STEARNS MEADOW WATER TREATMENT PLANT

STORMWATER MANAGEMENT REPORT

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1. INTRODUCTION

On behalf of the Town of Scituate, Massachusetts (Town), Woodard & Curran, Inc. (Woodard & Curran) has prepared this Stormwater Management Report for the proposed Stearns Meadow Water Treatment Plant (WTP) and associated site improvements (the Project) located just north of Tack Factory Pond (the Site). The Town of Scituate is proposing to construct a new Drinking Water Treatment Plant located at 453 Chief Justice Cushing Highway opposite the Lutheran Church. The project limits include the Stearns Meadow WTP and applicable portions of Chief Justice Cushing Highway (Route 3A – Massachusetts Department of Transportation [MassDOT] owned roadway). The Project limits are bounded to the south by Tack Factory Pond, to the east by Chief Justice Cushing Highway, to the north by residential lots located off Old Forge Road and to the west by residential lots located off Stearns Road.

The project includes the construction of a new Drinking Water Treatment Plant for the Town along with surrounding infrastructure improvements including but not limited to, the construction of a bituminous concrete access and circulation driveway, surface parking lots, sand drying beds, a pump station, and an on-site disposal system for sanitary wastewater. Drainage and utility infrastructure improvements are proposed within the Site as well as connections to existing utilities within Route 3A. Landscape restoration and improvements are also proposed as part of the Project.

The 2021 Water System Master Plan (prepared by Tighe & Bond) identified the disrepair of the Old Oaken Bucket (OOB) Water Treatment Plant (WTP) and recommended a new treatment facility be constructed to replace the existing OOB WTP. The proposed Stearns Meadow WTP is intended to substantively improve the Town's water and specifically reduce the discolored water complaints and address the total trihalomethanes (TTHM) exceedance that occurred in 2020, for which the Town is currently under an Administrative Consent Order (ACO). The current plant is unable to effectively manage the manganese levels in the raw waters of OOB Pond. This led to numerous complaints of discolored water caused by the presence of accumulated sediments (primarily iron and manganese). The project proposed to construct a new 35,000 square foot Water Treatment Plant to address water quality issues, as well as housing administrative and operational functions of the Town of Scituate's Water Department. The stormwater management for the proposed WTP site improvements are summarized in this report.

This Stormwater Management Plan (the Plan) has been developed to demonstrate compliance with the Town of Scituate Stormwater Management Regulations, to the extent feasible, and the Massachusetts Stormwater Management Handbook (the Handbook). The following sections describe the existing and proposed conditions at the Site, the stormwater management system design, and compliance with the Handbook.

2. PROJECT DESCRIPTION

2.1 Existing Conditions

A Site Locus Plan on a United States Geological Survey (USGS) Quadrangle Map depicting the project location has been provided in **Appendix A**. The Site is about 30 miles south of Boston and was previously comprised of 10 contiguous parcels prior to the lot consolidation in March 2022. The Site is approximately 15 acres and located at 453 Chief Justice Cushing Highway. The existing Site is currently undeveloped with the exception of the cemetery located along the western property line. The Site is largely wooded; therefore, there are no existing Site utilities. The Town has confirmed the following utilities are available for the Site: gas, electric, and telecommunications. Public sewers are not available near the Site, but an on-site disposal system for sanitary wastewater will be implemented for the Project and permitted through the Scituate Board of Health.

The Site generally slopes from north to south and its elevation ranges from 110 feet to 40 feet, with an average slope of approximately 5%. Subcatchment boundaries were delineated using the existing survey topographic data prepared by Feldman Land Surveyors in December 2021. In both the pre- and post-development Site conditions, stormwater discharges to Tack Factory Pond via overland flow and pipe conveyance systems at different locations, which are the Design Points selected for the stormwater management design documented herein. The existing and proposed hydrology is further described in Section 2.2 and are depicted in Watershed Figures in **Appendix C**.

Land cover and soils datasets were used to develop hydrologic curve numbers for the project area. Land cover was determined by review of aerial photography, Site survey data and field observations. A more detailed examination of the existing land cover within individual drainage subcatchments can be found in Section 2.2.2. Soil characteristics were observed during test pits conducted by Woodard & Curran in April 2023 and was supplemented with information obtained from the United States Department of Agriculture's (USDA's) most recent Web Soil Survey. A Site map showing soil types and hydrologic soil group classifications within the project vicinity from the USDA's Web Soil Survey is located in **Appendix B**.

The soil evaluation was performed in order to determine the existing soil conditions, water table elevations and whether on-site excavated soil would be suitable for reuse. It is important to note that test pits performed on the site indicated similar soil compositions throughout the Site which contradicts the most recent Web Soil Survey which showed a variety of soil. Test pit observations revealed tightly compacted sandy clay loam consistent with a Hydrologic Soil Group (HSG) C which varies from the most recent Web Soil Survey which indicates a distribution of HSG's (A, B and C) across the site. Additionally, test pit evaluations indicated high seasonal high groundwater tables ranging from 19" – 32" below existing grade. The test pit logs prepared by Woodard & Curran are located in **Appendix B**.

Per the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), effective July 6, 2021, portions of the southern limits of the Site are located within a Special Flood Hazard Area (Zone AE / Regulatory Floodway) and a 100-year storm flood area (Zone X). The FEMA National Flook Hazard Layer (NFHL) FIRMette Map is located in **Appendix A**. The 100-year Base Flood Elevation (BFE) per the FEMA Flood Insurance Study (FIS) indicates the BFE is at approximately elevation 44'. All proposed developments are outside of flood hazard areas.

2.2 Resource and Critical Areas

Woodard & Curran reviewed Massachusetts Geographic Information Systems (MassGIS) data, the Massachusetts Department of Environmental Protection's (MassDEP's) Habitat of Potential Regional and Statewide Importance maps, the Massachusetts Stormwater Handbook, the MassDEP's Bureau of Waste Site Cleanup's (BWSC's) Phase I Site Assessment database, the Massachusetts Surface Water Quality Standards (314 CMR 4.00), the Massachusetts Year 2016 Integrated List of Waters, FEMA's NFHL database, and the Town of Scituate Zoning Map to identify resources on or adjacent to the Site. The findings of our review are below:

- The Massachusetts Endangered Species Act (MESA) protects rare species and their habitats by prohibiting the taking of any plant or animal species listed as Endangered, Threatened, or Special Concern by the Massachusetts Division of Fisheries & Wildlife. MESA review is required by the Natural Heritage & Endangered Species Program (NHESP) for projects and activities located within a Priority or Estimated Habitat of Rare Species. Review of the MassGIS Data shows there are no Priority or Estimated Habitats within the Project Area; therefore, the project is not subject to MESA review.
- Per MassGIS Data, there are no Certified or Potential Vernal Pools within 500 feet of the project area.
- Per MassGIS Data, the project is not located within an Area of Critical Environmental Concern.
- Per the MassDEP's Habitat of Potential Regional and Statewide Importance map for the Town of Scituate, the project is not located within a Habitat of Regional or Statewide Importance. Portions of Tack Factory Pond are located within a Habitat of Regional or Statewide Importance.
- Per the Handbook, critical areas include Outstanding Resource Waters and Special Resource Waters, recharge areas for public water supplies, bathing beaches, cold-water fisheries, and shellfish growing areas. Review of MassGIS Data, the MassDEP's BWSC Phase I Site Assessment database, and the Massachusetts Surface Water Quality Standards indicate that portions of the Site are designated as the following critical areas:
    - Zone A
    - Outstanding Resource Water – Public Water Supply Watershed
    - Medium/High Yield Aquifer

    The Phase I Site Assessment Map for the Site is located in **Appendix A**.
- Per the Massachusetts Year 2016 Integrated List of Waters, Tack Factory Pond is classified as a Category 2 waterbody, meaning the waterbody is unimpaired for some uses and not assessed for other uses. Tack Factory Pond uses attained consist of fish, other aquatic life and wildlife. Tack Factory Pond was not assessed for aesthetic, primary contact recreation, secondary contract recreation and shellfish harvesting. An excerpt from the Massachusetts Year 2016 Integrated List of Waters is located in **Appendix A**.
- Per Scituate Zoning Map dated October 25, 2011 and revised on August 11, 2021 the Site is located within the Water Resource Protection District. According to the Town's Zoning regulations the Water Resource Protection District includes areas significant to the Town's drinking water supply sources which require zoning protection. Specific regulatory requirements for the Water

Resource protection district can be found within the Town's Zoning Bylaws. A copy of Scituate's Zoning Map displaying the Water Resource Protection District is located in **Appendix A**.

2.3 Proposed Project Work

As noted, above, the Project includes the construction of a new Drinking WTP including but not limited to, surface parking lots, bituminous concrete access roads, concrete walkways, gravel access road, concrete equipment pads, sand drying beds, a pump station, and an on-site disposal system for sanitary wastewater. Extensive transportation, drainage, and utility infrastructure improvements are proposed within portions of Chief Justice Cushing Highway adjacent to the Stearns Meadow WTP Site. Construction activities are expected to begin in Spring 2024.

2.4 Proposed Stormwater Management System

The proposed stormwater management system has been designed to comply with the Handbook Standards. The Site is defined as a new development and therefore shall meet the Massachusetts Stormwater Management Standards detailed in Section 4 – Compliance with Stormwater Management Standards. The Site is not considered a land use with higher potential pollutant loads (LUHPPL) however, the Site is within critical areas and therefore, all proposed BMPs have been sized to treat a water quality volume based on 1-inch of runoff. Pretreatment BMPs have been designed to remove 44% of total suspended solids (TSS) prior to infiltration. Additionally, per the Town of Scituate Stormwater Regulations, all runoff from impervious areas including roofs shall be treated to remove a total of 90% TSS. TSS removal calculations are included in **Appendix E**.

The Project results in an approximate 1.805 acre increase of impervious area when compared to existing conditions. In addition to the increase in impervious area, stormwater improvements include several Best Management Practices (BMPs) that will reduce the rate of stormwater discharging from the Site and significantly enhance the quality of the stormwater discharging to Tack Factory Pond. In general, stormwater from the Site will be conveyed to the following BMPs via overland flow or the Site's proposed closed conduit conveyance system:

- **Bioretention Basin No. 1 (1P)** is located to the southwest of the garage, north of the lagoons and sized to treat the required 1-inch water quality volume from the proposed process building rooftop. Stormwater runoff above the required water quality volume will be conveyed to the detention basin via the outlet control structure and closed conduit conveyance system.
- **Bioretention Basin No. 2 (2P)** is located west of the lagoons, north of the detention basin (4P), south of the bioretention basin (1P) and sized to treat the required 1-inch water quality volume from the proposed access drive. The limits of access drive flowing to Bioretention Basin No. 2 extends from the lagoon access road to the northeastern corner of the WTP. Stormwater runoff above the required water quality volume will be conveyed to the detention basin via the outlet control structure and closed conduit conveyance system.
- **Bioretention Basin No. 5 (5P)** is located north of the lagoon south of the WTP garage and sized to treat the required 1-inch water quality volume from the proposed garage apron, the proposed administration and garage rooftop, eastern surface parking lot and a portion of the entrance access road. Stormwater runoff above the required water quality volume will be conveyed to the detention basin via the outlet control structure and closed conduit conveyance system.

- **Bioretention Basin No. 8 (8P)** is located south of the exit driveway and sized to treat the required 1-inch water quality volume from the proposed exit driveway. Stormwater runoff above the required water quality volume will be collected via an underdrain and discharged via a flared end section and level lip spreader. Bioretention Basin No. 8 is proposed to be lined due to its separation from groundwater.
- **Sediment Forebays No. 3, 6, 9,10** as pretreatment and located throughout the Site have been sized to treat the required 0.1-inch water quality volume.
- **Water Quality Units 1 – 3** as pretreatment and located throughout the Site have been sized to treat the required 1-inch water quality volume.
- **Deep Sump Catch Basins** as pretreatment throughout the Site and will remove trash, debris, and coarse sediment from stormwater runoff prior to its treatment.
- A hydrologic and hydraulic analysis was performed for the proposed BMPs and is presented in **Appendix D**. Associated watershed areas directed to the proposed BMPs are depicted in Figure 3. The hydrologic methodology is described in Section 3.1.
- An Operation and Maintenance Plan has been developed for the proposed Stormwater Management System. The Plan describes the long-term operation and maintenance of the proposed stormwater management system and is included in **Appendix F**.

3. STORMWATER EVALUATION

3.1 Stormwater Modeling Methodology

TR-55/TR-20 methodology was used to develop a hydrologic model of the Site. Woodard & Curran used the computer program entitled HydroCAD Version 10.20, developed by HydroCAD Software Solutions, LLC, to create a stormwater model to analyze the Site's hydrology. The analysis was conducted to establish the peak rates of runoff from the project Site and evaluate pre- and post-development conditions during various storm events. Contributing drainage areas were identified and soils, surface cover, watershed slope, and flow paths were evaluated to develop the necessary HydroCAD model input parameters.

- **Design Event:** The project was evaluated under the 1-, 2-, 10-, and 100-year 24-hour SCS Type III Rainfall events. Rainfall depths for each event were obtained from data published by the Northeast Regional Climate Center Extreme Precipitation storm events, and are included in **Appendix A**. The total rainfall for each storm event was based upon data published by the Northeast Regional Climate Center, which can be accessed at the following web page: https://precip.eas.cornell.edu/#/. The total precipitation depth for the project Site associated with each rainfall event is outlined in **Table 3-1**, below.

Table 3-1: Design Rainfall Data

NRCC 24-Hour Storm Event (Frequency)	Rainfall Depth (Inches)
1-Year	2.75
2-Year	3.33
10-Year	4.95
100-Year	8.73

- **Curve Number:** Curve numbers are a measure of the retention and runoff properties which are specific to each watershed and are a function of the area-weighted average perviousness of the watershed cover, and the underlying soil type. Cover types for existing and proposed conditions are shown in the Existing and Proposed Conditions Watershed Maps (Figures C-001 & C-002, respectively) in **Appendix C**. Underlying soil types were identified using the soil data from the test pit logs, observed by Woodard & Curran, presented in **Appendix B**. Curve number calculations for each watershed are presented in **Tables 3-2 and 3-3** below as well as **Appendix D**.
- **Time of Concentration:** The time of concentration (Tc) represents the time for stormwater runoff to travel from the most hydrologically distant point of a watershed to the point of discharge. They are specific to each watershed and are a function of the slope, length, and surface roughness of the flow path. The primary types of flow consist of sheet flow and shallow concentrated flow; sheet flow typically occurs within the first 100-feet of overland flow. Flow paths for existing and proposed conditions were delineated using the Existing and Proposed Conditions Watershed Maps (Figures C-001 and C-002, respectively). The minimum Tc used for this project was 6 minutes. Calculations for the Tc for each watershed are presented in **Appendix D**.

- **Watershed Area:** Watershed boundaries were delineated using the existing conditions survey and proposed Site and Grading Plans. Watershed boundaries are illustrated in Figures C-001 and C-002 in **Appendix C** for existing and proposed conditions, respectively. Areas are included with the hydrologic calculations in **Appendix D**.

3.2 Hydraulic Model Description

A stormwater model has been developed to compare the peak discharge rates from the pre-development Site conditions to those in the post-development Site conditions. As further described herein, the model demonstrates that the post-development peak discharge rates will not exceed pre-development rates in all required storm events. Peak volume rates were also compared as part of this analysis. Due to poor, tightly compacted soils on site, peak volumes for the post-development site exceed the pre-development peak volumes. Because of the poor soil on site, this requirement has been met to the maximum extent practicable.

3.2.1 Design Points

Existing and proposed subcatchments were delineated to compare pre- and post-development peak discharge and volume rates. Although the sizes and quantities of subcatchments differ between the existing and proposed Site conditions, the total area analyzed between the two conditions remains the same. Design Points are typically established for each watershed and symbolize an area's ultimate stormwater discharge location.

Stormwater runoff from the Site discharges to Tack Factory Pond located south of the Site. As a result, two Design Points were selected for the Site, as described below:

- Design Point 1 (DP-1): Represents direct runoff discharging to Tack Factory Pond south of the Site.
- Design Point 2 (DP-2): Represents runoff discharging to Tack Factory Pond via pipe flow conveyance via catch basins located along Route 3A (Chief Justice Cushing Highway).

The locations of the Design Points do not differ in the pre- and post-development analyses, as seen in the figures located in **Appendix C**.

3.2.2 Pre-Development Analysis

The pre-development watershed area is approximately 15.27 acres in size, consists of undeveloped wooded area and comprised of two subcatchments. Stormwater runoff from two subcatchments within the project area is conveyed via overland flow and pipe conveyance to the Design Points, as described in **Table 3-2**, below:

Table 3-2: Pre-Development Watershed Summary

Design Point & Subcatchment		Area (acres)	Weighted Curve Number	Primary Land Cover(s)	Watershed Description
EX-DP-1	EX-1	14.59	70	Woods	Consists of undeveloped wooded area and conveyed via overland flow to Tack Factory Pond
EX-DP-2	EX-2	0.68	70	Woods	Consists of undeveloped wooded area and conveyed via overland & closed conduit conveyance to Tack Factory Pond

The subcatchment areas and their associated Design Points are illustrated on the Pre-Development Watershed Figure provided in **Appendix C** of this Report. The results of the pre-development analysis are provided in Section 3.3.

3.2.3 Post-Development Analysis

The post-development watershed consists of a variety of woods, grass and impervious surfaces comprised of sixteen (16) subcatchments which ultimately discharge to the same design points as the pre-development watershed. The project results in an increase of 1.805 acres of impervious area compared to existing conditions. Stormwater runoff from the site is conveyed via overland flow as well as stormwater closed conduit conveyance system to a series of treatment BMPs as described in **Table 3-3** below. Roof runoff is also conveyed to a series of treatment BMPs prior to discharge. The Project proposes to direct stormwater runoff from the Stearns Meadow Water Treatment Plant Site to a series of bioretention basins, sediment forebays, continuous deflective separation (CDS) units and deep sump catch basins. The building foundation drain will be a separate system which will freely discharge outside of the proposed stormwater BMPs.

Table 3-3: Post-Development Subcatchment Summary

Design Point & Subcatchment		Area (acres)	Weighted Curve Number	Primary Land Cover(s)	Watershed Description
PR-DP-1	PR-4	0.68	72	Grass, Woods	Consists of grass and wooded areas and conveyed via overland flow & closed conduit conveyance to Bioretention Basin 5P
	PR-5	0.30	94	Grass, Impervious	Consists of grass and impervious areas and conveyed via overland flow closed conduit conveyance to Bioretention Basin 5P
	PR-6	0.47	98	Impervious	Consists of impervious (bituminous concrete access drive and building roof) area and conveyed via overland flow & closed conduit conveyance to Bioretention Basin 5P
	PR-7	0.67	74	Grass, Woods, Impervious	Consists of grass, woods and impervious areas and conveyed via overland flow & closed conduit conveyance to Bioretention Basin 5p
	PR-8	0.39	75	Grass, Impervious	Consists of grass and impervious areas and conveyed via overland flow to Bioretention Basin 5P
	PR-9	0.17	84	Grass, Impervious	Consist of grass and impervious areas and conveyed via overland flow and closed conduit conveyance to Bioretention Basin 8P

Design Point & Subcatchment		Area (acres)	Weighted Curve Number	Primary Land Cover(s)	Watershed Description
	PR-10	0.84	74	Grass, Woods, Impervious	Consists of grass, woods and impervious areas and conveyed via overland flow and closed conduit conveyance to Detention Basin 4P
	PR-11	0.87	85	Grass, Impervious	Consists of grass and impervious areas and conveyed via overland flow and closed conduit conveyance to Bioretention Basin 2P
	PR-12	0.55	98	Impervious	Consists of impervious area (building roof) and conveyed via closed conduit conveyance to Bioretention Basin 1P
	PR-13	0.21	74	Grass	Consists of grass area and conveyed via overland flow to Bioretention Basin 1P
	PR-14	2.18	73	Grass, Woods, Impervious	Consists of grass, woods and impervious areas conveyed via overland flow to Detention Basin 4P
	PR-15	6.61	71	Grass, Woods	Consists of grass and woods conveyed to the southern discharge point via overland flow.
	PR-16	0.78	97	Impervious	Drying beds, internally drained and routed to treatment plant.
PR-DP-2	PR-1	0.13	71	Woods, Grass	Open areas tributary to Route 3A
	PR-2	0.29	72	Woods, Grass, Impervious	Open areas and impervious area tributary to Route 3A
	PR-3	0.12	73	Woods, Grass, Impervious	Open areas and impervious area tributary to Route 3A

The subcatchment areas and the associated Design Points are illustrated on the Post-Development Watershed Figure provided in **Appendix C** of this Report. The results of the post-development analysis are provided in Section 3.3.

3.3 Analysis Results

The project is required to attenuate peak rates per the Handbook as well as peak volumes per the Town of Scituate Stormwater Regulations. Peak rates have been attenuated up to the 100-year storm whereas peak volumes have been attenuated to the maximum extent practicable based on the poor soil on Site. A detailed hydrologic and hydraulic analysis of the pre- and post-development conditions was conducted to compare peak rates and volumes of runoff and evaluate the required design parameters for the proposed BMPs (i.e., storage capacity, sizing and velocity).

The proposed bioretention basins and sediment forebays located throughout the Site are sized to store and infiltrate storm events which generate up to 1-inch of runoff. These systems are designed to discharge flows generated from larger storm events via outlet control structures to the proposed detention basin with the exception of bioretention basin 8P. Bioretention basin 8P is intended only to provide TSS treatment and is not intended to provide peak rate or volume attenuation.

It is important to note that a Capture Area Adjustment factor has been incorporated into the stormwater design for the Project. Capture Area Adjustments are required when not all runoff from proposed impervious surfaces are captured within infiltrating BMPs; which is the scenario for the Site. A Capture Area Adjustment factor of approximately 6% was incorporated into the stormwater design for this project which resulted in an increase of approximately 100 cubic-feet of recharge volume bringing the total required recharge volume to 1,732 cubic-feet.

Table 3-4, below, summarizes the pre- and post-development peak discharge rates for each Design Points.

Table 3-4: Pre- and Post-Development Peak Discharge Rates

Design Point	1-year (cfs)			2-year (cfs)			10-year (cfs)			100-year (cfs)		
	Pre	**Post**	**Δ**	**Pre**	**Post**	**Δ**	**Pre**	**Post**	**Δ**	**Pre**	**Post**	**Δ**
DP-1	4.76	3.05	**-1.71**	8.06	4.88	**-3.18**	19.25	17.96	**-1.29**	50.09	45.37	**-4.72**
DP-2	0.33	0.29	**-0.04**	0.57	0.47	**-0.10**	1.38	1.06	**-0.32**	3.59	2.67	**-0.92**

Note: Δ stands for net difference between the pre- and post-development rates.

Table 3-4 demonstrates no increase in peak discharge rates between the existing and proposed Site conditions for all scenarios shown for Design Points DP-1 and DP-2.

Table 3-5: Pre- and Post-Development Peak Volume

Design Point	2-year (ac-ft)			10-year (ac-ft)			100-year (ac-ft)		
	Pre	**Post**	**Δ**	**Pre**	**Post**	**Δ**	**Pre**	**Post**	**Δ**
DP-1	1.1	1.241	**0.141**	2.431	2.64	**0.21**	6.199	6.419	**0.22**
DP-2	0.052	0.046	**-0.006**	0.114	0.096	**-0.018**	0.292	0.236	**-0.056**

Note: Δ stands for net difference between the pre- and post-development volumes.

Table 3-5 demonstrates increases in peak volume between the existing and proposed Site conditions for all scenarios shown for Design Point DP-1. **Table 3-5** demonstrates no increase in peak volume between existing and proposed Site conditions for all scenarios shown for Design Point DP-2.

Complete copies of the pre- and post-development HydroCAD computer model outputs documenting the peak discharge rates between the existing and proposed Site conditions are included in **Appendix D**.

3.4 Proposed Best Management Practices

3.4.1 Hooded Deep Sump Catch Basin

The proposed design includes the installation of hooded deep sump catch basins throughout the site for the retention of stormwater runoff, removal of trash, debris, and coarse sediment and temporary spill containment devices for floatables such as oils and greases. Hooded deep sump catch basins were selected due to the necessary pretreatment requirement for bioretention basins and to meet the 90% TSS requirement imposed by the Town's Stormwater Regulations. TSS removal calculations for the hooded deep sump catch basins are provided in **Appendix E**.

3.4.2 Continuous Deflective Separator (CDS) Unit

The proposed design includes the installation of two continuous deflective separator (CDS) units for the removal of trash, debris, and floatables such as oils and greases. CDS units were selected due to the necessary pretreatment requirement for bioretention basins and to meet the 90% TSS requirement imposed by the Town of Scituate Stormwater Regulations. TSS removal calculations for the CDS units are provided in **Appendix E**.

