STORMWATER REPORT

171 Mattakeesett Street
Pembroke, Massachusetts

Prepared for:

171 Mattakeesett Street LLC
283 Sawyer Street
New Bedford, MA 02746

December 17, 2018
This Stormwater Report has been prepared to document compliance with Stormwater Management Standards. The applicant is proposing to expand the existing warehouse/storage/industrial use by constructing an additional (3) three proposed garage buildings, each 7,000 square feet.

The property is located in a Flood Plain Zone X as shown on Flood Insurance Rate Map Community Panel Number 25023C0204J C dated July 17, 2012 and not in a Zone II Aquifer Protection zone. There are no wetland resource areas on the site.

The property is located at 171 Mattakeesett Street, Pembroke. The property is currently used for the construction and maintenance of boats. The property is approximately 34 percent developed. The developed area consists of a driveway with parking areas and three buildings. The undeveloped area consists of gravel area used for boat storage.

Soils on the site are classified as Udorthents soils, hydrologic soils group B, which are well drained soils with groundwater greater than 80 inches below the surface. The existing drainage system consisting catch basins, manholes, Stormceptor units, and infiltration basins exist on the site. Their designs are based on a hydrologic soil group A with an infiltration rate of 8.27 inches per hour. The proposed drainage system will utilize 3 existing catch basins that will discharge to a sediment forebay. The expanded driveway and parking areas will drain directly into two sediment forebays before entering into the proposed infiltration basin. Roof drains are proposed for the proposed buildings with discharges to the infiltration basin and to a catch basin/overflow unit.

The analysis was prepared to demonstrate that the proposed development complies with Stormwater Management Requirements and Town of Pembroke Planning Board Rules and Regulations. This includes removal of at least 80% of Total Suspended Solids and attenuation of stormwater flows for the proposed development. The attenuation of stormwater flows has been achieved by routing runoff from the proposed development to sediment forebays and an infiltration basin.

This analysis is divided into the following sections:

Section I Compliance with Massachusetts Stormwater Management Regulations
Section II Overall Site Analysis

The calculations have been performed for the 2, 10, and 25, 100-year 24 hour storm event, using the HydroCAD 10.0.
The following table summarizes runoff for the pre and post-development conditions.

### SUMMARY OF STORMWATER FLOWS

(CFS)

<table>
<thead>
<tr>
<th>Design Storm</th>
<th>Existing Condition (Pre 1)</th>
<th>Proposed Condition (Link 14L)</th>
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<tbody>
<tr>
<td>2-year</td>
<td>3.4” 9.58</td>
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<tr>
<td>10-year</td>
<td>4.7” 14.51</td>
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</tr>
<tr>
<td>25-year</td>
<td>5.6” 17.92</td>
<td>8.63</td>
</tr>
<tr>
<td>100-year</td>
<td>7.0” 23.18</td>
<td>22.69</td>
</tr>
</tbody>
</table>

| 2-year       | 3.4” 0.04                   | 0.02                          |
| 10-year      | 4.7” 0.20                   | 0.12                          |
| 25-year      | 5.6” 0.35                   | 0.21                          |
| 100-year     | 7.0” 0.62                   | 0.37                          |
Section I

Compliance with Massachusetts Stormwater Management Regulations
Checklist for Stormwater Report

A. Introduction

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. 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
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

[Signature and Date]

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment
Checklist for Stormwater Report

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 (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 Field¹
☒ 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 (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.
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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 proprietary 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.
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.
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 Plan 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.
STANDARD 1. NO UNTREATED DISCHARGES OR EROSION TO WETLANDS
 Applicants must demonstrate that there are no new untreated discharges. To demonstrate that all new discharges are adequately treated, applicants may rely on the computations required to demonstrate compliance with Standards 4 through 6. No additional computations are required.

All proposed developed areas of the lot are routed through the infiltration basin and galley infiltration systems prior to discharge.

STANDARD 2. PEAK RATE ATTENUATION
“Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.”

No increases in post development peak discharge rates are proposed. Calculations demonstrating this are located in Section II.

STANDARD 3. STORMWATER RECHARGE
“Loss of annual recharge to ground water shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.”

Based on Plymouth County Soil Survey, the site consists of Hydrologic Soils Group “Type B”. The previous Drainage Calculations and Stormwater Management Plan shows a soil with a Hydrologic Soils Group “Type A” with and infiltration rate of 8.27 inches per hour. A test hole was performed on 12/14/18 and the soil was determined to be a loamy sand with and infiltration rate of 2.41 inches/hour.

Sample Calculation Post 1A-1E

Impervious Area = 130,239 SF
Target Depth Factor (F) = 0.6”

\[ Rv = F \times \text{impervious area} = 0.6" \times 130,239 \text{ SF} \times 1'\div 12" = 6,511 \text{ CF} \]

Sizing Storage Volume
Using the “static method”, the proposed infiltration device must provide sufficient storage capacity to hold the Required Recharge Volume without taking any infiltration into account. The volumes below are listed in the Hydroflow calculations.

Proposed storage volume infiltration basin 1=26,214 (below the outlet),
Drawdown Within 72 Hours

\[
\text{Time}_{\text{drawdown}} = \frac{R_v}{(K)(\text{Bottom Area})}
\]

Where:

\( R_v = \) Storage Volume

\( K = \) Saturated Hydraulic Conductivity For “Static” and “Simple Dynamic” Methods, use Rawls Rate (see Table 2.3.3). For “Dynamic Field” Method, use 50% of the in-situ saturated hydraulic conductivity.

\( \text{Bottom Area} = \) Bottom Area of Recharge Structure

\[
\text{Time} = \frac{26,214 \text{ CF}}{(2.41”)(1’/12”)(6,243 \text{ SF})} = 21 \text{ hours} < 72 \text{ hours}
\]
Mounding Analysis

“Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm (e.g., 10-year, 25-year, 50-year, or 100-year 24-hour storm). In such cases, the mounding analysis must demonstrate that the Required Recharge Volume (e.g., infiltration basin storage) is fully dewatered within 72 hours (so the next storm can be stored for exfiltration). The mounding analysis must also show that the groundwater mound that forms under the recharge system will not break out above the land or water surface of a wetland (e.g., it doesn’t increase the water sheet elevation in a Bordering Vegetated Wetland, Salt Marsh, or Land Under Water within the 72-hour evaluation period).”

“The Hantush1 or other equivalent method may be used to conduct the mounding analysis. The Hantush method predicts the maximum height of the groundwater mound beneath a rectangular or circular recharge area. It assumes unconfined groundwater flow, and that a linear relation exists between the water table elevation and water table decline rate. It results in a water table recession hydrograph depicting exponential decline. The Hantush method is available in proprietary software and free on-line calculators on the Web in automated format. If the analysis indicates the mound will prevent the infiltration BMP from fully draining within the 72-hour period, an iterative process must be employed to determine an alternative design that drains within the 72-hour period.”

Groundwater is greater than 4 feet below the bottom of the basin and a mounding calculation is not required.

STANDARD 4. WATER QUALITY

“Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
b) Structural stormwater best management practices are sized to capture the required water quality volume as determined in accordance with the Massachusetts Stormwater Handbook; and
c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

This standard applies after the site is stabilized. Since removal efficiency may vary with each storm, 80% TSS removal is not required for each storm. It is the average removal over the year that is required to meet the standard. The required water quality volume, the runoff volume requiring TSS treatment, is calculated as follows:

The required water quality volume equals 1.0 inch of runoff times the total impervious area of the post-development project site for a discharge
- from a land use with a higher potential pollutant load;
- within an area with a rapid infiltration rate (greater than 2.4 inches per hour);
- within a Zone II or Interim Wellhead Protection Area;
- near or to the following critical areas:
  - Outstanding Resource Waters,
  - Special Resource Waters,
  - bathing beaches,
  - shellfish growing areas,
  - cold-water fisheries.

The required water quality volume equals 0.5 inches of runoff times the total impervious area of the post-development site for all other discharges.”

The proposed work meets the requirement for removal of total suspended solids (TSS).

Standard 4 requires the development and implementation of suitable practices for source control and pollution prevention. These measures must be identified in a long-term pollution prevention plan. The long-term pollution prevention plan shall include the proper procedures for the following:
- good housekeeping;
- storing materials and waste products inside or under cover;
• vehicle washing;
• routine inspections and maintenance of stormwater BMPs;
• spill prevention and response;
• maintenance of lawns, gardens, and other landscaped areas;
• storage and use of fertilizers, herbicides, and pesticides;
• pet waste management;
• operation and management of septic systems; and
  proper management of deicing chemicals and snow.

The long-term pollution prevention plan shall provide that sand piles be contained and stabilized to prevent the discharge of sand to wetlands or water bodies, and, where feasible, covered. If a Total Maximum Daily Load (TMDL) has been developed that indicates that use of fertilizers containing nutrients must be reduced, the long-term pollution prevention plan shall also include a nutrient management plan. The long-term pollution prevention plan may be prepared as a separate document or combined with the Operation and Maintenance Plan required by Standard 9.

The long-term pollution prevention plan will be combined with the Operation and Maintenance Plan required by Standard 9.

WATER QUALITY TREATMENT VOLUME

\[ VWQ = \left( \frac{DWQ}{12 \text{ inches/foot}} \right) \times (AIMP \times 43,560 \text{ square feet/acre}) \]

\( VWQ \) = Required Water Quality Volume (in cubic feet)

\( DWQ \) = Water Quality Depth: one-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour or greater; ½-inch for discharges near or to other areas.

\( AIMP \) = Impervious Area (in acres)

The site is located in soils with an infiltration rate greater than 2.4 inches/hour so a Water Quality Depth of one-inch is required.

\[ VWQ = \left( \frac{1 \text{ inch}}{12 \text{ inches/foot}} \right) \times (130,239 \text{ square feet}) = 10,853 \text{ CF} \]

26,214 CF storage volume provided in the infiltration basin below the outlet

TSS REMOVAL PERCENTAGE COMPUTATIONS

The following calculation demonstrates the required 80% removal of total solids (TSS).
STANDARD 5 LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The land use is considered a higher potential pollutant load. The owner currently employs measures to protect the land uses with higher pollutant loads from exposure to rain, snow, snow melt, and stormwater run-off. These are summarized in the Operation and Maintenance Plan.
Stormceptor Brief Sizing Report - Existing STC 450?

**Project Information & Location**

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<th>171 Mattakeesett St</th>
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**Designer Information**

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<th>Name</th>
<th>Jim Lyons</th>
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<td>Phone #</td>
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<td><a href="mailto:jamesj.lyons@rinkerpipe.com">jamesj.lyons@rinkerpipe.com</a></td>
<td>Email</td>
<td><a href="mailto:Darren@gradyconsulting.com">Darren@gradyconsulting.com</a></td>
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**EOR Information (optional)**

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<thead>
<tr>
<th>Name</th>
<th>Darren Grady</th>
<th>Company</th>
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**Stormwater Treatment Recommendation**

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

**Stormceptor Sizing Summary**

<table>
<thead>
<tr>
<th>Stormceptor Model</th>
<th>% TSS Removal Provided</th>
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<td>96</td>
</tr>
<tr>
<td>STC 13000</td>
<td>97</td>
</tr>
<tr>
<td>STC 16000</td>
<td>97</td>
</tr>
<tr>
<td>StormceptorMAX</td>
<td>Custom</td>
</tr>
</tbody>
</table>
### Sizing Details

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>Water Quality Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Area (acres)</strong></td>
<td><strong>TSS Removal (%)</strong></td>
</tr>
<tr>
<td>1.31</td>
<td>80.0</td>
</tr>
<tr>
<td><strong>Imperviousness %</strong></td>
<td><strong>Runoff Volume Capture (%)</strong></td>
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<tr>
<td>90.0</td>
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### Rainfall

<table>
<thead>
<tr>
<th>Station Name</th>
<th>BOSTON WSFO AP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State/Province</strong></td>
<td>Massachusetts</td>
</tr>
<tr>
<td><strong>Station ID #</strong></td>
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<td><strong>Years of Records</strong></td>
<td>58</td>
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<tr>
<td><strong>Latitude</strong></td>
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<tr>
<td><strong>Longitude</strong></td>
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### Up Stream Storage

<table>
<thead>
<tr>
<th>Storage (ac-ft)</th>
<th>Discharge (cfs)</th>
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</thead>
<tbody>
<tr>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Up Stream Flow Diversion

<table>
<thead>
<tr>
<th>Max. Flow to Stormceptor (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Particle Size Distribution (PSD)
The selected PSD defines TSS removal

<table>
<thead>
<tr>
<th>Particle Diameter (microns)</th>
<th>Distribution</th>
<th>Specific Gravity</th>
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<tbody>
<tr>
<td>1.0</td>
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<td>88.0</td>
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<td>2.65</td>
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<tr>
<td>106.0</td>
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<td>2.65</td>
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<tr>
<td>125.0</td>
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<td>2.65</td>
</tr>
<tr>
<td>150.0</td>
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<td>2.65</td>
</tr>
<tr>
<td>212.0</td>
<td>0.0</td>
<td>2.65</td>
</tr>
</tbody>
</table>

### Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

---

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications
### Brief Stormceptor Sizing Report - Stormceptor 1

#### Project Information & Location

<table>
<thead>
<tr>
<th>Project Name</th>
<th>171 Mattakeesett St</th>
<th>Project Number</th>
<th>121018</th>
</tr>
</thead>
<tbody>
<tr>
<td>City</td>
<td>Pembroke</td>
<td>State/ Province</td>
<td>Massachusetts</td>
</tr>
<tr>
<td>Country</td>
<td>United States of America</td>
<td>Date</td>
<td>12/10/2018</td>
</tr>
</tbody>
</table>

#### Designer Information

<table>
<thead>
<tr>
<th>Name</th>
<th>Jim Lyons</th>
<th>Email</th>
<th><a href="mailto:jamesj.lyons@rinkerpipe.com">jamesj.lyons@rinkerpipe.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>Rinker Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone #</td>
<td>413-246-5151</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### EOR Information (optional)

<table>
<thead>
<tr>
<th>Name</th>
<th>Darren Grady</th>
<th>Email</th>
<th><a href="mailto:Darren@gradyconsulting.com">Darren@gradyconsulting.com</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Company</td>
<td>Grady Consulting LLC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phone #</td>
<td>781-585-2300</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

#### Stormceptor Sizing Summary

<table>
<thead>
<tr>
<th>Stormceptor Model</th>
<th>% TSS Removal Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>STC 450i</td>
<td>87</td>
</tr>
<tr>
<td>STC 900</td>
<td>92</td>
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<tr>
<td>STC 1200</td>
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</tr>
<tr>
<td>STC 1800</td>
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<tr>
<td>STC 2400</td>
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<tr>
<td>STC 3600</td>
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<tr>
<td>STC 4800</td>
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<td>STC 6000</td>
<td>97</td>
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<td>STC 7200</td>
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<tr>
<td>STC 11000</td>
<td>98</td>
</tr>
<tr>
<td>STC 13000</td>
<td>98</td>
</tr>
<tr>
<td>STC 16000</td>
<td>99</td>
</tr>
<tr>
<td>StormceptorMAX</td>
<td>Custom</td>
</tr>
</tbody>
</table>

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.
### Sizing Details

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>Water Quality Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Area (acres)</td>
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</tr>
<tr>
<td>1</td>
<td>80.0</td>
</tr>
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<td>Imperviousness %</td>
<td>Runoff Volume Capture (%)</td>
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<tr>
<td>57.0</td>
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</table>

<table>
<thead>
<tr>
<th>Water Quality Objective</th>
<th>Oil Spill Capture Volume (Gal)</th>
<th>Peak Conveyed Flow Rate (CFS)</th>
<th>Water Quality Flow Rate (CFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

### Rainfall

<table>
<thead>
<tr>
<th>Rainfall Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station Name</td>
</tr>
<tr>
<td>State/Province</td>
</tr>
<tr>
<td>Station ID #</td>
</tr>
<tr>
<td>Years of Records</td>
</tr>
<tr>
<td>Latitude</td>
</tr>
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<td>Longitude</td>
</tr>
</tbody>
</table>

### Up Stream Storage

<table>
<thead>
<tr>
<th>Up Stream Storage</th>
<th>Storage (ac-ft)</th>
<th>Discharge (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

### Up Stream Flow Diversion

<table>
<thead>
<tr>
<th>Max. Flow to Stormceptor (cfs)</th>
</tr>
</thead>
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### Particle Size Distribution (PSD)

The selected PSD defines TSS removal

<table>
<thead>
<tr>
<th>Particle Size Distribution (PSD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK-110</td>
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<tr>
<td>Particle Diameter (microns)</td>
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<tr>
<td>1.0</td>
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<tr>
<td>53.0</td>
</tr>
<tr>
<td>75.0</td>
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<tr>
<td>88.0</td>
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<tr>
<td>106.0</td>
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<tr>
<td>125.0</td>
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<tr>
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</tr>
<tr>
<td>212.0</td>
</tr>
</tbody>
</table>

### Notes

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For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications
STANDARD 6. CRITICAL AREAS

The land use is not located within a critical area.

