STORMWATER MANAGEMENT REPORT

PROPOSED RETAIL MOTOR FUEL OUTLET RE-DEVELOPMENT
MAP U45 LOTS 7, 7-B, 8-A & 11-0
254, 256 & 260 AYER ROAD (ROUTE 2A)
LITTLETON, MA

MAP 30 LOT 16
0 LITTLETON ROAD
AYER, MA

GPI

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Prepared For:

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Revised: April 20, 2023
February 8, 2023

Energy North Group
Proposed Retail Motor Fuel Outlet
Stormwater Management Report

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SECTION 1 EXECUTIVE SUMMARY

Greenman-Pedersen, Inc. (GPI) has prepared this analysis of the stormwater management system for the proposed retail motor fuel outlet re-development located at 254, 256 & 260 Ayer Road (Route 2A/110) in Littleton, Massachusetts and 0 Littleton Road in Ayer, Massachusetts. This analysis includes pre-development and post-development calculations or stormwater runoff rates from the project site. The analysis has been prepared in accordance with the Town of Ayer and Town of Littleton requirements and the Stormwater Management Standards of the Massachusetts Department of Environmental Protection (MassDEP) Massachusetts Stormwater Policy. The design is intended to interface with the improvements proposed as part of the MassDOT project #608443 which will reconstruct Route 2A along the site frontage.

The project site consists of five parcels total. Three parcels south of Ayer Road identified as Map U45 Lots 7-0, 7-B & 8-A (located in Littleton, MA) total approximately 2.79 acres and comprise the primary development area. Two parcels north of Ayer Road identified as Map U45 Lot 11-0 (located in Littleton, MA) and Map 30 Lot 16 (located in Ayer, MA) total approximately 0.52 acres and are ancillary to the primary development. The site south of Ayer Road is bounded by Ayer Road to the north, the intersection of Ayer Road and Bruce Street to the northeast, private residences along Bruce Street to the east, and wooded area to the south and west containing a campground.

The applicant, Energy North Group, proposes to redevelop the existing three parcels into a single development by demolishing the existing buildings and retail motor fuel outlet to construct a new retail motor fuel outlet. The re-development will include a 6,000 square foot convenience store, a new retail fuel canopy with five (5) dispensers (10 fueling positions), a new high-speed diesel fuel canopy with three (3) dispensers (2 fueling positions), three (3) new double-wall fiberglass underground fuel storage tanks, and an associated paved parking lot and driveways.

This project, which is considered a mix of redevelopment and new development under the DEP Stormwater Management Standards, provides on-site stormwater runoff management improvements over the existing site conditions.

In order to mitigate increases in peak discharge rates of stormwater runoff as a result of the new impervious surfaces, a new comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, First Defense hydrodynamic separator units, two oil/water separators, two underground infiltration systems, a sediment forebay, an aboveground infiltration basin, and a bioretention area. The BMP's included in the proposed stormwater system are designed in accordance with the MassDEP Stormwater Management Standards to improve stormwater quality and quantity at the design points.

Based on site topography and discharge points, three design points are utilized for the purpose of this analysis. Design Point #1 represents Ayer Road. Design Point #2 represents the rear of the adjacent property to the east. Design Point #3 represents Willow Road.

The table below summarizes the comparative pre- and post-development peak rates of stormwater runoff at the design points.

TABLE 1: PEAK RATE ANALYSIS SUMMARY

Design Storm	Pre-Development (cfs)	Post-Development (cfs)	Change (cfs)
Design Point #1 – Ayer Road			
2-year	1.3	0.0	-1.3
10-year	3.6	0.2	-3.4
25-year	5.3	0.4	-4.9
100-year	8.0	1.5	-6.5
Design Point #2 – Adjacent Property (east)			
2-year	0.6	0.2	-0.4
10-year	1.7	0.7	-1.0
25-year	2.5	1.0	-1.5
100-year	3.8	1.5	-2.3
Design Point #3 – Willow Road			
2-year	1.1	0.0	-1.1
10-year	2.0	0.4	-1.6
25-year	2.6	0.9	-1.7
100-year	3.5	1.5	-2.0

(All values shown are peak rates in CFS)

In conclusion, by incorporating a new on-site drainage system that includes provisions for stormwater treatment, recharge and detention, there will be a reduction in peak rates of runoff at the Design Points as a result of the project during all storms analyzed.

Implementing the maintenance procedures outlined in the Operation and Maintenance Plan (O&M) will ensure the long-term performance of the system.

SECTION 2 EXISTING CONDITIONS

The project site consists of five parcels total. Three parcels south of Ayer Road identified as Map U45 Lots 7-0, 7-B & 8-A (located in Littleton, MA) total approximately 2.79 acres and comprise the primary development area. Two parcels north of Ayer Road identified as Map U45 Lot 11-0 (located in Littleton, MA) and Map 30 Lot 16 (located in Ayer, MA) total approximately 0.52 acres and are ancillary to the primary development. The site south of Ayer Road is bounded by Ayer Road to the north, the intersection of Ayer Road and Bruce Street to the northeast, private residences along Bruce Street to the east, and wooded area to the south and west containing a campground.

The site contains an existing retail motor fuel outlet with a 1,983 square foot convenience store, a retail fuel canopy with 4 dispensers, a diesel dispenser in the eastern portion of the site, and an associated paved parking lot. The rear (southern) portion of the site contains a 1,974 square foot building housing a tire recycling business. Parcel U45-8-A, which represents the western portion of the project site, is currently undeveloped and contains grassed and wooded areas throughout. Access is provided via two full-access driveways along Ayer Road.

Site topography generally slopes from south to north from a high elevation of 284 at the southern corner of the property to a low elevation of 253 at the northeast property corner along Ayer Road.

The two parcels north of Ayer Road consist of an existing paved parking area with wooded area to the north. Topography in that area slopes south to north from a high elevation of 254 along Ayer Road to a low elevation of 250 at the northern property corner.

Stormwater runoff from the existing development is either captured by one of several existing on-site catch basins or sheet flows over pavement uncontrolled into Ayer Road. It is unclear by survey and record plans where piped outlets from the on-site catch basins are directed, however, it is assumed that all flow eventually discharges into Ayer Road without treatment. Runoff from pervious areas flows over land to the north eventually into Ayer Road. Runoff from the southeastern portion of the site flows over land through woods to the east off-site to the rear of the abutting property. Currently, stormwater runoff receives no treatment or peak flow attenuation prior to discharging off-site eventually into the Ayer Road drainage system.

Stormwater runoff from the parcels north of Ayer Road flows uncontrolled over pavement and through woods to the northeast eventually to Willow Road.

The NRCS Web Soil Survey identifies on-site and surrounding soils as Canton-Charlton-Urban land complex and Hollis-Rock outcrop-Charlton complex with a Hydrologic Soil Group (HSG) classifications of ‘A’ and ‘D’ respectively. Refer to Appendix D for more information.

Test pits were performed by Greenman-Pedersen, Inc. (GPI) on December 15, 2022. The pits included several for drainage system design and others for septic system design. Test pits for drainage encountered sand and gravel as well as loamy sand overlain by fill (up to 5' thick). Test pits #2 - #4 were excavated to depths of nearly 10' with no redoximorphic features or refusal encountered. Test Pit #1 was performed on the property north of Ayer Road and encountered similar soil conditions with no redoximorphic features or refusal to 100" below ground.

There are no wetlands on or immediately adjacent to the site. The site is not located within a special flood hazard area (100-year flood) per insurance rate map number 25017C0216E, with an effective date of June 4, 2010.

SECTION 3 PROPOSED CONDITIONS

The applicant, Energy North Group, proposes to redevelop the existing three parcels into a single development by demolishing the existing buildings and retail motor fuel outlet to construct a new retail motor fuel outlet. The re-development will include a 6,000 square foot convenience store, a new retail fuel canopy with five (5) dispensers (10 fueling positions), a new high-speed diesel fuel canopy with three (3) dispensers (2 fueling positions), three (3) new double-wall fiberglass underground fuel storage tanks, and an associated paved parking lot and driveways.

To serve the redevelopment, the existing easterly driveway will remain and be slightly reconfigured to be an exit-only driveway. The existing driveway to the west will be closed and a new full-access driveway will be constructed further west with geometry to accommodate turning movements for WB-67 trucks.

The project will result in an increase in impervious area of approximately 45,700 square feet and is therefore considered a mix of redevelopment and new development under the DEP Stormwater Management Standards. The proposed design will provide on-site stormwater runoff management improvements over the existing site conditions.

In order to mitigate increases in peak discharge rates of stormwater runoff as a result of the new impervious surfaces, a new comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, First Defense hydrodynamic separator units, two oil/water separators, two underground infiltration systems, a sediment forebay, an aboveground infiltration basin, and a bioretention area.

The BMP's included in the proposed stormwater system are designed in accordance with the MassDEP Stormwater Management Standards to improve stormwater quality and quantity at the design points. Underground drainage pipes have been sized to accommodate the 25-year storm event.

Runoff from the building roof, retail canopy, and diesel canopy will be directed through pipes to an underground infiltration system (UG-INF-2) consisting of Stormtech MC-3500 chambers surrounded by crushed stone. The volume of the system has been designed to maximize the amount of roof runoff recharge. A 6" HDPE outlet pipe is provided as an emergency overflow which is directed back into the on-site drainage system.

Runoff from paved surfaces in the southeastern, southern, and western portions of the site which do not have potential for fuel spills will be captured in deep sump catch basins with hooded outlets and directed through pipes to an underground infiltration system (UG-INF-1). This system consists of Stormtech MC-3500 chambers surrounded by crushed stone with manifold piping and an isolator row for additional pre-treatment prior to infiltration. Outlet control is provided via an outlet pipe and drain manhole to regulate flow rates from the infiltration system before

discharging into the closed drainage system downstream. The infiltration system volume has been designed to maximize the amount of on-site groundwater recharge in an effort to reduce the rate and volume of runoff ultimately leaving the site.

Paved surfaces in the northern and northeastern portions of the site including areas surrounding the dispensers and underground fuel tank pad have the potential for fuel spills and are considered land uses with a higher potential pollutant load (LUHPPL). Runoff from these areas will be captured in deep sump catch basins with hooded outlets and be directed through a First Defense hydrodynamic separator and an oil/water separator to remove floatables, fine particles, and provide storage for fuels/oils in the event of a spill. Runoff will then enter a sediment forebay with an impermeable liner and an aboveground infiltration system to provide treatment and groundwater recharge. An emergency overflow pipe will allow larger storm events to discharge into the closed drainage system within Ayer Road.

As part of the re-development, all existing on-site catch basins are to be removed. The majority of stormwater runoff from the existing site, as described above, currently discharges into Ayer Road with no stormwater treatment, however, due to limited record information the exact pipe discharge points are not known. Accordingly, a new drain overflow connection to the Ayer Road drainage system is proposed to convey treated overflow from the site which is not otherwise infiltrated on-site.

The project will also improve the quantity and quality of the runoff from the two parcels north of Ayer Road by constructing a new bioretention area with rip rap apron to treat runoff from the paved parking area by filtering it through a designed media before infiltrating into the underlying soil or discharging off-site to Willow Road.

An Operation & Maintenance Plan (O&M) will be implemented to safeguard against future intrusion of contaminants and TSS and ensure proper maintenance and function of all drainage components.

To prevent erosion and sedimentation during construction, Best Management Practices including stabilized construction entrances, silt fence, catch basin inserts, and temporary and permanent seeding have been incorporated into the construction sequence.

The total area of disturbance related to the proposed construction on this property is approximately 122,000 square feet, therefore, the project is subject to a US EPA Construction General Permit under the NPDES program.

Stormwater Quality Controls:

1. **Street Sweeping** - to capture sediment prior to entering the drainage system. This would be done on a scheduled basis. TSS Removal Rate = 5%

2. **Catch Basins with Deep Sumps and Hooded Outlets** to capture, pretreat, and direct stormwater to the proposed treatment devices. TSS Removal Rate = 25%
3. **First Defense units** – to provide pretreatment and TSS removal of stormwater runoff prior to entering downstream BMPs. TSS removal rate = 70%
4. **Oil/Water Separator** – to provide additional pretreatment, as well sediment & oil storage capacity prior to discharge to the underground detention system. TSS Removal Rate = 25%
5. **Underground Infiltration Systems** - to recharge convenience store and canopy rooftop runoff & runoff from non-LUHPPL pavement areas. TSS removal rate = 80%
6. **Sediment Forebay** – to provide pretreatment through gravity settling of suspended solids. TSS removal rate = 25%
7. **Aboveground Infiltration Basin** - to recharge runoff from pavement areas. TSS removal rate = 80%
8. **Bioretention Area** – to provide treatment through filtration, microbe activity, and uptake by plants. TSS removal rate = 90%

Groundwater Recharge:

Groundwater recharge is provided in the underground infiltration systems, aboveground infiltration basin, and bioretention area.

Stormwater Quantity Controls:

The stormwater management system has been designed to convey stormwater runoff from the site during the 25-year storm event. Peak flow rates of stormwater runoff are reduced though the use of two underground infiltration systems, an aboveground infiltration basin, and a bioretention area.

Stormwater Management Standards:

Standard #1: Untreated Stormwater

Full compliance:

- No new untreated stormwater discharges directly to wetlands or waters of the Commonwealth are proposed.

Standard #2: Post Development Peak Discharge Rates

Full compliance:

- Implementing the stormwater management system will result in a decrease in post-development peak flow rates compared with pre-development rates for all storms analyzed. Refer to Table 1 in Section 1.

Standard #3: Groundwater Recharge

Full Compliance

On-site groundwater recharge is provided through the use of two underground infiltration systems and a bioretention area.

In accordance with Massachusetts Stormwater Policy, the required groundwater recharge volume (Rv) is based on a target depth factor (F) over impervious areas. The target depth factors for HSG-A & D soils is 0.60 and 0.10 inches respectively. The on-site impervious area = 54,758 sf for A soils and 34,553 sf for D soils.

Required Groundwater Recharge Volume:

$$R_v = F * A_{impervious}$$

$$R_v = 0.60\ inches\left(\frac{1\ ft}{12\ in}\right) * 54{,}758\ sf = \mathbf{2{,}738\ c.f.}$$

$$R_v = F * A_{impervious}$$

$$R_v = 0.10\ inches\left(\frac{1\ ft}{12\ in}\right) * 34{,}553\ sf = \mathbf{288\ c.f.}$$

The total required groundwater recharge volume is **3,026 cubic feet**. The recharge volume provided is the volume within the system below the lowest outlet elevation (measured statically). See summary table below.

Groundwater Recharge Volume Provided		
BMP	**Elevation**	**Volume Provided**
Underground Infiltration System #1	250.00-253.05	**5,781 c.f.**
Underground Infiltration System #2	249.50 – 253.02	**1,522 c.f.**
Aboveground Infiltration Basin	250.00-252.00	**2,945 c.f.**
Bioretention Area	248.00-251.50	**320 c.f.**

Total Annual Recharge Volume Provided = 10,568 c.f.
(See Appendix G for HydroCAD summaries)

Standard #4: TSS Removal

Full Compliance (Except CB-9, Compliance to Maximum Extent Practicable)

Water Quality Volume Calculations:

The proposed infiltration practices are designed to store and infiltrate the water quality volume (V_{WQ}) from its contributing paved impervious surfaces. The water quality volume (V_{WQ}) is the volume of impervious surfaces times the water quality depth (D_{WQ}). A water quality depth of 1 inch is used due to the soils having an infiltration rate greater than 2.4 inches per hour and the use classified as a land use with higher potential pollutant loads (LUHPPL).

Underground Infiltration System #1:

The contributing impervious area to the Infiltration Basin is 31,701 sf.

$$V_{WQ} = D_{WQ} * A_{impervious}$$

$$V_{WQ} = 1\ in \left(\frac{1\ ft}{12\ in}\right) * 31{,}701\ sf = \mathbf{2{,}642\ c.f.}$$

The infiltration basin provides storage capacity for a treatment volume of 5,781 cf of runoff and exceeds the required volume of 2,642 cf.

Aboveground Infiltration #1:

The contributing impervious area to the Infiltration Basin is 28,108 sf.

$$V_{WQ} = D_{WQ} * A_{impervious}$$

$$V_{WQ} = 1\ in \left(\frac{1\ ft}{12\ in}\right) * 28{,}108\ sf = \mathbf{2{,}342\ c.f.}$$

The infiltration basin provides storage capacity for a treatment volume of 2,945 cf of runoff and exceeds the required volume of 2,342 cf.

First Defense Units:

The proposed First Defense units are sized by the manufacturer to provide treatment of the water quality flow rate for each contributing area. The water quality flow rates at DMH-9(FD) and CB-8(FD) during a 1-inch water quality storm are 0.23 cfs and 0.22 cfs respectively. The proposed First Defense FD-4HC unit is NJDEP certified to treat runoff up to 1.50 cfs. Refer to the product brochure and sizing calculations prepared by the manufacturer included in Appendix G.

Oil/Water Separator:
Refer to the detail sheet for information on the oil/water separator design.

Pre-treatment Volume Calculations:

Sediment Forebay:
The proposed sediment forebay provides pretreatment for runoff entering the aboveground infiltration basin.

$$Pre-treatment\ V_{WQ} = 0.1\ in * A_{impervious}$$

$$V_{WQ} = 0.1\ in \left(\frac{1\ ft}{12\ in}\right) * 28{,}108\ sf = \mathbf{234\ c.f.}$$

The sediment forebay provides storage capacity for a pre-treatment volume of 645 cf of runoff and exceeds the required volume of 234 cf.

Isolator Row:
The proposed isolator row provides pretreatment for runoff entering Underground Infiltration Basin #1.

$$Pre-treatment\ V_{WQ} = 0.1\ in * A_{impervious}$$

$$V_{WQ} = 0.1\ in \left(\frac{1\ ft}{12\ in}\right) * 31{,}701\ sf = \mathbf{264\ c.f.}$$

The isolator row provides storage capacity for a pre-treatment volume of 690 cf of runoff and exceeds the required volume of 264 cf.

TSS Removal Rates Summary:

BMP	TSS Removal Rate
Street Sweeping	5%
Deep Sump Catch Basin	25%
Oil/Water Separator	25%
First Defense Unit	70%
Underground Infiltration Systems	80%
Sediment Forebay	25%
Aboveground Infiltration Basin	80%
Bioretention Basin	90%

Treatment Train 'A'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Catch Basin w/ deep sump removal rate (0.25) = 0.24
Load Remaining = 0.95 – 0.24 = **0.71**
Remaining Load: 0.71 x Isolator Row removal rate (0.25) = 0.18
Load Remaining = 0.71 – 0.18 = **0.53**
Remaining Load: 0.53 x Underground Infiltration System removal rate (0.80) = 0.42
Load Remaining = 0.53 – 0.42 = **0.09**
TSS Removal Rate = (1.00 – 0.09) **= 91%**

Treatment Train 'B'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Catch Basin w/ deep sump removal rate (0.25) = 0.24
Load Remaining = 0.95 – 0.24 = **0.71**
Remaining Load: 0.71 x First Defense removal rate (0.70) = 0.50
Load Remaining = 0.71 – 0.50 = **0.21**
Remaining Load: 0.21 x Oil/ Water Separator removal rate (0.25) = 0.05
Load Remaining = 0.21 – 0.05 = **0.16**
Remaining Load: 0.16 x Sediment forebay removal rate (0.25) = 0.04
Load Remaining = 0.16 – 0.04 = **0.12**
Remaining Load: 0.12 x Aboveground Infiltration Basin removal rate (0.80) = 0.10
Load Remaining = 0.12 – 0.10 = **0.02**
TSS Removal Rate = (1.00 – 0.02) **= 98%**

Treatment Train 'C'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x First Defense removal rate (0.70) = 0.67
Load Remaining = 0.95 – 0.67 = **0.28**
Remaining Load: 0.28 x Oil/ Water Separator removal rate (0.25) = 0.07
Load Remaining = 0.28 – 0.07 = **0.21**
Remaining Load: 0.21 x Sediment forebay removal rate (0.25) = 0.05
Load Remaining = 0.21 – 0.05 = **0.16**
Remaining Load: 0.16 x Aboveground Infiltration Basin removal rate (0.80) = 0.13
Load Remaining = 0.16– 0.13 = **0.03**
TSS Removal Rate = (1.00 – 0.03) **= 97%**

Treatment Train 'D'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Bioretention Area removal rate (0.90) = 0.86
Load Remaining = 0.95 – 0.86 = **0.09**
TSS Removal Rate = (1.00 – 0.09) **= 91%**

Treatment Train 'E'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Catch Basin w/ deep sump removal rate (0.25) = 0.24
Load Remaining = 0.95 – 0.24 = **0.71**
Remaining Load: 0.71 x Aboveground Infiltration Basin removal rate (0.80) = 0.57
Load Remaining = 0.71 – 0.57 = **0.14**
TSS Removal Rate = (1.00 – 0.14) **= 86%**

Collectively, the BMPs designed achieve at least 80% removal of the average annual total suspended solids (TSS) from stormwater runoff.

Standard #5: Land Uses with Higher Potential Pollutant Loads (LUHPPL)

Pollution Prevention:

- The project is classified as a land use with higher potential pollutant loads as a gas station. BMPs capable of removing oil and grease have been selected to mitigate any risk associated with potential petroleum spills.
- The site is designed with a canopy structure covering the fuel dispensing islands.
- Spill containment grooves, positive limiting barriers (PLB's), surrounding the entire fueling area are designed to capture any potential spills at the dispensing islands.
- The long-term pollution plan includes good housekeeping practices, preventative maintenance procedures and regular inspections.

Standard #6: Protection of Critical Areas

The site is located within a Zone II of a public water supply. Source control and pollution prevention measures are identified in the Long-Term Pollution Prevention Plan within the Operation and Maintenance Plan (O&M). BMPs have been selected that are suitable for protection of these areas.

Standard #7: Redevelopment Projects

The site is a mix of redevelopment and new development. The redevelopment portion of the project and is subject to Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6 to the maximum extent practicable.

As shown in the standards above, the project fully complies with the Stormwater Management Standards.

Standard #8: Erosion and Sediment Control

Full compliance:

- Erosion and sediment controls are incorporated into the project design to prevent erosion. An Erosion & Sediment Control Plan is included in the site plan set.

Standard #9: Operation and Maintenance Plan

Full compliance:

- A long-term Operation and Maintenance Plan meeting the requirements of this standard has been prepared and is included as a separate document.

Standard #10: Illicit Discharges

Full compliance:

- To the best of our knowledge, the site does not contain any illicit discharges. An illicit discharge statement is included below.

February 8, 2023

Town of Littleton Planning Board
Littleton Town Hall
37 Shattuck Street, PO Box 1305
Littleton, MA 01460

Re: 254, 256 & 260 Ayer Road (Route 2A)
Map U45 Lots 7, 7-B, 8-A & 11-0
Sub: Illicit Discharge Statement
Standard #10

Dear Board Members:

On behalf of our client, Energy North Group, we hereby state that to the best of our knowledge, no illicit discharges exist on the above referenced site and none are proposed with the site re-development plans. Implementing the pollution prevention plan measures outlined in the site redevelopment plans will prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. Refer to the Grading & Drainage Plan from the site plan set for additional information.

Sincerely,
Greenman-Pedersen, Inc.

Cory Mason, P.E.
Project Engineer

February 8, 2023

Town of Ayer Planning Board
Ayer Town Hall
1 Main Street
Ayer, MA 01432

Re: 0 Littleton Road
Map 30 Lot 16
Sub: Illicit Discharge Statement
Standard #10

Dear Board Members:

On behalf of our client, Energy North Group, we hereby state that to the best of our knowledge, no illicit discharges exist on the above referenced site and none are proposed with the site re-development plans. Implementing the pollution prevention plan measures outlined in the site redevelopment plans will prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. Refer to the Grading & Drainage Plan from the site plan set for additional information.

Sincerely,
Greenman-Pedersen, Inc.

Cory Mason, P.E.
Project Engineer

SECTION 4 STORMWATER MODELING METHODOLOGY

The drainage system for this project was modeled using HydroCAD, a stormwater modeling computer program that analyzes the hydrology, and hydraulics of stormwater runoff. HydroCAD is based largely on the hydrology techniques developed by the Soil Conservation Service (SCS/NRCS), combined with other hydrology and hydraulics calculations. For a given rainfall event, these techniques are used to generate hydrographs throughout a watershed. This provides verification that a given drainage system is adequate for the area under consideration, or to predict where flooding or erosion is likely to occur.

In HydroCAD, each watershed is modeled as a Subcatchment, streams and culverts as a Reach (or Pond, depending on available storage capacity), and large wetlands and other natural or artificial storage areas as a Pond. SCS hydrograph generation and routing procedures were used to model both Pre-development and Post-development runoff conditions.

The Pre-development and Post-development watershed limits and the subcatchment characteristics were determined using both USGS and on-the-ground topographic survey information and through visual, on-site inspection. Conservative estimates were used at all times in estimating the hydrologic characteristics of each watershed or subcatchment.

APPENDIX A

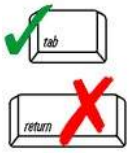
MassDEP Stormwater Checklist

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.

[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.

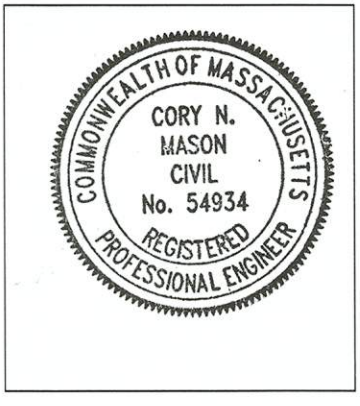
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Cory Mason 4-20-23

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

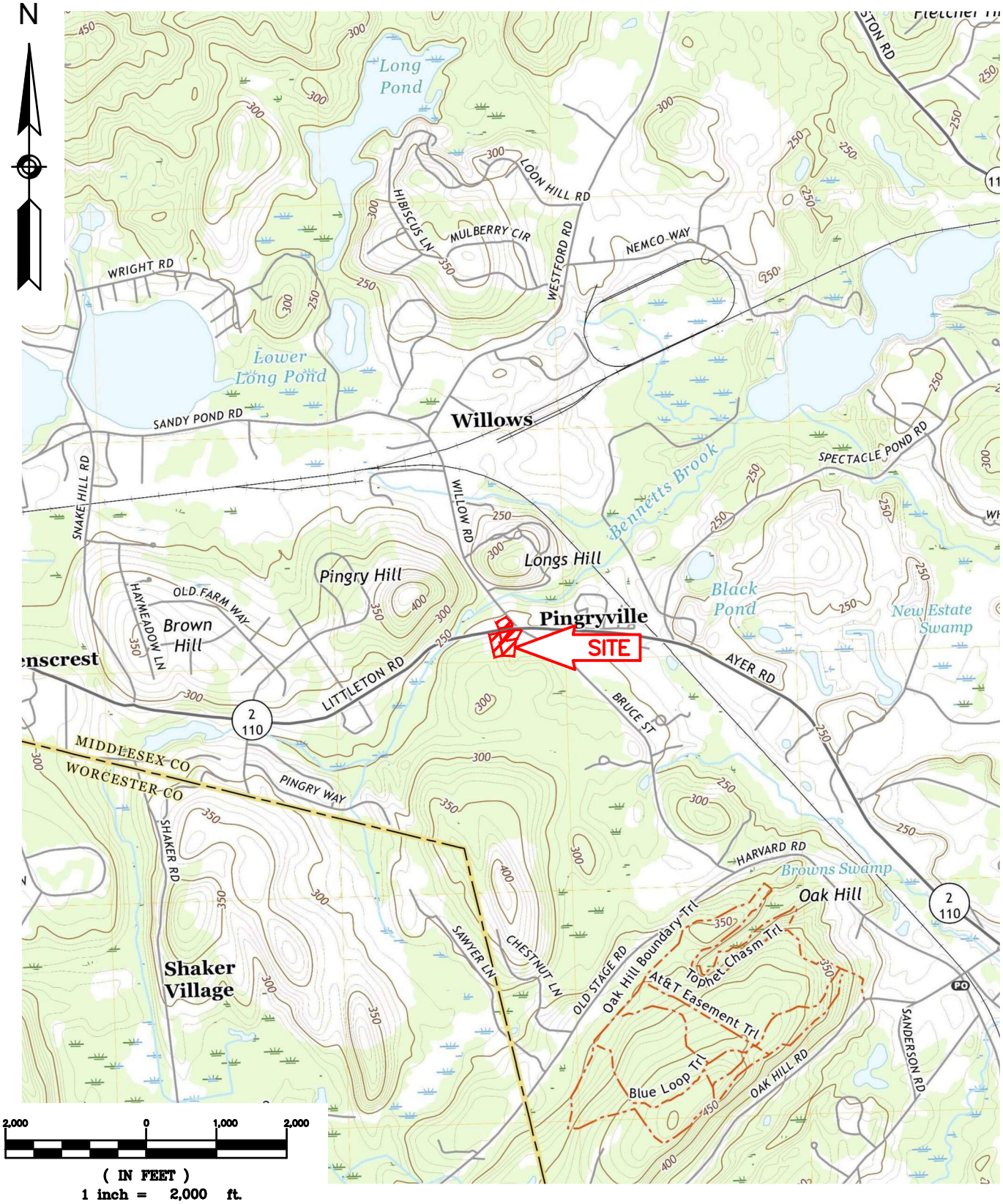
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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.

APPENDIX B

Figures



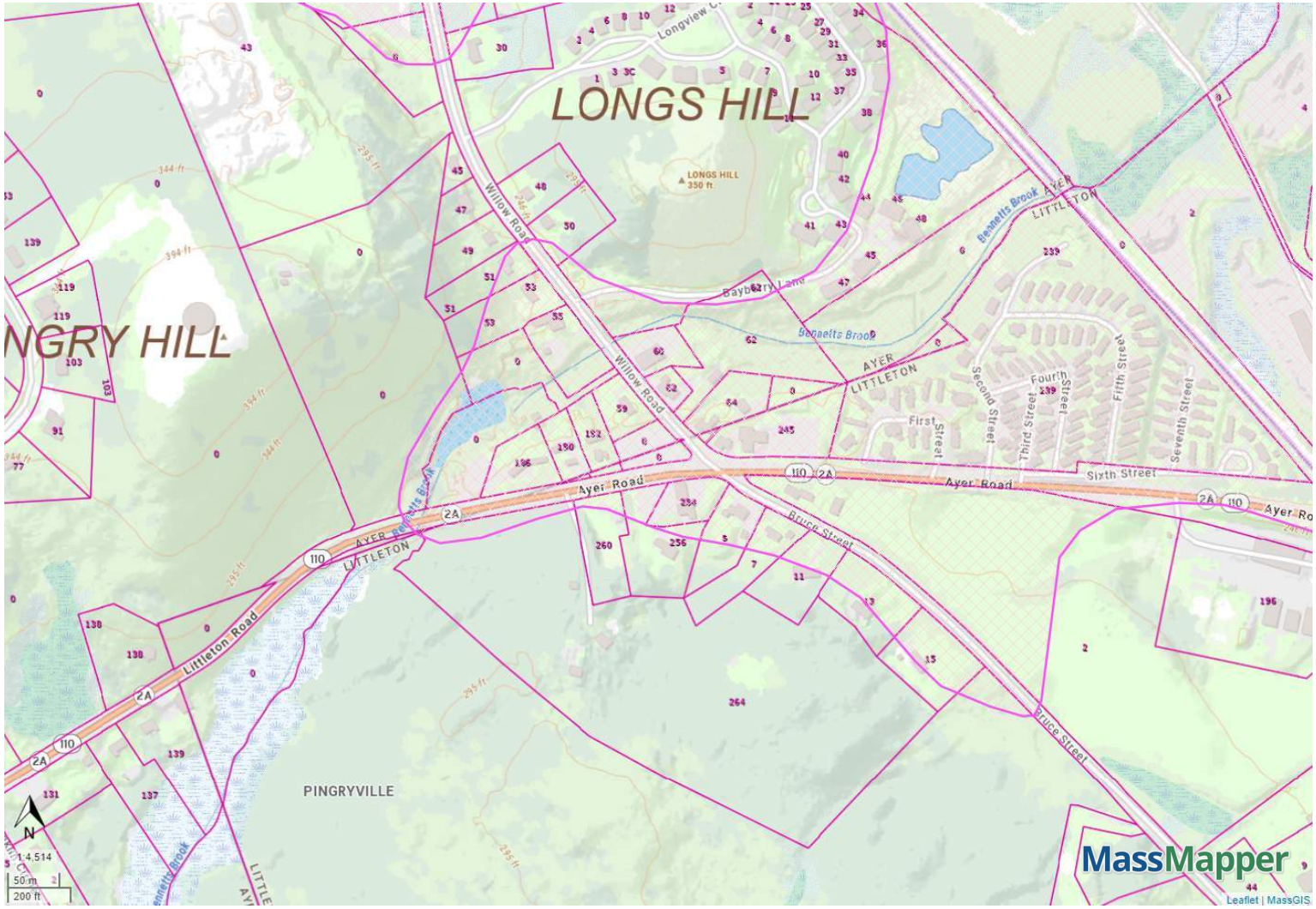
USGS MAP

ENERGY NORTH GROUP
254, 256 & 260 AYER ROAD
LITTLETON, MA
0 LITTLETON ROAD
AYER, MA

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

DRAWN BY: CNM
PROJECT #: NEX-2021267
DATE: 2/8/2023
FIGURE 1

F:\Projects\NEX-2021267 - Littleton, MA - Energy North Goup\Drainage\Stormwater Report\Appendix B - Figures\21267 - USGS MAP.dwg USGS 2/01/23 3:54pm cmason



Areas of Critical Environmental Concern
ACECs

Zone IIs

Property Tax Parcels

APPENDIX C

NRCS Soil Information

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Middlesex County, Massachusetts

November 16, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:3,230 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 22, 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
53A	Freetown muck, ponded, 0 to 1 percent slopes	3.1	8.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	1.9	4.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	2.3	6.1%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	13.7	35.4%
307E	Paxton fine sandy loam, 25 to 35 percent slopes, extremely stony	0.6	1.5%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.6	1.5%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.0	0.1%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.7	1.9%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	15.7	40.6%
Totals for Area of Interest		**38.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion

of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Middlesex County, Massachusetts

53A—Freetown muck, ponded, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2qc
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown, ponded, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Ponded

Setting

Landform: Kettles, marshes, depressions, depressions, bogs, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Swansea, ponded

Percent of map unit: 5 percent
Landform: Bogs, swamps, marshes, depressions, depressions, kettles

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, ponded

Percent of map unit: 5 percent
Landform: Depressions on ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

103B—Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 98yc
Elevation: 0 to 1,490 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 50 percent
Hollis and similar soils: 25 percent
Rock outcrop: 15 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex

Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam
H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D

Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ledges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Canton

Percent of map unit: 2 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Narragansett

Percent of map unit: 2 percent
Landform: Hills, ridges
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder, toeslope
Landform position (three-dimensional): Head slope, nose slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Depressions, hillslopes
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Montauk

Percent of map unit: 1 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent

Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

104C—Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69p
Elevation: 0 to 1,270 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis, extremely stony, and similar soils: 35 percent
Rock outcrop: 25 percent
Charlton, extremely stony, and similar soils: 25 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None

Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Charlton, Extremely Stony

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Canton, extremely stony

Percent of map unit: 7 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 1 percent
Landform: Hills, recessionial moraines, ground moraines, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 1 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

307E—Paxton fine sandy loam, 25 to 35 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w67q
Elevation: 0 to 1,400 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Paxton, extremely stony, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Paxton, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 10 inches: fine sandy loam
Bw1 - 10 to 17 inches: fine sandy loam
Bw2 - 17 to 28 inches: fine sandy loam
Cd - 28 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 25 to 35 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 18 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Ecological site: F144AY007CT - Well Drained Dense Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 8 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Woodbridge, extremely stony

Percent of map unit: 1 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 1 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

311B—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Woodbridge, very stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Very Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, very stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 8 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave

Across-slope shape: Concave
Hydric soil rating: Yes

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 6 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Scituate, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ground moraines, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk, extremely stony

Percent of map unit: 4 percent
Landform: Recessionial moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 4 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer

Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor
Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury
Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley
Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

629C—Canton-Charlton-Urban land complex, 3 to 15 percent slopes

Map Unit Setting
National map unit symbol: 9959
Elevation: 0 to 1,000 feet
Mean annual precipitation: 32 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 110 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 40 percent
Charlton and similar soils: 30 percent
Urban land: 25 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable sandy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 8 inches: fine sandy loam
H2 - 8 to 21 inches: fine sandy loam
H3 - 21 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: 18 to 30 inches to strongly contrasting textural stratification
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Charlton

Setting

Landform: Ground moraines, drumlins
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss

Typical profile

H1 - 0 to 5 inches: fine sandy loam
H2 - 5 to 22 inches: sandy loam

H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Excavated and filled land

Minor Components

Montauk

Percent of map unit: 2 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Head slope, nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Scituate

Percent of map unit: 2 percent
Landform: Hillslopes, depressions
Landform position (two-dimensional): Summit, toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Udorthents, loamy

Percent of map unit: 1 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

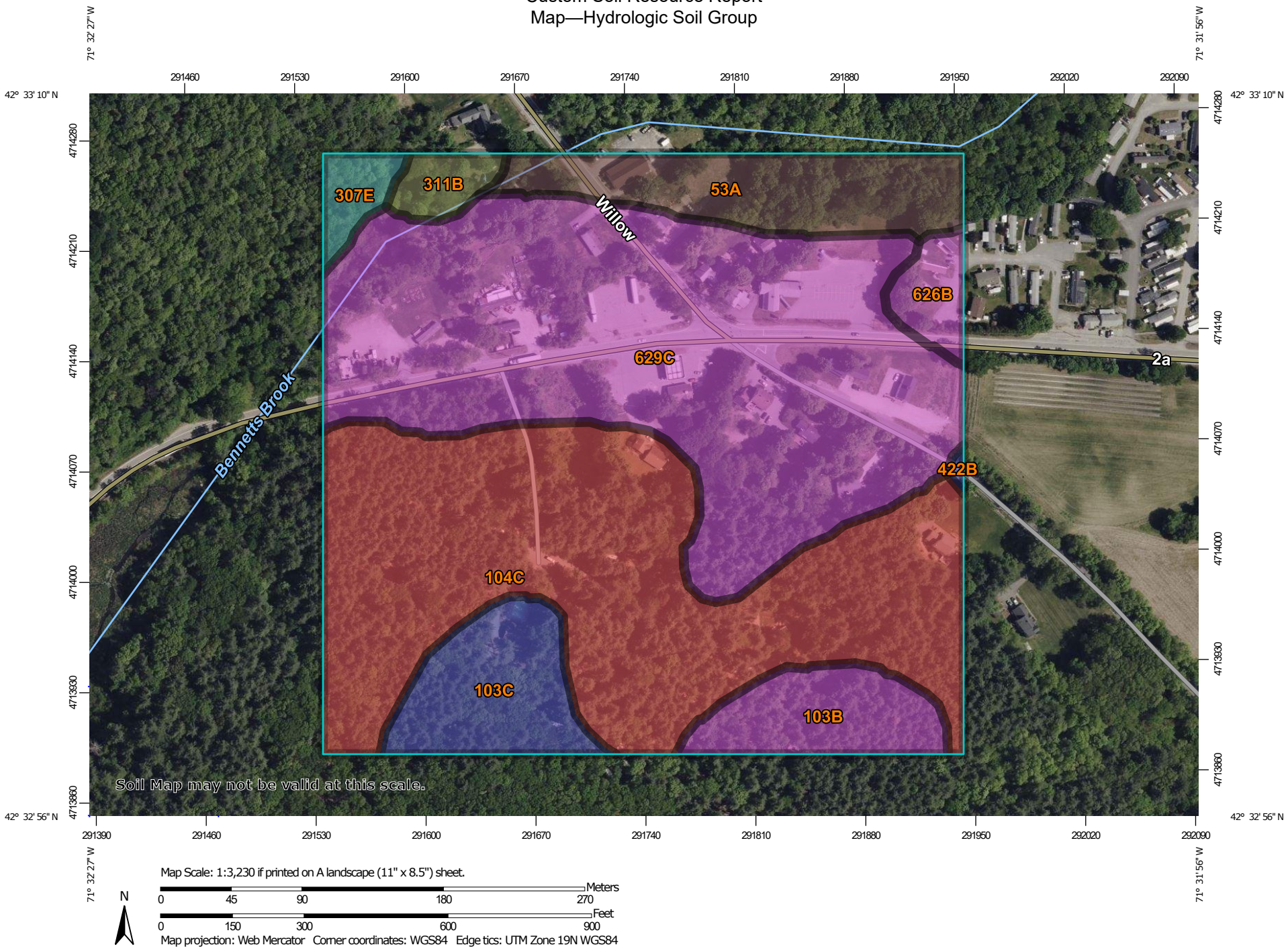
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:3,230 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 22, 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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	3.1	8.0%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	1.9	4.8%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	2.3	6.1%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	13.7	35.4%
307E	Paxton fine sandy loam, 25 to 35 percent slopes, extremely stony	C	0.6	1.5%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	0.6	1.5%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	0.0	0.1%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	0.7	1.9%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A	15.7	40.6%
Totals for Area of Interest			**38.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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APPENDIX D

Test Pit Logs

TEST PIT DATA

Client: Energy North Group
Project Address: 254, 256, & 260 Ayer Road
Town, State: Littleton, MA
Job Number: NEX-2021267
Date: December 15, 2022
Performed by: Diane Pantermoller (SE#1835)

Test Pit No. 1 — SCS Soil: Canton-Charlton-Urban Land Complex
ESHWT: >100” — Standing Water: None
Refusal: >100” — Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Mottles; Quantity/Contrast
0-36”	Fill	Mixed Soils	Variable		
36-100”	C	Coarse Sand	2.5y 4/3	Loose	

Test Pit No. 2 — SCS Soil: Canton-Charlton-Urban Land Complex
ESHWT: >116” — Standing Water: None
Refusal: >116” — Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Mottles; Quantity/Contrast
0-36”	Fill	Mixed Soils	Variable		
36-48”	B	Loamy Sand	10yr 5/6	Friable	
48-116”	C	Sand & Gravel	2.5y 4/3	Loose	

Test Pit No. 3 — SCS Soil: Canton-Charlton-Urban Land Complex
ESHWT: >116” — Standing Water: None
Refusal: >116” — Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Mottles; Quantity/Contrast
0-22”	A/Fill	Loamy Sand	10yr 3/2	Friable	
22-36”	B	Loamy Sand	10yr 5/6	Friable	
36-116”	C	Sand & Gravel	2.5y 4/3	Loose	