3.4.3 Sediment Forebay

The proposed design includes the installation of two sediment forebays for the dissipation of incoming stormwater runoff velocities as well as facilitate the gravity separation of suspended solids. The sediment forebays were selected due to the necessary pretreatment requirement for bioretention basins and to meet the 90% TSS requirement imposed by the Town's Stormwater Regulations. The proposed sediment forebays are sized to hold 0.1-inch/impervious acre to pretreat the water quality volume, 654 cubic feet, in accordance with the *Massachusetts Stormwater* standards. TSS removal and water quality volume calculations for the sediment forebay BMPs are provided in **Appendix E**.

3.4.4 Bioretention Pond

The proposed stormwater management design includes the construction of four bioretention ponds (one is lined and only intended for TSS purposes; not for recharge) for treatment of impervious runoff for the Stearns Meadow WTP roof and proposed impervious surfaces. The bioretention ponds were selected due to the 90% TSS requirement imposed by the Town's Stormwater Regulations. The proposed bioretention pond BMPs are designed to pretreat the required water quality volume associated with the 1-inch storm event, or 6,538 cubic feet, in accordance with the *Massachusetts Stormwater* standards. Runoff from proposed impervious areas is directed to the treatment trains which cumulatively provides a total of 90% TSS removal. TSS removal and water quality volume calculations for the bioretention pond BMPs are provided in **Appendix E**.

3.4.5 Detention Basin

The proposed design includes the installation of one detention basin for the short-term detention and controlled release of stormwater runoff. The detention basin was selected to attenuate peak rates. The detention basin was designed in accordance with the *Massachusetts Stormwater* design criteria.

3.4.6 Riprap Apron

The proposed design includes the installation of two riprap aprons at the discharge pipe from each of the infiltration basins. The apron has been sized and designed in accordance with the Federal Highway Administration's (FHWA's) *Hydraulic Engineering Circular No. 14, Third Edition – Hydraulic Design of Energy Dissipators for Culverts and Channels* and the *Massachusetts Stormwater Handbook*. A riprap apron sizing calculation is located in **Appendix E** of this Report.

4. COMPLIANCE WITH STORMWATER MANAGEMENT STANDARDS

4.1 Massachusetts Stormwater Handbook

The sections below describe the project's compliance with Volume 1, Chapter 1 of the *Massachusetts Stormwater Handbook*.

4.1.1 Standard 1: No New Untreated Discharges

"No new stormwater conveyances (e.g., outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."

In the existing Site condition, stormwater is generally transported via overland flow from the north towards Tack Factory Pond south of the Site as well as piped conveyance flow within Chief Justice Cushing Highway which ultimately discharges to Tack Factory Pond. Under existing conditions, runoff from the project area is currently untreated prior to discharging into Tack Factory Pond. Under proposed conditions, the roof runoff from the proposed Stearns Meadow WTP and runoff from the proposed impervious surfaces will be treated by the proposed stormwater BMPs, as described in Section 2.4 of this report. The treated stormwater discharges within upland area and is designed to minimize any potential erosion of the Site. This Standard has been met.

4.1.2 Standard 2: Peak Rate Attenuation

"Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates."

Calculations are provided to show that the post-development peak discharge rates do not exceed pre-development rates for all storm events analyzed for Design Point DP-1 and DP-2. A detailed description of both the existing and proposed Site conditions are located in Section 2.2 of this report. Copies of the existing and proposed HydroCAD computer model outputs are included in Appendix D. This Standard has been met.

4.1.3 Standard 3: Recharge

"Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This condition is met when the stormwater management system is designed to infiltrate the required volume as determined in accordance with the Massachusetts Stormwater Handbook."

This project is proposing to implement bioretention ponds to provide adequate annual recharge through the implementation of infiltration. Calculations are provided in Appendix E which show that the bioretention ponds provide more than the required annual recharge volume.

4.1.4 Standard 4: Water Quality

"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."

An Operations and Maintenance Plan is provided in Appendix F, which specifies suitable practices for source control and long-term pollution prevention at the project Site.

The required water quality volume for the portion of the Site discharging to the proposed bioretention ponds was calculated using a water quality depth of 1-inch, in accordance with the Massachusetts Stormwater Handbook standards for critical areas. Per the Town of Scituate Stormwater Regulations, a 90% removal of average annual post-construction load of Total Suspended Solids is required, which is more stringent than the State regulation requirement of 80%. Roof runoff will be treated to the 90% requirement as mandated by the local regulations through the implementation of CDS units. The proposed bioretention basins and associated sediment forebays have been sized to accommodate the required water quality volume, as demonstrated by the sizing calculations provided in Appendix E.

Runoff from proposed impervious areas is directed to the bioretention ponds which provides a total of 94% TSS removal. TSS removal and water quality volume calculations for the bioretention pond BMP are provided in Appendix E. This Standard has been met.

4.1.5 Standard 5: Land Uses with Higher Potential Pollutant Loads

"For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook."

The proposed project area is not considered a Land Use with Higher Potential Pollutant Loads; therefore, this Standard does not apply.

4.1.6 Standard 6: Critical Areas

"Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas as provided in the Massachusetts Stormwater Handbook."

Per the *Massachusetts Stormwater Handbook*, the project Site is classified as a critical area. Critical areas have specific stormwater analysis guidelines, requiring the use of certain pollution prevention measures and BMPs. Compliance with these guidelines is discussed below:

- **Standard 6 requires a stormwater discharge within a Zone II interim well head protection area or to an Outstanding Resource Water to provide 80% TSS removal prior to discharge. The Town of Scituate requires all stormwater discharge to provide 90% TSS removal prior to discharge. However, non-metal roofs shall have a treatment train that provides 44% TSS removal prior to discharge to an infiltration structure per the Massachusetts Stormwater Handbook. Deep sump catch basins, CDS units are proposed pretreatment BMPs within the treatment train that would achieve the 44% pretreatment prior to the infiltration BMP for impervious surfaces. The proposed bioretention basins will provide the remaining 90% TSS removal bringing the total predicted TSS removal for the site to 94%.**
- **A water quality depth of 1-inch must be used for water quality volume calculations in critical areas. As described in Section 3.1.4 above and demonstrated by the water quality volume calculations provided in Appendix E, a water quality depth of 1-inch was used to calculate the required water quality volume for the Site.**

4.1.7 Standard 7: Redevelopment

"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."

The proposed project is not considered a redevelopment project per the *Massachusetts Stormwater Handbook*. All other Stormwater Management Standards have been met.

4.1.8 Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

"A plan to control construction related impacts including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented."

The proposed project has been designed to minimize land disturbance and preserve existing vegetation to the maximum extent practicable. The project exceeds one acre of total disturbance and thus will be required to file a Notice of Intent in accordance with the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP). A Stormwater Pollution Prevention Plan (SWPPP) will be submitted before land disturbance begins and will outline the necessary measures to meet the requirements of this Standard.

4.1.9 Standard 9: Operation and Maintenance Plan

"A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed."

A long-term Operation and Maintenance Plan is included in Appendix F of this report. This Standard has been met.

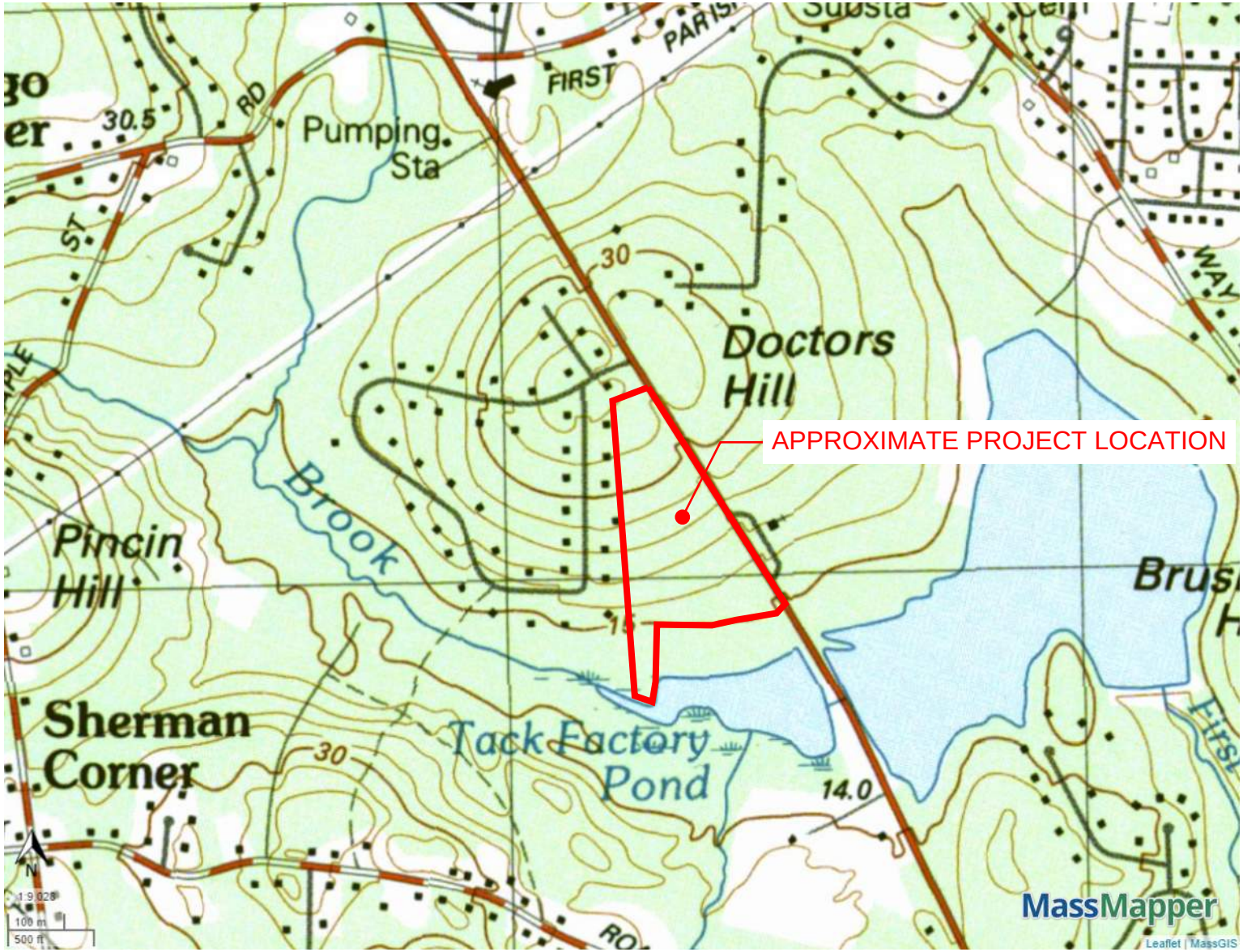
4.1.10 Standard 10: Prohibition of Illicit Discharges

"All illicit discharges to the stormwater management system are prohibited."

The project will not result in any new illicit discharges. An Illicit Discharge Compliance Statement will be submitted prior to construction. This Standard has been met.

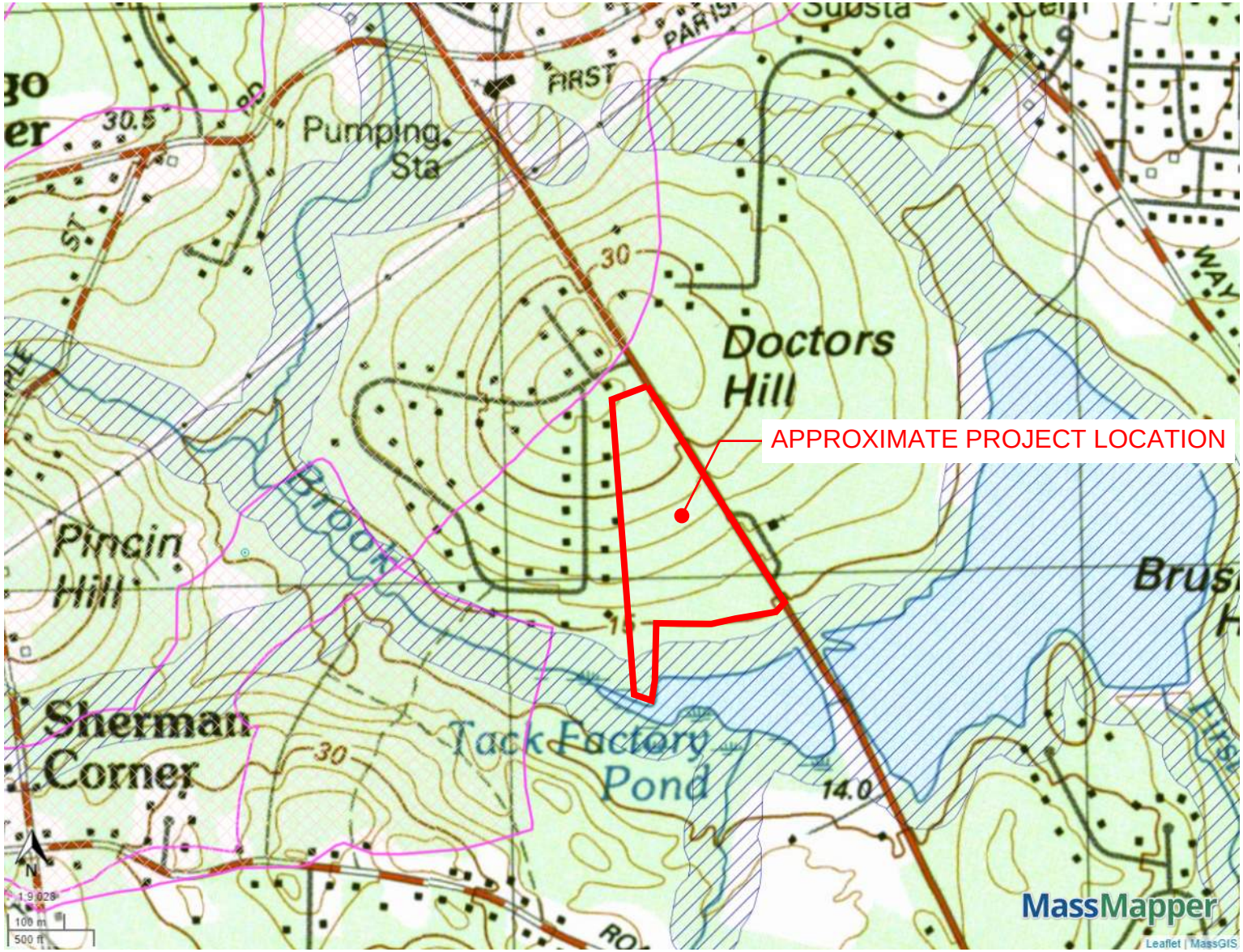
APPENDIX A: ENVIRONMENTAL RESOURCE DOCUMENTATION

Stearns Meadow Water Treatment Plant - Locus Plan



USGS Topographic Maps
Property Tax Parcels

Stearns Meadow Water Treatment Plant - Environmental Resource Map



Zone A

Potential Vernal Pools

NHESP Ecoregions

NHESP Priority Habitats of Rare Species

NHESP Estimated Habitats of Rare Wildlife

NHESP Certified Vernal Pools

Areas of Critical Environmental Concern ACECs

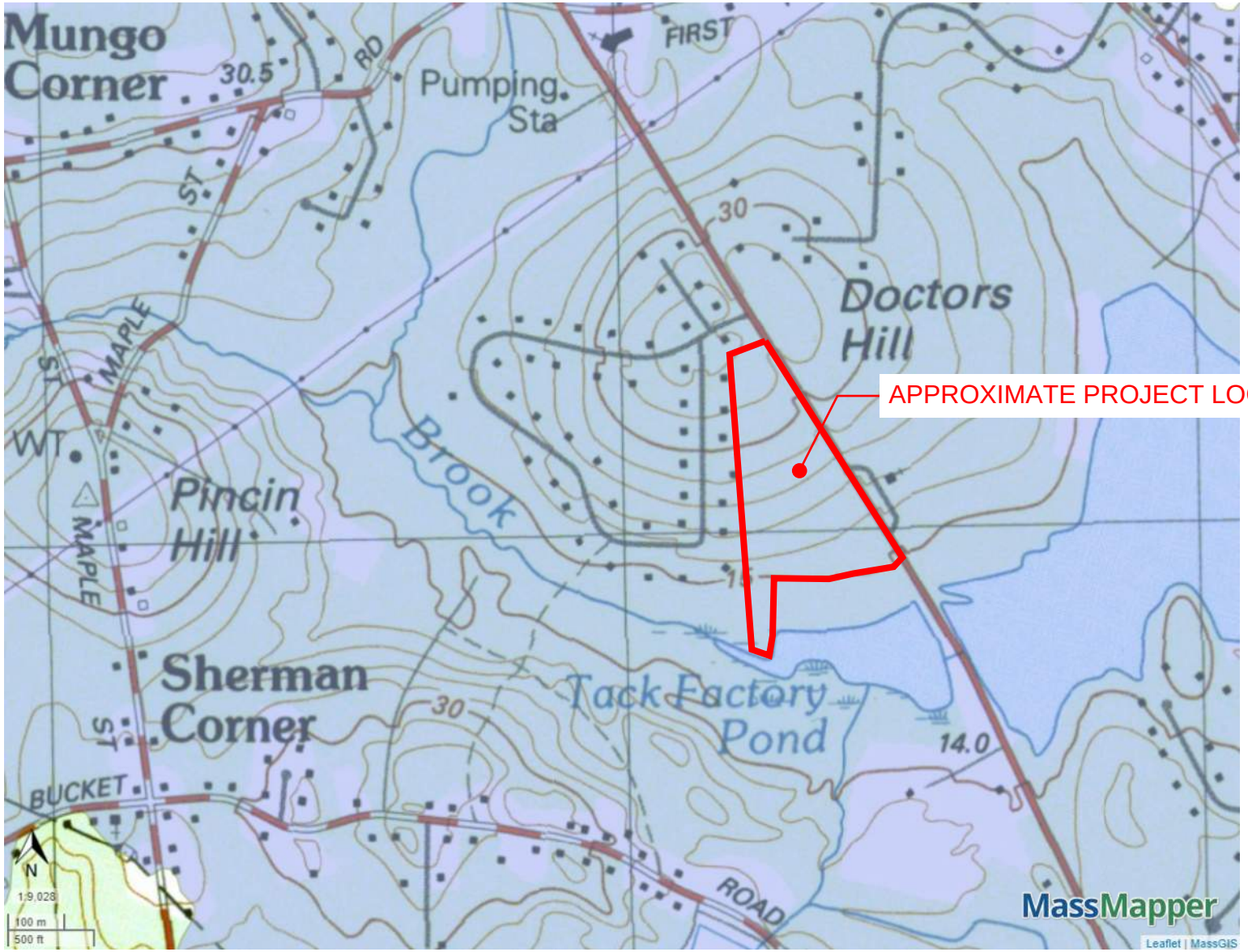
IWPAs

Zone IIs

USGS Topographic Maps

Property Tax Parcels

Stearns Meadow Water Treatment Plant - Outstanding Resource Waters



Outstanding Resource Waters

- ACEC
- Cape Cod National Seashore
- Protected Shoreline
- Public Water Supply Watershed
- Retired Public Water Supply
- Scenic/Protected River
- Wildlife Refuge

USGS Topographic Maps

Property Tax Parcels

MassDEP - Bureau of Waste Site Cleanup

Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

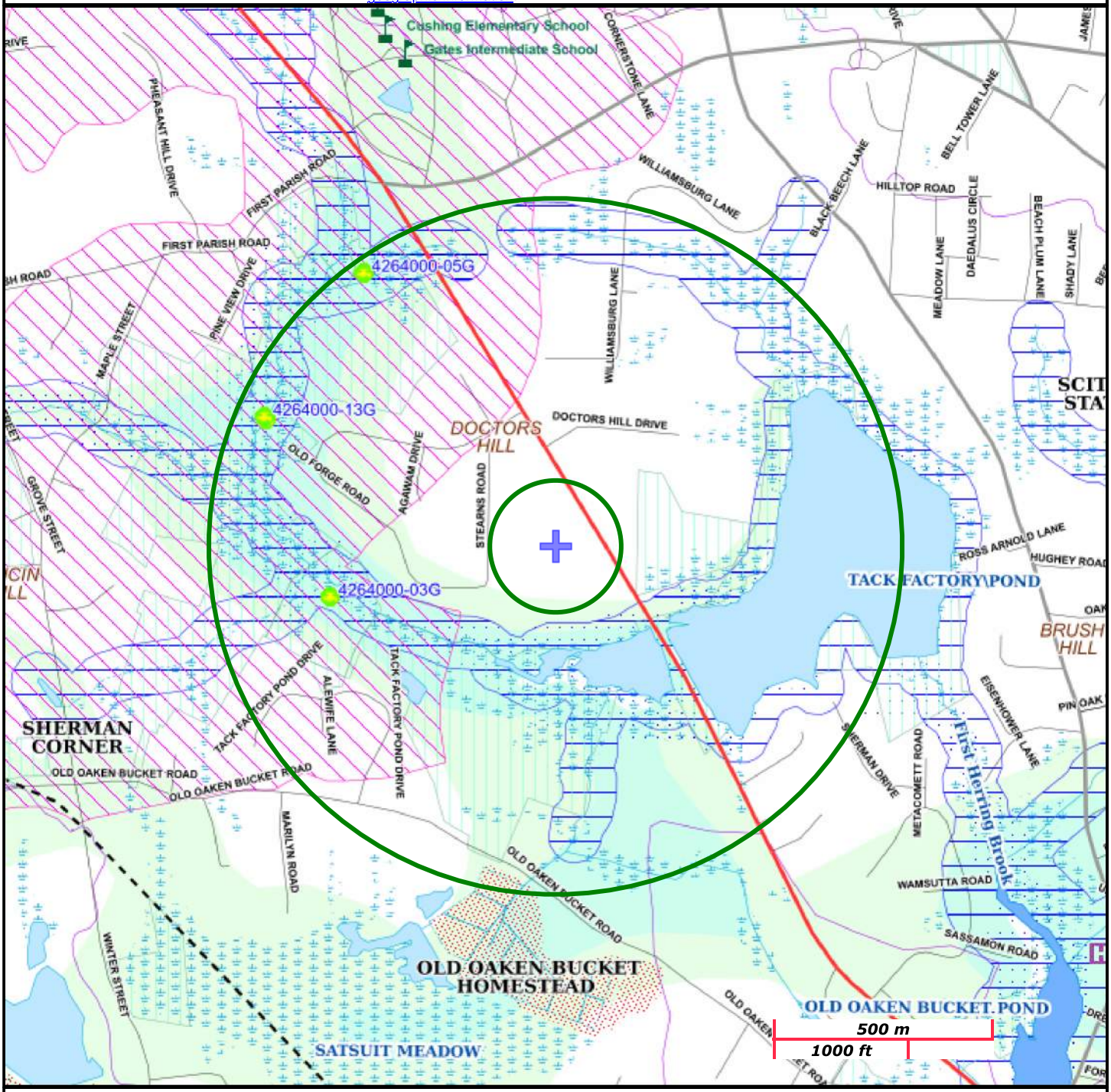
Site Information:

SCITUATE, MA

NAD83 UTM Meters:
4672288mN , 354350mE (Zone: 19)
August 1, 2023

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection



Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam

Aquifers: Medium Yield, High Yield, EPA Sole Source

Non Potential Drinking Water Source Area: Medium, High (Yield)

