(\text{Silencer Size})^2 \times (14.7 + \text{Discharge Press. PSIG})}$$

$$\text{Discharge Velocity} = \frac{5.17 \times \_\_\_\_ \times (460 + \_\_\_\_ \text{°F})}{(\_\_\_\_)^2 \times (14.7 + \_\_\_\_ \text{PSIG})}$$

$$\text{Discharge Velocity} = \_\_\_\_ \text{FPM}$$

2. Convert Discharge Velocity (FPM) to Velocity Pressure. (inches of water)

$$\text{Velocity Pressure} = \left(\frac{\text{Discharge Velocity}}{4000}\right)^2$$

$$\text{Velocity Pressure} = \left(\frac{\_\_\_\_}{4000}\right)^2$$

$$\text{Velocity Pressure} = \_\_\_\_ \text{inches of water}$$

3. Determine Discharge Silencer Pressure Drop - (inches of water)

$$\text{Pressure Drop} = \text{Velocity Pressure} \times C \times \frac{(14.7 + \text{Disch. Press. PSIG})}{(460 + \text{Disch. Temp. °F})}$$

$$\text{Pressure Drop} = \_\_\_\_ \times C \times \frac{(14.7 + \_\_\_\_)}{(460 + \_\_\_\_)}$$

$$\text{Pressure Drop} = \_\_\_\_ \text{inches of water}$$

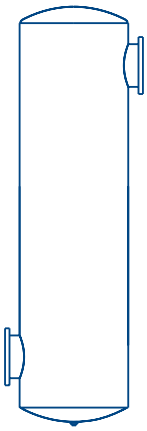
"C" - Pressure Drop Constant for Discharge Silencers

Model	C	Model	C
D32 / D32H	151	D12 / D12H	151
D32T	162	D13 / D13H	151
D33 / D33H	151	D31H	151
D33T	162	D71 / D71J	27

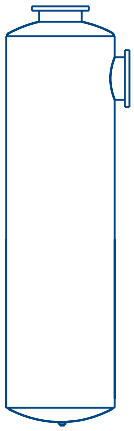
Basic Silencer Configurations

In-Line
Configuration

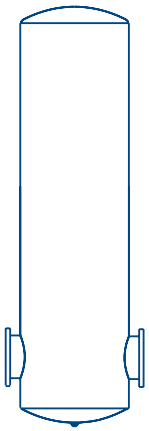
"H"
Configuration



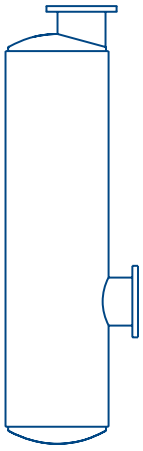
"R"
Configuration



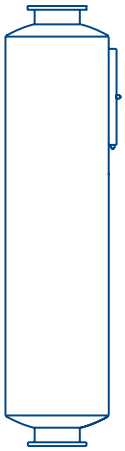
"G"
Configuration



"T"
Configuration



"HX"
Configuration

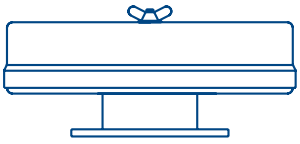


Spark
Arrester

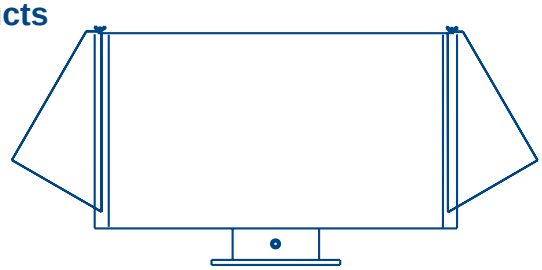
Flanged, NPT and plain pipe tubes inlet, outlet are available

See Accessory Bulletin "A" for optional mounting brackets, raincaps, and other accessories

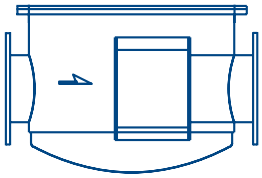
Other Stoddard Silencers Products



F64 Air Filters
Up to 5600 CFM



F21 Panel Air Filters
2500 CFM and Up



F65 In-Line Air Filters
Up to 5600 CFM

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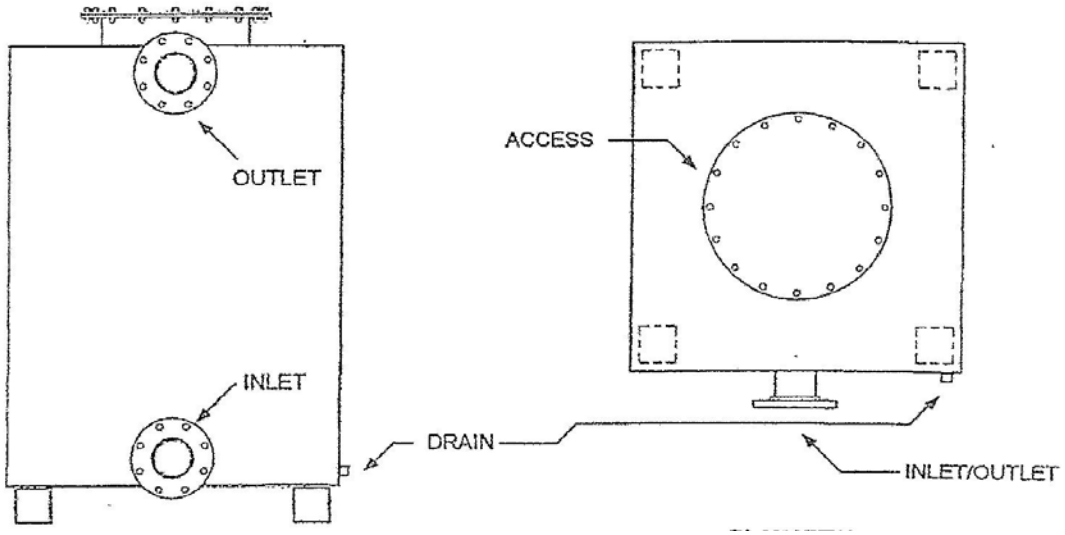
VS Series – High Flow
Vapor Phase Activated Carbon Adsorber



MODEL	VGAC(lbs.)	Flow(cfm) Max	Footprint	Overall Height	Inlet/Outlet	Overall Weight-lbs.
VS-500	500	650	3' x 3'	4'	4" FPT	900
VS-1000	1000	1200	4' x 4'	4' 6"	4" FPT	1,500
VS-2000	2000	1200	4' x 4'	6' 8"	4" or 6"	2,700
VS-3000	3000	1750	5' x 5'	6' 8"	8"	4,500
VS-5000	5000	3500	6' x 8'	6' 8"	10"	7,500
VS-10000	10,000	6000	8' x 10'	7' 8"	12"	15,000

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APPENDIX M - SITE HEALTH AND SAFETY PLAN

GZA SITE-SPECIFIC HEALTH, SAFETY & ACCIDENT PREVENTION STANDARD-PLAN

1. CLIENT/SITE/PROJECT INFORMATION		
Client: National Grid		
Site Address: 284 Winter Street, Haverhill, Massachusetts		
Site Description (be sure to list pertinent site features, chemicals used at the facility, and other potential hazard sources: The Site is an active Haffner's retail Gasoline Station and car wash.		
Work Environment (active manufacturing, office, vacant site, undeveloped property, etc.): Developed property currently used as a gasoline dispensing station and car wash. The Little River borders the property to the west, separated from the upland area by a retaining wall. Site is a former MGP Site.		
Job/Project #: 01.0172397.10	Estimated Start Date: September 1, 2024	Estimated Finish Date: September 1, 2027
Site is Covered by the Following Regulations:	OSHA HAZWOPER Standard ☒	Mine Safety and Health Administration ☐
	OSHA Construction Regulations ☐	

2. EMERGENCY INFORMATION		
Hospital Name: Holy Family Hospital		Hospital Phone: 978-374-2000
Hospital Address: 140 Lincoln Avenue, Haverhill, MA		Directions and Street Map Attached: ☒ Yes
Local Fire #: 911 or 978-373-8460	Local Ambulance #: 911 or 978-373-8460	Local Police #: 911 or 978-373-1212
WorkCare Incident Intervention Services:	**For non-emergencies, if an employee becomes hurt or sick call 888-449-7787**	
Other Emergency Contact(s): Charles Lindberg – GZA Jesse Edmands – National Grid	Phone #'s: 781-278-3830 (office) 781-760-6412 (cell) (781) 434-8631 (cell)	

GZA SITE-SPECIFIC HEALTH, SAFETY & ACCIDENT PREVENTION STANDARD-PLAN

Site-Specific Emergency Preparedness/Response Procedures/Concerns:

Site is an active gas station and car wash. Service station manager must be notified a minimum of 24 hours in advance of scheduled work. Alert attendants/station manager of any emergencies. Significant vehicle traffic. Conduct a H&S briefing with personnel each visit and comply with GZA HASP. Reference attached map and directions to local hospital. Reference attached Job Hazard Analysis forms. Reference attached National Grid Incident Reporting best practices.

Conduct pre job site briefing with project members, including client representatives (as applicable), to review emergency procedures and responsibilities prior to start of each day's work. Review emergency contact information, locations of emergency equipment (e.g. first aid kits, fire extinguishers, and evacuation routes), current location and access to hospital. Ensure that cell phones are charged daily and have vehicle phone chargers on hand. Emergency Response Procedures and Rally Points will be discussed in the site-specific orientation and periodically during daily site health and safety briefings. Make potable water and soap (for washing) available to site personnel. Acid sample preservatives (hydrochloric acid, nitric acid) will be used on-Site. Refer to the attached SDSs for each commercial chemical used on the Site.

Anticipated emergencies on site include physical injuries, potential for chemical exposure, fire, and heat related injuries. Personnel on site will have current first aid and CPR training and will be able to respond to minor injuries and potential heart attacks while emergency response personnel are contacted for assistance.

Personal Injury: For minor injuries, such as cuts, burns, exhaustion, heat cramps, insect stings, etc., the affected employee will be removed to an uncontaminated area for administration of appropriate first aid. If the injury warrants additional medical attention, the affected employee will be properly decontaminated, as necessary and appropriate to the situation, and transported to the nearest hospital or emergency medical facility.

For more serious injuries the Field Safety Officer (FSO) or designee will summon emergency assistance to the project site. No attempt will be made by GZA personnel to move the victim, without the aid and/or instructions of qualified emergency response personnel.

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit
- Portable eye wash station

Portable potable water station to wash hands and exposed skin

- All EHS Events (incidents, first aid, near misses, unsafe acts/conditions, fires, chemical spills, property damage, and extraordinary safe behaviors) must be reported immediately to the Project Manager and to the GZA People-Based Safety App. National Grid project manager must be notified of any health and safety incidents as soon as is practicable.
- In the event of a chemical release greater than 5 gallons, site personnel will evacuate the affected area and relocate to an upwind location. The GZA Field Safety Officer and client site representative shall be contacted immediately.
- Site work shall not be conducted during severe weather, including high winds and lightning, or high flows within the Little River or immediately following significant precipitation events. In the event of severe weather, stop work, lower any equipment (drill rigs), and evacuate the affected area.

3. SCOPE OF WORK	
General project description, and phase(s) or work to which this H&S Plan applies[1].	Installation of air sparge and soil vapor extraction wells, above and below grade piping between wells, and the remediation unit. Work includes: vacuum excavation and drilling, shallow soil excavation, construction of the piping enclosures and exterior vault boxes, soil management, installation of an electrical power supply feed and interconnects for the remedial system, and Site restoration. Operation, Maintenance and Monitoring (OMM) activities will be performed on a routine basis following system startup.
Specific Tasks Performed by GZA:	Tasks by GZA during construction will include construction management of subcontractors and oversight of the new piping installation, pressure testing air sparge and soil vapor extraction piping and instrumentation sections, and installation of the remediation unit. Soil screening during subsurface work and collection of laboratory samples if necessary. While the system is operational, tasks by GZA will include collection of system data, adjustments to system components and/or individual wells, and other activities associated with the startup.
Concurrent Tasks to be Performed by GZA-hired Subcontractors (List Subcontractors by Name):	As of the date of this draft HASP, subcontractor procurement has not been finalized. GZA is assuming a multiple-source procurement process for the remedial system including (but not limited to) drilling, earthwork, system assembly and electrical power supply installation/connection. This HASP will be updated when the procurement approach is finalized.
Concurrent Tasks to be Performed by Others:	None

[1] Copy from or reference proposal or applicable design plan as appropriate.

Any OSHA PERMIT-REQUIRED CONFINED SPACE entry? ☐ YES ☒ NO IF YES, ADD CONFINED SPACE ENTRY PERMIT FOR THAT PORTION OF THE WORK	Any INDOOR fieldwork? ☐ YES ☒ NO IF YES, EXPLAIN:

4. SUB-SURFACE WORK, UNDERGROUND UTILITY LOCATION		
Will subsurface explorations be conducted for this work (drilling, excavation, test pits)?	☒ Yes ☐ No	
Have GZA project-related files been searched for existing private utility drawings?	☒ Yes ☐ No ☐ N/A	
Has GZA requested utility drawings from our Client, property owner, and others?	☒ Yes ☐ No ☐ N/A	
Have existing drawings been reviewed for possible conflicts with planned work?	☒ Yes ☐ No ☐ N/A	
Will GZA personnel be required to use a hand-auger as part of this work?	☐ Yes ☒ No ☐ N/A	
Will subsurface explorations be conducted as part of this work (drilling or excavation)?	☒ Yes ☐ No	
Will GZA personnel be required to use a hand-auger as part of this work?	☐ Yes ☒ No	
Site property ownership where underground explorations will be conducted on: Haffner's Realty Trust (Haffner's Gas Station)	Public Access Property ☐ Yes ☒ No Private Property ☒ Yes ☐ No	
Have Necessary Underground Utility Notifications for Subsurface Work Been Made?	☒ Yes ☐ Yet to be conducted	
Specify Clearance Date & Time, Dig Safe Clearance I.D. #, And Other Relevant Information: Dig safe clearance will be acquired by the drilling and/or excavation contractor prior to mobilization and will provide clearance I.D.# and other relevant information to GZA.		
IMPORTANT! For subsurface work, prior to the initiation of ground penetrating activities, GZA personnel to assess whether the underground utility clearance (UUC) process has been completed in an manner that appears acceptable, based on participation/ confirmation by other responsible parties (utility companies, subcontractor, client, owner, etc.), for the following:		
Electric:	☐ Yes ☐ No ☐ NA	☐ Other_____
Fuel (gas, petroleum, steam):	☐ Yes ☐ No ☐ NA	☐ Other_____
Communication:	☐ Yes ☐ No ☐ NA	☐ Other_____
Water:	☐ Yes ☐ No ☐ NA	☐ Other_____
Sewer:	☐ Yes ☐ No ☐ NA	☐ Other_____
Other:_____	☐ Yes ☐ No ☐ NA	☐ Other_____
Comments: GZA's review of the UUC process will be performed subsequent to Dig safe activities and clearance.		

