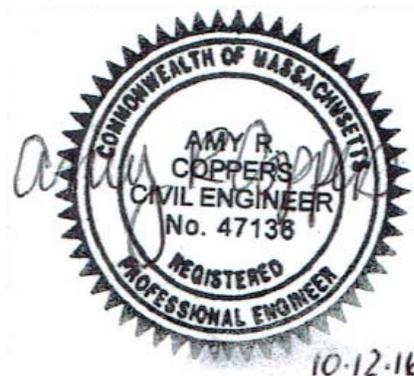


STORMWATER MANAGEMENT PLAN

KENOZA LAKE WATER TREATMENT PLANT COMPREHENSIVE UPGRADES

PREPARED FOR:
HAVERHILL WATER DEPARTMENT

OCTOBER 2016



WRIGHT-PIERCE 
Engineering a Better Environment

**STORMWATER MANAGEMENT
PLAN
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ATTACHMENTS

Attachments

- A Operation and Maintenance Plan

Section 1

SECTION 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The Haverhill Water Department will be undertaking a comprehensive upgrade to its water treatment plant in 2017. The plant located at 131 Amesbury Road treats water from Kenoza lake. The improvements are aimed at hydraulic and process improvements that were identified in a 2010 Comprehensive Water System Master Plan completed for the City. The proposed upgrades will enable the plant to provide 12 MGD of hydraulic and treatment capacity and full operational redundancy. The project's construction period is expected to take 2.5 years to complete.

Some of the components of the proposed upgrades include:

- Upgrade of the raw water pumping capacity and electrical systems;
- Reconfiguration of the raw water inlet piping, chemical injection, and mixing system;
- Upgrade of the existing sedimentation process to accommodate a Dissolved Air Flotation process;
- Relocation and expansion of the filter system;
- Construction of an equalization and backwash tank;
- Expansion of the GAC filter system;
- Upgrade of the chemical feed systems;
- Construction of a new clearwell for improved disinfection efficiency;
- Upgrade of all major building systems; and
- Site improvements to include reconfigured parking areas, truck access improvements, updates to the site drainage system, and other site piping improvements.

In accordance with the Massachusetts Stormwater Rules and Regulations, the improvements at the Haverhill Water Treatment plant is considered a redevelopment project. The improvements at the plant have been designed to keep as much of the existing drainage patterns at the site intact with slight modifications where required.

There are three separate drainage systems associated with the water treatment plant. The existing treatment plant has one stormwater outfall near the raw water pump station building collecting runoff from the southwest side of the site. The second area includes the enclosed drainage system within the access drive to the plant which conveys drainage to the storm drain system in Amesbury Road which outlets to the large wetland area on the north side of Amesbury Road. The final area includes the system of underdrains and roof drains at the plant which connects into drain pipes on the east side of the plant where it discharges to the lake. This pipe system will remain in place with the proposed improvements. The outfall at the raw water pump station will need to be relocated to the east to allow construction of the new electrical room for the pump station. The outfall location will remain in the same area however.

At the northwest corner of the site, there is a series of catch basins that collect runoff from the parking area and directs it to the west where it outlets onto the grassed lawn area. This drainage eventually makes its way into the enclosed drainage system along Amesbury Road. While some modifications will be constructed to this drainage system, it will discharge in nearly the same location at the existing discharge and continue to drain into the drainage system in Amesbury Road.

The plant improvements will include a new access to the parking and chemical delivery area of the site. Runoff from this portion of the redevelopment site will discharge onto the lawn area and flow to the existing enclosed drainage system in the access drive to the plant. As noted above this system drains into the drainage system in Amesbury Road and discharges away from the lake.

The project will be funded through MassDEP's Drinking Water State Revolving Fund (DWSRF) program.

The proposed project schedule is summarized below:

- September 2016: Design Plans and Specifications submitted to MassDEP for approval
- Late 2016: Construction Bids Received for Project
- Winter 2017: Construction Begins on the Project
- Mid to End of 2019: Final Completion of Project

The purpose of that report is to summarize the drainage analysis and erosion and sediment controls for the project area and demonstrate its compliance with the Massachusetts Stormwater Standards, Haverhill Stormwater Regulations and Conservation Commission Rules and Regulations.