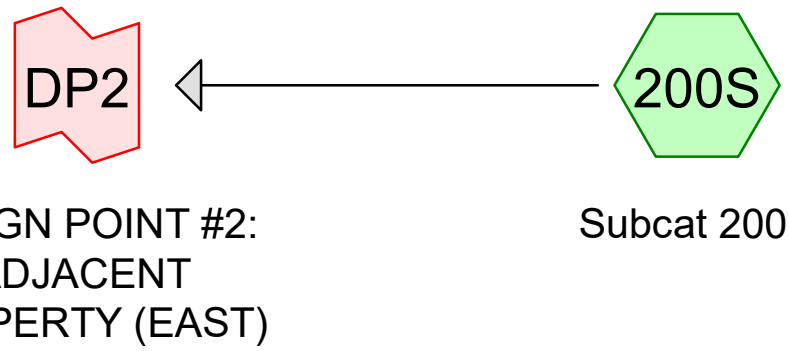
Test Pit No. 4 — SCS Soil: Canton-Charlton-Urban Land Complex
ESHWT: >120” — Standing Water: None
Refusal: >120” — Roots: None

Depth	Horizon	Soil Texture	Color	Consistence	Mottles; Quantity/Contrast
0-60”	Fill	Mixed Soils	Variable		
60-120”	C	Sand & Gravel	2.5y 4/3	Loose	

NOTES

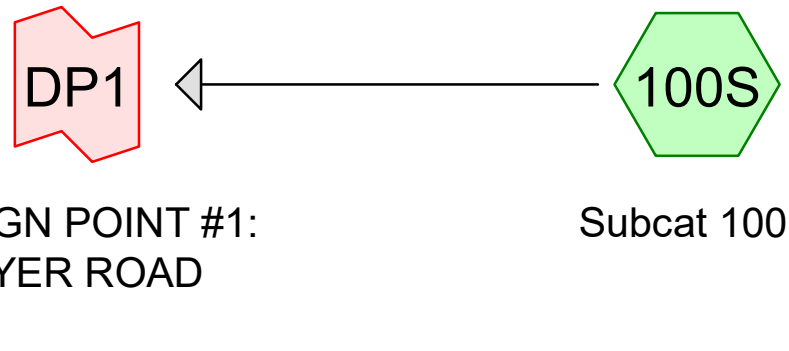
APPENDIX E

Pre-Development HydroCAD Computations



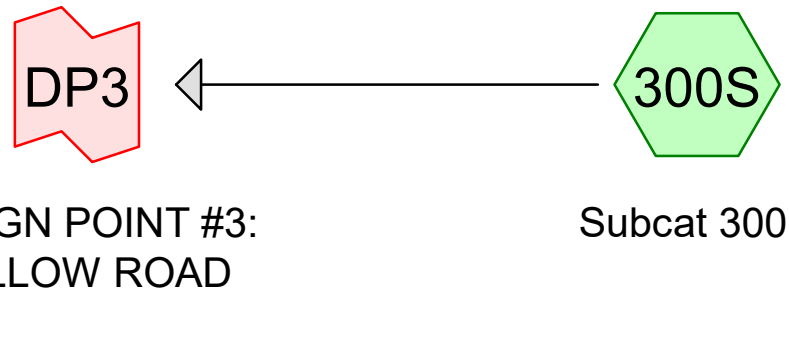
DESIGN POINT #2:
ADJACENT
PROPERTY (EAST)

Subcat 200S



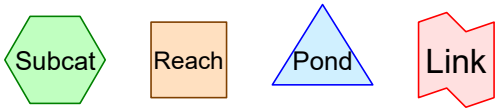
DESIGN POINT #1:
AYER ROAD

Subcat 100S



DESIGN POINT #3:
WILLOW ROAD

Subcat 300S



Routing Diagram for 21267_PRE REV 1
Prepared by Greenman-Pedersen, Inc, Printed 4/20/2023
HydroCAD® 10.20-2g s/n 01710 © 2022 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
14,167	39	>75% Grass cover, Good, HSG A (100S, 200S, 300S)
11,082	80	>75% Grass cover, Good, HSG D (100S, 200S)
11,779	30	Brush, Good, HSG A (100S)
13,448	73	Brush, Good, HSG D (100S)
36,949	98	Paved parking, HSG A (100S, 200S, 300S)
866	98	Paved parking, HSG D (100S, 200S)
3,840	98	Roofs, HSG A (100S)
1,994	98	Roofs, HSG D (100S, 200S)
16,036	30	Woods, Good, HSG A (100S, 200S, 300S)
34,422	77	Woods, Good, HSG D (100S, 200S)
144,584	**70**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
82,772	HSG A	100S, 200S, 300S
0	HSG B	
0	HSG C	
61,812	HSG D	100S, 200S
0	Other	
144,584		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
14,167	0	0	11,082	0	25,249	>75% Grass cover, Good	
11,779	0	0	13,448	0	25,228	Brush, Good	
36,949	0	0	866	0	37,815	Paved parking	
3,840	0	0	1,994	0	5,834	Roofs	
16,036	0	0	34,422	0	50,458	Woods, Good	
82,772	**0**	**0**	**61,812**	**0**	**144,584**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Subcat 100S Runoff Area=1.912 ac 28.57% Impervious Runoff Depth=0.71"
Flow Length=300' Tc=8.3 min CN=68 Runoff=1.25 cfs 4,934 cf

Subcatchment 200S: Subcat 200S Runoff Area=38,429 sf 3.58% Impervious Runoff Depth=0.71"
Flow Length=310' Slope=0.1000 '/' Tc=7.4 min CN=68 Runoff=0.59 cfs 2,277 cf

Subcatchment 300S: Subcat 300S Runoff Area=22,872 sf 80.77% Impervious Runoff Depth=1.72"
Flow Length=130' Tc=6.0 min CN=85 Runoff=1.06 cfs 3,285 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=1.25 cfs 4,934 cf
Primary=1.25 cfs 4,934 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=0.59 cfs 2,277 cf
Primary=0.59 cfs 2,277 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=1.06 cfs 3,285 cf
Primary=1.06 cfs 3,285 cf

Total Runoff Area = 144,584 sf Runoff Volume = 10,496 cf Average Runoff Depth = 0.87"
69.81% Pervious = 100,935 sf 30.19% Impervious = 43,649 sf

Summary for Subcatchment 100S: Subcat 100S

Runoff = 1.25 cfs @ 12.13 hrs, Volume= 4,934 cf, Depth= 0.71"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (ac)	CN	Description
0.234	39	>75% Grass cover, Good, HSG A
0.122	80	>75% Grass cover, Good, HSG D
0.270	30	Brush, Good, HSG A
0.309	73	Brush, Good, HSG D
0.424	98	Paved parking, HSG A
0.017	98	Paved parking, HSG D
0.088	98	Roofs, HSG A
0.017	98	Roofs, HSG D
0.143	30	Woods, Good, HSG A
0.287	77	Woods, Good, HSG D
1.912	68	Weighted Average
1.366		71.43% Pervious Area
0.546		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0800	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	75	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	145	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	300	Total			

Summary for Subcatchment 200S: Subcat 200S

Runoff = 0.59 cfs @ 12.12 hrs, Volume= 2,277 cf, Depth= 0.71"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
3,900	39	>75% Grass cover, Good, HSG A
5,755	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG A
105	98	Paved parking, HSG D
1,271	98	Roofs, HSG D
5,493	30	Woods, Good, HSG A
21,905	77	Woods, Good, HSG D
38,429	68	Weighted Average
37,052		96.42% Pervious Area
1,377		3.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	30	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
3.0	280	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	310	Total			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 1.06 cfs @ 12.09 hrs, Volume= 3,285 cf, Depth= 1.72"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
69	39	>75% Grass cover, Good, HSG A
18,474	98	Paved parking, HSG A
4,329	30	Woods, Good, HSG A
22,872	85	Weighted Average
4,398		19.23% Pervious Area
18,474		80.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	130	Total, Increased to minimum Tc = 6.0 min			

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 83,283 sf, 28.57% Impervious, Inflow Depth = 0.71" for 2-yr event
Inflow = 1.25 cfs @ 12.13 hrs, Volume= 4,934 cf
Primary = 1.25 cfs @ 12.13 hrs, Volume= 4,934 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 38,429 sf, 3.58% Impervious, Inflow Depth = 0.71" for 2-yr event
Inflow = 0.59 cfs @ 12.12 hrs, Volume= 2,277 cf
Primary = 0.59 cfs @ 12.12 hrs, Volume= 2,277 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 80.77% Impervious, Inflow Depth = 1.72" for 2-yr event
Inflow = 1.06 cfs @ 12.09 hrs, Volume= 3,285 cf
Primary = 1.06 cfs @ 12.09 hrs, Volume= 3,285 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Subcat 100S Runoff Area=1.912 ac 28.57% Impervious Runoff Depth=1.79"
Flow Length=300' Tc=8.3 min CN=68 Runoff=3.58 cfs 12,407 cf

Subcatchment 200S: Subcat 200S Runoff Area=38,429 sf 3.58% Impervious Runoff Depth=1.79"
Flow Length=310' Slope=0.1000 '/' Tc=7.4 min CN=68 Runoff=1.70 cfs 5,725 cf

Subcatchment 300S: Subcat 300S Runoff Area=22,872 sf 80.77% Impervious Runoff Depth=3.25"
Flow Length=130' Tc=6.0 min CN=85 Runoff=1.98 cfs 6,191 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=3.58 cfs 12,407 cf
Primary=3.58 cfs 12,407 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=1.70 cfs 5,725 cf
Primary=1.70 cfs 5,725 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=1.98 cfs 6,191 cf
Primary=1.98 cfs 6,191 cf

Total Runoff Area = 144,584 sf Runoff Volume = 24,322 cf Average Runoff Depth = 2.02"
69.81% Pervious = 100,935 sf 30.19% Impervious = 43,649 sf

Summary for Subcatchment 100S: Subcat 100S

Runoff = 3.58 cfs @ 12.13 hrs, Volume= 12,407 cf, Depth= 1.79"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (ac)	CN	Description
0.234	39	>75% Grass cover, Good, HSG A
0.122	80	>75% Grass cover, Good, HSG D
0.270	30	Brush, Good, HSG A
0.309	73	Brush, Good, HSG D
0.424	98	Paved parking, HSG A
0.017	98	Paved parking, HSG D
0.088	98	Roofs, HSG A
0.017	98	Roofs, HSG D
0.143	30	Woods, Good, HSG A
0.287	77	Woods, Good, HSG D
1.912	68	Weighted Average
1.366		71.43% Pervious Area
0.546		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0800	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	75	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	145	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	300	Total			

Summary for Subcatchment 200S: Subcat 200S

Runoff = 1.70 cfs @ 12.11 hrs, Volume= 5,725 cf, Depth= 1.79"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
3,900	39	>75% Grass cover, Good, HSG A
5,755	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG A
105	98	Paved parking, HSG D
1,271	98	Roofs, HSG D
5,493	30	Woods, Good, HSG A
21,905	77	Woods, Good, HSG D
38,429	68	Weighted Average
37,052		96.42% Pervious Area
1,377		3.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	30	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
3.0	280	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	310	Total			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 1.98 cfs @ 12.09 hrs, Volume= 6,191 cf, Depth= 3.25"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
69	39	>75% Grass cover, Good, HSG A
18,474	98	Paved parking, HSG A
4,329	30	Woods, Good, HSG A
22,872	85	Weighted Average
4,398		19.23% Pervious Area
18,474		80.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	130	Total, Increased to minimum Tc = 6.0 min			

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 83,283 sf, 28.57% Impervious, Inflow Depth = 1.79" for 10-yr event
Inflow = 3.58 cfs @ 12.13 hrs, Volume= 12,407 cf
Primary = 3.58 cfs @ 12.13 hrs, Volume= 12,407 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 38,429 sf, 3.58% Impervious, Inflow Depth = 1.79" for 10-yr event
Inflow = 1.70 cfs @ 12.11 hrs, Volume= 5,725 cf
Primary = 1.70 cfs @ 12.11 hrs, Volume= 5,725 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 80.77% Impervious, Inflow Depth = 3.25" for 10-yr event
Inflow = 1.98 cfs @ 12.09 hrs, Volume= 6,191 cf
Primary = 1.98 cfs @ 12.09 hrs, Volume= 6,191 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Subcat 100S Runoff Area=1.912 ac 28.57% Impervious Runoff Depth=2.57"
Flow Length=300' Tc=8.3 min CN=68 Runoff=5.25 cfs 17,817 cf

Subcatchment 200S: Subcat 200S Runoff Area=38,429 sf 3.58% Impervious Runoff Depth=2.57"
Flow Length=310' Slope=0.1000 '/' Tc=7.4 min CN=68 Runoff=2.50 cfs 8,221 cf

Subcatchment 300S: Subcat 300S Runoff Area=22,872 sf 80.77% Impervious Runoff Depth=4.24"
Flow Length=130' Tc=6.0 min CN=85 Runoff=2.56 cfs 8,075 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=5.25 cfs 17,817 cf
Primary=5.25 cfs 17,817 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=2.50 cfs 8,221 cf
Primary=2.50 cfs 8,221 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=2.56 cfs 8,075 cf
Primary=2.56 cfs 8,075 cf

Total Runoff Area = 144,584 sf Runoff Volume = 34,113 cf Average Runoff Depth = 2.83"
69.81% Pervious = 100,935 sf 30.19% Impervious = 43,649 sf

Summary for Subcatchment 100S: Subcat 100S

Runoff = 5.25 cfs @ 12.12 hrs, Volume= 17,817 cf, Depth= 2.57"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (ac)	CN	Description
0.234	39	>75% Grass cover, Good, HSG A
0.122	80	>75% Grass cover, Good, HSG D
0.270	30	Brush, Good, HSG A
0.309	73	Brush, Good, HSG D
0.424	98	Paved parking, HSG A
0.017	98	Paved parking, HSG D
0.088	98	Roofs, HSG A
0.017	98	Roofs, HSG D
0.143	30	Woods, Good, HSG A
0.287	77	Woods, Good, HSG D
1.912	68	Weighted Average
1.366		71.43% Pervious Area
0.546		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0800	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	75	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	145	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	300	Total			

Summary for Subcatchment 200S: Subcat 200S

Runoff = 2.50 cfs @ 12.11 hrs, Volume= 8,221 cf, Depth= 2.57"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
3,900	39	>75% Grass cover, Good, HSG A
5,755	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG A
105	98	Paved parking, HSG D
1,271	98	Roofs, HSG D
5,493	30	Woods, Good, HSG A
21,905	77	Woods, Good, HSG D
38,429	68	Weighted Average
37,052		96.42% Pervious Area
1,377		3.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	30	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
3.0	280	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	310	Total			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 2.56 cfs @ 12.09 hrs, Volume= 8,075 cf, Depth= 4.24"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
69	39	>75% Grass cover, Good, HSG A
18,474	98	Paved parking, HSG A
4,329	30	Woods, Good, HSG A
22,872	85	Weighted Average
4,398		19.23% Pervious Area
18,474		80.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	130	Total, Increased to minimum Tc = 6.0 min			

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 83,283 sf, 28.57% Impervious, Inflow Depth = 2.57" for 25-yr event
Inflow = 5.25 cfs @ 12.12 hrs, Volume= 17,817 cf
Primary = 5.25 cfs @ 12.12 hrs, Volume= 17,817 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 38,429 sf, 3.58% Impervious, Inflow Depth = 2.57" for 25-yr event
Inflow = 2.50 cfs @ 12.11 hrs, Volume= 8,221 cf
Primary = 2.50 cfs @ 12.11 hrs, Volume= 8,221 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 80.77% Impervious, Inflow Depth = 4.24" for 25-yr event
Inflow = 2.56 cfs @ 12.09 hrs, Volume= 8,075 cf
Primary = 2.56 cfs @ 12.09 hrs, Volume= 8,075 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 100S: Subcat 100S Runoff Area=1.912 ac 28.57% Impervious Runoff Depth=3.88"
Flow Length=300' Tc=8.3 min CN=68 Runoff=8.03 cfs 26,963 cf

Subcatchment 200S: Subcat 200S Runoff Area=38,429 sf 3.58% Impervious Runoff Depth=3.88"
Flow Length=310' Slope=0.1000 '/' Tc=7.4 min CN=68 Runoff=3.82 cfs 12,441 cf

Subcatchment 300S: Subcat 300S Runoff Area=22,872 sf 80.77% Impervious Runoff Depth=5.81"
Flow Length=130' Tc=6.0 min CN=85 Runoff=3.46 cfs 11,071 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=8.03 cfs 26,963 cf
Primary=8.03 cfs 26,963 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=3.82 cfs 12,441 cf
Primary=3.82 cfs 12,441 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=3.46 cfs 11,071 cf
Primary=3.46 cfs 11,071 cf

Total Runoff Area = 144,584 sf Runoff Volume = 50,475 cf Average Runoff Depth = 4.19"
69.81% Pervious = 100,935 sf 30.19% Impervious = 43,649 sf

Summary for Subcatchment 100S: Subcat 100S

Runoff = 8.03 cfs @ 12.12 hrs, Volume= 26,963 cf, Depth= 3.88"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (ac)	CN	Description
0.234	39	>75% Grass cover, Good, HSG A
0.122	80	>75% Grass cover, Good, HSG D
0.270	30	Brush, Good, HSG A
0.309	73	Brush, Good, HSG D
0.424	98	Paved parking, HSG A
0.017	98	Paved parking, HSG D
0.088	98	Roofs, HSG A
0.017	98	Roofs, HSG D
0.143	30	Woods, Good, HSG A
0.287	77	Woods, Good, HSG D
1.912	68	Weighted Average
1.366		71.43% Pervious Area
0.546		28.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0800	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	75	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	145	0.0410	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.3	300	Total			

Summary for Subcatchment 200S: Subcat 200S

Runoff = 3.82 cfs @ 12.11 hrs, Volume= 12,441 cf, Depth= 3.88"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
3,900	39	>75% Grass cover, Good, HSG A
5,755	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG A
105	98	Paved parking, HSG D
1,271	98	Roofs, HSG D
5,493	30	Woods, Good, HSG A
21,905	77	Woods, Good, HSG D
38,429	68	Weighted Average
37,052		96.42% Pervious Area
1,377		3.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	30	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.02"
3.0	280	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	310	Total			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 3.46 cfs @ 12.09 hrs, Volume= 11,071 cf, Depth= 5.81"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
69	39	>75% Grass cover, Good, HSG A
18,474	98	Paved parking, HSG A
4,329	30	Woods, Good, HSG A
22,872	85	Weighted Average
4,398		19.23% Pervious Area
18,474		80.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	10	0.2000	2.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	130	Total, Increased to minimum Tc = 6.0 min			

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 83,283 sf, 28.57% Impervious, Inflow Depth = 3.88" for 100-yr event
Inflow = 8.03 cfs @ 12.12 hrs, Volume= 26,963 cf
Primary = 8.03 cfs @ 12.12 hrs, Volume= 26,963 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 38,429 sf, 3.58% Impervious, Inflow Depth = 3.88" for 100-yr event
Inflow = 3.82 cfs @ 12.11 hrs, Volume= 12,441 cf
Primary = 3.82 cfs @ 12.11 hrs, Volume= 12,441 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

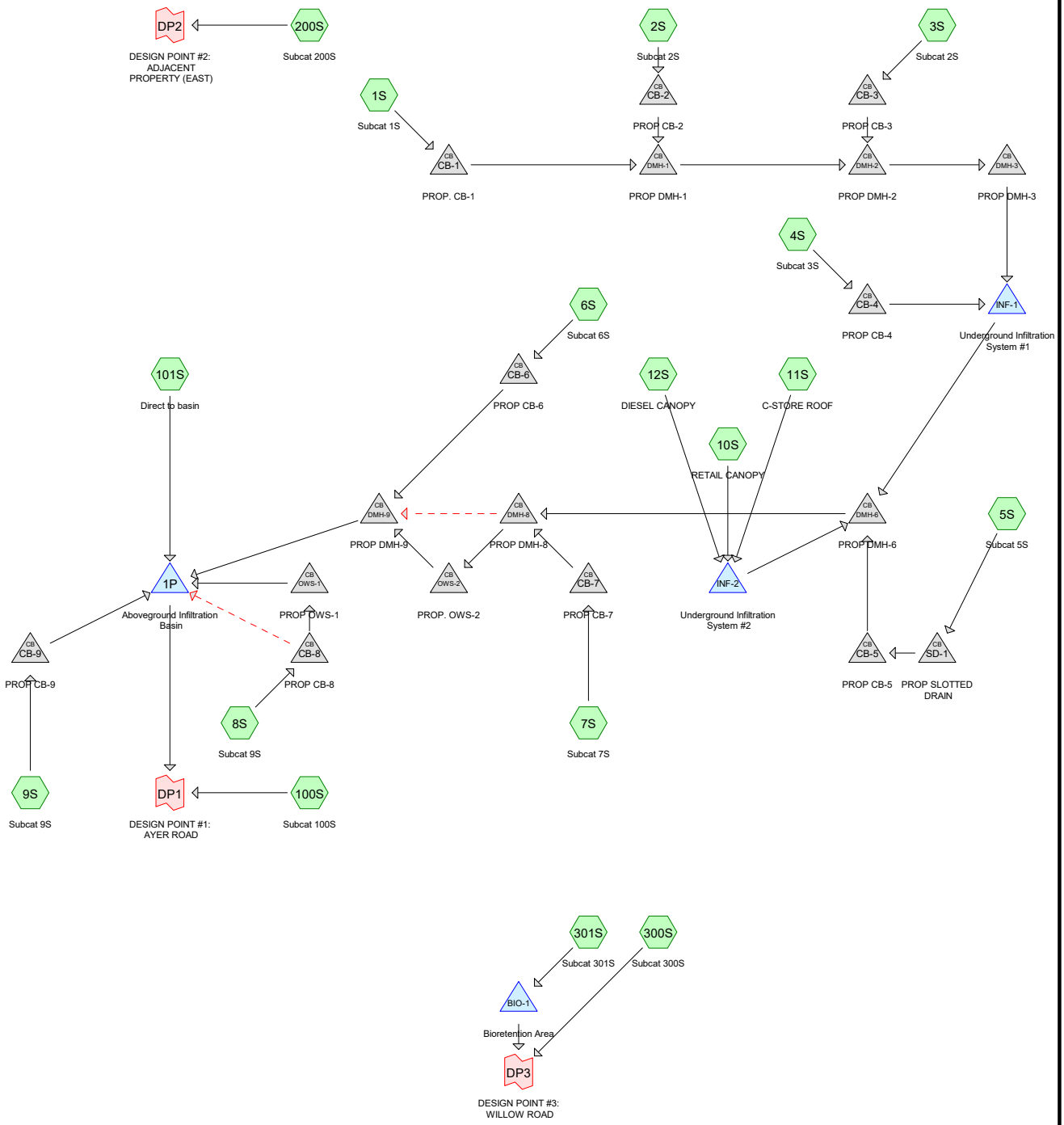
Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 80.77% Impervious, Inflow Depth = 5.81" for 100-yr event
Inflow = 3.46 cfs @ 12.09 hrs, Volume= 11,071 cf
Primary = 3.46 cfs @ 12.09 hrs, Volume= 11,071 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX F

Post-Development HydroCAD Computations



Routing Diagram for 21267_POST REV 1
Prepared by Greenman-Pedersen, Inc, Printed 4/20/2023
HydroCAD® 10.20-2g s/n 01710 © 2022 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
24,770	39	>75% Grass cover, Good, HSG A (4S, 5S, 6S, 8S, 100S, 101S, 200S, 300S, 301S)
19,439	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S, 6S, 8S, 200S)
50,506	98	Paved parking, HSG A (1S, 4S, 5S, 6S, 7S, 8S, 9S, 100S, 101S, 300S, 301S)
28,553	98	Paved parking, HSG D (1S, 2S, 3S, 4S, 6S, 8S, 200S)
4,252	98	Roofs, HSG A (10S, 12S)
6,000	98	Roofs, HSG D (11S)
3,243	30	Woods, Good, HSG A (100S, 101S, 200S, 300S, 301S)
7,823	77	Woods, Good, HSG D (200S)
144,587	**83**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
82,772	HSG A	1S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 12S, 100S, 101S, 200S, 300S, 301S
0	HSG B	
0	HSG C	
61,815	HSG D	1S, 2S, 3S, 4S, 6S, 8S, 11S, 200S
0	Other	
144,587		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
24,770	0	0	19,439	0	44,209	>75% Grass cover, Good	
50,506	0	0	28,553	0	79,059	Paved parking	
4,252	0	0	6,000	0	10,252	Roofs	
3,243	0	0	7,823	0	11,066	Woods, Good	
82,772	**0**	**0**	**61,815**	**0**	**144,587**	**TOTAL AREA**	

Pipe Listing (selected 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	252.00	248.00	31.0	0.1290	0.012	0.0	8.0	0.0
2	CB-1	253.45	252.70	109.0	0.0069	0.012	0.0	12.0	0.0
3	CB-2	254.20	254.00	11.0	0.0182	0.012	0.0	12.0	0.0
4	CB-3	253.20	253.00	11.0	0.0182	0.012	0.0	12.0	0.0
5	CB-4	252.85	252.80	12.0	0.0042	0.012	0.0	12.0	0.0
6	CB-5	253.35	253.10	25.0	0.0100	0.012	0.0	12.0	0.0
7	CB-6	252.90	252.25	78.0	0.0083	0.012	0.0	12.0	0.0
8	CB-7	252.80	252.60	16.0	0.0125	0.012	0.0	12.0	0.0
9	CB-8	250.80	250.70	7.0	0.0143	0.012	0.0	8.0	0.0
10	CB-8	251.80	251.00	20.0	0.0400	0.012	0.0	12.0	0.0
11	CB-9	251.00	250.00	37.0	0.0270	0.012	0.0	12.0	0.0
12	DMH-1	252.60	252.20	85.0	0.0047	0.012	0.0	12.0	0.0
13	DMH-2	251.95	251.65	41.0	0.0073	0.012	0.0	15.0	0.0
14	DMH-3	251.55	250.92	119.0	0.0053	0.012	0.0	15.0	0.0
15	DMH-6	252.60	251.70	149.0	0.0060	0.012	0.0	12.0	0.0
16	DMH-8	251.60	251.50	6.0	0.0167	0.012	0.0	6.0	0.0
17	DMH-8	252.60	252.20	8.0	0.0500	0.012	0.0	18.0	0.0
18	DMH-9	251.05	250.50	106.0	0.0052	0.012	0.0	18.0	0.0
19	INF-1	253.05	252.70	65.0	0.0054	0.012	0.0	12.0	0.0
20	INF-2	253.02	252.70	18.0	0.0178	0.012	0.0	6.0	0.0
21	OWS-1	250.45	250.30	13.0	0.0115	0.012	0.0	8.0	0.0
22	OWS-2	251.25	251.15	6.0	0.0167	0.012	0.0	6.0	0.0
23	SD-1	253.85	253.75	5.0	0.0200	0.012	0.0	8.0	0.0

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1S Runoff Area=8,273 sf 88.76% Impervious Runoff Depth=2.71"
Flow Length=105' Tc=6.0 min CN=96 Runoff=0.56 cfs 1,868 cf

Subcatchment 2S: Subcat 2S Runoff Area=8,626 sf 76.54% Impervious Runoff Depth=2.51"
Flow Length=115' Tc=6.0 min CN=94 Runoff=0.56 cfs 1,801 cf

Subcatchment 3S: Subcat 2S Runoff Area=17,131 sf 55.06% Impervious Runoff Depth=2.13"
Flow Length=155' Tc=6.0 min CN=90 Runoff=0.97 cfs 3,043 cf

Subcatchment 4S: Subcat 3S Runoff Area=14,990 sf 55.51% Impervious Runoff Depth=1.96"
Flow Length=215' Tc=6.0 min CN=88 Runoff=0.79 cfs 2,450 cf

Subcatchment 5S: Subcat 5S Runoff Area=6,531 sf 75.80% Impervious Runoff Depth=1.65"
Flow Length=75' Tc=6.0 min CN=84 Runoff=0.29 cfs 897 cf

Subcatchment 6S: Subcat 6S Runoff Area=5,068 sf 98.56% Impervious Runoff Depth=2.82"
Flow Length=108' Slope=0.0180 '/' Tc=6.0 min CN=97 Runoff=0.35 cfs 1,190 cf

Subcatchment 7S: Subcat 7S Runoff Area=5,589 sf 100.00% Impervious Runoff Depth=2.93"
Flow Length=112' Slope=0.0130 '/' Tc=6.0 min CN=98 Runoff=0.39 cfs 1,364 cf

Subcatchment 8S: Subcat 9S Runoff Area=12,740 sf 96.03% Impervious Runoff Depth=2.71"
Flow Length=150' Slope=0.0230 '/' Tc=6.0 min CN=96 Runoff=0.87 cfs 2,877 cf

Subcatchment 9S: Subcat 9S Runoff Area=338 sf 100.00% Impervious Runoff Depth=2.93"
Flow Length=47' Slope=0.0290 '/' Tc=6.0 min CN=98 Runoff=0.02 cfs 82 cf

Subcatchment 10S: RETAIL CANOPY Runoff Area=3,144 sf 100.00% Impervious Runoff Depth=2.93"
Tc=0.0 min CN=98 Runoff=0.27 cfs 767 cf

Subcatchment 11S: C-STORE ROOF Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=2.93"
Tc=0.0 min CN=98 Runoff=0.52 cfs 1,464 cf

Subcatchment 12S: DIESEL CANOPY Runoff Area=1,108 sf 100.00% Impervious Runoff Depth=2.93"
Tc=0.0 min CN=98 Runoff=0.10 cfs 270 cf

Subcatchment 100S: Subcat 100S Runoff Area=12,338 sf 25.79% Impervious Runoff Depth=0.21"
Flow Length=30' Slope=0.0830 '/' Tc=6.0 min CN=54 Runoff=0.02 cfs 219 cf

Subcatchment 101S: Direct to basin Runoff Area=6,362 sf 0.02% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=37 Runoff=0.00 cfs 0 cf

Subcatchment 200S: Subcat 200S Runoff Area=13,477 sf 0.01% Impervious Runoff Depth=0.76"
Flow Length=182' Tc=6.0 min CN=69 Runoff=0.24 cfs 850 cf

Subcatchment 300S: Subcat 300S Runoff Area=5,994 sf 37.25% Impervious Runoff Depth=0.39"
Flow Length=105' Slope=0.0260 '/' Tc=6.0 min CN=60 Runoff=0.04 cfs 196 cf

Subcatchment 301S: Subcat 301S Runoff Area=16,878 sf 81.98% Impervious Runoff Depth=1.88"
Flow Length=120' Slope=0.0175 '/' Tc=6.0 min CN=87 Runoff=0.85 cfs 2,644 cf

Pond 1P: Aboveground Infiltration Basin Peak Elev=251.50' Storage=1,784 cf Inflow=1.92 cfs 6,410 cf
Discarded=0.74 cfs 6,410 cf Primary=0.00 cfs 0 cf Outflow=0.74 cfs 6,410 cf

Pond BIO-1: Bioretention Area Peak Elev=251.39' Storage=253 cf Inflow=0.85 cfs 2,644 cf
Discarded=0.72 cfs 2,644 cf Primary=0.00 cfs 0 cf Outflow=0.72 cfs 2,644 cf

Pond CB-1: PROP. CB-1 Peak Elev=253.88' Inflow=0.56 cfs 1,868 cf
12.0" Round Culvert n=0.012 L=109.0' S=0.0069 '/' Outflow=0.56 cfs 1,868 cf

Pond CB-2: PROP CB-2 Peak Elev=254.58' Inflow=0.56 cfs 1,801 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=0.56 cfs 1,801 cf

Pond CB-3: PROP CB-3 Peak Elev=253.73' Inflow=0.97 cfs 3,043 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=0.97 cfs 3,043 cf

Pond CB-4: PROP CB-4 Peak Elev=253.41' Inflow=0.79 cfs 2,450 cf
12.0" Round Culvert n=0.012 L=12.0' S=0.0042 '/' Outflow=0.79 cfs 2,450 cf

Pond CB-5: PROP CB-5 Peak Elev=253.62' Inflow=0.29 cfs 897 cf
12.0" Round Culvert n=0.012 L=25.0' S=0.0100 '/' Outflow=0.29 cfs 897 cf

Pond CB-6: PROP CB-6 Peak Elev=253.20' Inflow=0.35 cfs 1,190 cf
12.0" Round Culvert n=0.012 L=78.0' S=0.0083 '/' Outflow=0.35 cfs 1,190 cf

Pond CB-7: PROP CB-7 Peak Elev=253.12' Inflow=0.39 cfs 1,364 cf
12.0" Round Culvert n=0.012 L=16.0' S=0.0125 '/' Outflow=0.39 cfs 1,364 cf

Pond CB-8: PROP CB-8 Peak Elev=251.57' Inflow=0.87 cfs 2,877 cf
Primary=0.87 cfs 2,877 cf Secondary=0.00 cfs 0 cf Outflow=0.87 cfs 2,877 cf

Pond CB-9: PROP CB-9 Peak Elev=251.50' Inflow=0.02 cfs 82 cf
12.0" Round Culvert n=0.012 L=37.0' S=0.0270 '/' Outflow=0.02 cfs 82 cf

Pond DMH-1: PROP DMH-1 Peak Elev=253.26' Inflow=1.12 cfs 3,669 cf
12.0" Round Culvert n=0.012 L=85.0' S=0.0047 '/' Outflow=1.12 cfs 3,669 cf

Pond DMH-2: PROP DMH-2 Peak Elev=252.77' Inflow=2.09 cfs 6,712 cf
15.0" Round Culvert n=0.012 L=41.0' S=0.0073 '/' Outflow=2.09 cfs 6,712 cf

Pond DMH-3: PROP DMH-3 Peak Elev=252.34' Inflow=2.09 cfs 6,712 cf
15.0" Round Culvert n=0.012 L=119.0' S=0.0053 '/' Outflow=2.09 cfs 6,712 cf

Pond DMH-6: PROP DMH-6 Peak Elev=252.96' Inflow=0.29 cfs 897 cf
12.0" Round Culvert n=0.012 L=149.0' S=0.0060 '/' Outflow=0.29 cfs 897 cf

Pond DMH-8: PROP DMH-8 Peak Elev=252.59' Inflow=0.68 cfs 2,261 cf
Primary=0.68 cfs 2,261 cf Secondary=0.00 cfs 0 cf Outflow=0.68 cfs 2,261 cf

Pond DMH-9: PROP DMH-9 Peak Elev=251.58' Inflow=1.03 cfs 3,451 cf
18.0" Round Culvert n=0.012 L=106.0' S=0.0052 '/' Outflow=1.03 cfs 3,451 cf

Pond INF-1: Underground Infiltration Peak Elev=251.32' Storage=2,141 cf Inflow=2.88 cfs 9,162 cf
Discarded=0.67 cfs 9,162 cf Primary=0.00 cfs 0 cf Outflow=0.67 cfs 9,162 cf

Pond INF-2: Underground Infiltration System Peak Elev=250.95' Storage=555 cf Inflow=0.88 cfs 2,501 cf
Discarded=0.17 cfs 2,501 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 2,501 cf

Pond OWS-1: PROP OWS-1 Peak Elev=251.53' Inflow=0.87 cfs 2,877 cf
8.0" Round Culvert n=0.012 L=13.0' S=0.0115 '/' Outflow=0.87 cfs 2,877 cf

Pond OWS-2: PROP. OWS-2 Peak Elev=252.08' Inflow=0.68 cfs 2,261 cf
6.0" Round Culvert n=0.012 L=6.0' S=0.0167 '/' Outflow=0.68 cfs 2,261 cf

Pond SD-1: PROP SLOTTED DRAIN Peak Elev=254.17' Inflow=0.29 cfs 897 cf
8.0" Round Culvert n=0.012 L=5.0' S=0.0200 '/' Outflow=0.29 cfs 897 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=0.02 cfs 219 cf
Primary=0.02 cfs 219 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=0.24 cfs 850 cf
Primary=0.24 cfs 850 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=0.04 cfs 196 cf
Primary=0.04 cfs 196 cf

Total Runoff Area = 144,587 sf Runoff Volume = 21,981 cf Average Runoff Depth = 1.82"
38.23% Pervious = 55,276 sf 61.77% Impervious = 89,311 sf

Summary for Subcatchment 1S: Subcat 1S

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 1,868 cf, Depth= 2.71"
Routed to Pond CB-1 : PROP. CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
929	80	>75% Grass cover, Good, HSG D
1,328	98	Paved parking, HSG A
6,015	98	Paved parking, HSG D
8,273	96	Weighted Average
929		11.24% Pervious Area
7,343		88.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	25	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.5	80	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: Subcat 2S

Runoff = 0.56 cfs @ 12.08 hrs, Volume= 1,801 cf, Depth= 2.51"
Routed to Pond CB-2 : PROP CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
2,023	80	>75% Grass cover, Good, HSG D
6,603	98	Paved parking, HSG D
8,626	94	Weighted Average
2,023		23.46% Pervious Area
6,603		76.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	30	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	85	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	115	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Subcat 2S

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 3,043 cf, Depth= 2.13"
Routed to Pond CB-3 : PROP CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
7,699	80	>75% Grass cover, Good, HSG D
9,432	98	Paved parking, HSG D
17,131	90	Weighted Average
7,699		44.94% Pervious Area
9,432		55.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	75	0.2100	3.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0380	3.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	155	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: Subcat 3S

Runoff = 0.79 cfs @ 12.09 hrs, Volume= 2,450 cf, Depth= 1.96"
Routed to Pond CB-4 : PROP CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
889	39	>75% Grass cover, Good, HSG A
5,780	80	>75% Grass cover, Good, HSG D
2,875	98	Paved parking, HSG A
5,446	98	Paved parking, HSG D
14,990	88	Weighted Average
6,669		44.49% Pervious Area
8,321		55.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
1.0	150	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0240	3.14		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	215	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Subcat 5S

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 897 cf, Depth= 1.65"
Routed to Pond SD-1 : PROP SLOTTED DRAIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
1,580	39	>75% Grass cover, Good, HSG A
4,951	98	Paved parking, HSG A
6,531	84	Weighted Average
1,580		24.20% Pervious Area
4,951		75.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.3	25	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Subcat 6S

Runoff = 0.35 cfs @ 12.08 hrs, Volume= 1,190 cf, Depth= 2.82"
Routed to Pond CB-6 : PROP CB-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
31	39	>75% Grass cover, Good, HSG A
42	80	>75% Grass cover, Good, HSG D
3,973	98	Paved parking, HSG A
1,022	98	Paved parking, HSG D
5,068	97	Weighted Average
73		1.44% Pervious Area
4,995		98.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0180	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	88	0.0180	2.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	108	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Subcat 7S

Runoff = 0.39 cfs @ 12.08 hrs, Volume= 1,364 cf, Depth= 2.93"
Routed to Pond CB-7 : PROP CB-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
5,589	98	Paved parking, HSG A
5,589		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0130	0.82		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	92	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	112	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Subcat 9S

Runoff = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf, Depth= 2.71"
Routed to Pond CB-8 : PROP CB-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
44	80	>75% Grass cover, Good, HSG D
12,201	98	Paved parking, HSG A
34	98	Paved parking, HSG D
12,740	96	Weighted Average
505		3.97% Pervious Area
12,234		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0230	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	130	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: Subcat 9S

Runoff = 0.02 cfs @ 12.08 hrs, Volume= 82 cf, Depth= 2.93"
Routed to Pond CB-9 : PROP CB-9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
338	98	Paved parking, HSG A
338		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0290	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.1	22	0.0290	3.46		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	47	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 10S: RETAIL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.27 cfs @ 12.00 hrs, Volume= 767 cf, Depth= 2.93"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
3,144	98	Roofs, HSG A
3,144		100.00% Impervious Area

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

Summary for Subcatchment 11S: C-STORE ROOF

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.52 cfs @ 12.00 hrs, Volume= 1,464 cf, Depth= 2.93"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
6,000	98	Roofs, HSG D
6,000		100.00% Impervious Area

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

Summary for Subcatchment 12S: DIESEL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.10 cfs @ 12.00 hrs, Volume= 270 cf, Depth= 2.93"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
1,108	98	Roofs, HSG A
1,108		100.00% Impervious Area

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

Summary for Subcatchment 100S: Subcat 100S

Runoff = 0.02 cfs @ 12.37 hrs, Volume= 219 cf, Depth= 0.21"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
9,110	39	>75% Grass cover, Good, HSG A
3,182	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
12,338	54	Weighted Average
9,156		74.21% Pervious Area
3,182		25.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0830	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
2.2	30	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 101S: Direct to basin

[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 1P : Aboveground Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
5,132	39	>75% Grass cover, Good, HSG A
1	98	Paved parking, HSG A
1,229	30	Woods, Good, HSG A
6,362	37	Weighted Average
6,361		99.98% Pervious Area
1		0.02% Impervious Area

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

Summary for Subcatchment 200S: Subcat 200S

Runoff = 0.24 cfs @ 12.10 hrs, Volume= 850 cf, Depth= 0.76"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
1,612	39	>75% Grass cover, Good, HSG A
2,921	80	>75% Grass cover, Good, HSG D
1	98	Paved parking, HSG D
1,119	30	Woods, Good, HSG A
7,823	77	Woods, Good, HSG D
13,477	69	Weighted Average
13,476		99.99% Pervious Area
1		0.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	25	0.1500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.6	67	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	182	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 196 cf, Depth= 0.39"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
2,957	39	>75% Grass cover, Good, HSG A
2,233	98	Paved parking, HSG A
804	30	Woods, Good, HSG A
5,994	60	Weighted Average
3,761		62.75% Pervious Area
2,233		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0260	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	75	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	5	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 301S: Subcat 301S

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 2,644 cf, Depth= 1.88"
Routed to Pond BIO-1 : Bioretention Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.16"

Area (sf)	CN	Description
2,997	39	>75% Grass cover, Good, HSG A
13,836	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
16,878	87	Weighted Average
3,042		18.02% Pervious Area
13,836		81.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	120	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Aboveground Infiltration Basin

[80] Warning: Exceeded Pond CB-9 by 0.49' @ 12.57 hrs (0.87 cfs 965 cf)

Inflow Area = 95,900 sf, 73.05% Impervious, Inflow Depth = 0.80" for 2-yr event
Inflow = 1.92 cfs @ 12.08 hrs, Volume= 6,410 cf
Outflow = 0.74 cfs @ 12.32 hrs, Volume= 6,410 cf, Atten= 61%, Lag= 14.3 min
Discarded = 0.74 cfs @ 12.32 hrs, Volume= 6,410 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.50' @ 12.32 hrs Surf.Area= 1,899 sf Storage= 1,784 cf
Flood Elev= 254.00' Surf.Area= 4,536 sf Storage= 9,913 cf