STANDARD 7. REDEVELOPMENT PROJECT

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

The project is partially a redevelopment project. The design is in full compliance with the regulations.

STANDARD 8. CONSTRUCTION PERIOD CONTROLS

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

The proposed project will not disturb more than one acre of land and is eligible to obtain coverage under the NPDES Construction General Permit issued by EPA without the preparation of a Stormwater Pollution Plan.

STANDARD 9. LONG-TERM OPERATION AND MAINTENANCE (O&M) PLAN

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Long-Term Operation and Maintenance Plan shall at a minimum include:

1. Stormwater management system(s) owners;
2. The party or parties responsible for operation and maintenance, including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;
3. The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
4. A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
5. A description and delineation of public safety features; and
6. An estimated operations and maintenance budget.
STANDARD 10. ILLICIT DISCHARGES PROHIBITED

“All illicit discharges to the stormwater management system are prohibited.”

This statement is intended to meet Standard #10 of the Stormwater Management requirements

Illicit discharges to the stormwater management system are discharges that are not entirely comprised of stormwater.

Except for the potential for deliberate criminal act of discharge by an unauthorized entity for which the property owner has no control, there are to be no illicit discharges into the stormwater system.

__________________________________
Applicant/Owner
OVERFLOW SPILLWAY DESIGN - INFILTRATION BASIN

Job No.: 18-181
Location: 171 Mattakeesett Street

- Design Spillway for $Q_{100}$ into Basin
  
  $Q_{100} = 22.97$ cfs

- Length of Spillway = 22 ft

- Set Spillway Elevation 0.5 Above 100 Year Level of Basin
  
  100 Year Level = 88.67
  Feet above 100 Year Level = 0.5
  Use Spillway Elevation = 89.20

- Set Top of Berm 0.50 feet Above 100 Year Spillway Surface
  
  $Q = CLH^{3/2}$
  $C = 2.7$ Handbook of Hydraulics p. 5-40, King & Brater
  $L = $ Length of Weir
  $H = $ Head on Weir

  $H = \left(\frac{Q}{CL}\right)^{2/3}$

  $H = \frac{22.97}{(2.7*22)}^{2/3} = 0.53$

  Top of Berm Elevation = $89.2 + 0.53 + 0.50 = 90.23$
  Use 90.30
National Flood Hazard Layer FIRMette

Legend

- Without Base Flood Elevation (BFE)
  - Zone A, V, A99
- With BFE or Depth
  - Zone AE, AO, AH, VE, AR
- Regulatory Floodway

SPECIAL FLOOD HAZARD AREAS

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
  - Zone X
- Future Conditions 1% Annual Chance Flood Hazard
  - Zone X
- Area with Reduced Flood Risk due to Levee. See Notes
  - Zone X
- Area with Flood Risk due to Levee
  - Zone D

OTHER AREAS OF FLOOD HAZARD

- Area of Minimal Flood Hazard
  - Zone X
- Effective LOMRs
- Area of Undetermined Flood Hazard
  - Zone D

OTHER AREAS

- Area with Reduced Flood Risk due to Levee. See Notes
  - Zone X
- Area with Flood Risk due to Levee
  - Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

MAP PANELS

- The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/19/2018 at 7:25:48 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.
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.

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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.
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    55A—Freetown coarse sand, 0 to 3 percent slopes, sanded surface................. 15  
    253B—Hinckley loamy sand, 3 to 8 percent slopes........................................... 16  
    256B—Deerfield fine sand, 3 to 8 percent slopes................................................. 18  
    289B—Hinckley gravelly sandy loam, 3 to 8 percent slopes, bouldery..... 20  
    480C—Plymouth - Carver complex, 8 to 15 percent slopes............................. 22  
    656B—Udorthents - Urban land complex, 0 to 8 percent slopes...................... 24  
    700A—Udipsamments, wet substratum, 0 to 3 percent slopes...................... 25  
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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

Soil Map may not be valid at this scale.
Custom Soil Resource Report

**MAP LEGEND**

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

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

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

Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

**MAP INFORMATION**

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

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

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

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

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

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

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

Soil Survey Area:  Plymouth County, Massachusetts
Survey Area Data:  Version 10, Oct 6, 2017

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

Date(s) aerial images were photographed:  Aug 26, 2014—Sep 4, 2014

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

<table>
<thead>
<tr>
<th>Map Unit Symbol</th>
<th>Map Unit Name</th>
<th>Acres in AOI</th>
<th>Percent of AOI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Water</td>
<td>0.4</td>
<td>0.7%</td>
</tr>
<tr>
<td>52A</td>
<td>Freetown muck, 0 to 1 percent slopes</td>
<td>2.0</td>
<td>3.6%</td>
</tr>
<tr>
<td>55A</td>
<td>Freetown coarse sand, 0 to 3 percent slopes, sanded surface</td>
<td>4.7</td>
<td>8.4%</td>
</tr>
<tr>
<td>253B</td>
<td>Hinckley loamy sand, 3 to 8 percent slopes</td>
<td>4.7</td>
<td>8.5%</td>
</tr>
<tr>
<td>256B</td>
<td>Deerfield fine sand, 3 to 8 percent slopes</td>
<td>0.8</td>
<td>1.4%</td>
</tr>
<tr>
<td>289B</td>
<td>Hinckley gravelly sandy loam, 3 to 8 percent slopes, bouldery</td>
<td>0.1</td>
<td>0.3%</td>
</tr>
<tr>
<td>480C</td>
<td>Plymouth - Carver complex, 8 to 15 percent slopes</td>
<td>22.9</td>
<td>41.1%</td>
</tr>
<tr>
<td>656B</td>
<td>Udorthents - Urban land complex, 0 to 8 percent slopes</td>
<td>19.7</td>
<td>35.4%</td>
</tr>
<tr>
<td>700A</td>
<td>Udipsamments, wet substratum, 0 to 3 percent slopes</td>
<td>0.4</td>
<td>0.7%</td>
</tr>
<tr>
<td>Totals for Area of Interest</td>
<td></td>
<td>55.7</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

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.
Plymouth County, Massachusetts

1—Water

Map Unit Setting
National map unit symbol: bd0b
Elevation: 0 to 330 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days

Map Unit Composition
Water: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Freetown
Percent of map unit: 1 percent
Landform: Bogs, depressions, kettles, marshes, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea
Percent of map unit: 1 percent
Landform: Bogs, depressions, kettles, marshes, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

52A—Freetown muck, 0 to 1 percent slopes

Map Unit Setting
National map unit symbol: 2t2q9
Elevation: 0 to 1,110 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 and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.
Description of Freetown

Setting

Landform: Bogs, depressions, depressions, kettles, marshes, 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
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural 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 storage in profile: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 5 percent
Landform: Bogs, depressions, depressions, kettles, marshes, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Depressions, drainageways
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: Depressions, drainageways
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

55A—Freetown coarse sand, 0 to 3 percent slopes, sanded surface

Map Unit Setting
- National map unit symbol: 2t2qj
- Elevation: 0 to 180 feet
- Mean annual precipitation: 40 to 52 inches
- Mean annual air temperature: 48 to 55 degrees F
- Frost-free period: 190 to 250 days
- Farmland classification: Farmland of unique importance

Map Unit Composition
- Freetown, sanded surface, and similar soils: 85 percent
- Minor components: 15 percent
  Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Sanded Surface

Setting
- Landform: Bogs, depressions, kettles
- Landform position (two-dimensional): Toeslope
- Landform position (three-dimensional): Talf
- Down-slope shape: Concave
- Across-slope shape: Concave
- Parent material: Sandy human-transported material over highly decomposed organic material

Typical profile
- Ap - 0 to 15 inches: coarse sand
- 2Oa - 15 to 79 inches: muck

Properties and qualities
- Slope: 0 to 3 percent
- Depth to restrictive feature: More than 80 inches
- Natural 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: Frequent
- Frequency of ponding: None
- Available water storage in profile: Very high (about 20.9 inches)

Interpretive groups
- Land capability classification (irrigated): None specified
- Land capability classification (nonirrigated): 5w
- Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Swansea, sanded surface, inactive
Percent of map unit: 5 percent
Landform: Bogs, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Rainberry, sanded surface
Percent of map unit: 4 percent
Landform: Depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Tihonet
Percent of map unit: 3 percent
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Udipsamments, wet substratum
Percent of map unit: 3 percent
Landform: Dikes on bogs
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex
Across-slope shape: Concave, linear
Hydric soil rating: No

253B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition
Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile
Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: 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
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydric Soil Group: A
Hydric soil rating: No

Minor Components

Windsor
Percent of map unit: 8 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No
Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope, head slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

256B—Deerfield fine sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: bcwx
Elevation: 0 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
Oa - 2 to 3 inches: highly decomposed plant material
Custom Soil Resource Report

$E1$ - 3 to 5 inches: fine sand  
$E2$ - 5 to 8 inches: fine sand  
$Bs$ - 8 to 11 inches: fine sand  
$Bw1$ - 11 to 15 inches: fine sand  
$Bw2$ - 15 to 20 inches: fine sand  
$BC$ - 20 to 26 inches: fine sand  
$C1$ - 26 to 39 inches: fine sand  
$C2$ - 39 to 61 inches: fine sand

Properties and qualities
- **Slope:** 3 to 8 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Moderately well drained
- **Runoff class:** Very high
- **Capacity of the most limiting layer to transmit water ($K_{sat}$):** Moderately high to very high (1.42 to 14.17 in/hr)
- **Depth to water table:** About 18 to 36 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water storage in profile:** Low (about 4.1 inches)

Interpretive groups
- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 3w
- **Hydrologic Soil Group:** A
- **Hydric soil rating:** No

Minor Components

**Merrimac**
- **Percent of map unit:** 4 percent
- **Landform:** Kames, outwash plains, terraces
- **Landform position (two-dimensional):** Summit, shoulder
- **Landform position (three-dimensional):** Tread
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Hydric soil rating:** No

**Carver**
- **Percent of map unit:** 4 percent
- **Landform:** Outwash plains, moraines, pitted outwash plains
- **Landform position (two-dimensional):** Summit, shoulder
- **Landform position (three-dimensional):** Tread
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Hydric soil rating:** No

**Mashpee**
- **Percent of map unit:** 4 percent
- **Landform:** Depressions, terraces, drainageways
- **Landform position (two-dimensional):** Footslope, toeslope
- **Landform position (three-dimensional):** Tread
- **Down-slope shape:** Concave
- **Across-slope shape:** Concave
- **Hydric soil rating:** Yes
Massasoit
Percent of map unit: 4 percent
Landform: Depressions, terraces, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury
Percent of map unit: 4 percent
Landform: Depressions, outwash plains, terraces
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

289B—Hinckley gravelly sandy loam, 3 to 8 percent slopes, bouldery

Map Unit Setting
National map unit symbol: bd1g
Elevation: 0 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Hinckley, bouldery, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley, Bouldery

Setting
Landform: Eskers, kames, terraces, outwash deltas
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile
Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 3 inches: gravelly sandy loam
Bw - 3 to 19 inches: very gravelly loamy coarse sand
C1 - 19 to 33 inches: very gravelly coarse sand
C2 - 33 to 60 inches: very gravelly coarse sand
**Properties and qualities**

- **Slope:** 3 to 8 percent
- **Percent of area covered with surface fragments:** 0.1 percent
- **Depth to restrictive feature:** More than 80 inches
- **Natural drainage class:** Excessively drained
- **Runoff class:** Low
- **Capacity of the most limiting layer to transmit water (Ksat):** Moderately high to very high (1.42 to 28.34 in/hr)
- **Depth to water table:** More than 80 inches
- **Frequency of flooding:** None
- **Frequency of ponding:** None
- **Available water storage in profile:** Very low (about 1.9 inches)

**Interpretive groups**

- **Land capability classification (irrigated):** None specified
- **Land capability classification (nonirrigated):** 3s
- **Hydric soil rating:** No

**Minor Components**

**Merrimac**

- **Percent of map unit:** 10 percent
- **Landform:** Kames, outwash plains, terraces
- **Landform position (two-dimensional):** Summit, shoulder
- **Landform position (three-dimensional):** Tread
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Hydric soil rating:** No

**Gloucester, bouldery**

- **Percent of map unit:** 7 percent
- **Landform:** Ground moraines, hills
- **Landform position (two-dimensional):** Summit, shoulder
- **Landform position (three-dimensional):** Interfluve
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Hydric soil rating:** No

**Barnstable, bouldery**

- **Percent of map unit:** 3 percent
- **Landform:** Moraines
- **Landform position (two-dimensional):** Summit, shoulder
- **Landform position (three-dimensional):** Interfluve
- **Down-slope shape:** Convex
- **Across-slope shape:** Convex
- **Hydric soil rating:** No
480C—Plymouth - Carver complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: bcyy
Elevation: 0 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Plymouth and similar soils: 45 percent
Carver and similar soils: 40 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the map unit.