Section 2

SECTION 2

REGULATORY STANDARDS

2.1 ORGANIZATION OF THE REGULATORY STANDARDS SECTION

This Section of the Stormwater Management Plan (SMP) is organized to describe the Ten Massachusetts Stormwater Standards, consistent with Section 7 of the Stormwater Management By-Law, which are listed below:

- Standard #1: No New Untreated Discharges
- Standard #2: Post-development Peak Discharge Rates
- Standard #3: Recharge to Groundwater
- Standard #4: 80% TSS Removal
- Standard #5: Higher Potential Pollutant Loads
- Standard #6: Protection of Critical Areas
- Standard #7: Redevelopment Projects
- Standard #8: Erosion & Sedimentation Control Plan
- Standard #9: Operation & Maintenance Plan
- Standard #10: Illicit Discharges

For redevelopment projects, the project is required to meet these standards to the maximum extent practicable for standards 1 through 6. Other provisions in standards 7 through 10 shall comply with the provisions in the standards.

2.2 STANDARD 1: NO NEW UNTREATED DISCHARGES

An existing catch basin in the vicinity of the Raw Water Pump Station will be relocated to allow construction of the new electrical room associated with the Raw Water Pump Station. This basin collects runoff from the back parking area of the plant and discharges to the base of the slope prior to draining to the lake. To accommodate the proposed addition to this building, the catch basin will be moved approximately 25-feet up the slope (to the east). The discharge will be located only

a few feet from where the existing discharge is located. The same buffer between the discharge and the lake will remain in the post construction conditions.

2.3 STANDARD 2: POST-DEVELOPMENT PEAK DISCHARGE RATES

Under Standard 2, the proposed project shall be designed so that post-development peak discharge rates do not exceed the pre-development peak discharge rates for the 2-year, 10-year, and 100-year, 24-hour storm events, to prevent downstream and off-site flooding to the maximum extent practicable. Due to the proximity of the site within a Zone A Water Supply Protection Area, infiltration stormwater BMPs are not allowed and therefore the requirements under this standard cannot be met.

Runoff rates will not be significantly altered as a result of the project. The site has four main subwatersheds where work is taking place. These watersheds are described as follows:

- Water Department Maintenance Building and Boat Ramp;
- Raw Water Pump Station;
- Building Addition and Eastern Drainage Swale; and
- Access Drive and Amesbury Road Drainage.

Each of these watersheds is discussed below.

Water Department Maintenance Building and Boat Ramp

This subwatershed includes the area from the Raw Water Pump Station and extends to the west towards the existing boat ramp, and parking area associated with the Maintenance Building. The net increase in impervious area in this area is primarily associated with the proposed addition to the Raw Water Pump Station. All other pavement disturbances will be restored to their original condition. Between the Raw Water Pump Station and the Boat Ramp, a section of existing curbing will be removed to allow runoff to disperse into the lawn buffer area between the pavement and the lake. Some grading work will be taking place within the lawn area to create a slight depression to allow runoff to pond before discharging to the lake. Currently, runoff is directed directly to the boat ramp.

Raw Water Pump Station

This watershed includes the southerly parking area in back of the Water Treatment Plant and includes the drainage to the relocated catch basin mentioned previously. This watershed area is slightly reduced by moving the catch basin up hill to allow construction of the proposed electrical room. Discharge location of the catch basin is essentially unaltered. The length of the overland flow from the drain outlet to the lake will not be altered as a result of the proposed improvements.

Building Addition and Eastern Drainage Swale

The proposed addition to the treatment plant is being constructed where an underground tank existed previously. A strip of pavement is being added to the northerly side of the proposed addition. A drainage swale exists on the easterly side of the building and this swale will be extended to improve drainage on the northeast side of the proposed addition. The underdrain and roof drain systems will remain in their current configuration within this watershed area. The swale is graded at roughly 1% which will allow some mitigation to runoff rates in this portion of the site.

New Access Drive and Amesbury Road Drainage

The addition of the new access drive for employees and chemical deliveries will occur within this watershed area. While the employee parking area is being expanded slightly, the new pavement will replace the gravel surfaces that exist currently near the existing electrical entrance. The addition of curbing in the parking area will require the installation of a new catch basin. Other catch basins are being added to pick up drainage from the improved material laydown area on the northern portion of the site. These structures will discharge in the location of the existing drainage outfall on the northern side of the new access drive. As noted previously, the discharge drains to the enclosed drainage system in Amesbury Road. Flow across the lawn area provides attenuation of the discharge rates and also offers treatment of the runoff.