PWS Protection Areas: Zone II, IWPA, Zone A

Hydrography: Open Water, PWS Reservoir, Tidal Flat

Wetlands: Freshwater, Saltwater, Cranberry Bog

FEMA 100yr Floodplain; Protected Open Space; ACEC

NHESP Pri-Hab of Rare Species; Vernal Pool: Cert., Potential

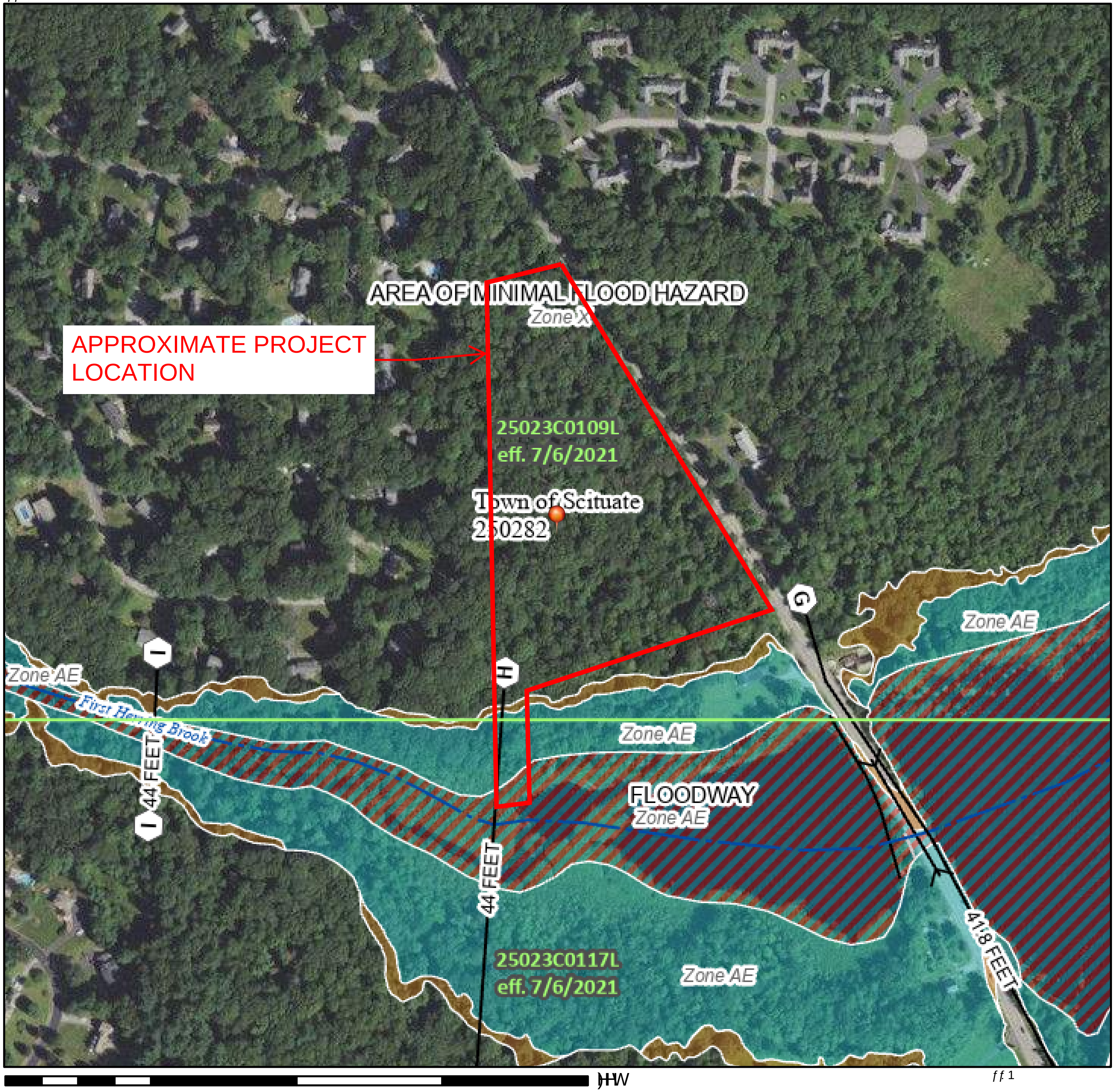
Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

Category 2 waters listed alphabetically by major watershed
"Attaining some uses; other uses not assessed"

					Uses Attained				
Water Body	**Segment ID**	**Description**	**Size**	**Units**	**Aesthetic**	**Fish, other Aquatic Life and Wildlife**	**Primary Contact Recreation**	**Secondary Contact Recreation**	**Shellfish Harvesting**
Unnamed Tributary	MA41-27	Unnamed tributary to Mill Brook, headwaters south of East Hill Road, Brimfield to mouth at confluence with Mill Brook, Brimfield.	1.70	Miles		X			
Shawsheen									
Elm Brook	MA83-23	Headwaters, south of Route 2A, Lincoln to beginning of channelized portion southwest of Kendall Court, Bedford (formerly part of segment MA83-05).	2.70	Miles		X			
Meadow Brook	MA83-12	Headwaters, outlet Ames Pond, Tewksbury, to confluence with Strong Water Brook, Tewksbury.	1.70	Miles		X			
Spring Brook	MA83-14	Headwaters, wetland northeast of Route 3 Billerica, to confluence with Shawsheen River, Bedford.	2.60	Miles	X	X	X	X	
South Coastal									
Bartlett Pond	MA94005	Plymouth.	33.00	Acres	X				
Ben Mann Brook	MA94-41	Headwaters, south of Abington Rockland Reservoir, Rockland to mouth at confluence with Cushing Brook, Hanover.	2.00	Miles	X		X	X	
First Herring Brook	MA94-36	Headwaters, in South Swamp, Norwell to inlet Tack Factory Pond, Scituate (formerly reported as portion of segment MA94-25).	2.60	Miles	X	X	X	X	
Iron Mine Brook	MA94-24	Headwaters north of Route 139, Hanover to mouth at confluence with Indian Head River, Hanover (area associated with North River Corridor designated as ORW).	1.40	Miles	X	X	X	X	
Plymouth Bay	MA94-17	The waters southeast of a line drawn from Saquish Head to the tip of Plymouth Beach, Plymouth and west of a line from Gurnet Point to Rocky Point, Plymouth.	10.30	Square Miles		X	X	X	X
Second Herring Brook	MA94-26	Headwaters, outlet Turner Pond, Norwell (excluding the approximately 0.3 mile throughTorrey Pond) to the Second Herring Brook Pond Dam (NATID: MA02171), Norwell (area associated with North River Corridor designated as ORW).	1.50	Miles		X			
South River	MA94-08	Headwaters, outlet unnamed pond north of Congress Street, Duxbury to dam near Main Street (Route 3A), Marshfield (through South River Pond, formerly segment MA94148).	4.90	Miles	X	X	X	X	
Tack Factory Pond	MA94152	Scituate.	8.00	Acres		X			
Third Herring Brook	MA94-27	Headwaters, outlet Jacobs Pond, Norwell/Hanover to mouth at confluence with North River, Norwell/Hanover (area associated with North River Corridor designated as ORW).	5.30	Miles	X	X	X	X	
Town Brook	MA94-42	Headwaters, outlet Billington Sea, Plymouth to just upstream of the Route 3A bridge, Plymouth (excluding the approximately 0.07 mile through Arms House Pond).	1.50	Miles	X		X	X	

1DWLRQDO)ORRG+D]DUG/D\HU),50HWWH

FEMA



Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

Smoothing	Yes
State	
Location	
Latitude	42.189 degrees North
Longitude	70.762 degrees West
Elevation	10 feet
Date/Time	Tue Feb 21 2023 08:53:15 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.54	0.71	0.88	1.12	**1yr**	0.76	1.06	1.30	1.66	2.13	2.75	3.10	**1yr**	2.44	2.98	3.47	4.02	4.84	**1yr**
2yr	0.35	0.54	0.68	0.89	1.12	1.42	**2yr**	0.97	1.31	1.64	2.08	2.63	3.33	3.71	**2yr**	2.95	3.57	4.10	4.87	5.51	**2yr**
5yr	0.42	0.66	0.82	1.10	1.41	1.80	**5yr**	1.22	1.64	2.09	2.64	3.32	4.17	4.73	**5yr**	3.69	4.55	5.21	6.15	6.85	**5yr**
10yr	0.48	0.75	0.95	1.29	1.68	2.16	**10yr**	1.45	1.95	2.51	3.17	3.96	4.95	5.68	**10yr**	4.38	5.47	6.24	7.33	8.08	**10yr**
25yr	0.57	0.91	1.16	1.59	2.11	2.73	**25yr**	1.82	2.45	3.19	4.01	5.01	6.20	7.26	**25yr**	5.48	6.98	7.94	9.27	10.07	**25yr**
50yr	0.65	1.04	1.33	1.87	2.52	3.28	**50yr**	2.17	2.92	3.84	4.83	5.99	7.36	8.73	**50yr**	6.51	8.40	9.54	11.07	11.89	**50yr**
100yr	0.74	1.20	1.55	2.20	3.00	3.93	**100yr**	2.59	3.47	4.61	5.79	7.15	8.73	10.52	**100yr**	7.73	10.11	11.45	13.23	14.04	**100yr**
200yr	0.85	1.39	1.80	2.59	3.58	4.72	**200yr**	3.09	4.13	5.54	6.94	8.54	10.38	12.67	**200yr**	9.18	12.18	13.76	15.81	16.59	**200yr**
500yr	1.04	1.71	2.23	3.23	4.53	6.00	**500yr**	3.91	5.21	7.04	8.81	10.80	13.04	16.22	**500yr**	11.54	15.60	17.55	20.03	20.70	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.47	0.64	0.78	0.88	**1yr**	0.68	0.86	1.15	1.46	1.83	2.57	2.83	**1yr**	2.27	2.72	3.14	3.59	4.54	**1yr**
2yr	0.34	0.52	0.64	0.87	1.07	1.29	**2yr**	0.93	1.26	1.49	1.97	2.52	3.23	3.59	**2yr**	2.86	3.46	3.97	4.74	5.36	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.54	**5yr**	1.13	1.51	1.76	2.31	2.94	3.82	4.33	**5yr**	3.38	4.16	4.77	5.68	6.35	**5yr**
10yr	0.44	0.67	0.83	1.16	1.50	1.77	**10yr**	1.29	1.73	1.99	2.60	3.29	4.34	4.96	**10yr**	3.84	4.77	5.45	6.67	7.16	**10yr**
25yr	0.50	0.76	0.95	1.36	1.78	2.10	**25yr**	1.54	2.05	2.30	3.04	3.82	5.15	5.93	**25yr**	4.56	5.71	6.50	8.08	8.36	**25yr**
50yr	0.56	0.85	1.05	1.52	2.04	2.40	**50yr**	1.76	2.34	2.55	3.43	4.28	5.86	6.77	**50yr**	5.19	6.51	7.40	9.35	9.43	**50yr**
100yr	0.62	0.94	1.18	1.71	2.34	2.72	**100yr**	2.02	2.66	2.83	3.87	4.79	6.65	7.73	**100yr**	5.89	7.43	8.40	10.84	10.61	**100yr**
200yr	0.70	1.05	1.33	1.93	2.69	3.11	**200yr**	2.32	3.04	3.13	4.35	5.37	7.57	8.78	**200yr**	6.70	8.44	9.51	12.60	11.96	**200yr**
500yr	0.81	1.21	1.56	2.26	3.21	3.70	**500yr**	2.77	3.62	3.55	5.10	6.24	8.98	10.35	**500yr**	7.95	9.95	11.16	15.40	14.01	**500yr**

Upper Confidence Limits

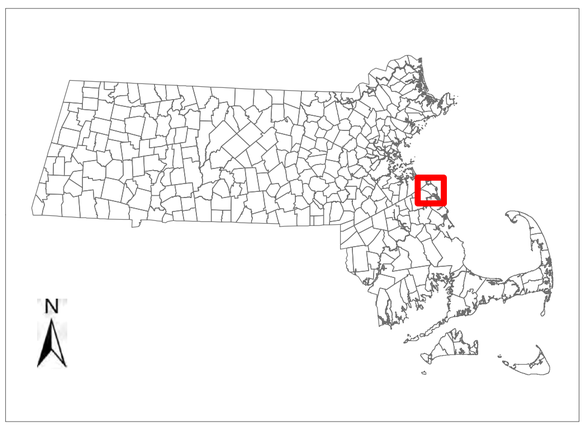
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	

Habitat of Potential Regional or Statewide Importance
Town of SCITUATE, MA

APPROXIMATE PROJECT LOCATION

0 0.5 1 2 Miles

Updated July 23, 2021



Habitat of Potential Regional or Statewide Importance

MassDEP's Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands (June 2006) adopted a new approach for assessing wildlife habitat impacts associated with work in wetlands. This approach utilizes maps developed at the University of Massachusetts Amherst using the Conservation Assessment and Prioritization System (CAPS). The maps depict Habitat of Potential Regional or Statewide Importance that may trigger more intensive review under the MA Wetlands Protection Act. For more information on how to assess wildlife habitat impacts, see Section III of the Guidance document: https://www.mass.gov/doc/massachusetts-wildlife-habitat-protection-guidance-for-inland-wetlands/download.

CAPS is an approach to prioritizing land for conservation/protection based on the assessment of ecological integrity for various ecological communities (e.g. forested wetland, shrub swamp, headwater stream) within an area. The CAPS model assesses ecological integrity of the Massachusetts landscape as influenced by environmental stressor metrics (e.g. pollution, fragmentation). It relies on data that are broadly available across Massachusetts. Ecological features which are not consistently surveyed or uniformly available, such as certified vernal pools, rare species habitat, and contamination sites are not included in the CAPS analysis. When available, this more specific ecological information may be used in conjunction with the CAPS outputs to better understand particular sites in Massachusetts and support informed conservation decision-making. For more information on the statewide maps produced by the CAPS model, see: http://www.umasscaps.org. These maps were prepared by the University of Massachusetts Amherst, with funding from the Massachusetts Department of Environmental Protection.

UMass Amherst

MassDEP

UMass Extension
CENTER FOR AGRICULTURE

TOWN OF SCITUATE
MASSACHUSETTS
ZONING MAP

OCTOBER 25, 2011

REVISED AUGUST 11, 2021

LEGEND

ZONING DISTRICTS		MINIMUM DIMENSIONAL REQUIREMENTS					
		LOT AREA (UPLAND) (SQ. FT.)	FRONTAGE[2] (FT.)	SETBACKS[1] FRONT[3] (FT.)	SIDE (FT.)	REAR (FT.)	LOT WIDTH (FT.)
R-1	RESIDENCE R-1	40,000	100	30	15	30	175
R-2	RESIDENCE R-2	20,000	100	30	15	30	125
R-3	RESIDENCE R-3	10,000	100	30	8	20	100
B	BUSINESS[4]	---	60	30	8[5]	8	--
VCN	VILLAGE CENTER & NEIGHBORHOODS (See Zoning Bylaw for information on districts and subdistricts)						
D	SALTMARSH & TIDELAND CONSERVATION DISTRICT						

OVERLAY DISTRICTS

- FLOOD PLAIN & WATERSHED PROTECTION DISTRICT
- HUMAROCK VILLAGE RESIDENTIAL OVERLAY DISTRICT
- RESIDENTIAL CLUSTER DISTRICT
- VILLAGE BUSINESS OVERLAY DISTRICT
- WATER RESOURCE PROTECTION DISTRICT
- WIRELESS COMMUNICATION OVERLAY DISTRICT
- SCENIC ROAD (Parts of the Driftway were designated as a Scenic Road by Article 23 of the 1985 Annual Town Meeting. All other Scenic Roads were designated by Article 53 of the 1974 Annual Town Meeting.)

GRAPHIC SCALE

1000 0 500 1000 2000 4000

(IN FEET)

1 inch = 1000 FEET

TOWN OF SCITUATE MASSACHUSETTS INCORPORATED 1636 SATUIT

Original by Amory Engineers, P.C.

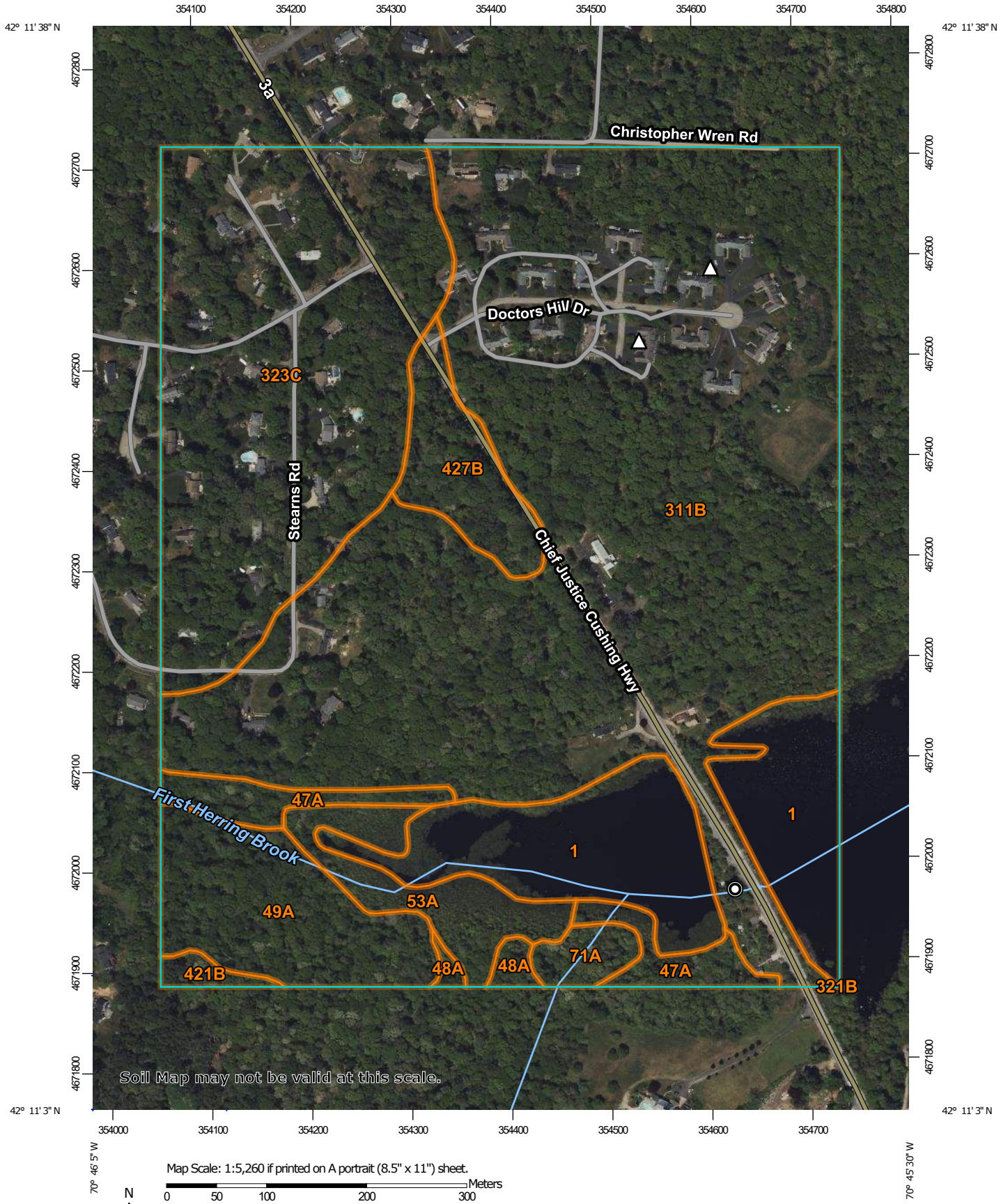
Revision by Dodson & Flinker, Inc.

NOTES:

1. SEE ZONING BYLAW SECTION 510.5, NON-DISTURBANCE BUFFER ZONE, FOR REQUIRED SETBACK WITHIN WRPD FROM THE HIGH WATER MARK OF TACK FACTORY POND RESERVOIR AND TRIBUTARIES IN THE RESERVOIR WATERSHED.
2. SEE ZONING BYLAW SECTION 610.2, LOT FRONTAGE REQUIREMENTS, FOR ADDITIONAL INFORMATION.
3. SEE ZONING BYLAW SECTION 620.3, SETBACK AND YARD REQUIREMENTS, FOR REQUIRED SETBACKS FROM CHIEF JUSTICE CUSHING HIGHWAY, THE NEW DRIFTWAY, THE DRIFTWAY AND NEW KENT STREET.
4. SEE ZONING BYLAW SECTIONS 610.1, LOT AREA AND WIDTH REQUIREMENTS AND 620.3, SETBACK AND YARD REQUIREMENTS, FOR THE REQUIRED AREA, FRONTAGE, LOT WIDTH AND SETBACKS FOR DWELLINGS IN THE BUSINESS AND COMMERCIAL ZONING DISTRICTS.
5. UNLESS HAVING A PARTY WALL ON THE SAME LOT LINE, PER ZONING BYLAW SECTION 620.3, SETBACKS AND YARD REQUIREMENTS.

APPENDIX B: SOILS DATA

Soil Map—Plymouth County, Massachusetts
(Stearns Meadow Water Treatment Plant - Soils Map)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 15, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	14.7	10.4%
47A	Brockton sandy loam, 0 to 3 percent slopes	3.7	2.6%
48A	Brockton sandy loam, 0 to 3 percent slopes, extremely stony	0.7	0.5%
49A	Norwell mucky fine sandy loam, 0 to 3 percent slopes, extremely stony	8.1	5.8%
53A	Freetown muck, ponded, 0 to 1 percent slopes	4.4	3.1%
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	1.3	0.9%
311B	Woodbridge fine sandy loam, 3 to 8 percent slopes, very stony	73.5	52.2%
321B	Birchwood sand, 3 to 8 percent slopes, very stony	0.0	0.0%
323C	Poquonock sand, 8 to 15 percent slopes, very stony	29.6	21.0%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	0.6	0.4%
427B	Newfields fine sandy loam, 3 to 8 percent slopes, extremely stony	4.2	3.0%
Totals for Area of Interest		**140.8**	**100.0%**

22x34
PLOT SCALE: 1:1

● Proposed Test Pit Location (for discussion)

TP-1
TP-2
TP-3
TP-4
TP-5
TP-6
TP-7
TP-8

B-1
B-2
B-3
B-4

HSG A
HSG B
HSG C/D

15.57± ACRES
TOTAL UPLAND AREA
14.95± ACRES
TOTAL WETLAND AREA
0.62± ACRES

TEST PIT NOT COMPLETED (DIFFICULT ACCESS)

APPROXIMATE LOCATION OF EXISTING WETLANDS
APPROXIMATE FLOOD PLAIN & WATERSHED PROTECTION DISTRICT
APPROXIMATE LOCATION OF WIRELESS COMMUNICATION OVERLAY DISTRICT

42-3-8 N/F RYAN ROBERT & MARYANN
42-3-7 N/F MICHAEL J & STACEY CAPLINGER
42-3-6 N/F MICHAEL & GIOVANNA SHEEHAN
42-3-5 N/F WILLIAM K & PAMELLA KENNEY
42-3-4 N/F DAVID P & NORA MCCORMACK
42-3-3 N/F HOWARD H & STACEY E SZKLUT
42-3-2 N/F CHRISTINE & ROBERT CHESSIA
42-3-1 N/F STEPHEN & SUSAN YOUNG

CHIEF JUSTICE CUSHING HIGHWAY
(PUBLIC - 80' WIDE - STATE HIGHWAY)

SUB-1
SUB-2
DESIGN POINT 2

BAR SCALE
1" = 50'
CHECK GRAPHIC SCALE BEFORE USING

\\woodardcurran.net\shared\Projects\0233681.02 Scituate MA Stearns Meadow WTP - Design\wip\Engineering\Stormwater\Catchment Delineations\2023.03.06 HSG Figure.dwg, Mar 07, 2023 - 3:33pm, JCASE

Woodard & Curran
250 Royall Street Suite 200E
Canton, Massachusetts 02021
800.446.5518 | www.woodardcurran.com

PE SEAL:

NOT FOR CONSTRUCTION

CLIENT INFO:

TOWN OF SCITUATE
MASSACHUSETTS

STEARNS MEADOW DRINKING WATER TREATMENT PLANT

REV	MM/DD/YY	DESCRIPTION

JOB NO:	0233681.02
DATE:	MARCH 2023
SCALE:	AS NOTED
DESIGNED BY:	JC
DRAWN BY:	JC
CHECKED BY:	SK
FILENAME:	2023.03.06 HSG FIGURE.dwg

DRAWING TITLE:

CIVIL
HYDROLOGIC SOIL GROUP, PREVIOUS DEVELOPMENT TEST PIT LOCATIONS, BORING LOCATIONS AND SITE LAYOUT

DRAWING NO:

FIGURE 2

SHEET: 2 OF 3

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) 3/29/23 (Date) 9:30 AM (Time) 40's+sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use: woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation: underbrush | Surface Stones (e.g., cobbles, stones, boulders, etc.): cobbles + Boulders | Slope (%): 5

Description of Location: _____

2. Soil Parent Material: _____ | Landform: _____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): BS.

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 34" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-15	A	Silt Loam	5YR 2.5/1		Cnc : Dpl:		0	—			
15-24	B	Silt Loam	10YR 5/4		Cnc : Dpl:		0	—	Massive	Friable	
24-38	C1	SILT LOAM	5YR 5/1	24"	Cnc : 2.5YR 4/6 Dpl: 5YR 5/1	10%	10%	—	↓	↓	- very wet
38-132	C2	~~Silt Loam~~ SANDY LOAM	5YR, 6/1		Cnc : Dpl:		20%	—	↓	↓	- More sandy Than Top
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Bottom of Hole 132"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 (Hole #) 3/24 (Date) 11130 (Time) 40's + sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) | woodland (Vegetation) | cobbles + STONES (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5% (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet | Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: 30" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	Loam	5YR 2.5/1		Cnc : Dpl:	0			massive		
10-32	B	SILT Loam	10 YR 5/4	32"	Cnc : 7.5YR 4/6 Dpl: 5Y 3/1	2%	2%	—		Friable	
32-132	C	SILT Loam	5YR 5/1		Cnc : Dpl:	-	30%	5%			V/wet
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Bottom @ 132

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 (Hole #) 3/29/23 (Date) 1:15pm (Time) 50's+ sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use: woodland (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 2% (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: 55" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-2	A	Loam	5YR 2.5/1		Cnc : Dpl:	—	—	—	mashe	Friable	
2-55	B	silt Loam	10YR 5/4	55"	Cnc : 7.5YR 4/6 Dpl: 5Y 3/1	5%	10%	—			
55-132	C	SILT Loam	5YR 5/1		Cnc : Dpl:	—	30%	—			
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Bottom of Pit = 132"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 (Hole #) 3/29 (Date) ____ (Time) ____ (Weather) ____ (Latitude) ____ (Longitude)