Description of Plymouth

Setting

Landform: Outwash plains, moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy and gravelly supraglacial meltout till over sandy and gravelly glaciofluvial deposits

Typical profile

Oi - 0 to 4 inches: slightly decomposed plant material
Oe - 4 to 6 inches: moderately decomposed plant material
A - 6 to 7 inches: loamy coarse sand
E - 7 to 11 inches: coarse sand
Bs - 11 to 15 inches: loamy coarse sand
Bw - 15 to 20 inches: coarse sand
BC - 20 to 29 inches: coarse sand
C - 29 to 64 inches: gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)
Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Carver

Setting
Landform: Outwash plains, moraines, pitted outwash plains
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy glaciofluvial deposits

Typical profile
Oi - 0 to 2 inches: slightly decomposed plant material
Oe - 2 to 3 inches: moderately decomposed plant material
A - 3 to 7 inches: coarse sand
E - 7 to 10 inches: coarse sand
Bw1 - 10 to 15 inches: coarse sand
Bw2 - 15 to 28 inches: coarse sand
BC - 28 to 32 inches: coarse sand
C - 32 to 67 inches: coarse sand

Properties and qualities
Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Barnstable
Percent of map unit: 10 percent
Landform: Moraines
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Merrimac
Percent of map unit: 5 percent
Landform: Kames, outwash plains, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

656B—Udorthents - Urban land complex, 0 to 8 percent slopes

Map Unit Setting
National map unit symbol: bd08
Elevation: 0 to 390 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Udorthents, loamy, 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 Udorthents, Loamy
Setting
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy human transported material

Typical profile
^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 80 inches: gravelly sandy loam

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.01 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.9 inches)
Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Udipsamments, wet substratum
Percent of map unit: 5 percent
Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

Udorthents, wet substratum
Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Udipsamments
Percent of map unit: 5 percent
Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

700A—Udipsamments, wet substratum, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: bd02
Elevation: 0 to 390 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Udipsamments, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the map unit.
Description of Udipsamments, Wet Substratum

Setting

Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile

^Ap - 0 to 3 inches: loamy fine sand
^C1 - 3 to 20 inches: fine sand
Ab - 20 to 24 inches: loamy fine sand
Bwb - 24 to 31 inches: fine sand
BC - 31 to 44 inches: fine sand
C2 - 44 to 51 inches: fine sand
C3 - 51 to 72 inches: very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: About 20 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydric Soil Group: A/D
Hydric soil rating: No

Minor Components

Tihonet

Percent of map unit: 10 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Udipsamments

Percent of map unit: 5 percent
Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Hydric soil rating: No

**Udorthents, wet substratum**

- Percent of map unit: 5 percent
- Landform position (two-dimensional): Footslope
- Landform position (three-dimensional): Tread
- Down-slope shape: Linear
- Across-slope shape: Linear
- Hydric soil rating: No
References


OPERATION AND MAINTENANCE PLAN
PROPOSED DRAINAGE SYSTEM – DURING CONSTRUCTION
171 Mattakeeset Street
Pembroke, MA 02359

Owner:
171 Mattakeeset Street LLC
283 Sawyer Street
NewBedford, MA 02746
Contact: Kevin Welch (508) 999-7363

Party Responsible for Operation and Maintenance:
171 Mattakeeset Street LLC
283 Sawyer Street
NewBedford, MA 02746
Contact: Kevin Welch (508) 999-7363

Source of Funding:
Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

During Construction:
Construction activities shall follow the Construction Sequence shown on the approved plan. During periods of active construction the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than ½”. Maintenance tasks shall be performed monthly or after significant rainfall events of 1” of rain or greater. During construction, silt-laden runoff shall be prevented from entering the drainage system and off-site properties. Temporary swales shall be constructed as needed during construction to direct runoff to sediment traps. Infiltration systems shall not be placed in service until after the installation of base course pavement and vegetative stabilization of the areas contributing to the systems.

During dewatering operations, all water pumped from the dewatering shall be directed to a “dirt bag” pumped sediment removal system (or approved equal) as manufactured by ACF Environmental. The unit shall be placed on a crushed stone blanket. Disposal of such “dirt bag” shall occur when the device is full and can no longer effectively filter sediment or allow water to pass at a reasonable flow rate. Disposal of this unit shall be the responsibility of the contractor and shall be as directed by the owner in accordance with applicable local, state, and federal guidelines and regulations.

Stabilized construction entrances shall be placed at the entrances and shall consist of 1½“ to 2” stone and be constructed as shown on the approved plans.
All erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established.

Heavy equipment shall not be used on basin bottoms.

All exposed soils not to be paved shall be stabilized as soon as practical. Seed mixes shall only be applied during appropriate periods as recommended by the seed supplier, typically May 1 to October 15. Any exposed soils that can not be stabilized by vegetation during these dates shall be stabilized with hay bales, hay mulch, check dams, jute netting or other acceptable means.

Once each structure is in place, it should be maintained in accordance with the procedures described in the post-construction Operations and Maintenance Plan.

During dry periods where dust is created by construction activities the following control measures should be implemented.

- Sprinkling – The contractor may sprinkle the ground along haul roads and traffic areas until moist.
- Vegetative cover – Areas that are not expected to be disturbed regularly may be stabilized with vegetative cover.
- Mulch – Mulching can be used as a quick and effective means of dust control in recently disturbed areas.
- Spray on chemical soil treatments may be utilized. Application rates shall conform to manufacturers recommendations.

**Inspections**

The Owner shall be responsible to secure the services of a Professional Engineer to perform inspections as required. Inspections during periods of active construction shall be weekly and within 24 hours of a storm event of greater than ½ “. The Professional Engineer shall perform inspections to insure that the approved plan is being followed with particular attention to the Planning Board Approval and the Construction Sequencing. The Engineer shall be responsible for inspecting the roadway construction and the construction of the stormwater management system. The Engineer shall prepare and submit to the Planning Board, the Inspection Schedule and Evaluation Checklist (see attached) and, if necessary, request the required maintenance and/or repair of the necessary items. This form shall be stamped by the Engineer and the Owner shall be notified that specific changes and/or repairs are necessary.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.
## STORMWATER MANAGEMENT
### BEST MANAGEMENT PRACTICES
### INSPECTION SCHEDULE AND EVALUATION CHECKLIST – CONSTRUCTION PHASE

**PROJECT LOCATION:** 171 Mattakeeset Street – Pembroke, MA  
Latest Revision: 12/10/18

<table>
<thead>
<tr>
<th>Best Management Practice</th>
<th>Inspection Frequency (1)</th>
<th>Date Inspected</th>
<th>Inspector</th>
<th>Minimum Maintenance and Key Items to Check</th>
<th>Cleaning/Repair Needed yes/no</th>
<th>List items</th>
<th>Date of Cleaning/Repair</th>
<th>Performed By</th>
<th>Water Level in Detention System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silt fence &amp; swales and silt traps</td>
<td>After every major storm event</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep Sump Catch Basins</td>
<td>Weekly or after major storm event</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormceptor(s)</td>
<td>Weekly or after major storm event</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Infiltration Basins</td>
<td>After every major storm event</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dewatering Operations</td>
<td>Daily during actual dewatering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temporary Construction Entrance</td>
<td>Daily or as needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.

Other notes: (Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)
OPERATION AND MAINTENANCE PLAN
PROPOSED DRAINAGE SYSTEM – POST CONSTRUCTION
171 Mattakeeset Street
Pembroke, MA 02359

Owner:
171 Mattakeeset Street LLC
283 Sawyer Street
NewBedford, MA 02746
Contact: Kevin Welch (508) 999-7363

Party Responsible for Operation and Maintenance:
171 Mattakeeset Street LLC
283 Sawyer Street
NewBedford, MA 02746
Contact: Kevin Welch (508) 999-7363

Source of Funding:
Operation and Maintenance of this stormwater management system will be the responsibility of the owners until the road and drainage system are accepted by Town Meeting and conveyed to the Town of Pembroke. Once accepted by the Town, funding for operation and maintenance of the stormwater management system will be the responsibility of the Department of Public Works.

Post Construction Inspection and Maintenance:

Street Sweeping

Streets shall be swept at least twice per year. Sweeping shall be completed during the early spring, no later than May 1st, before sediment from winter sanding operations is washed into the drainage system. Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

Deep Sump Catch Basins

Deep sump catch basins shall become part of the roadway system and shall be inspected after every major storm event during construction and cleaned when sediment exceeds 18” depth. After construction when all slopes have been stabilized, basins shall be cleaned a minimum of twice per year. Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.
**Stormceptor Unit(s)**

**New Installations**
The condition of each unit shall be checked after every runoff event for the first 30 days. The visual inspection shall ascertain that the unit is functioning properly (weir structure is not blocked) and shall measure the amount of sediment that has accumulated in the sump and floating trash and debris in the separation chamber. This can be done with a calibrated “dip stick” so that the depth of deposition can be tracked. Schedules for inspections and cleanout shall be based on storm events and pollutant accumulation.

**Ongoing Operation**
During the rainfall season, the unit shall be inspected at least once every 30 days. The floatables shall be removed and the sump cleaned when the sump is 85% full. If floatables accumulate more rapidly than the settleable solids, the floatables shall be removed using a vactor truck or dip net when the layer is two feet thick.

Cleanout of the Stormceptor units shall be performed no later than May 1st because of the nature of pollutants collected and the potential for odor generation from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water for the Stormceptor units during periods of low rainfall. The Stormceptor unit shall be cleaned at least twice yearly.

**Cleanout and Disposal**
Standard vactoring operations shall be employed in the cleanout of the Stormceptor units. Disposal of material from the Stormceptor units shall be in accordance with applicable local, state, and federal guidelines and regulations. Disposal of the decant material to a POTW is recommended. Field decanting to the storm drainage system shall not be permitted. Solids can be disposed similar to normal practices for materials collected from catch basin cleaning.

**Infiltration Galley System(s)**
The Infiltration System should be inspected at least once per year to ensure that the subsurface system is operating as intended. If accumulated sediment is observed within the galley it should be removed from the galley as necessary.

**Infiltration Basin(s)**
After construction, the infiltration basins should be inspected for standing water 1-2 days after any significant rainfall exceeding 1” of rainfall in 24 hours. If the infiltration basin is continuing to hold standing water after 2 days the owner should have outlet structure inspected and repaired. The basin should also be inspected to verify whether infiltration function has been lost. If infiltration capacity has become degraded, it should be restored under the direction of a qualified professional.
The infiltration basins should be inspected quarterly and at least once per year to ensure that the system is operating as intended. If accumulated sediment is observed within the basin it should be removed from the basin as necessary. Any sediment removed from the infiltration systems should be disposed of in accordance with Town, State and Federal Regulations. The system including the stormwater discharge locations should also be inspected for growth of any invasive species and removed if found.

The embankments of the basin shall be mowed periodically, to prevent the establishment of woody vegetation on the berms. Embankments and spillways shall be inspected annually for general structural integrity, with immediate corrective action as warranted by inspection.

**Lawn Fertilization**

Lawn fertilizer shall be slow release and limited to 3 lbs per 1000 s.f. per year.

**Estimated Annual Budget**

The estimated annual budget for performance of the above is $1,100-$1,600.
## STORMWATER MANAGEMENT
### BEST MANAGEMENT PRACTICES

**INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE**

**PROJECT LOCATION:** 171 Mattakesett Street – Pembroke, MA   
**Latest Revision:** 12/10/18

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<tr>
<th>Best Management Practice</th>
<th>Inspection Frequency (1)</th>
<th>Date Inspected</th>
<th>Inspector</th>
<th>Minimum Maintenance and Key Items to Check</th>
<th>Cleaning/Repair Needed yes/no</th>
<th>List items</th>
<th>Date of Cleaning/Repair</th>
<th>Performed By</th>
<th>Water Level in Detention System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Sump Catch Basins</td>
<td>Twice per year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormceptor(s)</td>
<td>Twice per year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsurface Galley System</td>
<td>Twice per year</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infiltration Basin</td>
<td>Once per year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.

Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: ____  

Stamp
Section II

Overall Site Analysis
# Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
<th>(subcatchment-numbers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>135,561</td>
<td>96</td>
<td>Gravel surface, HSG A (PRE 1, PRE 2, PRE 3)</td>
<td></td>
</tr>
<tr>
<td>37,934</td>
<td>98</td>
<td>Paved parking, HSG A (PRE 2)</td>
<td></td>
</tr>
<tr>
<td>30,962</td>
<td>98</td>
<td>Roofs, HSG A (PRE 1, PRE 2)</td>
<td></td>
</tr>
<tr>
<td>28,532</td>
<td>36</td>
<td>Woods, Fair, HSG A (PRE 1, PRE 3)</td>
<td></td>
</tr>
<tr>
<td><strong>232,990</strong></td>
<td><strong>89</strong></td>
<td><strong>TOTAL AREA</strong></td>
<td>**</td>
</tr>
</tbody>
</table>
## Soil Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>Soil Group</th>
<th>Subcatchment Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>232,990</td>
<td>HSG A</td>
<td>PRE 1, PRE 2, PRE 3</td>
</tr>
<tr>
<td>0</td>
<td>HSG B</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>HSG C</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>HSG D</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>Other</td>
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</tr>
<tr>
<td><strong>232,990</strong></td>
<td>TOTAL AREA</td>
<td></td>
</tr>
<tr>
<td>Ground Covers (all nodes)</td>
<td>HSG-A (sq-ft)</td>
<td>HSG-B (sq-ft)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>135,561</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>37,934</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>30,962</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>28,532</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>232,990</td>
<td>0</td>
</tr>
</tbody>
</table>
Type III 24-hr 2-Year Rainfall = 3.40"

Time span = 0.50-48.00 hrs, dt = 0.02 hrs, 2376 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Runoff Area (sf)</th>
<th>Impervious (%)</th>
<th>Runoff Depth (&quot;&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRE 1</td>
<td>174,663</td>
<td>17.73</td>
<td>2.26</td>
</tr>
<tr>
<td></td>
<td>Flow Length = 800'</td>
<td>Tc = 8.8 min</td>
<td>CN = 89</td>
</tr>
<tr>
<td></td>
<td>Runoff = 9.58 cfs</td>
<td>32,967 cf</td>
<td></td>
</tr>
<tr>
<td>PRE 2</td>
<td>46,749</td>
<td>81.14</td>
<td>3.17</td>
</tr>
<tr>
<td></td>
<td>Tc = 6.0 min</td>
<td>CN = 98</td>
<td>Runoff = 3.54 cfs</td>
</tr>
<tr>
<td></td>
<td>12,337 cf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE 3</td>
<td>11,577</td>
<td>0.00</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Tc = 6.0 min</td>
<td>CN = 55</td>
<td>Runoff = 0.04 cfs</td>
</tr>
<tr>
<td></td>
<td>302 cf</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Runoff Area = 232,990 sf  Runoff Volume = 45,605 cf  Average Runoff Depth = 2.35"
70.43% Pervious = 164,094 sf  29.57% Impervious = 68,896 sf
Summary for Subcatchment PRE 1: Subcat PRE 1