Plug-Flow detention time= 40.0 min calculated for 6,408 cf (100% of inflow)
Center-of-Mass det. time= 40.0 min (816.7 - 776.7)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	9,913 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.00	830	155.0	0	0	830
251.49	1,591	183.0	1,773	1,773	1,624
251.50	2,092	287.0	18	1,792	5,514
252.00	2,529	297.0	1,154	2,945	6,001
254.00	4,536	329.0	6,968	9,913	7,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	252.00'	**8.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.00' / 248.00' S= 0.1290 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#3	Primary	253.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.74 cfs @ 12.32 hrs HW=251.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.74 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' TW=0.00' (Dynamic Tailwater)
├**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BIO-1: Bioretention Area

Inflow Area = 16,878 sf, 81.98% Impervious, Inflow Depth = 1.88" for 2-yr event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 2,644 cf
Outflow = 0.72 cfs @ 12.14 hrs, Volume= 2,644 cf, Atten= 15%, Lag= 3.0 min
Discarded = 0.72 cfs @ 12.14 hrs, Volume= 2,644 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.39' @ 12.14 hrs Surf.Area= 548 sf Storage= 253 cf
Flood Elev= 252.00' Surf.Area= 1,438 sf Storage= 837 cf

Plug-Flow detention time= 13.2 min calculated for 2,643 cf (100% of inflow)
Center-of-Mass det. time= 13.2 min (832.6 - 819.4)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	837 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	59	38.0	0.0	0	0	59
250.49	59	38.0	35.0	51	51	154
250.50	59	38.0	100.0	1	52	154
251.00	199	90.0	100.0	61	113	685
252.00	1,438	414.0	100.0	724	837	13,682

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	251.50'	**6.0' 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

Discarded OutFlow Max=0.72 cfs @ 12.14 hrs HW=251.39' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.72 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=248.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond CB-1: PROP. CB-1

Inflow Area = 8,273 sf, 88.76% Impervious, Inflow Depth = 2.71" for 2-yr event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 1,868 cf
Outflow = 0.56 cfs @ 12.08 hrs, Volume= 1,868 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.08 hrs, Volume= 1,868 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.88' @ 12.09 hrs
Flood Elev= 256.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.45'	**12.0" Round Culvert**
			L= 109.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 253.45' / 252.70' S= 0.0069 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.56 cfs @ 12.08 hrs HW=253.88' TW=253.26' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.56 cfs @ 2.58 fps)

Summary for Pond CB-2: PROP CB-2

Inflow Area = 8,626 sf, 76.54% Impervious, Inflow Depth = 2.51" for 2-yr event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 1,801 cf
Outflow = 0.56 cfs @ 12.08 hrs, Volume= 1,801 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.08 hrs, Volume= 1,801 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.58' @ 12.08 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	254.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 254.20' / 254.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.56 cfs @ 12.08 hrs HW=254.58' TW=253.26' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.56 cfs @ 3.06 fps)

Summary for Pond CB-3: PROP CB-3

Inflow Area = 17,131 sf, 55.06% Impervious, Inflow Depth = 2.13" for 2-yr event
Inflow = 0.97 cfs @ 12.09 hrs, Volume= 3,043 cf
Outflow = 0.97 cfs @ 12.09 hrs, Volume= 3,043 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.09 hrs, Volume= 3,043 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.73' @ 12.09 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.20' / 253.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.97 cfs @ 12.09 hrs HW=253.73' TW=252.77' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.97 cfs @ 3.38 fps)

Summary for Pond CB-4: PROP CB-4

Inflow Area = 14,990 sf, 55.51% Impervious, Inflow Depth = 1.96" for 2-yr event
Inflow = 0.79 cfs @ 12.09 hrs, Volume= 2,450 cf
Outflow = 0.79 cfs @ 12.09 hrs, Volume= 2,450 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.09 hrs, Volume= 2,450 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.41' @ 12.09 hrs
Flood Elev= 256.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.85'	**12.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 252.85' / 252.80' S= 0.0042 '/' Cc= 0.900
n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.09 hrs HW=253.41' TW=250.83' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.79 cfs @ 2.54 fps)

Summary for Pond CB-5: PROP CB-5

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 1.65" for 2-yr event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.62' @ 12.09 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.35'	**12.0" Round Culvert**
			L= 25.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 253.35' / 253.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.09 hrs HW=253.62' TW=252.96' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.29 cfs @ 2.52 fps)

Summary for Pond CB-6: PROP CB-6

Inflow Area = 5,068 sf, 98.56% Impervious, Inflow Depth = 2.82" for 2-yr event
Inflow = 0.35 cfs @ 12.08 hrs, Volume= 1,190 cf
Outflow = 0.35 cfs @ 12.08 hrs, Volume= 1,190 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.08 hrs, Volume= 1,190 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.20' @ 12.08 hrs
Flood Elev= 256.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.90'	**12.0" Round Culvert**
			L= 78.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 252.90' / 252.25' S= 0.0083 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.35 cfs @ 12.08 hrs HW=253.20' TW=251.56' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.35 cfs @ 2.70 fps)

Summary for Pond CB-7: PROP CB-7

Inflow Area = 5,589 sf,100.00% Impervious, Inflow Depth = 2.93" for 2-yr event
Inflow = 0.39 cfs @ 12.08 hrs, Volume= 1,364 cf
Outflow = 0.39 cfs @ 12.08 hrs, Volume= 1,364 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.39 cfs @ 12.08 hrs, Volume= 1,364 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.12' @ 12.08 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.80'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.80' / 252.60' S= 0.0125 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.08 hrs HW=253.12' TW=252.57' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.39 cfs @ 2.73 fps)

Summary for Pond CB-8: PROP CB-8

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 2.71" for 2-yr event
Inflow = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf
Outflow = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf
Routed to Pond OWS-1 : PROP OWS-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.57' @ 12.33 hrs
Flood Elev= 254.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.80'	**8.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.80' / 250.70' S= 0.0143 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#2	Secondary	251.80'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.80' / 251.00' S= 0.0400 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.86 cfs @ 12.08 hrs HW=251.46' TW=251.19' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.86 cfs @ 3.12 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.80' TW=250.00' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Summary for Pond CB-9: PROP CB-9

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=577)

Inflow Area = 338 sf,100.00% Impervious, Inflow Depth = 2.93" for 2-yr event
Inflow = 0.02 cfs @ 12.08 hrs, Volume= 82 cf
Outflow = 0.02 cfs @ 12.08 hrs, Volume= 82 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 12.08 hrs, Volume= 82 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.50' @ 12.33 hrs
Flood Elev= 253.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.00'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.00' / 250.00' S= 0.0270 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.02 cfs @ 12.08 hrs HW=251.09' TW=250.97' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.02 cfs @ 0.84 fps)

Summary for Pond DMH-1: PROP DMH-1

Inflow Area = 16,899 sf, 82.53% Impervious, Inflow Depth = 2.61" for 2-yr event
Inflow = 1.12 cfs @ 12.08 hrs, Volume= 3,669 cf
Outflow = 1.12 cfs @ 12.08 hrs, Volume= 3,669 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.08 hrs, Volume= 3,669 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.26' @ 12.09 hrs
Flood Elev= 257.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0047 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.11 cfs @ 12.08 hrs HW=253.26' TW=252.77' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.11 cfs @ 2.87 fps)

Summary for Pond DMH-2: PROP DMH-2

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 2.37" for 2-yr event
Inflow = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf
Outflow = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf
Routed to Pond DMH-3 : PROP DMH-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.77' @ 12.09 hrs
Flood Elev= 257.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.95'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.95' / 251.65' S= 0.0073 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.08 cfs @ 12.09 hrs HW=252.77' TW=252.34' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.08 cfs @ 3.46 fps)

Summary for Pond DMH-3: PROP DMH-3

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 2.37" for 2-yr event
Inflow = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf
Outflow = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.09 cfs @ 12.09 hrs, Volume= 6,712 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.34' @ 12.09 hrs
Flood Elev= 258.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.55'	**15.0" Round Culvert** L= 119.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.55' / 250.92' S= 0.0053 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.09 cfs @ 12.09 hrs HW=252.34' TW=250.82' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.09 cfs @ 3.66 fps)

Summary for Pond DMH-6: PROP DMH-6

Inflow Area = 65,803 sf, 71.28% Impervious, Inflow Depth = 0.16" for 2-yr event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.96' @ 12.10 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 149.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 251.70' S= 0.0060 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.28 cfs @ 12.09 hrs HW=252.96' TW=252.58' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.28 cfs @ 1.64 fps)

Summary for Pond DMH-8: PROP DMH-8

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.38" for 2-yr event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf
Outflow = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf
Routed to Pond OWS-2 : PROP. OWS-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.59' @ 12.09 hrs
Flood Elev= 255.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.60'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.60' / 251.50' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Secondary	252.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.67 cfs @ 12.09 hrs HW=252.57' TW=252.07' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.67 cfs @ 3.41 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=251.60' TW=251.05' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond DMH-9: PROP DMH-9

Inflow Area = 76,460 sf, 75.18% Impervious, Inflow Depth = 0.54" for 2-yr event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 3,451 cf
Outflow = 1.03 cfs @ 12.09 hrs, Volume= 3,451 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.03 cfs @ 12.09 hrs, Volume= 3,451 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.58' @ 12.32 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.05'	**18.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.05' / 250.50' S= 0.0052 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.99 cfs @ 12.09 hrs HW=251.56' TW=250.98' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.99 cfs @ 2.80 fps)

Summary for Pond INF-1: Underground Infiltration System #1

Inflow Area = 49,020 sf, 64.67% Impervious, Inflow Depth = 2.24" for 2-yr event
Inflow = 2.88 cfs @ 12.09 hrs, Volume= 9,162 cf
Outflow = 0.67 cfs @ 12.49 hrs, Volume= 9,162 cf, Atten= 77%, Lag= 24.1 min
Discarded = 0.67 cfs @ 12.49 hrs, Volume= 9,162 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.32' @ 12.49 hrs Surf.Area= 2,808 sf Storage= 2,141 cf
Flood Elev= 255.50' Surf.Area= 2,808 sf Storage= 9,206 cf

Plug-Flow detention time= 17.8 min calculated for 9,158 cf (100% of inflow)
Center-of-Mass det. time= 17.8 min (816.8 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	250.00'	2,103 cf	**29.92'W x 48.72'L x 5.50'H Field A** 8,016 cf Overall - 2,758 cf Embedded = 5,258 cf x 40.0% Voids
#2A	250.75'	2,758 cf	**ADS_StormTech MC-3500 d +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 24 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
#3B	250.00'	804 cf	**8.42'W x 63.06'L x 5.50'H Field B** 2,919 cf Overall - 909 cf Embedded = 2,010 cf x 40.0% Voids
#4B	250.75'	909 cf	**ADS_StormTech MC-3500 d +Cap** x 8 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#5C	250.00'	715 cf	**8.42'W x 55.89'L x 5.50'H Field C** 2,587 cf Overall - 799 cf Embedded = 1,788 cf x 40.0% Voids
#6C	250.75'	799 cf	**ADS_StormTech MC-3500 d +Cap** x 7 Inside #5 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#7D	250.00'	538 cf	**8.42'W x 41.55'L x 5.50'H Field D** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids

#8D	250.75'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #7 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		9,206 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.05'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.05' / 252.70' S= 0.0054 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.67 cfs @ 12.49 hrs HW=251.32' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.67 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' TW=252.60' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)

Summary for Pond INF-2: Underground Infiltration System #2

Inflow Area = 10,252 sf,100.00% Impervious, Inflow Depth = 2.93" for 2-yr event
Inflow = 0.88 cfs @ 12.00 hrs, Volume= 2,501 cf
Outflow = 0.17 cfs @ 12.37 hrs, Volume= 2,501 cf, Atten= 80%, Lag= 22.3 min
Discarded = 0.17 cfs @ 12.37 hrs, Volume= 2,501 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 250.95' @ 12.37 hrs Surf.Area= 651 sf Storage= 555 cf
Flood Elev= 255.00' Surf.Area= 651 sf Storage= 2,111 cf

Plug-Flow detention time= 16.9 min calculated for 2,500 cf (100% of inflow)
Center-of-Mass det. time= 16.9 min (768.0 - 751.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	249.50'	981 cf	**8.42'W x 77.40'L x 5.50'H Field A** 3,583 cf Overall - 1,129 cf Embedded = 2,454 cf x 40.0% Voids
#2A	250.25'	1,129 cf	**ADS_StormTech MC-3500 d +Cap** x 10 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		2,111 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.50'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.02'	**6.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.02' / 252.70' S= 0.0178 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.17 cfs @ 12.37 hrs HW=250.95' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.50' TW=252.60' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Summary for Pond OWS-1: PROP OWS-1

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 2.71" for 2-yr event
Inflow = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf
Outflow = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.87 cfs @ 12.08 hrs, Volume= 2,877 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.53' @ 12.32 hrs
Flood Elev= 254.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.45'	**8.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.45' / 250.30' S= 0.0115 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.78 cfs @ 12.08 hrs HW=251.19' TW=250.97' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.78 cfs @ 2.25 fps)

Summary for Pond OWS-2: PROP. OWS-2

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.38" for 2-yr event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf
Outflow = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 12.09 hrs, Volume= 2,261 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.08' @ 12.09 hrs
Flood Elev= 255.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.25' / 251.15' S= 0.0167 '/' Cc= 0.900

n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.68 cfs @ 12.09 hrs HW=252.07' TW=251.56' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.68 cfs @ 3.44 fps)

Summary for Pond SD-1: PROP SLOTTED DRAIN

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 1.65" for 2-yr event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 897 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 897 cf
Routed to Pond CB-5 : PROP CB-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.17' @ 12.09 hrs
Flood Elev= 255.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.85'	**8.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.85' / 253.75' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.29 cfs @ 12.09 hrs HW=254.17' TW=253.62' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.29 cfs @ 2.53 fps)

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 108,238 sf, 67.67% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.02 cfs @ 12.37 hrs, Volume= 219 cf
Primary = 0.02 cfs @ 12.37 hrs, Volume= 219 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 13,477 sf, 0.01% Impervious, Inflow Depth = 0.76" for 2-yr event
Inflow = 0.24 cfs @ 12.10 hrs, Volume= 850 cf
Primary = 0.24 cfs @ 12.10 hrs, Volume= 850 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 70.26% Impervious, Inflow Depth = 0.10" for 2-yr event
Inflow = 0.04 cfs @ 12.13 hrs, Volume= 196 cf
Primary = 0.04 cfs @ 12.13 hrs, Volume= 196 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1S Runoff Area=8,273 sf 88.76% Impervious Runoff Depth=4.40"
Flow Length=105' Tc=6.0 min CN=96 Runoff=0.89 cfs 3,036 cf

Subcatchment 2S: Subcat 2S Runoff Area=8,626 sf 76.54% Impervious Runoff Depth=4.18"
Flow Length=115' Tc=6.0 min CN=94 Runoff=0.90 cfs 3,005 cf

Subcatchment 3S: Subcat 2S Runoff Area=17,131 sf 55.06% Impervious Runoff Depth=3.75"
Flow Length=155' Tc=6.0 min CN=90 Runoff=1.67 cfs 5,355 cf

Subcatchment 4S: Subcat 3S Runoff Area=14,990 sf 55.51% Impervious Runoff Depth=3.55"
Flow Length=215' Tc=6.0 min CN=88 Runoff=1.40 cfs 4,429 cf

Subcatchment 5S: Subcat 5S Runoff Area=6,531 sf 75.80% Impervious Runoff Depth=3.15"
Flow Length=75' Tc=6.0 min CN=84 Runoff=0.55 cfs 1,715 cf

Subcatchment 6S: Subcat 6S Runoff Area=5,068 sf 98.56% Impervious Runoff Depth=4.52"
Flow Length=108' Slope=0.0180 '/' Tc=6.0 min CN=97 Runoff=0.55 cfs 1,908 cf

Subcatchment 7S: Subcat 7S Runoff Area=5,589 sf 100.00% Impervious Runoff Depth=4.63"
Flow Length=112' Slope=0.0130 '/' Tc=6.0 min CN=98 Runoff=0.61 cfs 2,158 cf

Subcatchment 8S: Subcat 9S Runoff Area=12,740 sf 96.03% Impervious Runoff Depth=4.40"
Flow Length=150' Slope=0.0230 '/' Tc=6.0 min CN=96 Runoff=1.37 cfs 4,675 cf

Subcatchment 9S: Subcat 9S Runoff Area=338 sf 100.00% Impervious Runoff Depth=4.63"
Flow Length=47' Slope=0.0290 '/' Tc=6.0 min CN=98 Runoff=0.04 cfs 131 cf

Subcatchment 10S: RETAIL CANOPY Runoff Area=3,144 sf 100.00% Impervious Runoff Depth=4.63"
Tc=0.0 min CN=98 Runoff=0.42 cfs 1,214 cf

Subcatchment 11S: C-STORE ROOF Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=4.63"
Tc=0.0 min CN=98 Runoff=0.80 cfs 2,317 cf

Subcatchment 12S: DIESEL CANOPY Runoff Area=1,108 sf 100.00% Impervious Runoff Depth=4.63"
Tc=0.0 min CN=98 Runoff=0.15 cfs 428 cf

Subcatchment 100S: Subcat 100S Runoff Area=12,338 sf 25.79% Impervious Runoff Depth=0.86"
Flow Length=30' Slope=0.0830 '/' Tc=6.0 min CN=54 Runoff=0.21 cfs 882 cf

Subcatchment 101S: Direct to basin Runoff Area=6,362 sf 0.02% Impervious Runoff Depth=0.12"
Tc=0.0 min CN=37 Runoff=0.00 cfs 62 cf

Subcatchment 200S: Subcat 200S Runoff Area=13,477 sf 0.01% Impervious Runoff Depth=1.86"
Flow Length=182' Tc=6.0 min CN=69 Runoff=0.66 cfs 2,093 cf

Subcatchment 300S: Subcat 300S Runoff Area=5,994 sf 37.25% Impervious Runoff Depth=1.23"
Flow Length=105' Slope=0.0260 '/' Tc=6.0 min CN=60 Runoff=0.18 cfs 612 cf

Subcatchment 301S: Subcat 301S Runoff Area=16,878 sf 81.98% Impervious Runoff Depth=3.45"
Flow Length=120' Slope=0.0175 '/' Tc=6.0 min CN=87 Runoff=1.54 cfs 4,845 cf

Pond 1P: Aboveground Infiltration Basin Peak Elev=251.89' Storage=2,673 cf Inflow=3.12 cfs 10,648 cf
Discarded=1.13 cfs 10,648 cf Primary=0.00 cfs 0 cf Outflow=1.13 cfs 10,648 cf

Pond BIO-1: Bioretention Area Peak Elev=251.57' Storage=372 cf Inflow=1.54 cfs 4,845 cf
Discarded=1.16 cfs 4,760 cf Primary=0.27 cfs 85 cf Outflow=1.43 cfs 4,845 cf

Pond CB-1: PROP. CB-1 Peak Elev=254.05' Inflow=0.89 cfs 3,036 cf
12.0" Round Culvert n=0.012 L=109.0' S=0.0069 '/' Outflow=0.89 cfs 3,036 cf

Pond CB-2: PROP CB-2 Peak Elev=254.70' Inflow=0.90 cfs 3,005 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=0.90 cfs 3,005 cf

Pond CB-3: PROP CB-3 Peak Elev=253.94' Inflow=1.67 cfs 5,355 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=1.67 cfs 5,355 cf

Pond CB-4: PROP CB-4 Peak Elev=253.62' Inflow=1.40 cfs 4,429 cf
12.0" Round Culvert n=0.012 L=12.0' S=0.0042 '/' Outflow=1.40 cfs 4,429 cf

Pond CB-5: PROP CB-5 Peak Elev=253.74' Inflow=0.55 cfs 1,715 cf
12.0" Round Culvert n=0.012 L=25.0' S=0.0100 '/' Outflow=0.55 cfs 1,715 cf

Pond CB-6: PROP CB-6 Peak Elev=253.28' Inflow=0.55 cfs 1,908 cf
12.0" Round Culvert n=0.012 L=78.0' S=0.0083 '/' Outflow=0.55 cfs 1,908 cf

Pond CB-7: PROP CB-7 Peak Elev=253.21' Inflow=0.61 cfs 2,158 cf
12.0" Round Culvert n=0.012 L=16.0' S=0.0125 '/' Outflow=0.61 cfs 2,158 cf

Pond CB-8: PROP CB-8 Peak Elev=252.14' Inflow=1.37 cfs 4,675 cf
Primary=1.01 cfs 4,358 cf Secondary=0.46 cfs 317 cf Outflow=1.37 cfs 4,675 cf

Pond CB-9: PROP CB-9 Peak Elev=251.89' Inflow=0.04 cfs 131 cf
12.0" Round Culvert n=0.012 L=37.0' S=0.0270 '/' Outflow=0.04 cfs 130 cf

Pond DMH-1: PROP DMH-1 Peak Elev=253.56' Inflow=1.79 cfs 6,040 cf
12.0" Round Culvert n=0.012 L=85.0' S=0.0047 '/' Outflow=1.79 cfs 6,040 cf

Pond DMH-2: PROP DMH-2 Peak Elev=253.11' Inflow=3.46 cfs 11,395 cf
15.0" Round Culvert n=0.012 L=41.0' S=0.0073 '/' Outflow=3.46 cfs 11,395 cf

Pond DMH-3: PROP DMH-3 Peak Elev=252.63' Inflow=3.46 cfs 11,395 cf
15.0" Round Culvert n=0.012 L=119.0' S=0.0053 '/' Outflow=3.46 cfs 11,395 cf

Pond DMH-6: PROP DMH-6 Peak Elev=253.17' Inflow=0.55 cfs 1,715 cf
12.0" Round Culvert n=0.012 L=149.0' S=0.0060 '/' Outflow=0.55 cfs 1,715 cf

Pond DMH-8: PROP DMH-8 Peak Elev=252.90' Inflow=1.16 cfs 3,873 cf
Primary=0.72 cfs 3,664 cf Secondary=0.48 cfs 210 cf Outflow=1.16 cfs 3,873 cf

Pond DMH-9: PROP DMH-9 Peak Elev=251.93' Inflow=1.71 cfs 5,781 cf
18.0" Round Culvert n=0.012 L=106.0' S=0.0052 '/' Outflow=1.71 cfs 5,781 cf

Pond INF-1: Underground Infiltration Peak Elev=252.53' Storage=4,749 cf Inflow=4.86 cfs 15,824 cf
Discarded=0.79 cfs 15,824 cf Primary=0.00 cfs 0 cf Outflow=0.79 cfs 15,824 cf

Pond INF-2: Underground Infiltration Peak Elev=251.99' Storage=1,067 cf Inflow=1.37 cfs 3,958 cf
Discarded=0.21 cfs 3,958 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 3,958 cf

Pond OWS-1: PROP OWS-1 Peak Elev=251.95' Inflow=1.01 cfs 4,358 cf
8.0" Round Culvert n=0.012 L=13.0' S=0.0115 '/' Outflow=1.01 cfs 4,358 cf

Pond OWS-2: PROP. OWS-2 Peak Elev=252.40' Inflow=0.72 cfs 3,664 cf
6.0" Round Culvert n=0.012 L=6.0' S=0.0167 '/' Outflow=0.72 cfs 3,664 cf

Pond SD-1: PROP SLOTTED DRAIN Peak Elev=254.33' Inflow=0.55 cfs 1,715 cf
8.0" Round Culvert n=0.012 L=5.0' S=0.0200 '/' Outflow=0.55 cfs 1,715 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=0.21 cfs 882 cf
Primary=0.21 cfs 882 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=0.66 cfs 2,093 cf
Primary=0.66 cfs 2,093 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=0.44 cfs 697 cf
Primary=0.44 cfs 697 cf

Total Runoff Area = 144,587 sf Runoff Volume = 38,863 cf Average Runoff Depth = 3.23"
38.23% Pervious = 55,276 sf 61.77% Impervious = 89,311 sf

Summary for Subcatchment 1S: Subcat 1S

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 3,036 cf, Depth= 4.40"
Routed to Pond CB-1 : PROP. CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
929	80	>75% Grass cover, Good, HSG D
1,328	98	Paved parking, HSG A
6,015	98	Paved parking, HSG D
8,273	96	Weighted Average
929		11.24% Pervious Area
7,343		88.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	25	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.5	80	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: Subcat 2S

Runoff = 0.90 cfs @ 12.08 hrs, Volume= 3,005 cf, Depth= 4.18"
Routed to Pond CB-2 : PROP CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
2,023	80	>75% Grass cover, Good, HSG D
6,603	98	Paved parking, HSG D
8,626	94	Weighted Average
2,023		23.46% Pervious Area
6,603		76.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	30	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	85	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	115	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Subcat 2S

Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,355 cf, Depth= 3.75"
Routed to Pond CB-3 : PROP CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
7,699	80	>75% Grass cover, Good, HSG D
9,432	98	Paved parking, HSG D
17,131	90	Weighted Average
7,699		44.94% Pervious Area
9,432		55.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	75	0.2100	3.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0380	3.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	155	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: Subcat 3S

Runoff = 1.40 cfs @ 12.09 hrs, Volume= 4,429 cf, Depth= 3.55"
Routed to Pond CB-4 : PROP CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
889	39	>75% Grass cover, Good, HSG A
5,780	80	>75% Grass cover, Good, HSG D
2,875	98	Paved parking, HSG A
5,446	98	Paved parking, HSG D
14,990	88	Weighted Average
6,669		44.49% Pervious Area
8,321		55.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
1.0	150	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0240	3.14		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	215	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Subcat 5S

Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf, Depth= 3.15"
Routed to Pond SD-1 : PROP SLOTTED DRAIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
1,580	39	>75% Grass cover, Good, HSG A
4,951	98	Paved parking, HSG A
6,531	84	Weighted Average
1,580		24.20% Pervious Area
4,951		75.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.3	25	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Subcat 6S

Runoff = 0.55 cfs @ 12.08 hrs, Volume= 1,908 cf, Depth= 4.52"
Routed to Pond CB-6 : PROP CB-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
31	39	>75% Grass cover, Good, HSG A
42	80	>75% Grass cover, Good, HSG D
3,973	98	Paved parking, HSG A
1,022	98	Paved parking, HSG D
5,068	97	Weighted Average
73		1.44% Pervious Area
4,995		98.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0180	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	88	0.0180	2.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	108	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Subcat 7S

Runoff = 0.61 cfs @ 12.08 hrs, Volume= 2,158 cf, Depth= 4.63"
Routed to Pond CB-7 : PROP CB-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
5,589	98	Paved parking, HSG A
5,589		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0130	0.82		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	92	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	112	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Subcat 9S

Runoff = 1.37 cfs @ 12.08 hrs, Volume= 4,675 cf, Depth= 4.40"
Routed to Pond CB-8 : PROP CB-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
44	80	>75% Grass cover, Good, HSG D
12,201	98	Paved parking, HSG A
34	98	Paved parking, HSG D
12,740	96	Weighted Average
505		3.97% Pervious Area
12,234		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0230	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	130	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: Subcat 9S

Runoff = 0.04 cfs @ 12.08 hrs, Volume= 131 cf, Depth= 4.63"
Routed to Pond CB-9 : PROP CB-9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
338	98	Paved parking, HSG A
338		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0290	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.1	22	0.0290	3.46		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	47	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 10S: RETAIL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.42 cfs @ 12.00 hrs, Volume= 1,214 cf, Depth= 4.63"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
3,144	98	Roofs, HSG A
3,144		100.00% Impervious Area

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

Summary for Subcatchment 11S: C-STORE ROOF

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.80 cfs @ 12.00 hrs, Volume= 2,317 cf, Depth= 4.63"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
6,000	98	Roofs, HSG D
6,000		100.00% Impervious Area

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

Summary for Subcatchment 12S: DIESEL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.15 cfs @ 12.00 hrs, Volume= 428 cf, Depth= 4.63"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
1,108	98	Roofs, HSG A
1,108		100.00% Impervious Area

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

Summary for Subcatchment 100S: Subcat 100S

Runoff = 0.21 cfs @ 12.11 hrs, Volume= 882 cf, Depth= 0.86"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
9,110	39	>75% Grass cover, Good, HSG A
3,182	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
12,338	54	Weighted Average
9,156		74.21% Pervious Area
3,182		25.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0830	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
2.2	30	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 101S: Direct to basin

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.00 cfs @ 14.65 hrs, Volume= 62 cf, Depth= 0.12"
Routed to Pond 1P : Aboveground Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
5,132	39	>75% Grass cover, Good, HSG A
1	98	Paved parking, HSG A
1,229	30	Woods, Good, HSG A
6,362	37	Weighted Average
6,361		99.98% Pervious Area
1		0.02% Impervious Area

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

Summary for Subcatchment 200S: Subcat 200S

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 2,093 cf, Depth= 1.86"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
1,612	39	>75% Grass cover, Good, HSG A
2,921	80	>75% Grass cover, Good, HSG D
1	98	Paved parking, HSG D
1,119	30	Woods, Good, HSG A
7,823	77	Woods, Good, HSG D
13,477	69	Weighted Average
13,476		99.99% Pervious Area
1		0.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	25	0.1500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.6	67	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	182	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 0.18 cfs @ 12.10 hrs, Volume= 612 cf, Depth= 1.23"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
2,957	39	>75% Grass cover, Good, HSG A
2,233	98	Paved parking, HSG A
804	30	Woods, Good, HSG A
5,994	60	Weighted Average
3,761		62.75% Pervious Area
2,233		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0260	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	75	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	5	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 301S: Subcat 301S

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 4,845 cf, Depth= 3.45"
Routed to Pond BIO-1 : Bioretention Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.87"

Area (sf)	CN	Description
2,997	39	>75% Grass cover, Good, HSG A
13,836	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
16,878	87	Weighted Average
3,042		18.02% Pervious Area
13,836		81.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	120	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Aboveground Infiltration Basin

[80] Warning: Exceeded Pond CB-9 by 0.79' @ 12.55 hrs (2.03 cfs 2,342 cf)

Inflow Area = 95,900 sf, 73.05% Impervious, Inflow Depth = 1.33" for 10-yr event
Inflow = 3.12 cfs @ 12.08 hrs, Volume= 10,648 cf
Outflow = 1.13 cfs @ 12.34 hrs, Volume= 10,648 cf, Atten= 64%, Lag= 15.2 min
Discarded = 1.13 cfs @ 12.34 hrs, Volume= 10,648 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.89' @ 12.34 hrs Surf.Area= 2,430 sf Storage= 2,673 cf
Flood Elev= 254.00' Surf.Area= 4,536 sf Storage= 9,913 cf

Plug-Flow detention time= 37.3 min calculated for 10,648 cf (100% of inflow)
Center-of-Mass det. time= 37.3 min (805.4 - 768.2)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	9,913 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.00	830	155.0	0	0	830
251.49	1,591	183.0	1,773	1,773	1,624
251.50	2,092	287.0	18	1,792	5,514
252.00	2,529	297.0	1,154	2,945	6,001
254.00	4,536	329.0	6,968	9,913	7,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	252.00'	**8.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.00' / 248.00' S= 0.1290 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#3	Primary	253.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.13 cfs @ 12.34 hrs HW=251.89' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' TW=0.00' (Dynamic Tailwater)
├**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BIO-1: Bioretention Area

Inflow Area = 16,878 sf, 81.98% Impervious, Inflow Depth = 3.45" for 10-yr event
Inflow = 1.54 cfs @ 12.09 hrs, Volume= 4,845 cf
Outflow = 1.43 cfs @ 12.12 hrs, Volume= 4,845 cf, Atten= 7%, Lag= 2.0 min
Discarded = 1.16 cfs @ 12.12 hrs, Volume= 4,760 cf
Primary = 0.27 cfs @ 12.12 hrs, Volume= 85 cf
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.57' @ 12.12 hrs Surf.Area= 768 sf Storage= 372 cf
Flood Elev= 252.00' Surf.Area= 1,438 sf Storage= 837 cf

Plug-Flow detention time= 12.5 min calculated for 4,844 cf (100% of inflow)
Center-of-Mass det. time= 12.5 min (814.8 - 802.2)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	837 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	59	38.0	0.0	0	0	59
250.49	59	38.0	35.0	51	51	154
250.50	59	38.0	100.0	1	52	154
251.00	199	90.0	100.0	61	113	685
252.00	1,438	414.0	100.0	724	837	13,682

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	251.50'	**6.0' 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

Discarded OutFlow Max=1.16 cfs @ 12.12 hrs HW=251.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.16 cfs)

Primary OutFlow Max=0.27 cfs @ 12.12 hrs HW=251.57' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.62 fps)

Summary for Pond CB-1: PROP. CB-1

Inflow Area = 8,273 sf, 88.76% Impervious, Inflow Depth = 4.40" for 10-yr event
Inflow = 0.89 cfs @ 12.08 hrs, Volume= 3,036 cf
Outflow = 0.89 cfs @ 12.08 hrs, Volume= 3,036 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.08 hrs, Volume= 3,036 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.05' @ 12.09 hrs
Flood Elev= 256.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.45'	**12.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.45' / 252.70' S= 0.0069 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.87 cfs @ 12.08 hrs HW=254.04' TW=253.55' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.87 cfs @ 2.59 fps)

Summary for Pond CB-2: PROP CB-2

Inflow Area = 8,626 sf, 76.54% Impervious, Inflow Depth = 4.18" for 10-yr event
Inflow = 0.90 cfs @ 12.08 hrs, Volume= 3,005 cf
Outflow = 0.90 cfs @ 12.08 hrs, Volume= 3,005 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.08 hrs, Volume= 3,005 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.70' @ 12.08 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	254.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 254.20' / 254.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.90 cfs @ 12.08 hrs HW=254.70' TW=253.55' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.90 cfs @ 3.34 fps)

Summary for Pond CB-3: PROP CB-3

Inflow Area = 17,131 sf, 55.06% Impervious, Inflow Depth = 3.75" for 10-yr event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,355 cf
Outflow = 1.67 cfs @ 12.09 hrs, Volume= 5,355 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.67 cfs @ 12.09 hrs, Volume= 5,355 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.94' @ 12.09 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.20' / 253.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.67 cfs @ 12.09 hrs HW=253.94' TW=253.11' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.67 cfs @ 3.74 fps)

Summary for Pond CB-4: PROP CB-4

Inflow Area = 14,990 sf, 55.51% Impervious, Inflow Depth = 3.55" for 10-yr event
Inflow = 1.40 cfs @ 12.09 hrs, Volume= 4,429 cf
Outflow = 1.40 cfs @ 12.09 hrs, Volume= 4,429 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.40 cfs @ 12.09 hrs, Volume= 4,429 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.62' @ 12.09 hrs
Flood Elev= 256.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.85'	**12.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 252.85' / 252.80' S= 0.0042 '/' Cc= 0.900
n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.40 cfs @ 12.09 hrs HW=253.62' TW=251.42' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.40 cfs @ 2.96 fps)

Summary for Pond CB-5: PROP CB-5

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 3.15" for 10-yr event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.74' @ 12.09 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.35'	**12.0" Round Culvert**
			L= 25.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 253.35' / 253.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.55 cfs @ 12.09 hrs HW=253.74' TW=253.17' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.55 cfs @ 2.90 fps)

Summary for Pond CB-6: PROP CB-6

Inflow Area = 5,068 sf, 98.56% Impervious, Inflow Depth = 4.52" for 10-yr event
Inflow = 0.55 cfs @ 12.08 hrs, Volume= 1,908 cf
Outflow = 0.55 cfs @ 12.08 hrs, Volume= 1,908 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.08 hrs, Volume= 1,908 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.28' @ 12.08 hrs
Flood Elev= 256.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.90'	**12.0" Round Culvert**
			L= 78.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 252.90' / 252.25' S= 0.0083 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.55 cfs @ 12.08 hrs HW=253.28' TW=251.88' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.55 cfs @ 3.03 fps)

Summary for Pond CB-7: PROP CB-7

Inflow Area = 5,589 sf,100.00% Impervious, Inflow Depth = 4.63" for 10-yr event
Inflow = 0.61 cfs @ 12.08 hrs, Volume= 2,158 cf
Outflow = 0.61 cfs @ 12.08 hrs, Volume= 2,158 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.08 hrs, Volume= 2,158 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.21' @ 12.08 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.80'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.80' / 252.60' S= 0.0125 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.61 cfs @ 12.08 hrs HW=253.21' TW=252.90' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.61 cfs @ 2.98 fps)

Summary for Pond CB-8: PROP CB-8

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 4.40" for 10-yr event
Inflow = 1.37 cfs @ 12.08 hrs, Volume= 4,675 cf
Outflow = 1.37 cfs @ 12.08 hrs, Volume= 4,675 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.01 cfs @ 12.04 hrs, Volume= 4,358 cf
Routed to Pond OWS-1 : PROP OWS-1
Secondary = 0.46 cfs @ 12.10 hrs, Volume= 317 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.14' @ 12.10 hrs
Flood Elev= 254.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.80'	**8.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.80' / 250.70' S= 0.0143 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#2	Secondary	251.80'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.80' / 251.00' S= 0.0400 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.93 cfs @ 12.04 hrs HW=251.99' TW=251.68' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.93 cfs @ 2.66 fps)

Secondary OutFlow Max=0.46 cfs @ 12.10 hrs HW=252.14' TW=251.63' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.46 cfs @ 1.98 fps)

Summary for Pond CB-9: PROP CB-9

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=580)

Inflow Area = 338 sf,100.00% Impervious, Inflow Depth = 4.63" for 10-yr event
Inflow = 0.04 cfs @ 12.08 hrs, Volume= 131 cf
Outflow = 0.04 cfs @ 12.08 hrs, Volume= 130 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.08 hrs, Volume= 130 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.89' @ 12.35 hrs
Flood Elev= 253.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.00'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.00' / 250.00' S= 0.0270 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=251.55' TW=251.58' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond DMH-1: PROP DMH-1

Inflow Area = 16,899 sf, 82.53% Impervious, Inflow Depth = 4.29" for 10-yr event
Inflow = 1.79 cfs @ 12.08 hrs, Volume= 6,040 cf
Outflow = 1.79 cfs @ 12.08 hrs, Volume= 6,040 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.79 cfs @ 12.08 hrs, Volume= 6,040 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.56' @ 12.09 hrs
Flood Elev= 257.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0047 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.76 cfs @ 12.08 hrs HW=253.55' TW=253.11' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.76 cfs @ 2.94 fps)

Summary for Pond DMH-2: PROP DMH-2

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 4.02" for 10-yr event
Inflow = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf
Outflow = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf
Routed to Pond DMH-3 : PROP DMH-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.11' @ 12.09 hrs
Flood Elev= 257.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.95'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.95' / 251.65' S= 0.0073 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.44 cfs @ 12.08 hrs HW=253.11' TW=252.63' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.44 cfs @ 3.77 fps)

Summary for Pond DMH-3: PROP DMH-3

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 4.02" for 10-yr event
Inflow = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf
Outflow = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.46 cfs @ 12.08 hrs, Volume= 11,395 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.63' @ 12.08 hrs
Flood Elev= 258.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.55'	**15.0" Round Culvert** L= 119.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.55' / 250.92' S= 0.0053 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=3.46 cfs @ 12.08 hrs HW=252.63' TW=251.41' (Dynamic Tailwater)
1=Culvert (Barrel Controls 3.46 cfs @ 4.10 fps)

Summary for Pond DMH-6: PROP DMH-6

[80] Warning: Exceeded Pond INF-1 by 2.00' @ 12.03 hrs (0.00 cfs 13 cf)
[80] Warning: Exceeded Pond INF-2 by 1.89' @ 12.02 hrs (0.00 cfs 22 cf)

Inflow Area = 65,803 sf, 71.28% Impervious, Inflow Depth = 0.31" for 10-yr event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.17' @ 12.09 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 149.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 251.70' S= 0.0060 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.55 cfs @ 12.09 hrs HW=253.17' TW=252.90' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.55 cfs @ 1.69 fps)

Summary for Pond DMH-8: PROP DMH-8

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.65" for 10-yr event
Inflow = 1.16 cfs @ 12.09 hrs, Volume= 3,873 cf
Outflow = 1.16 cfs @ 12.09 hrs, Volume= 3,873 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.02 hrs, Volume= 3,664 cf
Routed to Pond OWS-2 : PROP. OWS-2
Secondary = 0.48 cfs @ 12.09 hrs, Volume= 210 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.90' @ 12.09 hrs
Flood Elev= 255.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.60'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.60' / 251.50' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Secondary	252.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.69 cfs @ 12.02 hrs HW=252.76' TW=252.23' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.69 cfs @ 3.51 fps)

Secondary OutFlow Max=0.48 cfs @ 12.09 hrs HW=252.90' TW=251.89' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.48 cfs @ 1.87 fps)

Summary for Pond DMH-9: PROP DMH-9

Inflow Area = 76,460 sf, 75.18% Impervious, Inflow Depth = 0.91" for 10-yr event
Inflow = 1.71 cfs @ 12.08 hrs, Volume= 5,781 cf
Outflow = 1.71 cfs @ 12.08 hrs, Volume= 5,781 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.71 cfs @ 12.08 hrs, Volume= 5,781 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.93' @ 12.30 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.05'	**18.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.05' / 250.50' S= 0.0052 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.62 cfs @ 12.08 hrs HW=251.88' TW=251.58' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.62 cfs @ 2.34 fps)

Summary for Pond INF-1: Underground Infiltration System #1

Inflow Area = 49,020 sf, 64.67% Impervious, Inflow Depth = 3.87" for 10-yr event
Inflow = 4.86 cfs @ 12.08 hrs, Volume= 15,824 cf
Outflow = 0.79 cfs @ 12.56 hrs, Volume= 15,824 cf, Atten= 84%, Lag= 28.3 min
Discarded = 0.79 cfs @ 12.56 hrs, Volume= 15,824 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.53' @ 12.56 hrs Surf.Area= 2,808 sf Storage= 4,749 cf
Flood Elev= 255.50' Surf.Area= 2,808 sf Storage= 9,206 cf