5. HAZARD ASSESSMENT (CHECK ALL THAT APPLY AND ADDRESS EACH HAZARD IN SECTION 6)

A. GENERAL FIELDWORK HAZARDS

☐ Confined Space Entry (Add Confined Space Entry Permit)	☒ Overhead Hazards (i.e. falling objects, overhead power lines)
☐ Abandoned or vacant building/Enclosed Spaces	☒ Portable Hand Tools or Power Tools
☒ Significant Slip/Trip/Fall Hazards	☒ Significant Lifting or Ergonomic Hazards
☐ Unsanitary/Infectious Hazards	☒ Electrical Hazards (i.e. Equipment 120V)
☐ Poisonous Plants	☒ Other Stored energy Hazards (i.e. Equipment with High Pressure or Stored Chemicals)
☒ Biting/Stinging Insects	☒ Fire and/or Explosion Hazard
☐ Feral Animal Hazards	☒ Elevated Noise Levels
☒ Water/Wetlands Hazards	☒ Excavations/Test Pits
☐ Remote Locations/Navigation/Orientation hazards	☐ Explosives or Unexploded Ordinance/MEC
☒ Heavy Traffic or Work Alongside a Roadway	☐ Long Distance or Overnight Travel
☒ Weather-Related Hazards	☒ Personal Security or High Crime Area Hazards
☒ Motor vehicle operation Hazards	☒ Working Alone
☒ Heavy Equipment Hazards	☐ Ionizing Radiation or Non-Ionizing Radiation
☐ Structural Hazards (i.e. unsafe floors/stairways/roof)	☒ Chemical/Exposure Hazards (See Part B for Details)
☐ Demolition/Renovation	☒ Other: Biohazard from improperly discarded hypodermic needles / waste on land and in water
☒ Presence of Pedestrians or the General Public	

B. CHEMICAL/EXPOSURE HAZARDS (CONTAMINANTS ARE CONTAINED IN X SOIL, X WATER, X GROUNDWATER)

☐ No chemical hazards anticipated	☐ Methane
☐ Hydrogen Sulfide (H2S)	☐ Chemicals Subject to OSHA Hazard Communication (attach Safety Data Sheet for each chemical GZA brings to the site)
☐ Cyanides, Hydrogen Cyanide (HCN)	☐ Containerized Waste, Chemicals in Piping & Process Equipment
☐ Carbon Monoxide	☒ Emissions from Gasoline-, Diesel-, Propane-fired Engine, Heater, Similar Equipment
☐ Herbicides, Pesticide, Fungicide, Animal Poisons	☒ General Work Site Airborne Dust Hazards
☐ Metals, Metal Compounds:	☒ Volatile Organic Compounds (VOCs), BTEX
☐ Corrosives, Acids, Caustics, Strong Irritants	☐ Chlorinated Organic Compounds
☐ Polychlorinated Biphenyls (PCBs)	☒ Fuel Oil, Gasoline, Petroleum Products, Waste Oil
☒ Polycyclic Aromatic Hydrocarbons (PAHs)	☐ Asbestos
☐ Compressed Gases	☐ Oxygen Deficiency, Asphyxiation Hazards
☒ Flammable/Combustible Liquids	☐ Other:
☐ Radiation Hazards (i.e. radioactive sealed/open source, x-rays, ultra violet, infrared, radio-frequency, etc.)	

6. SITE-SPECIFIC OVERVIEW OF H&S HAZARDS/MITIGATIONS (NOTE: Based on Hazard Assessment, Section 5)

Describe the major hazards expected to be present at the jobsite, and describe the safety measures to be implemented for worker protection (refer to items checked in Section 5 above). Use brief abstract statements or more detailed narrative as may be appropriate.

ON-SITE HAZARDS:	HAZARD MITIGATIONS:
Task Hazard Analyses	The following THA's are appropriate for reference under this scope: • 4.01 - Drilling Observations/Soil Sampling • 4.02 - Groundwater Sampling

	• 4.4B - Manual Excavation and Trenching • 5.02 - Soil Vapor Extraction-Air Sparging • 11.01 - Hazardous Materials Survey and Remediation • 17.01 - Construction Oversight • 18.01 - Remediation Systems O-M • 20.11 - Field Sampling • 21.01 - General Outdoor Field Work.
Owning Zero	Ensure all GZA personnel on-site have downloaded the People-Based Safety app to their mobile phones and are familiar with using it to report safety events. Prior to work each day, review Owning Zero rules with all on-site during the morning safety meeting. Hold daily safety meetings and provide updates as site conditions change, add new hazards as work dictates, utilize work pauses and stoppages if unsafe conditions are identified and additional safety procedures are required.
General Field Work Hazards	The Site is an active gas dispensing station and car wash. Field personnel should be aware of other work and/or equipment, mainly motor vehicles, being used at the time of the soil gas, soil, and groundwater sampling. Be aware of drilling operations, personnel, and any other equipment at all times. Field personnel will be required to wear level D personal protection equipment at all times (e.g., hard-hat, safety glasses, steel-toed boots, inner gloves, etc.). Personnel must also be cognizant of uneven footing including slip, trip, and fall hazards while overseeing vacuum, drilling, shallow excavation (trenching) and AS and SVE piping system installation activities. *Also reference attached 21.01 – General Outdoor Field Work*
Weather-Related Hazards	Assess weather conditions prior to on-Site work and examine forecast for anticipated period of work. Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work.) Be aware of the anticipated weather conditions prior to mobilization to the Site. Unacceptable field work conditions are not precise, but may include Site specific conditions, general location, extreme weather conditions (e.g., lightning, excessive heat, cold, or wind), travel conditions, and other factors. Professional judgement is required, and personal assessment of safety must always be individually assessed. Stay hydrated. Wear sunscreen and layers, as appropriate. *Also reference attached 21.01 – General Outdoor Field Work*
Drilling Hazards	Prior to mobilization to the project site, all underground utilities will be located and properly marked. All personnel working in proximity to heavy equipment will be familiarized with the location and operation of emergency kill switches prior to equipment start-up. No loose clothing, jewelry or unsecured long hair is permitted near the equipment. Keep hands and feet AWAY from all moving parts while work is in progress. Persons shall not pass under or over a moving stem or auger, or other elevated loads or equipment. Watch for moving vehicles and equipment. Stay out of equipment radius while work is in progress. Maintain visibility and eye contact with operators. Wear reflective vest to enhance visibility. Stay clear of equipment (minimum 6 feet) while operating, and do not approach unless equipment has been stopped and eye contact/coordination is made with equipment operator for personnel to approach equipment to make observations or collect samples. GZA personnel shall not climb onto rig or approach rig while operating or while drill rods or other equipment are being attached or removed. GZA staff should verify that the onsite equipment has been routinely inspected. GZA staff should also maintain a safe working distance from the equipment while it is maneuvering around the Site. A fire extinguisher (with up to date inspection sticker indicating at a minimum an annual certification and monthly inspections) should be available on the machine or support truck on site. GZA staff are not authorized to operate the equipment. Keep drilling equipment at least 25 feet from all overhead power lines;

	use spotters to assist operator in to positioning equipment when overhead power lines or other obstructions are near. Personnel are not allowed on a mast while the auger is in operation. When equipment is moved from one location to another, tools and other equipment shall be secured and the mast placed in a safe position. All borings will be adequately covered and/or barricaded if left unattended for any period of time to prevent injury. While working around heavy equipment maintain awareness for pinch points, rotating equipment, and winch-operated equipment. Maintain safe working distance and never walk underneath overhead projection of the equipment. Follow GZA safe drilling and field work procedures. Be aware of rotating, falling, and mechanical hazards around equipment. Stay aware of surroundings and wear proper PPE such as safety glasses, hard hats, high visibility vests, and steel toe boots. Stay alert for potential overhead hazards (utilities lines, tree limbs) and other overhead objects that may pose hazards or may dislodge and fall during operations or while equipment is obtaining access to the next location. Take care maneuvering the equipment over vegetated areas, especially after heavy rains or wet snows. Planking may be needed to prevent the equipment from sinking into softened grounds. See attached Job Hazard Analysis – Task 4.01 Drilling observations . *ALSO REFERENCE ATTACHED THA 4.1 – DRILLING OBSERVATIONS*
Portable Hand Tools or Power Tools	Be familiar with tool's operating instructions and specific hazards before beginning work; wear leather gloves when appropriate. Use grounded or double insulated power hand tools. Use GFCI plugs. Check extension cords and power cords keep all cords organized to avoid tripping hazards. Check cords for sign of fraying, or damage. Do not use portable tools that shows signs of damage.
Chemical/Exposure Hazards	The work area is located at the site of a former manufactured gas plant (MGP). Contaminants may be observed or encountered during gauging/sampling such as volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs). NAPL may be present in the subsurface soils, sediment, and/or groundwater, and is known to exist within existing groundwater monitoring wells. Appropriate PPE is required when performing recovery activities (i.e. pumping and gauging) and handling containers of recovered groundwater and tar for transfer into drums. Pants/long sleeves and a face shield will be worn during sampling to minimize exposure.). When working with cleaning solvents (e.g. Tarbuster, Simple Green) to decontaminate equipment, appropriate PPE should be worn at all times. Appropriate PPE, including nitrile gloves and safety glasses, is required when handling soil samples. Also reference attached THAs 04.02, 05.04 and 20.11.
Polycyclic Aromatic Hydrocarbons (PAHs)	Due to the relatively low vapor pressure of PAH compounds, vapor hazards at ambient temperatures are not expected to occur. However, if site conditions are dry, the generation of contaminated dusts may pose a potential inhalation hazard. Therefore dust levels should be controlled with wetting if necessary. Repeated contact with certain PAH compounds have been associated with the development of skin cancer. Contact of PAH compounds with the skin may cause photosensitization of the skin, producing skin burns after subsequent exposure to ultraviolet radiation. The major routes of exposure of PAHs during work activities to be conducted at this Site is through direct contact and inhalation. Exposure through direct contact will be addressed via the use of PPE as prescribed herein.
Volatile Organic Compounds (VOCs), BTEX	BTEX COMPOUNDS. Exposure to the vapors of benzene, ethyl benzene, toluene and xylenes above their respective permissible exposure limits (PELs), as defined by the Occupational Safety and Health Administration (OSHA), may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and drunken-like behavior.

	Benzene has been determined to be carcinogenic, targeting blood-forming organs and bone marrow. The odor threshold for benzene is higher than the PEL and employees may be overexposed to benzene without sensing its presence, therefore, detector tubes must be utilized to evaluate airborne concentrations. The vapor pressures of these compounds are high enough to generate significant quantities of airborne vapor. On sites where high concentrations of these compounds are present, a potential inhalation hazard to the field team during subsurface investigations can result. However, if the site is open and the anticipated quantities of BTEX contamination are small (i.e., part per million concentrations in the soil or groundwater), overexposure potential will also be small.
Collection of Groundwater, and Fluid Samples	Wear appropriate PPE, nitrile gloves, and safety glasses. Wash hands and face before eating or applying cosmetics (I.e. sunscreen or chapstick). Do not eat within the work zone. Keep samples upright during transport. Sample containers may have broken during transport. Handle containers only while wearing nitrile gloves and used leather work gloves in addition to nitrile gloves to remove any broken or cracked containers. Pack containers in an upright orientation and use packaging (such as bubble wrap) between each glass container to prevent breakage. Keep face and breathing zone away from the well opening. Stand up wind of the well to avoid breathing fumes.
General Public	The Site has a history of a known homeless population on both the east and west sides of the Little River along the riverbank. The site is an active gas station. Use traffic cones to delineate the work area. Use the buddy system to prevent working alone. Contact PM when arriving and leaving the site. Determine if a security detail is required to keep the job site safe. Leave the area if it becomes unsafe. Use the AlertMedia app to contact emergency contacts should an emergency situation occur. If the general public comes into the work station, stop work immediately until they leave the work area.
Specific Site Awareness	General surroundings and footing should be observed for the potential of hypodermic needles, fecal matter, etc that may contain or have the ability to cause illness/disease (i.e. Hepatitis C). Make sure everyone on Site, or who will be accessing the Site aware of the location of these potential hazards to avoid contact/injury. Call Workcare and seek medical attention if contact with potential biohazardous materials occurs. Wash hands and exposed skin prior to taking breaks and leaving the work site. Personnel should be aware of the condition of the existing chain link fence along the top of the retaining wall along the Little River. Sporadic fence posts are no longer embedded within the concrete retaining wall and could create a fall hazard. The fence should not be used to rest on or support any personnel or equipment. Motor vehicle traffic will be the main concern at the Site during the upland exploration program and groundwater sampling at the gas station, as well as the car wash located on Site. While work is being performed on Site, appropriate traffic controls should be used (cones, signs, etc.) to alert vehicular traffic of the work being performed.
Motor Vehicle Operation	Ensure vehicle is operating properly prior to leaving office. Review directions and check air pressure in vehicle tires prior to departure. Plan to take periodic breaks while driving long distances. Do not use cell phone (handheld or hands-free) while vehicle motor is running. While driving, be observant of other drivers and potential for severe weather conditions. Maintain appropriate speeds for the road conditions.
Elevated Noise Levels	In accordance with 29 CFR 1910.95(b)(1) When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table. TABLE G-16 - PERMISSIBLE NOISE EXPOSURES (1)