Runoff = 9.58 cfs @ 12.12 hrs, Volume= 32,967 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>123,094</td>
<td>96</td>
<td>Gravel surface, HSG A</td>
</tr>
<tr>
<td>30,962</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>20,607</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>174,663</td>
<td>89</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>143,701</td>
<td></td>
<td>82.27% Pervious Area</td>
</tr>
<tr>
<td>30,962</td>
<td></td>
<td>17.73% Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1.0</td>
<td>50</td>
<td>0.0070</td>
<td>0.81</td>
<td></td>
<td>Sheet Flow, Smooth surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>n= 0.011 P2= 3.40&quot;</td>
</tr>
<tr>
<td>7.8</td>
<td>750</td>
<td>0.0100</td>
<td>1.61</td>
<td></td>
<td>Shallow Concentrated Flow,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unpaved Kv= 16.1 fps</td>
</tr>
</tbody>
</table>

8.8 800 Total

Subcatchment PRE 1: Subcat PRE 1

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=174,663 sf
Runoff Volume=32,967 cf
Runoff Depth=2.26"
Flow Length=800'
Tc=8.8 min
CN=89
Summary for Subcatchment PRE 2: Subcat PRE 2

Runoff = 3.54 cfs @ 12.08 hrs, Volume= 12,337 cf, Depth= 3.17" 

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,815</td>
<td>96</td>
<td>Gravel surface, HSG A</td>
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<tr>
<td>37,934</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>0</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>46,749</td>
<td>98</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>8,815</td>
<td></td>
<td>18.86% Pervious Area</td>
</tr>
<tr>
<td>37,934</td>
<td></td>
<td>81.14% Impervious Area</td>
</tr>
</tbody>
</table>

\[ T_c = 6.0 \text{ min} \]

Subcatchment PRE 2: Subcat PRE 2

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=46,749 sf
Runoff Volume=12,337 cf
Runoff Depth=3.17"
Tc=6.0 min
CN=98
Summary for Subcatchment PRE 3: Subcat PRE 3

Runoff = 0.04 cfs @ 12.29 hrs, Volume= 302 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,652</td>
<td>96</td>
<td>Gravel surface, HSG A</td>
</tr>
<tr>
<td>7,926</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>11,577</td>
<td>55</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>11,577</td>
<td>100.00%</td>
<td>Pervious Area</td>
</tr>
</tbody>
</table>

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

Subcatchment PRE 3: Subcat PRE 3

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=11,577 sf
Runoff Volume=302 cf
Runoff Depth=0.31"
Tc=6.0 min
CN=55
Type III 24-hr 10-Year Rainfall=4.70"

Time span=0.50-48.00 hrs, dt=0.02 hrs, 2376 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PRE 1: Subcat PRE 1  
Runoff Area=174,663 sf  17.73% Impervious  Runoff Depth=3.49"  
Flow Length=800’  Tc=8.8 min  CN=89  Runoff=14.51 cfs  50,731 cf

Subcatchment PRE 2: Subcat PRE 2  
Runoff Area=46,749 sf  81.14% Impervious  Runoff Depth=4.46"  
Tc=6.0 min  CN=98  Runoff=4.92 cfs  17,389 cf

Subcatchment PRE 3: Subcat PRE 3  
Runoff Area=11,577 sf  0.00% Impervious  Runoff Depth=0.83"  
Tc=6.0 min  CN=55  Runoff=0.20 cfs  805 cf

Total Runoff Area = 232,990 sf  Runoff Volume = 68,925 cf  Average Runoff Depth = 3.55"  
70.43% Pervious = 164,094 sf  29.57% Impervious = 68,896 sf
Summary for Subcatchment PRE 1: Subcat PRE 1

Runoff = 14.51 cfs @ 12.12 hrs, Volume = 50,731 cf, Depth = 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.50-48.00 hrs, dt = 0.02 hrs
Type III 24-hr 10-Year Rainfall = 4.70"

<table>
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<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td>123,094</td>
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<td>Gravel surface, HSG A</td>
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<td>36</td>
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</tr>
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<td>89</td>
<td>Weighted Average</td>
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<td>143,701</td>
<td>82.27% Pervious Area</td>
<td></td>
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<td>17.73% Impervious Area</td>
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<table>
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<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
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<tbody>
<tr>
<td>1.0</td>
<td>50</td>
<td>0.0070</td>
<td>0.81</td>
<td></td>
<td>Sheet Flow, Smooth surfaces n= 0.011  P2= 3.40&quot;</td>
</tr>
<tr>
<td>7.8</td>
<td>750</td>
<td>0.0100</td>
<td>1.61</td>
<td></td>
<td>Shallow Concentrated Flow, Unpaved Kv= 16.1 fps</td>
</tr>
</tbody>
</table>

Subcatchment PRE 1: Subcat PRE 1

Hydrograph

Runoff Area = 174,663 sf
Runoff Volume = 50,731 cf
Runoff Depth = 3.49"
Flow Length = 800'
Tc = 8.8 min
CN = 89
Summary for Subcatchment PRE 2: Subcat PRE 2

Runoff = 4.92 cfs @ 12.08 hrs, Volume = 17,389 cf, Depth = 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.50-48.00 hrs, dt = 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
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<tbody>
<tr>
<td>8,815</td>
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<td>Gravel surface, HSG A</td>
</tr>
<tr>
<td>37,934</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>0</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>46,749</td>
<td>98</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>8,815</td>
<td>18.86% Pervious Area</td>
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</tr>
<tr>
<td>37,934</td>
<td>81.14% Impervious Area</td>
<td></td>
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Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
6.0

Direct Entry,

Subcatchment PRE 2: Subcat PRE 2

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=46,749 sf
Runoff Volume=17,389 cf
Runoff Depth=4.46"
Tc=6.0 min
CN=98
Summary for Subcatchment PRE 3: Subcat PRE 3

Runoff = 0.20 cfs @ 12.11 hrs, Volume= 805 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs

Type III 24-hr 10-Year Rainfall=4.70"

<table>
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<tr>
<th>Area (sf)</th>
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<tbody>
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<tr>
<td>11,577</td>
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<td>11,577</td>
<td>100.00%</td>
<td>Pervious Area</td>
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Tc = 6.0 min

Subcatchment PRE 3: Subcat PRE 3

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=11,577 sf
Runoff Volume=805 cf
Runoff Depth=0.83"
Tc=6.0 min
CN=55
Time span = 0.50-48.00 hrs, dt = 0.02 hrs, 2376 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment PRE 1: Subcat PRE 1**
- Runoff Area = 174,663 sf
- 17.73% Impervious
- Runoff Depth = 4.35"
- Flow Length = 800'
- Tc = 8.8 min
- CN = 89
- Runoff = 17.92 cfs
- 63,296 cf

**Subcatchment PRE 2: Subcat PRE 2**
- Runoff Area = 46,749 sf
- 81.14% Impervious
- Runoff Depth = 5.36"
- Tc = 6.0 min
- CN = 98
- Runoff = 5.88 cfs
- 20,890 cf

**Subcatchment PRE 3: Subcat PRE 3**
- Runoff Area = 11,577 sf
- 0.00% Impervious
- Runoff Depth = 1.29"
- Tc = 6.0 min
- CN = 55
- Runoff = 0.35 cfs
- 1,248 cf

**Total Runoff Area = 232,990 sf**
- Runoff Volume = 85,435 cf
- Average Runoff Depth = 4.40"
- 70.43% Pervious = 164,094 sf
- 29.57% Impervious = 68,896 sf
Summary for Subcatchment PRE 1: Subcat PRE 1

Runoff  =  17.92 cfs @ 12.12 hrs,  Volume= 63,296 cf,  Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr  25-Year Rainfall=5.60"

<table>
<thead>
<tr>
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<tr>
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<th>Tc (min)</th>
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<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
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<tr>
<td>1.0</td>
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<td>0.81</td>
<td></td>
<td><strong>Sheet Flow,</strong> Smooth surfaces n= 0.011  P2= 3.40&quot;</td>
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<tr>
<td>7.8</td>
<td>750</td>
<td>0.0100</td>
<td>1.61</td>
<td></td>
<td><strong>Shallow Concentrated Flow,</strong> Unpaved Kv= 16.1 fps</td>
</tr>
</tbody>
</table>

8.8 800 Total

Subcatchment PRE 1: Subcat PRE 1

Hydrograph

Type III 24-hr  25-Year Rainfall=5.60"
Runoff Area=174,663 sf
Runoff Volume=63,296 cf
Runoff Depth=4.35"
Flow Length=800'
Tc=8.8 min
CN=89
Summary for Subcatchment PRE 2: Subcat PRE 2

Runoff = 5.88 cfs @ 12.08 hrs, Volume = 20,890 cf, Depth = 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.50-48.00 hrs, dt = 0.02 hrs
Type III 24-hr 25-Year Rainfall = 5.60"

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<td>98</td>
<td>Weighted Average</td>
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<tr>
<td>8,815</td>
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<td>18.86% Pervious Area</td>
</tr>
<tr>
<td>37,934</td>
<td></td>
<td>81.14% Impervious Area</td>
</tr>
</tbody>
</table>

Tc=6.0 min

Subcatchment PRE 2: Subcat PRE 2

Hydrograph

Type III 24-hr 25-Year Rainfall = 5.60"
Runoff Area = 46,749 sf
Runoff Volume = 20,890 cf
Runoff Depth = 5.36"
Tc=6.0 min
CN=98
Summary for Subcatchment PRE 3: Subcat PRE 3

Runoff = 0.35 cfs @ 12.10 hrs, Volume = 1,248 cf, Depth = 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.50-48.00 hrs, dt = 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

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<td>100.00%</td>
<td>Pervious Area</td>
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<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
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<tr>
<td>6.0</td>
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<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
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</table>

Subcatchment PRE 3: Subcat PRE 3

Hydrograph

Type III 24-hr 25-Year Rainfall=5.60"
Runoff Area=11,577 sf
Runoff Volume=1,248 cf
Runoff Depth=1.29"
Tc=6.0 min
CN=55
Time span = 0.50-48.00 hrs, \(dt = 0.02\) hrs, 2376 points
Runoff by SCS TR-20 method, UH = SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment PRE 1: Subcat PRE 1
- Runoff Area = 174,663 sf
- 17.73% Impervious
- Runoff Depth = 5.71”
- Flow Length = 800’
- \(T_c = 8.8\) min
- \(CN = 89\)
- Runoff = 23.18 cfs
- 83,082 cf

Subcatchment PRE 2: Subcat PRE 2
- Runoff Area = 46,749 sf
- 81.14% Impervious
- Runoff Depth = 6.76”
- \(T_c = 6.0\) min
- \(CN = 98\)
- Runoff = 7.36 cfs
- 26,339 cf

Subcatchment PRE 3: Subcat PRE 3
- Runoff Area = 11,577 sf
- 0.00% Impervious
- Runoff Depth = 2.12”
- \(T_c = 6.0\) min
- \(CN = 55\)
- Runoff = 0.62 cfs
- 2,049 cf

Total Runoff Area = 232,990 sf
Runoff Volume = 111,470 cf
Average Runoff Depth = 5.74”
70.43% Pervious = 164,094 sf
29.57% Impervious = 68,896 sf
Summary for Subcatchment PRE 1: Subcat PRE 1

Runoff = 23.18 cfs @ 12.12 hrs, Volume= 83,082 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

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<td>1.61</td>
<td></td>
<td>Shallow Concentrated Flow, Unpaved Kv= 16.1 fps</td>
</tr>
</tbody>
</table>

8.8 800 Total

Subcatchment PRE 1: Subcat PRE 1

Hydrograph

Type III 24-hr 100-Year Rainfall=7.00"
Runoff Area=174,663 sf
Runoff Volume=83,082 cf
Runoff Depth=5.71"
Flow Length=800'
Tc=8.8 min
CN=89
Summary for Subcatchment PRE 2: Subcat PRE 2

Runoff = 7.36 cfs @ 12.08 hrs, Volume= 26,339 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

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<td>37,934</td>
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<td>81.14% Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
--- --- --- --- ---
6.0  Direct Entry,

Subcatchment PRE 2: Subcat PRE 2

Hydrograph

Type III 24-hr 100-Year Rainfall=7.00"
Runoff Area=46,749 sf
Runoff Volume=26,339 cf
Runoff Depth=6.76"
Tc=6.0 min
CN=98
Summary for Subcatchment PRE 3: Subcat PRE 3

Runoff = 0.62 cfs @ 12.10 hrs, Volume= 2,049 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

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</tr>
<tr>
<td>11,577</td>
<td>100.00%</td>
<td>Pervious Area</td>
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</table>

Tc = 6.0 min

Subcatchment PRE 3: Subcat PRE 3

Hydrograph

Type III 24-hr 100-Year Rainfall=7.00"
Runoff Area=11,577 sf
Runoff Volume=2,049 cf
Runoff Depth=2.12"
Tc=6.0 min
CN=55
### Area Listing (all nodes)

<table>
<thead>
<tr>
<th>Area (sq-ft)</th>
<th>CN</th>
<th>Description</th>
<th>Subcatchment-numbers</th>
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<tbody>
<tr>
<td>19,845</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
<td>POST 1A, POST 1B, POST 1D, POST 3</td>
</tr>
<tr>
<td>68,663</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
<td>POST 1, POST 1A, POST 1C, POST 1D, POST 1E, POST 3</td>
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<tr>
<td>78,585</td>
<td>98</td>
<td>Paved parking, HSG A</td>
<td>POST 1A, POST 1B</td>
</tr>
<tr>
<td>51,655</td>
<td>98</td>
<td>Roofs, HSG A</td>
<td>POST 1A, POST 1C, POST 1D, POST 1E</td>
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<tr>
<td>14,266</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
<td>POST 1, POST 1C, POST 1D, POST 1E, POST 3</td>
</tr>
<tr>
<td><strong>233,013</strong></td>
<td><strong>84</strong></td>
<td><strong>TOTAL AREA</strong></td>
<td></td>
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</table>
### Soil Listing (all nodes)

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</tr>
<tr>
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<tr>
<td>0 HSG C</td>
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<tr>
<td>0 HSG D</td>
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<tr>
<td>0 Other</td>
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<tr>
<td><strong>233,013</strong></td>
<td><strong>TOTAL AREA</strong></td>
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### Ground Covers (all nodes)

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<th>HSG-C (sq-ft)</th>
<th>HSG-D (sq-ft)</th>
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<td>19,845</td>
<td>50-75% Grass cover, Fair</td>
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<tr>
<td>68,663</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>233,013</td>
<td>TOTAL AREA</td>
</tr>
</tbody>
</table>
Subcatchment POST 1: Subcat POST 1  
Runoff Area=4,219 sf  0.00% Impervious  Runoff Depth>0.45"  
Tc=6.0 min  CN=59  Runoff=0.03 cfs  158 cf

