

Stormwater Management System Report

PLUMBERS SUPPLY COMPANY

PROPOSED OFFICE/WAREHOUSE FACILITY

FLAHERTY DRIVE

NEW BEDFORD, MASSACHUSETTS

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Preface

Stormwater Management Standards Compliance Checklist



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

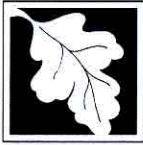
In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

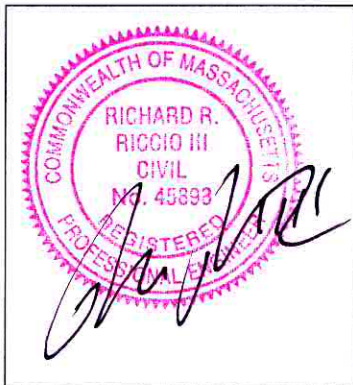
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date  3/21/18

Checklist

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

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic 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 for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the 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) NOT APPLICABLE

- ☐ 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 NOT APPLICABLE

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable **NOT APPLICABLE**

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☐ Name of the stormwater management system owners;
 - ☐ Party responsible for operation and maintenance;
 - ☐ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☐ Description and delineation of public safety features;
 - ☐ Estimated operation and maintenance budget; and
 - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

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Section 1

Hydrologic Overview

1.0 INTRODUCTION

1.1 Project Description

The applicant is proposing to construct an approximate 175,000 square foot warehouse facility with associated office space with on a vacant parcel of land located at the end of Flaherty Drive in the New Bedford Business Park. The project will consist of construction of the building, proposed parking and loading areas, associated stormwater management facilities and utilities. The applicants are proposing construction of this building to relocate and expand their existing operations currently located on Church Street in New Bedford to a new and larger facility. The facility will be serviced by an on-site stormwater management system and will tie into existing sewer and water utilities currently available in Flaherty Drive.

The majority of the new paved surfaces on the site will be serviced by an on-site stormwater management system consisting of a combination a closed conduit drainage system, sediment forebays and a substantial detention/infiltration system. The roof drainage will be directed to the large detention/infiltration system to be constructed to the rear of the proposed building.

The stormwater management system has been designed to accept and treat the projected stormwater flows from development in accordance with the current DEP Stormwater Management Standards. As part of the new DEP Stormwater Management Standards and Regulations, the DEP is requiring Low Impact Development (LID) measures to be considered in the design of the project. The project, as proposed, does make use of certain LID measures including the bio-retention areas and extended detention/infiltration basins being proposed through the site

In the present condition, the site supports a wetland resource area as defined in the Wetlands Protection Act and 310 CMR 10.00 surrounding the property on three sides. The resource areas have been previously reviewed and approved by the Conservation Commission and the Department of Environmental Protection under an Order of Resource Area and we will be requesting an updated approval of the line through the filing of a Notice of Intent.

The specific resource areas specific to the subject parcel are as follows:

- Bordering Vegetated Wetland

1.2 Hydrologic Overview

A hydrologic analysis for the pre and post developed conditions for the project site has been prepared and is submitted in the following sections of this report. The primary goal of this analysis is to evaluate and mitigate the potential impacts of the proposed development to the adjacent properties, roadway drainage systems, and on-site wetland resource areas. Particular consideration has been given to stormwater quantity and quality at the existing bordering vegetated wetland system which surrounds the property, which is considered as the sole Analysis Point for the stormwater management calculations.

The analysis of the present condition and the proposed condition hydrology includes a calculated estimation of the runoff volume and peak storm flow rates from the site for each individual drainage area. The HydroCAD hydrologic program, developed by Applied Microcomputer Systems, was utilized in the preparation of the stormwater runoff models. The HydroCAD software is based upon the Soil Conservation Service, "Technical Release 20 – Urban Hydrology for Small Watersheds" and is a generally accepted industry standard methodology.

An analysis was performed for the 2, 10, 25, and 100-year frequency rainfall events. These events were based on a 24-hour duration storm with a SCS Type III storm distribution curve. Time of Concentration (Tc) values and runoff curve numbers (CN) were developed for each of the calculated existing and proposed drainage areas based upon prevalent topographic patterns, ground cover conditions, and SCS Hydrologic Soil Group classifications.

The hydrologic study area of the pre-developed condition consists of one (1) watershed areas with one analysis point as described above. The hydrologic study area in the post-developed condition consists of three (3) watershed areas with the same analysis point corresponding to the pre-development model. The pre and post development watershed areas and corresponding analysis points are described in the following sections and shown on the Watershed Plans submitted in Appendix A.