	Duration per day, hours | Sound level dBA slow response _____|_____ 8.....| 90 6.....| 92 4.....| 95 3.....| 97 2.....| 100 1 1/2 .....| 102 1.....| 105 1/2 .....| 110 1/4 or less.....| 115 _____|_____ Hearing protection in the form of disposable ear plugs will be worn during field work with sound levels anticipated above those listed in Table G-16. Use sound meter app on phone to assess required PPE. Be aware that hearing protection can diminish warning sounds - do not stand with back to operating equipment and be alert for changing conditions.
Slips, Trips, and Falls	Inspect work area prior to starting work. Mark out or remove any potential hazards. Inspect area for uneven or sloped terrain, or around test pits. Wear sturdy shoes with ankle support and good tread. In winter weather, wear boot grips for more traction when walking. Look for potential natural depressions/holes/animal burrows, downed trees/limbs and other obstructions in the area of work and travel. Maintain one free hand to break falls. Watch for equipment on ground and slippery surfaces. Keep work area clean, no running, be mindful of changing weather conditions that may change footing conditions. Maintain safe distance from open borings. Be aware of surroundings. Ensure that borings are well marked (if left uncovered) or are appropriately filled to reduce trip/fall hazards. Do not leave borings open at the end of the work shift. Cover with metal plate if hole cannot be backfilled and label. Cover & secure any trenches left open. Per OSHA standard 1926.502(i): covers shall be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time; all covers shall be secured when installed so as to prevent accidental displacement by wind, equipment, or employees; all covers shall be color coded (orange) or be marked (in orange) with the word “HOLE” or “COVER” to provide warning of the hazard.
Overhead Hazards	Observe proposed exploration locations for possible overhead utility lines/tree branches and avoid these if applicable. Maintain awareness of mechanical raising and falling of drilling and excavation equipment. Maintain safe working distance from equipment and work being performed and maintain eye contact and communication with operator. Wear steel toed boots, hardhat and safety glasses/goggles, hearing protection. If stacked materials appear unstable inform the site representative. Never stand under elevated loads or equipment. Keep equipment at least 25 feet from overhead utilities.
Biting/Stinging Insects	Ticks carry risk of lyme and other diseases. Tick season is basically any field day above 40 degrees f. Tuck pants into long socks and apply deet (or permethrin pre-treatment) to clothing in season to control exposure to ticks. Check clothing for ticks frequently. Check whole body immediately upon returning from field and shower. Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (eee), and their locations relative to your field site. Use deet or other mosquito repellant. Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or

	approach with appropriate safety clothing protection and netting. See attached policy - GZA Policy 03-3019 lyme disease
Struck by, Caught by, Run Over by Equipment	Do not stand near or where equipment operators cannot see you. Always be in line of sight. Do not make sudden moves and always let the operator know of your intentions. Wear high-visibility safety vest, hard hat, eye protection, steel toe boots and use common sense and good housekeeping practices to avoid injury. Stay within sight of rig/excavator operator but at least 10 feet away from rig and excavator swing area. Maintain clear lines of communication (verbal and/or visual) with the operator. Stand clear of exhaust from operating equipment and stay out of the swing radius of heavy equipment. Be aware of overhead equipment and potential for falling objects (i.e. tree branches). Avoid any "pinch points" where one could become trapped between the equipment and other objects. Maintain awareness of general rig movement/operation and communication with drill crew. Do not conduct soil classification/sampling directly adjacent to the drill rig. Hearing protection shall be worn when working near operating equipment. Equipment should be situated so that at full extension of bucket arm, the equipment is at least 10 feet away from overhead lines.
Significant Lifting or Ergonomic Hazards	Use proper lifting techniques (lifting with the legs, carrying the load at a reasonable height to allow for proper posture during the carry, and avoiding twisting while carrying loads) should be followed at all times. Caution should be used when lifting equipment. Be aware of hand position during all stages of the lift, transport and placement of equipment. Review equipment to be moved prior to lifting to prevent moving parts from crushing fingers or otherwise pinching skin. Do not stack items prior to carrying, but rather transport one item at a time to prevent shifting during carrying. Get help when items are heavy or awkward to lift. Use lifting and transport devices whenever possible. Follow gza safe lifting sop.
Excavations/Test Pits	Stay clear of equipment while operating, and do not approach operating heavy equipment until eye contact is made with operator and equipment operation is stopped. Operators must be aware of your position on the site at all times. Consult with contractor to properly maintain Site access roads to assure vehicles can safely leave and enter the Site. Be especially aware of and clear of the swing radius of all heavy equipment. Stay aware of surroundings and wear hard hats, high visibility vests, and steel toe boots. Stay alert for potential overhead hazards (utilities lines, tree limbs) and other overhead objects that may pose hazards or may dislodge and fall during excavation operations or while equipment is moving. Heed back up alarms of all equipment. Do not work under raised loads. Always first attempt to collect soil/water samples from the securely placed bucket of the excavator on the surface of the ground at a safe distance from the excavation. Use proper communication with operator when sampling from the bucket of the excavator. Only enter excavations if there is no alternative method to perform the work and it is safe to do so. DO NOT stand near edges of excavations, maintain 2' distance. DO NOT enter excavations unless absolutely necessary. Approach a test pit for logging from the sloped end. Never stand above vertical wall. The excavation must be safe to enter before entering. A means of egress (stairways, ladders or ramps) from trench excavations greater than 4 feet in depth must be positioned so that no more than 25 feet of lateral travel is required. If needed to enter excavations consult with onsite Competent Person to assess if it is safe to do so. If you are the Competent Person assess if it is safe to enter excavation before doing so. Never ride inside the bucket to observe the inside of the test pit excavation. Test pits are to be backfilled soon after excavation and are not to be left open overnight unless appropriate precautions have been implemented to secure the excavation and the site.

Heavy Traffic or Work Alongside a Roadway	Caution will be used when exiting vehicles or retrieving equipment, while crossing the streets and sidewalks. Use cones, barricades and/or caution tape to secure work area when working in parking lot. All personnel shall be made aware of active roadway and wear reflective vest at all times while onsite. Acquire operator's attention prior to moving into vicinity of equipment. The work proposed is being performed adjacent to existing roadways. At a minimum, set up cones and signs to delineate the work area. No vehicles or equipment shall be working or parked in the roadway or shoulder Maintain site control, do not allow access to unauthorized persons. Maintain safe distance from travel area and work outside the main traffic flow area whenever possible. Wear high visibility/reflective vest (Class III) at all times you are on and adjacent to roadway. Utilize flashing amber light on vehicle when vehicle is in or near traffic corridor and to access/egress the lane closure. Always face flow of traffic to maintain awareness. Access vehicle from opposite side of traffic.
Remediation Equipment/Hand Tools	The treatment system includes high voltage pumps and components. Caution shall be used when working with equipment. Ensure electrical components are de-energized prior to performing maintenance. A qualified subcontractor will complete electrical/mechanical work and necessary repairs. Lift and transport hand tools using proper lifting techniques and keep a clean and orderly workspace. Be familiar with tool's operating instructions and specific hazards before beginning work; wear leather gloves when appropriate. Use grounded or double insulated power hand tools. Use GFCI plugs. Check extension cords and power cords keep all cords organized to avoid tripping hazards. Check cords for sign of fraying, or damage. Do not use portable tools that shows signs of damage. Observe proper electrical safety practices. Wear proper PPE. Store and carry tools correctly. Use the correct tool for the job. Know first aid response procedures to address potential injuries.
Electrical Hazards (i.e. Equipment 120 Volts or Greater, Work Inside Electrical Panels, or Maintenance of Electrical Equipment	GZA employees are non-electrically qualified. Electricity is a strong, invisible force that gives power to tools, machinery, lights, heaters, and many other forms of equipment that can be used at the site. Electricity can be very dangerous. Accidental contact with electrical currents can cause injury, fire, extensive damage, and even death. It is very important to remember that working with and around electricity requires the full attention and respect of all workers. • De-energized utilities should be verified by the proper company personnel and the certification record retained. • Verify, mark and discuss located utilities at the daily safety meeting prior to beginning work for the day. Maintain safe distance from stored energy hazards, follow proper procedures when using equipment that has stored energy. Follow all proper LOTO procedures before working on process equipment. GZA employees should not need to perform this type of work but may be in the vicinity when this work is being performed. GZA employees should issue a stop work order if proper procedures are not followed by others.
Chemical Hazards	Wear nitrile gloves when handling samples, groundwater, and equipment. Be cautious when sampling groundwater and be alert for daylighting. Safety data sheets for all the reagents are attached to this HASP. If chemicals come into contact with skin, wash with plenty of water. Get medical attention if irritation develops and persists. If chemicals come into contact with eyes, rise cautiously with water for 15 minutes. Remove contact lenses, if present and continue rinsing. If eye irritation persists, get medical attention.

	If inhaled or swallowed, remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms, call a poison control center or doctor. Inspection and awareness of chemical storage containers, transfer lines and remediation equipment will be completed daily. Proper staging and signage of chemical storage. Subcontractor will utilize and follow proper spill procedures if a spill occurs. All chemicals used in field activities such as solvents, reagents, decontamination solutions, or any other hazardous chemical must be accompanied by the required labels, Safety Data Sheets (SDS), and employee training documentation (OSHA 1910.1200).
Emissions from Gasoline-, Diesel-, Propane-fired Engine, Heater, Similar Equipment (such as a generator)	Avoid standing near the exhaust system and/or downwind of the gasoline combustion emissions when possible. Ensure personnel are properly trained. See attached THAs 5.06, 11.01 and 20.11

7. AIR MONITORING ACTION LEVELS – Make sure air monitoring instruments are in working order, calibrated before use, and 'bump-checked' periodically throughout the day and/or over multiple days of use

Is air monitoring to be performed for this project? Yes ☒ No ☐

ACTION LEVELS FOR OXYGEN DEFICIENCY AND EXPLOSIVE ATMOSPHERIC HAZARDS (Action levels apply to occupied work space in general work area)

☒ Applicable, See Below. ☐ Not Applicable

Parameter	Response Actions for Elevated Airborne Hazards
Oxygen	At 19.5% or below – Exit area, provide adequate ventilation, or proceed to Level B, or discontinue activities Verify presence of adequate oxygen (approx. 12% or more) before taking readings with LEL meter. Note: If oxygen levels are below 12%, LEL meter readings are not valid.
LEL	Less than 10% LEL – Continue working, continue to monitor LEL levels Greater than or Equal to 10% LEL – Discontinue work operations and immediately withdraw from area. Resume work activities ONLY after LEL readings have been reduced to less than 10% through passive dissipation, or through active vapor control measures.

ACTION LEVELS FOR INHALATION OF TOXIC/HAZARDOUS SUBSTANCES (Action levels are for sustained breathing zone concentrations)

☒ Applicable, See Below. ☐ Not Applicable

Air Quality Parameters (Check all that apply)	Remain in Level D or Modified D	Response Actions for Elevated Airborne Hazards
☒ VOCs	0 to 5 ppm	If greater than 5 ppm in the breathing zone continuously for more than 5 minutes, leave area, allow area to ventilate, retest area. If elevated levels persist, contact EHS Team.
☐ Carbon Monoxide	0 to 35 ppm	At greater than 35 ppm, exit area, provide adequate ventilation, proceed to Level B, or discontinue activities.
☐ Hydrogen Sulfide	0 to 10 ppm	At greater than 10 ppm, exit area, provide adequate ventilation, proceed to Level B, or discontinue activities.
☒ Dust	0 to 2.5 mg/m^3	At greater than 2.5 mg/m3, implement engineering controls and re-measure or discontinue activities.

SPECIAL INSTRUCTIONS/COMMENTS REGARDING AIR MONITORING (IF APPLICABLE)

AIR MONITORING WITH A PID WILL OCCUR PRIOR TO START OF AS TEST AND DURING AS TEST. AIR SAMPLING WILL BE PERFORMED TO EVALUATE INCREASES IN VOC CONCENTRATIONS WITH INCREASED AIR PRESSURE.