Plug-Flow detention time= 40.4 min calculated for 15,819 cf (100% of inflow)
Center-of-Mass det. time= 40.4 min (825.2 - 784.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	250.00'	2,103 cf	**29.92'W x 48.72'L x 5.50'H Field A** 8,016 cf Overall - 2,758 cf Embedded = 5,258 cf x 40.0% Voids
#2A	250.75'	2,758 cf	**ADS_StormTech MC-3500 d +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 24 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
#3B	250.00'	804 cf	**8.42'W x 63.06'L x 5.50'H Field B** 2,919 cf Overall - 909 cf Embedded = 2,010 cf x 40.0% Voids
#4B	250.75'	909 cf	**ADS_StormTech MC-3500 d +Cap** x 8 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#5C	250.00'	715 cf	**8.42'W x 55.89'L x 5.50'H Field C** 2,587 cf Overall - 799 cf Embedded = 1,788 cf x 40.0% Voids
#6C	250.75'	799 cf	**ADS_StormTech MC-3500 d +Cap** x 7 Inside #5 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#7D	250.00'	538 cf	**8.42'W x 41.55'L x 5.50'H Field D** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#8D	250.75'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #7 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		9,206 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.05'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.05' / 252.70' S= 0.0054 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.79 cfs @ 12.56 hrs HW=252.53' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=250.00' TW=252.60' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond INF-2: Underground Infiltration System #2

Inflow Area = 10,252 sf,100.00% Impervious, Inflow Depth = 4.63" for 10-yr event
Inflow = 1.37 cfs @ 12.00 hrs, Volume= 3,958 cf
Outflow = 0.21 cfs @ 12.43 hrs, Volume= 3,958 cf, Atten= 85%, Lag= 25.9 min
Discarded = 0.21 cfs @ 12.43 hrs, Volume= 3,958 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.99' @ 12.43 hrs Surf.Area= 651 sf Storage= 1,067 cf
Flood Elev= 255.00' Surf.Area= 651 sf Storage= 2,111 cf

Plug-Flow detention time= 31.5 min calculated for 3,957 cf (100% of inflow)
Center-of-Mass det. time= 31.5 min (774.4 - 742.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	249.50'	981 cf	**8.42'W x 77.40'L x 5.50'H Field A** 3,583 cf Overall - 1,129 cf Embedded = 2,454 cf x 40.0% Voids
#2A	250.25'	1,129 cf	**ADS_StormTech MC-3500 d +Cap** x 10 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		2,111 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.50'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.02'	**6.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.02' / 252.70' S= 0.0178 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.21 cfs @ 12.43 hrs HW=251.99' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.50' TW=252.60' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond OWS-1: PROP OWS-1

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 4.11" for 10-yr event
Inflow = 1.01 cfs @ 12.04 hrs, Volume= 4,358 cf
Outflow = 1.01 cfs @ 12.04 hrs, Volume= 4,358 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.01 cfs @ 12.04 hrs, Volume= 4,358 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 251.95' @ 12.29 hrs
Flood Elev= 254.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.45'	**8.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.45' / 250.30' S= 0.0115 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.93 cfs @ 12.04 hrs HW=251.68' TW=251.38' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.93 cfs @ 2.66 fps)

Summary for Pond OWS-2: PROP. OWS-2

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.62" for 10-yr event
Inflow = 0.72 cfs @ 12.02 hrs, Volume= 3,664 cf
Outflow = 0.72 cfs @ 12.02 hrs, Volume= 3,664 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.02 hrs, Volume= 3,664 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.40' @ 12.10 hrs
Flood Elev= 255.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.25' / 251.15' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.70 cfs @ 12.02 hrs HW=252.23' TW=251.69' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.70 cfs @ 3.55 fps)

Summary for Pond SD-1: PROP SLOTTED DRAIN

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 3.15" for 10-yr event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,715 cf
Routed to Pond CB-5 : PROP CB-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.33' @ 12.09 hrs
Flood Elev= 255.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.85'	**8.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.85' / 253.75' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.55 cfs @ 12.09 hrs HW=254.33' TW=253.74' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.55 cfs @ 2.87 fps)

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 108,238 sf, 67.67% Impervious, Inflow Depth = 0.10" for 10-yr event
Inflow = 0.21 cfs @ 12.11 hrs, Volume= 882 cf
Primary = 0.21 cfs @ 12.11 hrs, Volume= 882 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 13,477 sf, 0.01% Impervious, Inflow Depth = 1.86" for 10-yr event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 2,093 cf
Primary = 0.66 cfs @ 12.09 hrs, Volume= 2,093 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 70.26% Impervious, Inflow Depth = 0.37" for 10-yr event
Inflow = 0.44 cfs @ 12.12 hrs, Volume= 697 cf
Primary = 0.44 cfs @ 12.12 hrs, Volume= 697 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1S Runoff Area=8,273 sf 88.76% Impervious Runoff Depth=5.46"
Flow Length=105' Tc=6.0 min CN=96 Runoff=1.09 cfs 3,763 cf

Subcatchment 2S: Subcat 2S Runoff Area=8,626 sf 76.54% Impervious Runoff Depth=5.23"
Flow Length=115' Tc=6.0 min CN=94 Runoff=1.12 cfs 3,758 cf

Subcatchment 3S: Subcat 2S Runoff Area=17,131 sf 55.06% Impervious Runoff Depth=4.78"
Flow Length=155' Tc=6.0 min CN=90 Runoff=2.10 cfs 6,821 cf

Subcatchment 4S: Subcat 3S Runoff Area=14,990 sf 55.51% Impervious Runoff Depth=4.56"
Flow Length=215' Tc=6.0 min CN=88 Runoff=1.78 cfs 5,694 cf

Subcatchment 5S: Subcat 5S Runoff Area=6,531 sf 75.80% Impervious Runoff Depth=4.13"
Flow Length=75' Tc=6.0 min CN=84 Runoff=0.72 cfs 2,248 cf

Subcatchment 6S: Subcat 6S Runoff Area=5,068 sf 98.56% Impervious Runoff Depth=5.57"
Flow Length=108' Slope=0.0180 '/' Tc=6.0 min CN=97 Runoff=0.67 cfs 2,354 cf

Subcatchment 7S: Subcat 7S Runoff Area=5,589 sf 100.00% Impervious Runoff Depth=5.69"
Flow Length=112' Slope=0.0130 '/' Tc=6.0 min CN=98 Runoff=0.75 cfs 2,651 cf

Subcatchment 8S: Subcat 9S Runoff Area=12,740 sf 96.03% Impervious Runoff Depth=5.46"
Flow Length=150' Slope=0.0230 '/' Tc=6.0 min CN=96 Runoff=1.68 cfs 5,794 cf

Subcatchment 9S: Subcat 9S Runoff Area=338 sf 100.00% Impervious Runoff Depth=5.69"
Flow Length=47' Slope=0.0290 '/' Tc=6.0 min CN=98 Runoff=0.05 cfs 160 cf

Subcatchment 10S: RETAIL CANOPY Runoff Area=3,144 sf 100.00% Impervious Runoff Depth=5.69"
Tc=0.0 min CN=98 Runoff=0.51 cfs 1,491 cf

Subcatchment 11S: C-STORE ROOF Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=5.69"
Tc=0.0 min CN=98 Runoff=0.98 cfs 2,846 cf

Subcatchment 12S: DIESEL CANOPY Runoff Area=1,108 sf 100.00% Impervious Runoff Depth=5.69"
Tc=0.0 min CN=98 Runoff=0.18 cfs 526 cf

Subcatchment 100S: Subcat 100S Runoff Area=12,338 sf 25.79% Impervious Runoff Depth=1.40"
Flow Length=30' Slope=0.0830 '/' Tc=6.0 min CN=54 Runoff=0.40 cfs 1,441 cf

Subcatchment 101S: Direct to basin Runoff Area=6,362 sf 0.02% Impervious Runoff Depth=0.33"
Tc=0.0 min CN=37 Runoff=0.01 cfs 173 cf

Subcatchment 200S: Subcat 200S Runoff Area=13,477 sf 0.01% Impervious Runoff Depth=2.66"
Flow Length=182' Tc=6.0 min CN=69 Runoff=0.96 cfs 2,985 cf

Subcatchment 300S: Subcat 300S Runoff Area=5,994 sf 37.25% Impervious Runoff Depth=1.88"
Flow Length=105' Slope=0.0260 '/' Tc=6.0 min CN=60 Runoff=0.29 cfs 937 cf

Subcatchment 301S: Subcat 301S Runoff Area=16,878 sf 81.98% Impervious Runoff Depth=4.45"
Flow Length=120' Slope=0.0175 '/' Tc=6.0 min CN=87 Runoff=1.97 cfs 6,259 cf

Pond 1P: Aboveground Infiltration Basin Peak Elev=252.22' Storage=3,511 cf Inflow=3.86 cfs 13,667 cf
Discarded=1.18 cfs 13,463 cf Primary=0.15 cfs 204 cf Outflow=1.34 cfs 13,667 cf

Pond BIO-1: Bioretention Area Peak Elev=251.62' Storage=411 cf Inflow=1.97 cfs 6,259 cf
Discarded=1.30 cfs 5,995 cf Primary=0.59 cfs 264 cf Outflow=1.88 cfs 6,259 cf

Pond CB-1: PROP. CB-1 Peak Elev=254.18' Inflow=1.09 cfs 3,763 cf
12.0" Round Culvert n=0.012 L=109.0' S=0.0069 '/' Outflow=1.09 cfs 3,763 cf

Pond CB-2: PROP CB-2 Peak Elev=254.77' Inflow=1.12 cfs 3,758 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=1.12 cfs 3,758 cf

Pond CB-3: PROP CB-3 Peak Elev=254.06' Inflow=2.10 cfs 6,821 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=2.10 cfs 6,821 cf

Pond CB-4: PROP CB-4 Peak Elev=253.75' Inflow=1.78 cfs 5,694 cf
12.0" Round Culvert n=0.012 L=12.0' S=0.0042 '/' Outflow=1.78 cfs 5,694 cf

Pond CB-5: PROP CB-5 Peak Elev=253.80' Inflow=0.72 cfs 2,248 cf
12.0" Round Culvert n=0.012 L=25.0' S=0.0100 '/' Outflow=0.72 cfs 2,248 cf

Pond CB-6: PROP CB-6 Peak Elev=253.32' Inflow=0.67 cfs 2,354 cf
12.0" Round Culvert n=0.012 L=78.0' S=0.0083 '/' Outflow=0.67 cfs 2,354 cf

Pond CB-7: PROP CB-7 Peak Elev=253.28' Inflow=0.75 cfs 2,651 cf
12.0" Round Culvert n=0.012 L=16.0' S=0.0125 '/' Outflow=0.75 cfs 2,651 cf

Pond CB-8: PROP CB-8 Peak Elev=252.28' Inflow=1.68 cfs 5,794 cf
Primary=0.92 cfs 4,882 cf Secondary=0.85 cfs 913 cf Outflow=1.68 cfs 5,794 cf

Pond CB-9: PROP CB-9 Peak Elev=252.22' Inflow=0.05 cfs 160 cf
12.0" Round Culvert n=0.012 L=37.0' S=0.0270 '/' Outflow=0.05 cfs 160 cf

Pond DMH-1: PROP DMH-1 Peak Elev=253.79' Inflow=2.21 cfs 7,520 cf
12.0" Round Culvert n=0.012 L=85.0' S=0.0047 '/' Outflow=2.21 cfs 7,520 cf

Pond DMH-2: PROP DMH-2 Peak Elev=253.39' Inflow=4.31 cfs 14,341 cf
15.0" Round Culvert n=0.012 L=41.0' S=0.0073 '/' Outflow=4.31 cfs 14,341 cf

Pond DMH-3: PROP DMH-3 Peak Elev=253.37' Inflow=4.31 cfs 14,341 cf
15.0" Round Culvert n=0.012 L=119.0' S=0.0053 '/' Outflow=4.31 cfs 14,341 cf

Pond DMH-6: PROP DMH-6 Peak Elev=253.27' Inflow=0.72 cfs 2,534 cf
12.0" Round Culvert n=0.012 L=149.0' S=0.0060 '/' Outflow=0.72 cfs 2,534 cf

Pond DMH-8: PROP DMH-8 Peak Elev=253.00' Inflow=1.46 cfs 5,185 cf
Primary=0.70 cfs 4,634 cf Secondary=0.80 cfs 551 cf Outflow=1.46 cfs 5,185 cf

Pond DMH-9: PROP DMH-9 Peak Elev=252.24' Inflow=2.13 cfs 7,539 cf
18.0" Round Culvert n=0.012 L=106.0' S=0.0052 '/' Outflow=2.13 cfs 7,539 cf

Pond INF-1: Underground Infiltration Peak Elev=253.34' Storage=6,336 cf Inflow=6.09 cfs 20,035 cf
Discarded=0.88 cfs 19,749 cf Primary=0.24 cfs 286 cf Outflow=1.12 cfs 20,035 cf

Pond INF-2: Underground Infiltration Peak Elev=252.74' Storage=1,402 cf Inflow=1.67 cfs 4,863 cf
Discarded=0.23 cfs 4,863 cf Primary=0.00 cfs 0 cf Outflow=0.23 cfs 4,863 cf

Pond OWS-1: PROP OWS-1 Peak Elev=252.24' Inflow=0.92 cfs 4,882 cf
8.0" Round Culvert n=0.012 L=13.0' S=0.0115 '/' Outflow=0.92 cfs 4,882 cf

Pond OWS-2: PROP. OWS-2 Peak Elev=252.54' Inflow=0.70 cfs 4,634 cf
6.0" Round Culvert n=0.012 L=6.0' S=0.0167 '/' Outflow=0.70 cfs 4,634 cf

Pond SD-1: PROP SLOTTED DRAIN Peak Elev=254.42' Inflow=0.72 cfs 2,248 cf
8.0" Round Culvert n=0.012 L=5.0' S=0.0200 '/' Outflow=0.72 cfs 2,248 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=0.40 cfs 1,645 cf
Primary=0.40 cfs 1,645 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=0.96 cfs 2,985 cf
Primary=0.96 cfs 2,985 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=0.87 cfs 1,201 cf
Primary=0.87 cfs 1,201 cf

Total Runoff Area = 144,587 sf Runoff Volume = 49,901 cf Average Runoff Depth = 4.14"
38.23% Pervious = 55,276 sf 61.77% Impervious = 89,311 sf

Summary for Subcatchment 1S: Subcat 1S

Runoff = 1.09 cfs @ 12.08 hrs, Volume= 3,763 cf, Depth= 5.46"
Routed to Pond CB-1 : PROP. CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
929	80	>75% Grass cover, Good, HSG D
1,328	98	Paved parking, HSG A
6,015	98	Paved parking, HSG D
8,273	96	Weighted Average
929		11.24% Pervious Area
7,343		88.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	25	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.5	80	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: Subcat 2S

Runoff = 1.12 cfs @ 12.08 hrs, Volume= 3,758 cf, Depth= 5.23"
Routed to Pond CB-2 : PROP CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
2,023	80	>75% Grass cover, Good, HSG D
6,603	98	Paved parking, HSG D
8,626	94	Weighted Average
2,023		23.46% Pervious Area
6,603		76.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	30	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	85	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	115	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Subcat 2S

Runoff = 2.10 cfs @ 12.08 hrs, Volume= 6,821 cf, Depth= 4.78"
Routed to Pond CB-3 : PROP CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
7,699	80	>75% Grass cover, Good, HSG D
9,432	98	Paved parking, HSG D
17,131	90	Weighted Average
7,699		44.94% Pervious Area
9,432		55.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	75	0.2100	3.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0380	3.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	155	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: Subcat 3S

Runoff = 1.78 cfs @ 12.09 hrs, Volume= 5,694 cf, Depth= 4.56"
Routed to Pond CB-4 : PROP CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
889	39	>75% Grass cover, Good, HSG A
5,780	80	>75% Grass cover, Good, HSG D
2,875	98	Paved parking, HSG A
5,446	98	Paved parking, HSG D
14,990	88	Weighted Average
6,669		44.49% Pervious Area
8,321		55.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
1.0	150	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0240	3.14		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	215	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Subcat 5S

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf, Depth= 4.13"
Routed to Pond SD-1 : PROP SLOTTED DRAIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
1,580	39	>75% Grass cover, Good, HSG A
4,951	98	Paved parking, HSG A
6,531	84	Weighted Average
1,580		24.20% Pervious Area
4,951		75.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.3	25	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Subcat 6S

Runoff = 0.67 cfs @ 12.08 hrs, Volume= 2,354 cf, Depth= 5.57"
Routed to Pond CB-6 : PROP CB-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
31	39	>75% Grass cover, Good, HSG A
42	80	>75% Grass cover, Good, HSG D
3,973	98	Paved parking, HSG A
1,022	98	Paved parking, HSG D
5,068	97	Weighted Average
73		1.44% Pervious Area
4,995		98.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0180	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	88	0.0180	2.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	108	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Subcat 7S

Runoff = 0.75 cfs @ 12.08 hrs, Volume= 2,651 cf, Depth= 5.69"
Routed to Pond CB-7 : PROP CB-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
5,589	98	Paved parking, HSG A
5,589		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0130	0.82		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	92	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	112	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Subcat 9S

Runoff = 1.68 cfs @ 12.08 hrs, Volume= 5,794 cf, Depth= 5.46"
Routed to Pond CB-8 : PROP CB-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
44	80	>75% Grass cover, Good, HSG D
12,201	98	Paved parking, HSG A
34	98	Paved parking, HSG D
12,740	96	Weighted Average
505		3.97% Pervious Area
12,234		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0230	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	130	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: Subcat 9S

Runoff = 0.05 cfs @ 12.08 hrs, Volume= 160 cf, Depth= 5.69"
Routed to Pond CB-9 : PROP CB-9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
338	98	Paved parking, HSG A
338		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0290	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.1	22	0.0290	3.46		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	47	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 10S: RETAIL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.51 cfs @ 12.00 hrs, Volume= 1,491 cf, Depth= 5.69"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
3,144	98	Roofs, HSG A
3,144		100.00% Impervious Area

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

Summary for Subcatchment 11S: C-STORE ROOF

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.98 cfs @ 12.00 hrs, Volume= 2,846 cf, Depth= 5.69"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
6,000	98	Roofs, HSG D
6,000		100.00% Impervious Area

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

Summary for Subcatchment 12S: DIESEL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.18 cfs @ 12.00 hrs, Volume= 526 cf, Depth= 5.69"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
1,108	98	Roofs, HSG A
1,108		100.00% Impervious Area

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

Summary for Subcatchment 100S: Subcat 100S

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 1,441 cf, Depth= 1.40"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
9,110	39	>75% Grass cover, Good, HSG A
3,182	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
12,338	54	Weighted Average
9,156		74.21% Pervious Area
3,182		25.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0830	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
2.2	30	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 101S: Direct to basin

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.01 cfs @ 12.31 hrs, Volume= 173 cf, Depth= 0.33"
Routed to Pond 1P : Aboveground Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
5,132	39	>75% Grass cover, Good, HSG A
1	98	Paved parking, HSG A
1,229	30	Woods, Good, HSG A
6,362	37	Weighted Average
6,361		99.98% Pervious Area
1		0.02% Impervious Area

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

Summary for Subcatchment 200S: Subcat 200S

Runoff = 0.96 cfs @ 12.09 hrs, Volume= 2,985 cf, Depth= 2.66"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
1,612	39	>75% Grass cover, Good, HSG A
2,921	80	>75% Grass cover, Good, HSG D
1	98	Paved parking, HSG D
1,119	30	Woods, Good, HSG A
7,823	77	Woods, Good, HSG D
13,477	69	Weighted Average
13,476		99.99% Pervious Area
1		0.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	25	0.1500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.6	67	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	182	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 0.29 cfs @ 12.10 hrs, Volume= 937 cf, Depth= 1.88"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
2,957	39	>75% Grass cover, Good, HSG A
2,233	98	Paved parking, HSG A
804	30	Woods, Good, HSG A
5,994	60	Weighted Average
3,761		62.75% Pervious Area
2,233		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0260	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	75	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	5	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 301S: Subcat 301S

Runoff = 1.97 cfs @ 12.09 hrs, Volume= 6,259 cf, Depth= 4.45"
Routed to Pond BIO-1 : Bioretention Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.93"

Area (sf)	CN	Description
2,997	39	>75% Grass cover, Good, HSG A
13,836	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
16,878	87	Weighted Average
3,042		18.02% Pervious Area
13,836		81.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	120	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Aboveground Infiltration Basin

[80] Warning: Exceeded Pond CB-9 by 1.18' @ 12.54 hrs (3.11 cfs 4,921 cf)

Inflow Area = 95,900 sf, 73.05% Impervious, Inflow Depth = 1.71" for 25-yr event
Inflow = 3.86 cfs @ 12.08 hrs, Volume= 13,667 cf
Outflow = 1.34 cfs @ 12.36 hrs, Volume= 13,667 cf, Atten= 65%, Lag= 16.7 min
Discarded = 1.18 cfs @ 12.36 hrs, Volume= 13,463 cf
Primary = 0.15 cfs @ 12.36 hrs, Volume= 204 cf
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.22' @ 12.36 hrs Surf.Area= 2,718 sf Storage= 3,511 cf
Flood Elev= 254.00' Surf.Area= 4,536 sf Storage= 9,913 cf

Plug-Flow detention time= 38.9 min calculated for 13,662 cf (100% of inflow)
Center-of-Mass det. time= 38.9 min (803.8 - 764.9)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	9,913 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.00	830	155.0	0	0	830
251.49	1,591	183.0	1,773	1,773	1,624
251.50	2,092	287.0	18	1,792	5,514
252.00	2,529	297.0	1,154	2,945	6,001
254.00	4,536	329.0	6,968	9,913	7,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	252.00'	**8.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.00' / 248.00' S= 0.1290 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#3	Primary	253.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.18 cfs @ 12.36 hrs HW=252.22' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.18 cfs)

Primary OutFlow Max=0.15 cfs @ 12.36 hrs HW=252.22' TW=0.00' (Dynamic Tailwater)
├**2=Culvert** (Inlet Controls 0.15 cfs @ 1.58 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BIO-1: Bioretention Area

Inflow Area = 16,878 sf, 81.98% Impervious, Inflow Depth = 4.45" for 25-yr event
Inflow = 1.97 cfs @ 12.09 hrs, Volume= 6,259 cf
Outflow = 1.88 cfs @ 12.11 hrs, Volume= 6,259 cf, Atten= 4%, Lag= 1.5 min
Discarded = 1.30 cfs @ 12.11 hrs, Volume= 5,995 cf
Primary = 0.59 cfs @ 12.11 hrs, Volume= 264 cf
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.62' @ 12.11 hrs Surf.Area= 834 sf Storage= 411 cf
Flood Elev= 252.00' Surf.Area= 1,438 sf Storage= 837 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 11.8 min (806.9 - 795.1)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	837 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	59	38.0	0.0	0	0	59
250.49	59	38.0	35.0	51	51	154
250.50	59	38.0	100.0	1	52	154
251.00	199	90.0	100.0	61	113	685
252.00	1,438	414.0	100.0	724	837	13,682

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	251.50'	**6.0' 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

Discarded OutFlow Max=1.30 cfs @ 12.11 hrs HW=251.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.30 cfs)

Primary OutFlow Max=0.59 cfs @ 12.11 hrs HW=251.62' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 0.81 fps)

Summary for Pond CB-1: PROP. CB-1

Inflow Area = 8,273 sf, 88.76% Impervious, Inflow Depth = 5.46" for 25-yr event
Inflow = 1.09 cfs @ 12.08 hrs, Volume= 3,763 cf
Outflow = 1.09 cfs @ 12.08 hrs, Volume= 3,763 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.09 cfs @ 12.08 hrs, Volume= 3,763 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.18' @ 12.10 hrs
Flood Elev= 256.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.45'	**12.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.45' / 252.70' S= 0.0069 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.05 cfs @ 12.08 hrs HW=254.17' TW=253.77' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 1.05 cfs @ 2.44 fps)

Summary for Pond CB-2: PROP CB-2

Inflow Area = 8,626 sf, 76.54% Impervious, Inflow Depth = 5.23" for 25-yr event
Inflow = 1.12 cfs @ 12.08 hrs, Volume= 3,758 cf
Outflow = 1.12 cfs @ 12.08 hrs, Volume= 3,758 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.12 cfs @ 12.08 hrs, Volume= 3,758 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.77' @ 12.08 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	254.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 254.20' / 254.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.11 cfs @ 12.08 hrs HW=254.77' TW=253.78' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.11 cfs @ 3.47 fps)

Summary for Pond CB-3: PROP CB-3

Inflow Area = 17,131 sf, 55.06% Impervious, Inflow Depth = 4.78" for 25-yr event
Inflow = 2.10 cfs @ 12.08 hrs, Volume= 6,821 cf
Outflow = 2.10 cfs @ 12.08 hrs, Volume= 6,821 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.10 cfs @ 12.08 hrs, Volume= 6,821 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.06' @ 12.08 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.20' / 253.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.10 cfs @ 12.08 hrs HW=254.06' TW=253.34' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.10 cfs @ 3.91 fps)

Summary for Pond CB-4: PROP CB-4

Inflow Area = 14,990 sf, 55.51% Impervious, Inflow Depth = 4.56" for 25-yr event
Inflow = 1.78 cfs @ 12.09 hrs, Volume= 5,694 cf
Outflow = 1.78 cfs @ 12.09 hrs, Volume= 5,694 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.78 cfs @ 12.09 hrs, Volume= 5,694 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.75' @ 12.09 hrs
Flood Elev= 256.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.85'	**12.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500

Inlet / Outlet Invert= 252.85' / 252.80' S= 0.0042 '/' Cc= 0.900
n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.77 cfs @ 12.09 hrs HW=253.75' TW=251.83' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.77 cfs @ 3.16 fps)

Summary for Pond CB-5: PROP CB-5

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 4.13" for 25-yr event
Inflow = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf
Outflow = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.80' @ 12.09 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.35'	**12.0" Round Culvert**
			L= 25.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 253.35' / 253.10' S= 0.0100 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.09 hrs HW=253.80' TW=253.27' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.71 cfs @ 3.07 fps)

Summary for Pond CB-6: PROP CB-6

Inflow Area = 5,068 sf, 98.56% Impervious, Inflow Depth = 5.57" for 25-yr event
Inflow = 0.67 cfs @ 12.08 hrs, Volume= 2,354 cf
Outflow = 0.67 cfs @ 12.08 hrs, Volume= 2,354 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.08 hrs, Volume= 2,354 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.32' @ 12.08 hrs
Flood Elev= 256.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.90'	**12.0" Round Culvert**
			L= 78.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 252.90' / 252.25' S= 0.0083 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.67 cfs @ 12.08 hrs HW=253.32' TW=252.05' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.67 cfs @ 3.18 fps)

Summary for Pond CB-7: PROP CB-7

Inflow Area = 5,589 sf,100.00% Impervious, Inflow Depth = 5.69" for 25-yr event
Inflow = 0.75 cfs @ 12.08 hrs, Volume= 2,651 cf
Outflow = 0.75 cfs @ 12.08 hrs, Volume= 2,651 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.75 cfs @ 12.08 hrs, Volume= 2,651 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.28' @ 12.09 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.80'	**12.0" Round Culvert** L= 16.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.80' / 252.60' S= 0.0125 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.08 hrs HW=253.27' TW=253.00' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.74 cfs @ 2.93 fps)

Summary for Pond CB-8: PROP CB-8

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 5.46" for 25-yr event
Inflow = 1.68 cfs @ 12.08 hrs, Volume= 5,794 cf
Outflow = 1.68 cfs @ 12.08 hrs, Volume= 5,794 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.04 hrs, Volume= 4,882 cf
Routed to Pond OWS-1 : PROP OWS-1
Secondary = 0.85 cfs @ 12.10 hrs, Volume= 913 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.28' @ 12.13 hrs
Flood Elev= 254.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.80'	**8.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.80' / 250.70' S= 0.0143 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#2	Secondary	251.80'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.80' / 251.00' S= 0.0400 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.86 cfs @ 12.04 hrs HW=252.17' TW=251.91' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.86 cfs @ 2.47 fps)

Secondary OutFlow Max=0.83 cfs @ 12.10 hrs HW=252.27' TW=251.88' (Dynamic Tailwater)
2=Culvert (Outlet Controls 0.83 cfs @ 3.36 fps)

Summary for Pond CB-9: PROP CB-9

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=585)

Inflow Area = 338 sf,100.00% Impervious, Inflow Depth = 5.69" for 25-yr event
Inflow = 0.05 cfs @ 12.08 hrs, Volume= 160 cf
Outflow = 0.05 cfs @ 12.08 hrs, Volume= 160 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.08 hrs, Volume= 160 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.22' @ 12.37 hrs
Flood Elev= 253.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.00'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.00' / 250.00' S= 0.0270 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=251.77' TW=251.81' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond DMH-1: PROP DMH-1

Inflow Area = 16,899 sf, 82.53% Impervious, Inflow Depth = 5.34" for 25-yr event
Inflow = 2.21 cfs @ 12.08 hrs, Volume= 7,520 cf
Outflow = 2.21 cfs @ 12.08 hrs, Volume= 7,520 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.21 cfs @ 12.08 hrs, Volume= 7,520 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.79' @ 12.09 hrs
Flood Elev= 257.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0047 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.14 cfs @ 12.08 hrs HW=253.78' TW=253.34' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.14 cfs @ 2.91 fps)

Summary for Pond DMH-2: PROP DMH-2

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 5.06" for 25-yr event
Inflow = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf
Outflow = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf
Routed to Pond DMH-3 : PROP DMH-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.39' @ 12.51 hrs
Flood Elev= 257.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.95'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.95' / 251.65' S= 0.0073 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.27 cfs @ 12.08 hrs HW=253.34' TW=252.82' (Dynamic Tailwater)
1=Culvert (Inlet Controls 4.27 cfs @ 3.48 fps)

Summary for Pond DMH-3: PROP DMH-3

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 5.06" for 25-yr event
Inflow = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf
Outflow = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.31 cfs @ 12.08 hrs, Volume= 14,341 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.37' @ 12.52 hrs
Flood Elev= 258.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.55'	**15.0" Round Culvert** L= 119.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.55' / 250.92' S= 0.0053 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=4.30 cfs @ 12.08 hrs HW=252.82' TW=251.82' (Dynamic Tailwater)
1=Culvert (Barrel Controls 4.30 cfs @ 4.28 fps)

Summary for Pond DMH-6: PROP DMH-6

[80] Warning: Exceeded Pond INF-1 by 1.87' @ 12.00 hrs (0.00 cfs 59 cf)
[80] Warning: Exceeded Pond INF-2 by 1.84' @ 11.98 hrs (0.00 cfs 71 cf)

Inflow Area = 65,803 sf, 71.28% Impervious, Inflow Depth = 0.46" for 25-yr event
Inflow = 0.72 cfs @ 12.09 hrs, Volume= 2,534 cf
Outflow = 0.72 cfs @ 12.09 hrs, Volume= 2,534 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.09 hrs, Volume= 2,534 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.27' @ 12.09 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 149.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 251.70' S= 0.0060 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.09 hrs HW=253.27' TW=253.00' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.71 cfs @ 1.79 fps)

Summary for Pond DMH-8: PROP DMH-8

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.87" for 25-yr event
Inflow = 1.46 cfs @ 12.08 hrs, Volume= 5,185 cf
Outflow = 1.46 cfs @ 12.08 hrs, Volume= 5,185 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.01 hrs, Volume= 4,634 cf
Routed to Pond OWS-2 : PROP. OWS-2
Secondary = 0.80 cfs @ 12.09 hrs, Volume= 551 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.00' @ 12.09 hrs
Flood Elev= 255.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.60'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.60' / 251.50' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Secondary	252.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.67 cfs @ 12.01 hrs HW=252.83' TW=252.32' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.67 cfs @ 3.42 fps)

Secondary OutFlow Max=0.80 cfs @ 12.09 hrs HW=253.00' TW=252.07' (Dynamic Tailwater)
2=Culvert (Inlet Controls 0.80 cfs @ 2.14 fps)

Summary for Pond DMH-9: PROP DMH-9

Inflow Area = 76,460 sf, 75.18% Impervious, Inflow Depth = 1.18" for 25-yr event
Inflow = 2.13 cfs @ 12.08 hrs, Volume= 7,539 cf
Outflow = 2.13 cfs @ 12.08 hrs, Volume= 7,539 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.13 cfs @ 12.08 hrs, Volume= 7,539 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.24' @ 12.36 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.05'	**18.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.05' / 250.50' S= 0.0052 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.96 cfs @ 12.08 hrs HW=252.06' TW=251.82' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.96 cfs @ 2.21 fps)

Summary for Pond INF-1: Underground Infiltration System #1

Inflow Area = 49,020 sf, 64.67% Impervious, Inflow Depth = 4.90" for 25-yr event
Inflow = 6.09 cfs @ 12.08 hrs, Volume= 20,035 cf
Outflow = 1.12 cfs @ 12.54 hrs, Volume= 20,035 cf, Atten= 82%, Lag= 27.3 min
Discarded = 0.88 cfs @ 12.53 hrs, Volume= 19,749 cf
Primary = 0.24 cfs @ 12.54 hrs, Volume= 286 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.34' @ 12.53 hrs Surf.Area= 2,808 sf Storage= 6,336 cf
Flood Elev= 255.50' Surf.Area= 2,808 sf Storage= 9,206 cf

Plug-Flow detention time= 51.0 min calculated for 20,028 cf (100% of inflow)
Center-of-Mass det. time= 51.0 min (830.0 - 779.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	250.00'	2,103 cf	**29.92'W x 48.72'L x 5.50'H Field A** 8,016 cf Overall - 2,758 cf Embedded = 5,258 cf x 40.0% Voids
#2A	250.75'	2,758 cf	**ADS_StormTech MC-3500 d +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 24 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
#3B	250.00'	804 cf	**8.42'W x 63.06'L x 5.50'H Field B** 2,919 cf Overall - 909 cf Embedded = 2,010 cf x 40.0% Voids
#4B	250.75'	909 cf	**ADS_StormTech MC-3500 d +Cap** x 8 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#5C	250.00'	715 cf	**8.42'W x 55.89'L x 5.50'H Field C** 2,587 cf Overall - 799 cf Embedded = 1,788 cf x 40.0% Voids
#6C	250.75'	799 cf	**ADS_StormTech MC-3500 d +Cap** x 7 Inside #5 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#7D	250.00'	538 cf	**8.42'W x 41.55'L x 5.50'H Field D** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#8D	250.75'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #7 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		9,206 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.05'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.05' / 252.70' S= 0.0054 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.88 cfs @ 12.53 hrs HW=253.34' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.88 cfs)

Primary OutFlow Max=0.24 cfs @ 12.54 hrs HW=253.34' TW=253.03' (Dynamic Tailwater)
↑—**2=Culvert** (Outlet Controls 0.24 cfs @ 1.89 fps)

Summary for Pond INF-2: Underground Infiltration System #2

Inflow Area = 10,252 sf,100.00% Impervious, Inflow Depth = 5.69" for 25-yr event
Inflow = 1.67 cfs @ 12.00 hrs, Volume= 4,863 cf
Outflow = 0.23 cfs @ 12.45 hrs, Volume= 4,863 cf, Atten= 86%, Lag= 26.9 min
Discarded = 0.23 cfs @ 12.45 hrs, Volume= 4,863 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.74' @ 12.45 hrs Surf.Area= 651 sf Storage= 1,402 cf
Flood Elev= 255.00' Surf.Area= 651 sf Storage= 2,111 cf

Plug-Flow detention time= 40.1 min calculated for 4,863 cf (100% of inflow)
Center-of-Mass det. time= 40.1 min (779.9 - 739.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	249.50'	981 cf	**8.42'W x 77.40'L x 5.50'H Field A** 3,583 cf Overall - 1,129 cf Embedded = 2,454 cf x 40.0% Voids
#2A	250.25'	1,129 cf	**ADS_StormTech MC-3500 d +Cap** x 10 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		2,111 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.50'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.02'	**6.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.02' / 252.70' S= 0.0178 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.23 cfs @ 12.45 hrs HW=252.74' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.50' TW=252.60' (Dynamic Tailwater)
2=Culvert (Controls 0.00 cfs)

Summary for Pond OWS-1: PROP OWS-1

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 4.60" for 25-yr event
Inflow = 0.92 cfs @ 12.04 hrs, Volume= 4,882 cf
Outflow = 0.92 cfs @ 12.04 hrs, Volume= 4,882 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.92 cfs @ 12.04 hrs, Volume= 4,882 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 252.24' @ 12.34 hrs
Flood Elev= 254.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.45'	**8.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.45' / 250.30' S= 0.0115 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.86 cfs @ 12.04 hrs HW=251.91' TW=251.65' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.86 cfs @ 2.46 fps)

Summary for Pond OWS-2: PROP. OWS-2

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.78" for 25-yr event
Inflow = 0.70 cfs @ 12.01 hrs, Volume= 4,634 cf
Outflow = 0.70 cfs @ 12.01 hrs, Volume= 4,634 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.01 hrs, Volume= 4,634 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.54' @ 12.11 hrs
Flood Elev= 255.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.25' / 251.15' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.67 cfs @ 12.01 hrs HW=252.32' TW=251.81' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.67 cfs @ 3.43 fps)

Summary for Pond SD-1: PROP SLOTTED DRAIN

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 4.13" for 25-yr event
Inflow = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf
Outflow = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.09 hrs, Volume= 2,248 cf
Routed to Pond CB-5 : PROP CB-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.42' @ 12.09 hrs
Flood Elev= 255.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.85'	**8.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.85' / 253.75' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.71 cfs @ 12.09 hrs HW=254.42' TW=253.80' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.71 cfs @ 3.03 fps)

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 108,238 sf, 67.67% Impervious, Inflow Depth = 0.18" for 25-yr event
Inflow = 0.40 cfs @ 12.10 hrs, Volume= 1,645 cf
Primary = 0.40 cfs @ 12.10 hrs, Volume= 1,645 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 13,477 sf, 0.01% Impervious, Inflow Depth = 2.66" for 25-yr event
Inflow = 0.96 cfs @ 12.09 hrs, Volume= 2,985 cf
Primary = 0.96 cfs @ 12.09 hrs, Volume= 2,985 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 70.26% Impervious, Inflow Depth = 0.63" for 25-yr event
Inflow = 0.87 cfs @ 12.11 hrs, Volume= 1,201 cf
Primary = 0.87 cfs @ 12.11 hrs, Volume= 1,201 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcat 1S Runoff Area=8,273 sf 88.76% Impervious Runoff Depth=7.10"
Flow Length=105' Tc=6.0 min CN=96 Runoff=1.40 cfs 4,896 cf

Subcatchment 2S: Subcat 2S Runoff Area=8,626 sf 76.54% Impervious Runoff Depth=6.86"
Flow Length=115' Tc=6.0 min CN=94 Runoff=1.44 cfs 4,934 cf

Subcatchment 3S: Subcat 2S Runoff Area=17,131 sf 55.06% Impervious Runoff Depth=6.39"
Flow Length=155' Tc=6.0 min CN=90 Runoff=2.77 cfs 9,126 cf

Subcatchment 4S: Subcat 3S Runoff Area=14,990 sf 55.51% Impervious Runoff Depth=6.16"
Flow Length=215' Tc=6.0 min CN=88 Runoff=2.36 cfs 7,692 cf

Subcatchment 5S: Subcat 5S Runoff Area=6,531 sf 75.80% Impervious Runoff Depth=5.69"
Flow Length=75' Tc=6.0 min CN=84 Runoff=0.97 cfs 3,098 cf

Subcatchment 6S: Subcat 6S Runoff Area=5,068 sf 98.56% Impervious Runoff Depth=7.22"
Flow Length=108' Slope=0.0180 '/' Tc=6.0 min CN=97 Runoff=0.86 cfs 3,050 cf

Subcatchment 7S: Subcat 7S Runoff Area=5,589 sf 100.00% Impervious Runoff Depth=7.34"
Flow Length=112' Slope=0.0130 '/' Tc=6.0 min CN=98 Runoff=0.95 cfs 3,419 cf

Subcatchment 8S: Subcat 9S Runoff Area=12,740 sf 96.03% Impervious Runoff Depth=7.10"
Flow Length=150' Slope=0.0230 '/' Tc=6.0 min CN=96 Runoff=2.16 cfs 7,540 cf

Subcatchment 9S: Subcat 9S Runoff Area=338 sf 100.00% Impervious Runoff Depth=7.34"
Flow Length=47' Slope=0.0290 '/' Tc=6.0 min CN=98 Runoff=0.06 cfs 207 cf

Subcatchment 10S: RETAIL CANOPY Runoff Area=3,144 sf 100.00% Impervious Runoff Depth=7.34"
Tc=0.0 min CN=98 Runoff=0.66 cfs 1,923 cf

Subcatchment 11S: C-STORE ROOF Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=7.34"
Tc=0.0 min CN=98 Runoff=1.25 cfs 3,670 cf

Subcatchment 12S: DIESEL CANOPY Runoff Area=1,108 sf 100.00% Impervious Runoff Depth=7.34"
Tc=0.0 min CN=98 Runoff=0.23 cfs 678 cf

Subcatchment 100S: Subcat 100S Runoff Area=12,338 sf 25.79% Impervious Runoff Depth=2.40"
Flow Length=30' Slope=0.0830 '/' Tc=6.0 min CN=54 Runoff=0.75 cfs 2,466 cf

Subcatchment 101S: Direct to basin Runoff Area=6,362 sf 0.02% Impervious Runoff Depth=0.82"
Tc=0.0 min CN=37 Runoff=0.08 cfs 436 cf

Subcatchment 200S: Subcat 200S Runoff Area=13,477 sf 0.01% Impervious Runoff Depth=4.00"
Flow Length=182' Tc=6.0 min CN=69 Runoff=1.45 cfs 4,487 cf

Subcatchment 300S: Subcat 300S Runoff Area=5,994 sf 37.25% Impervious Runoff Depth=3.02"
Flow Length=105' Slope=0.0260 '/' Tc=6.0 min CN=60 Runoff=0.48 cfs 1,509 cf

Subcatchment 301S: Subcat 301S Runoff Area=16,878 sf 81.98% Impervious Runoff Depth=6.04"
Flow Length=120' Slope=0.0175 '/' Tc=6.0 min CN=87 Runoff=2.63 cfs 8,497 cf

Pond 1P: Aboveground Infiltration Basin Peak Elev=252.87' Storage=5,490 cf Inflow=5.08 cfs 21,022 cf
Discarded=1.29 cfs 17,708 cf Primary=1.23 cfs 3,313 cf Outflow=2.52 cfs 21,022 cf

Pond BIO-1: Bioretention Area Peak Elev=251.68' Storage=463 cf Inflow=2.63 cfs 8,497 cf
Discarded=1.47 cfs 7,851 cf Primary=1.07 cfs 646 cf Outflow=2.54 cfs 8,497 cf