The Bristol County Soil Conservation Service (SCS) mapping for this area indicates a single soil type soil type over the subject parcel. The predominant soil classification is as follows:

- Woodbridge Fine Sandy Loam (312B), 0 to 8 percent slopes, extremely stony – Hydrologic Soil Group C

1.3 Pre-Development Hydrologic Summary

In the present condition, the site is comprised of one (1) watershed areas as shown on the attached Pre-Development Watershed Plan. The watershed designations and corresponding analysis points are as follows:

- Subcatchment PRE 1 is a 27.0 area consisting of the subject watershed area which currently flows unattenuated towards the bordering vegetated wetland system surrounding the site. This wetland system is being considered as Analysis Point 1 (AP-1) in the Pre-Development Hydrologic Calculations. The Time of Concentration for Subcatchment PRE 1 was estimated at 25.7 minutes and the CN was estimated to be 70.

A summary of the Pre-Development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.3 below.

Table 1.3 – Pre-Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	16.65
10-year storm	33.09
25-year storm	44.29
100-year storm	64.99

1.4 Post Development Hydrologic Summary

In the developed condition, the site is comprised of three (3) watershed areas as shown on the attached Post Development Watershed Plan. The designated post-development analysis point corresponds to the previously described pre-development analysis points. The watershed designations and corresponding analysis point for each of the post development watersheds are as follows:

- Subcatchment POST 1 is a 8.7-acre portion of the overall watershed area consisting of the areas of the site including the office portion of the proposed building, proposed parking and loading areas, and landscaped areas around the building which will flow through a closed conduit drainage system to a sediment forebay ahead of an extended detention/infiltration basin (POND 1) which will discharge runoff at a controlled rate to the bordering vegetated wetland system, taken as Analysis Point 1 (AP-1) in the Post Development Hydrologic Analysis. The Time of Concentration for POST 1 was estimated at 18.4 minutes and the CN was estimated at 89.
- Subcatchment POST 1A is a 3.6-acre portion of the overall watershed areas consisting of the roof area of warehouse portion of the building which will flow to a subsurface recharge trench (RECH 1) prior to overtopping and discharging towards the extended detention/infiltration basin (POND 1). The Time of Concentration for POST 1A was estimated at 6.0 minutes and the CN was estimated at 98.
- Subcatchment POST 2 is a 13.1-acre portion of the overall watershed area of the undeveloped portions of the lot that will continue to flow unattenuated towards the bordering vegetated wetland system taken as Analysis Point 1 (AP-1) in the Post Development Hydrologic Analysis. The Time of Concentration for POST 2 was estimated at 22.3 minutes and the CN was estimated at 72.

A summary of the post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.4 below.

Table 1.4 – Post Development Hydrologic Summary

Storm Event	Analysis Point AP-1 Rate of Flow (c.f.s.)
2-year storm	10.78
10-year storm	22.63
25-year storm	31.88
100-year storm	49.04

A summary of the pre and post-development hydrologic conditions for the 2, 10, 25, and 100-year storm events is submitted in Table 1.5 below. Results shown as a “negative” represent a decrease in post development condition rates of runoff.

Table 1.5 – Pre-Post Development Hydrologic Results

Storm Event	Analysis Point AP-1 Rate of Flow
2-year storm	-35.3%
10-year storm	-31.6%
25-year storm	-28.0%
100-year storm	-24.5%

The hydrologic analysis indicates that the stormwater management system design for the site meets or reduces peak runoff rates for the 2, 10, 25, and 100-year, 24-hour, Type III storm events from the pre developed levels at the subject analysis point. The analysis shows the proposed development of this project area will not result in an increase in the rates of runoff from the project site.

1.5 Stormwater Management System Summary

The proposed stormwater management system incorporates a number of Best Management Practices (BMPs), as prescribed in the Department of Environmental Protection Stormwater Management Handbook. These practices include structural and non-structural measures providing stormwater quantity and quality management. These BMPs will function to minimize potential adverse water quality impacts to the surrounding wetland ecosystem. The following sections describe the temporary and permanent stormwater BMPs proposed for the site development.

The proposed stormwater management plan has been developed based on the projected site conditions and the present condition of the water resource areas that receive stormwater runoff from the site. The proposed BMPs have been designed to comply with the Massachusetts Stormwater Management Handbook.

The existing and proposed paved and impervious areas on the developed lot are the primary target area for water quantity and quality control measures for the project. The goal of the proposed stormwater management system design was to provide the necessary water quality treatment and attenuation for all of the runoff generated in proposed conditions. The stormwater management system makes use of a variety of stormwater Best Management Practices (BMP's) to meet this objective. These BMP's are described in more detail in the follow section.