1. Land Use ____ (e.g., woodland, agricultural field, vacant lot, etc.) ____ Vegetation ____ Surface Stones (e.g., cobbles, stones, boulders, etc.) ____ Slope (%)

Description of Location: ____

2. Soil Parent Material: ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body ____ feet Drainage Way ____ feet Wetlands ____ feet

Property Line ____ feet Drinking Water Well ____ feet Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: 32" Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	Loam	5YR 2.5/1		Cnc : / Dpl:	—	—	—	Massive	Friable	
6-32	B	Silt Loam	10YR 5/4	32	Cnc : 7.5YR 4/6 / Dpl: 5Y 3/1	5%	10%	5%			
32-102	C	Silt Loam	5YR 5/1		Cnc : / Dpl:	—	20%	10%			
					Cnc : / Dpl:						
					Cnc : / Dpl:						
					Cnc : / Dpl:						

Additional Notes: Bottom of Pit = 102" (Refusal) - weeping in very fast

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-5 (Hole #) 3/30 (Date) 10:15 (Time) 40's + Sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use woodland (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) _____ (Slope (%))

Description of Location: _____

2. Soil Parent Material: _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain)) _____

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ feet; Drinking Water Well _____ feet; Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: 28" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-11	A	Loam	5YR 2.5/1		Cnc : Dpl:	-	10%	5%	mass	friable	
11-28	B	SiLT Loam	10YR 5/4	28	Cnc : 7.5YR 4/6 Dpl: 5Y 3/1	5%	10%	—	↓	↓	
28-138	C	SILT Loam	5YR 5/1		Cnc : Dpl:	—	20%.	10%	↓	FIRM	LOOTS OF Fines
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: very wet - COULD NOT PERC

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-6 (Hole #) 3/30 (Date) 11:15AM (Time) 40's + Sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%) _____

Description of Location: _____

2. Soil Parent Material: _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: X 19" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	Loam	5YR 2.5/1		Cnc : Dpl:		-	-	Mashe	Friable	
6-19	B	Silt Loam	10YR 5/4	19"	Cnc : 7.5YR 4/6 Dpl: 5YR 3/1	10%	5%	—			
19-72	C1	Silt Loam	5YR 5/1		Cnc : Dpl:		30%	10%		Firm in Place	
72-132	C2	Sandy Loam	5YR 6/1		Cnc : Dpl:		40%	2%			
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: 11' = Bottom

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: IP-7 (Hole #) 3/30 (Date) 1:30 (Time) 40's+Sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use _____ (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) 5% Slope (%)

Description of Location: _____

2. Soil Parent Material: _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A/O	Loam	5YR 2.5/1		Cnc : Dpl:	—	—	—	massive	Friable	
12-24	B	Silt Loam	10YR 5/4	24"	Cnc : 7.5YR 4/6 Dpl: 5Y 3/1	10%	5	2			
24-132	C	Silt Loam	5YR 5/1		Cnc : Dpl:	-	30%	10%			Firm Massive
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-8 (Hole #) 3/30/23 (Date) 2:30 (Time) 40's + sunny (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use woodland (e.g., woodland, agricultural field, vacant lot, etc.) _____ (Vegetation) _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ (Slope (%)

Description of Location: _____

2. Soil Parent Material: _____ (Landform) _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

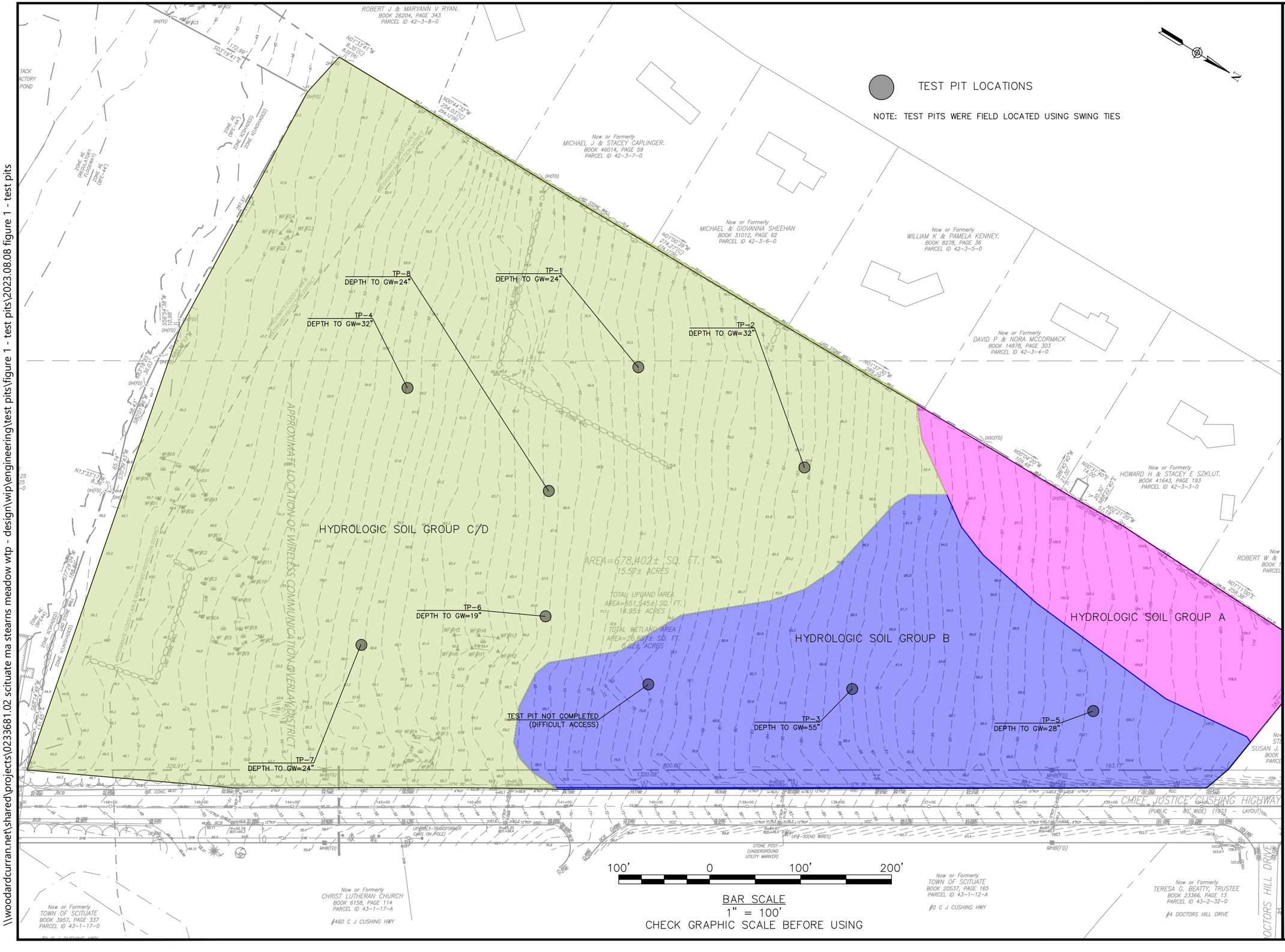
5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-9	A	Loam	5YR 2.5/1		Cnc : Dpl:		-	-	massive	Friable	
9-24	B	Silt Loam	10YR 5/4	24	Cnc : Dpl: TI		5%	5%			
24-132	C	Silt Loam	5YR 5/1		Cnc : 7.5 YR 4/6 Dpl: 5Y 3/1	10%	30%	10%			- Layers of Fine Sand
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

\\woodardcurran.net\shared\projects\0233681.02 scituate ma stearns meadow wtp - design\wip\engineering\test pits\figure 1 - test pits\2023.08.08 figure 1 - test pits



Woodard & Curran

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Canton, Massachusetts 02021
800.446.5518 | www.woodardcurran.com

PE SEAL:

ISSUED FOR PERMITTING

CLIENT INFO:

TOWN OF SCITUATE
MASSACHUSETTS

STEARNS MEADOW DRINKING WATER TREATMENT PLANT

JOB NO:	0233681.02
DATE:	AUGUST 2023
SCALE:	AS NOTED
DESIGNED BY:	JC
DRAWN BY:	JC
CHECKED BY:	SK
FILENAME:	2023.08.08 FIGURE 1 - T*.dwg

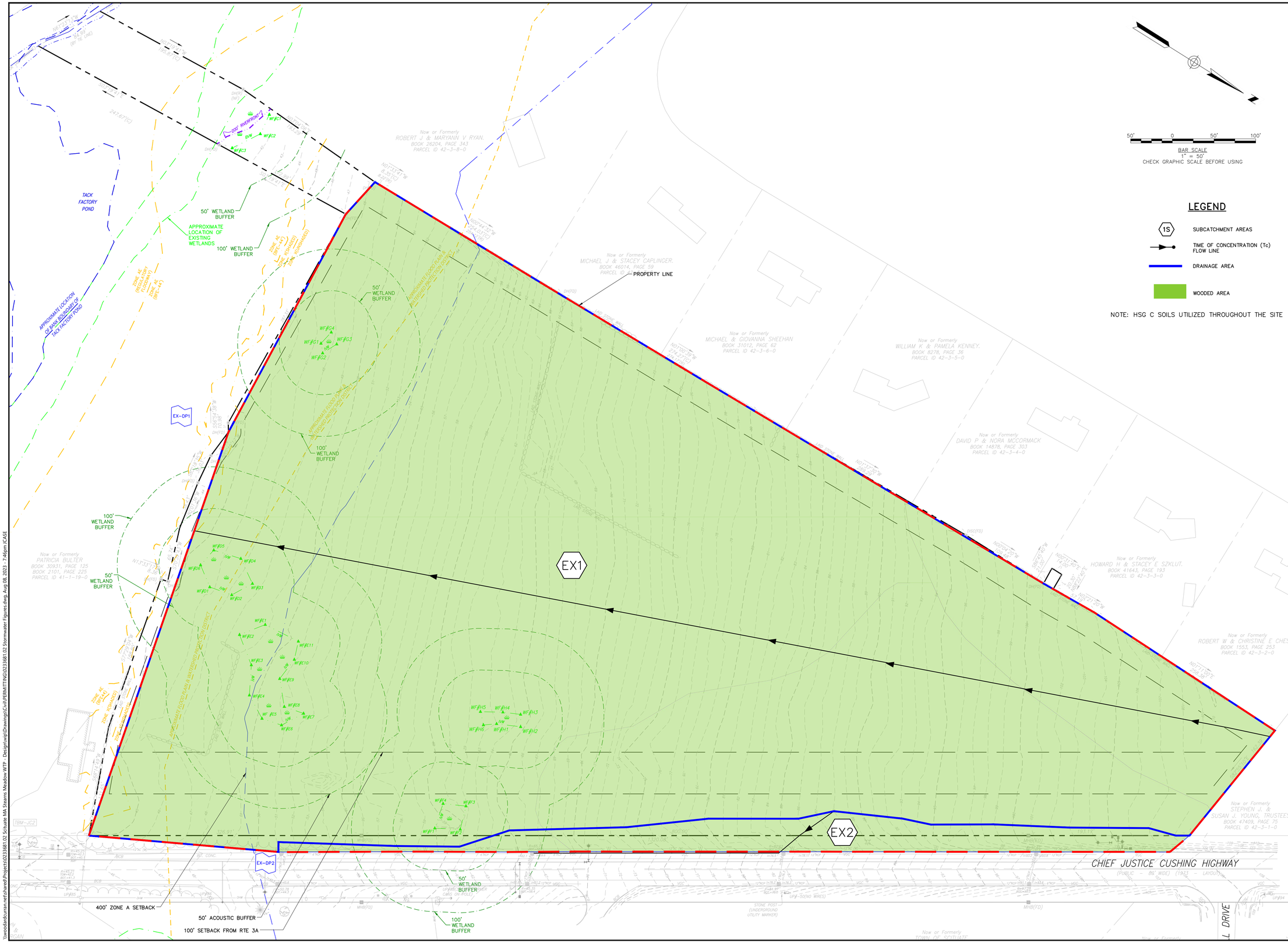
DRAWING TITLE:

CIVIL
TEST PIT LOCATIONS

DRAWING NO:

FIGURE 1

APPENDIX C: WATERSHED FIGURES



50' 0 50' 100'

BAR SCALE
1" = 50'
CHECK GRAPHIC SCALE BEFORE USING

LEGEND

- 1S — SUBCATCHMENT AREAS
- TIME OF CONCENTRATION (Tc) FLOW LINE
- DRAINAGE AREA
- WOODED AREA

NOTE: HSG C SOILS UTILIZED THROUGHOUT THE SITE

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Canton, Massachusetts 02021
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PE SEAL:

ISSUE FOR PERMIT

CLIENT INFO:
TOWN OF SCITUATE,
MASSACHUSETTS
453 CHIEF JUSTICE
CUSHING HIGHWAY

STEARNS MEADOW
DRINKING WATER
TREATMENT PLANT

REV	MM/DD/YY	DESCRIPTION

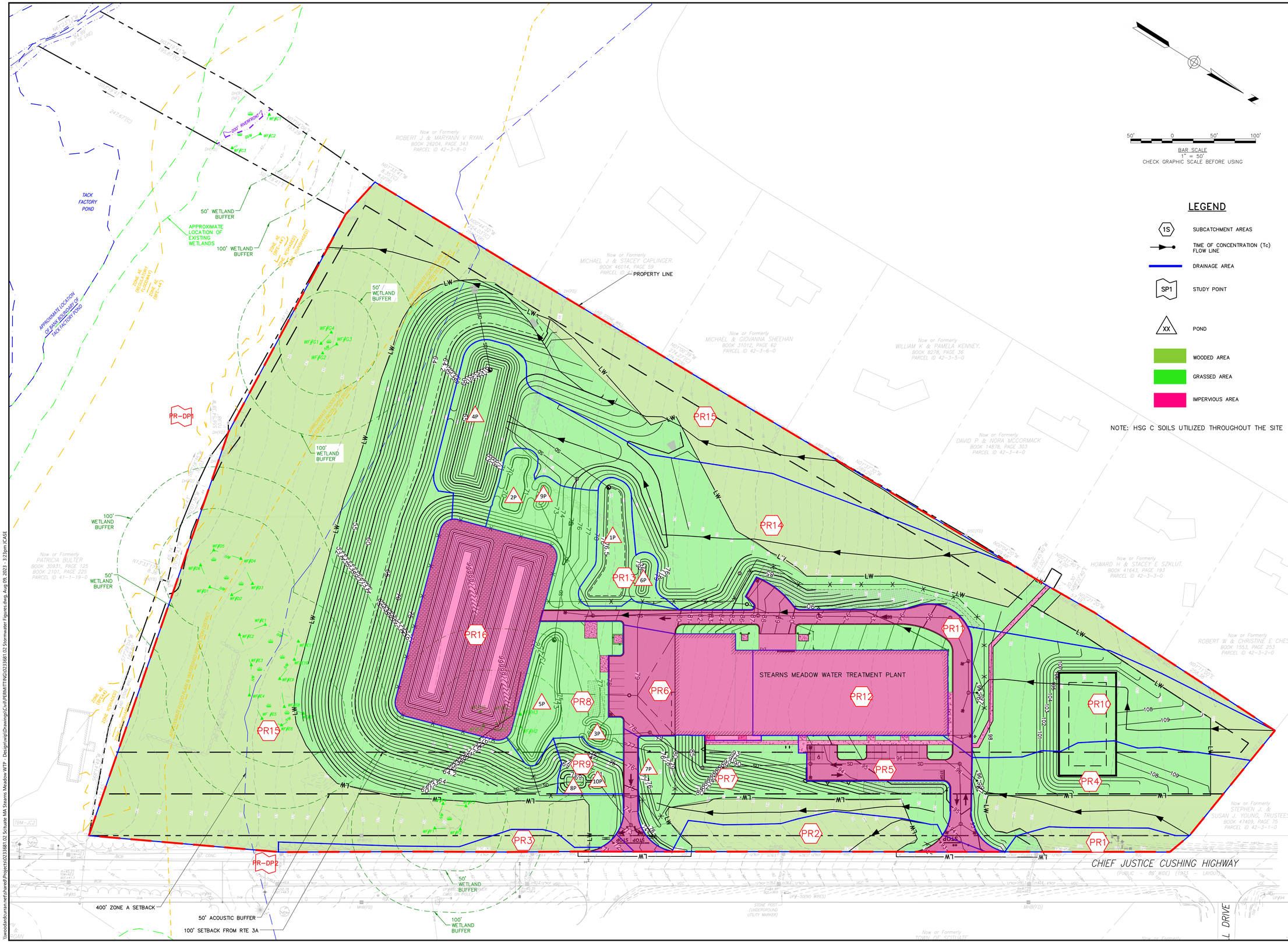
JOB NO:	0233681.02
DATE:	AUGUST 10, 2023
SCALE:	AS SHOWN
DESIGNED BY:	JC
DRAWN BY:	MB
CHECKED BY:	SK
FILENAME:	0233681.02 STORMWATER F*.dwg

DRAWING TITLE:

POST DEVELOPMENT STORMWATER FIGURE

DRAWING NO:

PRE



LEGEND

- 1S — SUBCATCHMENT AREAS
- TIME OF CONCENTRATION (Tc) FLOW LINE
- DRAINAGE AREA
- SP1 — STUDY POINT
- XX — POND
- WOODED AREA
- GRASSED AREA
- IMPERVIOUS AREA

NOTE: HSG C SOILS UTILIZED THROUGHOUT THE SITE

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PE SEAL:

ISSUE FOR PERMIT

CLIENT INFO:
TOWN OF SCITUATE,
MASSACHUSETTS
453 CHIEF JUSTICE
CUSHING HIGHWAY

STEARNS MEADOW
DRINKING WATER
TREATMENT PLANT

REV	MM/DD/YY	DESCRIPTION

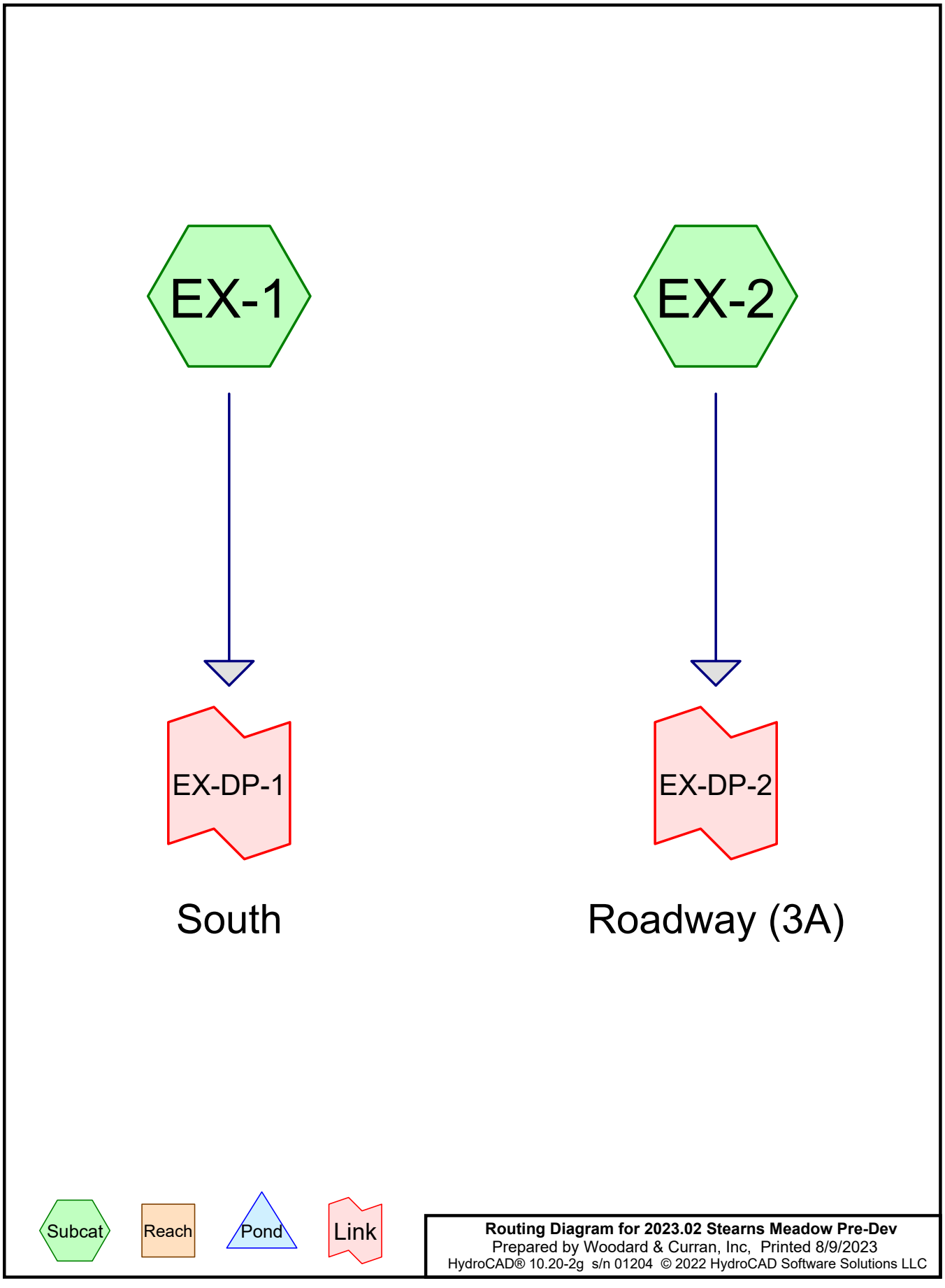
JOB NO:	0233681.02
DATE:	AUGUST 10, 2023
SCALE:	AS SHOWN
DESIGNED BY:	JC
DRAWN BY:	MB
CHECKED BY:	SK
FILENAME:	0233681.02 STORMWATER F*.dwg

DRAWING TITLE:
POST DEVELOPMENT STORMWATER FIGURE

DRAWING NO:
POST

\\woodardcurran.net\shared\Projects\0233681.02 Scituate MA Stearns Meadow WTP - Design\wip\Drawings\Civil\PERMITTING\0233681.02 Stormwater Figures.dwg, Aug 09, 2023 - 3:23pm, JCASE

APPENDIX D: HYDROCAD STORMWATER MODEL REPORTS



Routing Diagram for 2023.02 Stearns Meadow Pre-Dev
Prepared by Woodard & Curran, Inc, Printed 8/9/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
15.278	70	Woods, Good, HSG C (EX-1, EX-2)
15.278	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
15.278	HSG C	EX-1, EX-2
0.000	HSG D	
0.000	Other	
15.278		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	15.278	0.000	0.000	15.278	Woods, Good	EX-1, EX-2
0.000	**0.000**	**15.278**	**0.000**	**0.000**	**15.278**	**TOTAL AREA**	

Time span=0.00-74.00 hrs, dt=0.01 hrs, 7401 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=635,594 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=1,335' Tc=28.9 min CN=70/0 Runoff=4.76 cfs 0.705 af

Subcatchment EX-2: Runoff Area=29,928 sf 0.00% Impervious Runoff Depth=0.58"
Flow Length=178' Tc=10.0 min CN=70/0 Runoff=0.33 cfs 0.033 af

Link EX-DP-1: South Inflow=4.76 cfs 0.705 af
Primary=4.76 cfs 0.705 af

Link EX-DP-2: Roadway (3A) Inflow=0.33 cfs 0.033 af
Primary=0.33 cfs 0.033 af

Total Runoff Area = 15.278 ac Runoff Volume = 0.738 af Average Runoff Depth = 0.58"
100.00% Pervious = 15.278 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1:

Runoff = 4.76 cfs @ 12.49 hrs, Volume= 0.705 af, Depth= 0.58"
Routed to Link EX-DP-1 : South

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-74.00 hrs, dt= 0.01
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
635,594	70	Woods, Good, HSG C
635,594	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0350	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
19.2	1,285	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
28.9	1,335	Total			

Summary for Subcatchment EX-2:

Road and around lagoons

Runoff = 0.33 cfs @ 12.16 hrs, Volume= 0.033 af, Depth= 0.58"
Routed to Link EX-DP-2 : Roadway (3A)

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-74.00 hrs, dt= 0.01
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
29,928	70	Woods, Good, HSG C
29,928	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.3	22	0.0454	1.07		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	13	0.2692	2.59		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	93	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.0	178	Total			

Summary for Link EX-DP-1: South

Inflow Area = 14.591 ac, 0.00% Impervious, Inflow Depth = 0.58" for 1-Year event
Inflow = 4.76 cfs @ 12.49 hrs, Volume= 0.705 af
Primary = 4.76 cfs @ 12.49 hrs, Volume= 0.705 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-74.00 hrs, dt= 0.01 hrs

Summary for Link EX-DP-2: Roadway (3A)