Subcatchment POST 1A: Subcat POST 1A  
Runoff Area=60,171 sf  89.62% Impervious  Runoff Depth>2.84"  
Tc=6.0 min  CN=95  Runoff=4.33 cfs  14,233 cf

Subcatchment POST 1B: Subcat POST 1B  
Runoff Area=43,008 sf  57.36% Impervious  Runoff Depth>1.35"  
Tc=6.0 min  CN=77  Runoff=1.54 cfs  4,856 cf

Subcatchment POST 1C: Subcat POST 1C  
Runoff Area=37,314 sf  24.30% Impervious  Runoff Depth>1.35"  
Tc=6.0 min  CN=77  Runoff=1.34 cfs  4,213 cf

Subcatchment POST 1D: Subcat POST 1D  
Runoff Area=55,491 sf  51.52% Impervious  Runoff Depth>2.09"  
Tc=6.0 min  CN=87  Runoff=3.12 cfs  9,667 cf

Subcatchment POST 1E: Subcat POST 1E  
Runoff Area=25,851 sf  54.12% Impervious  Runoff Depth>1.63"  
Tc=6.0 min  CN=81  Runoff=1.13 cfs  3,503 cf

Subcatchment POST 3: Subcat POST 3  
Runoff Area=6,958 sf  0.00% Impervious  Runoff Depth>0.31"  
Tc=6.0 min  CN=55  Runoff=0.02 cfs  181 cf

Pond 1P: UC-1  
Peak Elev=86.64'  Storage=8,444 cf  Inflow=5.66 cfs  18,445 cf  
Discarded=0.24 cfs  12,638 cf  Primary=0.35 cfs  1,527 cf  Outflow=0.59 cfs  14,165 cf

Pond 13P: Basin  
Peak Elev=88.14'  Storage=10,345 cf  Inflow=5.78 cfs  19,552 cf  
Discarded=0.36 cfs  15,165 cf  Primary=0.00 cfs  0 cf  Outflow=0.36 cfs  15,165 cf

Link 14L: (new Link)  
Inflow=0.03 cfs  158 cf  
Primary=0.03 cfs  158 cf

Total Runoff Area = 233,013 sf  Runoff Volume = 36,810 cf  Average Runoff Depth = 1.90"  
44.11% Pervious = 102,774 sf  55.89% Impervious = 130,239 sf
Summary for Subcatchment POST 1: Subcat POST 1

Runoff = 0.03 cfs @ 12.13 hrs, Volume= 158 cf, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,397</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>1,822</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>4,219</td>
<td>59</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>4,219</td>
<td>100.00%</td>
<td>Pervious Area</td>
</tr>
</tbody>
</table>

Tc = 6.0 min
Length (feet), Slope (ft/ft), Velocity (ft/sec), Capacity (cfs)

Direct Entry,

Subcatchment POST 1: Subcat POST 1

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=4,219 sf
Runoff Volume=158 cf
Runoff Depth>0.45"
Tc=6.0 min
CN=59
Summary for Subcatchment POST 1A: Subcat POST 1A

Runoff = 4.33 cfs @ 12.08 hrs, Volume = 14,233 cf, Depth > 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs

Type III 24-hr 2-Year Rainfall = 3.40"

---

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,385</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>4,861</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>53,917</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>8</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>60,171</td>
<td>95</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,246</td>
<td>10.38%</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>53,925</td>
<td>89.62%</td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
6.0

Subcatchment POST 1A: Subcat POST 1A

Type III 24-hr 2-Year Rainfall = 3.40"

Runoff Area = 60,171 sf
Runoff Volume = 14,233 cf
Runoff Depth > 2.84"

Tc = 6.0 min
CN = 95
Summary for Subcatchment POST 1B: Subcat POST 1B

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 4,856 cf, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,340</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>24,668</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>43,008</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>18,340</td>
<td></td>
<td>42.64% Pervious Area</td>
</tr>
<tr>
<td>24,668</td>
<td></td>
<td>57.36% Impervious Area</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
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<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1B: Subcat POST 1B

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=43,008 sf
Runoff Volume=4,856 cf
Runoff Depth>1.35"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1C: Subcat POST 1C

Runoff = 1.34 cfs @ 12.09 hrs, Volume= 4,213 cf, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24,247</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>9,068</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>3,999</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>37,314</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>28,246</td>
<td>75.70% Pervious Area</td>
<td></td>
</tr>
<tr>
<td>9,068</td>
<td>24.30% Impervious Area</td>
<td></td>
</tr>
</tbody>
</table>

Tc=6.0 min

Direct Entry,

Subcatchment POST 1C: Subcat POST 1C

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=37,314 sf
Runoff Volume=4,213 cf
Runoff Depth>1.35"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1D: Subcat POST 1D

Runoff = 3.12 cfs @ 12.09 hrs, Volume= 9,667 cf, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>26,832</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>28,587</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>55,491</td>
<td>87</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>26,905</td>
<td>48.48% Pervious Area</td>
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</tr>
<tr>
<td>28,587</td>
<td>51.52% Impervious Area</td>
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</tbody>
</table>

Tc = 6.0 min, Direct Entry, 6.0

Subcatchment POST 1D: Subcat POST 1D

Hydrograph

Type III 24-hr 2-Year Rainfall=3.40"
Runoff Area=55,491 sf
Runoff Volume=9,667 cf
Runoff Depth>2.09"
Tc=6.0 min
CN=87
Summary for Subcatchment POST 1E: Subcat POST 1E

Runoff = 1.13 cfs @ 12.09 hrs, Volume = 3,503 cf, Depth > 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 2-Year Rainfall = 3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,096</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
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<tr>
<td>13,991</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>4,764</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>25,851</td>
<td>81</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>11,860</td>
<td></td>
<td>45.88% Pervious Area</td>
</tr>
<tr>
<td>13,991</td>
<td></td>
<td>54.12% Impervious Area</td>
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</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1E: Subcat POST 1E

Hydrograph

Type III 24-hr 2-Year Rainfall = 3.40"
Runoff Area = 25,851 sf
Runoff Volume = 3,503 cf
Runoff Depth > 1.63"
Tc = 6.0 min
CN = 81
Summary for Subcatchment POST 3: Subcat POST 3

Runoff = 0.02 cfs @ 12.30 hrs, Volume= 181 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.40"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tr>
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<tr>
<td>3,230</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
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<tr>
<td>3,670</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>6,958</td>
<td>55</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,958</td>
<td>100</td>
<td>100.00% Pervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 3: Subcat POST 3

Hydrograph

Type III 24-hr
2-Year Rainfall=3.40"
Runoff Area=6,958 sf
Runoff Volume=181 cf
Runoff Depth>0.31"
Tc=6.0 min
CN=55
Summary for Pond 1P: UC-1

Inflow Area = 97,486 sf, 64.62% Impervious, Inflow Depth > 2.27" for 2-Year event
Inflow = 5.66 cfs @ 12.09 hrs, Volume= 18,445 cf
Outflow = 0.59 cfs @ 12.88 hrs, Volume= 14,165 cf, Atten= 90%, Lag= 47.8 min
Discarded = 0.24 cfs @ 12.88 hrs, Volume= 12,638 cf
Primary = 0.35 cfs @ 12.88 hrs, Volume= 1,527 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 86.64' @ 12.88 hrs  Surf.Area= 3,346 sf  Storage= 8,444 cf

Plug-Flow detention time= 243.9 min calculated for 14,159 cf (77% of inflow)
Center-of-Mass det. time= 160.4 min ( 954.9 - 794.4 )

Volume Invert Avail.Storage Storage Description
#1A 83.00' 2,570 cf 32.80'W x 102.00'L x 5.00'H Field A
16,728 cf Overall - 10,303 cf Embedded = 6,425 cf x 40.0% Voids
#2A 83.50' 7,760 cf Concrete Galley 4x4x4 x 175 Inside #1
Insie= 42.0"W x 43.0"H >= 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H >= 14.72 sf x 4.00'L = 58.9 cf
7 Rows of 25 Chambers

10,330 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device Routing Invert Outlet Devices
#1 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#2 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#3 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#4 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#5 Discarded 83.00' 2.410 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.24 cfs @ 12.88 hrs HW=86.64’ (Free Discharge)
5=Exfiltration (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.34 cfs @ 12.88 hrs HW=86.64’ (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.09 cfs @ 1.28 fps)
2=Orifice/Grate (Orifice Controls 0.09 cfs @ 1.28 fps)
3=Orifice/Grate (Orifice Controls 0.09 cfs @ 1.28 fps)
4=Orifice/Grate (Orifice Controls 0.09 cfs @ 1.28 fps)
Pond 1P: UC-1 - Chamber Wizard Field A

Chamber Model = Concrete Galley  4x4x4 (Concrete Galley, UCPI 4x4x4 Galley or equivalent)
Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf

25 Chambers/Row x 4.00' Long = 100.00' Row Length +12.0" End Stone x 2 = 102.00' Base Length
7 Rows x 52.8" Wide + 12.0" Side Stone x 2 = 32.80' Base Width
6.0" Base + 48.0" Chamber Height + 6.0" Cover = 5.00' Field Height

175 Chambers x 44.3 cf = 7,760.3 cf Chamber Storage
175 Chambers x 58.9 cf = 10,303.4 cf Displacement

16,728.0 cf Field - 10,303.4 cf Chambers = 6,424.6 cf Stone x 40.0% Voids = 2,569.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,330.2 cf = 0.237 af
Overall Storage Efficiency = 61.8%
Overall System Size = 102.00' x 32.80' x 5.00'

175 Chambers @ $ 300.00 /ea = $ 52,500.00
619.6 cy Field Excavation @ $ 10.00 /cy = $ 6,195.56
237.9 cy Stone @ $ 30.00 /cy = $ 7,138.49
Total Cost = $ 65,834.05
Pond 1P: UC-1

Hydrograph

Inflow Area=97,486 sf
Peak Elev=86.64'
Storage=8,444 cf

Flow (cfs)

Time (hours)

Pond 1P: UC-1

Stage-Discharge

Discharge (cfs)

Elevation (feet)

Orifice/Grate + Orifice/Grate + Orifice/Grate + Orifice/Grate

Exfiltration

Total
Discarded
Primary
Pond 1P: UC-1

Stage-Area-Storage

Surface/Horizotal/Wetted Area (sq-ft)

Elevation (feet)

Storage (cubic-feet)

- Concrete Galley 4x4x4
- Field A

Wetted

Storage
Summary for Pond 13P: Basin

[81] Warning: Exceeded Pond 1P by 2.12’ @ 12.01 hrs

Inflow Area = 221,836 sf, 58.71% Impervious, Inflow Depth > 1.06” for 2-Year event
Inflow = 5.78 cfs @ 12.09 hrs, Volume= 19,552 cf
Outflow = 0.36 cfs @ 14.81 hrs, Volume= 15,165 cf, Atten= 94%, Lag= 163.1 min
Discarded = 0.36 cfs @ 14.81 hrs, Volume= 15,165 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 88.14’ @ 14.81 hrs Surf.Area= 6,440 sf Storage= 10,345 cf
Plug-Flow detention time= 280.9 min calculated for 15,165 cf (78% of inflow)
Center-of-Mass det. time= 201.9 min (1,028.9 - 826.9)

Volume Invert Avail.Storage Storage Description
#1 86.00’ 24,764 cf Custom Stage Data (Conic) Listed below

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<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>86.00</td>
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<td>0</td>
<td>0</td>
<td>3,183</td>
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<tr>
<td>88.00</td>
<td>6,205</td>
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<td>9,221</td>
<td>6,243</td>
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<tr>
<td>90.00</td>
<td>9,451</td>
<td>15,543</td>
<td>24,764</td>
<td>9,548</td>
</tr>
</tbody>
</table>

Device Routing Invert Outlet Devices
#1 Discarded 86.00’ 2.410 in/hr Exfiltration over Surface area
18.0’ long x 0.8’ 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
Coef. (English) 2.74 2.78 2.86 3.00 3.11 3.18 3.25 3.29 3.32 3.31 3.32

Discarded OutFlow Max=0.36 cfs @ 14.81 hrs HW=88.14’ (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=86.00’ (Free Discharge)
↑2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
Pond 13P: Basin

Hydrograph

- Inflow Area = 221,836 sf
- Peak Elev = 88.14'
- Storage = 10,345 cf

- Flow (cfs): 5.78
- Inflow Area = 221,836 sf
- Peak Elev = 88.14'
- Storage = 10,345 cf

Stage-Discharge

- Broad-Crested Rectangular Weir
- Exfiltration

Discharge (cfs):
0 10 20 30 40 50
Elevation (feet):
86 87 88 89 90
Pond 13P: Basin

Stage-Area-Storage

Surface/Horizontal/Wetted Area (sq-ft)

Storage (cubic-feet)

Elevation (feet)

Custom Stage Data
Summary for Link 14L: (new Link)

Inflow Area = 226,055 sf, 57.61% Impervious, Inflow Depth > 0.01” for 2-Year event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 158 cf
Primary = 0.03 cfs @ 12.13 hrs, Volume= 158 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: (new Link)
Type III 24-hr 10-Year Rainfall=4.70"

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment POST 1: Subcat POST 1
Runoff Area=4,219 sf  0.00% Impervious  Runoff Depth>1.07"
Tc=6.0 min   CN=59   Runoff=0.10 cfs  375 cf

Subcatchment POST 1A: Subcat POST 1A
Runoff Area=60,171 sf  89.62% Impervious  Runoff Depth>4.12"
Tc=6.0 min   CN=95   Runoff=6.15 cfs  20,654 cf

Subcatchment POST 1B: Subcat POST 1B
Runoff Area=43,008 sf  57.36% Impervious  Runoff Depth>2.37"
Tc=6.0 min   CN=77   Runoff=2.75 cfs  8,498 cf

Subcatchment POST 1C: Subcat POST 1C
Runoff Area=37,314 sf  24.30% Impervious  Runoff Depth>2.37"
Tc=6.0 min   CN=77   Runoff=2.38 cfs  7,373 cf

Subcatchment POST 1D: Subcat POST 1D
Runoff Area=55,491 sf  51.52% Impervious  Runoff Depth>3.28"
Tc=6.0 min   CN=87   Runoff=4.83 cfs  15,178 cf

Subcatchment POST 1E: Subcat POST 1E
Runoff Area=25,851 sf  54.12% Impervious  Runoff Depth>2.72"
Tc=6.0 min   CN=81   Runoff=1.89 cfs  5,857 cf

Subcatchment POST 3: Subcat POST 3
Runoff Area=6,958 sf  0.00% Impervious  Runoff Depth>0.83"
Tc=6.0 min   CN=55   Runoff=0.12 cfs  483 cf

Pond 1P: UC-1
Peak Elev=87.03'  Storage=9,400 cf  Inflow=8.53 cfs  28,027 cf
Discarded=0.25 cfs  13,701 cf  Primary=4.21 cfs  8,855 cf  Outflow=4.46 cfs  22,556 cf