Pond CB-1: PROP. CB-1 Peak Elev=255.50' Inflow=1.40 cfs 4,896 cf
12.0" Round Culvert n=0.012 L=109.0' S=0.0069 '/' Outflow=1.40 cfs 4,896 cf

Pond CB-2: PROP CB-2 Peak Elev=255.44' Inflow=1.44 cfs 4,934 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=1.44 cfs 4,934 cf

Pond CB-3: PROP CB-3 Peak Elev=255.11' Inflow=2.77 cfs 9,126 cf
12.0" Round Culvert n=0.012 L=11.0' S=0.0182 '/' Outflow=2.77 cfs 9,126 cf

Pond CB-4: PROP CB-4 Peak Elev=254.26' Inflow=2.36 cfs 7,692 cf
12.0" Round Culvert n=0.012 L=12.0' S=0.0042 '/' Outflow=2.36 cfs 7,692 cf

Pond CB-5: PROP CB-5 Peak Elev=254.90' Inflow=0.97 cfs 3,098 cf
12.0" Round Culvert n=0.012 L=25.0' S=0.0100 '/' Outflow=0.97 cfs 3,098 cf

Pond CB-6: PROP CB-6 Peak Elev=253.38' Inflow=0.86 cfs 3,050 cf
12.0" Round Culvert n=0.012 L=78.0' S=0.0083 '/' Outflow=0.86 cfs 3,050 cf

Pond CB-7: PROP CB-7 Peak Elev=253.47' Inflow=0.95 cfs 3,419 cf
12.0" Round Culvert n=0.012 L=16.0' S=0.0125 '/' Outflow=0.95 cfs 3,419 cf

Pond CB-8: PROP CB-8 Peak Elev=252.88' Inflow=2.16 cfs 7,540 cf
Primary=0.83 cfs 5,616 cf Secondary=1.40 cfs 1,924 cf Outflow=2.16 cfs 7,540 cf

Pond CB-9: PROP CB-9 Peak Elev=252.87' Inflow=0.06 cfs 207 cf
12.0" Round Culvert n=0.012 L=37.0' S=0.0270 '/' Outflow=0.06 cfs 207 cf

Pond DMH-1: PROP DMH-1 Peak Elev=255.32' Inflow=2.85 cfs 9,831 cf
12.0" Round Culvert n=0.012 L=85.0' S=0.0047 '/' Outflow=2.85 cfs 9,831 cf

Pond DMH-2: PROP DMH-2 Peak Elev=254.65' Inflow=5.61 cfs 18,956 cf
15.0" Round Culvert n=0.012 L=41.0' S=0.0073 '/' Outflow=5.61 cfs 18,956 cf

Pond DMH-3: PROP DMH-3 Peak Elev=254.34' Inflow=5.61 cfs 18,956 cf
15.0" Round Culvert n=0.012 L=119.0' S=0.0053 '/' Outflow=5.61 cfs 18,956 cf

Pond DMH-6: PROP DMH-6 Peak Elev=254.90' Inflow=3.57 cfs 6,371 cf
12.0" Round Culvert n=0.012 L=149.0' S=0.0060 '/' Outflow=3.57 cfs 6,371 cf

Pond DMH-8: PROP DMH-8 Peak Elev=253.45' Inflow=3.89 cfs 9,790 cf
Primary=0.72 cfs 5,596 cf Secondary=3.27 cfs 4,195 cf Outflow=3.89 cfs 9,790 cf

Pond DMH-9: PROP DMH-9 Peak Elev=253.09' Inflow=4.19 cfs 12,840 cf
18.0" Round Culvert n=0.012 L=106.0' S=0.0052 '/' Outflow=4.19 cfs 12,840 cf

Pond INF-1: Underground Infiltration Peak Elev=254.22' Storage=7,752 cf Inflow=7.97 cfs 26,649 cf
Discarded=0.97 cfs 23,648 cf Primary=2.78 cfs 3,000 cf Outflow=3.75 cfs 26,649 cf

Pond INF-2: Underground Infiltration Peak Elev=253.80' Storage=1,796 cf Inflow=2.14 cfs 6,271 cf
Discarded=0.27 cfs 5,999 cf Primary=0.55 cfs 272 cf Outflow=0.81 cfs 6,271 cf

Pond OWS-1: PROP OWS-1 Peak Elev=252.88' Inflow=0.83 cfs 5,616 cf
8.0" Round Culvert n=0.012 L=13.0' S=0.0115 '/' Outflow=0.83 cfs 5,616 cf

Pond OWS-2: PROP. OWS-2 Peak Elev=253.32' Inflow=0.72 cfs 5,596 cf
6.0" Round Culvert n=0.012 L=6.0' S=0.0167 '/' Outflow=0.72 cfs 5,596 cf

Pond SD-1: PROP SLOTTED DRAIN Peak Elev=254.93' Inflow=0.97 cfs 3,098 cf
8.0" Round Culvert n=0.012 L=5.0' S=0.0200 '/' Outflow=0.97 cfs 3,098 cf

Link DP1: DESIGN POINT #1: AYER ROAD Inflow=1.49 cfs 5,780 cf
Primary=1.49 cfs 5,780 cf

Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST) Inflow=1.45 cfs 4,487 cf
Primary=1.45 cfs 4,487 cf

Link DP3: DESIGN POINT #3: WILLOW ROAD Inflow=1.54 cfs 2,155 cf
Primary=1.54 cfs 2,155 cf

Total Runoff Area = 144,587 sf Runoff Volume = 67,629 cf Average Runoff Depth = 5.61"
38.23% Pervious = 55,276 sf 61.77% Impervious = 89,311 sf

Summary for Subcatchment 1S: Subcat 1S

Runoff = 1.40 cfs @ 12.08 hrs, Volume= 4,896 cf, Depth= 7.10"
Routed to Pond CB-1 : PROP. CB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
929	80	>75% Grass cover, Good, HSG D
1,328	98	Paved parking, HSG A
6,015	98	Paved parking, HSG D
8,273	96	Weighted Average
929		11.24% Pervious Area
7,343		88.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	25	0.0200	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.5	80	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
3.8	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: Subcat 2S

Runoff = 1.44 cfs @ 12.08 hrs, Volume= 4,934 cf, Depth= 6.86"
Routed to Pond CB-2 : PROP CB-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
2,023	80	>75% Grass cover, Good, HSG D
6,603	98	Paved parking, HSG D
8,626	94	Weighted Average
2,023		23.46% Pervious Area
6,603		76.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	30	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	85	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	115	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: Subcat 2S

Runoff = 2.77 cfs @ 12.08 hrs, Volume= 9,126 cf, Depth= 6.39"
Routed to Pond CB-3 : PROP CB-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
7,699	80	>75% Grass cover, Good, HSG D
9,432	98	Paved parking, HSG D
17,131	90	Weighted Average
7,699		44.94% Pervious Area
9,432		55.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.4	75	0.2100	3.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	60	0.0380	3.96		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.6	155	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4S: Subcat 3S

Runoff = 2.36 cfs @ 12.08 hrs, Volume= 7,692 cf, Depth= 6.16"
Routed to Pond CB-4 : PROP CB-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
889	39	>75% Grass cover, Good, HSG A
5,780	80	>75% Grass cover, Good, HSG D
2,875	98	Paved parking, HSG A
5,446	98	Paved parking, HSG D
14,990	88	Weighted Average
6,669		44.49% Pervious Area
8,321		55.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
1.0	150	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	45	0.0240	3.14		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.1	215	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: Subcat 5S

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf, Depth= 5.69"
Routed to Pond SD-1 : PROP SLOTTED DRAIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
1,580	39	>75% Grass cover, Good, HSG A
4,951	98	Paved parking, HSG A
6,531	84	Weighted Average
1,580		24.20% Pervious Area
4,951		75.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	20	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.3	25	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6S: Subcat 6S

Runoff = 0.86 cfs @ 12.08 hrs, Volume= 3,050 cf, Depth= 7.22"
Routed to Pond CB-6 : PROP CB-6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
31	39	>75% Grass cover, Good, HSG A
42	80	>75% Grass cover, Good, HSG D
3,973	98	Paved parking, HSG A
1,022	98	Paved parking, HSG D
5,068	97	Weighted Average
73		1.44% Pervious Area
4,995		98.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0180	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	88	0.0180	2.72		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	108	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7S: Subcat 7S

Runoff = 0.95 cfs @ 12.08 hrs, Volume= 3,419 cf, Depth= 7.34"
Routed to Pond CB-7 : PROP CB-7

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
5,589	98	Paved parking, HSG A
5,589		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0130	0.82		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	92	0.0130	2.31		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	112	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: Subcat 9S

Runoff = 2.16 cfs @ 12.08 hrs, Volume= 7,540 cf, Depth= 7.10"
Routed to Pond CB-8 : PROP CB-8

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
462	39	>75% Grass cover, Good, HSG A
44	80	>75% Grass cover, Good, HSG D
12,201	98	Paved parking, HSG A
34	98	Paved parking, HSG D
12,740	96	Weighted Average
505		3.97% Pervious Area
12,234		96.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0230	1.02		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	130	0.0230	3.08		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.0	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 9S: Subcat 9S

Runoff = 0.06 cfs @ 12.08 hrs, Volume= 207 cf, Depth= 7.34"
Routed to Pond CB-9 : PROP CB-9

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
338	98	Paved parking, HSG A
338		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0290	1.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.1	22	0.0290	3.46		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.5	47	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 10S: RETAIL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.66 cfs @ 12.00 hrs, Volume= 1,923 cf, Depth= 7.34"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
3,144	98	Roofs, HSG A
3,144		100.00% Impervious Area

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

Summary for Subcatchment 11S: C-STORE ROOF

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.25 cfs @ 12.00 hrs, Volume= 3,670 cf, Depth= 7.34"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
6,000	98	Roofs, HSG D
6,000		100.00% Impervious Area

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

Summary for Subcatchment 12S: DIESEL CANOPY

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.23 cfs @ 12.00 hrs, Volume= 678 cf, Depth= 7.34"
Routed to Pond INF-2 : Underground Infiltration System #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
1,108	98	Roofs, HSG A
1,108		100.00% Impervious Area

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

Summary for Subcatchment 100S: Subcat 100S

Runoff = 0.75 cfs @ 12.10 hrs, Volume= 2,466 cf, Depth= 2.40"
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
9,110	39	>75% Grass cover, Good, HSG A
3,182	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
12,338	54	Weighted Average
9,156		74.21% Pervious Area
3,182		25.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0830	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
2.2	30	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 101S: Direct to basin

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.08 cfs @ 12.05 hrs, Volume= 436 cf, Depth= 0.82"
Routed to Pond 1P : Aboveground Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
5,132	39	>75% Grass cover, Good, HSG A
1	98	Paved parking, HSG A
1,229	30	Woods, Good, HSG A
6,362	37	Weighted Average
6,361		99.98% Pervious Area
1		0.02% Impervious Area

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

Summary for Subcatchment 200S: Subcat 200S

Runoff = 1.45 cfs @ 12.09 hrs, Volume= 4,487 cf, Depth= 4.00"
Routed to Link DP2 : DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
1,612	39	>75% Grass cover, Good, HSG A
2,921	80	>75% Grass cover, Good, HSG D
1	98	Paved parking, HSG D
1,119	30	Woods, Good, HSG A
7,823	77	Woods, Good, HSG D
13,477	69	Weighted Average
13,476		99.99% Pervious Area
1		0.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	25	0.1500	0.28		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.02"
0.6	67	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.2	90	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	182	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 300S: Subcat 300S

Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,509 cf, Depth= 3.02"
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
2,957	39	>75% Grass cover, Good, HSG A
2,233	98	Paved parking, HSG A
804	30	Woods, Good, HSG A
5,994	60	Weighted Average
3,761		62.75% Pervious Area
2,233		37.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0260	1.12		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.5	75	0.0260	2.60		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	5	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.0	105	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 301S: Subcat 301S

Runoff = 2.63 cfs @ 12.08 hrs, Volume= 8,497 cf, Depth= 6.04"
Routed to Pond BIO-1 : Bioretention Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.58"

Area (sf)	CN	Description
2,997	39	>75% Grass cover, Good, HSG A
13,836	98	Paved parking, HSG A
45	30	Woods, Good, HSG A
16,878	87	Weighted Average
3,042		18.02% Pervious Area
13,836		81.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	25	0.0175	0.96		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.02"
0.7	95	0.0175	2.13		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	120	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Aboveground Infiltration Basin

[80] Warning: Exceeded Pond CB-8 by 1.70' @ 12.65 hrs (2.70 cfs 372 cf)
[80] Warning: Exceeded Pond CB-9 by 1.86' @ 12.55 hrs (4.41 cfs 8,548 cf)
[80] Warning: Exceeded Pond OWS-1 by 2.37' @ 12.64 hrs (2.40 cfs 469 cf)

Inflow Area = 95,900 sf, 73.05% Impervious, Inflow Depth = 2.63" for 100-yr event
Inflow = 5.08 cfs @ 12.08 hrs, Volume= 21,022 cf
Outflow = 2.52 cfs @ 12.50 hrs, Volume= 21,022 cf, Atten= 50%, Lag= 24.8 min
Discarded = 1.29 cfs @ 12.50 hrs, Volume= 17,708 cf
Primary = 1.23 cfs @ 12.50 hrs, Volume= 3,313 cf
Routed to Link DP1 : DESIGN POINT #1: AYER ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 252.87' @ 12.50 hrs Surf.Area= 3,332 sf Storage= 5,490 cf
Flood Elev= 254.00' Surf.Area= 4,536 sf Storage= 9,913 cf

Plug-Flow detention time= 38.4 min calculated for 21,015 cf (100% of inflow)
Center-of-Mass det. time= 38.4 min (798.3 - 760.0)

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	9,913 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.00	830	155.0	0	0	830
251.49	1,591	183.0	1,773	1,773	1,624
251.50	2,092	287.0	18	1,792	5,514
252.00	2,529	297.0	1,154	2,945	6,001
254.00	4,536	329.0	6,968	9,913	7,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	252.00'	**8.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.00' / 248.00' S= 0.1290 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#3	Primary	253.65'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=1.29 cfs @ 12.50 hrs HW=252.87' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.29 cfs)

Primary OutFlow Max=1.23 cfs @ 12.50 hrs HW=252.87' TW=0.00' (Dynamic Tailwater)
├**2=Culvert** (Inlet Controls 1.23 cfs @ 3.53 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BIO-1: Bioretention Area

Inflow Area = 16,878 sf, 81.98% Impervious, Inflow Depth = 6.04" for 100-yr event
Inflow = 2.63 cfs @ 12.08 hrs, Volume= 8,497 cf
Outflow = 2.54 cfs @ 12.11 hrs, Volume= 8,497 cf, Atten= 3%, Lag= 1.2 min
Discarded = 1.47 cfs @ 12.11 hrs, Volume= 7,851 cf
Primary = 1.07 cfs @ 12.11 hrs, Volume= 646 cf
Routed to Link DP3 : DESIGN POINT #3: WILLOW ROAD

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 251.68' @ 12.11 hrs Surf.Area= 918 sf Storage= 463 cf
Flood Elev= 252.00' Surf.Area= 1,438 sf Storage= 837 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 10.7 min (797.4 - 786.7)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	837 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
248.00	59	38.0	0.0	0	0	59
250.49	59	38.0	35.0	51	51	154
250.50	59	38.0	100.0	1	52	154
251.00	199	90.0	100.0	61	113	685
252.00	1,438	414.0	100.0	724	837	13,682

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	251.50'	**6.0' 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

Discarded OutFlow Max=1.47 cfs @ 12.11 hrs HW=251.68' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 1.47 cfs)

Primary OutFlow Max=1.07 cfs @ 12.11 hrs HW=251.68' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.07 cfs @ 0.99 fps)

Summary for Pond CB-1: PROP. CB-1

Inflow Area = 8,273 sf, 88.76% Impervious, Inflow Depth = 7.10" for 100-yr event
Inflow = 1.40 cfs @ 12.08 hrs, Volume= 4,896 cf
Outflow = 1.40 cfs @ 12.08 hrs, Volume= 4,896 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.40 cfs @ 12.08 hrs, Volume= 4,896 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 255.50' @ 12.12 hrs
Flood Elev= 256.45'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.45'	**12.0" Round Culvert** L= 109.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.45' / 252.70' S= 0.0069 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=254.96' TW=255.02' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond CB-2: PROP CB-2

Inflow Area = 8,626 sf, 76.54% Impervious, Inflow Depth = 6.86" for 100-yr event
Inflow = 1.44 cfs @ 12.08 hrs, Volume= 4,934 cf
Outflow = 1.44 cfs @ 12.08 hrs, Volume= 4,934 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.08 hrs, Volume= 4,934 cf
Routed to Pond DMH-1 : PROP DMH-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 255.44' @ 12.12 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	254.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 254.20' / 254.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=255.00' TW=255.03' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond CB-3: PROP CB-3

Inflow Area = 17,131 sf, 55.06% Impervious, Inflow Depth = 6.39" for 100-yr event
Inflow = 2.77 cfs @ 12.08 hrs, Volume= 9,126 cf
Outflow = 2.77 cfs @ 12.08 hrs, Volume= 9,126 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.77 cfs @ 12.08 hrs, Volume= 9,126 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 255.11' @ 12.11 hrs
Flood Elev= 257.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.20'	**12.0" Round Culvert** L= 11.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.20' / 253.00' S= 0.0182 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.27 cfs @ 12.08 hrs HW=254.81' TW=254.44' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.27 cfs @ 2.90 fps)

Summary for Pond CB-4: PROP CB-4

Inflow Area = 14,990 sf, 55.51% Impervious, Inflow Depth = 6.16" for 100-yr event
Inflow = 2.36 cfs @ 12.08 hrs, Volume= 7,692 cf
Outflow = 2.36 cfs @ 12.08 hrs, Volume= 7,692 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.36 cfs @ 12.08 hrs, Volume= 7,692 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.26' @ 12.41 hrs
Flood Elev= 256.85'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.85'	**12.0" Round Culvert** L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.85' / 252.80' S= 0.0042 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.36 cfs @ 12.08 hrs HW=253.94' TW=252.56' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.36 cfs @ 3.44 fps)

Summary for Pond CB-5: PROP CB-5

[80] Warning: Exceeded Pond SD-1 by 0.72' @ 12.39 hrs (1.42 cfs 509 cf)

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 5.69" for 100-yr event
Inflow = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf
Outflow = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.90' @ 12.39 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.35'	**12.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.35' / 253.10' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.97 cfs @ 12.09 hrs HW=253.89' TW=253.41' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.97 cfs @ 3.27 fps)

Summary for Pond CB-6: PROP CB-6

Inflow Area = 5,068 sf, 98.56% Impervious, Inflow Depth = 7.22" for 100-yr event
Inflow = 0.86 cfs @ 12.08 hrs, Volume= 3,050 cf
Outflow = 0.86 cfs @ 12.08 hrs, Volume= 3,050 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.08 hrs, Volume= 3,050 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.38' @ 12.08 hrs
Flood Elev= 256.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.90'	**12.0" Round Culvert**

L= 78.0' CPP, square edge headwall, Ke= 0.500
Inlet / Outlet Invert= 252.90' / 252.25' S= 0.0083 '/' Cc= 0.900
n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.86 cfs @ 12.08 hrs HW=253.38' TW=252.34' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.86 cfs @ 3.38 fps)

Summary for Pond CB-7: PROP CB-7

Inflow Area = 5,589 sf,100.00% Impervious, Inflow Depth = 7.34" for 100-yr event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 3,419 cf
Outflow = 0.95 cfs @ 12.08 hrs, Volume= 3,419 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 12.08 hrs, Volume= 3,419 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.47' @ 12.37 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.80'	**12.0" Round Culvert**
			L= 16.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 252.80' / 252.60' S= 0.0125 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.08 hrs HW=253.38' TW=253.12' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.94 cfs @ 2.90 fps)

Summary for Pond CB-8: PROP CB-8

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 7.10" for 100-yr event
Inflow = 2.16 cfs @ 12.08 hrs, Volume= 7,540 cf
Outflow = 2.16 cfs @ 12.08 hrs, Volume= 7,540 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.03 hrs, Volume= 5,616 cf
Routed to Pond OWS-1 : PROP OWS-1
Secondary = 1.40 cfs @ 12.09 hrs, Volume= 1,924 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.88' @ 12.50 hrs
Flood Elev= 254.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.80'	**8.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 250.80' / 250.70' S= 0.0143 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf
#2	Secondary	251.80'	**12.0" Round Culvert**
			L= 20.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 251.80' / 251.00' S= 0.0400 '/' Cc= 0.900
			n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 12.03 hrs HW=252.29' TW=252.09' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.76 cfs @ 2.17 fps)

Secondary OutFlow Max=1.30 cfs @ 12.09 hrs HW=252.50' TW=252.20' (Dynamic Tailwater)
↑—**2=Culvert** (Outlet Controls 1.30 cfs @ 3.10 fps)

Summary for Pond CB-9: PROP CB-9

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=581)

Inflow Area = 338 sf,100.00% Impervious, Inflow Depth = 7.34" for 100-yr event
Inflow = 0.06 cfs @ 12.08 hrs, Volume= 207 cf
Outflow = 0.06 cfs @ 12.08 hrs, Volume= 207 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 12.08 hrs, Volume= 207 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.87' @ 12.51 hrs
Flood Elev= 253.65'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.00'	**12.0" Round Culvert** L= 37.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.00' / 250.00' S= 0.0270 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=252.10' TW=252.15' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Summary for Pond DMH-1: PROP DMH-1

[80] Warning: Exceeded Pond CB-1 by 0.11' @ 12.08 hrs (0.99 cfs 47 cf)
[80] Warning: Exceeded Pond CB-2 by 0.03' @ 12.08 hrs (0.50 cfs 36 cf)

Inflow Area = 16,899 sf, 82.53% Impervious, Inflow Depth = 6.98" for 100-yr event
Inflow = 2.85 cfs @ 12.08 hrs, Volume= 9,831 cf
Outflow = 2.85 cfs @ 12.08 hrs, Volume= 9,831 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.85 cfs @ 12.08 hrs, Volume= 9,831 cf
Routed to Pond DMH-2 : PROP DMH-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 255.32' @ 12.11 hrs
Flood Elev= 257.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 85.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0047 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.50 cfs @ 12.08 hrs HW=255.03' TW=254.43' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.50 cfs @ 3.18 fps)

Summary for Pond DMH-2: PROP DMH-2

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 6.68" for 100-yr event
Inflow = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf
Outflow = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf
Routed to Pond DMH-3 : PROP DMH-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.65' @ 12.11 hrs
Flood Elev= 257.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.95'	**15.0" Round Culvert** L= 41.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.95' / 251.65' S= 0.0073 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.15 cfs @ 12.08 hrs HW=254.44' TW=253.68' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.15 cfs @ 4.20 fps)

Summary for Pond DMH-3: PROP DMH-3

Inflow Area = 34,030 sf, 68.70% Impervious, Inflow Depth = 6.68" for 100-yr event
Inflow = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf
Outflow = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.61 cfs @ 12.08 hrs, Volume= 18,956 cf
Routed to Pond INF-1 : Underground Infiltration System #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.34' @ 12.38 hrs
Flood Elev= 258.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.55'	**15.0" Round Culvert** L= 119.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.55' / 250.92' S= 0.0053 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=5.32 cfs @ 12.08 hrs HW=253.68' TW=252.55' (Dynamic Tailwater)
1=Culvert (Outlet Controls 5.32 cfs @ 4.33 fps)

Summary for Pond DMH-6: PROP DMH-6

[80] Warning: Exceeded Pond CB-5 by 1.22' @ 12.38 hrs (3.82 cfs 1,647 cf)
[80] Warning: Exceeded Pond INF-1 by 1.73' @ 11.93 hrs (0.00 cfs 1,285 cf)
[80] Warning: Exceeded Pond INF-2 by 1.99' @ 11.89 hrs (0.00 cfs 811 cf)

Inflow Area = 65,803 sf, 71.28% Impervious, Inflow Depth = 1.16" for 100-yr event
Inflow = 3.57 cfs @ 12.36 hrs, Volume= 6,371 cf
Outflow = 3.57 cfs @ 12.36 hrs, Volume= 6,371 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.57 cfs @ 12.36 hrs, Volume= 6,371 cf
Routed to Pond DMH-8 : PROP DMH-8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.90' @ 12.38 hrs
Flood Elev= 256.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	252.60'	**12.0" Round Culvert** L= 149.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 251.70' S= 0.0060 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.22 cfs @ 12.36 hrs HW=254.88' TW=253.45' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.22 cfs @ 4.09 fps)

Summary for Pond DMH-8: PROP DMH-8

[80] Warning: Exceeded Pond CB-7 by 0.25' @ 12.36 hrs (1.10 cfs 504 cf)

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 1.65" for 100-yr event
Inflow = 3.89 cfs @ 12.36 hrs, Volume= 9,790 cf
Outflow = 3.89 cfs @ 12.36 hrs, Volume= 9,790 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.30 hrs, Volume= 5,596 cf
Routed to Pond OWS-2 : PROP. OWS-2
Secondary = 3.27 cfs @ 12.38 hrs, Volume= 4,195 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.45' @ 12.38 hrs
Flood Elev= 255.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.60'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.60' / 251.50' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf
#2	Secondary	252.60'	**18.0" Round Culvert** L= 8.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 252.60' / 252.20' S= 0.0500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.30 cfs @ 12.30 hrs HW=253.42' TW=253.31' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.30 cfs @ 1.55 fps)

Secondary OutFlow Max=2.77 cfs @ 12.38 hrs HW=253.45' TW=253.07' (Dynamic Tailwater)
2=Culvert (Outlet Controls 2.77 cfs @ 3.85 fps)

Summary for Pond DMH-9: PROP DMH-9

Inflow Area = 76,460 sf, 75.18% Impervious, Inflow Depth = 2.02" for 100-yr event
Inflow = 4.19 cfs @ 12.34 hrs, Volume= 12,840 cf
Outflow = 4.19 cfs @ 12.34 hrs, Volume= 12,840 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.19 cfs @ 12.34 hrs, Volume= 12,840 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.09' @ 12.44 hrs
Flood Elev= 255.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.05'	**18.0" Round Culvert** L= 106.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.05' / 250.50' S= 0.0052 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.09 cfs @ 12.34 hrs HW=253.03' TW=252.78' (Dynamic Tailwater)
1=Culvert (Outlet Controls 4.09 cfs @ 2.32 fps)

Summary for Pond INF-1: Underground Infiltration System #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=17)

Inflow Area = 49,020 sf, 64.67% Impervious, Inflow Depth = 6.52" for 100-yr event
Inflow = 7.97 cfs @ 12.08 hrs, Volume= 26,649 cf
Outflow = 3.75 cfs @ 12.40 hrs, Volume= 26,649 cf, Atten= 53%, Lag= 19.0 min
Discarded = 0.97 cfs @ 12.41 hrs, Volume= 23,648 cf
Primary = 2.78 cfs @ 12.40 hrs, Volume= 3,000 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 254.22' @ 12.41 hrs Surf.Area= 2,808 sf Storage= 7,752 cf
Flood Elev= 255.50' Surf.Area= 2,808 sf Storage= 9,206 cf

Plug-Flow detention time= 49.0 min calculated for 26,649 cf (100% of inflow)
Center-of-Mass det. time= 49.0 min (821.1 - 772.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	250.00'	2,103 cf	**29.92'W x 48.72'L x 5.50'H Field A** 8,016 cf Overall - 2,758 cf Embedded = 5,258 cf x 40.0% Voids
#2A	250.75'	2,758 cf	**ADS_StormTech MC-3500 d +Cap** x 24 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 24 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
#3B	250.00'	804 cf	**8.42'W x 63.06'L x 5.50'H Field B** 2,919 cf Overall - 909 cf Embedded = 2,010 cf x 40.0% Voids
#4B	250.75'	909 cf	**ADS_StormTech MC-3500 d +Cap** x 8 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#5C	250.00'	715 cf	**8.42'W x 55.89'L x 5.50'H Field C** 2,587 cf Overall - 799 cf Embedded = 1,788 cf x 40.0% Voids
#6C	250.75'	799 cf	**ADS_StormTech MC-3500 d +Cap** x 7 Inside #5 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
#7D	250.00'	538 cf	**8.42'W x 41.55'L x 5.50'H Field D** 1,923 cf Overall - 580 cf Embedded = 1,344 cf x 40.0% Voids
#8D	250.75'	580 cf	**ADS_StormTech MC-3500 d +Cap** x 5 Inside #7 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		9,206 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	250.00'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.05'	**12.0" Round Culvert** L= 65.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.05' / 252.70' S= 0.0054 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.97 cfs @ 12.41 hrs HW=254.22' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.97 cfs)

Primary OutFlow Max=0.00 cfs @ 12.40 hrs HW=254.22' TW=254.87' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond INF-2: Underground Infiltration System #2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=20)

Inflow Area = 10,252 sf,100.00% Impervious, Inflow Depth = 7.34" for 100-yr event
Inflow = 2.14 cfs @ 12.00 hrs, Volume= 6,271 cf
Outflow = 0.81 cfs @ 12.32 hrs, Volume= 6,271 cf, Atten= 62%, Lag= 19.2 min
Discarded = 0.27 cfs @ 12.30 hrs, Volume= 5,999 cf
Primary = 0.55 cfs @ 12.32 hrs, Volume= 272 cf
Routed to Pond DMH-6 : PROP DMH-6

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.80' @ 12.30 hrs Surf.Area= 651 sf Storage= 1,796 cf
Flood Elev= 255.00' Surf.Area= 651 sf Storage= 2,111 cf

Plug-Flow detention time= 45.0 min calculated for 6,269 cf (100% of inflow)
Center-of-Mass det. time= 45.0 min (781.3 - 736.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	249.50'	981 cf	**8.42'W x 77.40'L x 5.50'H Field A** 3,583 cf Overall - 1,129 cf Embedded = 2,454 cf x 40.0% Voids
#2A	250.25'	1,129 cf	**ADS_StormTech MC-3500 d +Cap** x 10 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		2,111 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.50'	**8.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	253.02'	**6.0" Round Culvert** L= 18.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.02' / 252.70' S= 0.0178 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.27 cfs @ 12.30 hrs HW=253.80' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 12.32 hrs HW=253.79' TW=254.78' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond OWS-1: PROP OWS-1

[80] Warning: Exceeded Pond CB-8 by 1.73' @ 12.65 hrs (2.20 cfs 439 cf)

Inflow Area = 12,740 sf, 96.03% Impervious, Inflow Depth = 5.29" for 100-yr event
Inflow = 0.83 cfs @ 12.03 hrs, Volume= 5,616 cf
Outflow = 0.83 cfs @ 12.03 hrs, Volume= 5,616 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.03 hrs, Volume= 5,616 cf
Routed to Pond 1P : Aboveground Infiltration Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 252.88' @ 12.50 hrs
Flood Elev= 254.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	250.45'	**8.0" Round Culvert** L= 13.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 250.45' / 250.30' S= 0.0115 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.75 cfs @ 12.03 hrs HW=252.09' TW=251.88' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.75 cfs @ 2.16 fps)

Summary for Pond OWS-2: PROP. OWS-2

Inflow Area = 71,392 sf, 73.53% Impervious, Inflow Depth = 0.94" for 100-yr event
Inflow = 0.72 cfs @ 12.30 hrs, Volume= 5,596 cf
Outflow = 0.72 cfs @ 12.30 hrs, Volume= 5,596 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.30 hrs, Volume= 5,596 cf
Routed to Pond DMH-9 : PROP DMH-9

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 253.32' @ 12.30 hrs
Flood Elev= 255.55'

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**6.0" Round Culvert** L= 6.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 251.25' / 251.15' S= 0.0167 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.57 cfs @ 12.30 hrs HW=253.31' TW=252.96' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.57 cfs @ 2.88 fps)

Summary for Pond SD-1: PROP SLOTTED DRAIN

Inflow Area = 6,531 sf, 75.80% Impervious, Inflow Depth = 5.69" for 100-yr event
Inflow = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf
Outflow = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.09 hrs, Volume= 3,098 cf
Routed to Pond CB-5 : PROP CB-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Peak Elev= 254.93' @ 12.40 hrs
Flood Elev= 255.35'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.85'	**8.0" Round Culvert** L= 5.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 253.85' / 253.75' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.97 cfs @ 12.09 hrs HW=254.56' TW=253.89' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.97 cfs @ 3.26 fps)

Summary for Link DP1: DESIGN POINT #1: AYER ROAD

Inflow Area = 108,238 sf, 67.67% Impervious, Inflow Depth = 0.64" for 100-yr event
Inflow = 1.49 cfs @ 12.41 hrs, Volume= 5,780 cf
Primary = 1.49 cfs @ 12.41 hrs, Volume= 5,780 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP2: DESIGN POINT #2: ADJACENT PROPERTY (EAST)

Inflow Area = 13,477 sf, 0.01% Impervious, Inflow Depth = 4.00" for 100-yr event
Inflow = 1.45 cfs @ 12.09 hrs, Volume= 4,487 cf
Primary = 1.45 cfs @ 12.09 hrs, Volume= 4,487 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP3: DESIGN POINT #3: WILLOW ROAD

Inflow Area = 22,872 sf, 70.26% Impervious, Inflow Depth = 1.13" for 100-yr event
Inflow = 1.54 cfs @ 12.10 hrs, Volume= 2,155 cf
Primary = 1.54 cfs @ 12.10 hrs, Volume= 2,155 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

APPENDIX G

Supplemental Calculations and Backup Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Littleton, Massachusetts, USA*
Latitude: 42.5515°, Longitude: -71.5363°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.326** (0.256-0.409)	**0.386** (0.303-0.486)	**0.485** (0.379-0.610)	**0.566** (0.441-0.719)	**0.679** (0.511-0.896)	**0.763** (0.563-1.03)	**0.852** (0.610-1.19)	**0.954** (0.644-1.35)	**1.10** (0.716-1.61)	**1.23** (0.778-1.83)
10-min	**0.461** (0.363-0.580)	**0.547** (0.430-0.688)	**0.687** (0.538-0.867)	**0.803** (0.625-1.02)	**0.962** (0.724-1.27)	**1.08** (0.798-1.46)	**1.21** (0.865-1.68)	**1.35** (0.913-1.92)	**1.56** (1.01-2.28)	**1.74** (1.10-2.59)
15-min	**0.543** (0.427-0.682)	**0.643** (0.506-0.809)	**0.807** (0.631-1.02)	**0.943** (0.735-1.20)	**1.13** (0.852-1.49)	**1.27** (0.938-1.71)	**1.42** (1.02-1.98)	**1.59** (1.07-2.25)	**1.84** (1.19-2.69)	**2.05** (1.30-3.05)
30-min	**0.737** (0.580-0.926)	**0.874** (0.687-1.10)	**1.10** (0.860-1.39)	**1.28** (0.999-1.63)	**1.54** (1.16-2.03)	**1.73** (1.28-2.33)	**1.93** (1.39-2.69)	**2.17** (1.46-3.07)	**2.51** (1.63-3.66)	**2.79** (1.77-4.15)
60-min	**0.931** (0.733-1.17)	**1.11** (0.868-1.39)	**1.39** (1.09-1.75)	**1.62** (1.26-2.06)	**1.95** (1.47-2.57)	**2.19** (1.62-2.95)	**2.45** (1.75-3.41)	**2.74** (1.85-3.88)	**3.17** (2.06-4.63)	**3.53** (2.23-5.25)
2-hr	**1.17** (0.929-1.46)	**1.41** (1.12-1.76)	**1.81** (1.43-2.26)	**2.13** (1.67-2.68)	**2.58** (1.96-3.39)	**2.91** (2.17-3.91)	**3.27** (2.37-4.56)	**3.70** (2.51-5.21)	**4.36** (2.83-6.31)	**4.91** (3.12-7.24)
3-hr	**1.34** (1.07-1.67)	**1.63** (1.30-2.02)	**2.10** (1.66-2.61)	**2.49** (1.96-3.11)	**3.02** (2.31-3.96)	**3.42** (2.56-4.57)	**3.85** (2.80-5.35)	**4.37** (2.97-6.11)	**5.17** (3.37-7.46)	**5.85** (3.72-8.59)
6-hr	**1.71** (1.37-2.10)	**2.08** (1.67-2.57)	**2.69** (2.15-3.33)	**3.20** (2.54-3.97)	**3.89** (2.99-5.06)	**4.41** (3.32-5.85)	**4.97** (3.64-6.86)	**5.65** (3.86-7.85)	**6.71** (4.39-9.61)	**7.62** (4.86-11.1)
12-hr	**2.16** (1.75-2.64)	**2.63** (2.13-3.22)	**3.39** (2.73-4.16)	**4.03** (3.22-4.96)	**4.90** (3.79-6.31)	**5.54** (4.20-7.30)	**6.24** (4.60-8.54)	**7.10** (4.87-9.77)	**8.40** (5.52-11.9)	**9.52** (6.10-13.8)
24-hr	**2.59** (2.12-3.14)	**3.16** (2.58-3.84)	**4.10** (3.33-4.98)	**4.87** (3.93-5.95)	**5.93** (4.63-7.59)	**6.72** (5.13-8.78)	**7.58** (5.61-10.3)	**8.62** (5.94-11.8)	**10.2** (6.73-14.4)	**11.6** (7.44-16.6)
2-day	**2.95** (2.42-3.54)	**3.62** (2.98-4.36)	**4.73** (3.87-5.71)	**5.65** (4.59-6.85)	**6.91** (5.43-8.77)	**7.84** (6.02-10.2)	**8.86** (6.61-11.9)	**10.1** (6.99-13.7)	**12.0** (7.96-16.8)	**13.7** (8.82-19.5)
3-day	**3.22** (2.66-3.85)	**3.95** (3.26-4.72)	**5.13** (4.22-6.16)	**6.11** (5.00-7.38)	**7.47** (5.89-9.43)	**8.47** (6.53-10.9)	**9.55** (7.15-12.8)	**10.9** (7.55-14.7)	**12.9** (8.58-18.0)	**14.7** (9.49-20.8)
4-day	**3.48** (2.89-4.14)	**4.23** (3.51-5.04)	**5.46** (4.51-6.53)	**6.48** (5.31-7.79)	**7.88** (6.23-9.91)	**8.92** (6.89-11.5)	**10.0** (7.52-13.4)	**11.4** (7.94-15.3)	**13.5** (8.97-18.7)	**15.3** (9.90-21.6)
7-day	**4.18** (3.50-4.96)	**4.98** (4.16-5.90)	**6.27** (5.22-7.46)	**7.35** (6.07-8.78)	**8.83** (7.01-11.0)	**9.93** (7.70-12.6)	**11.1** (8.32-14.6)	**12.5** (8.74-16.7)	**14.6** (9.73-20.1)	**16.4** (10.6-22.9)
10-day	**4.86** (4.08-5.73)	**5.68** (4.76-6.70)	**7.01** (5.85-8.30)	**8.12** (6.73-9.66)	**9.64** (7.68-11.9)	**10.8** (8.38-13.6)	**12.0** (8.98-15.7)	**13.4** (9.38-17.8)	**15.4** (10.3-21.1)	**17.1** (11.1-23.8)
20-day	**6.87** (5.81-8.03)	**7.74** (6.55-9.06)	**9.18** (7.73-10.8)	**10.4** (8.66-12.2)	**12.0** (9.62-14.6)	**13.3** (10.3-16.5)	**14.5** (10.8-18.6)	**15.9** (11.2-20.8)	**17.7** (11.9-24.0)	**19.1** (12.4-26.4)
30-day	**8.53** (7.26-9.93)	**9.46** (8.04-11.0)	**11.0** (9.28-12.8)	**12.2** (10.3-14.4)	**14.0** (11.2-16.9)	**15.3** (11.9-18.8)	**16.6** (12.4-21.0)	**17.9** (12.7-23.4)	**19.6** (13.2-26.4)	**20.8** (13.6-28.6)
45-day	**10.6** (9.08-12.3)	**11.6** (9.91-13.4)	**13.2** (11.2-15.4)	**14.5** (12.3-17.0)	**16.4** (13.2-19.7)	**17.8** (14.0-21.8)	**19.2** (14.3-24.0)	**20.5** (14.6-26.6)	**22.1** (14.9-29.6)	**23.1** (15.1-31.6)
60-day	**12.4** (10.6-14.3)	**13.4** (11.5-15.5)	**15.1** (12.9-17.5)	**16.5** (14.0-19.2)	**18.4** (14.9-22.1)	**20.0** (15.7-24.3)	**21.4** (16.0-26.6)	**22.7** (16.2-29.4)	**24.2** (16.4-32.3)	**25.2** (16.5-34.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Summary for Pond 3P: Sediment Forebay

Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	645 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.00	94	45.0	0	0	94
251.50	458	93.0	380	380	631
252.00	605	103.0	265	645	795

Summary for Pond 10P: Isolator Row

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	0 cf	**8.42'W x 48.72'L x 5.50'H Field A** 2,255 cf Overall - 690 cf Embedded = 1,566 cf x 0.0% Voids
#2A	0.75'	690 cf	**ADS_StormTech MC-3500 d +Cap** x 6 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= 14.9 cf x 2 x 1 rows = 29.8 cf
		690 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
250.00	830	830	0
250.01	834	835	8
250.02	839	840	17
250.03	843	845	25
250.04	847	850	34
250.05	852	855	42
250.06	856	859	51
250.07	860	864	59
250.08	865	869	68
250.09	869	874	76
250.10	873	879	85
250.11	878	884	94
250.12	882	889	103
250.13	887	894	112
250.14	891	899	120
250.15	896	904	129
250.16	900	909	138
250.17	904	914	147
250.18	909	919	156
250.19	913	924	166
250.20	918	929	175
250.21	922	934	184
250.22	927	939	193
250.23	931	944	202
250.24	936	949	212
250.25	941	954	221
250.26	945	959	231
250.27	950	964	240
250.28	954	969	250
250.29	959	974	259
250.30	963	979	269
250.31	968	984	278
250.32	973	989	288
250.33	977	995	298
250.34	982	1,000	308
250.35	987	1,005	318
250.36	991	1,010	327
250.37	996	1,015	337
250.38	1,001	1,020	347
250.39	1,005	1,025	357
250.40	1,010	1,030	367
250.41	1,015	1,035	378
250.42	1,020	1,041	388
250.43	1,024	1,046	398
250.44	1,029	1,051	408
250.45	1,034	1,056	419
250.46	1,039	1,061	429
250.47	1,044	1,066	439
250.48	1,048	1,071	450
250.49	1,053	1,077	460
250.50	1,058	1,082	471