Inflow Area = 0.687 ac, 0.00% Impervious, Inflow Depth = 0.58" for 1-Year event
Inflow = 0.33 cfs @ 12.16 hrs, Volume= 0.033 af
Primary = 0.33 cfs @ 12.16 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-74.00 hrs, dt= 0.01 hrs

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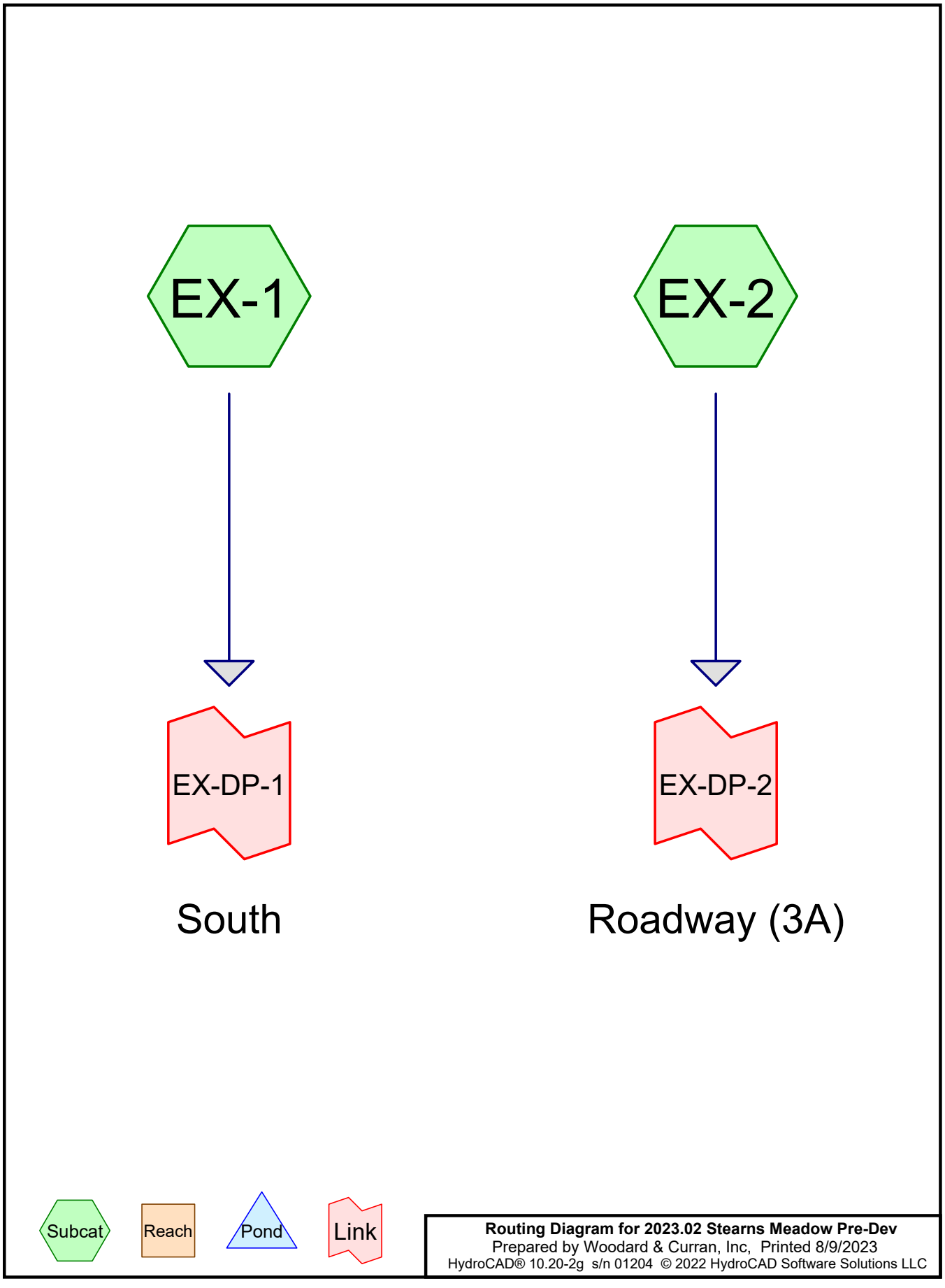

Routing Diagram for 2023.02 Stearns Meadow Pre-Dev
Prepared by Woodard & Curran, Inc, Printed 8/9/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
15.278	70	Woods, Good, HSG C (EX-1, EX-2)
15.278	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
15.278	HSG C	EX-1, EX-2
0.000	HSG D	
0.000	Other	
15.278		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	15.278	0.000	0.000	15.278	Woods, Good	EX-1, EX-2
0.000	**0.000**	**15.278**	**0.000**	**0.000**	**15.278**	**TOTAL AREA**	

Time span=0.00-74.00 hrs, dt=0.01 hrs, 7401 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=635,594 sf 0.00% Impervious Runoff Depth=0.90"
Flow Length=1,335' Tc=28.9 min CN=70/0 Runoff=8.06 cfs 1.100 af

Subcatchment EX-2: Runoff Area=29,928 sf 0.00% Impervious Runoff Depth=0.90"
Flow Length=178' Tc=10.0 min CN=70/0 Runoff=0.57 cfs 0.052 af

Link EX-DP-1: South Inflow=8.06 cfs 1.100 af
Primary=8.06 cfs 1.100 af

Link EX-DP-2: Roadway (3A) Inflow=0.57 cfs 0.052 af
Primary=0.57 cfs 0.052 af

Total Runoff Area = 15.278 ac Runoff Volume = 1.152 af Average Runoff Depth = 0.90"
100.00% Pervious = 15.278 ac 0.00% Impervious = 0.000 ac

Time span=0.00-74.00 hrs, dt=0.01 hrs, 7401 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=635,594 sf 0.00% Impervious Runoff Depth=2.00"
Flow Length=1,335' Tc=28.9 min CN=70/0 Runoff=19.25 cfs 2.431 af

Subcatchment EX-2: Runoff Area=29,928 sf 0.00% Impervious Runoff Depth=2.00"
Flow Length=178' Tc=10.0 min CN=70/0 Runoff=1.38 cfs 0.114 af

Link EX-DP-1: South Inflow=19.25 cfs 2.431 af
Primary=19.25 cfs 2.431 af

Link EX-DP-2: Roadway (3A) Inflow=1.38 cfs 0.114 af
Primary=1.38 cfs 0.114 af

Total Runoff Area = 15.278 ac Runoff Volume = 2.546 af Average Runoff Depth = 2.00"
100.00% Pervious = 15.278 ac 0.00% Impervious = 0.000 ac

Time span=0.00-74.00 hrs, dt=0.01 hrs, 7401 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment EX-1: Runoff Area=635,594 sf 0.00% Impervious Runoff Depth=5.10"
Flow Length=1,335' Tc=28.9 min CN=70/0 Runoff=50.09 cfs 6.199 af

Subcatchment EX-2: Runoff Area=29,928 sf 0.00% Impervious Runoff Depth=5.10"
Flow Length=178' Tc=10.0 min CN=70/0 Runoff=3.59 cfs 0.292 af

Link EX-DP-1: South Inflow=50.09 cfs 6.199 af
Primary=50.09 cfs 6.199 af

Link EX-DP-2: Roadway (3A) Inflow=3.59 cfs 0.292 af
Primary=3.59 cfs 0.292 af

Total Runoff Area = 15.278 ac Runoff Volume = 6.490 af Average Runoff Depth = 5.10"
100.00% Pervious = 15.278 ac 0.00% Impervious = 0.000 ac

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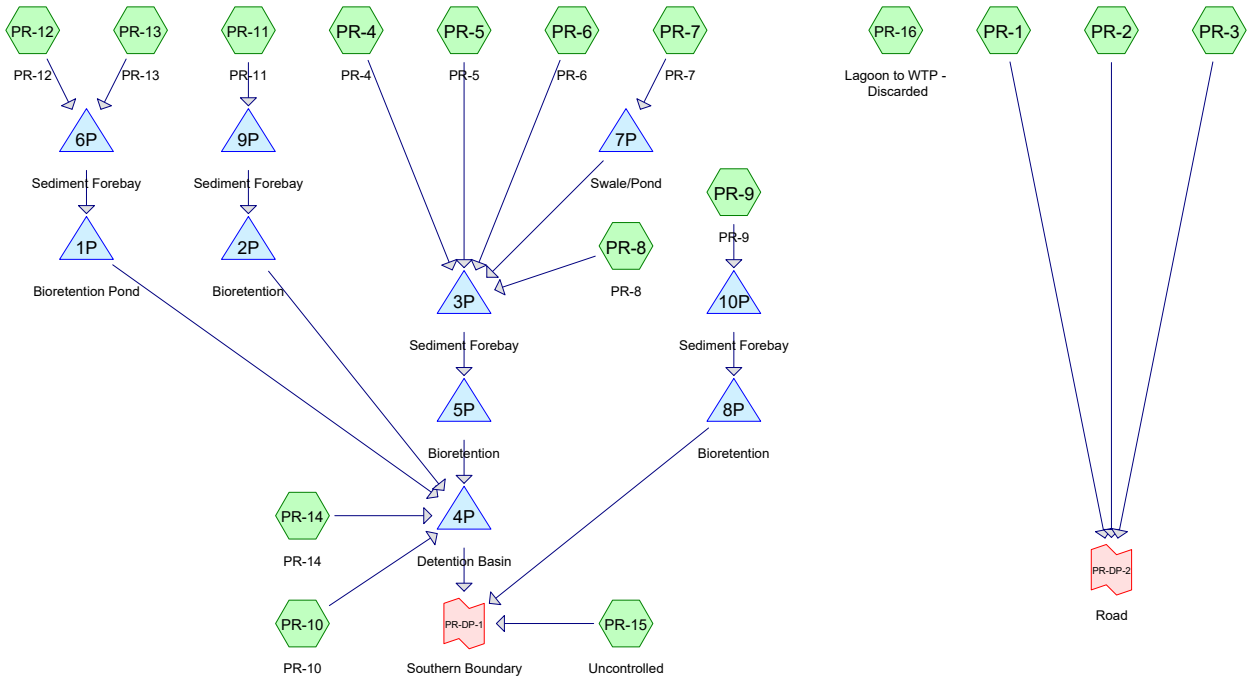

Subcat Reach Pond Link

Routing Diagram for 2023.08.02 Stearns Meadow Post-Dev_JCC
Prepared by Woodard & Curran, Inc, Printed 8/9/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.534	74	>75% Grass cover, Good, HSG C (PR-1, PR-10, PR-11, PR-13, PR-14, PR-15, PR-2, PR-3, PR-4, PR-5, PR-7, PR-8, PR-9)
0.256	96	Gravel surface, HSG C (PR-16)
0.544	98	Lagoons (PR-16)
0.902	98	Paved parking, HSG C (PR-11, PR-2, PR-3, PR-5, PR-6, PR-9)
0.810	98	Roofs, HSG C (PR-12, PR-6)
0.093	98	Unconnected pavement, HSG C (PR-10, PR-11, PR-14, PR-5, PR-7, PR-8)
6.139	70	Woods, Good, HSG C (PR-1, PR-10, PR-14, PR-15, PR-2, PR-3, PR-4, PR-7)
15.278	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
14.734	HSG C	PR-1, PR-10, PR-11, PR-12, PR-13, PR-14, PR-15, PR-16, PR-2, PR-3, PR-4, PR-5, PR-6, PR-7, PR-8, PR-9
0.000	HSG D	
0.544	Other	PR-16
15.278		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	6.534	0.000	0.000	6.534	>75% Grass cover, Good	PR-1, PR-10, PR-11, PR-13, PR-14, PR-15, PR-2, PR-3, PR-4, PR-5, PR-7, PR-8, PR-9
0.000	0.000	0.256	0.000	0.000	0.256	Gravel surface	PR-16
0.000	0.000	0.000	0.000	0.544	0.544	Lagoons	PR-16
0.000	0.000	0.902	0.000	0.000	0.902	Paved parking	PR-11, PR-2, PR-3, PR-5, PR-6, PR-9
0.000	0.000	0.810	0.000	0.000	0.810	Roofs	PR-12, PR-6
0.000	0.000	0.093	0.000	0.000	0.093	Unconnected pavement	PR-10, PR-11, PR-14, PR-5, PR-7, PR-8
0.000	0.000	6.139	0.000	0.000	6.139	Woods, Good	PR-1, PR-10, PR-14, PR-15, PR-2, PR-3, PR-4, PR-7
0.000	**0.000**	**14.734**	**0.000**	**0.544**	**15.278**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	71.75	68.70	152.0	0.0201	0.013	0.0	12.0	0.0
2	4P	59.00	58.00	70.0	0.0143	0.013	0.0	12.0	0.0
3	5P	70.89	67.50	290.0	0.0117	0.013	0.0	24.0	0.0
4	7P	74.10	74.00	63.0	0.0016	0.012	0.0	12.0	0.0
5	8P	66.00	65.00	85.0	0.0118	0.010	0.0	6.0	0.0

Time span=0.00-124.00 hrs, dt=0.010 hrs, 12401 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-1: Runoff Area=5,451 sf 0.00% Impervious Runoff Depth=0.62"
Tc=6.0 min CN=71/0 Runoff=0.08 cfs 0.006 af

SubcatchmentPR-10: PR-10 Runoff Area=36,662 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=376' Tc=17.5 min CN=74/0 Runoff=0.48 cfs 0.053 af

SubcatchmentPR-11: PR-11 Runoff Area=37,713 sf 42.64% Impervious Runoff Depth=1.51"
Tc=6.0 min CN=74/98 Runoff=1.38 cfs 0.109 af

SubcatchmentPR-12: PR-12 Runoff Area=23,907 sf 100.00% Impervious Runoff Depth=2.52"
Tc=6.0 min CN=0/98 Runoff=1.46 cfs 0.115 af

SubcatchmentPR-13: PR-13 Runoff Area=9,057 sf 0.00% Impervious Runoff Depth=0.75"
Tc=6.0 min CN=74/0 Runoff=0.17 cfs 0.013 af

SubcatchmentPR-14: PR-14 Runoff Area=95,069 sf 0.00% Impervious Runoff Depth=0.71"
Flow Length=634' Tc=21.3 min CN=73/0 Runoff=1.06 cfs 0.129 af

SubcatchmentPR-15: Uncontrolled Runoff Area=287,937 sf 0.00% Impervious Runoff Depth=0.62"
Flow Length=939' Tc=25.6 min CN=71/0 Runoff=2.49 cfs 0.342 af

SubcatchmentPR-16: Lagoon to WTP - Runoff Area=34,886 sf 67.98% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=96/98 Runoff=2.10 cfs 0.164 af

SubcatchmentPR-2: Runoff Area=12,575 sf 6.19% Impervious Runoff Depth=0.70"
Flow Length=107' Slope=0.0700 '/' Tc=12.9 min CN=70/98 Runoff=0.16 cfs 0.017 af

SubcatchmentPR-3: Runoff Area=5,171 sf 9.19% Impervious Runoff Depth=0.76"
Tc=6.0 min CN=70/98 Runoff=0.09 cfs 0.007 af

SubcatchmentPR-4: PR-4 Runoff Area=29,600 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=267' Tc=20.2 min CN=72/0 Runoff=0.31 cfs 0.038 af

SubcatchmentPR-5: PR-5 Runoff Area=12,985 sf 74.86% Impervious Runoff Depth=2.20"
Tc=6.0 min CN=83/98 Runoff=0.70 cfs 0.055 af

SubcatchmentPR-6: PR-6 Runoff Area=20,541 sf 100.00% Impervious Runoff Depth=2.52"
Tc=6.0 min CN=0/98 Runoff=1.25 cfs 0.099 af

SubcatchmentPR-7: PR-7 Runoff Area=29,347 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=336' Tc=16.8 min CN=74/0 Runoff=0.39 cfs 0.042 af

SubcatchmentPR-8: PR-8 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=75/0 Runoff=0.34 cfs 0.026 af

SubcatchmentPR-9: PR-9 Runoff Area=7,575 sf 40.66% Impervious Runoff Depth=1.47"
Tc=6.0 min CN=74/98 Runoff=0.27 cfs 0.021 af

Pond 1P: Bioretention Pond Peak Elev=77.41' Storage=2,995 cf Inflow=1.61 cfs 0.118 af
Discarded=0.01 cfs 0.083 af Primary=0.17 cfs 0.034 af Outflow=0.18 cfs 0.118 af

Pond 2P: Bioretention Peak Elev=70.48' Storage=1,211 cf Inflow=1.37 cfs 0.101 af
Discarded=0.01 cfs 0.030 af Primary=1.24 cfs 0.071 af Outflow=1.25 cfs 0.101 af

Pond 3P: Sediment Forebay Peak Elev=76.21' Storage=791 cf Inflow=2.40 cfs 0.260 af
Outflow=2.39 cfs 0.244 af

Pond 4P: Detention Basin Peak Elev=63.42' Storage=7,235 cf Inflow=3.46 cfs 0.443 af
Outflow=0.63 cfs 0.443 af

Pond 5P: Bioretention Peak Elev=74.03' Storage=3,584 cf Inflow=2.39 cfs 0.244 af
Discarded=0.02 cfs 0.088 af Primary=1.43 cfs 0.156 af Outflow=1.45 cfs 0.244 af

Pond 6P: Sediment Forebay Peak Elev=78.77' Storage=557 cf Inflow=1.62 cfs 0.128 af
Outflow=1.61 cfs 0.118 af

Pond 7P: Swale/Pond Peak Elev=76.18' Storage=230 cf Inflow=0.39 cfs 0.042 af
Outflow=0.41 cfs 0.042 af

Pond 8P: Bioretention Peak Elev=69.00' Storage=0 cf Inflow=0.27 cfs 0.020 af
Outflow=0.27 cfs 0.020 af

Pond 9P: Sediment Forebay Peak Elev=71.65' Storage=389 cf Inflow=1.38 cfs 0.109 af
Outflow=1.37 cfs 0.101 af

Pond 10P: Sediment Forebay Peak Elev=70.13' Storage=89 cf Inflow=0.27 cfs 0.021 af
Outflow=0.27 cfs 0.020 af

Link PR-DP-1: Southern Boundary Inflow=3.05 cfs 0.805 af
Primary=3.05 cfs 0.805 af

Link PR-DP-2: Road Inflow=0.29 cfs 0.031 af
Primary=0.29 cfs 0.031 af

Total Runoff Area = 15.278 ac Runoff Volume = 1.236 af Average Runoff Depth = 0.97"
85.23% Pervious = 13.022 ac 14.77% Impervious = 2.257 ac

Summary for Subcatchment PR-1:

Road and around lagoons

Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.006 af, Depth= 0.62"
Routed to Link PR-DP-2 : Road

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
4,769	70	Woods, Good, HSG C
682	74	>75% Grass cover, Good, HSG C
5,451	71	Weighted Average
5,451	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-10: PR-10

Runoff = 0.48 cfs @ 12.27 hrs, Volume= 0.053 af, Depth= 0.75"
Routed to Pond 4P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
30,610	74	>75% Grass cover, Good, HSG C
761	98	Unconnected pavement, HSG C
5,291	70	Woods, Good, HSG C
36,662	74	Weighted Average
36,662	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	77	0.0430	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
1.8	23	0.0650	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
3.1	276	0.0453	1.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.5	376	Total			

Summary for Subcatchment PR-11: PR-11

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 0.109 af, Depth= 1.51"
Routed to Pond 9P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
21,184	74	>75% Grass cover, Good, HSG C
16,079	98	Paved parking, HSG C
450	98	Unconnected pavement, HSG C
37,713	85	Weighted Average
21,634	74	57.36% Pervious Area
16,079	98	42.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-12: PR-12

Runoff = 1.46 cfs @ 12.08 hrs, Volume= 0.115 af, Depth= 2.52"
Routed to Pond 6P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
23,907	98	Roofs, HSG C
23,907	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-13: PR-13

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 0.013 af, Depth= 0.75"
Routed to Pond 6P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
9,057	74	>75% Grass cover, Good, HSG C
9,057	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-14: PR-14

Runoff = 1.06 cfs @ 12.33 hrs, Volume= 0.129 af, Depth= 0.71"
Routed to Pond 4P : Detention Basin

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
61,280	74	>75% Grass cover, Good, HSG C
33,402	70	Woods, Good, HSG C
387	98	Unconnected pavement, HSG C
95,069	73	Weighted Average
95,069	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.4	251	0.0598	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.3	283	0.0247	1.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.3	634	Total			

Summary for Subcatchment PR-15: Uncontrolled

Lagoon area excluded from analysis (assumed lagoons store and treat themselves and area in between). Assumed gravel road around lagoons impervious and drains away from lagoons.

Runoff = 2.49 cfs @ 12.43 hrs, Volume= 0.342 af, Depth= 0.62"
Routed to Link PR-DP-1 : Southern Boundary

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
98,150	74	>75% Grass cover, Good, HSG C
189,787	70	Woods, Good, HSG C
287,937	71	Weighted Average
287,937	71	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	100	0.0500	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
6.5	465	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.0	209	0.0598	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	165	0.0485	1.10		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	939	Total			

Summary for Subcatchment PR-16: Lagoon to WTP - Discarded

Lagoon area excluded from analysis (assumed lagoons store and treat themselves and area in between).
Assumed gravel road around lagoons impervious and drains away from lagoons.