Pond 13P: Basin
Peak Elev=89.14'  Storage=18,076 cf  Inflow=9.94 cfs  38,388 cf
Discarded=0.45 cfs  19,963 cf  Primary=2.59 cfs  8,009 cf  Outflow=3.04 cfs  27,972 cf

Link 14L: (new Link)
Inflow=2.61 cfs  8,384 cf  Primary=2.61 cfs  8,384 cf

Total Runoff Area = 233,013 sf  Runoff Volume = 58,419 cf  Average Runoff Depth = 3.01"
44.11% Pervious = 102,774 sf  55.89% Impervious = 130,239 sf
Summary for Subcatchment POST 1: Subcat POST 1

Runoff = 0.10 cfs @ 12.10 hrs, Volume = 375 cf, Depth > 1.07"

Runoff by SCS TR-20 method, UH = SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 10-Year Rainfall = 4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,397</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>1,822</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>4,219</td>
<td>59</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>4,219</td>
<td>100.00%</td>
<td>Pervious Area</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
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<td>6.0</td>
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<td></td>
<td>Direct Entry,</td>
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</table>

Subcatchment POST 1: Subcat POST 1

Hydrograph

Type III 24-hr 10-Year Rainfall = 4.70"
Runoff Area = 4,219 sf
Runoff Volume = 375 cf
Runoff Depth > 1.07"
Tc = 6.0 min
CN = 59
Summary for Subcatchment POST 1A: Subcat POST 1A

Runoff = 6.15 cfs @ 12.08 hrs, Volume= 20,654 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
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<tbody>
<tr>
<td>1,385</td>
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<td>50-75% Grass cover, Fair, HSG A</td>
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<tr>
<td>4,861</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
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<tr>
<td>53,917</td>
<td>98</td>
<td>Paved parking, HSG A</td>
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<tr>
<td>8</td>
<td>98</td>
<td>Roofs, HSG A</td>
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<tr>
<td>60,171</td>
<td>95</td>
<td>Weighted Average</td>
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<tr>
<td>6,246</td>
<td></td>
<td>10.38% Pervious Area</td>
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<tr>
<td>53,925</td>
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<td>89.62% Impervious Area</td>
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<th>Tc</th>
<th>Length</th>
<th>Slope</th>
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<td>6.0</td>
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<td></td>
<td>Direct Entry,</td>
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</tbody>
</table>

Subcatchment POST 1A: Subcat POST 1A

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=60,171 sf
Runoff Volume=20,654 cf
Runoff Depth>4.12"
Tc=6.0 min
CN=95
Summary for Subcatchment POST 1B: Subcat POST 1B

Runoff = 2.75 cfs @ 12.09 hrs, Volume= 8,498 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,340</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>24,668</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tr>
<td>43,008</td>
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<td>Weighted Average</td>
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<tr>
<td>18,340</td>
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<td>42.64% Pervious Area</td>
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<tr>
<td>24,668</td>
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<td>57.36% Impervious Area</td>
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Direct Entry,
Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=43,008 sf
Runoff Volume=8,498 cf
Runoff Depth>2.37"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1C: Subcat POST 1C

Runoff = 2.38 cfs @ 12.09 hrs, Volume= 7,373 cf, Depth> 2.37"  

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24,247</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>9,068</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>3,999</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>37,314</td>
<td>77</td>
<td>Weighted Average</td>
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<tr>
<td>28,246</td>
<td>75.70%</td>
<td>Pervious Area</td>
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<td>9,068</td>
<td>24.30%</td>
<td>Impervious Area</td>
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<table>
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<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
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<td>6.0</td>
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<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1C: Subcat POST 1C

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=37,314 sf
Runoff Volume=7,373 cf
Runoff Depth>2.37"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1D: Subcat POST 1D

Runoff = 4.83 cfs @ 12.09 hrs, Volume= 15,178 cf, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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<tbody>
<tr>
<td>62</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
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<tr>
<td>26,832</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>28,587</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>55,491</td>
<td>87</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>26,905</td>
<td></td>
<td>48.48% Pervious Area</td>
</tr>
<tr>
<td>28,587</td>
<td></td>
<td>51.52% Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
6.0

Direct Entry,

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=55,491 sf
Runoff Volume=15,178 cf
Runoff Depth>3.28"
Tc=6.0 min
CN=87
Summary for Subcatchment POST 1E: Subcat POST 1E

Runoff = 1.89 cfs @ 12.09 hrs, Volume = 5,857 cf, Depth > 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>7,096</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
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<tr>
<td>13,991</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>4,764</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
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<tr>
<td>25,851</td>
<td>81</td>
<td>Weighted Average</td>
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<tr>
<td>11,860</td>
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<td>45.88% Pervious Area</td>
</tr>
<tr>
<td>13,991</td>
<td></td>
<td>54.12% Impervious Area</td>
</tr>
</tbody>
</table>

Tc = 6.0 min, Length = Direct Entry

Subcatchment POST 1E: Subcat POST 1E

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area = 25,851 sf
Runoff Volume = 5,857 cf
Runoff Depth > 2.72"
Tc = 6.0 min
CN = 81
Summary for Subcatchment POST 3: Subcat POST 3

Runoff = 0.12 cfs @ 12.11 hrs, Volume= 483 cf, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.70"

---

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
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<tr>
<td>3,230</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
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<td>3,670</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>6,958</td>
<td>55</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,958</td>
<td>100.00%</td>
<td>Pervious Area</td>
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</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
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<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 3: Subcat POST 3

Hydrograph

Type III 24-hr 10-Year Rainfall=4.70"
Runoff Area=6,958 sf
Runoff Volume=483 cf
Runoff Depth>0.83"
Tc=6.0 min
CN=55
Summary for Pond 1P: UC-1

Inflow Area = 97,486 sf, 64.62% Impervious, Inflow Depth > 3.45" for 10-Year event
Inflow = 8.53 cfs @ 12.09 hrs, Volume= 28,027 cf
Outflow = 4.46 cfs @ 12.22 hrs, Volume= 22,556 cf, Atten= 48%, Lag= 8.1 min
Discarded = 0.25 cfs @ 12.22 hrs, Volume= 13,701 cf
Primary = 4.21 cfs @ 12.22 hrs, Volume= 8,855 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 87.03' @ 12.22 hrs  Surf.Area= 3,346 sf  Storage= 9,400 cf

Plug-Flow detention time= 166.0 min calculated for 22,556 cf (80% of inflow)
Center-of-Mass det. time= 90.4 min (876.2 - 785.8 )

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
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</thead>
<tbody>
<tr>
<td>#1A</td>
<td>83.00'</td>
<td>2,570 cf</td>
<td>32.80'W x 102.00'L x 5.00'H Field A</td>
</tr>
<tr>
<td>#2A</td>
<td>83.50'</td>
<td>7,760 cf</td>
<td>Concrete Galley 4x4x4 x 175 Inside #1</td>
</tr>
</tbody>
</table>

10,330 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device  Routing  Invert  Outlet Devices  
#1 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600 
#2 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600 
#3 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600 
#4 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600 
#5 Discarded 83.00' 2.410 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.25 cfs @ 12.22 hrs  HW=87.03' (Free Discharge)
Exfiltration (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=4.21 cfs @ 12.22 hrs  HW=87.03' (Free Discharge)
1=Orifice/Grate (Orifice Controls 1.05 cfs @ 2.48 fps)
2=Orifice/Grate (Orifice Controls 1.05 cfs @ 2.48 fps)
3=Orifice/Grate (Orifice Controls 1.05 cfs @ 2.48 fps)
4=Orifice/Grate (Orifice Controls 1.05 cfs @ 2.48 fps)
Pond 1P: UC-1 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4 (Concrete Galley, UCPI 4x4x4 Galley or equivalent)
Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf

25 Chambers/Row x 4.00' Long = 100.00' Row Length +12.0" End Stone x 2 = 102.00' Base Length
7 Rows x 52.8" Wide + 12.0" Side Stone x 2 = 32.80' Base Width
6.0" Base + 48.0" Chamber Height + 6.0" Cover = 5.00' Field Height

175 Chambers x 44.3 cf = 7,760.3 cf Chamber Storage
175 Chambers x 58.9 cf = 10,303.4 cf Displacement

16,728.0 cf Field - 10,303.4 cf Chambers = 6,424.6 cf Stone x 40.0% Voids = 2,569.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,330.2 cf = 0.237 af
Overall Storage Efficiency = 61.8%
Overall System Size = 102.00' x 32.80' x 5.00'

175 Chambers @ $ 300.00 /ea = $ 52,500.00
619.6 cy Field Excavation @ $ 10.00 /cy = $ 6,195.56
237.9 cy Stone @ $ 30.00 /cy = $ 7,138.49
Total Cost = $ 65,834.05
Pond 1P: UC-1

Hydrograph

- Inflow Area = 97,486 sf
- Peak Elev = 87.03'
- Storage = 9,400 cf

- Discharge:
  - 8.53 cfs
  - 4.46 cfs
  - 4.21 cfs
  - 0.25 cfs

Stage-Discharge

- Exfiltration
- Orifice/Grate + Orifice/Grate + Orifice/Grate + Orifice/Grate
Summary for Pond 13P: Basin

[81] Warning: Exceeded Pond 1P by 2.72’ @ 23.99 hrs

Inflow Area = 221,836 sf, 58.71% Impervious, Inflow Depth > 2.08” for 10-Year event
Inflow = 9.94 cfs @ 12.17 hrs, Volume= 38,388 cf
Outflow = 3.04 cfs @ 12.58 hrs, Volume= 27,972 cf, Atten= 69%, Lag= 24.6 min
Discarded = 0.45 cfs @ 12.58 hrs, Volume= 19,963 cf
Primary = 2.59 cfs @ 12.58 hrs, Volume= 8,009 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.14’ @ 12.58 hrs  Surf.Area= 8,054 sf  Storage= 18,076 cf

Plug-Flow detention time= 228.5 min calculated for 27,960 cf (73% of inflow)
Center-of-Mass det. time= 151.7 min ( 957.5 - 805.8 )

Volume Invert Avail.Storage Storage Description
#1 86.00’ 24,764 cf Custom Stage Data (Conic) Listed below

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>86.00</td>
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<td>0</td>
<td>3,183</td>
</tr>
<tr>
<td>88.00</td>
<td>6,205</td>
<td>9,221</td>
<td>9,221</td>
<td>6,243</td>
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<tr>
<td>90.00</td>
<td>9,451</td>
<td>15,543</td>
<td>24,764</td>
<td>9,548</td>
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</table>

Device Routing Invert Outlet Devices
#1 Discarded 86.00’ 2.410 in/hr Exfiltration over Surface area
#2 Primary 89.00’ 18.0’ long x 0.8’ 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
Coef. (English) 2.74 2.78 2.86 3.00 3.11 3.18 3.25 3.29 3.32 3.31 3.32

Discarded OutFlow Max=0.45 cfs @ 12.58 hrs  HW=89.14’ (Free Discharge)

Primary OutFlow Max=2.57 cfs @ 12.58 hrs  HW=89.14’ (Free Discharge)
Pond 13P: Basin

**Hydrograph**

Inflow Area = 221,836 sf  
Peak Elev = 89.14'  
Storage = 18,076 cf

- **Inflow**
  - 0: 0.00 cfs  
  - 2: 2.59 cfs  
  - 4: 0.45 cfs

- **Outflow**
  - 0: 0.00 cfs  
  - 2: 3.04 cfs  
  - 4: 9.94 cfs

- **Discarded**
  - 0: 0.00 cfs  
  - 2: 2.59 cfs  
  - 4: 0.45 cfs

- **Primary**
  - 0: 0.00 cfs  
  - 2: 3.04 cfs  
  - 4: 9.94 cfs

**Stage-Discharge**

- **Exfiltration**
  - 86

- **Broad-Crested Rectangular Weir**
  - 87

- **Total**
  - 88

- **Discarded**
  - 89

- **Primary**
  - 90
Pond 13P: Basin

Stage-Area-Storage

Surface/Horizontal/Wetted Area (sq-ft)

Storage (cubic-feet)

Elevation (feet)

Custom Stage Data
Summary for Link 14L: (new Link)

Inflow Area = 226,055 sf, 57.61% Impervious, Inflow Depth > 0.45" for 10-Year event
Inflow = 2.61 cfs @ 12.58 hrs, Volume= 8,384 cf
Primary = 2.61 cfs @ 12.58 hrs, Volume= 8,384 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: (new Link)
Subcatchment POST 1: Subcat POST 1
Runoff Area=4,219 sf  0.00% Impervious  Runoff Depth>1.59"
  Tc=6.0 min   CN=59   Runoff=0.17 cfs  558 cf

Subcatchment POST 1A: Subcat POST 1A
Runoff Area=60,171 sf  89.62% Impervious  Runoff Depth>5.01"
  Tc=6.0 min   CN=95   Runoff=7.41 cfs  25,123 cf

Subcatchment POST 1B: Subcat POST 1B
Runoff Area=43,008 sf  57.36% Impervious  Runoff Depth>3.13"
  Tc=6.0 min   CN=77   Runoff=3.63 cfs  11,213 cf

Subcatchment POST 1C: Subcat POST 1C
Runoff Area=37,314 sf  24.30% Impervious  Runoff Depth>3.13"
  Tc=6.0 min   CN=77   Runoff=3.15 cfs  9,729 cf

Subcatchment POST 1D: Subcat POST 1D
Runoff Area=55,491 sf  51.52% Impervious  Runoff Depth>4.13"
  Tc=6.0 min   CN=87   Runoff=6.03 cfs  19,105 cf

Subcatchment POST 1E: Subcat POST 1E
Runoff Area=25,851 sf  54.12% Impervious  Runoff Depth>3.52"
  Tc=6.0 min   CN=81   Runoff=2.44 cfs  7,577 cf

Subcatchment POST 3: Subcat POST 3
Runoff Area=6,958 sf  0.00% Impervious  Runoff Depth>1.29"
  Tc=6.0 min   CN=55   Runoff=0.21 cfs  749 cf

Pond 1P: UC-1
  Peak Elev=87.43’  Storage=9,636 cf   Inflow=10.55 cfs  34,852 cf
  Discarded=0.25 cfs  14,299 cf   Primary=9.96 cfs  14,424 cf   Outflow=10.21 cfs  28,723 cf

Pond 13P: Basin
  Peak Elev=89.31’  Storage=19,394 cf   Inflow=21.96 cfs  52,320 cf
  Discarded=0.46 cfs  20,873 cf   Primary=8.55 cfs  19,943 cf   Outflow=9.01 cfs  40,817 cf

Link 14L: (new Link)
  Inflow=8.63 cfs  20,501 cf
  Primary=8.63 cfs  20,501 cf

Total Runoff Area = 233,013 sf   Runoff Volume = 74,053 cf   Average Runoff Depth = 3.81"
  44.11% Pervious = 102,774 sf   55.89% Impervious = 130,239 sf
Summary for Subcatchment POST 1: Subcat POST 1