At the intersection of the new access drive and the existing drive into the plant, a new catch basin will collect runoff from a portion of the new drive and the lawn area. This basin will be connected to the enclosed drainage system in the existing access drive and discharge to the system in Amesbury Road. The Amesbury Road drainage system consists of a combination of 10 and 12-inch reinforced concrete drains. The system discharges to the wetland to the northwest of the

access road into the treatment plant. This wetland is a large area that is situated between Routes 110 and 108 which acts as a natural detention pond.

Due to the configuration of the existing plant, location adjacent to the lake, and the scope of the needed improvements, little opportunity exists to attenuate runoff rates from the site. Impervious surfaces within the 100-foot buffer zone of the lake will not be significantly increased as part of the work. In areas where the impervious area is being increased the runoff is directed to the existing lawn area and connected to the Amesbury Road drainage system where it discharges to the large wetland area away from the lake.

2.4 STANDARD 3: RECHARGE TO GROUNDWATER

In accordance with the Massachusetts Stormwater Rules and Regulations, “stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply”. Therefore, installation of infiltration BMPs to meet the groundwater recharge requirements under Standard 3 cannot be met.

2.5 STANDARD 4: 80% TSS REMOVAL

Standard 4 requires the design of stormwater management features to remove 80% of the average annual post-construction load of total suspended solids (TSS). Since stormwater discharges are prohibited to a Zone A, this criterion cannot be met. However, deep sump catch basins are being proposed which provide 25% TSS removal, in accordance with the Massachusetts Stormwater Handbook. The elimination of the curbing adjacent to the boat ramp area will alleviate a direct surface runoff discharge to the lake. Where the curb is being removed between the raw water pump station and the boat ramp, the area will be regraded to provide a sediment trap before runoff discharges to the lake. This will improve the current configuration. Drainage is also being directed to grass swales where possible to assist in removing TSS loads.

2.6 STANDARD 5: HIGHER POTENTIAL POLLUTANT LOADS

The project site is not considered a land use with higher potential pollutant loads and therefore this standard does not apply.

2.7 STANDARD 6: PROTECTION OF CRITICAL AREAS

The project site is considered an Outstanding Resources Waters as defined in 310 CMR 22.02, since the site falls within a Zone A Water Supply Protection Area. Under Standard 6, for Zone A Water Supply Protection Areas, stormwater discharges are prohibited unless essential to the operation of the public water supply. The existing stormwater outfall is considered essential to the ongoing operation and maintenance of the plant. The catch basin in front of the raw water pump station will be relocated approximately 15-feet to the east to accommodate the new entrance to the electric room. This catch basin is essential to the operation of the facility and will prevent any ice build-up during the winter months in front of the new electrical room entrance. The outlet to this catch basin will essentially remain in the same location.

2.8 STANDARD 7: REDEVELOPMENT PROJECTS

The project site is considered a redevelopment project, as much of the existing pavement area and building foot prints will remain in place.

2.9 STANDARD 8: EROSION & SEDIMENT CONTROL PLAN

2.9.1 Implementation of Erosion and Sedimentation Controls

Prior to the start of any earthwork or demolition on the site, the sedimentation and erosion controls shall be installed. Section 2.9.3 provides a listing of controls and a sequence of construction.

2.9.2 Inspection and Maintenance of Stormwater Controls

Stormwater controls must be maintained in good operating condition until all disturbed soils are permanently stabilized. To ensure this, the following areas will be inspected by the Contractor every week and after every rainfall event of 0.5 inches or greater:

The following standard maintenance practices will apply to the erosion and sedimentation controls for the project:

- All erosion and sediment control measures will be properly maintained. If repairs or other maintenance is necessary, it will be initiated by the Contractor within 24 hours of report;
- Stabilized construction entrance will be inspected regularly. Adjacent roadways will be inspected for track-out and swept as needed.
- Silt sacks will be installed in catch basins adjacent to the work area and inspected on a regular basis and cleaned as necessary;
- Silt fence will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground;
- Built up sediment will be removed from silt fence when it has reached one-half the height of the fence and at end of the job;
- Erosion control measures will be maintained for disturbed areas of the site that have not been stabilized;
- Erosion control measures will be installed and maintained for the construction staging area, stockpiles, and material storage areas until those areas have been stabilized after construction; and,
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts, and healthy growth.

If the inspections reveal the need for additional control devices to prevent erosion and sedimentation, the Contractor will promptly install additional protection devices as required. Control devices in need of repair will be repaired promptly after identification. A stockpile of 300 linear feet of silt fence will be maintained on the site and under cover for emergency repairs and routine maintenance.