Runoff from the majority of the site will flow through sediment forebays and an extended detention/infiltration basin with a flow control structure and overflow riprap spillway which will serve to reduce the rates of runoff to the subject analysis point. A portion of the roof area will also flow through a roof drain recharge trench prior to discharging to the extended detention/infiltration basin for additional recharge. The predicted Total Suspended Solids (TSS) Removal and Water Quality calculations for these areas are submitted in Section 4. Calculations have been provided to show that the proposed stormwater management system will provide more than adequate water quality volume and recharge volume for proposed paved and impervious areas on the developed portions of the lot, prior to discharge to the surrounding wetland system.

1.6 Select Structural Best Management Practices (BMP's)

Hooded Catch Basins with Deep Sumps

Stormwater from portions of the paved parking and driveway areas will be collected in a closed conduit piping system fitted with 4-foot deep sump catch basins with hooded outlets. Catch basin sump systems are effective devices for removal of large matter and pollutants that adsorb to sediments and other particulates. Catch basins with sumps and hooded outlets are designed to trap sediment particles and floating contaminants (e.g., oil and greases), that are typically the most significant constituents of the urban runoff pollutant load. Regular maintenance and cleaning of catch basins is required to assure adequate performance of these structures. A specific maintenance schedule is submitted in this document and on the plans.

Extended Detention/Infiltration Basins with Sediment Forebay

Runoff from the proposed paved parking and paved material storage areas will be conveyed to a sediment forebay in advance a new extended detention/infiltration basin wetland system. The forebays are designed to accept a minimum 0.10 inch per contributing acre of watershed area and are approximately 2.0 feet deep. The extended detention basins have been designed with sediment traps to extend the detention time of runoff within the basins and to enhance sediment deposition. Water quality treatment will be provided by capturing the required water quality volume (0.5 inch of runoff over the contributing paved area) within the bottom area of the basin (below the lowest outfall), trapping particulates and allowing treated stormwater to settle and slowly infiltration into the ground. The detention stage of the basin will serve to attenuate flow rates and, through extended detention time, provide for additional treatment and pollutant removal. Dead storage volume below the lowest outfall from the basin will provide the necessary recharge volumes for the site. Storage volume above the outfall culvert will provide attenuation of the runoff for larger storm events.

1.7 Select Non-Structural Best Management Practices (BMP's)

Pavement Sweeping Program

All paved surfaces will be swept twice annually (fall and spring). The sweeping program will remove contaminants directly from the paved surfaces before their release into the stormwater runoff. The U.S. Environmental Protection Agency has determined that pavement sweeping can be an effective initial treatment for reducing pollutant loading into stormwater runoff.

Stormwater Management System Maintenance Program

All structural components of the stormwater management system will be inspected and maintained on a regular basis in accordance with the requirements of the Stormwater Management Policy. A detailed Stormwater Management System Operation and Maintenance Plan has been prepared in accordance with the Stormwater Management Standards and Stormwater Management Handbook prepared by the Massachusetts Department of Environmental Protection.

1.8 Regulatory Compliance

The Massachusetts Stormwater Handbook, Volume 3 (February, 2008), has been used as the primary guidance for the selection and design of permanent non-structural and structural BMPs for the long-term protection of existing wetland and water resources. The Stormwater Management Plan developed for this project incorporates water quantity and quality controls that will protect surface and groundwater resources, wetlands and adjacent properties

from potential impacts due to increased impervious areas on the site. The Stormwater Management Plan also incorporates select LID measures in accordance with the new Stormwater Management Policies.

The stormwater performance standards developed by the DEP and a brief discussion on how the proposed project will achieve the standards are provided below. The Stormwater Management System Compliance Certification and Checklist has been included as the Preface to this Report.

Standard 1. No new stormwater conveyances may discharge untreated stormwater directly to, or cause erosion in wetlands or waters of the Commonwealth.

- No proposed site stormwater conveyance system will discharge untreated stormwater runoff directly to wetlands. Stormwater runoff from the paved surfaces and parking areas will be collected and treated by a closed conduit pipe system consisting of one or a series of structural BMPs including deep sump/hooded catch basins, sediment forebays, and an extended detention/infiltration basin. Riprap pads and level spreader spillways have been installed at the point of discharge of all drainage outfalls to eliminate potential erosive flow velocities and dissipate the energy of the discharged stormwater, thereby avoiding sedimentation to the downgradient areas.

Standard 2. Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.

- The storage volume within the extended detention/infiltration basin will serve to limit the peak rates of stormwater runoff at or below pre development levels for the 2-, 10-, 25- and 100-year storm events. Refer to the Calculations in Sections 2 & 3 for additional information.

Standard 3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of 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.