8. HEALTH AND SAFETY EQUIPMENT AND CONTROLS

AIR MONITORING INSTRUMENTS

- ☒ PID Type: IonScience tiger Pro Lamp Energy: 10.6 eV
- ☐ FID Type:
- ☐ Carbon Monoxide Meter
- ☐ Hydrogen Sulfide Meter
- ☒ O_2/LEL Meter (for Air Sparging)
- ☒ Particulate (Dust) Meter
- ☒ Calibration Gas Type: Isobutylene
- ☐ Others:

OTHER H&S EQUIPMENT & GEAR

- ☐ Fire Extinguisher
- ☒ Caution Tape
- ☒ Traffic Cones or Stanchions
- ☐ Warning Signs or Placards
- ☐ Decon Buckets, Brushes, etc.
- ☒ Portable Ground Fault Interrupter (GFI)
- ☐ Lockout/Tagout Equipment
- ☐ Ventilation Equipment
- ☒ Others: First Aid Kit, cell phone, soap, water

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Respirator – Type
- ☐ Respirator - Cartridge Type:
- ☒ Hardhat
- ☒ Outer Gloves Type: Nitrile
- ☐ Inner Gloves Type:
- ☒ Steel-toed boots/shoes
- ☐ Coveralls – Type
- ☒ Outer Boots – Type Disposable covers as needed
- ☒ Eye Protection with side shields
- ☒ Face Shield
- ☒ Traffic Vest
- ☐ Personal Flotation Device (PFD)
- ☐ Fire Retardant Clothing
- ☐ EH (Electrical Hazard) Rated Boots, Gloves, etc.
- ☒ Noise/Hearing Protection
- ☐ Others: **Discuss/Clarify, as Appropriate:**

9. H&S TRAINING/QUALIFICATIONS FOR FIELD PERSONNEL

- ☒ Project-Specific H&S Orientation (Required for All Projects/Staff)
- ☒ OSHA 40-Hour HAZWOPER/8 Hour Refreshers
- ☐ Hazard Communication (for project-specific chemical products)
- ☒ First Aid/CPR (required for HAZWOPER for at least one individual on site)
- ☒ Current Medical Clearance Letter (required for HAZWOPER)
- ☐ OSHA 10-hour Construction Safety Training
- ☐ Fall Protection Training
- ☒ Trenching & Excavation
- ☐ Lockout/Tagout Training
- ☐ Electrical Safety Training
- ☒ Bloodborne Pathogen Training (potential needles)
- ☒ Safe Drilling SOP
- ☐
- ☐
- ☐
- ☐

Discuss/Clarify, as needed:

10. PERSONNEL AND EQUIPMENT DECONTAMINATION (SECTION ONLY REQUIRED FOR HAZWOPER SITES)	
Describe personnel decontamination procedures for the project site, including "dry decon" (simple removal of PPE)	Dry decontamination will be the Site procedure. Disposable PPE will be thrown away and reusable PPE will be cleaned by dry methods before leaving the Site. Any oil soaked nitrile gloves, oil-soaked absorbent pads, poly sheeting, tubing, and other PPE or supplies contaminated with NAPL should be stored in a drum. These materials will not be placed in the normal trash. Wash exposed hands and skin before taking breaks and leaving site, change PPE before leaving site. INHALATION: Remove source of contamination or move victim to fresh air. If breathing has stopped, properly trained personnel should begin artificial respiration immediately. If heart has stopped, trained personnel should begin cardiopulmonary resuscitation (CPR) immediately. Obtain medical attention. SKIN CONTACT: Remove contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Wash gently and thoroughly with water and non-abrasive soap. If irritation persists, obtain medical attention. Completely decontaminate clothing, shoes, and leather goods before re-use, or discard. EYE CONTACT: Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 20 minutes, by the clock, holding the eyelid(s) open. If irritation persists, obtain medical attention. Protect the eyes from light if painful. INGESTION: Seek immediate medical attention.

11. PROJECT PERSONNEL - ROLES AND RESPONSIBILITIES		
GZA ON-SITE PERSONNEL:		
Name(s)	**Project Title/Assigned Role**	**Telephone Numbers**
Olivia Baglieri	Site Supervisor/ Field Safety Officer/First Aid Personnel	Cell: 781.223.3505
Justin Ivas	Other GZA Project Team Members	Work: 781.278.5843 Cell: 781.223.7329
Nicholas Loden		Cell: 617.780.5165
Eric Nygaard		Cell: 508.254.9634
Ryan Baronowski		Cell: 781.559.9039

Site Supervisors and Project Managers (SS/PM): Responsibility for compliance with GZA Health and Safety programs, policies, procedures and applicable laws and regulations is shared by all GZA management and supervisory personnel. This includes the need for effective oversight and supervision of project staff necessary to control the Health and Safety aspects of GZA on-site activities.

Field Safety Officer (FSO): The FSO is responsible for implementation of the Site Specific Health and Safety Plan.

First Aid Personnel: At least one individual designated by GZA who has current training and certification in basic first aid and cardiopulmonary resuscitation (CPR) must be present during on-site activities involving multiple GZA personnel at HAZWOPER sites.

GZA Project Team: Follow instructions relayed by the HASP and GZA manager on-site.

OTHER PROJECT PERSONNEL:		
Name	**Project Title/Assigned Role**	**Telephone Numbers**
Charles A. Lindberg	Principal-in-Charge	Work: 781-278-3830 Cell: 781-760-6412

Matthew Dion	Project Manager	Work: 781.278.3849 Cell: 781.364.0519
Melissa Kenerson	Office Safety Coordinator	Work: 781.278.5848 Cell: 781-223-6517
Richard Ecord	GZA EHS Director	Work: 781-278-3809 Cell: 404-234-2834

Principal-in-Charge: Responsible of overall project oversight, including responsibility for Health and Safety.

Project Manager: Responsible for day-to-day project management, including Health and Safety.

Health and Safety Coordinator: General Health and Safety guidance and assistance.

GZA EHS Director: H &S technical and regulatory guidance, assistance regarding GZA H&S policies and procedures.

12. PLAN ACKNOWLEDGEMENT AND APPROVALS

GZA Project Site Worker Plan Acknowledgement

I have read, understood, and agree to abide by the information set forth in this Safety and Accident Prevention Plan. I will follow guidance in this plan and in the GZA Health and Safety Program Manual. I understand the training and medical monitoring requirements covered by the work outlined in this plan and have met those requirements.

GZA Employee Name	GZA Employee Signature	Date

Subcontractor Site Worker Plan Acknowledgement

GZA has prepared this plan solely for the purpose of protecting the health and safety of GZA employees. Subcontractors, visitors, and others at the site must refer to their organization's health and safety program or site-specific HASP for their protection. Subcontractor employees may use this plan for general informational purposes only. Subcontractor firms are obligated to comply with safety regulations applicable to their work, and understand this plan covers GZA activities only.

Subcontractor Employee Name	Subcontractor Employee Signatures	Date

GZA HASP Approval Signatures

The following individuals indicate their acknowledgement and/or approval of the contents of this Site Specific H&S Plan based on their understanding of project work activities, associated hazards and the appropriateness of health and safety measures to be implemented. A signed copy of this document must be present at the project site at all times work is being performed.

GZA Author/Reviewer Role	Signature	Date
Matthew Dion **HASP Preparer**		**5-23-2024**

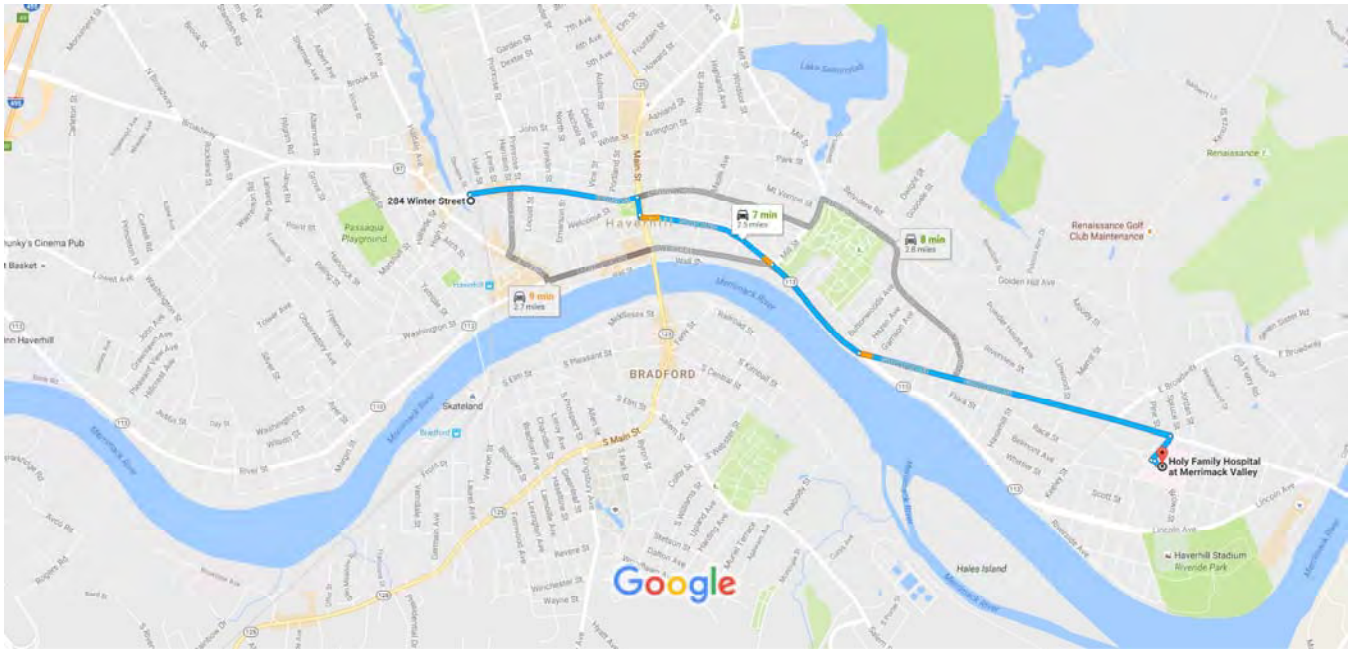
Chris Mayne **EHS Reviewer**	Christopher D. Mayne	**5-23-2024**
Charles Lindberg **Principal in Charge**	Charles A. Lindberg	**5/24/2024**

Google Maps

284 Winter Street, Haverhill, MA to Holy Family Hospital at Merrimack Valley

Drive 2.5 miles, 7 min

HASP Directions to Emergency Room Hospital - 978-374-2000



Map data ©2016 Google 1000 ft

284 Winter Street

Haverhill, MA 01832

Take Winter St and Groveland St to Katsaras Dr

7 min (2.4 mi)

1. Head east on Winter St toward Hale St

0.5 mi

2. Turn right onto Main St

302 ft

3. Turn left onto Ginty Blvd

0.5 mi

4. Use the right 2 lanes to merge onto Water St

0.4 mi

5. Slight left onto Groveland St

1.0 mi

Continue on Katsaras Dr to your destination

52 s (0.1 mi)

6. Turn right onto Katsaras Dr

0.1 mi

7. Turn left

56 ft

8. Turn right

Destination will be on the right

148 ft

Holy Family Hospital at Merrimack Valley

140 Lincoln Avenue, Haverhill, MA 01830

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Drilling Observations, Monitoring Well Installation Observation and Soil Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: October 2, 2011 **Revised: June 14, 2012**	**Date: June 14, 2012**	**Date: June 26, 2012**

Task 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS, SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 21.1 – General Outdoor Field Work		
Observation of Deploying of Traffic Protection Equipment by Drilling Contractor (e.g., cones, signs, etc.)	Personal injury due to vehicle traffic, Collisions, injuries	Wear high visibility vest at all times when out of vehicle.
		Park in designated parking locations or select off-road areas that are firm and free of hazards. Directly inspect parking location on foot if necessary.
		Use emergency flashers or other appropriate vehicle warning system as appropriate to local conditions when parking personal or GZA vehicle and/or equipment.
		If parking outside of a designated parking area, demarcate vehicle with traffic cones or equivalent.
		Use emergency flashers or other appropriate vehicle warning system when placing equipment.
		Observe if police detail or other required traffic control system (if necessary) is in place.
		Stay within the confines of the work area and do not venture outside of the demarcated work area into traffic.
		If you observe that contractor may back into structures, vehicles, fences, etc., notify contractor immediately with pre-determined signals. Do not cross the path of the heavy equipment.
		Stand clear of moving Drill Rig.
Observation of Mobilizing Drill Rig To Job Site and positioning at borehole by Drilling Contractor	Struck by drill rig	Before drilling begins, confirm that drill rig has been parked properly and securely by the drilling contractor.
		Wear high visibility vests. Make sure that the driver can see you and is aware of your location at all times.
		Inform the driller if it is observed that the rig is being moved with the mast raised and/or tools and other equipment on the rig are not secured and can fall over and potentially hurt personnel.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Drilling Observations, Monitoring Well Installation Observation and Soil Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
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Task 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS, SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Overhead utility	Look overhead to assess if any utilities are present and confirm with driller that they are aware of the overhead utility location and to take appropriate actions to prevent contact with the overhead utilities and to minimize any arc flash hazards. Review GZA's Electrical Safe Work Practices Program 03-3003.
Observation of drilling operations and monitoring well installations	Underground utilities	Confirm that underground utility clearance procedures have been completed in accordance with GZA Policy # 04-0301 *Responsibility for Utility Clearance of Exploration Locations* for clearing utility locations prior
	Moving machinery, rotating parts, cables, ropes, etc.	Do not wear loose fitting clothing.
		All GZA personnel working in proximity to a drill rig will be familiarized with the location and operation of emergency kill switches prior to equipment start-up. Maintain safe distance from rotating auger, drill casing, rods and cathead at all times. Observe operations from a safe distance. Persons shall not pass under or over a moving stem or auger Check that "kill" switches are present and working. Confirm with driller that daily inspection of rig has been performed prior to commencing work and no conditions were noted with the rig that would affect its proper operation.
		Do not touch or operate or assist with any rig operations and maintenance work.
		Make eye contact with operator before approaching equipment.
		Be alert and take proper precautions regarding slippery ground surfaces and similar hazards near rotating auger.
		Do not engage the driller or helper when drill is in operation. Work out prearranged signals to get their attention before approaching them.
		Confirm prior to drilling operations that driller and helper communicate and coordinate their actions and movements.
		GZA personnel are not allowed to be on the drill rig or operate a rig.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

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Task 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS, SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Wear steel toed boots, hardhat and side-shielding safety glasses/goggles.
	Falling objects, debris	Stand clear of stacked drill rods. If stack appears unstable inform driller.
	Noise	Wear appropriate hearing protection.
	Roadway/traffic hazards	Be alert at all times; never step outside traffic cones.
		Wear high visibility vests at all times.
		Be familiar with escape routes at each location.
		Follow project Traffic Control Plan. Be alert at all times and never step outside the traffic cones. Use a Police detail when necessary.
	Slips, trips and falls	Maintain clean and sanitary work area free of tripping/slipping hazards.
		All borings, excavations, or partially completed groundwater monitoring wells will be adequately covered and/or barricaded if left unattended for any period of time to prevent injury.
		Store any hand tools used for sampling in their proper storage location when not in use.
		Provide adequate space for each employee to work safely with sound footing.
		Do not perform work if adequate lighting is not available.
		Maintain an exit pathway away from the rig at all times.
	Cuts, bruises, shocks, lacerations, sprains and strains during tool use	When working with a driller, do not assist the drilling crew with their work.
		Use properly maintained tools; do not use damaged tools.
		Wear the proper Personal Protective Equipment based on the task being performed.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices. Do not use electrical tools in wet areas.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Drilling Observations, Monitoring Well Installation Observation and Soil Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: October 2, 2011 **Revised: June 14, 2012**	**Date: June 14, 2012**	**Date: June 26, 2012**