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
250.51	1,063	1,087	481
250.52	1,068	1,092	492
250.53	1,073	1,097	503
250.54	1,077	1,103	514
250.55	1,082	1,108	524
250.56	1,087	1,113	535
250.57	1,092	1,118	546
250.58	1,097	1,123	557
250.59	1,102	1,129	568
250.60	1,107	1,134	579
250.61	1,112	1,139	590
250.62	1,117	1,144	601
250.63	1,122	1,150	613
250.64	1,127	1,155	624
250.65	1,132	1,160	635
250.66	1,137	1,166	646
250.67	1,142	1,171	658
250.68	1,147	1,176	669
250.69	1,152	1,181	681
250.70	1,157	1,187	692
250.71	1,162	1,192	704
250.72	1,167	1,197	716
250.73	1,172	1,203	727
250.74	1,177	1,208	739
250.75	1,182	1,213	751
250.76	1,187	1,219	763
250.77	1,193	1,224	775
250.78	1,198	1,229	786
250.79	1,203	1,235	798
250.80	1,208	1,240	811
250.81	1,213	1,245	823
250.82	1,218	1,251	835
250.83	1,224	1,256	847
250.84	1,229	1,262	859
250.85	1,234	1,267	872
250.86	1,239	1,272	884
250.87	1,245	1,278	896
250.88	1,250	1,283	909
250.89	1,255	1,289	921
250.90	1,260	1,294	934
250.91	1,266	1,299	947
250.92	1,271	1,305	959
250.93	1,276	1,310	972
250.94	1,282	1,316	985
250.95	1,287	1,321	998
250.96	1,292	1,327	1,010
250.97	1,298	1,332	1,023
250.98	1,303	1,337	1,036
250.99	1,308	1,343	1,050
251.00	1,314	1,348	1,063
251.01	1,319	1,354	1,076

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
251.02	1,324	1,359	1,089
251.03	1,330	1,365	1,102
251.04	1,335	1,370	1,116
251.05	1,341	1,376	1,129
251.06	1,346	1,381	1,142
251.07	1,352	1,387	1,156
251.08	1,357	1,392	1,169
251.09	1,363	1,398	1,183
251.10	1,368	1,404	1,197
251.11	1,374	1,409	1,210
251.12	1,379	1,415	1,224
251.13	1,385	1,420	1,238
251.14	1,390	1,426	1,252
251.15	1,396	1,431	1,266
251.16	1,401	1,437	1,280
251.17	1,407	1,442	1,294
251.18	1,412	1,448	1,308
251.19	1,418	1,454	1,322
251.20	1,424	1,459	1,336
251.21	1,429	1,465	1,351
251.22	1,435	1,470	1,365
251.23	1,441	1,476	1,379
251.24	1,446	1,482	1,394
251.25	1,452	1,487	1,408
251.26	1,458	1,493	1,423
251.27	1,463	1,499	1,437
251.28	1,469	1,504	1,452
251.29	1,475	1,510	1,467
251.30	1,480	1,516	1,481
251.31	1,486	1,521	1,496
251.32	1,492	1,527	1,511
251.33	1,498	1,533	1,526
251.34	1,503	1,538	1,541
251.35	1,509	1,544	1,556
251.36	1,515	1,550	1,571
251.37	1,521	1,555	1,586
251.38	1,526	1,561	1,602
251.39	1,532	1,567	1,617
251.40	1,538	1,572	1,632
251.41	1,544	1,578	1,648
251.42	1,550	1,584	1,663
251.43	1,556	1,590	1,679
251.44	1,561	1,595	1,694
251.45	1,567	1,601	1,710
251.46	1,573	1,607	1,726
251.47	1,579	1,613	1,741
251.48	1,585	1,618	1,757
251.49	1,591	1,624	1,773
251.50	2,092	5,514	1,792
251.51	2,100	5,523	1,812
251.52	2,109	5,533	1,834

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)	
251.53	2,117	5,543	1,855	
251.54	2,125	5,552	1,876	
251.55	2,134	5,562	1,897	
251.56	2,142	5,571	1,919	
251.57	2,151	5,581	1,940	
251.58	2,159	5,591	1,962	
251.59	2,168	5,600	1,983	
251.60	2,176	5,610	2,005	
251.61	2,185	5,620	2,027	
251.62	2,193	5,629	2,049	
251.63	2,202	5,639	2,071	
251.64	2,210	5,649	2,093	
251.65	2,219	5,658	2,115	
251.66	2,227	5,668	2,137	
251.67	2,236	5,678	2,159	
251.68	2,245	5,687	2,182	
251.69	2,253	5,697	2,204	
251.70	2,262	5,707	2,227	
251.71	2,270	5,716	2,249	
251.72	2,279	5,726	2,272	
251.73	2,288	5,736	2,295	
251.74	2,297	5,746	2,318	
251.75	2,305	5,755	2,341	Vwq Elevation
251.76	2,314	5,765	2,364	
251.77	2,323	5,775	2,387	
251.78	2,332	5,785	2,411	
251.79	2,340	5,794	2,434	
251.80	2,349	5,804	2,457	
251.81	2,358	5,814	2,481	
251.82	2,367	5,824	2,505	
251.83	2,376	5,833	2,528	
251.84	2,385	5,843	2,552	
251.85	2,394	5,853	2,576	
251.86	2,402	5,863	2,600	
251.87	2,411	5,873	2,624	
251.88	2,420	5,883	2,648	
251.89	2,429	5,892	2,672	
251.90	2,438	5,902	2,697	
251.91	2,447	5,912	2,721	
251.92	2,456	5,922	2,746	
251.93	2,465	5,932	2,770	
251.94	2,474	5,942	2,795	
251.95	2,483	5,952	2,820	
251.96	2,493	5,961	2,845	
251.97	2,502	5,971	2,870	
251.98	2,511	5,981	2,895	
251.99	2,520	5,991	2,920	
252.00	2,529	6,001	2,945	Storage below lowest outlet orifice
252.01	2,538	6,009	2,970	
252.02	2,546	6,017	2,996	
252.03	2,555	6,025	3,021	

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
252.04	2,563	6,034	3,047
252.05	2,572	6,042	3,073
252.06	2,581	6,050	3,098
252.07	2,589	6,058	3,124
252.08	2,598	6,066	3,150
252.09	2,607	6,074	3,176
252.10	2,616	6,082	3,202
252.11	2,624	6,091	3,228
252.12	2,633	6,099	3,255
252.13	2,642	6,107	3,281
252.14	2,651	6,115	3,308
252.15	2,659	6,123	3,334
252.16	2,668	6,132	3,361
252.17	2,677	6,140	3,388
252.18	2,686	6,148	3,414
252.19	2,695	6,156	3,441
252.20	2,704	6,164	3,468
252.21	2,712	6,173	3,495
252.22	2,721	6,181	3,522
252.23	2,730	6,189	3,550
252.24	2,739	6,197	3,577
252.25	2,748	6,205	3,604
252.26	2,757	6,214	3,632
252.27	2,766	6,222	3,660
252.28	2,775	6,230	3,687
252.29	2,784	6,238	3,715
252.30	2,793	6,247	3,743
252.31	2,802	6,255	3,771
252.32	2,811	6,263	3,799
252.33	2,820	6,271	3,827
252.34	2,829	6,280	3,855
252.35	2,838	6,288	3,884
252.36	2,847	6,296	3,912
252.37	2,856	6,305	3,941
252.38	2,866	6,313	3,969
252.39	2,875	6,321	3,998
252.40	2,884	6,329	4,027
252.41	2,893	6,338	4,056
252.42	2,902	6,346	4,085
252.43	2,911	6,354	4,114
252.44	2,921	6,363	4,143
252.45	2,930	6,371	4,172
252.46	2,939	6,379	4,202
252.47	2,948	6,388	4,231
252.48	2,958	6,396	4,260
252.49	2,967	6,404	4,290
252.50	2,976	6,413	4,320
252.51	2,985	6,421	4,350
252.52	2,995	6,429	4,380
252.53	3,004	6,438	4,410
252.54	3,014	6,446	4,440

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
252.55	3,023	6,454	4,470
252.56	3,032	6,463	4,500
252.57	3,042	6,471	4,530
252.58	3,051	6,480	4,561
252.59	3,061	6,488	4,591
252.60	3,070	6,496	4,622
252.61	3,079	6,505	4,653
252.62	3,089	6,513	4,684
252.63	3,098	6,522	4,715
252.64	3,108	6,530	4,746
252.65	3,117	6,538	4,777
252.66	3,127	6,547	4,808
252.67	3,137	6,555	4,839
252.68	3,146	6,564	4,871
252.69	3,156	6,572	4,902
252.70	3,165	6,580	4,934
252.71	3,175	6,589	4,966
252.72	3,184	6,597	4,997
252.73	3,194	6,606	5,029
252.74	3,204	6,614	5,061
252.75	3,213	6,623	5,093
252.76	3,223	6,631	5,126
252.77	3,233	6,640	5,158
252.78	3,242	6,648	5,190
252.79	3,252	6,657	5,223
252.80	3,262	6,665	5,255
252.81	3,272	6,673	5,288
252.82	3,281	6,682	5,321
252.83	3,291	6,690	5,354
252.84	3,301	6,699	5,386
252.85	3,311	6,707	5,420
252.86	3,321	6,716	5,453
252.87	3,331	6,724	5,486
252.88	3,340	6,733	5,519
252.89	3,350	6,741	5,553
252.90	3,360	6,750	5,586
252.91	3,370	6,759	5,620
252.92	3,380	6,767	5,654
252.93	3,390	6,776	5,688
252.94	3,400	6,784	5,722
252.95	3,410	6,793	5,756
252.96	3,420	6,801	5,790
252.97	3,430	6,810	5,824
252.98	3,440	6,818	5,858
252.99	3,450	6,827	5,893
253.00	3,460	6,835	5,927
253.01	3,470	6,844	5,962
253.02	3,480	6,853	5,997
253.03	3,490	6,861	6,032
253.04	3,500	6,870	6,066
253.05	3,510	6,878	6,102

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
253.06	3,520	6,887	6,137
253.07	3,530	6,895	6,172
253.08	3,540	6,904	6,207
253.09	3,551	6,913	6,243
253.10	3,561	6,921	6,278
253.11	3,571	6,930	6,314
253.12	3,581	6,938	6,350
253.13	3,591	6,947	6,386
253.14	3,602	6,956	6,422
253.15	3,612	6,964	6,458
253.16	3,622	6,973	6,494
253.17	3,632	6,982	6,530
253.18	3,643	6,990	6,566
253.19	3,653	6,999	6,603
253.20	3,663	7,008	6,640
253.21	3,674	7,016	6,676
253.22	3,684	7,025	6,713
253.23	3,694	7,034	6,750
253.24	3,705	7,042	6,787
253.25	3,715	7,051	6,824
253.26	3,726	7,060	6,861
253.27	3,736	7,068	6,898
253.28	3,746	7,077	6,936
253.29	3,757	7,086	6,973
253.30	3,767	7,094	7,011
253.31	3,778	7,103	7,049
253.32	3,788	7,112	7,087
253.33	3,799	7,120	7,125
253.34	3,809	7,129	7,163
253.35	3,820	7,138	7,201
253.36	3,830	7,146	7,239
253.37	3,841	7,155	7,277
253.38	3,852	7,164	7,316
253.39	3,862	7,173	7,354
253.40	3,873	7,181	7,393
253.41	3,883	7,190	7,432
253.42	3,894	7,199	7,471
253.43	3,905	7,208	7,510
253.44	3,915	7,216	7,549
253.45	3,926	7,225	7,588
253.46	3,937	7,234	7,627
253.47	3,947	7,243	7,667
253.48	3,958	7,251	7,706
253.49	3,969	7,260	7,746
253.50	3,980	7,269	7,786
253.51	3,990	7,278	7,825
253.52	4,001	7,287	7,865
253.53	4,012	7,295	7,906
253.54	4,023	7,304	7,946
253.55	4,034	7,313	7,986
253.56	4,045	7,322	8,026

Stage-Area-Storage for Pond 1P: Aboveground Infiltration Basin (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
253.57	4,055	7,331	8,067
253.58	4,066	7,339	8,107
253.59	4,077	7,348	8,148
253.60	4,088	7,357	8,189
253.61	4,099	7,366	8,230
253.62	4,110	7,375	8,271
253.63	4,121	7,384	8,312
253.64	4,132	7,392	8,353
253.65	4,143	7,401	8,395
253.66	4,154	7,410	8,436
253.67	4,165	7,419	8,478
253.68	4,176	7,428	8,520
253.69	4,187	7,437	8,561
253.70	4,198	7,446	8,603
253.71	4,209	7,454	8,645
253.72	4,220	7,463	8,687
253.73	4,231	7,472	8,730
253.74	4,242	7,481	8,772
253.75	4,253	7,490	8,815
253.76	4,264	7,499	8,857
253.77	4,276	7,508	8,900
253.78	4,287	7,517	8,943
253.79	4,298	7,526	8,986
253.80	4,309	7,534	9,029
253.81	4,320	7,543	9,072
253.82	4,332	7,552	9,115
253.83	4,343	7,561	9,158
253.84	4,354	7,570	9,202
253.85	4,365	7,579	9,245
253.86	4,377	7,588	9,289
253.87	4,388	7,597	9,333
253.88	4,399	7,606	9,377
253.89	4,410	7,615	9,421
253.90	4,422	7,624	9,465
253.91	4,433	7,633	9,509
253.92	4,445	7,642	9,554
253.93	4,456	7,651	9,598
253.94	4,467	7,660	9,643
253.95	4,479	7,669	9,688
253.96	4,490	7,678	9,733
253.97	4,502	7,687	9,777
253.98	4,513	7,696	9,823
253.99	4,525	7,705	9,868
254.00	**4,536**	**7,714**	**9,913**

Stage-Area-Storage for Pond BIO-1: Bioretention Area

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
248.00	59	59	0
248.01	59	59	0
248.02	59	60	0
248.03	59	60	1
248.04	59	61	1
248.05	59	61	1
248.06	59	61	1
248.07	59	62	1
248.08	59	62	2
248.09	59	62	2
248.10	59	63	2
248.11	59	63	2
248.12	59	64	2
248.13	59	64	3
248.14	59	64	3
248.15	59	65	3
248.16	59	65	3
248.17	59	65	4
248.18	59	66	4
248.19	59	66	4
248.20	59	67	4
248.21	59	67	4
248.22	59	67	5
248.23	59	68	5
248.24	59	68	5
248.25	59	69	5
248.26	59	69	5
248.27	59	69	6
248.28	59	70	6
248.29	59	70	6
248.30	59	70	6
248.31	59	71	6
248.32	59	71	7
248.33	59	72	7
248.34	59	72	7
248.35	59	72	7
248.36	59	73	7
248.37	59	73	8
248.38	59	73	8
248.39	59	74	8
248.40	59	74	8
248.41	59	75	8
248.42	59	75	9
248.43	59	75	9
248.44	59	76	9
248.45	59	76	9
248.46	59	76	9
248.47	59	77	10
248.48	59	77	10
248.49	59	78	10
248.50	59	78	10

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
248.51	59	78	11
248.52	59	79	11
248.53	59	79	11
248.54	59	80	11
248.55	59	80	11
248.56	59	80	12
248.57	59	81	12
248.58	59	81	12
248.59	59	81	12
248.60	59	82	12
248.61	59	82	13
248.62	59	83	13
248.63	59	83	13
248.64	59	83	13
248.65	59	84	13
248.66	59	84	14
248.67	59	84	14
248.68	59	85	14
248.69	59	85	14
248.70	59	86	14
248.71	59	86	15
248.72	59	86	15
248.73	59	87	15
248.74	59	87	15
248.75	59	88	15
248.76	59	88	16
248.77	59	88	16
248.78	59	89	16
248.79	59	89	16
248.80	59	89	17
248.81	59	90	17
248.82	59	90	17
248.83	59	91	17
248.84	59	91	17
248.85	59	91	18
248.86	59	92	18
248.87	59	92	18
248.88	59	92	18
248.89	59	93	18
248.90	59	93	19
248.91	59	94	19
248.92	59	94	19
248.93	59	94	19
248.94	59	95	19
248.95	59	95	20
248.96	59	95	20
248.97	59	96	20
248.98	59	96	20
248.99	59	97	20
249.00	59	97	21
249.01	59	97	21

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
249.02	59	98	21
249.03	59	98	21
249.04	59	99	21
249.05	59	99	22
249.06	59	99	22
249.07	59	100	22
249.08	59	100	22
249.09	59	100	23
249.10	59	101	23
249.11	59	101	23
249.12	59	102	23
249.13	59	102	23
249.14	59	102	24
249.15	59	103	24
249.16	59	103	24
249.17	59	103	24
249.18	59	104	24
249.19	59	104	25
249.20	59	105	25
249.21	59	105	25
249.22	59	105	25
249.23	59	106	25
249.24	59	106	26
249.25	59	107	26
249.26	59	107	26
249.27	59	107	26
249.28	59	108	26
249.29	59	108	27
249.30	59	108	27
249.31	59	109	27
249.32	59	109	27
249.33	59	110	27
249.34	59	110	28
249.35	59	110	28
249.36	59	111	28
249.37	59	111	28
249.38	59	111	28
249.39	59	112	29
249.40	59	112	29
249.41	59	113	29
249.42	59	113	29
249.43	59	113	30
249.44	59	114	30
249.45	59	114	30
249.46	59	114	30
249.47	59	115	30
249.48	59	115	31
249.49	59	116	31
249.50	59	116	31
249.51	59	116	31
249.52	59	117	31

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
249.53	59	117	32
249.54	59	118	32
249.55	59	118	32
249.56	59	118	32
249.57	59	119	32
249.58	59	119	33
249.59	59	119	33
249.60	59	120	33
249.61	59	120	33
249.62	59	121	33
249.63	59	121	34
249.64	59	121	34
249.65	59	122	34
249.66	59	122	34
249.67	59	122	34
249.68	59	123	35
249.69	59	123	35
249.70	59	124	35
249.71	59	124	35
249.72	59	124	36
249.73	59	125	36
249.74	59	125	36
249.75	59	126	36
249.76	59	126	36
249.77	59	126	37
249.78	59	127	37
249.79	59	127	37
249.80	59	127	37
249.81	59	128	37
249.82	59	128	38
249.83	59	129	38
249.84	59	129	38
249.85	59	129	38
249.86	59	130	38
249.87	59	130	39
249.88	59	130	39
249.89	59	131	39
249.90	59	131	39
249.91	59	132	39
249.92	59	132	40
249.93	59	132	40
249.94	59	133	40
249.95	59	133	40
249.96	59	133	40
249.97	59	134	41
249.98	59	134	41
249.99	59	135	41
250.00	59	135	41
250.01	59	135	42
250.02	59	136	42
250.03	59	136	42

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
250.04	59	137	42
250.05	59	137	42
250.06	59	137	43
250.07	59	138	43
250.08	59	138	43
250.09	59	138	43
250.10	59	139	43
250.11	59	139	44
250.12	59	140	44
250.13	59	140	44
250.14	59	140	44
250.15	59	141	44
250.16	59	141	45
250.17	59	141	45
250.18	59	142	45
250.19	59	142	45
250.20	59	143	45
250.21	59	143	46
250.22	59	143	46
250.23	59	144	46
250.24	59	144	46
250.25	59	145	46
250.26	59	145	47
250.27	59	145	47
250.28	59	146	47
250.29	59	146	47
250.30	59	146	47
250.31	59	147	48
250.32	59	147	48
250.33	59	148	48
250.34	59	148	48
250.35	59	148	49
250.36	59	149	49
250.37	59	149	49
250.38	59	149	49
250.39	59	150	49
250.40	59	150	50
250.41	59	151	50
250.42	59	151	50
250.43	59	151	50
250.44	59	152	50
250.45	59	152	51
250.46	59	152	51
250.47	59	153	51
250.48	59	153	51
250.49	59	154	51
250.50	59	154	52
250.51	61	160	53
250.52	63	167	53
250.53	65	174	54
250.54	67	181	55

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
250.55	69	188	55
250.56	71	195	56
250.57	74	202	57
250.58	76	210	57
250.59	78	218	58
250.60	80	226	59
250.61	83	234	60
250.62	85	242	61
250.63	87	250	61
250.64	90	259	62
250.65	92	268	63
250.66	95	277	64
250.67	97	286	65
250.68	100	295	66
250.69	102	305	67
250.70	105	315	68
250.71	108	324	69
250.72	110	334	70
250.73	113	345	71
250.74	116	355	73
250.75	119	365	74
250.76	121	376	75
250.77	124	387	76
250.78	127	398	77
250.79	130	409	79
250.80	133	421	80
250.81	136	432	81
250.82	139	444	83
250.83	142	456	84
250.84	145	468	86
250.85	148	480	87
250.86	151	493	89
250.87	155	505	90
250.88	158	518	92
250.89	161	531	93
250.90	164	544	95
250.91	168	557	97
250.92	171	571	98
250.93	174	584	100
250.94	178	598	102
250.95	181	612	104
250.96	185	626	105
250.97	188	641	107
250.98	192	655	109
250.99	195	670	111
251.00	199	685	113
251.01	206	732	115
251.02	213	781	117
251.03	220	831	119
251.04	227	884	122
251.05	234	938	124

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)	
251.06	241	993	126	
251.07	249	1,051	129	
251.08	256	1,109	131	
251.09	264	1,170	134	
251.10	272	1,232	137	
251.11	280	1,296	139	
251.12	288	1,362	142	
251.13	296	1,429	145	
251.14	304	1,498	148	
251.15	313	1,569	151	
251.16	321	1,641	154	
251.17	330	1,715	158	
251.18	338	1,791	161	
251.19	347	1,868	164	
251.20	356	1,947	168	
251.21	365	2,028	171	
251.22	374	2,110	175	
251.23	384	2,194	179	
251.24	393	2,280	183	
251.25	402	2,367	187	
251.26	412	2,456	191	
251.27	422	2,547	195	
251.28	432	2,639	199	
251.29	442	2,733	204	
251.30	452	2,829	208	
251.31	462	2,927	213	
251.32	472	3,026	217	
251.33	482	3,126	222	
251.34	493	3,229	227	
251.35	504	3,333	232	
251.36	514	3,439	237	
251.37	525	3,546	242	
251.38	536	3,655	248	
251.39	547	3,766	253	
251.40	558	3,878	259	
251.41	570	3,992	264	
251.42	581	4,108	270	
251.43	593	4,226	276	
251.44	604	4,345	282	
251.45	616	4,465	288	
251.46	628	4,588	294	
251.47	640	4,712	300	
251.48	652	4,838	307	
251.49	664	4,965	313	
251.50	677	5,094	320	Storage below lowest outlet
251.51	689	5,225	327	
251.52	702	5,358	334	
251.53	714	5,492	341	
251.54	727	5,628	348	
251.55	740	5,765	356	
251.56	753	5,904	363	

Stage-Area-Storage for Pond BIO-1: Bioretention Area (continued)

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)
251.57	766	6,045	371
251.58	779	6,188	378
251.59	793	6,332	386
251.60	806	6,478	394
251.61	820	6,625	402
251.62	834	6,774	411
251.63	847	6,925	419
251.64	861	7,078	428
251.65	875	7,232	436
251.66	889	7,388	445
251.67	904	7,545	454
251.68	918	7,705	463
251.69	933	7,865	472
251.70	947	8,028	482
251.71	962	8,192	491
251.72	977	8,358	501
251.73	992	8,526	511
251.74	1,007	8,695	521
251.75	1,022	8,866	531
251.76	1,037	9,038	541
251.77	1,053	9,213	552
251.78	1,068	9,389	562
251.79	1,084	9,566	573
251.80	1,099	9,745	584
251.81	1,115	9,926	595
251.82	1,131	10,109	606
251.83	1,147	10,293	618
251.84	1,164	10,479	629
251.85	1,180	10,667	641
251.86	1,196	10,856	653
251.87	1,213	11,047	665
251.88	1,229	11,240	677
251.89	1,246	11,434	690
251.90	1,263	11,630	702
251.91	1,280	11,828	715
251.92	1,297	12,027	728
251.93	1,314	12,228	741
251.94	1,332	12,431	754
251.95	1,349	12,635	767
251.96	1,367	12,841	781
251.97	1,384	13,049	795
251.98	1,402	13,258	809
251.99	1,420	13,469	823
252.00	**1,438**	**13,682**	**837**

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
250.00	2,808	0	250.51	3,078	573
250.01	2,814	11	250.52	3,083	584
250.02	2,819	22	250.53	3,089	595
250.03	2,824	34	250.54	3,094	607
250.04	2,830	45	250.55	3,099	618
250.05	2,835	56	250.56	3,105	629
250.06	2,840	67	250.57	3,110	640
250.07	2,845	79	250.58	3,115	652
250.08	2,851	90	250.59	3,120	663
250.09	2,856	101	250.60	3,126	674
250.10	2,861	112	250.61	3,131	685
250.11	2,867	124	250.62	3,136	696
250.12	2,872	135	250.63	3,142	708
250.13	2,877	146	250.64	3,147	719
250.14	2,882	157	250.65	3,152	730
250.15	2,888	169	250.66	3,157	741
250.16	2,893	180	250.67	3,163	753
250.17	2,898	191	250.68	3,168	764
250.18	2,904	202	250.69	3,173	775
250.19	2,909	213	250.70	3,179	786
250.20	2,914	225	250.71	3,184	798
250.21	2,919	236	250.72	3,189	809
250.22	2,925	247	250.73	3,194	820
250.23	2,930	258	250.74	3,200	831
250.24	2,935	270	250.75	3,205	843
250.25	2,941	281	250.76	3,210	865
250.26	2,946	292	250.77	3,216	888
250.27	2,951	303	250.78	3,221	911
250.28	2,956	315	250.79	3,226	934
250.29	2,962	326	250.80	3,231	957
250.30	2,967	337	250.81	3,237	979
250.31	2,972	348	250.82	3,242	1,002
250.32	2,978	359	250.83	3,247	1,025
250.33	2,983	371	250.84	3,253	1,048
250.34	2,988	382	250.85	3,258	1,070
250.35	2,993	393	250.86	3,263	1,093
250.36	2,999	404	250.87	3,268	1,116
250.37	3,004	416	250.88	3,274	1,139
250.38	3,009	427	250.89	3,279	1,161
250.39	3,015	438	250.90	3,284	1,184
250.40	3,020	449	250.91	3,290	1,207
250.41	3,025	461	250.92	3,295	1,229
250.42	3,030	472	250.93	3,300	1,252
250.43	3,036	483	250.94	3,305	1,275
250.44	3,041	494	250.95	3,311	1,298
250.45	3,046	506	250.96	3,316	1,320
250.46	3,052	517	250.97	3,321	1,343
250.47	3,057	528	250.98	3,327	1,365
250.48	3,062	539	250.99	3,332	1,388
250.49	3,068	550	251.00	3,337	1,411
250.50	3,073	562	251.01	3,342	1,433

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
251.02	3,348	1,456
251.03	3,353	1,479
251.04	3,358	1,501
251.05	3,364	1,524
251.06	3,369	1,546
251.07	3,374	1,569
251.08	3,379	1,592
251.09	3,385	1,614
251.10	3,390	1,637
251.11	3,395	1,659
251.12	3,401	1,682
251.13	3,406	1,704
251.14	3,411	1,727
251.15	3,417	1,749
251.16	3,422	1,772
251.17	3,427	1,794
251.18	3,432	1,817
251.19	3,438	1,839
251.20	3,443	1,862
251.21	3,448	1,884
251.22	3,454	1,906
251.23	3,459	1,929
251.24	3,464	1,951
251.25	3,469	1,974
251.26	3,475	1,996
251.27	3,480	2,018
251.28	3,485	2,041
251.29	3,491	2,063
251.30	3,496	2,086
251.31	3,501	2,108
251.32	3,506	2,130
251.33	3,512	2,153
251.34	3,517	2,175
251.35	3,522	2,197
251.36	3,528	2,220
251.37	3,533	2,242
251.38	3,538	2,264
251.39	3,543	2,287
251.40	3,549	2,309
251.41	3,554	2,331
251.42	3,559	2,353
251.43	3,565	2,376
251.44	3,570	2,398
251.45	3,575	2,420
251.46	3,580	2,442
251.47	3,586	2,464
251.48	3,591	2,487
251.49	3,596	2,509
251.50	3,602	2,531
251.51	3,607	2,553
251.52	3,612	2,575
251.53	3,617	2,597
251.54	3,623	2,619
251.55	3,628	2,642
251.56	3,633	2,664
251.57	3,639	2,686
251.58	3,644	2,708
251.59	3,649	2,730
251.60	3,654	2,752
251.61	3,660	2,774
251.62	3,665	2,796
251.63	3,670	2,818
251.64	3,676	2,840
251.65	3,681	2,862
251.66	3,686	2,884
251.67	3,691	2,906
251.68	3,697	2,928
251.69	3,702	2,950
251.70	3,707	2,972
251.71	3,713	2,994
251.72	3,718	3,016
251.73	3,723	3,037
251.74	3,728	3,059
251.75	3,734	3,081
251.76	3,739	3,103
251.77	3,744	3,125
251.78	3,750	3,147
251.79	3,755	3,169
251.80	3,760	3,190
251.81	3,765	3,212
251.82	3,771	3,234
251.83	3,776	3,256
251.84	3,781	3,277
251.85	3,787	3,299
251.86	3,792	3,321
251.87	3,797	3,343
251.88	3,803	3,364
251.89	3,808	3,386
251.90	3,813	3,408
251.91	3,818	3,429
251.92	3,824	3,451
251.93	3,829	3,473
251.94	3,834	3,494
251.95	3,840	3,516
251.96	3,845	3,537
251.97	3,850	3,559
251.98	3,855	3,581
251.99	3,861	3,602
252.00	3,866	3,624
252.01	3,871	3,645
252.02	3,877	3,667
252.03	3,882	3,688

Vwq Elevation

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
252.04	3,887	3,710
252.05	3,892	3,731
252.06	3,898	3,753
252.07	3,903	3,774
252.08	3,908	3,795
252.09	3,914	3,817
252.10	3,919	3,838
252.11	3,924	3,860
252.12	3,929	3,881
252.13	3,935	3,902
252.14	3,940	3,924
252.15	3,945	3,945
252.16	3,951	3,966
252.17	3,956	3,987
252.18	3,961	4,009
252.19	3,966	4,030
252.20	3,972	4,051
252.21	3,977	4,072
252.22	3,982	4,093
252.23	3,988	4,115
252.24	3,993	4,136
252.25	3,998	4,157
252.26	4,003	4,178
252.27	4,009	4,199
252.28	4,014	4,220
252.29	4,019	4,241
252.30	4,025	4,262
252.31	4,030	4,283
252.32	4,035	4,304
252.33	4,040	4,325
252.34	4,046	4,346
252.35	4,051	4,367
252.36	4,056	4,388
252.37	4,062	4,409
252.38	4,067	4,430
252.39	4,072	4,451
252.40	4,077	4,472
252.41	4,083	4,492
252.42	4,088	4,513
252.43	4,093	4,534
252.44	4,099	4,555
252.45	4,104	4,576
252.46	4,109	4,596
252.47	4,114	4,617
252.48	4,120	4,638
252.49	4,125	4,658
252.50	4,130	4,679
252.51	4,136	4,700
252.52	4,141	4,720
252.53	4,146	4,741
252.54	4,151	4,762
252.55	4,157	4,782
252.56	4,162	4,803
252.57	4,167	4,823
252.58	4,173	4,844
252.59	4,178	4,864
252.60	4,183	4,885
252.61	4,189	4,905
252.62	4,194	4,925
252.63	4,199	4,946
252.64	4,204	4,966
252.65	4,210	4,987
252.66	4,215	5,007
252.67	4,220	5,027
252.68	4,226	5,048
252.69	4,231	5,068
252.70	4,236	5,088
252.71	4,241	5,108
252.72	4,247	5,128
252.73	4,252	5,149
252.74	4,257	5,169
252.75	4,263	5,189
252.76	4,268	5,209
252.77	4,273	5,229
252.78	4,278	5,249
252.79	4,284	5,269
252.80	4,289	5,289
252.81	4,294	5,309
252.82	4,300	5,329
252.83	4,305	5,349
252.84	4,310	5,369
252.85	4,315	5,389
252.86	4,321	5,409
252.87	4,326	5,429
252.88	4,331	5,448
252.89	4,337	5,468
252.90	4,342	5,488
252.91	4,347	5,508
252.92	4,352	5,527
252.93	4,358	5,547
252.94	4,363	5,567
252.95	4,368	5,586
252.96	4,374	5,606
252.97	4,379	5,626
252.98	4,384	5,645
252.99	4,389	5,665
253.00	4,395	5,684
253.01	4,400	5,704
253.02	4,405	5,723
253.03	4,411	5,742
253.04	4,416	5,762
253.05	4,421	5,781

Storage below lowest outlet orifice

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
253.06	4,426	5,800	253.57	4,696	6,743
253.07	4,432	5,820	253.58	4,701	6,760
253.08	4,437	5,839	253.59	4,707	6,777
253.09	4,442	5,858	253.60	4,712	6,795
253.10	4,448	5,877	253.61	4,717	6,812
253.11	4,453	5,897	253.62	4,723	6,830
253.12	4,458	5,916	253.63	4,728	6,847
253.13	4,463	5,935	253.64	4,733	6,864
253.14	4,469	5,954	253.65	4,738	6,881
253.15	4,474	5,973	253.66	4,744	6,898
253.16	4,479	5,992	253.67	4,749	6,915
253.17	4,485	6,011	253.68	4,754	6,932
253.18	4,490	6,030	253.69	4,760	6,949
253.19	4,495	6,049	253.70	4,765	6,966
253.20	4,500	6,068	253.71	4,770	6,983
253.21	4,506	6,087	253.72	4,775	7,000
253.22	4,511	6,106	253.73	4,781	7,017
253.23	4,516	6,124	253.74	4,786	7,034
253.24	4,522	6,143	253.75	4,791	7,050
253.25	4,527	6,162	253.76	4,797	7,067
253.26	4,532	6,181	253.77	4,802	7,083
253.27	4,538	6,199	253.78	4,807	7,100
253.28	4,543	6,218	253.79	4,812	7,116
253.29	4,548	6,237	253.80	4,818	7,133
253.30	4,553	6,255	253.81	4,823	7,149
253.31	4,559	6,274	253.82	4,828	7,165
253.32	4,564	6,292	253.83	4,834	7,182
253.33	4,569	6,311	253.84	4,839	7,198
253.34	4,575	6,329	253.85	4,844	7,214
253.35	4,580	6,347	253.86	4,849	7,230
253.36	4,585	6,366	253.87	4,855	7,246
253.37	4,590	6,384	253.88	4,860	7,262
253.38	4,596	6,402	253.89	4,865	7,278
253.39	4,601	6,421	253.90	4,871	7,294
253.40	4,606	6,439	253.91	4,876	7,309
253.41	4,612	6,457	253.92	4,881	7,325
253.42	4,617	6,475	253.93	4,886	7,341
253.43	4,622	6,493	253.94	4,892	7,356
253.44	4,627	6,511	253.95	4,897	7,371
253.45	4,633	6,529	253.96	4,902	7,387
253.46	4,638	6,547	253.97	4,908	7,402
253.47	4,643	6,565	253.98	4,913	7,417
253.48	4,649	6,583	253.99	4,918	7,432
253.49	4,654	6,601	254.00	4,924	7,447
253.50	4,659	6,619	254.01	4,929	7,462
253.51	4,664	6,637	254.02	4,934	7,477
253.52	4,670	6,654	254.03	4,939	7,492
253.53	4,675	6,672	254.04	4,945	7,506
253.54	4,680	6,690	254.05	4,950	7,521
253.55	4,686	6,707	254.06	4,955	7,535
253.56	4,691	6,725	254.07	4,961	7,550

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
254.08	4,966	7,564	254.59	5,235	8,184
254.09	4,971	7,578	254.60	5,241	8,195
254.10	4,976	7,592	254.61	5,246	8,207
254.11	4,982	7,605	254.62	5,251	8,218
254.12	4,987	7,619	254.63	5,257	8,229
254.13	4,992	7,633	254.64	5,262	8,240
254.14	4,998	7,646	254.65	5,267	8,252
254.15	5,003	7,659	254.66	5,272	8,263
254.16	5,008	7,673	254.67	5,278	8,274
254.17	5,013	7,686	254.68	5,283	8,285
254.18	5,019	7,699	254.69	5,288	8,296
254.19	5,024	7,712	254.70	5,294	8,308
254.20	5,029	7,724	254.71	5,299	8,319
254.21	5,035	7,737	254.72	5,304	8,330
254.22	5,040	7,750	254.73	5,310	8,341
254.23	5,045	7,762	254.74	5,315	8,353
254.24	5,050	7,775	254.75	5,320	8,364
254.25	5,056	7,787	254.76	5,325	8,375
254.26	5,061	7,800	254.77	5,331	8,386
254.27	5,066	7,812	254.78	5,336	8,398
254.28	5,072	7,824	254.79	5,341	8,409
254.29	5,077	7,836	254.80	5,347	8,420
254.30	5,082	7,849	254.81	5,352	8,431
254.31	5,087	7,861	254.82	5,357	8,443
254.32	5,093	7,873	254.83	5,362	8,454
254.33	5,098	7,885	254.84	5,368	8,465
254.34	5,103	7,897	254.85	5,373	8,476
254.35	5,109	7,909	254.86	5,378	8,487
254.36	5,114	7,921	254.87	5,384	8,499
254.37	5,119	7,933	254.88	5,389	8,510
254.38	5,124	7,945	254.89	5,394	8,521
254.39	5,130	7,956	254.90	5,399	8,532
254.40	5,135	7,968	254.91	5,405	8,544
254.41	5,140	7,980	254.92	5,410	8,555
254.42	5,146	7,992	254.93	5,415	8,566
254.43	5,151	8,003	254.94	5,421	8,577
254.44	5,156	8,015	254.95	5,426	8,589
254.45	5,161	8,026	254.96	5,431	8,600
254.46	5,167	8,038	254.97	5,436	8,611
254.47	5,172	8,049	254.98	5,442	8,622
254.48	5,177	8,060	254.99	5,447	8,633
254.49	5,183	8,072	255.00	5,452	8,645
254.50	5,188	8,083	255.01	5,458	8,656
254.51	5,193	8,094	255.02	5,463	8,667
254.52	5,198	8,106	255.03	5,468	8,678
254.53	5,204	8,117	255.04	5,473	8,690
254.54	5,209	8,128	255.05	5,479	8,701
254.55	5,214	8,139	255.06	5,484	8,712
254.56	5,220	8,150	255.07	5,489	8,723
254.57	5,225	8,162	255.08	5,495	8,735
254.58	5,230	8,173	255.09	5,500	8,746

Stage-Area-Storage for Pond INF-1: Underground Infiltration System #1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
255.10	5,505	8,757
255.11	5,510	8,768
255.12	5,516	8,780
255.13	5,521	8,791
255.14	5,526	8,802
255.15	5,532	8,813
255.16	5,537	8,824
255.17	5,542	8,836
255.18	5,547	8,847
255.19	5,553	8,858
255.20	5,558	8,869
255.21	5,563	8,881
255.22	5,569	8,892
255.23	5,574	8,903
255.24	5,579	8,914
255.25	5,584	8,926
255.26	5,590	8,937
255.27	5,595	8,948
255.28	5,600	8,959
255.29	5,606	8,970
255.30	5,611	8,982
255.31	5,616	8,993
255.32	5,621	9,004
255.33	5,627	9,015
255.34	5,632	9,027
255.35	5,637	9,038
255.36	5,643	9,049
255.37	5,648	9,060
255.38	5,653	9,072
255.39	5,659	9,083
255.40	5,664	9,094
255.41	5,669	9,105
255.42	5,674	9,117
255.43	5,680	9,128
255.44	5,685	9,139
255.45	5,690	9,150
255.46	5,696	9,161
255.47	5,701	9,173
255.48	5,706	9,184
255.49	5,711	9,195
255.50	**5,717**	**9,206**

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
249.50	651	0	250.01	739	133
249.51	653	3	250.02	741	136
249.52	655	5	250.03	742	138
249.53	657	8	250.04	744	141
249.54	658	10	250.05	746	143
249.55	660	13	250.06	748	146
249.56	662	16	250.07	749	149
249.57	663	18	250.08	751	151
249.58	665	21	250.09	753	154
249.59	667	23	250.10	754	156
249.60	669	26	250.11	756	159
249.61	670	29	250.12	758	162
249.62	672	31	250.13	760	164
249.63	674	34	250.14	761	167
249.64	675	36	250.15	763	169
249.65	677	39	250.16	765	172
249.66	679	42	250.17	766	175
249.67	681	44	250.18	768	177
249.68	682	47	250.19	770	180
249.69	684	50	250.20	772	182
249.70	686	52	250.21	773	185
249.71	687	55	250.22	775	188
249.72	689	57	250.23	777	190
249.73	691	60	250.24	778	193
249.74	693	63	250.25	780	195
249.75	694	65	250.26	782	201
249.76	696	68	250.27	784	206
249.77	698	70	250.28	785	211
249.78	700	73	250.29	787	216
249.79	701	76	250.30	789	221
249.80	703	78	250.31	790	227
249.81	705	81	250.32	792	232
249.82	706	83	250.33	794	237
249.83	708	86	250.34	796	242
249.84	710	89	250.35	797	247
249.85	712	91	250.36	799	253
249.86	713	94	250.37	801	258
249.87	715	96	250.38	802	263
249.88	717	99	250.39	804	268
249.89	718	102	250.40	806	273
249.90	720	104	250.41	808	278
249.91	722	107	250.42	809	284
249.92	724	109	250.43	811	289
249.93	725	112	250.44	813	294
249.94	727	115	250.45	815	299
249.95	729	117	250.46	816	304
249.96	730	120	250.47	818	309
249.97	732	122	250.48	820	315
249.98	734	125	250.49	821	320
249.99	736	128	250.50	823	325
250.00	737	130	250.51	825	330