- Provisions for groundwater recharge have been provided via the dead storage within the bottom area of substantial extended detention/infiltration basin being proposed on the site. Additional recharge volume is being provided within a crushed stone recharge trench which is accepting the roof runoff from the large warehouse portion of the facility.

Standard 4. 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.**
- The 80 percent TSS removal rate will be achieved with the implementation of a street sweeping program, deep sump/hooded catch basins, and/or extended detention/infiltration basins. The aggregate total of both structural

and non-structural BMPs will meet or exceed the target 80% removal rate. Detailed TSS removal calculations are submitted in Section 4. Pavement sweeping has also been incorporated into the Operation and Maintenance Plan shown on the plans and will be a requirement of the approval.

Standard 5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

- No portion of the proposed project would be considered a land use with higher potential pollutant loads.

Standard 6. Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

- The project does not discharge within a Critical Area as defined in the Stormwater Management Standards.

Standard 7. 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.

- No portion of the project would be considered a redevelopment project in accordance with the Stormwater Management Standards.

Standard 8. 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 development will incorporate erosion and sedimentation controls to minimize the potential for sedimentation in down gradient resources. These controls will include hay bales/silt fence barriers, and slope stabilization measures such as hay/straw blankets and jute matting. The proponent will complete a Stormwater Pollution Prevention Plan prior to construction in accordance with the NPDES General Permit for Stormwater Discharges associated with Construction Projects and this SWPPP will also be used as the plan to meet this standard.

Standard 9. A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

- The Stormwater Management Plan for this project has been developed in full compliance with the DEP Stormwater Management Policy. The Plan is based on a multi-dimensional approach to stormwater management that recognizes the need for proper site planning, source control of potential contaminants, and implementation of structural and non-structural treatment methods to ensure the protection of water resources in the vicinity of the site and adjacent properties. The Stormwater Operation and Maintenance Plan is provided on the construction drawings. A more detailed Long-Term Operation and Maintenance Plan is also included in the following sections.

Standard 10. Illicit Discharges to the Stormwater Management System are prohibited.

- An Illicit Discharge Compliance Statement has been completed and is included as an Appendix to this report.

1.8 Post Construction Operation and Maintenance Plan

Name and current address of the Applicant

Plumbers Supply Company, Inc.
429 Church Street
New Bedford, Massachusetts, 02745

Name and address of the Contractor of Record

To be determined and provided to Conservation Commission upon selection.

Plans of Record

Refer to Site Development Plans prepared for Raw Seafoods Inc. by Field Engineering and last dated 3/16/18 for locations of all BMP's on site as well as construction details of all BMP's. Refer to the Order of Conditions to be issued by the New Bedford Conservation Commission for additional information regarding the operation and maintenance of the stormwater management BMP's on site.

1. The contractor shall be responsible for the proper inspection and maintenance of all stormwater management facilities until such time as the Stormwater Management System is accepted by the Owner. Thereafter the Owner shall be responsible for the proper inspection and maintenance of the stormwater facilities in accordance with this Operation and Maintenance Plan as well as the continuing conditions of the Certificate of Compliance on the property.
2. All Structural Best Management Practices (BMP's) including the catch basins, and subsurface infiltration systems should be inspected after every major rainfall event exceeding 1.0-inch for the first 6 months after construction to ensure proper stabilization and construction.
3. Thereafter, regular BMP inspections should be conducted according to the following schedule:

<u>BMP Structure</u>	<u>Inspections per Year</u>
Deep Sump Catch Basins	4
Extended Detention/Infiltration Basins	2
Subsurface Recharge System	1

4. The owner shall maintain and submit to the Conservation Commission upon request a BMP Inspection Report following each site inspection as recommended above. The BMP Inspection report shall identify the Date of Inspection, the name and contact number of the responsible party, specific structures inspected, specific maintenance required and observations at a minimum, inspection reports should address the following conditions where applicable:
 1. Embankment Subsidence
 2. Erosion
 3. Cracking of Containment Berm
 4. Inlet/Outlet Conditions
 5. Sediment Accumulations
 6. Slope Stability