Task 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS, SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Coordinate activities with driller. Allow driller to open sampling equipment (i.e., split spoons, Geoprobe sleeves, etc.)
	Fire hazards	Be familiar with emergency procedures and where fire extinguishers are present on site.
		Inform GZA subcontractor if you observe improper storage of used rags and unsafe storage of flammable/combustible liquids brought on site.
		GZA and its subcontractors, suppliers and vendors shall not smoke in the work area in GZA project sites. Smoking can only be in designated smoking areas away from work areas and potential fire hazard locations.
		Confirm with driller that a fire extinguisher present with rig and will be available at all times and that inspection tag is not expired.
		If driller is welding or cutting on site confirm there are no flammables or combustible materials near the vicinity of welding machines or torches (such as debris, fuels, grass/weeds, etc.). Review Site requirements for obtaining “Hot Work Permit”.
		Stand well clear of welding/cutting/burning areas.
		When drilling activities encounter the presence of gas or electric, the drill crew shall immediately curtail drilling activity, shut down the drill rig and contact the Project Manager.
	Exposure to Hazardous Substances/Chemicals	Become familiar with hazards associated with hazardous commercial products used in drilling (fuels, silica sand, grout, cement, bentonite, etc.). Review Safety Data Sheets (SDSs) for such products and participate in daily safety tailgate meetings.
		Do not handle drilling chemicals.
		Wear appropriate personal protective equipment.
		Review hazards of chemicals that may have been used or currently are being used on site.
		Refer to the site specific HASP for chemical hazards and the necessary precautions required for sampling.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Drilling Observations, Monitoring Well Installation Observation and Soil Sampling		
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Task 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS, SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Assess whether procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate air monitoring, personal protective clothing and respiratory protection, as needed. If contamination is identified at the Site only personnel trained and medically qualified to work on hazardous sites will be permitted to proceed with the work.
Sampling Soil	Exposure to chemicals	Refer to the site specific HASP for chemical hazards and the necessary precautions required for sampling.
		Understand potential hazards associated with handling sample collection preservatives.
		Review and have SDS available for chemicals being brought on site, including that of sample preservatives.
		Wear appropriate PPE identified in the HASP
		Wash hands before eating and drinking. Eating and drinking are prohibited in areas of soil contamination/work area.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Groundwater Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: October 2, 2011 **Revised: June 15, 2012**	**Date: June 15, 2012**	**Date: June 26, 2012**

Task 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 21.1 – General Outdoor Field Work		
Deploying Traffic Protection Equipment	Personal injury due to vehicle traffic; Collisions, injuries	GZA drivers shall be properly licensed and abide by driving safety procedures. Inspect vehicle to determine if it is in safe operating condition.
		Park in designated parking locations, or select off-road areas that are firm and without hazards. Directly observe parking location on foot if necessary.
		Use emergency flashers or other appropriate vehicle warning system as appropriate to local conditions.
		Utilize police detail (when necessary) to direct traffic while entering traffic safety zone, if applicable.
Handling Flammable Liquids	Fire Hazards	Use only approved fuel containers for fuel, heavy duty metal cans with stable base and self closing nozzle is recommended.
		Store flammable liquids in an appropriate area when not in use.
		Provide working fire extinguisher with current inspection certificate with the sampling equipment.
		Observe GZA's "no smoking" policy at all work sites.
Mobilizing Equipment	Collision; struck by	Perform a pre-operation check of the vehicle, ensuring service brakes, parking brake, steering, lights, tires, horn, wipers mirrors, and glass are in good condition. Do not drive a vehicle that is not roadworthy.
		All vehicle occupants shall wear seat belts.
		Secure loose materials in the cab or bed of the vehicle.
		Keep the windows and lights clean.
		Do not operate the vehicle if it is in an unsafe condition.
		Abide by driving safety procedures and laws.
Positioning vehicle at monitoring well	Unstable, uneven terrain and ground obstacles	Locate the vehicle on stable ground.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Groundwater Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: October 2, 2011 **Revised: June 15, 2012**	**Date: June 15, 2012**	**Date: June 26, 2012**

Task 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Backing Collisions	Avoid wet areas/mud when possible.
		Assess the need for blocking/chocking wheels..
		If possible, avoid backing by taking a route that allows you to pull straight through.
		If you must back, do a complete walk around the vehicle to look for objects that could be struck or run over by the vehicle.
		Use a spotter when available to help guide the backing safely.
		Look over shoulders and glance back to make sure fenders are clearing objects. Back out slowly.
Well Sampling	Hazardous material contact	Identify wells with hazardous concentrations of contaminants.
		Sample wells in order from least to most impacted.
		Wear proper gloves specified in the project HASP when handling jars, preservatives could leak during shipment from the laboratory.
	Cuts and bruises from Sample jar	Do not over-tighten glass jars (especially VOAs); they can break, causing a laceration.
	Exposure to Hazardous Substances	Become familiar with the hazards associated with hazardous commercial products used while groundwater sampling (laboratory preservatives, decontamination solutions, etc.). Review Safety Data Sheets (SDS) for such products.
		Wear proper personal protective equipment (PPE) as specified in the Health and Safety Plan (HASP) to avoid direct contact with Site contaminants, calibration solutions, decontamination supplies, and laboratory preservatives.
		Respiratory protection as specified by the HASP must be available and used when necessary.
		Decontamination procedures as specified in the HASP must be followed.
Sampling Equipment Operation	Splashes, electrical shocks, fires, caught by	Perform an equipment observation before use; pumps, flow meters, and water quality meters must be calibrated and in good working condition.
		Use GFCI with all electrical cords.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Groundwater Sampling		
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Date: October 2, 2011 **Revised: June 15, 2012**	**Date: June 15, 2012**	**Date: June 26, 2012**

Task 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		All equipment (especially generators) must be properly grounded.
		Completely shut down all equipment prior to conducting maintenance activities, fueling, servicing or repairs. Follow lock-out/tag-out procedures as needed.
	Manual lifting, equipment handling	Use proper lifting techniques when lifting equipment (generators, pumps, air compressors, tubing, etc.) Seek assistance with heavy loads.
		Use work gloves where appropriate to prevent hand injuries.
		Wear steel toed boots.
		When containerizing water, do not try to carry more than you can safely carry. It is better to make multiple trips.
	Noise	Wear appropriate hearing protection during activities that produce noise (running generators, pumps, air compressors, etc.)
	Slips, trips and falls	Maintain a clean and sanitary work area free of tripping/slipping hazards.
		Store hand tools in their proper storage location when not in use.
		Provide adequate space for each employee to work safely with sound footing.
		Provide adequate lighting.
	Tool-related hazards	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices.
		Properly maintain tools; do not use damaged tools.
		Wear eye protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Protect from gouges, hammer blows, cutting tools, etc. Position your hands to prevent injury in case the tool slips while in use.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Manual Excavation and Trenching		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 30, 2011 **Revised: June 21, 2012**	**Date: June 21, 2012**	**Date: June 26, 2012**

Task 4.4B
Manual Excavation and Trenching

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 21.1 – General Outdoor Field Work		
Pre-Planning	Overlooking Hazards	Review and become familiar with the requirements of GZA Policy 03-3006, Excavation Safety Policy and Procedures.
Vehicle Safety Moving Vehicle and Trailer To Job Site	Collisions, injuries	Perform pre-operation check of vehicle, checking that service brakes, parking brake, steering, lights, tires, horn, wipers, mirrors and glass are in good condition and vehicles are roadworthy.
		Occupants shall wear seat belts.
		Secure loose materials in cab or bed of vehicle.
		Keep windows, lights clean.
		Do not operate vehicle if in an unsafe condition.
		Abide by driving safety procedures.
		Check that trailer hitch is securely fastened.
		Attach safety chains.
		Check trailer light connections and make sure lights are in good operating order.
		Locate trailers and parked vehicles out of right-of-ways, clear of facility traffic and in a manner that egress is not blocked.
		Use emergency flashers if necessary to stop in right-of-ways.
		Follow project Traffic Control Plan. Be alert at all times and never step outside the traffic cones.
		Wear high visibility vests at all times when out of the vehicle.
	Backing Collisions	If possible, avoid driving in reverse by using a route that allows you to pull straight through when leaving.
		If you must go in reverse, do a complete 360° walk around your vehicle.
		Use a spotter when available to help guide driving in reverse safely.
		Look over the shoulders and glance back to make sure fenders are clearing objects.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Manual Excavation and Trenching		
Analysis By: Andrew Whitsitt	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
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Task 4.4B
Manual Excavation and Trenching

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Unstable, uneven terrain	Locate trailer on stable ground.
		Level trailer with jacks, if necessary.
		Jacks must be on stable footing.
		Block/chock wheels.
	Overhead electrical lines	Confirm that overhead lines are cleared so that equipment, truck beds, etc. do not strike overhead utility.
		Stand clear of overhead lines while equipment is being mobilized.
Site Setup Manual lifting, equipment handling	Sprains and strains	Use proper lifting techniques when lifting equipment. Seek assistance with heavy loads.
		Use work gloves where appropriate to prevent hand injuries. Wear steel toed boots.
		Use equipment whenever possible to avoid heavy lifting.
	Slip, Trip and Fall Hazards	Inspect site for uneven terrain or tripping hazards; plan transportation route to avoid these areas or improve the site to eliminate the hazard.
		Clear brush from work area and clear vegetation that could cause trip hazards, eye injury or obstruct sight lines.
Excavation Operations	Underground utilities; above ground piping and appurtenances	Review and comply with GZA Policy 04-0301 *Responsibility for Utility Clearance of Exploration Locations* .
		Confirm that proper utility location/clearance has been conducted prior to breaking ground.
		Maintain safe distance from utilities, above ground piping and equipment while conducting manual excavations.
		Where necessary have client de-energize and lockout and/or purge active utilities. If lines cannot be deactivated and/or purged assess and implement other means needed to protect GZA personnel conducting manual excavations.
		Use non-sparking tools around active gas lines and implement safe work practices.
		If any damage is caused during excavation to utility lines notify utility owner.
	Collisions with workers using shovels and hand tools	GZA personnel must communicate and coordinate their actions and movements.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Manual Excavation and Trenching		
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Date: September 30, 2011 **Revised: June 21, 2012**	**Date: June 21, 2012**	**Date: June 26, 2012**

Task 4.4B
Manual Excavation and Trenching

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Falling objects, debris	Wear hardhat and safety glasses/goggles.
	Falls into Open Excavation	Secure work zone using barricades, caution tape, etc.
		DO NOT stand near edges of excavations/trenches.
		Keep non-essential personnel away from the work zone.
	Hazardous Spills	Maintain spill control kit, including sorbents, pad booms and shovels.
		Line excavated soil staging areas with polyethylene sheeting.
		Make timely notification of any spill. Document time of spill, quantity and type of material spilled, time of notification and to whom spill was reported. Complete GZA Accident/Incident Investigation procedures.
	Noise	Wear appropriate hearing protection.
Excavation Operations	Slips, trips and falls	Maintain clean and sanitary work area free of tripping/slipping hazards.
		Store hand tools in their proper storage location when not in use.
		Provide adequate space for each employee to work safely and with sound footing must be provided.
	Cuts, bruises, shocks, lacerations, sprains and strains	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices. Use GFCI with all cords.
		Tools must be properly maintained; do not use damaged tools.
		Wear eye and hearing protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Support the work piece (using clamps, vise, sawhorse, or other device). Do not hold the work piece with your hand.
		Unplug tools or remove batteries when servicing or changing bit, blades, abrasive wheels or other components.
		Protect your “off hand” from gouges, hammer blows, cutting tools, etc. Position your “off hand” to prevent injury in case of slippage of the tool.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

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Task 4.4B
Manual Excavation and Trenching

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Exposure to Hazardous Substances	Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Assess whether procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate air monitoring, personal protective clothing and respiratory protection, as needed. If contamination is identified at the Site only personnel trained and medically qualified to work on hazardous sites will be permitted to proceed with the work. Notify project manager if such conditions are encountered.
Soil Sampling	Cave-ins, slips, trips and falls, exposure to hazardous contamination, struck by, caught by, slips, trips and falls	Unless absolutely necessary DO NOT enter excavations to sample. Work with the contractor's equipment operator to obtain sample from the excavation and sample soil from the bucket of the excavator.
		See above for controls for other physical hazards.
	Exposure to chemicals	Refer to the site specific HASP for chemical hazards and the necessary precautions required for sampling.
		Understand potential hazards associated with handling sample collection preservatives.
		Review and have Safety Data Sheets available for chemicals being brought on site, including that of sample preservatives.
		Wear appropriate PPE identified in the HASP
		Wash hands before eating and drinking. Eating and drinking are prohibited in areas of soil contamination/work area.
Securing Site	Fall into excavations	Make sure excavation is secured and properly marked with caution signs.
		If excavation is to be open over night have subcontractor erect a fence or properly cover excavations to keep public out of the area and away from the excavation and the removed tank.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Soil Vapor Extraction/Air Sparging		
Analysis By: Mark Dalpe	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee, CIH**
Date: October 30, 2011 **Revised: July 12, 2012**	**Date: July 12, 2012**	**Date: July 12, 2012**

Task 5.2
Soil Vapor Extraction/Air Sparging

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review related THAs – 4.1 Drilling Observations, Monitoring Well Installation Observations and Soil Sampling 4.4A Excavation and Trenching (Heavy Equipment) 21.1 General Outdoor Field Work		
Installation of : • Temporary monitoring points (soil vapor) or • Permanent SVE well screens (air sparge)	General hazards associated with manual Installation (soil vapor).	Become familiar with relevant Site hazards through review of Task Hazard Analysis and Site-specific Health & Safety plans. Participate in daily safety tailgate meetings with all on-Site personnel.
		Communicate Task Hazard Analysis and Lessons Learned information to any subcontractors, if applicable, prior to initiating work and throughout the project; as needed.
		Use manufacturer-recommended maintenance schedules, operational settings and safety controls for necessary power tools utilized during manually-installed temporary monitoring points. This includes prior knowledge for the proper usage of any needed impact hammer drills, concrete cutting tools, power supply generators, sampling equipment, etc.; as needed.
		Wear appropriate safety equipment as required by the Site Specific Health & Safety Plan (HASP) when in general work area (hard hat, steel toe boots, work clothes, high visibility vest, eye and hearing protection, etc.).