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
250.52	827	335	251.03	914	595
250.53	828	340	251.04	916	600
250.54	830	346	251.05	917	605
250.55	832	351	251.06	919	610
250.56	833	356	251.07	921	615
250.57	835	361	251.08	923	620
250.58	837	366	251.09	924	626
250.59	839	371	251.10	926	631
250.60	840	376	251.11	928	636
250.61	842	381	251.12	929	641
250.62	844	387	251.13	931	646
250.63	845	392	251.14	933	651
250.64	847	397	251.15	935	656
250.65	849	402	251.16	936	661
250.66	851	407	251.17	938	666
250.67	852	412	251.18	940	671
250.68	854	417	251.19	942	676
250.69	856	422	251.20	943	681
250.70	857	428	251.21	945	686
250.71	859	433	251.22	947	691
250.72	861	438	251.23	948	696
250.73	863	443	251.24	950	701
250.74	864	448	251.25	952	706
250.75	866	453	251.26	954	711
250.76	868	458	251.27	955	716
250.77	869	463	251.28	957	721
250.78	871	468	251.29	959	726
250.79	873	474	251.30	960	730
250.80	875	479	251.31	962	735
250.81	876	484	251.32	964	740
250.82	878	489	251.33	966	745
250.83	880	494	251.34	967	750
250.84	881	499	251.35	969	755
250.85	883	504	251.36	971	760
250.86	885	509	251.37	972	765
250.87	887	514	251.38	974	770
250.88	888	519	251.39	976	775
250.89	890	524	251.40	978	780
250.90	892	530	251.41	979	785
250.91	893	535	251.42	981	790
250.92	895	540	251.43	983	795
250.93	897	545	251.44	984	800
250.94	899	550	251.45	986	805
250.95	900	555	251.46	988	810
250.96	902	560	251.47	990	815
250.97	904	565	251.48	991	819
250.98	905	570	251.49	993	824
250.99	907	575	251.50	995	829
251.00	909	580	251.51	996	834
251.01	911	585	251.52	998	839
251.02	912	590	251.53	1,000	844

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
251.54	1,002	849	252.05	1,089	1,094
251.55	1,003	854	252.06	1,091	1,098
251.56	1,005	859	252.07	1,093	1,103
251.57	1,007	864	252.08	1,094	1,108
251.58	1,008	868	252.09	1,096	1,112
251.59	1,010	873	252.10	1,098	1,117
251.60	1,012	878	252.11	1,099	1,122
251.61	1,014	883	252.12	1,101	1,126
251.62	1,015	888	252.13	1,103	1,131
251.63	1,017	893	252.14	1,105	1,136
251.64	1,019	898	252.15	1,106	1,140
251.65	1,020	903	252.16	1,108	1,145
251.66	1,022	907	252.17	1,110	1,150
251.67	1,024	912	252.18	1,111	1,154
251.68	1,026	917	252.19	1,113	1,159
251.69	1,027	922	252.20	1,115	1,163
251.70	1,029	927	252.21	1,117	1,168
251.71	1,031	932	252.22	1,118	1,173
251.72	1,032	936	252.23	1,120	1,177
251.73	1,034	941	252.24	1,122	1,182
251.74	1,036	946	252.25	1,123	1,186
251.75	1,038	951	252.26	1,125	1,191
251.76	1,039	956	252.27	1,127	1,196
251.77	1,041	961	252.28	1,129	1,200
251.78	1,043	965	252.29	1,130	1,205
251.79	1,044	970	252.30	1,132	1,209
251.80	1,046	975	252.31	1,134	1,214
251.81	1,048	980	252.32	1,135	1,218
251.82	1,050	985	252.33	1,137	1,223
251.83	1,051	989	252.34	1,139	1,228
251.84	1,053	994	252.35	1,141	1,232
251.85	1,055	999	252.36	1,142	1,237
251.86	1,057	1,004	252.37	1,144	1,241
251.87	1,058	1,008	252.38	1,146	1,246
251.88	1,060	1,013	252.39	1,147	1,250
251.89	1,062	1,018	252.40	1,149	1,255
251.90	1,063	1,023	252.41	1,151	1,259
251.91	1,065	1,027	252.42	1,153	1,264
251.92	1,067	1,032	252.43	1,154	1,268
251.93	1,069	1,037	252.44	1,156	1,273
251.94	1,070	1,042	252.45	1,158	1,277
251.95	1,072	1,046	252.46	1,159	1,282
251.96	1,074	1,051	252.47	1,161	1,286
251.97	1,075	1,056	252.48	1,163	1,291
251.98	1,077	1,061	252.49	1,165	1,295
251.99	1,079	1,065	252.50	1,166	1,300
252.00	1,081	1,070	252.51	1,168	1,304
252.01	1,082	1,075	252.52	1,170	1,308
252.02	1,084	1,079	252.53	1,171	1,313
252.03	1,086	1,084	252.54	1,173	1,317
252.04	1,087	1,089	252.55	1,175	1,322

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
252.56	1,177	1,326	253.07	1,264	1,542
252.57	1,178	1,331	253.08	1,266	1,546
252.58	1,180	1,335	253.09	1,268	1,550
252.59	1,182	1,339	253.10	1,269	1,554
252.60	1,184	1,344	253.11	1,271	1,558
252.61	1,185	1,348	253.12	1,273	1,562
252.62	1,187	1,353	253.13	1,274	1,566
252.63	1,189	1,357	253.14	1,276	1,570
252.64	1,190	1,361	253.15	1,278	1,573
252.65	1,192	1,366	253.16	1,280	1,577
252.66	1,194	1,370	253.17	1,281	1,581
252.67	1,196	1,374	253.18	1,283	1,585
252.68	1,197	1,379	253.19	1,285	1,589
252.69	1,199	1,383	253.20	1,286	1,593
252.70	1,201	1,387	253.21	1,288	1,597
252.71	1,202	1,392	253.22	1,290	1,601
252.72	1,204	1,396	253.23	1,292	1,605
252.73	1,206	1,400	253.24	1,293	1,608
252.74	1,208	1,405	253.25	1,295	1,612
252.75	1,209	1,409	253.26	1,297	1,616
252.76	1,211	1,413	253.27	1,299	1,620
252.77	1,213	1,417	253.28	1,300	1,624
252.78	1,214	1,422	253.29	1,302	1,627
252.79	1,216	1,426	253.30	1,304	1,631
252.80	1,218	1,430	253.31	1,305	1,635
252.81	1,220	1,434	253.32	1,307	1,639
252.82	1,221	1,439	253.33	1,309	1,642
252.83	1,223	1,443	253.34	1,311	1,646
252.84	1,225	1,447	253.35	1,312	1,650
252.85	1,226	1,451	253.36	1,314	1,653
252.86	1,228	1,455	253.37	1,316	1,657
252.87	1,230	1,460	253.38	1,317	1,661
252.88	1,232	1,464	253.39	1,319	1,664
252.89	1,233	1,468	253.40	1,321	1,668
252.90	1,235	1,472	253.41	1,323	1,672
252.91	1,237	1,476	253.42	1,324	1,675
252.92	1,238	1,480	253.43	1,326	1,679
252.93	1,240	1,485	253.44	1,328	1,682
252.94	1,242	1,489	253.45	1,329	1,686
252.95	1,244	1,493	253.46	1,331	1,689
252.96	1,245	1,497	253.47	1,333	1,693
252.97	1,247	1,501	253.48	1,335	1,696
252.98	1,249	1,505	253.49	1,336	1,700
252.99	1,250	1,509	253.50	1,338	1,703
253.00	1,252	1,513	253.51	1,340	1,707
253.01	1,254	1,517	253.52	1,341	1,710
253.02	1,256	1,522	253.53	1,343	1,714
253.03	1,257	1,526	253.54	1,345	1,717
253.04	1,259	1,530	253.55	1,347	1,720
253.05	1,261	1,534	253.56	1,348	1,724
253.06	1,262	1,538	253.57	1,350	1,727

Storage below lowest outlet orifice

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
253.58	1,352	1,730	254.09	1,439	1,874
253.59	1,353	1,733	254.10	1,441	1,876
253.60	1,355	1,737	254.11	1,443	1,879
253.61	1,357	1,740	254.12	1,444	1,881
253.62	1,359	1,743	254.13	1,446	1,884
253.63	1,360	1,746	254.14	1,448	1,887
253.64	1,362	1,749	254.15	1,450	1,889
253.65	1,364	1,752	254.16	1,451	1,892
253.66	1,365	1,755	254.17	1,453	1,895
253.67	1,367	1,758	254.18	1,455	1,897
253.68	1,369	1,761	254.19	1,456	1,900
253.69	1,371	1,764	254.20	1,458	1,902
253.70	1,372	1,767	254.21	1,460	1,905
253.71	1,374	1,770	254.22	1,462	1,908
253.72	1,376	1,773	254.23	1,463	1,910
253.73	1,377	1,776	254.24	1,465	1,913
253.74	1,379	1,779	254.25	1,467	1,915
253.75	1,381	1,782	254.26	1,468	1,918
253.76	1,383	1,785	254.27	1,470	1,921
253.77	1,384	1,787	254.28	1,472	1,923
253.78	1,386	1,790	254.29	1,474	1,926
253.79	1,388	1,793	254.30	1,475	1,928
253.80	1,389	1,796	254.31	1,477	1,931
253.81	1,391	1,799	254.32	1,479	1,934
253.82	1,393	1,802	254.33	1,480	1,936
253.83	1,395	1,804	254.34	1,482	1,939
253.84	1,396	1,807	254.35	1,484	1,941
253.85	1,398	1,810	254.36	1,486	1,944
253.86	1,400	1,813	254.37	1,487	1,947
253.87	1,401	1,815	254.38	1,489	1,949
253.88	1,403	1,818	254.39	1,491	1,952
253.89	1,405	1,821	254.40	1,492	1,954
253.90	1,407	1,824	254.41	1,494	1,957
253.91	1,408	1,826	254.42	1,496	1,960
253.92	1,410	1,829	254.43	1,498	1,962
253.93	1,412	1,832	254.44	1,499	1,965
253.94	1,414	1,834	254.45	1,501	1,967
253.95	1,415	1,837	254.46	1,503	1,970
253.96	1,417	1,840	254.47	1,504	1,973
253.97	1,419	1,842	254.48	1,506	1,975
253.98	1,420	1,845	254.49	1,508	1,978
253.99	1,422	1,848	254.50	1,510	1,980
254.00	1,424	1,850	254.51	1,511	1,983
254.01	1,426	1,853	254.52	1,513	1,986
254.02	1,427	1,855	254.53	1,515	1,988
254.03	1,429	1,858	254.54	1,516	1,991
254.04	1,431	1,861	254.55	1,518	1,994
254.05	1,432	1,863	254.56	1,520	1,996
254.06	1,434	1,866	254.57	1,522	1,999
254.07	1,436	1,868	254.58	1,523	2,001
254.08	1,438	1,871	254.59	1,525	2,004

Stage-Area-Storage for Pond INF-2: Underground Infiltration System #2 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
254.60	1,527	2,007
254.61	1,528	2,009
254.62	1,530	2,012
254.63	1,532	2,014
254.64	1,534	2,017
254.65	1,535	2,020
254.66	1,537	2,022
254.67	1,539	2,025
254.68	1,541	2,027
254.69	1,542	2,030
254.70	1,544	2,033
254.71	1,546	2,035
254.72	1,547	2,038
254.73	1,549	2,040
254.74	1,551	2,043
254.75	1,553	2,046
254.76	1,554	2,048
254.77	1,556	2,051
254.78	1,558	2,053
254.79	1,559	2,056
254.80	1,561	2,059
254.81	1,563	2,061
254.82	1,565	2,064
254.83	1,566	2,066
254.84	1,568	2,069
254.85	1,570	2,072
254.86	1,571	2,074
254.87	1,573	2,077
254.88	1,575	2,080
254.89	1,577	2,082
254.90	1,578	2,085
254.91	1,580	2,087
254.92	1,582	2,090
254.93	1,583	2,093
254.94	1,585	2,095
254.95	1,587	2,098
254.96	1,589	2,100
254.97	1,590	2,103
254.98	1,592	2,106
254.99	1,594	2,108
255.00	**1,595**	**2,111**

GPI Project No.	NEX-2021267	**Sheet**	1 of 2
Project Description	254, 256 & 260 Ayer Road, Littleton, MA & 0 Littleton Road, Ayer, MA		
Task	Drawdown Calculations		
Calculated By	CNM	**Date**	04/20/23
Checked By		**Date**	

Greenman-Pedersen, Inc.

Drawdown within 72 hours Analysis for Static Method

Underground Infiltration System #1

Infiltration Rate: 8.27 inches/hour (From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)

Design Infiltration Rate: 8.27 inches/hour

Volume Provided for Recharge: 5,781 cf

Basin bottom area: 2,809 sf

Time $_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

Time $_{drawdown}$ = (5,781 cf) (1 / 8.27 in/hr) (1ft/12 in.) (1 / 2,809 sf)

= 2.99 hours

Underground Infiltration System #2

Infiltration Rate: 8.27 inches/hour (From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)

Design Infiltration Rate: 8.27 inches/hour

Volume Provided for Recharge: 1,552 cf

Basin bottom area: 652 sf

Time $_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

Time $_{drawdown}$ = (1,552 cf) (1 / 8.27 in/hr) (1ft/12 in.) (1 / 652 sf)

= 3.45 hours

Drawdown within 72 hours Analysis for Static Method

Bioretention Area

Infiltration Rate: 8.27 inches/hour (From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)

Design Infiltration Rate: 8.27 inches/hour

Volume Provided for Recharge: 320 cf

Basin bottom area: 59 sf

Time $_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

Time $_{drawdown}$ = (320 cf) (1 / 8.27 in/hr) (1ft/12 in.) (1 / 59 sf)

= 7.87 hours

Infiltration Basin

Infiltration Rate: 8.27 inches/hour (From table 2.3.3: Rawls, Brakensiek, Saxton, 1982)

Design Infiltration Rate: 8.27 inches/hour

Volume Provided for Recharge: 2,945 cf

Basin bottom area: 830 sf

Time $_{drawdown}$ = (Required Recharge Volume in cubic feet as determined by the Static Method)(1/Design Infiltration Rate in inches per hour)(conversion for inches to feet)(1/bottom area in feet)

Time $_{drawdown}$ = (2,945 cf) (1 / 8.27 in/hr) (1ft/12 in.) (1 / 830 sf)

= 5.15 hours

OUTLET APRON DESIGN

Project: 256 Ayer Road - Littleton, MA Job # 2021267
Date: 20-Apr-23

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

ES-1 (from HydroCAD POND OWS-1)

Q10 = 1.0 cfs
D_o = 8 inches
Tw = 0.6 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **2** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do
La= **7.97** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

USE THIS La= **10.178** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La
W= **9.97** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

USE THIS W= **6.07** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.60** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))
d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

OUTLET APRON DESIGN

Project: 256 Ayer Road - Littleton, MA Job # 2021267
Date: 20-Apr-23

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

FES-1 (from HydroCAD POND CB-8)
Q10 = 0.5 cfs
D_o = 12 inches
Tw = 0.1 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **7.90** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **8.5** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **10.90** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **6.40** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.95** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))

d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

OUTLET APRON DESIGN

Project: 256 Ayer Road - Littleton, MA Job # 2021267
Date: 20-Apr-23

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

FES-2 (from HydroCAD POND CB-9)
Q10 = 0.04 cfs
D_o = 12 inches
Tw = 0.1 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **3** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **7.07** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **7.12** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **10.07** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **5.85** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.03** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))
d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

OUTLET APRON DESIGN

Project: 256 Ayer Road - Littleton, MA Job # 2021267
Date: 20-Apr-23

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road
Suite One
Salem, NH 03079

FES-3 (from HydroCAD POND DMH-9)
Q10 = 1.7 cfs
D_o = 18 inches
Tw = 0.6 feet

Design Criteria

Apron Dimensions

The dimensions of the apron at the outlet of the pipe shall be determined as follows:

1.) The width of the apron at the outlet of the pipe or channel shall be 3 times the diameter of the pipe, or the width of the channel.

USE THIS W= **4.5** feet

2.) The length of the apron shall be determined from the following formula when the tailwater depth at the outlet of the pipe or channel is less than one-half the diameter of the pipe or one-half the width of the channel:

La=1.8*Q/ Do^3/2+ 7Do

USE THIS La= **12.17** feet

Where:

La is the length of the apron
Q is the discharge from the pipe or channel
D_o is the diameter of pipe of width of channel

3.) When the depth of the tailwater at the outlet of the pipe or channel is equal to or greater than one-half the diameter of the pipe or the width of the channel. Then the following formula applies:

La=3.0*Qo/ Do^1.5 +7D_o

La= **13.276** feet

4.) Where there is no well defined channel downstream of the outlet, the width of the downstream end of the apron shall be determined as follows:

a. For minimum tailwater conditions where the tailwater depth is less than the elevation of the center of the pipe:

W=3*Do+La

USE THIS W= **16.67** feet

b. For maximum tailwater conditions where the tailwater depth is greater than the elevation of the center of the pipe:

W=3*Do+0.4*La

W= **9.81** feet

5.) Where there is a stable well-defined channel downstream of the apron, the bottom of the apron shall be equal to the width of the channel.

6.) The side of the apron in a well-defined channel shall be 2:1 (horizontal to vertical) or flatter. The height of the structural lining along the channel sides shall begin at the elevation equal to the top of conduit and taper down to the channel bottom through the length of the apron.

7.) The bottom grade of the apron shall be level (0% grade). No overfall is allowable at the end of the apron.

8.) The apron shall be located so that there are no bends in the horizontal alignment of the apron.

Rock Riprap

The following criteria shall be used to determine the dimensions of the rock riprap used for the apron:

1.) The median stone diameter shall be determined using the formula:

d_{50}=0.02*Q^4/3/(Tw*D_o)

d_{50}= **0.54** inches **USE** **3** inches

d_{50} minimum 3 inches

Where:

d_{50} is the median stone diameter in feet
Tw is the tailwater depth above the invert of the pipe channel in feet
Q is the discharge from the pipe or channel in cubic feet per second
D_o is the diameter of the pipe or width of the channel in feet

2.) Fifty percent by weight of the riprap mixture shall be smaller the than median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size.

3.) The quality and gradation of the rock, the thickness of the riprap lining, filter material and the quality of the stone shall meet the requirements in the Rock Riprap BMP. The minimum depth shall be 6 inches or 1.5 times the largest stone size in the mixture whichever is larger (d).

Thickness of the riprap
d = 1.5*(d100 avg.(largest stone size))

d= **8** inches*

* must use a minimum of 6"

Rock Rip Rap Gradation

% of weight smaller than the given size	size of stone in inches		
100	**4.5**	to	**6.0**
85	**3.9**	to	**5.4**
50	**3.0**	to	**4.5**
15	**0.9**	to	**1.5**

Calculation of Required Water Quality Flow for Sizing of Stormwater Treatment System

4/14/2023

Based on Massachusetts DEP document:
"Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices"

Stormwater Standard No. 4 requires that the full WQV be captured and treated to remove 80% of the average annual post-construction TSS load.
Since manufactured proprietary separators are sized using discharge rates and not volume, MassDEP is requiring this standard method be used to convert the required WQV to a discharge rate (WQF) to be treated.

Project Site: **254-260 Ayer Rd**
Project Location: **Littleton, MA**

Runoff Depth, Q: **1** " (0.5" or 1")

Table 1.

Structure Name	Area (acres)	% Impervious	Impervious A ($miles^2$)	t_c (min.)	t_c (hrs.)
DMH-9	**0.63**	**94.0%**	0.000925	**6.00**	0.100
CB-8	**0.292**	**96.0%**	0.000438	**6.00**	0.100

Because only runoff from impervious surfaces is used in calculation of WQV, area is considered 100% impervious
Therefore, CN = 98

Enter Ia/P Ratio for CN=98:
Ia/P = **0.034** (0.058 for Q=0.5" / 0.034 for Q=1")

Enter unit peak discharge, qu (csm/in) for Type III rainfall distribution, Ia/P, and tc:
From Figure 2 (Q=0.5") or Figure 4 (Q=1")

Table 2.

Structure Name	tc (hours)	qu (csm/in)
DMH-9	**0.100**	**774**
CB-8	**0.100**	**774**

WQF in cfs = (qu)(A)(Q), where:

WQF = water quality flow (cfs)
q_u = unit peak discharge (csm/in) — From Table 2 above
A = drainage area (mi^2) — From Table 1 above
Q = runoff depth (watershed inches) — Based on Area Type, from above

Table 3.

Structure Name	**q_u (csm/in)**	**Impervious A ($miles^2$)**	**Q (in)**	**WQF (cfs)**	**Proposed Device[1]**
DMH-9	774	0.000925	1	**0.72**	**FD-4HC**
CB-8	774	0.000438	1	**0.34**	**FD-4HC**

[1]Proposed Device is sized so that the required site WQF is less than the treatment flow at which the device achieves at least 80% TSS removal, as documented by enclosed test data.

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Applications

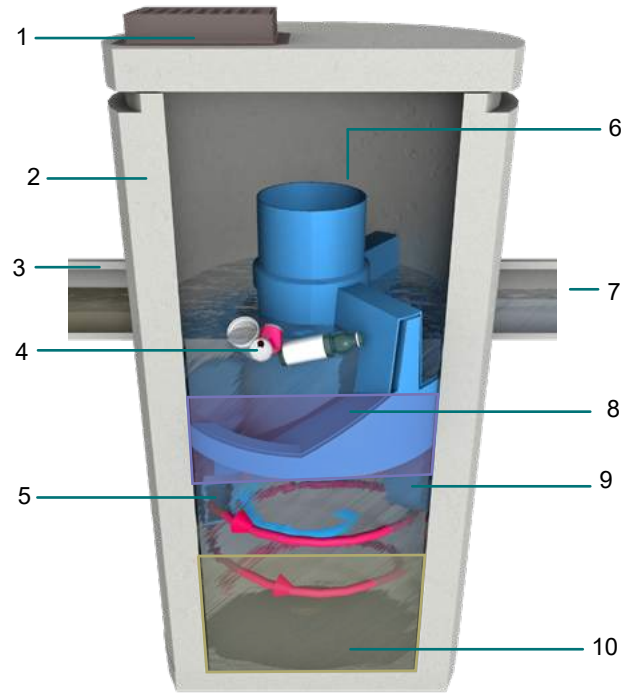
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Verified by NJCAT and NJDEP

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.



Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

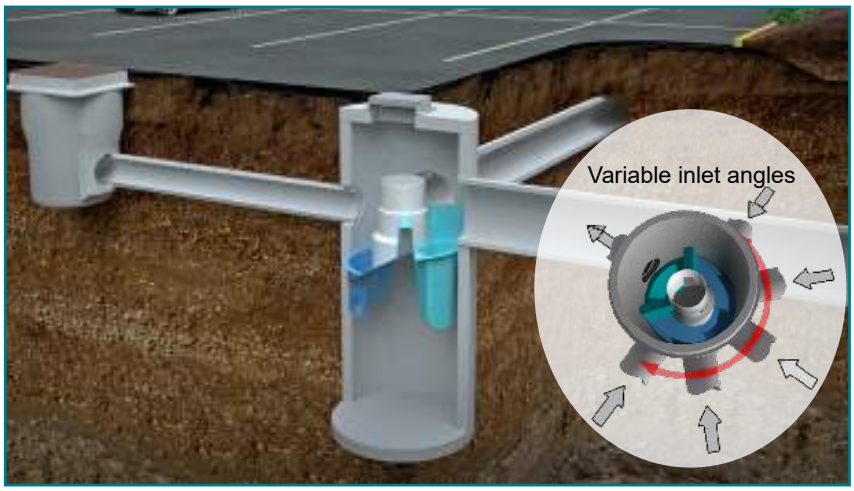


Fig 2. Works with multiple inlet pipes and grates

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

Sizing Calculator for Engineers

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.35 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Hydro International, 94 Hutchins Drive, Portland, ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Technical Abstract
First Defense® - High Capacity

NJCAT Verified 80% TSS Removal for 50 to 150 µm Particle Size Range

Introduction

Hydro International has a state-of-the-art hydraulics and test facility that is used both to develop products and to evaluate performance. Through controlled testing using industry standard test protocols, Hydro's treatment products are evaluated under varying hydraulic and sediment load conditions. With a known drainage area or water quality flow rate, these test results are used to benchmark treatment objectives and to select the correct model size.

A common stormwater treatment goal for manufactured treatment devices is to reduce the Total Suspended Solids (TSS) concentration by at least 80%. To comply with this goal, a silica-based test sand with known particle size gradation (PSD) and density is injected into the treatment system at different flow rates. With known TSS concentrations and particle sizes before and after treatment, efficiency curves are plotted and used to predict TSS reductions for a range of particle sizes.

OK110 Silica Test Sand

U.S. Silica OK110 is a common test sand that has been used by the industry but is no longer available. However, its PSD can be modelled from a blend of silica sands having a wide range of particle sizes. This abstract summarizes test results based on a particle size range similar to OK110 for the First Defense® High Capacity (FDHC). All test protocols and results have been independently verified by the New Jersey Corporation for Advanced Technology (NJCAT). The full report can be viewed at: FDHC_PSD_Removal_Verification_Report_9-16.pdf

First Defense High Capacity (FDHC)

The FDHC (Figure 1) has patented flow modifying internal components that create a gentle swirling flow path within the Vortex Chamber. The rotating flow creates low energy vortex forces that supplement gravitational settling forces to enhance separation of pollutants.

The internal components are fit into precast manholes to collect runoff as part of typical drainage network system. During rain events, flow enters either from a surface inlet grate or inlet pipe. As flow enters the manhole, components divert flow and pollutants into a Vortex Chamber beneath a separation module, that includes both Inlet\Outlet Chutes and Bypass Weirs. The internal Bypass Weirs divert peak flows over the separation module and away from the Vortex Chamber where pollutants are collecting. This prevents high velocities from re-suspending captured pollutants during infrequent but large storm events.

Capable of providing high pollutant removals for a wide range of flow rates and pipe sizes, the FDHC can be installed ether online or offline depending on pipes and peak flows. Its efficiency and simplicity make it economical to install and maintain.

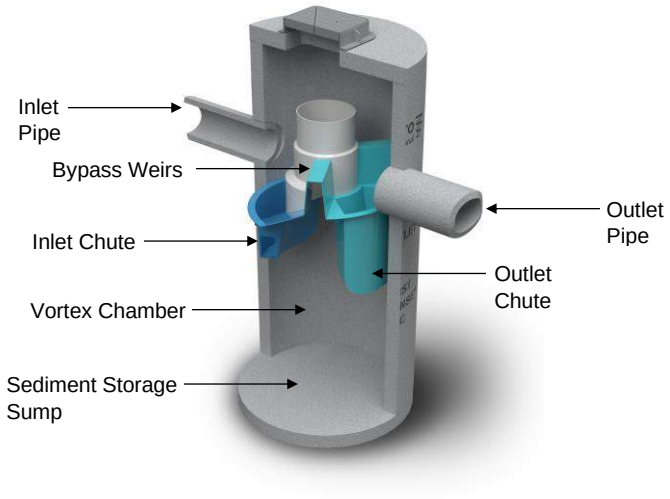


Figure 1 - First Defense High Capacity

Laboratory Testing Arrangement

The laboratory setup (Figure 2) consisted of a recirculating closed loop system with an 8-inch (200 mm) submersible Flygt pump that conveyed water from a 23,000 gal (87,064 L) reservoir through a PVC pipe network to the 4-ft (1.2m) FDHC. The flow rate of the pump was controlled by a GE Fuji Electric AF-300 P11 Adjustable Frequency Drive and measured by an EMCO Flow Systems 4411e Electromagnetic Flow Transmitter. Test sand was injected into the incoming flow stream using a volumetric screw feeder situated 10-ft prior to entering the test unit.

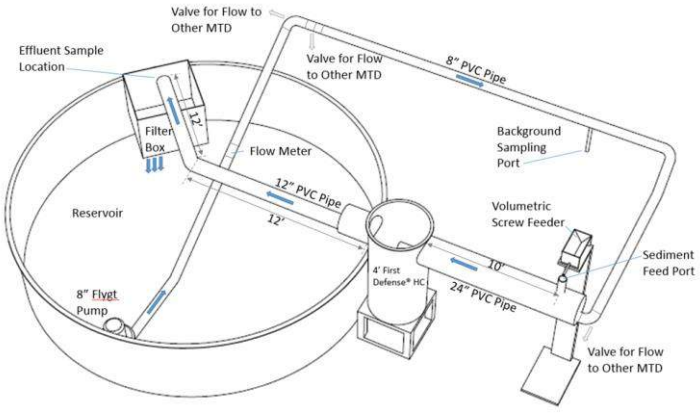


Figure 2 - Set-up of the Portland, Maine hydraulic testing facility

Test Sediment

The feed sediment injected into the inlet during removal efficiency testing was a blend of commercially available silica sands ranging from 2 µm to 1,000 µm. The PSD of the test sediment was analyzed by an independent laboratory in accordance with ASTM D 422-63.

First Defense® - High Capacity

To evaluate the performance consistent with OK110 test sand, results were analyzed from the particle sizes range of 50 µm to 150 µm (D_{50}=108µm). A comparison between the 50 – 150 µm range and OK110 gradation is shown in Figure 3. The 50 – 150 µm test sand gradation is overall finer than OK110 between 50 µm and 100 µm. For example, the test sand had 15% finer than 75 µm compared to the OK110 PSD that had only 3% less than 75 microns. Given that finer particles are more difficult to remove, performance results for 50 to 150 µm PSD is considered conservative.

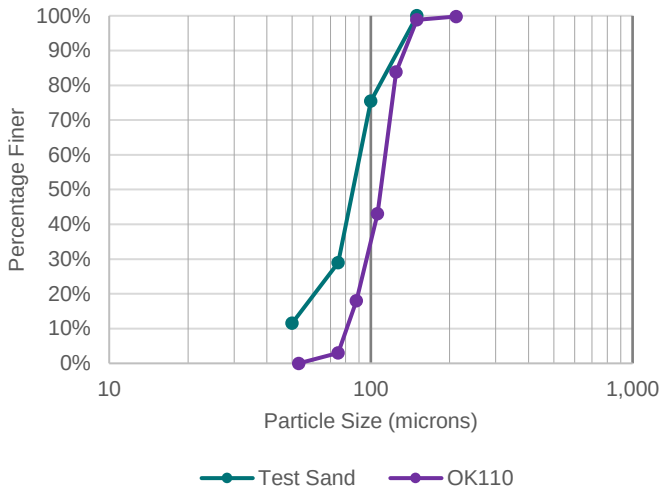


Figure 3 - Particle Size Distribution Comparison

Removal Efficiency Testing

Removal efficiency testing with the feed sediment was conducted in accordance with Section 5 of the NJDEP Laboratory Protocol for Manufactured Treatment Devices. Five flow rates ranging from 0.38 cfs to 1.88 cfs were tested to assess the performance trend.

The test sediment was fed into the flow stream at a rate that was equivalent to 200 mg/L. The average influent TSS concentration was calculated using the total sediment mass and volume of water added during dosing. The influent concentration for each particle size band was calculated using the percentage of particles in each particle size band and known average inlet concentration. Three time-spaced effluent grab samples were composited and analyzed using laser diffraction (ISO 13320) to evaluate the effluent particle sizes.

Table 1 – 50 – 150 µm Particle Size Range Test Results

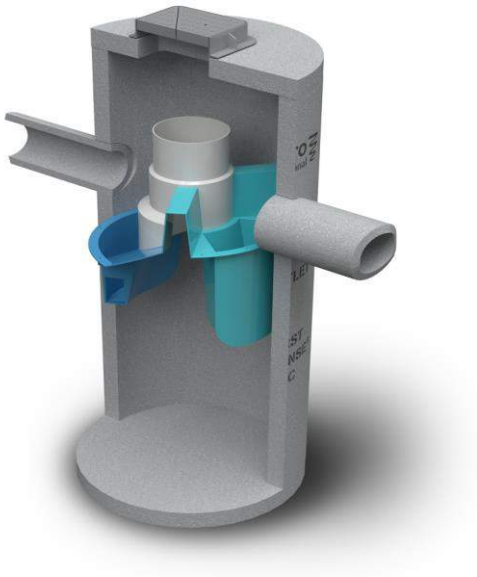
Flow	Inlet Mass	Outlet Mass	Removal
cfs (L/s)	grams	grams	%
0.38 (10.8)	1,554.6	107.1	93.1
0.75 (21.2)	1,761.0	150.8	91.4
1.13 (32.0)	1,872.8	127.2	93.2
1.5 (42.5)	2,203.2	226.7	89.7
1.88 (53.2)	2,366.6	303.8	87.2

The average effluent sediment concentration of the three composited samples was also measured for each flow rate in accordance with ASTM D3977-97. The effluent concentration for each particle size band was then calculated using the average effluent composite concentration and percentage of particles in each particle size band.

Percent removed at each of the five tested flow rates is shown in Table 1. Inlet concentrations of the OK110 particle size range varied from 79-84 mg/L compared to 4-8.5 mg/L at the outlet. As expected, the highest concentration measured at the outlet was at the highest tested flow rate of 1.88 cfs (53.2 L/s). In general, the 4-ft FDHC removed greater than 85% of the OK110 particle size range for all tested flow rates. Table 2 provides "Treatment Flow Rates" for the available models.

Table 2 – FDHC Treatment Flow Rate for > 85% OK110

Model:	FD-3HC	FD-4HC	FD-5HC	FD-6HC	FD-8HC	FD-10HC
Size:	3 ft (0.9 m)	4 ft (1.2 m)	5 ft (1.5 m)	6 ft (1.8 m)	8 ft (2.4 m)	10 ft (3.0 m)
cfs:	1.06	1.88	2.94	4.23	7.52	11.75
L/s:	30.02	53.2	83.3	119.8	212.9	332.6



For design purposes the selected model's Treatment Flow Rate must be equal or greater to the site's required Water Quality Flow Rate. The peak flow rate and maximum pipe size must be considered to determine whether an online or offline configuration is appropriate. Full removal curves are available on request.

Refer First Defense product information brochure or visit www.hydro-int.com/us for more information

Hydro International. 94 Hutchins Drive. Portland. ME 04102
Tel: 207.756.6200 Fax: 207.756.6212
Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions

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Turning Water Around…®

First Defense® Materials and Design

A. Structures for precast stormwater treatment systems shall conform to ASTM C478, C857 and C858 and meet the following additional requirements:

   1. In all cases the wall thickness shall be no less than the minimum thickness necessary to sustain HS20-44 loading requirements as determined by a licensed professional engineer.

   2. Sections shall have tongue and groove or ship-lap joints with butyl mastic sealant conforming to ASTM C 990.

   3. Cement shall be Type II or Type III Portland cement conforming to ASTM C150.

   4. Aggregates shall conform to ASTM C33

   5. All sections shall be cured by an approved method. Sections shall not be shipped until the concrete has attained a compressive strength of 4,000 psi and shall have a 28 day compressive strength of 5000 psi.

   6. Pipe openings shall be sized to accept pipes of the specified size(s) and material(s), and shall be sealed by the Contractor with hydraulic cement conforming to ASTM C595M.

B. Internal stainless steel components shall be grade 304 stainless steel in accordance with ASTM A314.

C. 4’ & 6’ diameter internal plastic components shall be rotationally molded from high density polyethylene.

D. Casting for manhole frames and covers shall be in accordance with ASTM A48, CL. 35B and AASHTO M306. Castings shall be placed on top of the structure per the requirements of the project engineer.

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com
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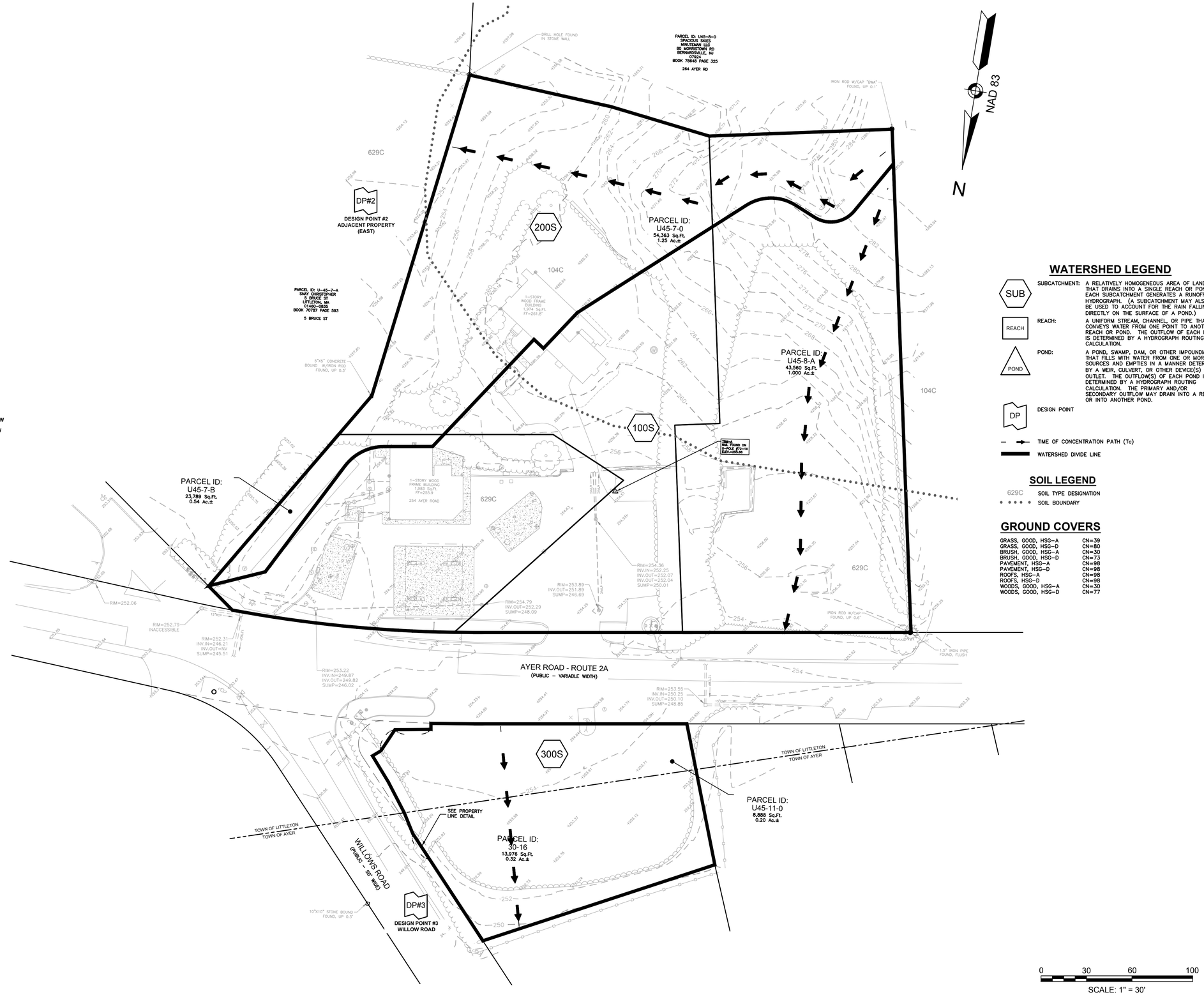

LEGEND

- SGC — SLOPED GRANITE CURB
- VGC — VERTICAL GRANITE CURB
- SCC — SLOPED CONCRETE CURB
- VCC — VERTICAL CONCRETE CURB
- CCB — CAPE COD BERM
- DSLY — DOUBLE SOLID LINE YELLOW
- DDLY — DOUBLE DASHED LINE YELLOW
- SDLY — SINGLE DASHED LINE YELLOW
- SSLY — SINGLE SOLID LINE YELLOW
- SSLW — SINGLE SOLID LINE WHITE
- SDLW — SINGLE DASHED LINE WHITE
- G — GAS LINE
- T — UNDERGROUND TELEPHONE
- W — WATER LINE
- E — UNDERGROUND ELECTRIC
- WOOD GUARDRAIL
- METAL GUARDRAIL
- CHAIN LINK FENCE
- STOCKADE FENCE
- POST & RAIL FENCE
- WIRE FENCE
- 90 — CONTOUR ELEVATION
- TREE
- UTILITY POLE
- GUY WIRE
- OVERHEAD WIRE
- TREELINE
- PB — PULL BOX
- SIGN
- SPOT ELEVATION
- DRAIN MANHOLE
- CATCH BASIN
- ROOF DRAIN
- CLEANOUT
- VENT
- SEWER MANHOLE
- TELEPHONE MANHOLE
- ELECTRIC MANHOLE
- WATER MANHOLE
- MANHOLE
- GV — GAS VALVE
- GAS SHUT OFF
- WV — WATER VALVE
- WATER SHUT OFF
- FIRE HYDRANT
- BOLLARD
- GM — GAS METER
- EM — ELECTRIC METER
- MONITORING WELL
- LIGHT POLE
- BORING
- WETLAND LINE
- WATER FEATURE
- U/GAT — UNDERGROUND COMM
- DITCH LINE
- EASEMENT LINE
- PROPERTY LINE
- ABUTTER PROPERTY LINE
- BUILDING SETBACK
- SOIL TYPE LINE
- ZONE LINE
- FLOOD ZONE LINE

WATERSHED LEGEND

- SUB — SUBCATCHMENT: A RELATIVELY HOMOGENEOUS AREA OF LAND THAT DRAINS INTO A SINGLE REACH OR POND. EACH SUBCATCHMENT GENERATES A RUNOFF HYDROGRAPH. (A SUBCATCHMENT MAY ALSO BE USED TO ACCOUNT FOR THE RAIN FALLING DIRECTLY ON THE SURFACE OF A POND.)
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- DP — DESIGN POINT
- TIME OF CONCENTRATION PATH (Tc)
- WATERSHED DIVIDE LINE

SOIL LEGEND

- 629C — SOIL TYPE DESIGNATION
- SOIL BOUNDARY

GROUND COVERS

GRASS, GOOD, HSG–A	CN=39
GRASS, GOOD, HSG–D	CN=80
BRUSH, GOOD, HSG–A	CN=30
BRUSH, GOOD, HSG–D	CN=73
PAVEMENT, HSG–A	CN=98
PAVEMENT, HSG–D	CN=98
ROOFS, HSG–A	CN=98
ROOFS, HSG–D	CN=98
WOODS, GOOD, HSG–A	CN=30
WOODS, GOOD, HSG–D	CN=77

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44 Stiles Road, Suite One
Salem, NH 03079

PREPARED FOR
ENERGY NORTH GROUP
2 INTERNATIONAL WAY,
LAWRENCE, MA 01843

PARCEL ID: U45-7-B, PARCEL ID: U45-7-0
PARCEL ID: U45-8-A, PARCEL ID:U45-11-0
254, 256 & 260 AYER ROAD
LITTLETON, MASSACHUSETTS

PARCEL ID: 30-160
0 LITTLETON ROAD
AYER, MASSACHUSETTS

REVISIONS		
1	REV. PER PEER REVIEW COMMENTS	4/20/23
NO.	REVISION	DATE

FEBRUARY 8, 2023

DRAWN/DESIGN BY	CHECKED BY
SJB	CMT

PRE-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=30'