5. Accumulated silt and sediment should be removed four times a year for sediment forebays and grassed swale or more frequently if accumulated depth of sediment exceeds six inches at the proposed stone check dams. Accumulated silt and sediment should be removed at least once a year for deep sump catch basins or more frequently if accumulated depth of sediment exceeds six inches.
6. All removed sediments are to be properly disposed of at a location to be approved by the Board of Health. Transportation and disposal of sediments shall comply with all applicable local, state, and federal regulations.
7. The driveway and parking areas shall be swept at least twice per year.
8. The extended detention/infiltration basin, sediment forebays and all landscaped areas should be inspected for trash on a monthly basis. Any accumulated trash, litter and discarded materials shall be removed.
9. Snow will be stockpiled within and around areas which drain into the stormwater management system wherever practicable. Catch basin grates will be cleaned of snow and ice after all snowfall events. The discharge of snow directly into the wetland resource areas will be prohibited.
10. No disposal of materials will be permitted within the any of the stormwater management system BMP's. This prohibition applies to trash, fill material, construction debris, grass clippings, collected leaves, and cut branches.
11. The embankments, side slopes, and bottom areas of the extended detention/infiltration basin and sediment forebay areas shall be mowed at least twice annually to facilitate maintenance of the basin.
12. An Operation and Maintenance Inspection Form shall be developed and copies of the completed forms shall be compiled by the Owner. These forms shall be available for review by the Conservation Commission upon request.
13. The Owner shall contract with a maintenance company on an annual basis that will be responsible for the operation and maintenance of the stormwater management system. The contact information for this company shall be provided to the Conservation Commission for their files.
14. The storm water BMP's will be inspected annually during regularly scheduled mid-summer landscaping and weeding operations for invasive or unwanted plants. If invasive species are found, they will be physically uprooted and removed from the area.

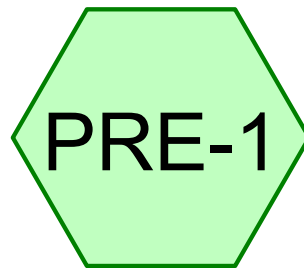
Invasive Species Control Plan (ISCP)

The owner will monitor the extended detention/infiltration basins and sediment forebays pursuant to the recommendations outlined in the USACE document titled "New England District Compensatory Mitigation Guidance" document, pages 24-26 section 4.f. Invasive Species.. Due to the proximity of the extended detention/infiltration system to the existing bordering vegetated wetland, the applicant has chosen a mechanical control method of removal. Invasive species will be removed by hand (pulling, mowing or excavating on-site). No chemical control will be utilized.

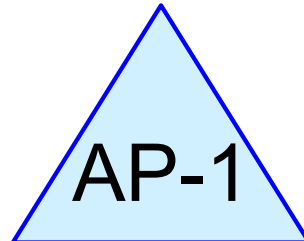
Special attention will be given to assure that none of the following invasive species populate the storm water BMP's: common reed (*Phragmites australis*), Purple loosestrife (*Lythrum salicaria*), Smooth and Common buckthorn (*Frangula alnus*, *Rhamnus carthartica*), Russian and Autumn olives (*Elaeagnus angustifolia* and *E. umbellata*), Multiflora rose (*Rosa multiflora*), Reed canary-grass (*Phalaris arundinacea*), and Japanese knotweed (*Fallopia japonica*).

Section 2

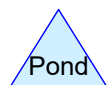
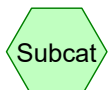
Pre Development Hydrologic Analysis



Pre Development Area 1



Surrounding Wetland
System



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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
25,528	89	Gravel roads, HSG C (PRE-1)
1,077,538	70	Woods, Good, HSG C (PRE-1)
1,103,066	70	TOTAL AREA

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Type III 24-hr 2 YR Rainfall=3.50"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PRE-1: Pre Development Runoff Area=1,103,066 sf 0.00% Impervious Runoff Depth=1.01"
Flow Length=1,318' Tc=25.7 min CN=70 Runoff=16.65 cfs 92,667 cf

Pond AP-1: Surrounding Wetland System

Inflow=16.65 cfs 92,667 cf

Primary=16.65 cfs 92,667 cf

Total Runoff Area = 1,103,066 sf Runoff Volume = 92,667 cf Average Runoff Depth = 1.01"
100.00% Pervious = 1,103,066 sf 0.00% Impervious = 0 sf

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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment PRE-1: Pre Development Area 1

Runoff = 16.65 cfs @ 12.40 hrs, Volume= 92,667 cf, Depth= 1.01"