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Soil Vapor Extraction/Air Sparging		
Analysis By: Mark Dalpe	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee, CIH**
Date: October 30, 2011 **Revised: July 12, 2012**	**Date: July 12, 2012**	**Date: July 12, 2012**

Task 5.2
Soil Vapor Extraction/Air Sparging

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	General hazards associated with permanent SVE System Installation (air sparge).	Same as manual installation, plus the inclusion of general hazards identified in THAs listed above as applicable. Most permanent air sparge systems utilize PVC wells and conduit (either horizontally or vertically), installed with the assistance of heavy machinery (drill rigs or excavators).
	Exposure to Hazardous Substances	Be familiar with hazards associated with hazardous commercial products used during installation (fuels, grout, cement, bentonite, etc.). Review Safety Data Sheets (SDSs) for such products have them available onsite. Wear appropriate personal protective equipment.
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Confirm that procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate personal protective clothing and respiratory protection, as specified in the HASP.
		Monitor atmosphere around work area as indicated in the site specific HASP.
	Fire	While working around potentially flammable or combustible soil vapors, monitor atmosphere around combustion engines / blower assemblies prior to ignition and throughout operation. Be aware of both Upper and Lower explosive limits of vapors likely to be encountered during work.
		Use explosion-proof rated equipment, where applicable. Observe “No Smoking” Policies.
Use of Portable Generators	Fires	If used during installation or sampling, have supplemental fuel supplies and debris safely moved / stored away from engine parts that generate heat. Re-fueling should occur when generator is off and relatively cool.
	Slips, trips and falls	Generators will require the use of grounding and GFCIs.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Soil Vapor Extraction/Air Sparging		
Analysis By: Mark Dalpe	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee, CIH**
Date: October 30, 2011 **Revised: July 12, 2012**	**Date: July 12, 2012**	**Date: July 12, 2012**

Task 5.2
Soil Vapor Extraction/Air Sparging

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	CO generation	Cords and wiring should be clearly visible and marked to avoid trip hazard. Tie-down or bundle cords where applicable.
	Electrical shocks and electrocution	Position generators down-wind from job-related activities to avoid both cross-contamination of vapor samples and to limit carbon monoxide and exhaust exposure.
		Do not place connections and engine equipment near standing water to avoid electrical shocks and/or electrocution during operation.
Installation of permanent power supply	Electrical hazards	Have a licensed electrician install and certify the installation prior to initial energizing of the circuits.
		Confirm that fuse box is installed and functioning properly.
		Conduct arc flash analysis of equipment as needed and post labels in accordance with NFPA 70E recommendations.
		Should fuse box maintenance be required, sub-contract a licensed electrician to do the work, GZA field employees should NEVER attempt to do work on electrical panels unless properly trained to do.
		If maintenance is required on any electrical component, prior to work, implement proper lockout / tag out safety procedures. Review GZA's Control of Hazardous Energy Program 03-2009. Only trained and authorized employees may perform such work.
Compressed gas use	Explosions, missiles, property damage	Properly store and handle compressed gas cylinders. Secure cylinders properly before transporting to the site. Follow DOT regulations for transporting and shipping. Cylinders must have properly secured valve caps on them when not in use. Use only approved connections for the cylinders and do not over tighten. Keep cylinders protected from temperature extremes. Use proper handling procedures of cylinders so as not to cause damage to the valves. Store empty cylinders separately and mark them empty.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Soil Vapor Extraction/Air Sparging		
Analysis By: Mark Dalpe	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee, CIH**
Date: October 30, 2011 **Revised: July 12, 2012**	**Date: July 12, 2012**	**Date: July 12, 2012**

Task 5.2
Soil Vapor Extraction/Air Sparging

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Tool Safety	Shocks, cuts, scrapes, bruises, lacerations from tool use	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices.
		Ensure tools are properly maintained; do not use damaged tools.
		Wear eye protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Support the work piece (using clamps, vise, sawhorse, or other device). Do not hold the work piece with your hand.
		Protect “off hand” from gouges, hammer blows, cutting tools, etc. Position your “off hand” to prevent injury in case of slip of the tool.
Use of flammable/combustible chemicals	Fire-related hazards;	Store all flammable/combustible liquids in proper containers.
		Dispose of oily rags properly and quickly.
		Have a properly size and type fire extinguisher present on-Site. Inspect fire extinguisher before starting work.
		Remove flammable or combustible materials from vicinity of welding or use of torches (such as debris, fuels, grass/weeds, etc.).
		Observe “no smoking” policies.
		Remove waste from work area and dispose of properly in accordance with local, state and federal laws.
	Noise	Wear appropriate hearing protection
	Airborne dust, chemical splashes to the eyes	Wear proper safety glasses. Regular sunglasses do not count as safety glasses.
		If liquid chemical operations are required or if flying particles are present, use safety goggles and face shields to avoid liquid splatter to face and eyes.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Sampling/Logging/Survey - Test Pits and Excavations

Analysis By: Mark Dalpe	**Reviewed By: Mark Dalpe**	**Approved By: Jayanti Chatterjee , CIH**
Date: October 15, 2011 **Revised: June 7, 2012**	**Date: June 7, 2012**	**Date: June 28, 2012**

Task 6.1
Sampling/Logging/Survey - Test Pits and Excavations

HAZARD CONTROLS

GZA Job Tasks	**Potential Hazards**	**Controls**
Review Related THA's – 4.4A Excavation and Trenching (Heavy Equipment) 21.1 General Outdoor Field Work		
Observation of Test Pit Excavations by GZA	Various Physical and Chemical Hazards	Review THA 4.4A Excavation and Trenching (Heavy Equipment)
Excavation Survey	Fall into excavations; Struck by heavy equipment	Stand away from edges of excavations.
		Stay clear of equipment at all times. Do not approach operating heavy equipment until eye contact is made with operator and equipment operation is stopped
		Observer needs to be at the furthest end of the excavation from the operator and in line of sight with the operator.
		Never ride inside the bucket to observe the inside of the test pit excavation.
Sampling and logging of soil	Cave-ins and engulfment	Measuring test pit depths can be performed by attaching a tape measure to the boom of the excavator, or marking the boom.
		Observers are NOT to measure pit depths by hand from the side of the pit. Use proper retractable tape measures.
		Approach a test pit for logging from the sloped end. Never stand above vertical wall.
		Watch for cracks/fissures in the ground surface in the immediate vicinity of the test pit, which indicate imminent sidewall failure/cave-in.
		DO NOT enter excavations that are not sloped or shored properly and have not been evaluated by a Competent Person to be safe. Always first attempt to collect soil/water samples from the securely placed bucket of the excavator on the surface of the ground at a safe distance from the excavation. Use proper communication with operator when sampling from the bucket of the excavator.
		Assess if confined space entry procedures need to be implemented. If so follow GZA's Confined Space Entry procedures.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Sampling/Logging/Survey - Test Pits and Excavations

Analysis By: Mark Dalpe	Reviewed By: Mark Dalpe	Approved By: Jayanti Chatterjee , CIH
Date: October 15, 2011 Revised: June 7, 2012	Date: June 7, 2012	Date: June 28, 2012

Task 6.1
Sampling/Logging/Survey - Test Pits and Excavations

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Provide appropriate means of egress if entering excavations when necessary (e.g. ladders every 25 ft., steps, etc.).
		Before entering excavation be aware of any hazards at the surface (boulders, equipment) which may fall into the excavation.
		Test pits are to backfilled soon after excavation and are not to be left open overnight unless appropriate precautions have been implemented to secure the excavation and the site.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Hazardous Materials Survey and Remediation		
Analysis By: Benjamin Sallemi, Ph.D.	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 30, 2011 **Revised: July 2, 2012**	**Date: July 2, 2012**	**Date: July 2, 2012**

Task 11
Hazardous Materials Survey and Remediation

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 21.1 Outdoor Field Work		
Hazardous Material Survey	Hazards associated with Asbestos, Lead-Based Paint, PCBs, etc.	Only GZA personnel trained and appropriately licensed/certified may perform these surveys. **NOTE:** Licensing and certification requirements may differ for States and municipalities. Be sure to check on the requirements.
	Working Alone	Review GZA's Working Alone Policy. Sign out or call into the office to leave site specific information where you are working, the anticipated duration/hours of work on site. Do this for each site if multiple in one day. Review GZA's Working Alone policy. Call office or the person identified as the emergency contact in the HASP when off site.
	Exposure to other building-related Toxic/Hazardous Substances	Wear appropriate safety equipment as required by the Site Specific Health and Safety Plan (HASP). Wear specific PPE and respiratory protection as required
		Become familiar with hazards associated with building-related components or materials (e.g., ACM, deteriorated lead-based paint, broken or damaged fluorescent light tubes/ballasts, visible mold, etc.). Review the HASP for details.
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Assess procedures and contingencies for characterizing hazards and protecting workers by use of appropriate personal protective clothing and respiratory protection, as needed.
	Vacant Buildings / Unsound Structures	Determine that the site building(s) is not inhabited by vagabonds or squatters.
		Determine that the site building(s) is not inhabited by wild animals.
		It is recommended that GZA employees in the field notify the local police prior to entering into a vacant building / property.
		GZA shall not enter into structurally damaged or unsound buildings, or buildings suspected of being unsound.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Hazardous Materials Survey and Remediation		
Analysis By: Benjamin Sallemi, Ph.D.	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 30, 2011 **Revised: July 2, 2012**	**Date: July 2, 2012**	**Date: July 2, 2012**

Task 11
Hazardous Materials Survey and Remediation

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Slips, Trips, and Falls	Become familiar with physical site specifics to reduce or eliminate slips, trips and falls due to uneven surfaces, onsite equipment, discarded materials, or working at height.
		Review GZA's Fall Protection Program 03-3001 and use the appropriate fall protection equipment when necessary.
		Use the proper ladder for the work area and follow ladder safety work practices.
		If operating manlifts/scissor lifts review the proper use of the equipment and conduct an inspection of the equipment prior to operating. Use proper fall protection when using manlifts/scissor lifts.
	Electrical Hazards	Review GZA's Electrical Safety Work Practices Program 03-3003. Power tools, sampling equipment, lighting, and any electrical power requirements must be GFCI protected.
		All survey personnel must determine that electrical equipment (e.g. panels) that may need to be accessed for sampling are properly de-energized and locked/tagged out prior to suspect material sampling. No sampling shall take place unless it is safe to do so.
		Do not use damaged electrical cords or tools with damaged cords. Cords and tools with grounding tab removed or with damage shall be labeled damaged and removed from service.
	Manual lifting, equipment handling	Use proper lifting techniques when lifting / moving objects or equipment to gain access into survey areas. Seek assistance with heavy loads.
		Use work gloves where appropriate to prevent hand injuries. Wear steel-toed work shoes.
	Cuts, scrapes, bruises, lacerations from use of tools	Maintain tools properly; do not use damaged tools.
		Use the right tool for the work.
		Wear gloves when appropriate.
		Wear eye protection; especially during sample collection.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Hazardous Materials Survey and Remediation		
Analysis By: Benjamin Sallemi, Ph.D.	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 30, 2011 **Revised: July 2, 2012**	**Date: July 2, 2012**	**Date: July 2, 2012**

Task 11
Hazardous Materials Survey and Remediation

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Hazardous Materials Abatement Monitoring / Oversight by GZA	Hazards associated with Asbestos, Lead-Based Paint, PCBs, etc.	Review hazards associated with the materials being abated and follow work practices identified in the HASP. Use PPE identified in the HASP. Follow proper decontamination procedures.
	Physical Hazards inside abatement work areas – Slips, trips and falls, tools and debris falling on head	Abatement work areas can be slippery due to the use of amended water or other chemicals to reduce dust. Be mindful of the work area and step carefully with sure footing. When performing overhead inspections assess the need for fall protection. Climb scaffolds and ladders with care always using the three point contact. If operating manlifts/scissor lifts review the proper use of the equipment and conduct an inspection of the equipment prior to operating.
		Workers working overhead with tools may accidentally drop tools or materials being removed could drop below. Wear hard hats and avoid standing directly underneath active abatement areas.
	Exposure to chemicals used for abatement operations	Review Safety Data Sheets (SDS) for chemicals and use the proper PPE identified in the HASP. Stay away from the work area where chemicals are being used if not needed to be there.
	Fire hazards	Contractors may use heat guns, torches, etc. or may conduct cutting operations that can generate heat and spark. Always evaluate the work area for the presence of flammable/combustible materials in the vicinity of “hot work” and notify the contractor if observed. Confirm with the contractor that appropriate fire extinguishers are available and know their locations. Stay away from cutting and hot work operations and observe safety protocols that are put in place by the contractor to prevent fires.
	Working Alone	See above.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Construction Oversight		
Analysis By: Brett Engard	**Reviewed By: Benjamin Sallemi, Ph.D.**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 19, 2011 **Revised: July 3, 2012**	**Date: July 3, 2012**	**Date: July 11, 2012**