Runoff = 2.10 cfs @ 12.08 hrs, Volume= 0.164 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

	Area (sf)	CN	Description
*	23,717	98	Lagoons
	11,169	96	Gravel surface, HSG C
	34,886	97	Weighted Average
	11,169	96	32.02% Pervious Area
	23,717	98	67.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-2:

Road and around lagoons

Runoff = 0.16 cfs @ 12.20 hrs, Volume= 0.017 af, Depth= 0.70"
Routed to Link PR-DP-2 : Road

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
10,346	70	Woods, Good, HSG C
1,450	74	>75% Grass cover, Good, HSG C
779	98	Paved parking, HSG C
12,575	72	Weighted Average
11,796	70	93.81% Pervious Area
779	98	6.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	100	0.0700	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.1	7	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.9	107	Total			

Summary for Subcatchment PR-3:

Road and around lagoons

Runoff = 0.09 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 0.76"
Routed to Link PR-DP-2 : Road

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
4,642	70	Woods, Good, HSG C
54	74	>75% Grass cover, Good, HSG C
475	98	Paved parking, HSG C
5,171	73	Weighted Average
4,696	70	90.81% Pervious Area
475	98	9.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-4: PR-4

Runoff = 0.31 cfs @ 12.32 hrs, Volume= 0.038 af, Depth= 0.66"
Routed to Pond 3P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
17,266	74	>75% Grass cover, Good, HSG C
12,334	70	Woods, Good, HSG C
29,600	72	Weighted Average
29,600	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9	100	0.0300	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.1	141	0.0496	1.11		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	26	0.0980	2.19		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.2	267	Total			

Summary for Subcatchment PR-5: PR-5

Runoff = 0.70 cfs @ 12.08 hrs, Volume= 0.055 af, Depth= 2.20"
Routed to Pond 3P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
1,973	74	>75% Grass cover, Good, HSG C
1,292	98	Unconnected pavement, HSG C
9,720	98	Paved parking, HSG C
12,985	94	Weighted Average
3,265	83	25.14% Pervious Area
9,720	98	74.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-6: PR-6

Runoff = 1.25 cfs @ 12.08 hrs, Volume= 0.099 af, Depth= 2.52"
Routed to Pond 3P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
9,173	98	Paved parking, HSG C
11,368	98	Roofs, HSG C
20,541	98	Weighted Average
20,541	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-7: PR-7

Runoff = 0.39 cfs @ 12.26 hrs, Volume= 0.042 af, Depth= 0.75"
Routed to Pond 7P : Swale/Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
21,961	74	>75% Grass cover, Good, HSG C
560	98	Unconnected pavement, HSG C
6,826	70	Woods, Good, HSG C
29,347	74	Weighted Average
29,347	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	100	0.0600	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.1	218	0.0550	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	18	0.0830	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
16.8	336	Total			

Summary for Subcatchment PR-8: PR-8

Runoff = 0.34 cfs @ 12.10 hrs, Volume= 0.026 af, Depth= 0.80"
Routed to Pond 3P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
16,447	74	>75% Grass cover, Good, HSG C
599	98	Unconnected pavement, HSG C
17,046	75	Weighted Average
17,046	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment PR-9: PR-9

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 0.021 af, Depth= 1.47"
Routed to Pond 10P : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-124.00 hrs, dt= 0.0
Type III 24-hr 1-Year Rainfall=2.75"

Area (sf)	CN	Description
4,495	74	>75% Grass cover, Good, HSG C
3,080	98	Paved parking, HSG C
7,575	84	Weighted Average
4,495	74	59.34% Pervious Area
3,080	98	40.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Pond 1P: Bioretention Pond

Inflow Area = 0.757 ac, 72.52% Impervious, Inflow Depth = 1.86" for 1-Year event
Inflow = 1.61 cfs @ 12.10 hrs, Volume= 0.118 af
Outflow = 0.18 cfs @ 12.79 hrs, Volume= 0.118 af, Atten= 89%, Lag= 41.6 min
Discarded = 0.01 cfs @ 12.79 hrs, Volume= 0.083 af
Primary = 0.17 cfs @ 12.79 hrs, Volume= 0.034 af
Routed to Pond 4P : Detention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 77.41' @ 12.79 hrs Surf.Area= 3,720 sf Storage= 2,995 cf
Flood Elev= 78.50' Surf.Area= 4,298 sf Storage= 5,342 cf

Plug-Flow detention time= 1,424.2 min calculated for 0.118 af (100% of inflow)
Center-of-Mass det. time= 1,424.4 min (2,230.0 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	76.50'	5,342 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
76.50	2,838	0	0
77.00	3,311	1,537	1,537
78.00	4,298	3,805	5,342

Device	Routing	Invert	Outlet Devices
#1	Primary	71.75'	**12.0" Round Culvert** L= 152.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 71.75' / 68.70' S= 0.0201 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	76.50'	**0.170 in/hr Exfiltration over Surface area**
#3	Device 1	77.38'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.79 hrs HW=77.41' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.17 cfs @ 12.79 hrs HW=77.41' TW=63.09' (Dynamic Tailwater)
↑└**1=Culvert** (Passes 0.17 cfs of 6.88 cfs potential flow)
↑└**3=Orifice/Grate** (Weir Controls 0.17 cfs @ 0.61 fps)

Summary for Pond 2P: Bioretention

Inflow Area = 0.866 ac, 42.64% Impervious, Inflow Depth = 1.40" for 1-Year event
Inflow = 1.37 cfs @ 12.10 hrs, Volume= 0.101 af
Outflow = 1.25 cfs @ 12.13 hrs, Volume= 0.101 af, Atten= 9%, Lag= 2.3 min
Discarded = 0.01 cfs @ 12.13 hrs, Volume= 0.030 af
Primary = 1.24 cfs @ 12.13 hrs, Volume= 0.071 af
Routed to Pond 4P : Detention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 70.48' @ 12.13 hrs Surf.Area= 1,483 sf Storage= 1,211 cf
Flood Elev= 71.50' Surf.Area= 1,751 sf Storage= 2,055 cf

Plug-Flow detention time= 569.3 min calculated for 0.101 af (100% of inflow)
Center-of-Mass det. time= 569.6 min (1,390.8 - 821.2)

Volume	Invert	Avail.Storage	Storage Description
#1	69.50'	2,055 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
69.50	1,003	0	0
70.00	1,238	560	560
71.00	1,751	1,495	2,055

Device	Routing	Invert	Outlet Devices
#1	Primary	70.34'	**10.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Discarded	69.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.13 hrs HW=70.48' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.24 cfs @ 12.13 hrs HW=70.48' TW=61.35' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 1.24 cfs @ 0.86 fps)

Summary for Pond 3P: Sediment Forebay

[80] Warning: Exceeded Pond 7P by 0.13' @ 12.07 hrs (1.27 cfs 0.062 af)

Inflow Area = 2.514 ac, 27.63% Impervious, Inflow Depth = 1.24" for 1-Year event
Inflow = 2.40 cfs @ 12.09 hrs, Volume= 0.260 af
Outflow = 2.39 cfs @ 12.10 hrs, Volume= 0.244 af, Atten= 1%, Lag= 0.6 min
Primary = 2.39 cfs @ 12.10 hrs, Volume= 0.244 af
Routed to Pond 5P : Bioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 76.21' @ 12.10 hrs Surf.Area= 605 sf Storage= 791 cf
Flood Elev= 77.00' Surf.Area= 827 sf Storage= 1,357 cf

Plug-Flow detention time= 59.0 min calculated for 0.244 af (94% of inflow)
Center-of-Mass det. time= 25.8 min (841.0 - 815.2)

Volume	Invert	Avail.Storage	Storage Description
#1	74.00'	1,357 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
74.00	152	0	0
75.00	321	237	237
76.00	546	434	670
77.00	827	687	1,357

Device	Routing	Invert	Outlet Devices
#1	Primary	76.00'	**10.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=2.39 cfs @ 12.10 hrs HW=76.21' TW=73.72' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.39 cfs @ 1.07 fps)

Summary for Pond 4P: Detention Basin

Inflow Area = 7.161 ac, 22.52% Impervious, Inflow Depth = 0.74" for 1-Year event
Inflow = 3.46 cfs @ 12.35 hrs, Volume= 0.443 af
Outflow = 0.63 cfs @ 14.05 hrs, Volume= 0.443 af, Atten= 82%, Lag= 102.2 min
Primary = 0.63 cfs @ 14.05 hrs, Volume= 0.443 af
Routed to Link PR-DP-1 : Southern Boundary

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 63.42' @ 14.05 hrs Surf.Area= 4,189 sf Storage= 7,235 cf
Flood Elev= 69.50' Surf.Area= 10,905 sf Storage= 48,530 cf

Plug-Flow detention time= 146.7 min calculated for 0.443 af (100% of inflow)
Center-of-Mass det. time= 146.6 min (1,031.5 - 885.0)

Volume	Invert	Avail.Storage	Storage Description
#1	61.00'	48,530 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
61.00	1,864	0	0
62.00	2,775	2,320	2,320
63.00	3,756	3,266	5,585
64.00	4,798	4,277	9,862
65.00	5,901	5,350	15,212
66.00	7,063	6,482	21,694
67.00	8,285	7,674	29,368
68.00	9,567	8,926	38,294
69.00	10,905	10,236	48,530

Device	Routing	Invert	Outlet Devices
#1	Primary	68.00'	**10.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Device 3	65.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	59.00'	**12.0" Round Culvert** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 59.00' / 58.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 3	61.00'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.63 cfs @ 14.05 hrs HW=63.42' TW=0.00' (Dynamic Tailwater)
- **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **3=Culvert** (Passes 0.63 cfs of 6.60 cfs potential flow)
  - **2=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Orifice Controls 0.63 cfs @ 7.22 fps)

Summary for Pond 5P: Bioretention

Inflow Area = 2.514 ac, 27.63% Impervious, Inflow Depth = 1.17" for 1-Year event
Inflow = 2.39 cfs @ 12.10 hrs, Volume= 0.244 af
Outflow = 1.45 cfs @ 12.40 hrs, Volume= 0.244 af, Atten= 39%, Lag= 18.1 min
Discarded = 0.02 cfs @ 12.40 hrs, Volume= 0.088 af
Primary = 1.43 cfs @ 12.40 hrs, Volume= 0.156 af
Routed to Pond 4P : Detention Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 74.03' @ 12.40 hrs Surf.Area= 3,962 sf Storage= 3,584 cf
Flood Elev= 75.00' Surf.Area= 4,940 sf Storage= 7,882 cf

Plug-Flow detention time= 746.6 min calculated for 0.244 af (100% of inflow)
Center-of-Mass det. time= 746.9 min (1,587.8 - 841.0)

Volume	Invert	Avail.Storage	Storage Description
#1	73.00'	7,882 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
73.00	2,970	0	0
74.00	3,927	3,449	3,449
75.00	4,940	4,434	7,882

Device	Routing	Invert	Outlet Devices
#1	Discarded	73.00'	**0.170 in/hr Exfiltration over Surface area**
#2	Device 3	73.89'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	70.89'	**24.0" Round Culvert** L= 290.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 70.89' / 67.50' S= 0.0117 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=0.02 cfs @ 12.40 hrs HW=74.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.43 cfs @ 12.40 hrs HW=74.03' TW=62.30' (Dynamic Tailwater)
↑—**3=Culvert** (Passes 1.43 cfs of 19.54 cfs potential flow)
↑—**2=Orifice/Grate** (Weir Controls 1.43 cfs @ 1.24 fps)

Summary for Pond 6P: Sediment Forebay

Inflow Area = 0.757 ac, 72.52% Impervious, Inflow Depth = 2.03" for 1-Year event
Inflow = 1.62 cfs @ 12.09 hrs, Volume= 0.128 af
Outflow = 1.61 cfs @ 12.10 hrs, Volume= 0.118 af, Atten= 1%, Lag= 0.7 min
Primary = 1.61 cfs @ 12.10 hrs, Volume= 0.118 af
Routed to Pond 1P : Bioretention Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 78.77' @ 12.10 hrs Surf.Area= 562 sf Storage= 557 cf
Flood Elev= 79.00' Surf.Area= 631 sf Storage= 696 cf

Plug-Flow detention time= 78.3 min calculated for 0.118 af (92% of inflow)
Center-of-Mass det. time= 34.4 min (805.5 - 771.2)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	696 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	92	0	0
78.00	334	213	213
79.00	631	483	696

Device	Routing	Invert	Outlet Devices
#1	Primary	78.60'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.61 cfs @ 12.10 hrs HW=78.77' TW=77.06' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.61 cfs @ 0.96 fps)

Summary for Pond 7P: Swale/Pond

[44] Hint: Outlet device #2 is below defined storage
[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.674 ac, 0.00% Impervious, Inflow Depth = 0.75" for 1-Year event
Inflow = 0.39 cfs @ 12.26 hrs, Volume= 0.042 af
Outflow = 0.41 cfs @ 12.33 hrs, Volume= 0.042 af, Atten= 0%, Lag= 4.2 min
Primary = 0.41 cfs @ 12.33 hrs, Volume= 0.042 af
Routed to Pond 3P : Sediment Forebay

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 76.18' @ 12.27 hrs Surf.Area= 1,305 sf Storage= 230 cf
Flood Elev= 77.00' Surf.Area= 1,768 sf Storage= 1,485 cf

Plug-Flow detention time= 17.3 min calculated for 0.042 af (100% of inflow)
Center-of-Mass det. time= 17.3 min (899.6 - 882.3)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	3,253 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
76.00	1,201	0	0
77.00	1,768	1,485	1,485
78.00	1,768	1,768	3,253

Device	Routing	Invert	Outlet Devices
#1	Primary	76.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	74.10'	**12.0" Round Culvert** L= 63.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 74.10' / 74.00' S= 0.0016 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.33 hrs HW=76.18' TW=76.17' (Dynamic Tailwater)
↑—**1=Orifice/Grate** (Passes 0.42 cfs of 0.86 cfs potential flow)
↑—**2=Culvert** (Outlet Controls 0.42 cfs @ 0.53 fps)

Summary for Pond 8P: Bioretention

[44] Hint: Outlet device #2 is below defined storage

Inflow Area = 0.174 ac, 40.66% Impervious, Inflow Depth = 1.36" for 1-Year event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af
Routed to Link PR-DP-1 : Southern Boundary

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 69.00' @ 0.00 hrs Surf.Area= 200 sf Storage= 0 cf
Flood Elev= 70.00' Surf.Area= 416 sf Storage= 301 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (825.9 - 825.9)

Volume	Invert	Avail.Storage	Storage Description
#1	69.00'	301 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
69.00	200	0	0	200
70.00	416	301	301	425

Device	Routing	Invert	Outlet Devices
#1	Primary	69.85'	**10.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#2	Primary	66.00'	**6.0" Round Culvert** L= 85.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 66.00' / 65.00' S= 0.0118 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.00 cfs @ 12.10 hrs HW=69.00' TW=0.00' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
2=Culvert (Passes 0.00 cfs of 1.24 cfs potential flow)

Summary for Pond 9P: Sediment Forebay

Inflow Area = 0.866 ac, 42.64% Impervious, Inflow Depth = 1.51" for 1-Year event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 0.109 af
Outflow = 1.37 cfs @ 12.10 hrs, Volume= 0.101 af, Atten= 1%, Lag= 0.5 min
Primary = 1.37 cfs @ 12.10 hrs, Volume= 0.101 af
Routed to Pond 2P : Bioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 71.65' @ 12.10 hrs Surf.Area= 407 sf Storage= 389 cf
Flood Elev= 72.00' Surf.Area= 487 sf Storage= 545 cf

Plug-Flow detention time= 67.2 min calculated for 0.101 af (93% of inflow)
Center-of-Mass det. time= 29.2 min (821.2 - 792.0)

Volume	Invert	Avail.Storage	Storage Description
#1	70.00'	545 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
70.00	85	0	0
71.00	259	172	172
72.00	487	373	545

Device	Routing	Invert	Outlet Devices
#1	Primary	71.50'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.37 cfs @ 12.10 hrs HW=71.65' TW=70.47' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.37 cfs @ 0.91 fps)

Summary for Pond 10P: Sediment Forebay

Inflow Area = 0.174 ac, 40.66% Impervious, Inflow Depth = 1.47" for 1-Year event
Inflow = 0.27 cfs @ 12.09 hrs, Volume= 0.021 af
Outflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af, Atten= 1%, Lag= 0.7 min
Primary = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af
Routed to Pond 8P : Bioretention

Routing by Dyn-Stor-Ind method, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs / 3
Peak Elev= 70.13' @ 12.10 hrs Surf.Area= 144 sf Storage= 89 cf
Flood Elev= 71.00' Surf.Area= 289 sf Storage= 277 cf

Plug-Flow detention time= 73.3 min calculated for 0.020 af (92% of inflow)
Center-of-Mass det. time= 32.0 min (825.9 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1	69.00'	277 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
69.00	22	0	0
70.00	121	72	72
71.00	289	205	277

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**2.0' long + 3.0 '/' SideZ x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.27 cfs @ 12.10 hrs HW=70.13' TW=69.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.83 fps)

Summary for Link PR-DP-1: Southern Boundary

Inflow Area = 13.945 ac, 12.07% Impervious, Inflow Depth = 0.69" for 1-Year event
Inflow = 3.05 cfs @ 12.43 hrs, Volume= 0.805 af
Primary = 3.05 cfs @ 12.43 hrs, Volume= 0.805 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs

Summary for Link PR-DP-2: Road

Inflow Area = 0.533 ac, 5.41% Impervious, Inflow Depth = 0.69" for 1-Year event
Inflow = 0.29 cfs @ 12.14 hrs, Volume= 0.031 af
Primary = 0.29 cfs @ 12.14 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-124.00 hrs, dt= 0.010 hrs

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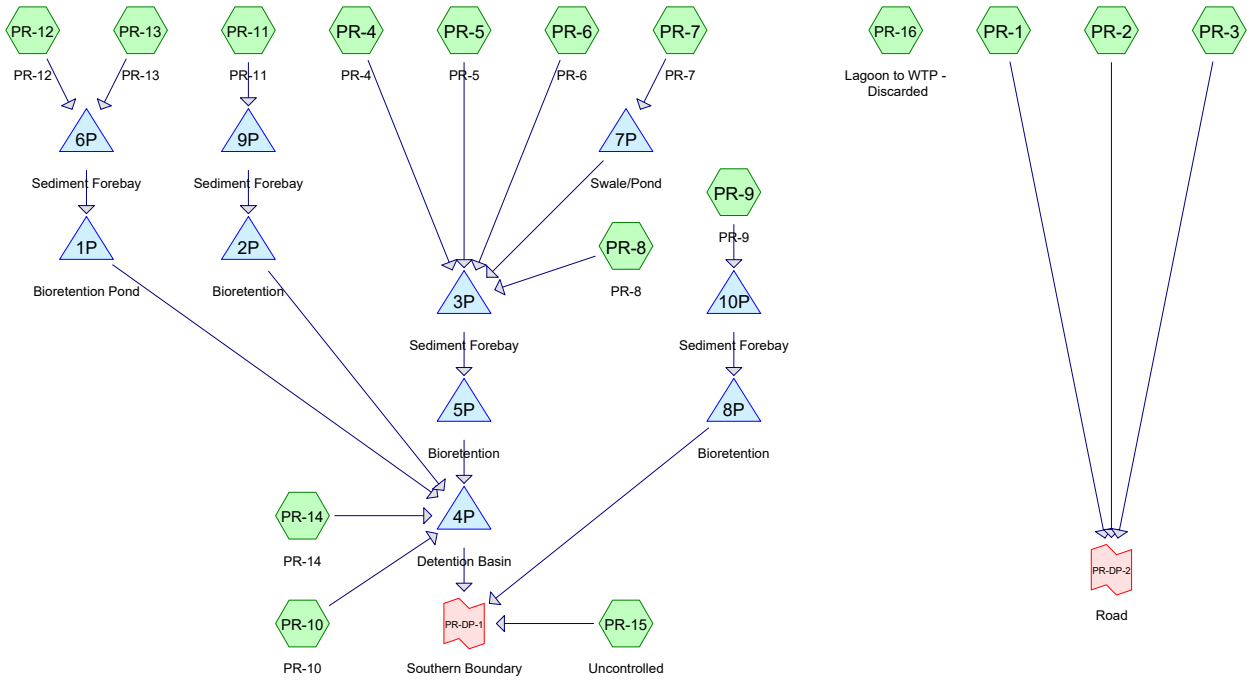

Subcat Reach Pond Link

Routing Diagram for 2023.08.02 Stearns Meadow Post-Dev_JCC
Prepared by Woodard & Curran, Inc, Printed 8/9/2023

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.534	74	>75% Grass cover, Good, HSG C (PR-1, PR-10, PR-11, PR-13, PR-14, PR-15, PR-2, PR-3, PR-4, PR-5, PR-7, PR-8, PR-9)
0.256	96	Gravel surface, HSG C (PR-16)
0.544	98	Lagoons (PR-16)
0.902	98	Paved parking, HSG C (PR-11, PR-2, PR-3, PR-5, PR-6, PR-9)
0.810	98	Roofs, HSG C (PR-12, PR-6)
0.093	98	Unconnected pavement, HSG C (PR-10, PR-11, PR-14, PR-5, PR-7, PR-8)
6.139	70	Woods, Good, HSG C (PR-1, PR-10, PR-14, PR-15, PR-2, PR-3, PR-4, PR-7)
15.278	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
14.734	HSG C	PR-1, PR-10, PR-11, PR-12, PR-13, PR-14, PR-15, PR-16, PR-2, PR-3, PR-4, PR-5, PR-6, PR-7, PR-8, PR-9
0.000	HSG D	
0.544	Other	PR-16
15.278		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	6.534	0.000	0.000	6.534	>75% Grass cover, Good	PR-1, PR-10, PR-11, PR-13, PR-14, PR-15, PR-2, PR-3, PR-4, PR-5, PR-7, PR-8, PR-9
0.000	0.000	0.256	0.000	0.000	0.256	Gravel surface	PR-16
0.000	0.000	0.000	0.000	0.544	0.544	Lagoons	PR-16
0.000	0.000	0.902	0.000	0.000	0.902	Paved parking	PR-11, PR-2, PR-3, PR-5, PR-6, PR-9
0.000	0.000	0.810	0.000	0.000	0.810	Roofs	PR-12, PR-6
0.000	0.000	0.093	0.000	0.000	0.093	Unconnected pavement	PR-10, PR-11, PR-14, PR-5, PR-7, PR-8
0.000	0.000	6.139	0.000	0.000	6.139	Woods, Good	PR-1, PR-10, PR-14, PR-15, PR-2, PR-3, PR-4, PR-7
0.000	**0.000**	**14.734**	**0.000**	**0.544**	**15.278**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	71.75	68.70	152.0	0.0201	0.013	0.0	12.0	0.0
2	4P	59.00	58.00	70.0	0.0143	0.013	0.0	12.0	0.0
3	5P	70.89	67.50	290.0	0.0117	0.013	0.0	24.0	0.0
4	7P	74.10	74.00	63.0	0.0016	0.012	0.0	12.0	0.0
5	8P	66.00	65.00	85.0	0.0118	0.010	0.0	6.0	0.0

Time span=0.00-124.00 hrs, dt=0.010 hrs, 12401 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-1: Runoff Area=5,451 sf 0.00% Impervious Runoff Depth=0.96"
Tc=6.0 min CN=71/0 Runoff=0.13 cfs 0.010 af

SubcatchmentPR-10: PR-10 Runoff Area=36,662 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=376' Tc=17.5 min CN=74/0 Runoff=0.75 cfs 0.079 af

SubcatchmentPR-11: PR-11 Runoff Area=37,713 sf 42.64% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=74/98 Runoff=1.82 cfs 0.142 af

SubcatchmentPR-12: PR-12 Runoff Area=23,907 sf 100.00% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=0/98 Runoff=1.78 cfs 0.142 af

SubcatchmentPR-13: PR-13 Runoff Area=9,057 sf 0.00% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=74/0 Runoff=0.26 cfs 0.019 af

SubcatchmentPR-14: PR-14 Runoff Area=95,069 sf 0.00% Impervious Runoff Depth=1.07"
Flow Length=634' Tc=21.3 min CN=73/0 Runoff=1.68 cfs 0.194 af

SubcatchmentPR-15: Uncontrolled Runoff Area=287,937 sf 0.00% Impervious Runoff Depth=0.96"
Flow Length=939' Tc=25.6 min CN=71/0 Runoff=4.13 cfs 0.527 af

SubcatchmentPR-16: Lagoon to WTP - Runoff Area=34,886 sf 67.98% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=96/98 Runoff=2.56 cfs 0.202 af

SubcatchmentPR-2: Runoff Area=12,575 sf 6.19% Impervious Runoff Depth=1.04"
Flow Length=107' Slope=0.0700 '/' Tc=12.9 min CN=70/98 Runoff=0.25 cfs 0.025 af

SubcatchmentPR-3: Runoff Area=5,171 sf 9.19% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=70/98 Runoff=0.14 cfs 0.011 af

SubcatchmentPR-4: PR-4 Runoff Area=29,600 sf 0.00% Impervious Runoff Depth=1.01"
Flow Length=267' Tc=20.2 min CN=72/0 Runoff=0.50 cfs 0.057 af

SubcatchmentPR-5: PR-5 Runoff Area=12,985 sf 74.86% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=83/98 Runoff=0.87 cfs 0.068 af

SubcatchmentPR-6: PR-6 Runoff Area=20,541 sf 100.00% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=0/98 Runoff=1.53 cfs 0.122 af

SubcatchmentPR-7: PR-7 Runoff Area=29,347 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=336' Tc=16.8 min CN=74/0 Runoff=0.61 cfs 0.063 af

SubcatchmentPR-8: PR-8 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth=1.18"
Tc=6.0 min CN=75/0 Runoff=0.52 cfs 0.039 af

SubcatchmentPR-9: PR-9 Runoff Area=7,575 sf 40.66% Impervious Runoff Depth=1.93"
Tc=6.0 min CN=74/98 Runoff=0.36 cfs 0.028 af

Pond 1P: Bioretention Pond Peak Elev=77.47' Storage=3,199 cf Inflow=2.02 cfs 0.150 af
Discarded=0.01 cfs 0.084 af Primary=0.69 cfs 0.066 af Outflow=0.71 cfs 0.150 af

Pond 2P: Bioretention Peak Elev=70.51' Storage=1,259 cf Inflow=1.81 cfs 0.134 af
Discarded=0.01 cfs 0.030 af Primary=1.71 cfs 0.104 af Outflow=1.72 cfs 0.134 af

Pond 3P: Sediment Forebay Peak Elev=76.25' Storage=814 cf Inflow=3.14 cfs 0.349 af
Outflow=3.12 cfs 0.334 af

Pond 4P: Detention Basin Peak Elev=64.72' Storage=13,588 cf Inflow=6.36 cfs 0.688 af
Outflow=0.79 cfs 0.687 af

Pond 5P: Bioretention Peak Elev=74.10' Storage=3,835 cf Inflow=3.12 cfs 0.334 af
Discarded=0.02 cfs 0.089 af Primary=2.47 cfs 0.245 af Outflow=2.48 cfs 0.334 af

Pond 6P: Sediment Forebay Peak Elev=78.80' Storage=573 cf Inflow=2.04 cfs 0.161 af
Outflow=2.02 cfs 0.150 af

Pond 7P: Swale/Pond Peak Elev=76.26' Storage=325 cf Inflow=0.61 cfs 0.063 af
Outflow=0.65 cfs 0.063 af

Pond 8P: Bioretention Peak Elev=69.00' Storage=0 cf Inflow=0.35 cfs 0.026 af
Outflow=0.35 cfs 0.026 af

Pond 9P: Sediment Forebay Peak Elev=71.68' Storage=401 cf Inflow=1.82 cfs 0.142 af
Outflow=1.81 cfs 0.134 af

Pond 10P: Sediment Forebay Peak Elev=70.16' Storage=93 cf Inflow=0.36 cfs 0.028 af
Outflow=0.35 cfs 0.026 af

Link PR-DP-1: Southern Boundary Inflow=4.88 cfs 1.241 af
Primary=4.88 cfs 1.241 af

Link PR-DP-2: Road Inflow=0.47 cfs 0.046 af
Primary=0.47 cfs 0.046 af

Total Runoff Area = 15.278 ac Runoff Volume = 1.728 af Average Runoff Depth = 1.36"
85.23% Pervious = 13.022 ac 14.77% Impervious = 2.257 ac

Time span=0.00-124.00 hrs, dt=0.010 hrs, 12401 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-1: Runoff Area=5,451 sf 0.00% Impervious Runoff Depth=2.08"
Tc=6.0 min CN=71/0 Runoff=0.30 cfs 0.022 af