The Owner (or their representative) will be responsible for preparing an inspection and maintenance report following each inspection and filing completed reports after maintenance action has taken place by the Contractor. The Contractor's superintendent will be responsible for

maintenance and repair activities and completing and signing the maintenance action portion of inspection and maintenance reports.

2.9.3 Stormwater Controls for Construction Period

CONSTRUCTION SEQUENCING

The project construction phasing will generally proceed in the following sequence:

1. Furnish and install erosion control measures. This includes at a minimum the placement of silt fencing at the down slope perimeter of all areas proposed for disturbance and installation of silt sack inlet protection in downstream catch basins.
2. Initiate tree removal and clearing and grubbing.
3. Removal and stockpile the existing loam from the area.
4. Begin excavation and construct the building foundations.
5. Commence building structure construction.
6. Start utility construction and site work, including water piping and site stormwater management controls.
7. Finalize building construction and site utility and piping work.
8. Establish finish grades, finalize stormwater management controls, realign driveway and construct the proposed walkways and parking areas.
9. Complete construction of the new driveways, parking areas and walkways with new bituminous asphalt concrete pavement.
10. Stabilize all remaining disturbed areas. Continue to touch-up and maintain all areas that have received loam and seed as needed until a 90% catch of vegetative growth has established.
11. Once the site has become permanently stabilized as determined by the Owner and the Engineer, remove all remaining temporary erosion and sedimentation control measures.

EROSION AND SEDIMENT CONTROLS:

1. Temporary stabilization measures shall be instituted to minimize effects of sedimentation and erosion during construction.
2. Permanent stabilization measures shall be employed to minimize effects of sedimentation and erosion after the completion of construction.

2.10 STANDARD 9: OPERATION & MAINTENANCE PLAN

Due to the nature and intensity of the proposed redevelopment project, the site is not anticipated to generate any significant TSS or pollutant loads. As such, inspection activities at the site should be focused on the development or potential for development, of any erosion issues.

To ensure compliance with all applicable stormwater regulations, and as a measure of good housekeeping, inspection and maintenance personnel shall maintain an operation and maintenance log for the last three years. The operation and maintenance log shall include inspections, repairs, replacements and disposals (for disposals, the log shall indicate the type of material and the disposal location). The operation and maintenance plan is included as Attachment A.

2.11 STANDARD 10: ILLICIT DISCHARGES

There are no known illicit discharges in the area of the project. New drainage proposed for the Plant will be constructed and tied into the existing system. Due to the site constraints, there is no future development anticipated that would create an illicit discharge in this area.

Appendix A

OPERATION AND MAINTENANCE PLAN

This Operation and Maintenance Plan (O&M Plan) was prepared in accordance with the City of Haverhill Stormwater Management Regulations to ensure that all soil erosion and stormwater runoff control facilities and measures are maintained during and after construction. Regular inspections and maintenance are essential for long-term effectiveness of soil erosion and stormwater runoff control facilities and measures. If not properly maintained, these facilities and measures will not operate as designed and will not provide effective treatment of stormwater runoff. The Haverhill Water Department will be responsible for performing the regular inspections and required maintenance for the stormwater treatment practices to be installed as part of the project. The following is an outline of these inspection and maintenance procedures.

INSPECTIONS

Deep Sump Catch Basins: Inspect deep sump basins at least four times per year and at the end of the foliage and snow removal seasons.

Keep and update an Inspection and Maintenance Log. Record the date, structure location, estimated volume of solids within the sump, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages. Sumps shall also be cleaned out at least annually.

Drainage Outlets: Inspect drainage outlets for any signs of erosion and debris accumulation at least four times per year and at the end of the foliage and snow removal seasons. Note any actions taken as a result of the inspections in the Inspection and Maintenance log.

Drainage Swales: The grass lined swales on the north and easterly sides of the site shall be mowed on a regular basis as required during the growing season. The swales shall be included on the regular inspection route to note any signs of erosion taking place.

MAINTENANCE

Deep Sump Catch Basins: Catch basins shall be cleaned when the estimated volume of solids within the sump is approximately 50%. Inspections should inform the removal of sediment from the deep sump catch basins.

Drainage Outlets: Remove any debris and repair any sign of erosion taking place at the outlet or immediately downgradient of the outlet.

Drainage Swales: The grass lined swales shall be mowed as required during the growing season. Any obstructions to flow, or signs of erosion shall be repaired within a week of discovery.