Task 17.1
Construction Oversight

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 4.4A Excavation and Trenching (Heavy Equipment) 21.1 General Outdoor Field Work		
General Construction Oversight	Slips, trips and falls	Maintain clean and sanitary work area free of tripping/slipping hazards.
		Assess for adequate space to work safely with sound footing.
		Assess for adequate lighting.
		Assess that walkways and footpaths are free of obstructions.
	Physical Hazards	Become familiar with construction-related hazards prior to going onsite. Be cognizant of slips, trips and falls and overhead hazards of bumps, falling objects. Review related THAs noted above.
	Electrical shocks	Use GFCIs with all electrical power tools.
		Review GZA's Electrical Safe Work Practices program 03-3003.
	Cuts, scrapes, lacerations from hand tools	Know how to properly use hand tools and follow proper guarding procedures.
	Struck by, caught by, run over by equipment	Do not stand near or where equipment operators cannot see you. Always be in line of sight.
		Do not make sudden moves and always let the operator know of your intentions.
		Wear appropriate safety equipment as required by the Site Specific Health and Safety Plan when near heavy equipment and in general work area (hard hat, steel toe boots, work clothes, high visibility vest, eye and hearing protection, etc.).
		Understand the daily Scope of Work by participating in daily safety tailgate meetings and review the appropriate Job Hazard Analysis.
	Exposure to Hazardous Substances	Review the Site Specific HASP, attend and Site Specific orientation and/or training as required prior to performing work.
		Become familiar with hazards associated with hazardous commercial products used in construction (fuels, cement, epoxy, paint, sealant etc.). Review the SDSs for such products are available, and wear appropriate personal protective equipment.
		Conduct air monitoring as required by the HASP and use appropriate PPE as specified in the HASP.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Construction Oversight		
Analysis By: Brett Engard	**Reviewed By: Benjamin Sallemi, Ph.D.**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 19, 2011 **Revised: July 3, 2012**	**Date: July 3, 2012**	**Date: July 11, 2012**

Task 17.1
Construction Oversight

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Become familiar with procedures and contingencies for characterizing hazards and the use of appropriate personal protective clothing and respiratory protection, as needed.
Energized or Gas Powered Equipment	Personal Injury	Perform equipment safety inspection daily; assess if pressure relief devices, wire ropes, hoisting equipment, hydraulic hoses, and emergency shut-off switches are in good working condition.
		If power equipment is being used, become trained in the use of the equipment buy a qualified operator. Become familiar with the manufacture's operating manual and warnings.
		Do not disable the manufacture's built-in safety guards or do not operate if the safety mechanisms, controls or switches are disabled or are not functioning properly. Inspect the equipment for damaged or missing parts, and de-energize the equipment if it is not in use.
		Prior to refueling, turn off the equipment and allow the equipment to cool down.
		Move any loose clothing or equipment that can come in contact with moving or high temperature parts.
		Keep on hand a properly-sized and inspected fire extinguisher appropriate for the work.
		Inspect equipment for structural integrity, proper footing, tie backs, support, locked wheels, etc.
Observations from elevated surfaces, man lifts, scaffolds, etc.	Fall from elevated work areas/surfaces	Cordon off around the work area.
		Inspect manlifts and scaffolds being used by GZA personnel equipment for structural integrity, proper footing, tie-backs, support, locked wheels, etc.
		Use three point of contact while climbing ladders or scaffolding.
		Check for safety nets, railings, guardrails, etc. and their condition or for damage Use the proper fall protection system for the work being conducted (i.e. fall arrest or fall restraint). For fall arrest systems verify that swing falls and fall clearance distances are accounted for. Inspect body harness/lanyards used by GZA personnel for damage and missing parts.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Remediation Systems O&M		
Analysis By: Michael McCoy, CIH	**Reviewed By: Benjamin Sallemi, Ph.D.**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 26, 2011 **Revised: June 26, 2012**	**Date: June 26, 2012**	**Date: June 28, 2012**

Task 18.0
Remediation Systems O&M

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review related THAs: 21.1 - Outdoor Fieldworkd		
Operation and Maintenance of Remediation Systems	Hazardous Energy	Consult the O&M manual for the treatment system equipment components and know how to properly control hazardous energy before working on equipment.
		Utilize lockout/tagout procedures if project work is to occur on or around any energized equipment. See GZA policy on Control of Hazardous Energy - Lockout/Tagout and address hazards in the site-specific health and safety plan.
		Review GZA's Electrical Safe Work Practices Program 03-3003.
		Utilize only properly grounded electrical tools and equipment, and insure cords are free from wear.
		Do not run electrical cords through or around areas of water.
		When necessary and internal GZA expertise and training is not available hire a licensed electrician for appropriate electrical repairs and or maintenance.
		Review and abide by signage regarding electrical hazards at remediation sites.
	Mechanical Hazards	Evaluate equipment for possible pinch points, crush points and other potential mechanical hazards.
		Maintenance of remediation systems often requires use of hand tools. Select the correct tool and gloves as necessary for each project per the site-specific health and safety plan.
	Chemical Hazards	Evaluate and address controls for chemical hazards of each project in the site-specific health and safety plan. Chemicals may be utilized in the maintenance or cleaning of the system.
		Store water treatment chemicals and other chemicals to be used on site in their proper containers and in proper storage areas. Review and maintain Safety Data Sheets (SDSs) for chemicals being used on site. Use proper PPE when handling chemicals.
		When necessary provide for proper eyewash and safety showers for washing off caustic chemicals.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Remediation Systems O&M		
Analysis By: Michael McCoy, CIH	**Reviewed By: Benjamin Sallemi, Ph.D.**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 26, 2011 **Revised: June 26, 2012**	**Date: June 26, 2012**	**Date: June 28, 2012**

Task 18.0
Remediation Systems O&M

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
	Slips, Trips and Falls	Work around remediation systems, especially equipment utilized for treating groundwater and product may present slip hazards. Wear slip resistant boots on projects where water could be present on the floor.
		If ladders are to be utilized, assess if they are the appropriate type, in good repair and can hold the appropriate load.
	Working Alone	Review GZA's Working Alone Policy if project involves solo work at a remediation system project site.
		Sign out or call into the office to leave site specific information where you are working, the anticipated duration/hours of work on site. Do this for each site if multiple in one day.
		Call office or the person identified as the emergency contact in the HASP when off site.
	Site Specific Hazards	Remediation systems may be in abandoned or unoccupied facilities in a variety of environments from rural to urban. Address site specific hazards in the health and safety plan.
		A variety of environmental conditions may exist including high or low temperatures, wind and other weather conditions. Address these hazards in the site-specific health and safety plan.
		Remediation systems treat a variety of water pollutants, using various chemicals. Address chemical hazards of water pollutants and treatment chemicals in the site specific health and safety plan. Wear proper PPE.
		Insects, rodents and other vermin. Consider using appropriate repellant, and avoid contact with vermin and nest areas. Utilize wasp or bee insecticide during insect season, as appropriate.
		Confined spaces such as tanks and pits may present as part of remediation treatment systems that may need occasional cleaning and/or maintenance. Only trained personnel are allowed to work in confined spaces. All confined space work shall be in accordance with GZA's Confined Space Program.
	Fire Hazards	Refer to chemical SDS for proper handling, storage and use of chemicals.
		Store flammable combustible chemicals in proper containers and in areas away from sparks and heat generating equipment.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Remediation Systems O&M		
Analysis By: Michael McCoy, CIH	**Reviewed By: Benjamin Sallemi, Ph.D.**	**Approved By: Jayanti Chatterjee , CIH**
Date: September 26, 2011 **Revised: June 26, 2012**	**Date: June 26, 2012**	**Date: June 28, 2012**

Task 18.0
Remediation Systems O&M

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Provide the appropriate fire extinguishers in the remediation treatment area and know their locations and how to use them.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Field Sampling

Analysis By: Christie Wagner	**Reviewed By: Jayanti Chatterjee, CIH**	**Approved By: Jayanti Chatterjee, CIH**
Date: November 4, 2011 **Revised: July 12, 2012**	**Date: July 12, 2012**	**Date: July 12, 2012**

Task 20.11
Field Sampling

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 21.1 General Outdoor Field Work		
Pre work task for site visit	Adverse Weather Conditions	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work).
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
		Be aware of the anticipated weather conditions prior to mobilization to the site. Unacceptable field work conditions are not precise, but may include site specific conditions, general location, extreme weather conditions (e.g., icing, lightening, excessive cold or wind), travel conditions, and other factors. Professional judgment is required, and personal assessment of safety must always be individually assessed.
Conduct visual inspection of site	Dangerous Terrain	Be aware of the site terrain, watch for holes and rocks that can be tripping hazards
		Learn to identify and watch for plants such as thorn bushes and poision ivy that can either scratch you or give you a rash.
Collecting sample	Muscle strain from lifting heavy objects	Use proper lifting techniques. Use appropriate mechanical assistance and tools when possible. Wear work gloves and steel toed boots.
	Exposure to unknown sample	Be sure to treat effluent samples as unknowns and wear the proper PPE.
		If there are any unusual odors/fumes coming from a sample, especially those that cause reactions in the eyes or nose, leave the area and inform a supervisor immediately.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: General Outdoor Field Work		
Analysis By: Anthony Zemba, CHMM	**Reviewed By: Guy Dalton**	**Approved By: Jayanti Chatterjee , CIH**
Date: June 25, 2012	**Date: June 25, 2012**	**Date: July 12, 2012**

Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Pre-work preparation	Overlooking of potential hazards	Become familiar with project area and job site by reviewing available on-line mapping (USGS Topographic, NWI Wetland, NRCS Soil, etc.; and aerial photographs before visiting site. Understand related hazards through review of this and other Task Hazard Analyses and participate in daily safety tailgate meetings (where applicable).
		Communicate Task Hazard Analysis and Lessons Learned information to operator(s) prior to initiating work and throughout the project as needed.
Driving to site	Vehicle accidents/collisions/injuries	Perform pre-operation check of vehicle, verifying service brakes, parking brake, steering, lights, tires, horn, wipers mirrors and glass are in good condition. verify that the rig is roadworthy.
		Wear seat belts always when driving even on site.
		Secure loose materials in cab or bed of vehicle.
		Keep windshields, windows and lights cleans.
		Abide by safe driving procedures.
	Backing collisions	If possible avoid backing by using a route that allows you to pull through.
		If backing up from a parked area do a quality 360 walker.
Working within transportation corridors or active construction sites	Collisions injuries	Wear high visibility safety vest on site when out of personal or GZA vehicle.
		Park vehicle in designated parking locations, or select off-road area that is firm, and without hazards. Directly inspect parking location on foot if necessary.
		Use emergency flashers or other appropriate vehicle warning system as appropriate to local conditions when parking vehicle.
		Use emergency flashers or other appropriate vehicle warning system when parking outside of standard parking spaces, or to stop in right-of-
		Be alert at all times; never step outside traffic cones.

Job: General Outdoor Field Work		
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Date: June 25, 2012	**Date: June 25, 2012**	**Date: July 12, 2012**

Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Stand clear of moving heavy equipment and away from any overhead utility lines until equipment is safely in position and parked properly and securely by the contractor.
		Do not wear headphones or earbuds, or listen to music or talk on the phone, which may distract from work hazards.
	Crossing Automobile traffic lanes	Wear high visibility safety vests at all times when out of vehicle and working within or adjacent to the roadway.
	Crossing Airport Movement Areas (e.g., Runways, taxiways, approaches)	Learn, know, and conform to project site Airport's, Airfield's, or Airbase's protocol for crossing movement areas (whether on foot or in vehicle).
		Work within airport movement areas or safety zones must be coordinated with the Air Traffic Control Tower.
		Vehicles to have blinking or flashing lights or beacons; pedestrians to wear high visibility safety vests.
		Using protocol, maintain communication with airport security and air traffic controllers.
	Crossing Railways	Work within active railroad ROWs requires railroad safety training. No work can be done within the railroad traffic envelope without the permission of a railroad flagman.
		No equipment or vehicles can cross without the permission of a railroad flagman.
		Expect any train on any track coming from either direction at any time.
Working in Natural or Remote Areas	Slips, trips, fall	Be aware of loose ground materials such as talus, unconsolidated rock, soil, sediment, ice and other media that could cause slips, trips or falls.
		Be careful when walking in heavily vegetated areas. Mind tangles of vines, thorny branches, and slippery logs and rock surfaces. Dense vegetation and especially entangled vines present trip hazards, or can mask voids, sharp objects, or other hazards beneath.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: General Outdoor Field Work		
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Date: June 25, 2012	**Date: June 25, 2012**	**Date: July 12, 2012**

Task 21.1
General Outdoor Field Work

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
		Be vigilant for signs of cracking, shifting, fracturing, and evidence of past movement.
		Use wood mats or other stabilizing materials for equipment if soft ground conditions are present.
		Use walking stick, auger, or ski poles to steady yourself when traversing loose material or slopes.

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Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Wear proper footwear for conditions.
		Store tools in their proper storage location when not in use.
		Provide adequate lighting when necessary.
	Falls into excavations/ voids	Stand away from edges of excavations and voids. Do not attempt access without proper equipment / training. Remember that some excavations or voids may constitute a confined space and may present structural stability issues.
	Cave-ins and engulfment	DO NOT enter caves, sinkholes, excavations, and other voids or concavities that are not sloped or shored properly and have not been evaluated by a competent person to be safe.
		Stand away from edges of excavations, cliffs, dug wells, and other voids.
		Watch for cracks/fissures in the ground surface in the immediate vicinity of a pit or void, which indicate imminent sidewall failure/cave-in.
		Assess if confined space entry procedures need to be implemented.
		Before entering void (if required to do so and with proper training) be aware of any hazards at the surface (boulders, equipment) which may fall into the void.
Working among hazardous biota	Plant toxins Incidental contact	Know the appearance of poison ivy and poison sumac in all seasons, and if sensitive to these toxins, carry and use special cleaning soaps/solutions when thought to be exposed. Stock first aid kit with poison ivy/sumac cleaning soaps/solutions.
	Ticks	Ticks carry risk of Lyme's and other Diseases. Tick season is basically any field day above 40 degrees F.
		Tuck pants into long socks.
		The application of DEET (or permethrin pre-treatment) to clothing in season to control exposure to ticks is recommended.
		Check clothing for ticks frequently.