SubcatchmentPR-10: PR-10 Runoff Area=36,662 sf 0.00% Impervious Runoff Depth=2.32"
Flow Length=376' Tc=17.5 min CN=74/0 Runoff=1.62 cfs 0.163 af

SubcatchmentPR-11: PR-11 Runoff Area=37,713 sf 42.64% Impervious Runoff Depth=3.34"
Tc=6.0 min CN=74/98 Runoff=3.13 cfs 0.241 af

SubcatchmentPR-12: PR-12 Runoff Area=23,907 sf 100.00% Impervious Runoff Depth=4.71"
Tc=6.0 min CN=0/98 Runoff=2.66 cfs 0.216 af

SubcatchmentPR-13: PR-13 Runoff Area=9,057 sf 0.00% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=74/0 Runoff=0.56 cfs 0.040 af

SubcatchmentPR-14: PR-14 Runoff Area=95,069 sf 0.00% Impervious Runoff Depth=2.24"
Flow Length=634' Tc=21.3 min CN=73/0 Runoff=3.72 cfs 0.408 af

SubcatchmentPR-15: Uncontrolled Runoff Area=287,937 sf 0.00% Impervious Runoff Depth=2.08"
Flow Length=939' Tc=25.6 min CN=71/0 Runoff=9.61 cfs 1.145 af

SubcatchmentPR-16: Lagoon to WTP - Runoff Area=34,886 sf 67.98% Impervious Runoff Depth=4.64"
Tc=6.0 min CN=96/98 Runoff=3.86 cfs 0.310 af

SubcatchmentPR-2: Runoff Area=12,575 sf 6.19% Impervious Runoff Depth=2.17"
Flow Length=107' Slope=0.0700 '/' Tc=12.9 min CN=70/98 Runoff=0.57 cfs 0.052 af

SubcatchmentPR-3: Runoff Area=5,171 sf 9.19% Impervious Runoff Depth=2.25"
Tc=6.0 min CN=70/98 Runoff=0.30 cfs 0.022 af

SubcatchmentPR-4: PR-4 Runoff Area=29,600 sf 0.00% Impervious Runoff Depth=2.16"
Flow Length=267' Tc=20.2 min CN=72/0 Runoff=1.14 cfs 0.122 af

SubcatchmentPR-5: PR-5 Runoff Area=12,985 sf 74.86% Impervious Runoff Depth=4.31"
Tc=6.0 min CN=83/98 Runoff=1.35 cfs 0.107 af

SubcatchmentPR-6: PR-6 Runoff Area=20,541 sf 100.00% Impervious Runoff Depth=4.71"
Tc=6.0 min CN=0/98 Runoff=2.28 cfs 0.185 af

SubcatchmentPR-7: PR-7 Runoff Area=29,347 sf 0.00% Impervious Runoff Depth=2.32"
Flow Length=336' Tc=16.8 min CN=74/0 Runoff=1.32 cfs 0.131 af

SubcatchmentPR-8: PR-8 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth=2.41"
Tc=6.0 min CN=75/0 Runoff=1.10 cfs 0.079 af

SubcatchmentPR-9: PR-9 Runoff Area=7,575 sf 40.66% Impervious Runoff Depth=3.30"
Tc=6.0 min CN=74/98 Runoff=0.62 cfs 0.048 af

Pond 1P: Bioretention Pond Peak Elev=77.60' Storage=3,688 cf Inflow=3.20 cfs 0.245 af
Discarded=0.02 cfs 0.086 af Primary=2.64 cfs 0.159 af Outflow=2.65 cfs 0.245 af

Pond 2P: Bioretention Peak Elev=70.58' Storage=1,370 cf Inflow=3.12 cfs 0.234 af
Discarded=0.01 cfs 0.031 af Primary=3.02 cfs 0.203 af Outflow=3.02 cfs 0.234 af

Pond 3P: Sediment Forebay Peak Elev=76.36' Storage=884 cf Inflow=5.78 cfs 0.625 af
Outflow=5.77 cfs 0.609 af

Pond 4P: Detention Basin Peak Elev=65.65' Storage=19,272 cf Inflow=14.66 cfs 1.450 af
Outflow=8.23 cfs 1.450 af

Pond 5P: Bioretention Peak Elev=74.23' Storage=4,393 cf Inflow=5.77 cfs 0.609 af
Discarded=0.02 cfs 0.091 af Primary=5.27 cfs 0.518 af Outflow=5.28 cfs 0.609 af

Pond 6P: Sediment Forebay Peak Elev=78.86' Storage=611 cf Inflow=3.22 cfs 0.256 af
Outflow=3.20 cfs 0.245 af

Pond 7P: Swale/Pond Peak Elev=76.45' Storage=592 cf Inflow=1.32 cfs 0.131 af
Outflow=1.31 cfs 0.131 af

Pond 8P: Bioretention Peak Elev=69.00' Storage=0 cf Inflow=0.62 cfs 0.046 af
Outflow=0.62 cfs 0.046 af

Pond 9P: Sediment Forebay Peak Elev=71.76' Storage=434 cf Inflow=3.13 cfs 0.241 af
Outflow=3.12 cfs 0.234 af

Pond 10P: Sediment Forebay Peak Elev=70.22' Storage=102 cf Inflow=0.62 cfs 0.048 af
Outflow=0.62 cfs 0.046 af

Link PR-DP-1: Southern Boundary Inflow=17.96 cfs 2.641 af
Primary=17.96 cfs 2.641 af

Link PR-DP-2: Road Inflow=1.06 cfs 0.096 af
Primary=1.06 cfs 0.096 af

Total Runoff Area = 15.278 ac Runoff Volume = 3.290 af Average Runoff Depth = 2.58"
85.23% Pervious = 13.022 ac 14.77% Impervious = 2.257 ac

Time span=0.00-124.00 hrs, dt=0.010 hrs, 12401 points x 3
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-1: Runoff Area=5,451 sf 0.00% Impervious Runoff Depth=5.22"
Tc=6.0 min CN=71/0 Runoff=0.77 cfs 0.054 af

SubcatchmentPR-10: PR-10 Runoff Area=36,662 sf 0.00% Impervious Runoff Depth=5.58"
Flow Length=376' Tc=17.5 min CN=74/0 Runoff=3.92 cfs 0.392 af

SubcatchmentPR-11: PR-11 Runoff Area=37,713 sf 42.64% Impervious Runoff Depth=6.82"
Tc=6.0 min CN=74/98 Runoff=6.40 cfs 0.492 af

SubcatchmentPR-12: PR-12 Runoff Area=23,907 sf 100.00% Impervious Runoff Depth=8.49"
Tc=6.0 min CN=0/98 Runoff=4.71 cfs 0.388 af

SubcatchmentPR-13: PR-13 Runoff Area=9,057 sf 0.00% Impervious Runoff Depth=5.58"
Tc=6.0 min CN=74/0 Runoff=1.35 cfs 0.097 af

SubcatchmentPR-14: PR-14 Runoff Area=95,069 sf 0.00% Impervious Runoff Depth=5.46"
Flow Length=634' Tc=21.3 min CN=73/0 Runoff=9.17 cfs 0.993 af

SubcatchmentPR-15: Uncontrolled Runoff Area=287,937 sf 0.00% Impervious Runoff Depth=5.22"
Flow Length=939' Tc=25.6 min CN=71/0 Runoff=24.51 cfs 2.875 af

SubcatchmentPR-16: Lagoon to WTP - Runoff Area=34,886 sf 67.98% Impervious Runoff Depth=8.41"
Tc=6.0 min CN=96/98 Runoff=6.85 cfs 0.561 af

SubcatchmentPR-2: Runoff Area=12,575 sf 6.19% Impervious Runoff Depth=5.31"
Flow Length=107' Slope=0.0700 '/' Tc=12.9 min CN=70/98 Runoff=1.42 cfs 0.128 af

SubcatchmentPR-3: Runoff Area=5,171 sf 9.19% Impervious Runoff Depth=5.41"
Tc=6.0 min CN=70/98 Runoff=0.74 cfs 0.054 af

SubcatchmentPR-4: PR-4 Runoff Area=29,600 sf 0.00% Impervious Runoff Depth=5.34"
Flow Length=267' Tc=20.2 min CN=72/0 Runoff=2.86 cfs 0.302 af

SubcatchmentPR-5: PR-5 Runoff Area=12,985 sf 74.86% Impervious Runoff Depth=8.03"
Tc=6.0 min CN=83/98 Runoff=2.48 cfs 0.200 af

SubcatchmentPR-6: PR-6 Runoff Area=20,541 sf 100.00% Impervious Runoff Depth=8.49"
Tc=6.0 min CN=0/98 Runoff=4.04 cfs 0.334 af

SubcatchmentPR-7: PR-7 Runoff Area=29,347 sf 0.00% Impervious Runoff Depth=5.58"
Flow Length=336' Tc=16.8 min CN=74/0 Runoff=3.19 cfs 0.313 af

SubcatchmentPR-8: PR-8 Runoff Area=17,046 sf 0.00% Impervious Runoff Depth=5.70"
Tc=6.0 min CN=75/0 Runoff=2.60 cfs 0.186 af

SubcatchmentPR-9: PR-9 Runoff Area=7,575 sf 40.66% Impervious Runoff Depth=6.77"
Tc=6.0 min CN=74/98 Runoff=1.28 cfs 0.098 af

Pond 1P: Bioretention Pond Peak Elev=77.73' Storage=4,210 cf Inflow=6.04 cfs 0.474 af
Discarded=0.02 cfs 0.089 af Primary=5.37 cfs 0.385 af Outflow=5.39 cfs 0.474 af

Pond 2P: Bioretention Peak Elev=70.72' Storage=1,579 cf Inflow=6.39 cfs 0.485 af
Discarded=0.01 cfs 0.032 af Primary=6.26 cfs 0.452 af Outflow=6.27 cfs 0.485 af

Pond 3P: Sediment Forebay Peak Elev=76.54' Storage=1,006 cf Inflow=11.88 cfs 1.335 af
Outflow=11.87 cfs 1.320 af

Pond 4P: Detention Basin Peak Elev=68.54' Storage=43,645 cf Inflow=32.09 cfs 3.448 af
Outflow=21.66 cfs 3.448 af

Pond 5P: Bioretention Peak Elev=74.46' Storage=5,342 cf Inflow=11.87 cfs 1.320 af
Discarded=0.02 cfs 0.095 af Primary=11.12 cfs 1.225 af Outflow=11.14 cfs 1.320 af

Pond 6P: Sediment Forebay Peak Elev=78.99' Storage=688 cf Inflow=6.06 cfs 0.485 af
Outflow=6.04 cfs 0.474 af

Pond 7P: Swale/Pond Peak Elev=77.03' Storage=1,533 cf Inflow=3.19 cfs 0.313 af
Outflow=2.68 cfs 0.313 af

Pond 8P: Bioretention Peak Elev=69.02' Storage=4 cf Inflow=1.27 cfs 0.096 af
Outflow=1.24 cfs 0.096 af

Pond 9P: Sediment Forebay Peak Elev=71.90' Storage=499 cf Inflow=6.40 cfs 0.492 af
Outflow=6.39 cfs 0.485 af

Pond 10P: Sediment Forebay Peak Elev=70.33' Storage=120 cf Inflow=1.28 cfs 0.098 af
Outflow=1.27 cfs 0.096 af

Link PR-DP-1: Southern Boundary Inflow=45.37 cfs 6.419 af
Primary=45.37 cfs 6.419 af

Link PR-DP-2: Road Inflow=2.67 cfs 0.236 af
Primary=2.67 cfs 0.236 af

Total Runoff Area = 15.278 ac Runoff Volume = 7.467 af Average Runoff Depth = 5.87"
85.23% Pervious = 13.022 ac 14.77% Impervious = 2.257 ac

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48 Link PR-DP-1: Southern Boundary
48 Link PR-DP-2: Road

APPENDIX E: STORMWATER DESIGN CALCULATIONS

Woodard & Curran
250 Royall Street: Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA		
PROJECT:	Stearns Meadow Water Treatment Plant		
DESIGNED BY:	JCC	DATE:	8/4/2023
CHECKED BY:	KM	DATE:	8/4/2023
PROJECT NO.	233681.02	SHEET NO.	

System Drawdown Calculations - Bioretention Pond 1

Drawdown Time (T_D)

$T_D = Re_P / (k \times \text{Bottom Area})$

T_D = Drawdown time (hours)

Re_p = Proposed groundwater recharge volume (cubic feet)

k = Saturated hydraulic conductivity; infiltration rate (inches/hour)*

Bottom Area = Bottom area of stormwater BMP (square feet)

ReP =	2,867	cubic feet
k=	0.17	inches/hour
Bottom Area =	2,838	square feet

T_D =	**71.31**	**hours**

T_D < 72 hours, therefore Standard has been met

250 Royall Street; Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA		
PROJECT:	Stearns Meadow Water Treatment Plant		
DESIGNED BY:	JCC	DATE:	8/4/2023
CHECKED BY:	KM	DATE:	8/8/2023
PROJECT NO.	233681.02	SHEET NO.	

System Drawdown Calculations - Bioretention Pond 2

Drawdown Time (T_D)

$T_D = Re_P / (k \times \text{Bottom Area})$

T_D = Drawdown time (hours)

Re_p = Proposed groundwater recharge volume (cubic feet)

k = Saturated hydraulic conductivity; infiltration rate (inches/hour)*

Bottom Area = Bottom area of stormwater BMP (square feet)

ReP =	1,011	cubic feet
k=	0.17	inches/hour
Bottom Area =	1,003	square feet

T_D =	**71.15**	**hours**

T_D < 72 hours, therefore Standard has been met

Woodard & Curran

250 Royall Street; Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA		
PROJECT:	Stearns Meadow Water Treatment Plant		
DESIGNED BY:	JCC	DATE:	8/4/2023
CHECKED BY:	KM	DATE:	8/8/2023
PROJECT NO.	233681.02	SHEET NO.	

System Drawdown Calculations - Bioretention Pond 3

Drawdown Time (T_D)

$T_D = Re_P / (k \times \text{Bottom Area})$

T_D = Drawdown time (hours)

Re_p = Proposed groundwater recharge volume (cubic feet)

k = Saturated hydraulic conductivity; infiltration rate (inches/hour)*

Bottom Area = Bottom area of stormwater BMP (square feet)

ReP =	3,022	cubic feet
k=	0.17	inches/hour
Bottom Area =	2,970	square feet

T_D =	**71.82**	**hours**

T_D < 72 hours, therefore Standard has been met

Woodard & Curran

250 Royall Street; Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA		
PROJECT:	Stearns Meadow Water Treatment Plant		
DESIGNED BY:	JCC	DATE:	8/4/2023
CHECKED BY:	KM	DATE:	8/8/2023
PROJECT NO.	234616.00	SHEET NO.	

Standard #3: Groundwater Recharge Volume Calculations

Required Groundwater Recharge (Re_R)

Re_R = F x Impervious Area

Re_R = Required recharge volume (cubic feet)

Re_C = Adjusted minimum required recharge volume (Capture Area Adjustment)

F = Target depth factor associated with each hydrologic soil group (inches)

Impervious Area = Pavement and Rooftop Area On-site (square feet)

Table 2.3.2: Recharge Target Depth by Hydrologic Soil Group		
NRCS Hydrologic Soil Type	Approx. Soil Texture	Target Depth Factor (F)
A	Sand	0.60
B	Loam	0.35
C	Silty Loam	0.25
D	Clay	0.10

Impervious Area by NRCS Hydrologic Soil Type

I_A	0.00	square feet
I_B	0.00	square feet
I_C	78,626.00	square feet
I_D	0.00	square feet
I_{Total}	78,626.00	square feet

Capture Area Adjustment

Re_R =	1,634.40	cubic feet
Site Area Draining to Recharge Facilities=	74,129.56	square feet
Total site area to site area=	78,451.56	square feet
Ratio of total site area to site area draining to recharge facilities=	1.06	
Re_C=	**1,729.69**	**cubic feet**

Re_R =	**1,638.04 cubic feet**

Proposed Groundwater Recharge Volume (Re_P)

Proposed BMP	Recharge Volume Provided
1 - Bioretention Pond	2,904.00
2 - Bioretention Pond	1,025.00
5 - Bioretention Pond	3,022.00
Total	**6,951.00**

Re_P=	**6,951.00 cubic feet**

Re_P > Re_R > Re_C=, therefore Standard has been met

Woodard & Curran
250 Royall Street: Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA		
PROJECT:	Stearns Meadow Water Treatment Plant		
DESIGNED BY:	JCC	DATE:	8/4/2023
CHECKED BY:	KM	DATE:	8/8/2023
PROJECT NO.	233681.02	SHEET NO.	

Standard #4: Water Quality Volume Calculations

Required Water Quality (WQV_R)

WQV_R = (D_{WQ} / (12 inches/foot)) x (A_{IMP} x (43,560 square feet/acre))

WQV_R = Water quality volume required (cubic feet)

D_{WQ} = Water Quality Depth (inches)

Note: D_{WQ} equals one-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with an infiltration rate greater than 2.4 inches/hour; 1/2 inch for discharges near or to other areas.

A_{IMP} = Impervious Area (acres)

D_{WQ} = 1.00 inches

A_{IMP} = 78,626 square feet

WQV_R = 6,552.17 cubic feet

Proposed Water Quality Volume (WQV_P)

Proposed BMP	Water Quality Volume Provided
1 - Bioretention Pond	2,904.00
2 - Bioretention Pond	1,025.00
5 - Biorentention Pond	3,022.00
Total	**6,951.00**

WQV_P= 6,951.00 cubic feet

WQV_P > WQV_R, therefore Standard has been met

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Subwatershed PR-5, PR-6 (lot), PR-9, PR-11

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Sediment Forebay	**0.25**	**0.75**	**0.19**	**0.56**
Bioretention Area	**0.90**	**0.56**	**0.51**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**
	0.00	**0.06**	**0.00**	**0.06**

Total TSS Removal = **94%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Stearns Meadow WTP**
Prepared By: **Woodard & Curran, JCC**
Date: **8/3/2023**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Subwatershed PR-6 (Roof), PR-12 (Roof)

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	**0.00**	**1.00**	**0.00**	**1.00**
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Stearns Meadow WTP
Prepared By: Woodard & Curran, JCC
Date: 8/3/2023

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Woodard & Curran
250 Royall Street; Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA				
PROJECT:	Stearns Meadow Water Treatment Plant				
DESIGNED BY:	JCC		DATE:	8/4/2023	
CHECKED BY:	KM		DATE:	8/8/2023	
PROJECT NO.	233681.02	SHEET NO.		of	

Stormwater Treatment Calculations - Riprap Apron Sizing (Outlet from 4P)

Per the Federal Highway Administration - Hydraulic Engineering Circular No. 14, Third Edition - Hydraulic Design of Energy Dissipators for Culverts and Channels

$$d_{50} = 0.2D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{T_w}\right)$$

L and d = see riprap class and apron dimension table

$$W_1 = 3D$$

$$W_2 = 3D + \frac{2}{3}L$$

d_{50} = median stone diameter (ft)
D = pipe diameter or channel width (ft)
Q = discharge from pipe during 10-year storm event (cfs)
g = acceleration due to gravity (32.2 ft/s^2)
T_w = tailwater depth (ft)
d = depth of apron
W_1 = width of apron at outlet (ft)
W_2 = width of apron downstream
L = length of apron (ft)

Riprap Classes and Apron Dimensions

Riprap Class	d_{50} (in)	Apron Length, L (ft)	Apron Depth, d (ft)
1	5	4D	$3.5d_{50}$
2	6	4D	$3.3d_{50}$
3	10	5D	$2.4d_{50}$
4	14	6D	$2.2d_{50}$
5	20	7D	$2.0d_{50}$
6	22	8D	$2.0d_{50}$

Massachusetts Stormwater Handbook Requirements

1. Riprap apron must have a minimum width of 5 feet.
2. Riprap apron must have a minimum length of 10 feet.
3. d50 must be at least 9 inches.

Riprap Apron Design Calculations

Input				Output						
Outlet	D (ft)	Q (cfs)	T_w (ft)	d_{50} (ft)*	d_{50} (in)*	Riprap Class	L (ft)*	d (ft)	W_1 (ft)*	W_2 (ft)*
1' Dia. Outlet Culvert	1	0.79	0.4	0.75	9	3	10	2	5	10

**If necessary, value increased to the minimum allowable value required by the Massachusetts Stormwater Handbook*

Woodard & Curran
250 Royall Street; Suite 200E
Canton, MA 02021
Tel: 800.426.4262

CLIENT:	Town of Scituate, MA				
PROJECT:	Stearns Meadow Water Treatment Plant				
DESIGNED BY:	JCC		DATE:	8/4/2023	
CHECKED BY:	KM		DATE:	8/8/2023	
PROJECT NO.	233681.02	SHEET NO.		of	

Stormwater Treatment Calculations - Riprap Apron Sizing (Outlet from 8P)

Per the Federal Highway Administration - Hydraulic Engineering Circular No. 14, Third Edition - Hydraulic Design of Energy Dissipators for Culverts and Channels

$$d_{50} = 0.2D\left(\frac{Q}{\sqrt{g}D^{2.5}}\right)^{4/3}\left(\frac{D}{T_w}\right)$$

L and d = *see riprap class and apron dimension table*

$$W_1 = 3D$$

$$W_2 = 3D + \frac{2}{3}L$$

d_{50} = median stone diameter (ft)
D = pipe diameter or channel width (ft)
Q = discharge from pipe during 10-year storm event (cfs)
g = acceleration due to gravity (32.2 ft/s^2)
T_w = tailwater depth (ft)
d = depth of apron
W_1 = width of apron at outlet (ft)
W_2 = width of apron downstream
L = length of apron (ft)

Riprap Classes and Apron Dimensions

Riprap Class	d_{50} (in)	Apron Length, L (ft)	Apron Depth, d (ft)
1	5	4D	$3.5d_{50}$
2	6	4D	$3.3d_{50}$
3	10	5D	$2.4d_{50}$
4	14	6D	$2.2d_{50}$
5	20	7D	$2.0d_{50}$
6	22	8D	$2.0d_{50}$

Massachusetts Stormwater Handbook Requirements

1. Riprap apron must have a minimum width of 5 feet.
2. Riprap apron must have a minimum length of 10 feet.
3. d50 must be at least 9 inches.