Runoff = 0.17 cfs @ 12.10 hrs, Volume= 558 cf, Depth> 1.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,397</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>1,822</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>4,219</td>
<td>59</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>4,219</td>
<td>100</td>
<td>100.00% Pervious Area</td>
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</table>

<table>
<thead>
<tr>
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<th>Length</th>
<th>Slope</th>
<th>Velocity</th>
<th>Capacity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1: Subcat POST 1

Hydrograph

Type III 24-hr
25-Year Rainfall=5.60"
Runoff Area=4,219 sf
Runoff Volume=558 cf
Runoff Depth>1.59"
Tc=6.0 min
CN=59
Summary for Subcatchment POST 1A: Subcat POST 1A

Runoff  =  7.41 cfs @  12.08 hrs,  Volume=  25,123 cf,  Depth>  5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr  25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,385</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>4,861</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>53,917</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>8</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>60,171</td>
<td>95</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,246</td>
<td></td>
<td>10.38% Pervious Area</td>
</tr>
<tr>
<td>53,925</td>
<td></td>
<td>89.62% Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
(min)  (feet) (ft/ft) (ft/sec) (cfs)
6.0     

Subcatchment POST 1A: Subcat POST 1A

Hydrograph

Type III 24-hr 25-Year Rainfall=5.60"
Runoff Area=60,171 sf
Runoff Volume=25,123 cf
Runoff Depth>5.01"
Tc=6.0 min
CN=95
Summary for Subcatchment POST 1B: Subcat POST 1B

Runoff = 3.63 cfs @ 12.09 hrs, Volume= 11,213 cf, Depth> 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,340</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>24,668</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>43,008</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>18,340</td>
<td></td>
<td>42.64% Pervious Area</td>
</tr>
<tr>
<td>24,668</td>
<td></td>
<td>57.36% Impervious Area</td>
</tr>
</tbody>
</table>

Tc=6.0 min

Subcatchment POST 1B: Subcat POST 1B

Type III 24-hr 25-Year Rainfall=5.60"
Runoff Area=43,008 sf
Runoff Volume=11,213 cf
Runoff Depth>3.13"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1C: Subcat POST 1C

Runoff = 3.15 cfs @ 12.09 hrs, Volume = 9,729 cf, Depth > 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 25-Year Rainfall = 5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24,247</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>9,068</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>3,999</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>37,314</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>28,246</td>
<td></td>
<td>75.70% Pervious Area</td>
</tr>
<tr>
<td>9,068</td>
<td></td>
<td>24.30% Impervious Area</td>
</tr>
</tbody>
</table>

Direct Entry,

Subcatchment POST 1C: Subcat POST 1C

Hydrograph

Type III 24-hr
25-Year Rainfall = 5.60"
Runoff Area = 37,314 sf
Runoff Volume = 9,729 cf
Runoff Depth > 3.13"
Tc = 6.0 min
CN = 77
Summary for Subcatchment POST 1D: Subcat POST 1D

Runoff = 6.03 cfs @ 12.09 hrs, Volume= 19,105 cf, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>26,832</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>28,587</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>55,491</td>
<td>87</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>26,905</td>
<td></td>
<td>48.48% Pervious Area</td>
</tr>
<tr>
<td>28,587</td>
<td></td>
<td>51.52% Impervious Area</td>
</tr>
</tbody>
</table>

Tc Length Slope Velocity Capacity Description
(min) (feet) (ft/ft) (ft/sec) (cfs)
6.0

Subcatchment POST 1D: Subcat POST 1D

Hydrograph

Type III 24-hr 25-Year Rainfall=5.60"
Runoff Area=55,491 sf
Runoff Volume=19,105 cf
Runoff Depth>4.13"
Tc=6.0 min
CN=87
Summary for Subcatchment POST 1E: Subcat POST 1E

Runoff = 2.44 cfs @ 12.09 hrs, Volume= 7,577 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,096</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>13,991</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>4,764</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>25,851</td>
<td>81</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>11,860</td>
<td>45.88</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>13,991</td>
<td>54.12</td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

Tc=6.0 min
Direct Entry,

Subcatchment POST 1E: Subcat POST 1E

Hydrograph

Type III 24-hr
25-Year Rainfall=5.60"
Runoff Area=25,851 sf
Runoff Volume=7,577 cf
Runoff Depth>3.52"
Tc=6.0 min
CN=81
Summary for Subcatchment POST 3: Subcat POST 3

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 749 cf, Depth> 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.60"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>3,230</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>3,670</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>6,958</td>
<td>55</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,958</td>
<td>100.00%</td>
<td>Pervious Area</td>
</tr>
</tbody>
</table>

Subcatchment POST 3: Subcat POST 3

Type III 24-hr 25-Year Rainfall=5.60"
Runoff Area=6,958 sf
Runoff Volume=749 cf
Runoff Depth>1.29"
Tc=6.0 min
CN=55
Summary for Pond 1P: UC-1

Inflow Area = 97,486 sf, 64.62% Impervious, Inflow Depth > 4.29" for 25-Year event
Inflow = 10.55 cfs @ 12.09 hrs, Volume= 34,852 cf
Outflow = 10.21 cfs @ 12.11 hrs, Volume= 28,723 cf, Atten= 3%, Lag= 1.4 min
Discarded = 0.25 cfs @ 12.11 hrs, Volume= 14,299 cf
Primary = 9.96 cfs @ 12.11 hrs, Volume= 14,424 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 87.43' @ 12.11 hrs  Surf.Area= 3,346 sf  Storage= 9,636 cf

Plug-Flow detention time= 137.1 min calculated for 28,723 cf (82% of inflow)
Center-of-Mass det. time= 66.1 min (847.3 - 781.3 )

Volume Invert Avail.Storage Storage Description
#1A 83.00' 2,570 cf 32.80'W x 102.00'L x 5.00'H Field A
16,728 cf Overall - 10,303 cf Embedded = 6,425 cf x 40.0% Voids

Concrete Galley 4x4x4 x 175 Inside #1
Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf
7 Rows of 25 Chambers

#2A 83.50' 7,760 cf

10,330 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device Routing Invert Outlet Devices
#1 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#2 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#3 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#4 Primary 86.50' 12.0" Vert. Orifice/Grate C= 0.600
#5 Discarded 83.00' 2.410 in/hr Exfiltration over Wetted area

Discarded OutFlow Max=0.25 cfs @ 12.11 hrs  HW=87.43' (Free Discharge)
Exfiltration (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=9.94 cfs @ 12.11 hrs  HW=87.43' (Free Discharge)
Orifice/Grate (Orifice Controls 2.48 cfs @ 3.27 fps)
Pond 1P: UC-1 - Chamber Wizard Field A

Chamber Model = Concrete Galley  4x4x4 (Concrete Galley, UCPI 4x4x4 Galley or equivalent)
Inside= 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside= 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf

25 Chambers/Row x 4.00' Long = 100.00' Row Length +12.0" End Stone x 2 = 102.00' Base Length
7 Rows x 52.8" Wide + 12.0" Side Stone x 2 = 32.80' Base Width
6.0" Base + 48.0" Chamber Height + 6.0" Cover = 5.00' Field Height

175 Chambers x 44.3 cf = 7,760.3 cf Chamber Storage
175 Chambers x 58.9 cf = 10,303.4 cf Displacement

16,728.0 cf Field - 10,303.4 cf Chambers = 6,424.6 cf Stone x 40.0% Voids = 2,569.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,330.2 cf = 0.237 af
Overall Storage Efficiency = 61.8%
Overall System Size = 102.00' x 32.80' x 5.00'

175 Chambers @ $ 300.00 /ea = $ 52,500.00
619.6 cy Field Excavation @ $ 10.00 /cy = $ 6,195.56
237.9 cy Stone @ $ 30.00 /cy = $ 7,138.49
Total Cost = $ 65,834.05
Pond 1P: UC-1

**Hydrograph**

- **Inflow Area:** 97,486 sf
- **Peak Elev:** 87.43'
- **Storage:** 9,636 cf

<table>
<thead>
<tr>
<th>Time (hours)</th>
<th>Flow (cfs)</th>
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<tbody>
<tr>
<td>24</td>
<td>0</td>
</tr>
<tr>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>10.55 cfs</td>
</tr>
<tr>
<td>0</td>
<td>10.21 cfs</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Stage-Discharge**

- **Exfiltration**
- **Orifice/Grate:**
  - + Orifice/Grate
  - + Orifice/Grate
  - + Orifice/Grate
  - + Orifice/Grate
### Pond 1P: UC-1

#### Stage-Area-Storage

<table>
<thead>
<tr>
<th>Elevation (feet)</th>
<th>Surface/Horizontal/Wetted Area (sq-ft)</th>
<th>Storage (cubic-feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>88</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>87</td>
<td>1,000</td>
<td>8,000</td>
</tr>
<tr>
<td>86</td>
<td>2,000</td>
<td>6,000</td>
</tr>
<tr>
<td>85</td>
<td>3,000</td>
<td>4,000</td>
</tr>
<tr>
<td>84</td>
<td>4,000</td>
<td>2,000</td>
</tr>
<tr>
<td>83</td>
<td>5,000</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Wetted**
- **Storage**

**Concrete Galley 4x4x4**

**Field A**

---

Type III 24-hr 25-Year Rainfall=5.60”

Post - 2018-10-05

Prepared by Microsoft

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Printed 12/17/2018

Page 48
### Summary for Pond 13P: Basin

[81] Warning: Exceeded Pond 1P by 2.59’ @ 23.99 hrs

<table>
<thead>
<tr>
<th>Inflow Area</th>
<th>221,836 sf, 58.71% Impervious, Inflow Depth &gt; 2.83” for 25-Year event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inflow</td>
<td>21.96 cfs @ 12.10 hrs, Volume= 52,320 cf</td>
</tr>
<tr>
<td>Outflow</td>
<td>9.01 cfs @ 12.33 hrs, Volume= 40,817 cf, Atten= 59%, Lag= 13.4 min</td>
</tr>
<tr>
<td>Discarded</td>
<td>0.46 cfs @ 12.33 hrs, Volume= 20,873 cf</td>
</tr>
<tr>
<td>Primary</td>
<td>8.55 cfs @ 12.33 hrs, Volume= 19,943 cf</td>
</tr>
</tbody>
</table>

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.31’ @ 12.33 hrs  Surf.Area= 8,329 sf  Storage= 19,394 cf

Plug-Flow detention time= 167.3 min calculated for 40,800 cf (78% of inflow)
Center-of-Mass det. time= 100.1 min (898.2 - 798.2)

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>86.00'</td>
<td>24,764 cf</td>
<td>Custom Stage Data (Conic) Listed below</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>86.00</td>
<td>3,183</td>
<td>0</td>
<td>0</td>
<td>3,183</td>
</tr>
<tr>
<td>88.00</td>
<td>6,205</td>
<td>9,221</td>
<td>9,221</td>
<td>6,243</td>
</tr>
<tr>
<td>90.00</td>
<td>9,451</td>
<td>15,543</td>
<td>24,764</td>
<td>9,548</td>
</tr>
</tbody>
</table>

Device Routing Invert Outlet Devices

| #1 Discarded     | 86.00' 2.410 in/hr Exfiltration over Surface area 18.0’ long x 0.8’ 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 Coef. (English) 2.74 2.78 2.86 3.00 3.11 3.18 3.25 3.29 3.32 3.31 3.32 |
| #2 Primary       | 89.00'  |

**Discarded OutFlow** Max=0.46 cfs @ 12.33 hrs  HW=89.31’ (Free Discharge)  
1=Exfiltration (Exfiltration Controls 0.46 cfs)

**Primary OutFlow** Max=8.53 cfs @ 12.33 hrs  HW=89.31’ (Free Discharge)  
2=Broad-Crested Rectangular Weir (Weir Controls 8.53 cfs @ 1.53 fps)
**Pond 13P: Basin**

**Hydrograph**
- Inflow Area = 221,836 sf
- Peak Elev = 89.31'
- Storage = 19,394 cf
- Discharge rates:
  - 21.96 cfs
  - 9.01 cfs
  - 8.55 cfs
  - 0.46 cfs

**Stage-Discharge**
- Exfiltration
- Broad-Crested Rectangular Weir
Pond 13P: Basin

Stage-Area-Storage

Surface/Horizontal/Wetted Area (sq-ft)

Storage (cubic-feet)

Elevation (feet)

Custom Stage Data
Summary for Link 14L: (new Link)

Inflow Area = 226,055 sf, 57.61% Impervious, Inflow Depth > 1.09" for 25-Year event
Inflow = 8.63 cfs @ 12.33 hrs, Volume= 20,501 cf
Primary = 8.63 cfs @ 12.33 hrs, Volume= 20,501 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 14L: (new Link)

Hydrograph

Inflow Area=226,055 sf, 8.63 cfs, 8.63 cfs
Type III 24-hr 100-Year Rainfall=7.00"

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment POST 1: Subcat POST 1
  Runoff Area=4,219 sf  0.00% Impervious  Runoff Depth>2.50"
  Tc=6.0 min   CN=59   Runoff=0.27 cfs  880 cf

Subcatchment POST 1A: Subcat POST 1A
  Runoff Area=60,171 sf  89.62% Impervious  Runoff Depth>6.40"
  Tc=6.0 min   CN=95   Runoff=9.34 cfs  32,094 cf

Subcatchment POST 1B: Subcat POST 1B
  Runoff Area=43,008 sf  57.36% Impervious  Runoff Depth>4.36"
  Tc=6.0 min   CN=77   Runoff=5.04 cfs  15,630 cf

Subcatchment POST 1C: Subcat POST 1C
  Runoff Area=37,314 sf  24.30% Impervious  Runoff Depth>4.36"
  Tc=6.0 min   CN=77   Runoff=4.37 cfs  13,561 cf

Subcatchment POST 1D: Subcat POST 1D
  Runoff Area=55,491 sf  51.52% Impervious  Runoff Depth>5.47"
  Tc=6.0 min   CN=87   Runoff=7.87 cfs  25,314 cf

Subcatchment POST 1E: Subcat POST 1E
  Runoff Area=25,851 sf  54.12% Impervious  Runoff Depth>4.80"
  Tc=6.0 min   CN=81   Runoff=3.30 cfs  10,341 cf

Subcatchment POST 3: Subcat POST 3
  Runoff Area=6,958 sf  0.00% Impervious  Runoff Depth>2.12"
  Tc=6.0 min   CN=55   Runoff=0.37 cfs  1,229 cf

Pond 1P: UC-1
  Peak Elev=87.70'  Storage=9,935 cf   Inflow=13.71 cfs  45,655 cf
  Discarded=0.26 cfs  15,115 cf   Primary=12.70 cfs  23,579 cf   Outflow=12.95 cfs  38,693 cf