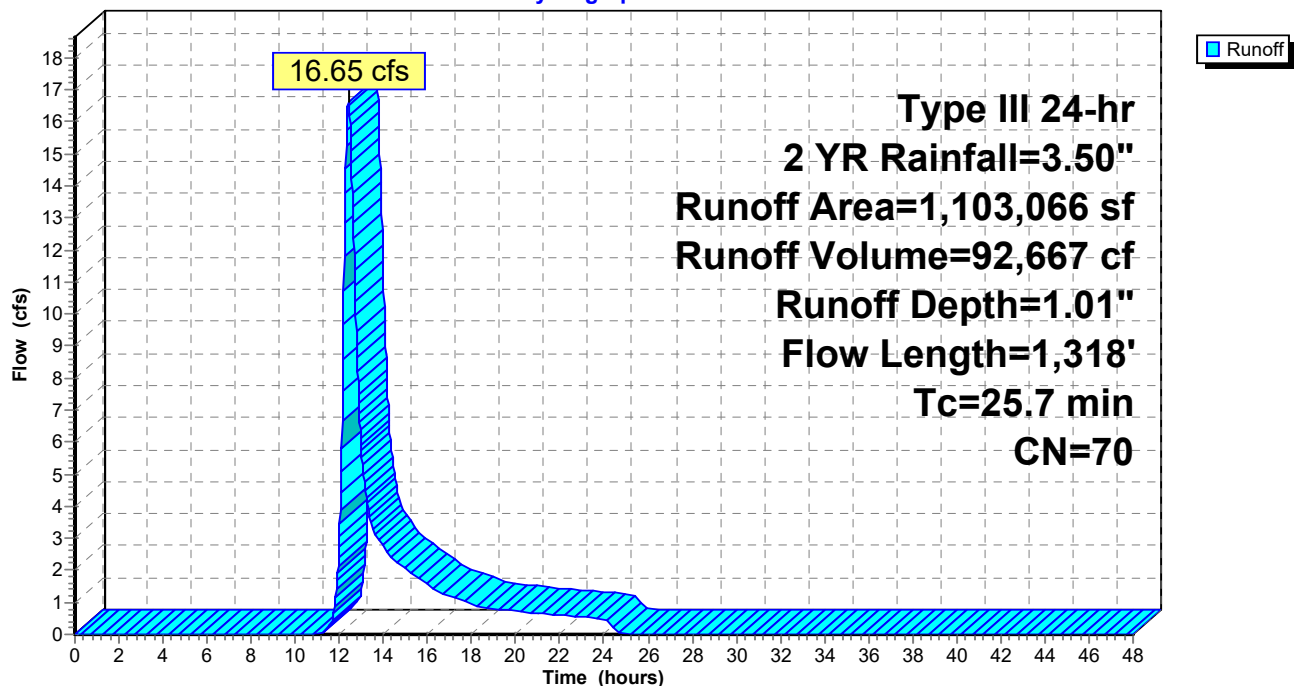
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
1,077,538	70	Woods, Good, HSG C
25,528	89	Gravel roads, HSG C
1,103,066	70	Weighted Average
1,103,066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.50"
10.1	1,268	0.0170	2.10		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
25.7	1,318	Total			