NEX-2021267

1 OF 1

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LEGEND

- SGC — SLOPED GRANITE CURB
- VGC — VERTICAL GRANITE CURB
- SCC — SLOPED CONCRETE CURB
- VCC — VERTICAL CONCRETE CURB
- CCB — CAPE COD BERM
- DSLY — DOUBLE SOLID LINE YELLOW
- DDLY — DOUBLE DASHED LINE YELLOW
- SDLY — SINGLE DASHED LINE YELLOW
- SSLY — SINGLE SOLID LINE YELLOW
- SSLW — SINGLE SOLID LINE WHITE
- SDLW — SINGLE DASHED LINE WHITE
- G — GAS LINE
- T — UNDERGROUND TELEPHONE
- W — WATER LINE
- E — UNDERGROUND ELECTRIC
- WOOD GUARDRAIL
- METAL GUARDRAIL
- CHAIN LINK FENCE
- STOCKADE FENCE
- POST & RAIL FENCE
- WIRE FENCE
- 90 — CONTOUR ELEVATION
- TREE
- UTILITY POLE
- GUY WIRE
- OVERHEAD WIRE
- TREELINE
- PB — PULL BOX
- SIGN
- SPOT ELEVATION
- DRAIN MANHOLE
- CATCH BASIN
- ROOF DRAIN
- CLEANOUT
- VENT
- S — SEWER MANHOLE
- T — TELEPHONE MANHOLE
- E — ELECTRIC MANHOLE
- W — WATER MANHOLE
- MH — MANHOLE
- GV — GAS VALVE
- GAS SHUT OFF
- WV — WATER VALVE
- WATER SHUT OFF
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- BOLLARD
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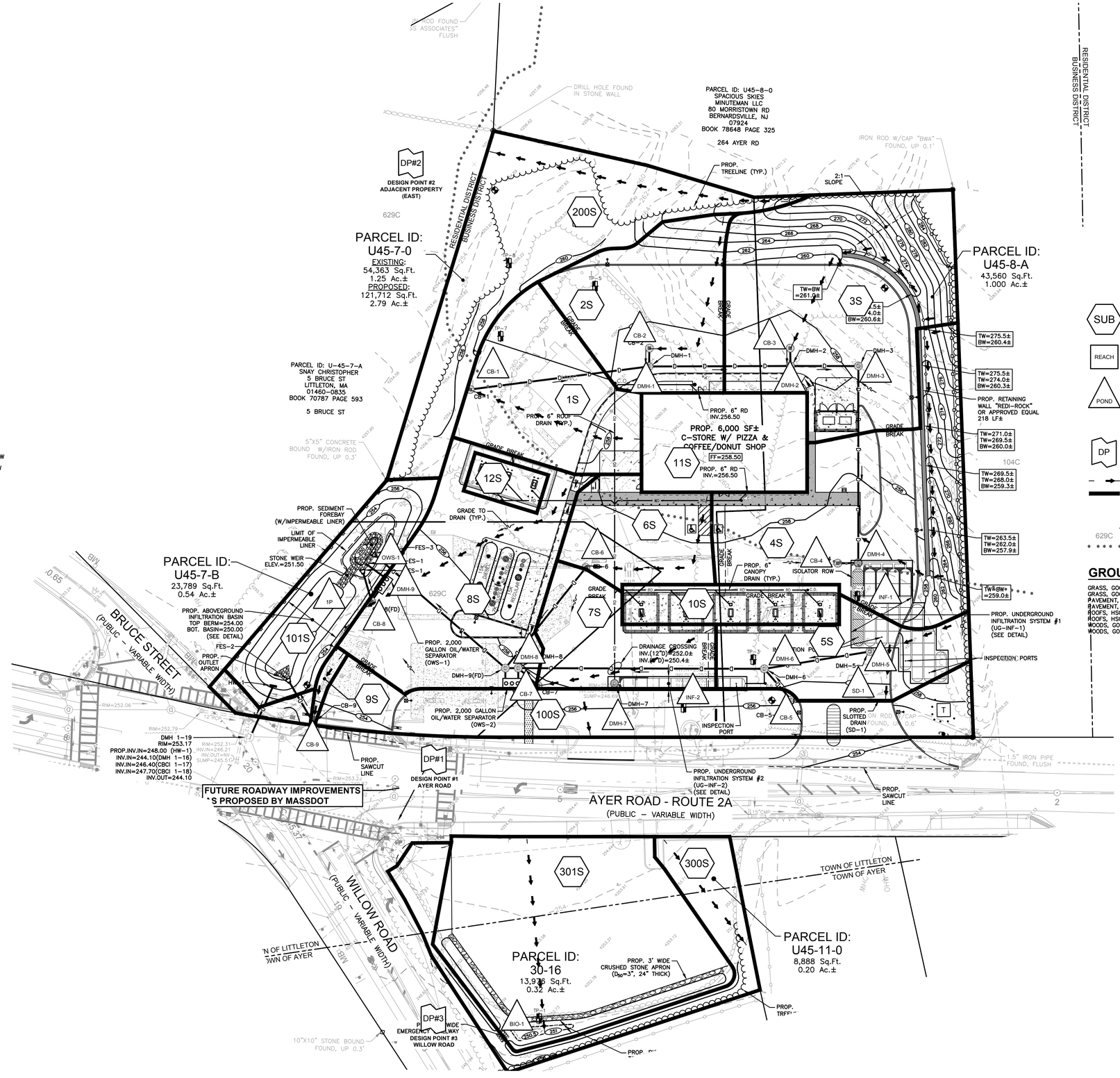

0 30 60 100

SCALE: 1" = 30'

WATERSHED LEGEND

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ROOFS, HSG-A	CN=98
ROOFS, HSG-D	CN=98
WOODS, GOOD, HSG-A	CN=30
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LITTLETON, MASSACHUSETTS

PARCEL ID: 30-160
0 LITTLETON ROAD
AYER, MASSACHUSETTS

REVISIONS		
1	REV. PER PEER REVIEW COMMENTS	4/20/23
NO.	REVISION	DATE

FEBRUARY 8, 2023

DRAWN/DESIGN BY	CHECKED BY
SJB	CMT

POST-DEVELOPMENT DRAINAGE AREA PLAN

SCALE: 1"=30'

NEX-2021267

1 OF 1

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OPERATION & MAINTENANCE PLAN
And
LONG TERM POLLUTION PREVENTION PLAN
For
STORMWATER MANAGEMENT SYSTEMS

PROPOSED RETAIL MOTOR FUEL OUTLET RE-DEVELOPMENT
MAP U45 LOTS 7, 7-B, 8-A & 11-0
254, 256 & 260 AYER ROAD (ROUTE 2A)
LITTLETON, MA

MAP 30 LOT 16
0 LITTLETON ROAD
AYER, MA

GPI

44 Stiles Road, Suite One
Salem, NH 03079
(603) 893-0720

Prepared For:

Energy North Group
2 International Way
Lawrence, MA 01843

February 8, 2023
Revised: April 20, 2023

Energy North Group
Proposed Retail Motor Fuel Outlet
Stormwater O&M and LTPPP

TABLE OF CONTENTS

SECTION 1 O & M DOCUMENTATION REQUIREMENTS

The property owner shall be responsible for the operation and maintenance of all stormwater management systems after construction in accordance with the below criteria. Logs of inspections and cleanings shall be maintained by the owner and annual BMP inspection forms shall be made available to the Town of Littleton and Town of Ayer upon request.

As required by the MassDEP Stormwater Management Handbook, which serves as guidance on the Massachusetts Stormwater Policy, and in accordance with Stormwater Standard #9, the following post construction operation and maintenance plan has been prepared.

Stormwater Management System Owner: Property owner

Party or Parties Responsible for Operation and Maintenance: Property owner

_____ _____

Stormwater Management System Owner Date

Documentation: A maintenance log shall be kept summarizing inspections, maintenance and any corrective actions taken. The log shall include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. The logs shall be made accessible to the Town of Littleton and Town of Ayer upon request.

All stormwater facilities associated with this redevelopment are identified on Figures 1A and 1B contained within Section 4 of this manual and listed individually on the log form included herein and shall be inspected and maintained in accordance with the procedures outlined in Section 2.

SECTION 2 BMP SPECIFIC O & M PROCEDURES

Driveway/Parking Lot Sweeping

Sweeping shall be done once in the early fall and then immediately following spring snowmelt to remove sand and other debris and when visual buildup of debris is apparent. Pavement surfaces shall be swept at other times such as in the fall after leaves have dropped to remove accumulated debris. Since contaminants typically accumulate within 12 inches of the curbline, street cleaning operations should concentrate in cleaning curb and gutter lines for maximum pollutant removal efficiency. Other areas shall also be swept periodically when visual buildup of debris is apparent. Once removed from paved surfaces, the sweeping must be handled and disposed of properly. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Deep Sump Hooded Catch Basins/Slotted Drain

Inspect catch basins and slotted drain at least 4 times per year and at the end of the foliage and snow removal seasons (preferably in spring and fall) to ensure that the catch basins are working in their intended fashion and that they are free of debris. Sediment must also be removed 4 times per year of whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. If the basin outlet is designed with a hood to trap floatable materials check to ensure watertight seal is working. At a minimum, remove floating debris and hydrocarbons at the time of the inspection. Sediment and debris can be removed by a clamshell bucket however, a vacuum truck is preferred. A vacuum truck must be used at a minimum of once per year for sediment removal. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Oil/Water Separator

The system should initially be inspected within the first three months after completion of the site's construction and after any rainfall greater than 1-inch. The units should be inspected after every major storm but at least on a monthly basis. Cleaning of the units should be done at least twice a year and should include the following:

Removal of accumulated oil and grease and sediment by using a vacuum truck or similar catch basin cleaning device.
Visually inspect, and clean as needed, inlet and outlets including tees during each inspection.
At a minimum, remove any floating debris at the time of the inspection.

Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

Hydrodynamic Separator (First Defense Units)

Initial maintenance to be performed twice a year for the first year after the unit is online and operational. A vacuum truck must be used at a minimum of once per year for sediment removal. Refer to the attached First Defense Maintenance Guide for operation and maintenance procedures and schedules thereafter.

Stormtech Underground Infiltration Systems

Inspect and measure the level of sediment in the isolator rows via the inspection port and the sumps of the drainage manholes. If sediment is at, or above 3", jetvac the isolator row with a fixed culvert cleaning nozzle with rear facing spread of 45". Apply multiple passes of the jetvac until backflush water is clean. Vacuum connecting drain manhole structures.

In the first year, inspect the System every 6 months. After the first year, the inspection schedule should be adjusted based on previous observations of sediment accumulation and high water elevations; however, inspections should be performed once a year at a minimum. Refer to the attached Isolator Row O&M Manual for more information.

Sediment Forebay

The sediment forebay shall be inspected monthly and cleaned four times per year and when sediment depth is between 3 to 6 feet.

Infiltration Basin

Periodic mowings of the embankment shall be performed. Inspect slope and embankments at least twice annually. Woody vegetation shall be removed from fill embankments. Sediment and debris removal should be through the use of truck mounted vacuum equipment. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations.

The inlets of the basin should be checked periodically to ensure that flow structures are not blocked by debris. Spillways should be checked for debris that may obstruct flow.

Bioretention Area

The bioretention areas should initially be inspected within the first three months after completion of the site's construction and after any rainfall event exceeding 2.5 inches in a 24-hour period. The system should be inspected at least twice annually thereafter.

Preventative maintenance will aid in proper function of the bioretention area. Inspect for trash and debris on a month-to-month basis year-round. Additional mulch should be laid down on an annual basis, preferably in the springtime. Prune any plantings and remove dead vegetation on an annual basis in the spring or fall and any dead vegetation should be replanted in the springtime. At least annually, the system should be inspected for drawdown time. In the event the bioretention area needs to be replaced due to failure or other reasons, any vegetation & filter media should be replaced in either the late spring or early summer.

Stone Aprons/Outlet Weirs

Inspect at least once annually for damage and deterioration. Repair damage immediately.

Vegetated Areas

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows. During the summer months, all landscape features are to be maintained with the minimum possible amount of fertilizers, pesticides or herbicides.

Winter Maintenance

Proposed snow storage is located along the edge of the driveways and parking areas. Any excess snow is to be trucked offsite. During the winter months all snow is to be stored such that snowmelt is controlled. Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage swales or ditches. The minimum amount of deicing chemicals needed is to be used.

For questions and additional information regarding snow storage or disposal, please contact the MassDEP's Central Regional Office in Worcester at 508-792-7650.

SECTION 3 LONG-TERM MAINTENANCE PLAN

The primary focus of the Long-Term Pollution Prevention Plan (LTPPP) is to establish procedures and controls for limiting the potential sources of pollutants, including nutrients that may contribute to excessive contaminant levels in the site's stormwater runoff. To this end the following source controls and procedures will be in place at the site:

- **Good House Keeping** – It shall be the responsibility of the property owner to keep the site clean at all times. Refuse disposal and pickup shall occur on a regular basis and all material shall be disposed of in the specified dumpster location area on the Site Development Plans.
- **Storing Material and waste products inside or under cover** – No material storage is to take place outside the proposed facility on either paved or lawn areas. All material stored on site will conform with all storage requirements of local, state and federal agencies.
- **Routine inspections and maintenance of stormwater BMP's** – Refer to the Operation and Maintenance procedures for each BMP as described in the O&M Plan as described herein.
- **Maintenance of lawns, gardens and other landscaped areas** – All landscaping and maintenance to be performed by an authorized company chosen by the property owner.
- **Storage and use of fertilizers, herbicides and pesticides** – All landscape maintenance will be conducted by an authorized company chosen by the property owner. Any application of herbicides or pesticides will be applied by a licensed applicator.
- **Proper management of deicing chemicals and snow** – Deicing chemicals and snow removal shall primarily be the responsibility of the property owner additional information can be found in the O&M Plan as described herein.
- **Nutrient management plan** - The goal of the nutrient management plan is to minimize the potential sources of excess nutrients on the site and the release of nutrients in the stormwater from the site. This minimization relates both to infiltrated water and runoff. In general, the nature of the site use will tend to reduce the nutrients in the stormwater. Further, procedures indicated above or in the O&M Plan related to deicing procedures, BMP maintenance procedures, and street sweeping will act to reduce the levels of nutrients in the stormwater, and the nutrients entering the adjacent wetland and the groundwater.
- **Spill Procedure -** Surrounding the entire fueling area is a concrete pad with positive limiting barriers (PLB's) which act as spill containment grooves to contain any minor spills that may occur within the fueling area. A spill containment kit will be provided inside the dumpster enclosure and will include a shovel and broom, 2-mil plastic cleanup bags, spill absorbent and SPC absorbent pads. A container of spill absorbent material will also be placed at each fuel dispenser island. Fuel facility employees on-site shall be properly trained in the operation and utilization of these spill cleanup kits and will have a list of emergency contact numbers in the event of a spill.

SECTION 4 LONG-TERM MAINTENANCE PLAN EXHIBIT

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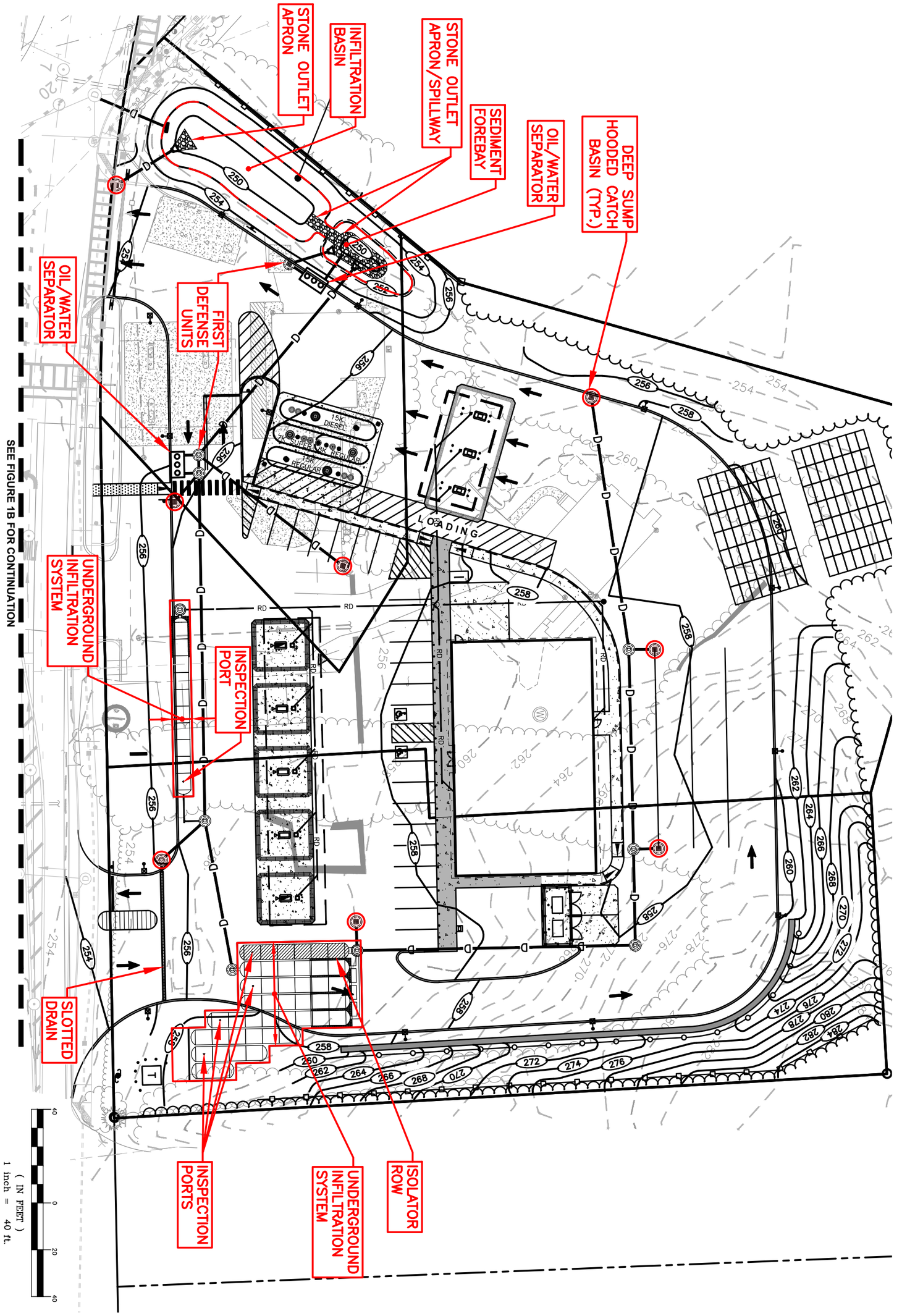

LONG TERM MAINTENANCE EXHIBIT

254, 256 & 260 AYER ROAD
LITTLETON, MASSACHUSETTS
0 LITTLETON ROAD
AYER, MASSACHUSETTS

GPI Engineering Design Planning Construction Management
603.893.0720 GPINET.COM
Greenman-Pedersen, Inc.
44 Stiles Road, Suite One
Salem, NH 03079

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PROJECT #:	2021267
DATE:	2/8/23
REV.:	4/20/23
FIGURE	1A

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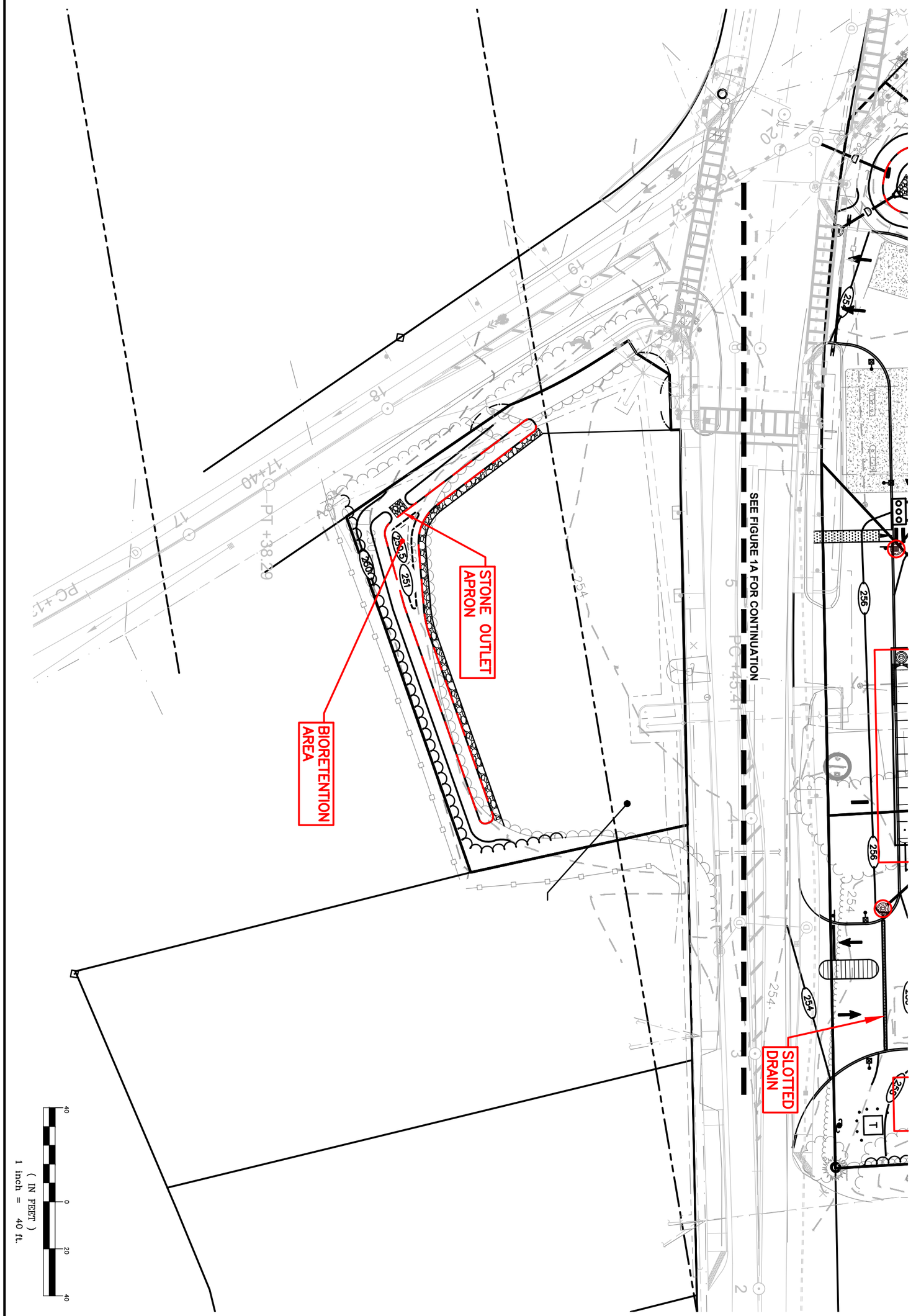

LONG TERM MAINTENANCE EXHIBIT

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LITTLETON, MASSACHUSETTS
0 LITTLETON ROAD
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DATE: 2/8/23
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FIGURE 1B

SECTION 5 STORMWATER OPERATION & MAINTENANCE LOG

STORMWATER INSPECTION & MAINTENANCE LOG

254, 256 & 260 Ayer Road, Littleton, MA & 0 Littleton Road, Ayer, MA

General Information			
Project Name	Proposed Retail Motor Fuel Outlet	**Location**	Littleton & Ayer, MA
Date of Inspection		**Start/ End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			

	Site Specific BMP's	Maintenance Interval
1	Street Sweeping	6 months
2	Deep Sump Catch Basins/Slotted Drain	3 months
3	Hydrodynamic Separators (First Defense Unit)	1 Year (See separate maintenance log for First Defense Unit)
4	Oil/ Water Separator	6 months
5	Stormtech Underground Infiltration Systems	6 months (See separate maintenance log for Isolator Rows)
6	Sediment Forebay	1 month
7	Infiltration Basin	6 months
8	Bioretention Area	6 months
9	Stone Outlet Aprons/Weirs	1 year

STORMWATER INSPECTION & MAINTENANCE LOG

254, 256 & 260 Ayer Road, Littleton, MA & 0 Littleton Road, Ayer, MA

BMP Description	Corrective Action Required?		Notes
Street Sweeping			
Evidence of debris accumulation	YES	NO	
Evidence of oil grease	YES	NO	
Other (specify)	YES	NO	
Deep Sump Catch Basins/Slotted Drain			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Evidence of oil grease	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidence of structural deterioration	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Other (specify)	YES	NO	
Hydrodynamic Separators (First Defense Units)			
See separate maintenance log for First Defense Units			
Oil / Water Seperator			
Grates clear of debris	YES	NO	
Inlet and outlet clear of debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Evidense of oil grease	YES	NO	
Evidence of flow bypassing facility	YES	NO	
Stormtech Underground Infiltration Systems			
Inlet and outlet clear of sediment/debris	YES	NO	
Chamber bottom clear of sediment/debris	YES	NO	
Outlet control structure clear of debris	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Bottom dewaters within 72 hrs. of a storm event	YES	NO	
Other (specify)	YES	NO	
Sediment Forebay			
Inlet and outlet clear of debris	YES	NO	
Bottom surface clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Observance of accumulated sediment	YES	NO	Sediment Depth =
Tree growth	YES	NO	
Other (specify)	YES	NO	
Infiltration Basin			
Inlet and outlet clear of debris	YES	NO	
Bottom surface clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Observance of accumulated sediment	YES	NO	
Bottom dewaters between storms	YES	NO	
Standing water or wet spots	YES	NO	

STORMWATER INSPECTION & MAINTENANCE LOG

254, 256 & 260 Ayer Road, Littleton, MA & 0 Littleton Road, Ayer, MA

Tree growth	YES	NO	
Other (specify)	YES	NO	
Bioretention Area			
Inlet and outlet clear of debris	YES	NO	
Bottom surface clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Observance of accumulated sediment	YES	NO	
Bottom dewaters between storms	YES	NO	
Standing water or wet spots	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	
Stone Outlet Aprons/Weirs			
Inlet/ inflow pipe clear of debris	YES	NO	
Overflow spillway clear of debris	YES	NO	
Evidence of rilling or gullying	YES	NO	
Tree growth	YES	NO	
Other (specify)	YES	NO	

NOTE: Photos shall be provided with each inspection log and shall be sufficiently labeled to identify photo location.

SECTION 6 DE-ICING LOG

Deicing Log

Date Applied	Type of Deicing Material	Amount Applied

StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual

THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) and Total Phosphorus (TP) removal with easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The woven geotextile provides a media for stormwater filtration, a durable surface for maintenance, prevents scour of the underlying stone and remains intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole provides access to the Isolator Row and typically includes a high flow weir. When flow rates or volumes exceed the Isolator Row weir capacity the water will flow over the weir and discharge through a manifold to the other chambers.

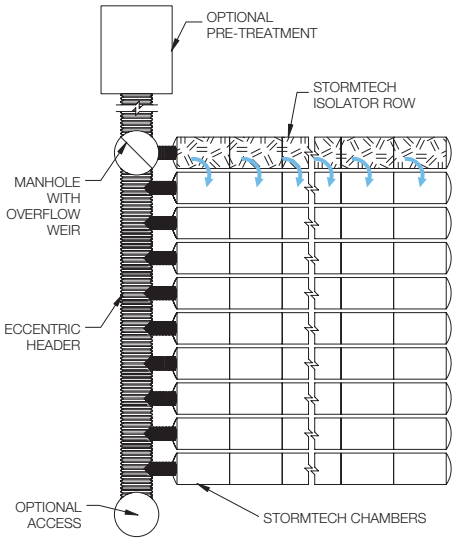
Another acceptable design uses one open grate inlet structure. Using a “high/low” design (low invert elevation on the Isolator Row and a higher invert elevation on the manifold) an open grate structure can provide the advantages of the Isolator Row by creating a differential between the Isolator Row and manifold thus allowing for settlement in the Isolator Row.

The Isolator Row may be part of a treatment train system. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

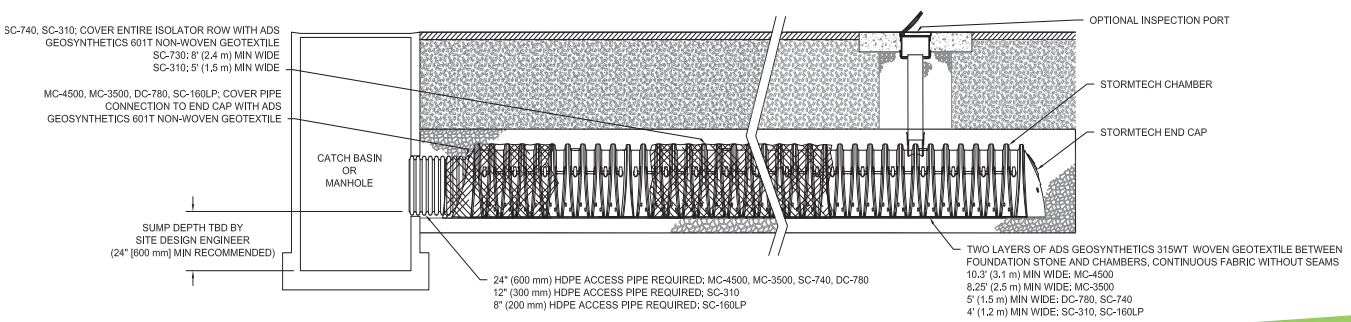
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1

Inspect Isolator Row for sediment.

A) Inspection ports (if present)
- i. Remove lid from floor box frame
- ii. Remove cap from inspection riser
- iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
- iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.

B) All Isolator Rows
- i. Remove cover from manhole at upstream end of Isolator Row
- ii. Using a flashlight, inspect down Isolator Row through outlet pipe
  1. Mirrors on poles or cameras may be used to avoid a confined space entry
  2. Follow OSHA regulations for confined space entry if entering manhole
- iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2

Clean out Isolator Row using the JetVac process.

A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

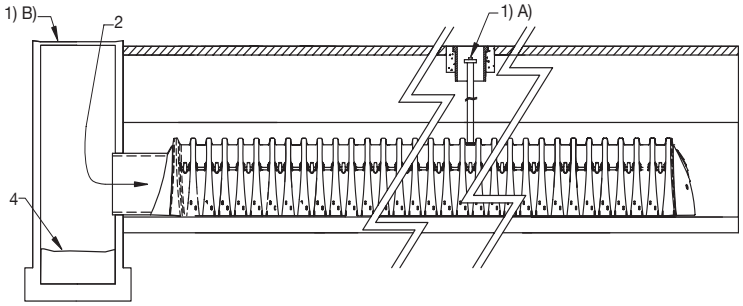
C) Vacuum manhole sump as required

STEP 3

Replace all caps, lids and covers, record observations and actions.

STEP 4

Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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StormTech Detention • Retention • Water Quality
An ADS company

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4640 Trueman Blvd., Hilliard, OH 43026
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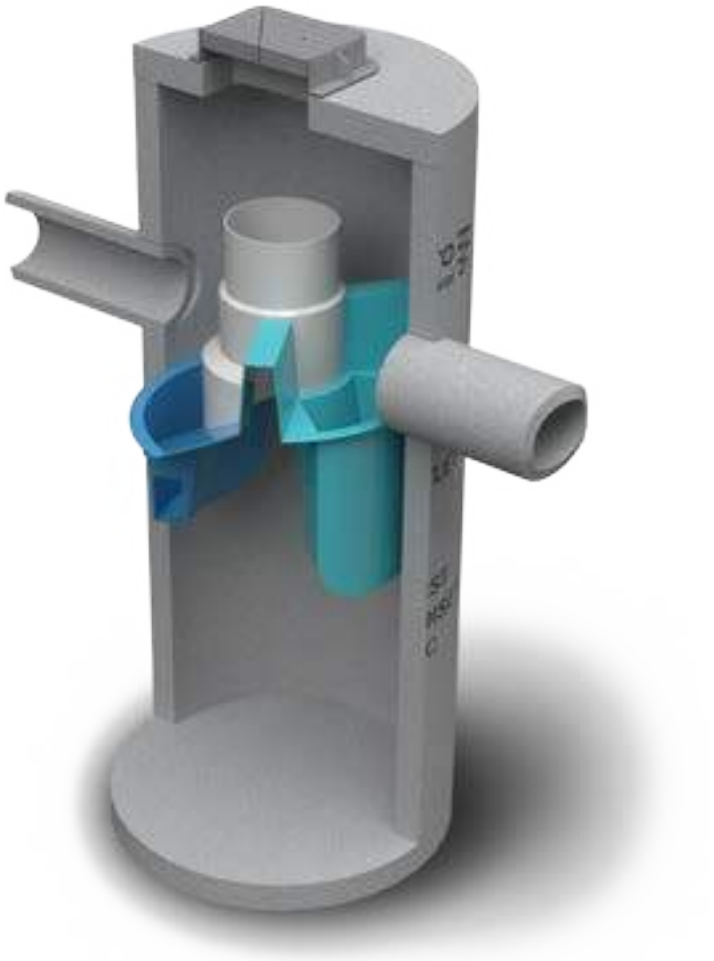
Hydro International



Operation and Maintenance Manual

First Defense® and First Defense® High Capacity

Vortex Separator for Stormwater Treatment

Table of Contents

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's First Defense®. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc has a policy of continuous product development and reserves the right to amend specifications without notice.

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro Maintenance Services

Hydro International has been engineering stormwater treatment systems for over 30 years. We understand the mechanics of removing pollutants from stormwater and how to keep systems running at an optimal level.

Nobody Knows our Systems Better than we do

Avoid Service Negligence

Sanitation services providers not intimately familiar with stormwater treatment systems are at risk of the following:

- Inadvertently breaking parts or failing to clean/replace system components appropriately.
- Charging you for more frequent maintenance because they lacked the tools to service your system properly in the first place.
- Billing you for replacement parts that might have been covered under your Hydro warranty plan
- Charging for maintenance that may not yet have been required.

Leave the Dirty Work to us

Trash, sediment and polluted water is stored inside treatment systems until they are removed by our team with a vactor truck. Sometimes teams must physically enter the system chambers in order to prepare the system for maintenance and install any replacement parts. Services include but are not limited to:

- Solids removal
- Removal of liquid pollutants
- Replacement media installation (when applicable)

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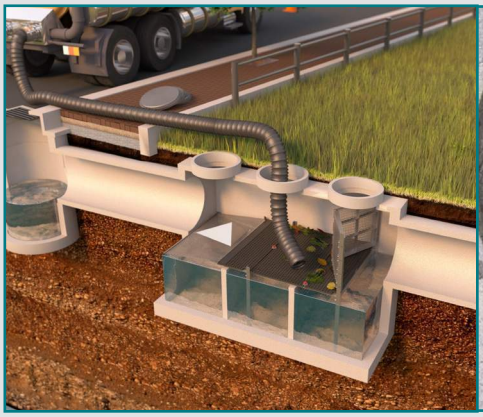
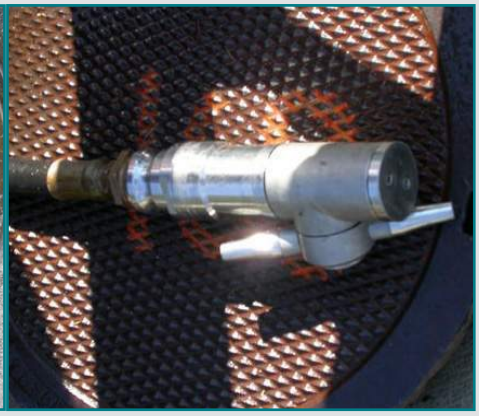
Better Tools, Better Results

Not all vactor trucks are created equal. Appropriate tools and suction power are needed to service stormwater systems appropriately. Companies who don't specialize in stormwater treatment won't have the tools to properly clean systems or install new parts.





Service Warranty

Make sure you're not paying for service that is covered under your warranty plan. Only Hydro International's service teams can identify tune-ups that should be on us, not you.

Treatment Systems Serviced by Hydro:

- Stormwwater filters
- Stormwater separators
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- Biofilters/biorention systems
- Storage structures
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- Stormwater ponds
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I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations (refer to *Section II. Model Sizes & Configurations*, page 4) to accommodate a wide range of pipe sizes, peak flows and depth constraints.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 500% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

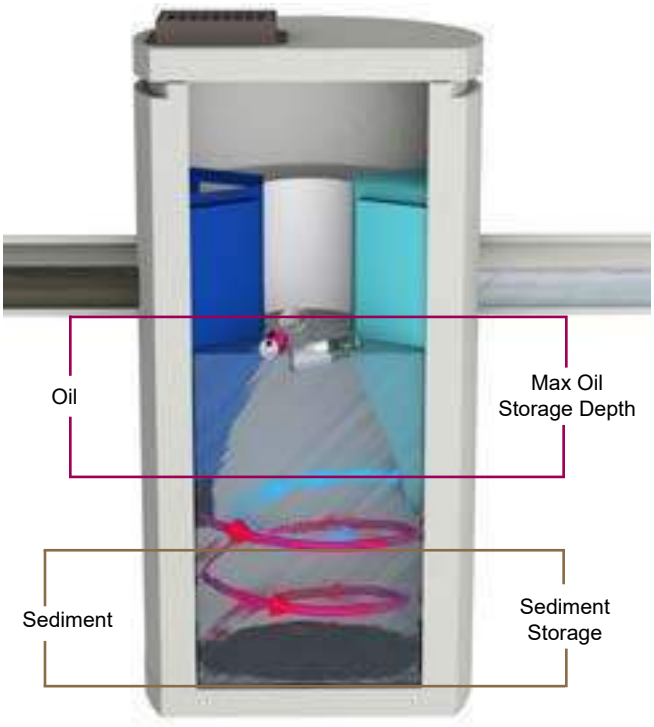

Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components of the First Defense®-4HC and First Defense®-6HC have modified geometries as to allow greater design flexibility needed to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2a - 2b). First Defense® model parameters and design criteria are shown in Table 1.

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

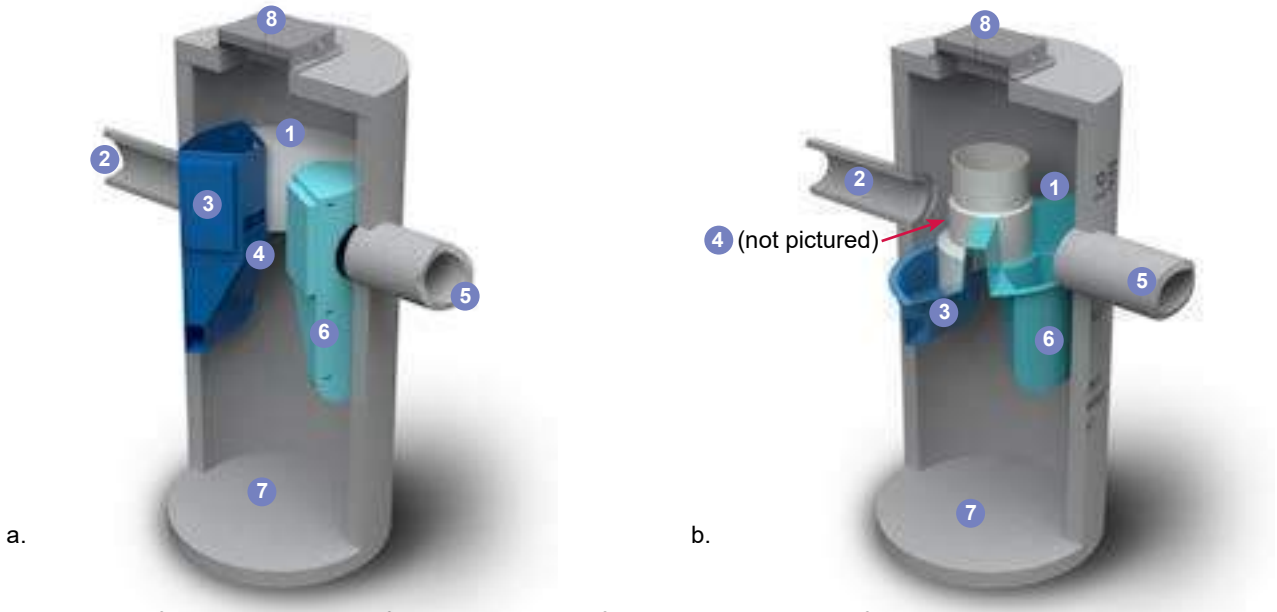

Fig.2a) First Defense®-4 and First Defense®-6; b) First Defense®-4HC and First Defense®-6HC, with higher capacity dual internal bypass and larger maximum pipe diameter.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	106µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.60 / 45.3	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 50.9	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 82.1	20 / 566	24 / 609	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.73 / 133.9	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

III. Maintenance

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil. Maximum pollutant storage capacities are provided in Table 1.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense®-HC have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

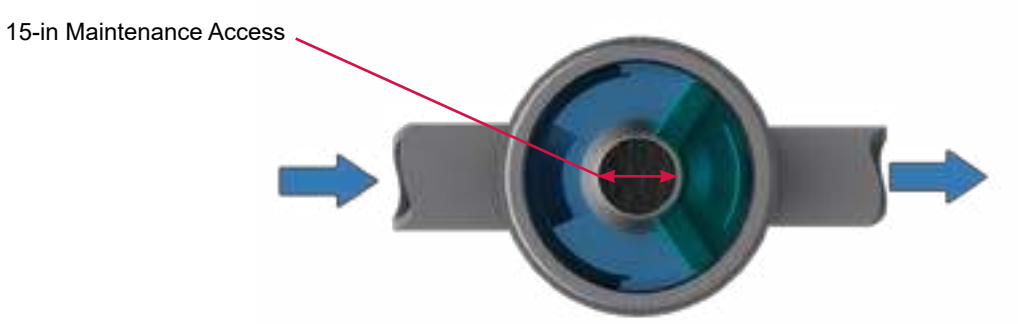

Fig.3 The central opening to the sump of the First Defense®-HC is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for a 6-ft First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.5).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose and skimmer pole to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose (First Defense model FD-4, shown).

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar or other tool to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge Judge®)
- Vactor truck (flexible hose recommended)
- First Defense® Maintenance Log

Floatables and sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose (Fig.5) or with the skimmer or net (not pictured).

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor (Fig.5).

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Fig.5 Sediment is removed with a vactor hose (First Defense model FD-4, shown).

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:	
SITE NAME:	
SITE LOCATION:	
OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

MODEL SIZE (CIRCLE ONE): **FD-4** **FD-4HC** **FD-6** **FD-6HC**

INLET (CIRCLE ALL THAT APPLY): **GRATED INLET (CATCH BASIN)** **INLET PIPE (FLOW THROUGH)**

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First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

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