Pond 13P: Basin
  Peak Elev=89.58'  Storage=21,474 cf   Inflow=28.63 cfs  74,864 cf
  Discarded=0.49 cfs  22,063 cf   Primary=22.48 cfs  39,880 cf   Outflow=22.97 cfs  61,944 cf

Link 14L: (new Link)
  Inflow=22.69 cfs  40,760 cf
  Primary=22.69 cfs  40,760 cf

Total Runoff Area = 233,013 sf   Runoff Volume = 99,050 cf   Average Runoff Depth = 5.10"
44.11% Pervious = 102,774 sf   55.89% Impervious = 130,239 sf
Summary for Subcatchment POST 1: Subcat POST 1

Runoff = 0.27 cfs @ 12.09 hrs, Volume = 880 cf, Depth > 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 100-Year Rainfall = 7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,397</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>1,822</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc</th>
<th>Length</th>
<th>Slope</th>
<th>Velocity</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1: Subcat POST 1

Hydrograph

Type III 24-hr 100-Year Rainfall = 7.00"
Runoff Area = 4,219 sf
Runoff Volume = 880 cf
Runoff Depth > 2.50"
Tc = 6.0 min
CN = 59
Summary for Subcatchment POST 1A: Subcat POST 1A

Runoff = 9.34 cfs @ 12.08 hrs, Volume= 32,094 cf, Depth> 6.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr  100-Year Rainfall=7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,385</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>4,861</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>53,917</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>8</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>60,171</td>
<td>95</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,246</td>
<td>10.38%</td>
<td>Pervious Area</td>
</tr>
<tr>
<td>53,925</td>
<td>89.62%</td>
<td>Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc</th>
<th>Length</th>
<th>Slope</th>
<th>Velocity</th>
<th>Capacity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1A: Subcat POST 1A

Hydrograph

Type III 24-hr 100-Year Rainfall=7.00"
Runoff Area=60,171 sf
Runoff Volume=32,094 cf
Runoff Depth>6.40"
Tc=6.0 min
CN=95
Summary for Subcatchment POST 1B: Subcat POST 1B

Runoff = 5.04 cfs @ 12.09 hrs, Volume= 15,630 cf, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>18,340</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>24,668</td>
<td>98</td>
<td>Paved parking, HSG A</td>
</tr>
<tr>
<td>43,008</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>18,340</td>
<td></td>
<td>42.64% Pervious Area</td>
</tr>
<tr>
<td>24,668</td>
<td></td>
<td>57.36% Impervious Area</td>
</tr>
</tbody>
</table>

Tc=6.0 min

Subcatchment POST 1B: Subcat POST 1B

Hydrograph

Type III 24-hr
100-Year Rainfall=7.00"
Runoff Area=43,008 sf
Runoff Volume=15,630 cf
Runoff Depth>4.36"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1C: Subcat POST 1C

Runoff = 4.37 cfs @ 12.09 hrs, Volume= 13,561 cf, Depth> 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr  100-Year Rainfall=7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>24,247</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>9,068</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>3,999</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>37,314</td>
<td>77</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>28,246</td>
<td></td>
<td>75.70% Pervious Area</td>
</tr>
<tr>
<td>9,068</td>
<td></td>
<td>24.30% Impervious Area</td>
</tr>
</tbody>
</table>

Tc = 6.0 min
Length = (feet)
Slope = (ft/ft)
Velocity = (ft/sec)
Capacity = (cfs)
Description

Subcatchment POST 1C: Subcat POST 1C

Hydrograph

Type III 24-hr
100-Year Rainfall=7.00"
Runoff Area=37,314 sf
Runoff Volume=13,561 cf
Runoff Depth>4.36"
Tc=6.0 min
CN=77
Summary for Subcatchment POST 1D: Subcat POST 1D

Runoff = 7.87 cfs @ 12.08 hrs, Volume= 25,314 cf, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>26,832</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>28,587</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>10</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>55,491</td>
<td>87</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>26,905</td>
<td></td>
<td>48.48% Pervious Area</td>
</tr>
<tr>
<td>28,587</td>
<td></td>
<td>51.52% Impervious Area</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 1D: Subcat POST 1D

Hydrograph

Type III 24-hr
100-Year Rainfall=7.00"
Runoff Area=55,491 sf
Runoff Volume=25,314 cf
Runoff Depth>5.47"
Tc=6.0 min
CN=87
Summary for Subcatchment POST 1E: Subcat POST 1E

Runoff = 3.30 cfs @ 12.09 hrs, Volume = 10,341 cf, Depth > 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs
Type III 24-hr 100-Year Rainfall = 7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,096</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>13,991</td>
<td>98</td>
<td>Roofs, HSG A</td>
</tr>
<tr>
<td>4,764</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>25,851</td>
<td>81</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>11,860</td>
<td></td>
<td>45.88% Pervious Area</td>
</tr>
<tr>
<td>13,991</td>
<td></td>
<td>54.12% Impervious Area</td>
</tr>
</tbody>
</table>

Tc | Length | Slope | Velocity | Capacity | Description
---|--------|-------|----------|----------|-------------------
6.0 |        |       |          |          | Direct Entry,

Subcatchment POST 1E: Subcat POST 1E

Hydrograph

Type III 24-hr
100-Year Rainfall = 7.00"
Runoff Area = 25,851 sf
Runoff Volume = 10,341 cf
Runoff Depth > 4.80"
Tc = 6.0 min
CN = 81
Summary for Subcatchment POST 3: Subcat POST 3

Runoff = 0.37 cfs @ 12.10 hrs, Volume= 1,229 cf, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.00"

<table>
<thead>
<tr>
<th>Area (sf)</th>
<th>CN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>57</td>
<td>49</td>
<td>50-75% Grass cover, Fair, HSG A</td>
</tr>
<tr>
<td>3,230</td>
<td>76</td>
<td>Gravel roads, HSG A</td>
</tr>
<tr>
<td>3,670</td>
<td>36</td>
<td>Woods, Fair, HSG A</td>
</tr>
<tr>
<td>6,958</td>
<td>55</td>
<td>Weighted Average</td>
</tr>
<tr>
<td>6,958</td>
<td>100.00% Pervious Area</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc (min)</th>
<th>Length (feet)</th>
<th>Slope (ft/ft)</th>
<th>Velocity (ft/sec)</th>
<th>Capacity (cfs)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Direct Entry,</td>
</tr>
</tbody>
</table>

Subcatchment POST 3: Subcat POST 3

Type III 24-hr 100-Year Rainfall=7.00"
Runoff Area=6,958 sf
Runoff Volume=1,229 cf
Runoff Depth>2.12"
Tc=6.0 min
CN=55

Hydrograph

Flow (cfs)

Type III 24-hr
100-Year Rainfall=7.00"
Runoff Area=6,958 sf
Runoff Volume=1,229 cf
Runoff Depth>2.12"
Tc=6.0 min
CN=55
Summary for Pond 1P: UC-1

Inflow Area = 97,486 sf, 64.62% Impervious, Inflow Depth > 5.62" for 100-Year event
Inflow = 13.71 cfs @ 12.08 hrs, Volume= 45,655 cf
Outflow = 12.95 cfs @ 12.11 hrs, Volume= 38,693 cf, Attenuation= 6%, Lag= 1.7 min
Discarded = 0.26 cfs @ 12.11 hrs, Volume= 15,115 cf
Primary = 12.70 cfs @ 12.11 hrs, Volume= 23,579 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 87.70' @ 12.11 hrs  Surf.Area= 3,346 sf  Storage= 9,935 cf

Plug-Flow detention time= 110.0 min calculated for 38,677 cf (85% of inflow)
Center-of-Mass det. time= 45.1 min (820.9 - 775.8)

<table>
<thead>
<tr>
<th>Volume</th>
<th>Invert</th>
<th>Avail.Storage</th>
<th>Storage Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1A</td>
<td>83.00'</td>
<td>2,570 cf</td>
<td>32.80'W x 102.00'L x 5.00'H Field A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16,728 cf Overall - 10,303 cf Embedded = 6,425 cf x 40.0% Voids</td>
</tr>
<tr>
<td>#2A</td>
<td>83.50'</td>
<td>7,760 cf</td>
<td>Concrete Galley 4x4x4 x 175 Inside #1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Inside= 42.0&quot;W x 43.0&quot;H =&gt; 12.67 sf x 3.50'L = 44.3 cf</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outside= 52.8&quot;W x 48.0&quot;H =&gt; 14.72 sf x 4.00'L = 58.9 cf</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7 Rows of 25 Chambers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10,330 cf</td>
<td>Total Available Storage</td>
</tr>
</tbody>
</table>

Storage Group A created with Chamber Wizard

<table>
<thead>
<tr>
<th>Device</th>
<th>Routing</th>
<th>Invert</th>
<th>Outlet Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Primary</td>
<td>86.50'</td>
<td>12.0&quot; Vert. Orifice/Grate C= 0.600</td>
</tr>
<tr>
<td>#2</td>
<td>Primary</td>
<td>86.50'</td>
<td>12.0&quot; Vert. Orifice/Grate C= 0.600</td>
</tr>
<tr>
<td>#3</td>
<td>Primary</td>
<td>86.50'</td>
<td>12.0&quot; Vert. Orifice/Grate C= 0.600</td>
</tr>
<tr>
<td>#4</td>
<td>Primary</td>
<td>86.50'</td>
<td>12.0&quot; Vert. Orifice/Grate C= 0.600</td>
</tr>
<tr>
<td>#5</td>
<td>Discarded</td>
<td>83.00'</td>
<td>2.410 in/hr Exfiltration over Wetted area</td>
</tr>
</tbody>
</table>

Discarded OutFlow Max=0.26 cfs @ 12.11 hrs  HW=87.70'  (Free Discharge)

Primary OutFlow Max=12.69 cfs @ 12.11 hrs  HW=87.70'  (Free Discharge)
Pond 1P: UC-1 - Chamber Wizard Field A

Chamber Model = Concrete Galley 4x4x4 (Concrete Galley, UCPI 4x4x4 Galley or equivalent)
Inside = 42.0"W x 43.0"H => 12.67 sf x 3.50'L = 44.3 cf
Outside = 52.8"W x 48.0"H => 14.72 sf x 4.00'L = 58.9 cf

25 Chambers/Row x 4.00' Long = 100.00' Row Length + 12.0" End Stone x 2 = 102.00' Base Length
7 Rows x 52.8" Wide + 12.0" Side Stone x 2 = 32.80' Base Width
6.0" Base + 48.0" Chamber Height + 6.0" Cover = 5.00' Field Height

175 Chambers x 44.3 cf = 7,760.3 cf Chamber Storage
175 Chambers x 58.9 cf = 10,303.4 cf Displacement

16,728.0 cf Field - 10,303.4 cf Chambers = 6,424.6 cf Stone x 40.0% Voids = 2,569.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,330.2 cf = 0.237 af
Overall Storage Efficiency = 61.8%
Overall System Size = 102.00' x 32.80' x 5.00'

175 Chambers @ $ 300.00 /ea = $ 52,500.00
619.6 cy Field Excavation @ $ 10.00 /cy = $ 6,195.56
237.9 cy Stone @ $ 30.00 /cy = $ 7,138.49
Total Cost = $ 65,834.05
Summary for Pond 13P: Basin

[81] Warning: Exceeded Pond 1P by 2.45’ @ 18.06 hrs

Inflow Area = 221,836 sf, 58.71% Impervious, Inflow Depth > 4.05” for 100-Year event

<table>
<thead>
<tr>
<th></th>
<th>Inflow</th>
<th>Volume</th>
<th>Outflow</th>
<th>Volume</th>
<th>Discarded</th>
<th>Volume</th>
<th>Primary</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>28.63 cfs @ 12.09 hrs</td>
<td>74,864 cf</td>
<td>22.97 cfs @ 12.16 hrs</td>
<td>61,944 cf</td>
<td>0.49 cfs @ 12.16 hrs</td>
<td>22,063 cf</td>
<td>22.48 cfs @ 12.16 hrs</td>
<td>39,880 cf</td>
</tr>
</tbody>
</table>

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 89.58’ @ 12.16 hrs  Surf.Area= 8,764 sf  Storage= 21,474 cf

Plug-Flow detention time= 119.9 min calculated for 61,918 cf (83% of inflow)
Center-of-Mass det. time= 62.0 min ( 852.8 - 790.7 )

Volume Invert Avail.Storage Storage Description

| #1  | 86.00’ | 24,764 cf | Custom Stage Data (Conic) Listed below |

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>86.00</td>
<td>3,183</td>
<td>0</td>
<td>0</td>
<td>3,183</td>
</tr>
<tr>
<td>88.00</td>
<td>6,205</td>
<td>9,221</td>
<td>9,221</td>
<td>6,243</td>
</tr>
<tr>
<td>90.00</td>
<td>9,451</td>
<td>15,543</td>
<td>24,764</td>
<td>9,548</td>
</tr>
</tbody>
</table>

Device Routing Invert Outlet Devices

| #1 Discarded | 86.00’ | 2.410 in/hr Exfiltration over Surface area 18.0’ long x 0.8’ breadth Broad-Crested Rectangular Weir |
| #2 Primary   | 89.00’ | Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50  
|               |        | Coef. (English) 2.74 2.78 2.86 3.00 3.11 3.18 3.25 3.29 3.32 3.31 3.32 |

Discarded OutFlow Max=0.49 cfs @ 12.16 hrs  HW=89.58’ (Free Discharge)  
1=Exfiltration (Exfiltration Controls 0.49 cfs)

Primary OutFlow Max=22.43 cfs @ 12.16 hrs  HW=89.58’ (Free Discharge)  
2=Broad-Crested Rectangular Weir (Weir Controls 22.43 cfs @ 2.16 fps)
Pond 13P: Basin

Hydrograph

- Inflow Area: 221,836 sf
- Peak Elev: 89.58'
- Storage: 21,474 cf

- Discharge: 28.63 cfs
- Discharge: 22.97 cfs
- Discharge: 22.48 cfs
- Discharge: 0.49 cfs

Pond 13P: Basin

Stage-Discharge

- Exfiltration
- Broad-Crested Rectangular Weir

- Total Discharge
- Discarded
- Primary

Elevation (feet)

- 86
- 87
- 88
- 89
- 90

Discharge (cfs)

- 0
- 10
- 20
- 30
- 40
- 50
Pond 13P: Basin

Stage-Area-Storage

Surface/Horizontal/Wetted Area (sq-ft)

Storage (cubic-feet)

Elevation (feet)
Summary for Link 14L: (new Link)

Inflow Area = 226,055 sf, 57.61% Impervious, Inflow Depth > 2.16" for 100-Year event
Inflow = 22.69 cfs @ 12.16 hrs, Volume = 40,760 cf
Primary = 22.69 cfs @ 12.16 hrs, Volume = 40,760 cf, Atten = 0%, Lag = 0.0 min

Primary outflow = Inflow, Time Span = 0.00-24.00 hrs, dt = 0.01 hrs

Link 14L: (new Link)