Riprap Apron Design Calculations

Input				Output						
Outlet	D (ft)	Q (cfs)	T_w (ft)	d_{50} (ft)*	d_{50} (in)*	Riprap Class	L (ft)*	d (ft)	W_1 (ft)*	W_2 (ft)*
0.5' Dia. Outlet Culvert	0.5	0.35	0.2	0.75	9	3	10	2	5	8

**If necessary, value increased to the minimum allowable value required by the Massachusetts Stormwater Handbook*

Project: Stearns Meadow Water Treatment Plant
Location: Scituate, MA
Prepared For: Woodard & Curran

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
WQU 1	0.26	0.0004078	6.0	0.100	1.00	774.00	0.32
WQU 2	0.55	0.0008577	6.0	0.100	1.00	774.00	0.66

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

STEARNS MEADOW WATER TREATMENT PLANT SCITUATE, MA

Area	**0.26 ac**	Unit Site Designation	**WQU 1**
Weighted C	**0.9**	Rainfall Station #	**68**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.00	0.00	9.0
0.04	9.5%	18.8%	0.01	0.01	9.1
0.06	8.7%	27.5%	0.01	0.01	8.4
0.08	10.1%	37.6%	0.02	0.02	9.7
0.10	7.2%	44.8%	0.02	0.02	6.8
0.12	6.0%	50.8%	0.03	0.03	5.7
0.14	6.3%	57.1%	0.03	0.03	6.0
0.16	5.6%	62.7%	0.04	0.04	5.3
0.18	4.7%	67.4%	0.04	0.04	4.4
0.20	3.6%	71.0%	0.05	0.05	3.4
0.25	8.2%	79.1%	0.06	0.06	7.6
0.50	14.9%	94.0%	0.12	0.12	13.3
0.75	3.2%	97.3%	0.18	0.18	2.7
1.00	1.2%	98.5%	0.23	0.23	1.0
1.50	0.7%	99.2%	0.35	0.35	0.5
2.00	0.8%	100.0%	0.47	0.47	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					93.6
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**87.2%**

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

STEARNS MEADOW WATER TREATMENT PLANT SCITUATE, MA

Area	0.55 ac	Unit Site Designation	WQU 2
Weighted C	0.9	Rainfall Station #	68
t_c	6 min		
CDS Model	1515-3	CDS Treatment Capacity	**1.0 cfs**

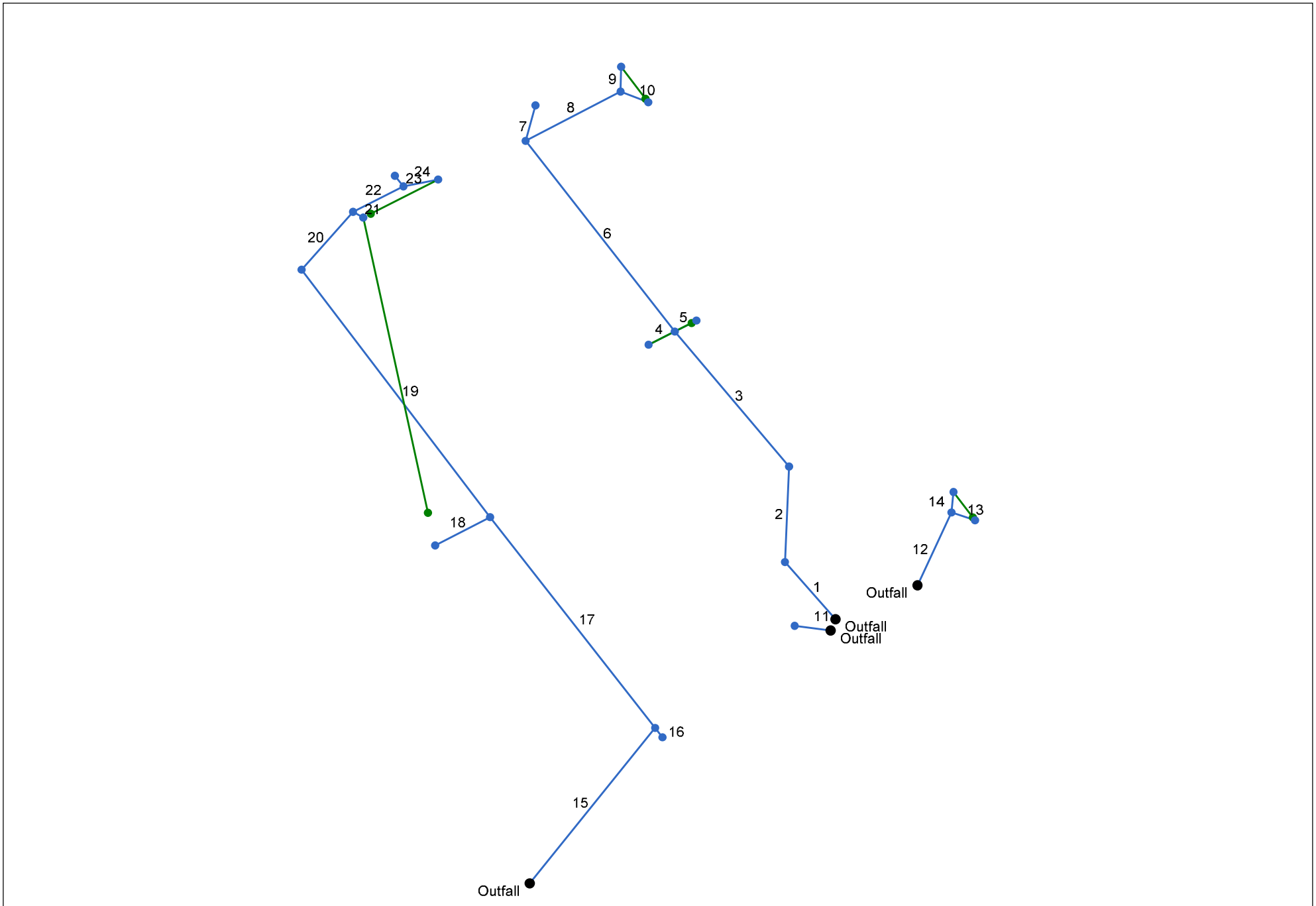
Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.0
0.04	9.5%	18.8%	0.02	0.02	9.1
0.06	8.7%	27.5%	0.03	0.03	8.3
0.08	10.1%	37.6%	0.04	0.04	9.5
0.10	7.2%	44.8%	0.05	0.05	6.7
0.12	6.0%	50.8%	0.06	0.06	5.6
0.14	6.3%	57.1%	0.07	0.07	5.8
0.16	5.6%	62.7%	0.08	0.08	5.1
0.18	4.7%	67.4%	0.09	0.09	4.3
0.20	3.6%	71.0%	0.10	0.10	3.3
0.25	8.2%	79.1%	0.12	0.12	7.2
0.50	14.9%	94.0%	0.25	0.25	12.0
0.75	3.2%	97.3%	0.37	0.37	2.3
1.00	1.2%	98.5%	0.49	0.49	0.8
1.50	0.7%	99.2%	0.74	0.74	0.3
2.00	0.8%	100.0%	0.99	0.99	0.2
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					89.7

Removal Efficiency Adjustment[2] =	6.5%
Predicted % Annual Rainfall Treated =	93.5%
Predicted Net Annual Load Removal Efficiency =	**83.2%**

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	55.734	-125.276	MH	0.00	0.00	0.00	0.0	74.00	1.08	74.60	12	Cir	0.013	0.66	79.00	
2	1	76.045	37.254	MH	0.00	0.00	0.00	0.0	74.70	6.97	80.00	12	Cir	0.013	0.64	87.00	
3	2	129.838	-36.089	MH	0.00	0.00	0.00	0.0	84.40	3.00	88.30	12	Cir	0.013	1.00	93.65	
4	3	19.716	-88.068	Grate	0.00	0.04	0.68	6.0	90.50	2.54	91.00	12	Cir	0.013	1.00	93.65	
5	3	16.351	91.757	Grate	0.00	0.19	0.82	6.0	90.50	1.22	90.70	12	Cir	0.013	1.00	93.30	
6	3	179.034	2.063	MH	0.00	0.00	0.00	0.0	88.40	1.01	90.20	12	Cir	0.013	1.00	96.00	
7	6	28.933	44.523	Grate	0.00	0.68	0.20	20.2	93.00	1.73	93.50	12	Cir	0.013	1.00	95.50	
8	6	72.117	89.074	MH	0.00	0.00	0.00	0.0	90.30	0.97	91.00	12	Cir	0.013	0.88	95.00	
9	8	19.752	-56.120	Grate	0.00	0.03	0.20	6.0	92.10	1.01	92.30	12	Cir	0.013	1.00	94.90	
10	8	19.568	58.721	Grate	0.00	0.03	0.20	6.0	91.10	1.02	91.30	12	Cir	0.013	1.00	93.90	
11	End	23.180	-170.690	Grate	0.00	0.21	0.90	6.0	74.00	4.31	75.00	12	Cir	0.013	1.00	77.90	
12	End	62.000	-69.525	MH	0.00	0.00	0.00	0.0	69.00	0.97	69.60	12	Cir	0.013	1.00	73.00	
13	12	16.250	92.145	Grate	0.00	0.05	0.90	6.0	69.70	1.23	69.90	12	Cir	0.013	1.00	72.50	
14	12	16.298	-16.076	Grate	0.00	0.02	0.90	6.0	70.10	1.23	70.30	12	Cir	0.013	1.00	72.90	
15	End	147.289	-57.160	MH	0.00	0.00	0.00	0.0	72.00	1.29	73.90	12	Cir	0.013	1.00	77.00	
16	15	8.844	115.154	Grate	0.00	0.31	0.50	6.0	74.00	3.39	74.30	12	Cir	0.013	1.00	76.90	
17	15	197.968	-64.915	MH	0.00	0.00	0.00	0.0	74.00	3.23	80.40	12	Cir	0.013	1.00	87.00	
18	17	41.608	-90.661	Grate	0.00	0.14	0.90	6.0	84.00	0.72	84.30	12	Cir	0.013	1.00	86.90	
19	17	230.703	0.714	MH	0.00	0.00	0.00	0.0	84.00	3.38	91.80	12	Cir	0.013	0.93	96.00	
20	19	56.467	66.810	MH	0.00	0.00	0.00	0.0	91.90	1.06	92.50	12	Cir	0.013	1.00	96.50	
21	20	7.957	88.990	Grate	0.00	0.03	0.78	6.0	93.30	1.26	93.40	12	Cir	0.013	1.00	96.30	
22	20	37.975	22.326	MH	0.00	0.00	0.00	0.0	92.60	1.05	93.00	12	Cir	0.013	1.00	96.50	
23	22	10.090	-90.382	Grate	0.00	0.84	0.22	17.5	93.20	2.97	93.50	12	Cir	0.013	1.00	95.50	

Project File: All Drainage Network.stm | Number of lines: 24 | Date: 8/4/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	22	22.798	18.265	Grate	0.00	0.05	0.90	6.0	93.20	2.19	93.70	12	Cir	0.013	1.00	96.30	

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	55.734	0.00	0.97	0.00	0.00	0.33	0.0	22.8	3.7	1.24	3.70	1.57	12	1.08	74.00	74.60	76.42	76.49	75.08	79.00	
2	1	76.045	0.00	0.97	0.00	0.00	0.33	0.0	22.3	3.8	1.25	9.40	2.51	12	6.97	74.70	80.00	76.51	80.47	79.00	87.00	
3	2	129.838	0.00	0.97	0.00	0.00	0.33	0.0	21.9	3.8	1.27	6.17	4.81	12	3.00	84.40	88.30	84.71	88.77	87.00	93.65	
4	3	19.716	0.04	0.04	0.68	0.03	0.03	6.0	6.0	6.7	0.18	5.67	2.64	12	2.54	90.50	91.00	90.62	91.17	93.65	93.65	
5	3	16.351	0.19	0.19	0.82	0.16	0.16	6.0	6.0	6.7	1.05	3.94	3.74	12	1.22	90.50	90.70	90.85	91.13	93.65	93.30	
6	3	179.034	0.00	0.74	0.00	0.00	0.15	0.0	20.3	4.0	0.59	3.57	1.94	12	1.01	88.40	90.20	89.02	90.52	93.65	96.00	
7	6	28.933	0.68	0.68	0.20	0.14	0.14	20.2	20.2	4.0	0.54	4.68	3.32	12	1.73	93.00	93.50	93.23	93.81	96.00	95.50	
8	6	72.117	0.00	0.06	0.00	0.00	0.01	0.0	6.2	6.6	0.08	3.51	0.95	12	0.97	90.30	91.00	90.66	91.11	96.00	95.00	
9	8	19.752	0.03	0.03	0.20	0.01	0.01	6.0	6.0	6.7	0.04	3.58	1.42	12	1.01	92.10	92.30	92.17	92.38	95.00	94.90	
10	8	19.568	0.03	0.03	0.20	0.01	0.01	6.0	6.0	6.7	0.04	3.60	1.43	12	1.02	91.10	91.30	91.17	91.38	95.00	93.90	
11	End	23.180	0.21	0.21	0.90	0.19	0.19	6.0	6.0	6.7	1.27	7.40	1.61	12	4.31	74.00	75.00	76.42	76.45	75.08	77.90	
12	End	62.000	0.00	0.07	0.00	0.00	0.06	0.0	6.2	6.6	0.42	3.50	0.63	12	0.97	69.00	69.60	70.28	70.29	70.08	73.00	
13	12	16.250	0.05	0.05	0.90	0.05	0.05	6.0	6.0	6.7	0.30	3.95	1.44	12	1.23	69.70	69.90	70.29	70.13	73.00	72.50	
14	12	16.298	0.02	0.02	0.90	0.02	0.02	6.0	6.0	6.7	0.12	3.95	1.42	12	1.23	70.10	70.30	70.30	70.44	73.00	72.90	
15	End	147.289	0.00	1.37	0.00	0.00	0.53	0.0	20.1	4.0	2.14	4.04	4.66	12	1.29	72.00	73.90	72.52	74.52	72.00	77.00	
16	15	8.844	0.31	0.31	0.50	0.16	0.16	6.0	6.0	6.7	1.04	6.56	2.31	12	3.39	74.00	74.30	74.91	74.73	77.00	76.90	
17	15	197.968	0.00	1.06	0.00	0.00	0.38	0.0	18.9	4.1	1.56	6.40	2.89	12	3.23	74.00	80.40	74.91	80.93	77.00	87.00	
18	17	41.608	0.14	0.14	0.90	0.13	0.13	6.0	6.0	6.7	0.85	3.02	3.17	12	0.72	84.00	84.30	84.36	84.68	87.00	86.90	
19	17	230.703	0.00	0.92	0.00	0.00	0.25	0.0	18.1	4.2	1.07	6.55	4.70	12	3.38	84.00	91.80	84.27	92.23	87.00	96.00	
20	19	56.467	0.00	0.92	0.00	0.00	0.25	0.0	17.8	4.3	1.08	3.67	2.86	12	1.06	91.90	92.50	92.45	92.94	96.00	96.50	
21	20	7.957	0.03	0.03	0.78	0.02	0.02	6.0	6.0	6.7	0.16	3.99	2.18	12	1.26	93.30	93.40	93.44	93.56	96.50	96.30	
22	20	37.975	0.00	0.89	0.00	0.00	0.23	0.0	17.6	4.3	0.99	3.65	2.70	12	1.05	92.60	93.00	93.15	93.42	96.50	96.50	
23	22	10.090	0.84	0.84	0.22	0.18	0.18	17.5	17.5	4.3	0.79	6.14	2.77	12	2.97	93.20	93.50	93.62	93.87	96.50	95.50	
24	22	22.798	0.05	0.05	0.90	0.05	0.05	6.0	6.0	6.7	0.30	5.27	1.62	12	2.19	93.20	93.70	93.62	93.93	96.50	96.30	

Project File: All Drainage Network.stm

Number of lines: 24

Run Date: 8/4/2023

NOTES:Intensity = 41.47 / (Inlet time + 7.10) ^ 0.71; Return period =Yrs. 25 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	2
4		0.18	0.00	0.15	0.04	Grate	0.0	0.00	0.00	2.00	2.00	0.006	2.00	0.025	0.006	0.013	0.08	6.75	0.05	1.82	0.0	5
5		1.05	0.04	1.08	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.023	0.023	0.013	-0.11	1.32	0.31	1.32	5.0	Off
6		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	3
7		0.54	0.00	0.54	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.110	0.110	0.013	0.19	1.76	0.19	1.76	0.0	6
8		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	6
9		0.04	0.00	0.04	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.004	2.00	0.050	0.050	0.013	0.07	1.34	0.00	0.00	0.0	10
10		0.04	0.00	0.04	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.013	2.00	0.050	0.050	0.013	0.05	1.07	0.00	0.00	0.0	Off
11		1.27	0.00	1.27	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.050	0.050	0.013	0.18	3.57	0.26	3.57	1.0	Off
12		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
13		0.30	0.00	0.23	0.07	Grate	0.0	0.00	0.00	2.00	2.00	0.200	2.00	0.400	0.400	0.013	0.15	0.37	0.09	0.22	0.0	Off
14		0.12	0.00	0.12	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.100	2.00	0.040	0.040	0.013	0.05	1.27	0.00	0.00	0.0	13
15		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
16		1.04	0.00	1.04	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.017	0.017	0.013	0.12	7.33	0.21	7.33	1.0	Off
17		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	15
18		0.85	-nan(ind)	0.00	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.025	2.00	0.040	0.040	0.013	5.00	125.00	5.00	125.00	0.0	Off
19		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	17
20		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	19
21		0.16	0.02	-nan(ind)	0.00	Grate	0.0	0.00	0.00	-nan(ind)	2.00	0.008	2.00	0.033	0.033	0.013	0.09	2.64	5.00	151.51	0.0	18
22		0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	20
23		0.79	0.00	0.79	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.125	0.125	0.013	0.25	1.99	0.25	1.99	0.0	22

Project File: All Drainage Network.stm | Number of lines: 24 | Run Date: 8/4/2023

NOTES: Inlet N-Values = 0.016; Intensity = 41.47 / (Inlet time + 7.10) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24		0.30	0.00	0.29	0.02	Grate	0.0	0.00	0.00	2.00	2.00	0.008	2.00	0.033	0.033	0.013	0.11	3.25	0.04	1.10	0.0	21

Project File: All Drainage Network.stm | Number of lines: 24 | Run Date: 8/4/2023

NOTES: Inlet N-Values = 0.016; Intensity = 41.47 / (Inlet time + 7.10) ^ 0.71; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

APPENDIX F: OPERATIONS & MAINTENANCE PLAN

STORMWATER MANAGEMENT SYSTEM
OPERATION & MAINTENANCE PLAN

This Stormwater Management System Operations & Maintenance Plan (the Plan) outlines measures that are essential for maintaining an effective stormwater management system at the Stearns Meadow Water Treatment Plant (WTP) and associated site improvements (the Site). Periodic and scheduled inspections and maintenance measures are recommended to prevent deficiencies and for proper performance of the stormwater management system. Failure to implement these measures can reduce the hydraulic capacity and the pollutant removal efficiency of stormwater measures potentially resulting in a reduced quality of stormwater runoff discharging from the Site.

RESPONSIBLE PARTY & ESTIMATED ANNUAL BUDGET

The party responsible for implementing this Plan and identifying the source of necessary funds is as follows:

Town of Scituate
600 Chief Justice Cushing Hwy
Scituate, MA 02066
Telephone: (781) 545-8732

GOOD HOUSEKEEPING

The Site will be maintained as clean and orderly. Routine inspections of the Site for debris and sediment accumulations shall be performed. Debris and sediment shall be disposed of in accordance with local and State requirements.

INSPECTIONS & MAINTENANCE MEASURES

Stormwater management is provided by sediment forebays, bioretention ponds, and Continuous Deflective Separation (CDS) units. These measures are illustrated on the Site Plans. Routine inspections and maintenance of the stormwater management system shall be performed in accordance with the *Stormwater Management System Operation & Maintenance Plan* for the Site. These measures are recommended to prevent deficiencies with the system that may result in poor quality stormwater runoff.

A sample Inspection Form is attached that is recommended for use during inspections of the stormwater management system. The form includes a table that outlines specific inspection and maintenance measures, in addition to the following information that can be recorded by the inspector during the inspection. Completed Inspections Forms should be kept at the Site to enable both facility managers and regulatory agencies to ensure that operation of the system is in compliance with permit requirements.

LANDSCAPE MANAGEMENT

Lawn and landscaped areas shall be inspected for patches of dead vegetation and erosion. If these conditions occur, effected areas shall be stabilized and replanted with vegetation to prevent sediment from entering the stormwater management system.

The following additional measures are provided in an effort to minimize the potential for runoff pollution due to overwatering, dead vegetation and erosion, direct disposal of lawn clippings, and over-application of materials such as fertilizers and pesticides.

<u>Lawn Mowing</u>

The following mowing practices are recommended:

- Maintain sharp mower blades.
- Grass shall not be cut shorter than 2 to 3 inches to minimize weed growth. Grass can be cut lower in the spring and fall to stimulate root growth, but no shorter than $1^1/_2$ inches.
- Do not dispose of grass clippings within the stormwater management system.
- Employ practices to minimize the potential for grass clippings to enter the stormwater management system.

Fertilizers & Pesticides

Use of pesticides and fertilizers should be minimized to the extent practicable. Application of these materials may degrade the quality of stormwater runoff and should therefore be applied judiciously. In addition, fertilizers and pesticides shall not be applied when rain is expected. These materials should be stored under cover to prevent their exposure to stormwater.

STORMWATER MANAGEMENT SYSTEM INSPECTION FORM

Town of Scituate, MA
Stearns Meadow Water Treatment Plant
453 Chief Justice Cushing Highway
Scituate, MA 02066

Name of Inspector: _____

Date/Time: _____

Weather: _____

Date of Last Inspection: _____

Items Inspected (Refer to Table 1. Provide additional sheets if necessary.):

_____

_____

_____

_____

_____

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Comments & Corrective Actions Taken (Provide additional sheets if necessary.):

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Table 1 –Operations & Maintenance Measures

Bioretention Pond	
Objective: *Maintain the infiltration and storage capacity of the bioretention pond section.*	
Frequency	***Measure***
Ongoing/As Needed[1]	• Replace or add organic material to improve performance • Inspect vegetation on a regular basis while vegetation is being established • Replace damaged or unhealthy plantings • Maintain vegetative cover on embankments and spillways. Confirm embankment are dense and healthy • Embankment should be mowed twice each year. Other area surrounding wetlands should not require mowing. Mowing and fertilizing help promote vigorous growth of plant roots and resist erosion • Remove accumulated trash from the area and at the outlet structure • Assess bank stability and erosion after major storm events • Inspect species distribution/survival, damage to embankments and spillways from burrowing animals, water elevations, and outlet condition • Remove obstruction that may impede flow through the basin, including trash, debris, and accumulated grass clippings and leaves. Dispose of material in accordance with all applicable regulations
After Heavy Rainfall Events[2]	• Do not stockpile snow on bioretention pond surface. This will require additional maintenance and vacuuming.

[1] At a minimum, perform inspections twice a year for the first year and annually thereafter.
[2] At a minimum, an event accumulating approximately 4.37 inches of rainfall in a 24-hour period

Closed Conduit Drainage Systems/Deep Sump Catch Basins/Outlet Control Structure/Hoods	
Objective: *Preserve the hydraulic capacity of the closed conduit drainage systems.*	
Frequency	***Measure***
Ongoing/As Needed	• Avoid placement of snow on top of catch basin grates. • Inspect catch basin grates and manhole covers for damage. Repair as necessary. Covers and grates shall not be welded to the frame so that the structure can be inspected and maintained. • Remove sediment from bottom of catch basin whenever the depth of sediment is greater than or equal to half the sump depth. Dispose of sediment in accordance with all applicable regulations. • Remove obstructions that may impede flow through catch basin grates, including trash, debris, and accumulated grass clippings and leaves. Dispose of material in accordance with all applicable regulations. • Inspect drainage piping for structural deficiency and debris accumulation. Repair piping as required. Dispose material in accordance with all applicable regulations.
After Heavy Rainfall Events[1]	• Remove sediment from bottom of catch basin when using ½ sump depth with sediment. Dispose of sediment in accordance with all applicable regulations.

[1] At a minimum, perform inspections twice a year for the first year and annually thereafter.

Sediment Forebay	
Objective: *Maintain the storage capacity and removal efficiency of the sediment forebay*	
Frequency	***Measure***
Ongoing/As Needed	• Remove obstruction that may limit runoff from entering the sediment forebay, including sediment, trash, debris, and leaves. • Maintain access to the basin. • Inspect area for signs of erosion. Stabilize accordingly with similar size riprap. • Sediment shall be cleaned out of the sediment forebay when it accumulates to a depth of more than ½ the design depth
After Heavy Rainfall Events[1]	• Inspect for ponded water 24-hours or several days after event. If water is ponded inside the sediment forebay, it may indicate that the bottom of the forebay has failed or that the bottom is clogged, To rehabilitate a failed sediment forebay, remove all riprap from the bottom and strip all accumulated sediment from the bottom. The bottom of the forebay must be scarified and tilled to induce infiltration and replace riprap.

[1] At a minimum, an event accumulating 2.7 inches of rainfall in a 24-hour period.

Detention Basin	
Objective: *Maintain the storage capacity of the detention basin.*	
Frequency	***Measure***
Ongoing/As Needed[1]	• Inspect contributing drainage areas for any sediment or debris. • Inspect detention basin, flared end section, outlet control structure, v-notch weir, and trash rack for any sediment, debris and other obstructions that may impede flow. • Inspect detention basin and outlet control for structural damage. • Inspect the detention basin for erosion. • Observe the water level in the detention basin. Verify that the basin is dry or that the water level is decreasing, and the water is discharging into the swale. • Remove sediment and debris from contributing drainage areas. • Remove silt/sediment from the pond bottom when the sediment volume exceeds 10% of the total basin volume. • Repair minor erosion observed along the embankments. • Remove debris and other obstructions from detention basin. • Remove sediment, debris and other obstructions that may impede flow through the outlet control structure (i.e. trash, debris and leaves). • Dispose of sediment in accordance with all local, state, and federal requirements. • Repair damage (if any) to detention basin, flared end section, outlet control structure, and trash rack. • All repaired areas/infrastructure shall be restored according to original design specifications. • Mow basin vegetation annually along maintenance rights-of-way and the embankment. The remaining setback can be mowed every other year. • Remove grass clippings and leaves from the area.
After Heavy Rainfall Events[2]	• Inspect for ponded water 24-hours or several days after event. If water is ponded it may indicate that the bottom of the basin has failed. To rehabilitate a failed basin, remove top 6 inches and roto-till the surface to a depth of 12 inches. Restore basin to original cross-section and seed to restore ground cover.

[1] At a minimum, an event accumulating 2.7 inches of rainfall in a 24-hour period.

Continuous Deflective Separation (CDS) Unit
Refer to CDS Inspection and Maintenance Guide

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

APPENDIX G: MASSDEP CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

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[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

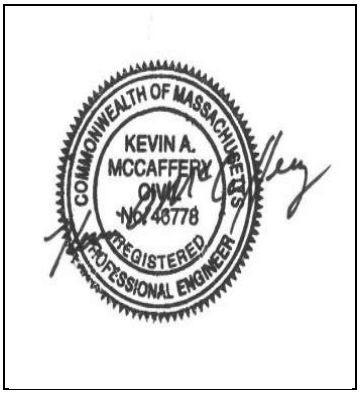
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☒ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☒ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Woodard & Curran

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