Subcatchment PRE-1: Pre Development Area 1

Hydrograph

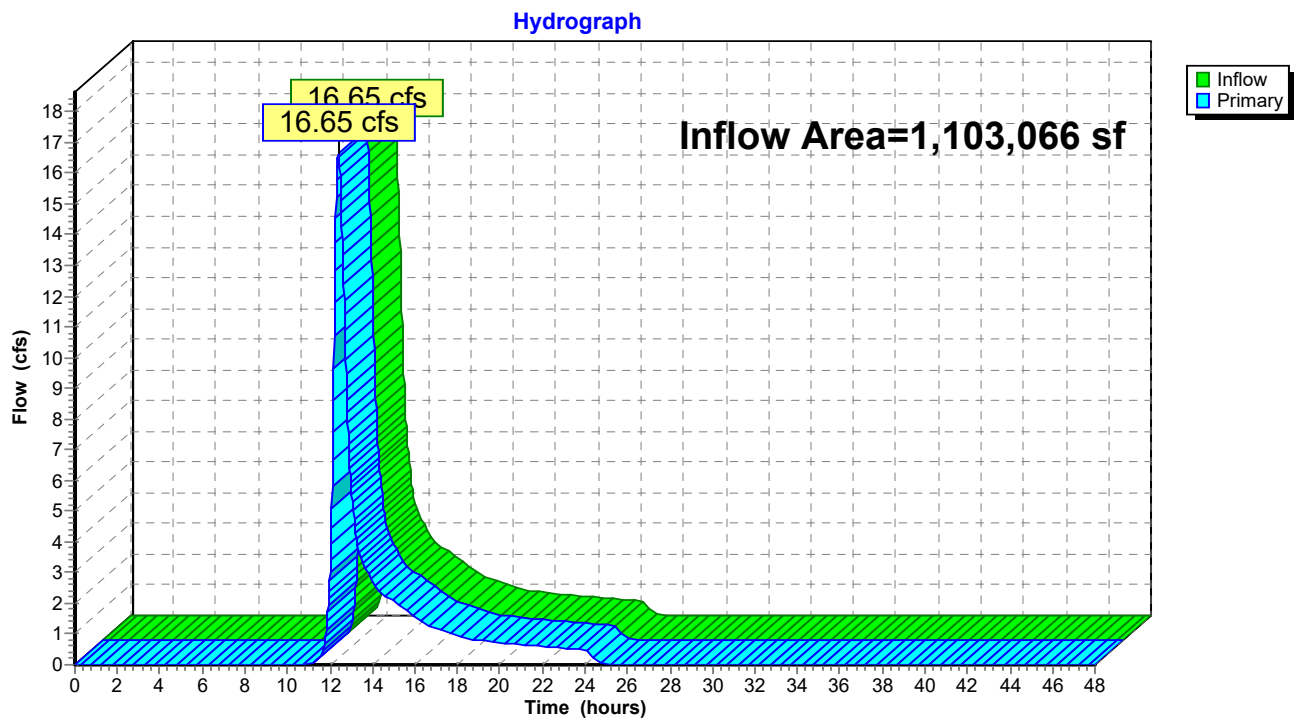


Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,103,066 sf, 0.00% Impervious, Inflow Depth = 1.01" for 2 YR event
Inflow = 16.65 cfs @ 12.40 hrs, Volume= 92,667 cf
Primary = 16.65 cfs @ 12.40 hrs, Volume= 92,667 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System

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Type III 24-hr 10 YR Rainfall=4.80"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PRE-1: Pre Development Runoff Area=1,103,066 sf 0.00% Impervious Runoff Depth=1.89"
Flow Length=1,318' Tc=25.7 min CN=70 Runoff=33.09 cfs 173,667 cf

Pond AP-1: Surrounding Wetland System

Inflow=33.09 cfs 173,667 cf
Primary=33.09 cfs 173,667 cf

Total Runoff Area = 1,103,066 sf Runoff Volume = 173,667 cf Average Runoff Depth = 1.89"
100.00% Pervious = 1,103,066 sf 0.00% Impervious = 0 sf

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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment PRE-1: Pre Development Area 1

Runoff = 33.09 cfs @ 12.37 hrs, Volume= 173,667 cf, Depth= 1.89"

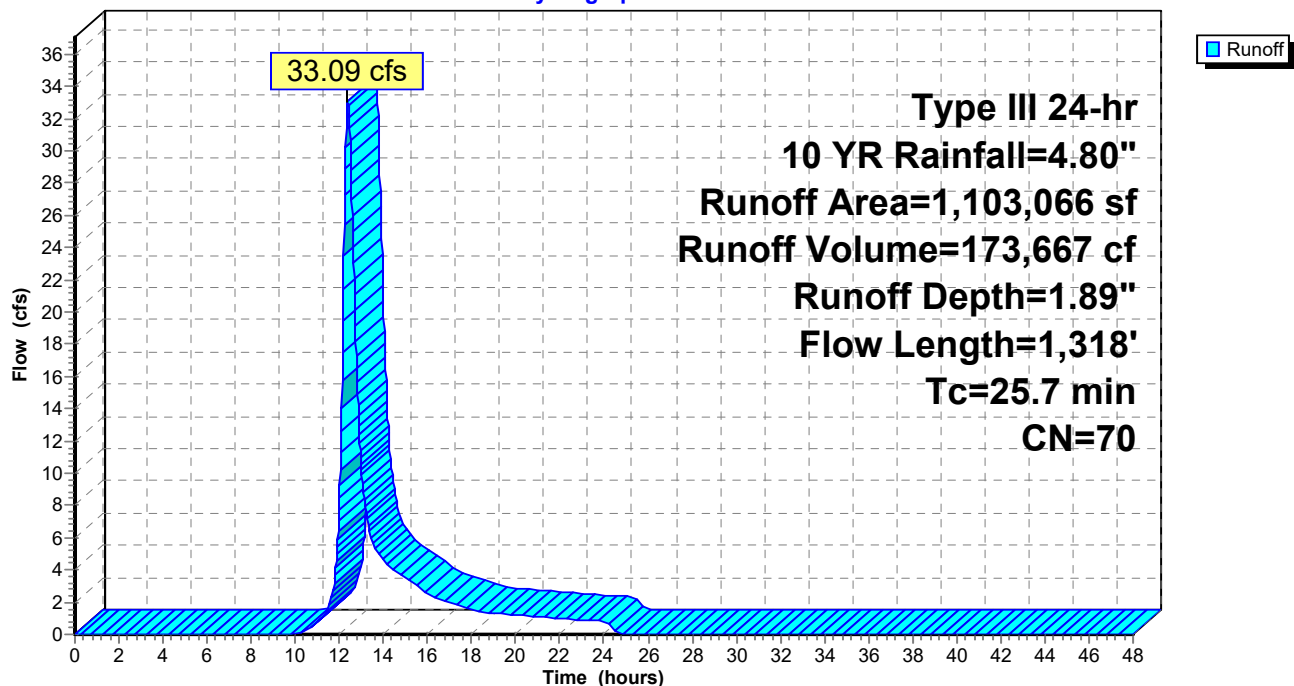
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
1,077,538	70	Woods, Good, HSG C
25,528	89	Gravel roads, HSG C
1,103,066	70	Weighted Average
1,103,066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.50"
10.1	1,268	0.0170	2.10		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
25.7	1,318	Total			