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JOB HAZARD ANALYSIS WORKSHEET

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Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Check whole body immediately upon returning from field and shower.
	Mosquitoes	Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (EEE), and their locations relative to your field site. Use of DEET or other mosquito repellant is recommended.
	Stinging bees and wasps	Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or approach with appropriate safety clothing, protection and netting.
		Take appropriate precautions if allergic to bees. Carry at least two epi-pens in first aid kit as well as anti-histamines (oral and inhalers).
		Avoid areas of heavy bee activity if allergic. Avoid perfumed soaps, shampoos, deodorants, colognes, etc. that may attract bees.
	Poisonous Snakes	Be aware of terrain likelihood of harboring poisonous snakes in your work zone. Avoid reaching or stepping into hidden areas (such as into wood pile, rock pile, debris pile, stone wall, etc.) without pre-inspection.
		Coordinate with local hospitals to verify they have proper anti-venom in stock.
		Learn first aid procedures in case of poisonous snake bite.
		Devise an action plan and include in the site-specific HASP.
	Wild Animals	Do NOT handle wildlife unless properly trained to do so.
		Beware of any wild animal that shows no sign of wariness of humans.
		Do NOT attempt to feed wild animals or to help apparently injured wild animals.
		Be aware of domestic animals that may also pose a threat such as dogs off leash, bulls out to pasture, etc.

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Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Working in Adverse Weather Conditions	Heat / cold stress and other weather related hazards	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work). Include clothing and the presence / absence of shade when calculating a heat index.
		Schedule work day to avoid working during hottest or coldest parts of the day, to the extent practicable.
		Keep exposed skin covered in extremely cold weather.
		Recognize signs of frostbite; use warming packs and layer clothing to maintain warmth.
		Use a wicking layer of clothing against your body to keep moisture away from skin.
		Wool clothing will continue to keep you warm after it becomes wet; cotton will not.
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
		Stay hydrated in hot weather; drink fluids regularly throughout the day, even if not thirsty.
		Recognize signs of heat stress; take frequent breaks in shade when working in direct sunlight for prolonged periods.
		Be familiar with Heat index chart - add 20 degrees to chart if fully clothed and if working in direct sunlight.
		NOTE: Unacceptable field work conditions are not precise, but may include site specific conditions, general location, extreme weather conditions (e.g., icing, lightning, excessive cold or wind), travel conditions, and other factors. Professional judgment is required, and personal assessment of safety must always be individually assessed.
	Working on Ice	Assess relative load bearing capacity of ice on lakes, ponds and other waterways. If unsure do not venture onto the ice.

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Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Wear proper footwear modified for traction on ice.
	Electrical storms	If lightning is observed during drilling activities, work shall be suspended immediately and employees shall find suitable shelter (building or vehicle at minimum). Work will commence no sooner than 30 minutes after the last indications of lightning have been observed
		Seek shelter inside a walled building or your vehicle.
		Open picnic pavilions and under trees are not adequate shelters.
		Assess vulnerability to lightning strikes as soon as thunder is heard on the horizon. Open areas and higher elevations are more susceptible to strikes.
		Tall objects such as metal towers and flag poles may attract lightning.
		Consult internet weather radar tracking devices to learn of impending storm patterns proximal to your work area.
	High Winds	Avoid working at high elevations, elevated platforms, and other exposed areas during high wind conditions.
		Assess work area for equipment that may be blown down, over, or carried aloft by high winds.
Working in areas without sanitary facilities	Hygiene related hazards	Provide hand washing kits (e.g., baby wipes, hand sanitizers, paper towels, bottled water, etc.) to be used prior to eating and drinking.
		Have garbage bags handy to collect trash.
Working in remote areas	Emergency Conditions	Be familiar with onsite emergency procedures and route to nearest hospital.
		Have a first aid kit available; know its contents and how to use them.
		Carry a cell phone during all field work for emergency purposes, and confirm the nearest location of cell phone signal on site prior to start of worksite.
	Disorientation	Plan your route and anticipated progress prior to field work.

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JOB HAZARD ANALYSIS WORKSHEET

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Task 21.1
General Outdoor Field Work

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Have multiple navigation aids (e.g., USGS Map, compass, GPS, etc.) and know how to use them before entering field. Remember to have charged batteries and battery back-ups for electronic devices.
		Share your progress plan with office staff prior to entering the field.
		Check in with office personnel periodically to update progress.
		Review and comply with GZA's Working Alone Policy 03-1009 in advance of working alone on a project site.
	Hunting	Be familiar with the various game hunting seasons. Follow rules and guidelines for remaining visible to hunters.
		Try to plan work around active hunting seasons or daily peak hunting hours as warranted.

National Grid Incident Reporting Requirements

All contractors and consultants working on National Grid projects hired either by National Grid or its representative will report incidents involving their personnel or subcontractor personnel to National Grid. Incidents include but are not limited to injuries, illnesses, near misses, motor vehicle incidents, environmental releases, fires, incidents involving the public, and property damage. The person reporting the incident is the Incident Reporter.

The Incident Reporter will notify the Project-Specific National Grid Project Manager (PM) **verbally** within **1 hour** of the incident. All work will be suspended until contact is made with the Project-Specific PM so that National Grid can assess if continued work suspension or if a stand down is necessary. If the National Grid PM cannot be reached, contact the National Grid SIR Regional Safety Lead as noted in the table below.

Name	Region	Phone Numbers	E-Mail
William Ryan	Downstate NY	W- (516) 545-2586 C - (516) 790-1660	William.Ryan@nationalgrid.com
Brian Stearns	Upstate NY	W- (315) 428-5731 C - (315) 461-7892	Brian.Stearns@nationalgrid.com
Elizabeth Greene	MA/RI	W- (781) 907-3656 C- (781) 248-6469	Elizabeth.Greene@nationalgrid.com

A DRAFT written Incident Report and/or email summary must be completed and submitted by the Incident Reporter to the Project-Specific National Grid PM, National Grid SIR Safety Lead, and/or other designated National Grid representative **within 4 hours** of the incident.

The Incident Reporter will provide a FINAL Incident Report within **24 hours** via e-mail to the Project-Specific National Grid PM, National Grid Regional Safety Lead, and/or the person to whom the verbal notification was initially provided.

Figures, photographs and/or sketches should be included within the Incident Report. Photographs of the incident area and/or vehicle (not of the personal injury) should be included. For vehicle incidents and cases of damaged or stolen property, a police report should be filed and a copy provided to the Project-Specific PM. A representative with knowledge of the incident should be available to provide incident information until the investigation is completed by National Grid. In some municipalities police will not be dispatched to a non-injury accident, but every effort needs to be made to try and obtain the report.

All personnel must be made aware that preventing or promptly addressing accidents and injuries takes precedence over completing field work. In addition, if any worker believes that working

conditions pose a risk of harm to on-site personnel or members of the public, work must stop and the situation must be addressed.

Incident Report Information

The following information should be included when reporting the incident to National Grid.

1. Incident Date and time

2. Date/Time National Grid PM was initially notified. Record different times and methods of notification (Call cell, Call office, Left message, e mail, text, etc.).

3. Employee type (regular, temp, contractor, consultant), company, company address, and what position held. Name, DOB, sex, full/part time.

4. Incident Type
    a. Injury/Illness to Employee (NG employee, temporary, consultant, contractor)
    b. Injury/Illness to Contractor
    c. Near Miss
    d. Motor Vehicle
    e. Public Incident
    f. Hazardous Condition
    g. Company property Damage/Equipment Damage/Equipment Failure
    h. Switching/Relay Incident
    i. Environmental

5. Incident location. Address where incident happened, site name/Owner.

6. Description of what happened, number people injured, fatalities, voltage, pressure (if applicable). Type of activity/task being performed.

7. Medical attention received

8. Spills (if applicable) - material, source, quantity, weather conditions, cause, responsible party for cleanup, PCB level, environmental media (land, water, and/or air) impacted. Clean up and Corrective actions.

9. Equipment details (if applicable) - type, number, size, unit, manufacturer

10. Witness Detail (name, address, statement).

11. OSHA severity

12. Name and address of medical care facility/doctor (if treated by a doctor or hospital). Was employee treated overnight? In the emergency room?

13. Nature of injury - part injured. Be specific.

14. Object that caused injury. Be specific.

15. What was employee doing just prior to injury?

16. How could this incident been prevented?

17. List any unsafe acts / unsafe conditions

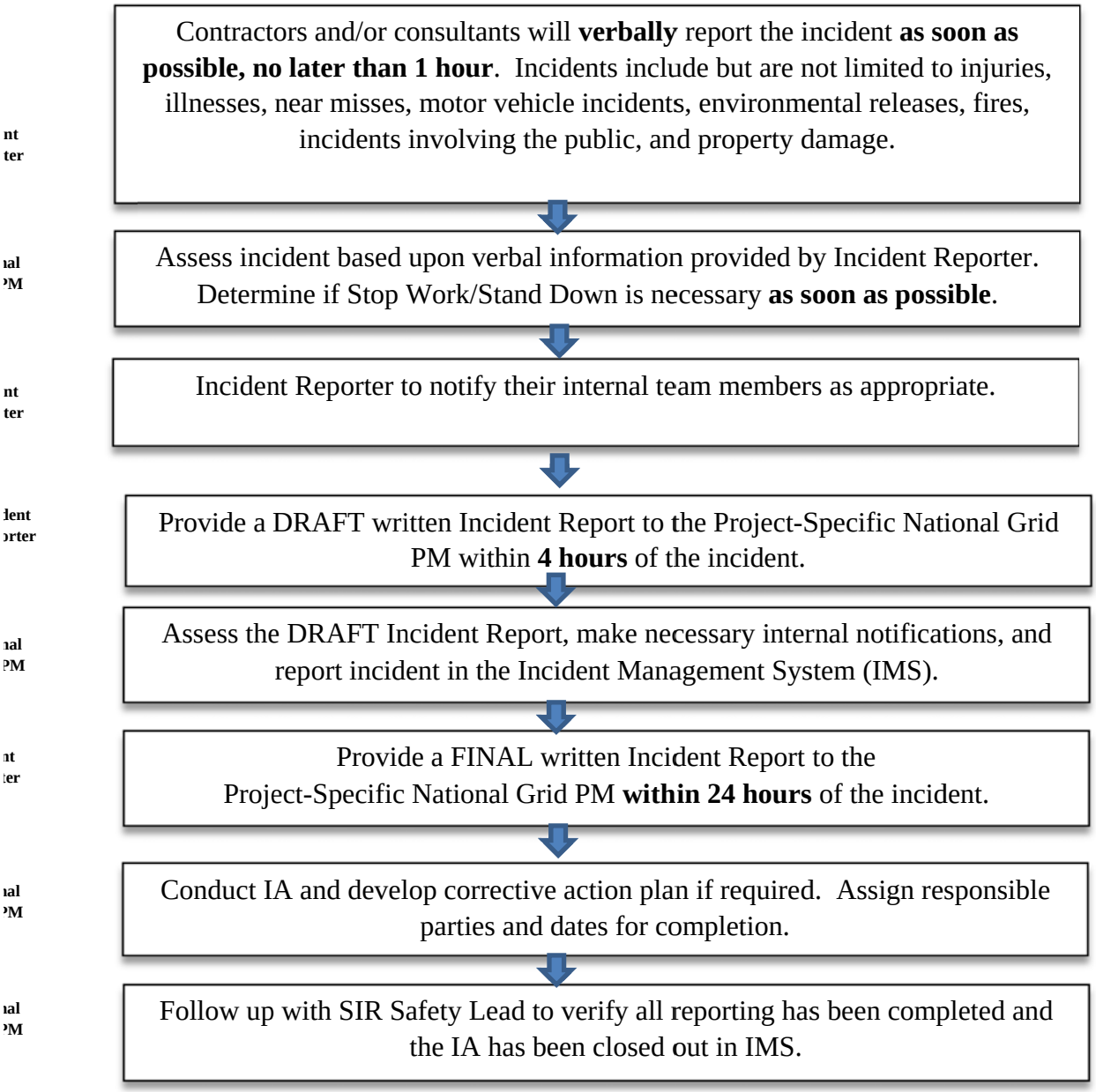
18. Were safety rules, work methods, procedures violated?

19. Was proper protective equipment worn?

20. List any prior accidents with dates that this employee has experienced

21. Lessons Learned

Flow Chart for Accident Reporting



TAILGATE SAFETY MEETING

CHECK ONE: _____ Initial H&S Orientation _____Periodic "Toolbox" Safety Meeting

Project Site/Location_____

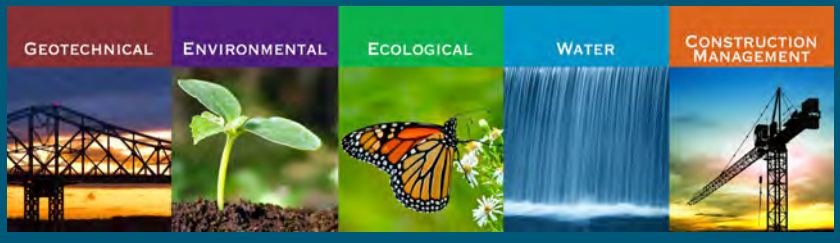
Date_____ Time_____ Job No._____

PM_____ PIC_____

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED (required topics are listed below to be covered in addition to regular site-specific topics)		
1.		
2.		
3.		
NAME (printed)	**SIGNATURE**	**COMPANY**

Conducted by: _____ Date:_____



GZA GeoEnvironmental, Inc.