Subcatchment PRE-1: Pre Development Area 1

Hydrograph



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Type III 24-hr 10 YR Rainfall=4.80"

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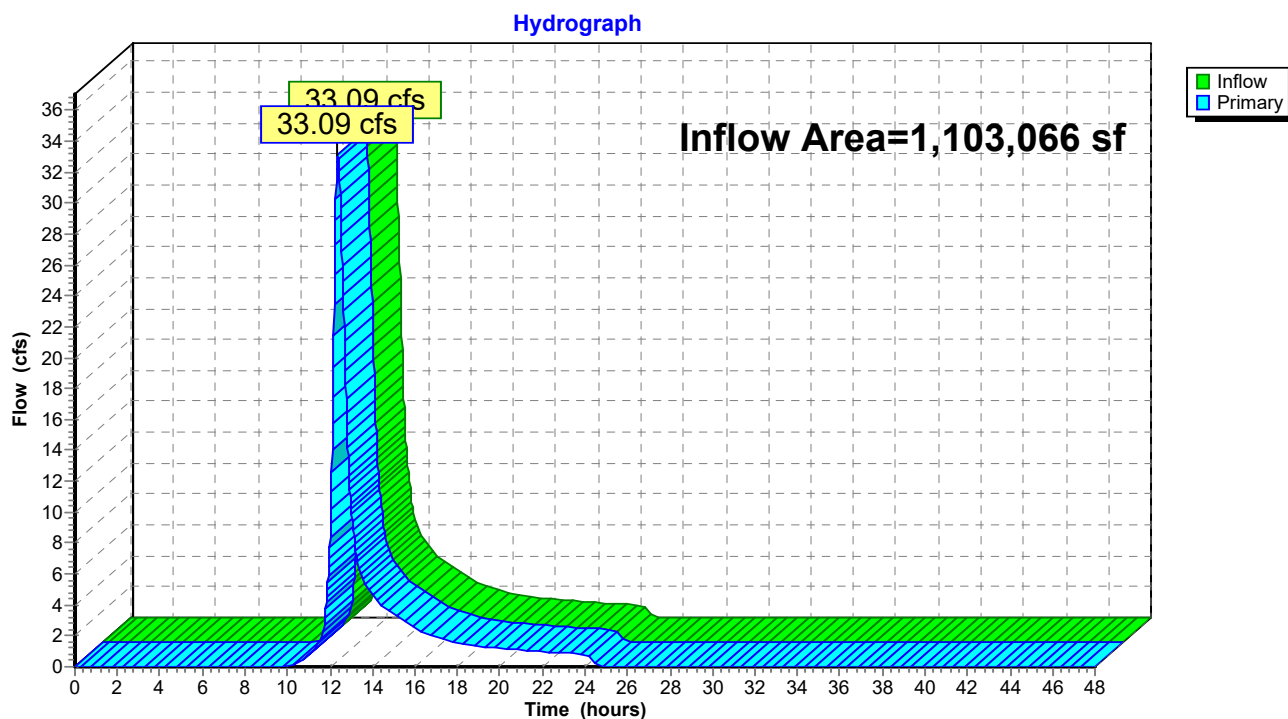
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,103,066 sf, 0.00% Impervious, Inflow Depth = 1.89" for 10 YR event
Inflow = 33.09 cfs @ 12.37 hrs, Volume= 173,667 cf
Primary = 33.09 cfs @ 12.37 hrs, Volume= 173,667 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 25 YR Rainfall=5.60"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PRE-1: Pre Development Runoff Area=1,103,066 sf 0.00% Impervious Runoff Depth=2.49"
Flow Length=1,318' Tc=25.7 min CN=70 Runoff=44.29 cfs 229,024 cf

Pond AP-1: Surrounding Wetland System

Inflow=44.29 cfs 229,024 cf
Primary=44.29 cfs 229,024 cf

Total Runoff Area = 1,103,066 sf Runoff Volume = 229,024 cf Average Runoff Depth = 2.49"
100.00% Pervious = 1,103,066 sf 0.00% Impervious = 0 sf

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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment PRE-1: Pre Development Area 1

Runoff = 44.29 cfs @ 12.37 hrs, Volume= 229,024 cf, Depth= 2.49"

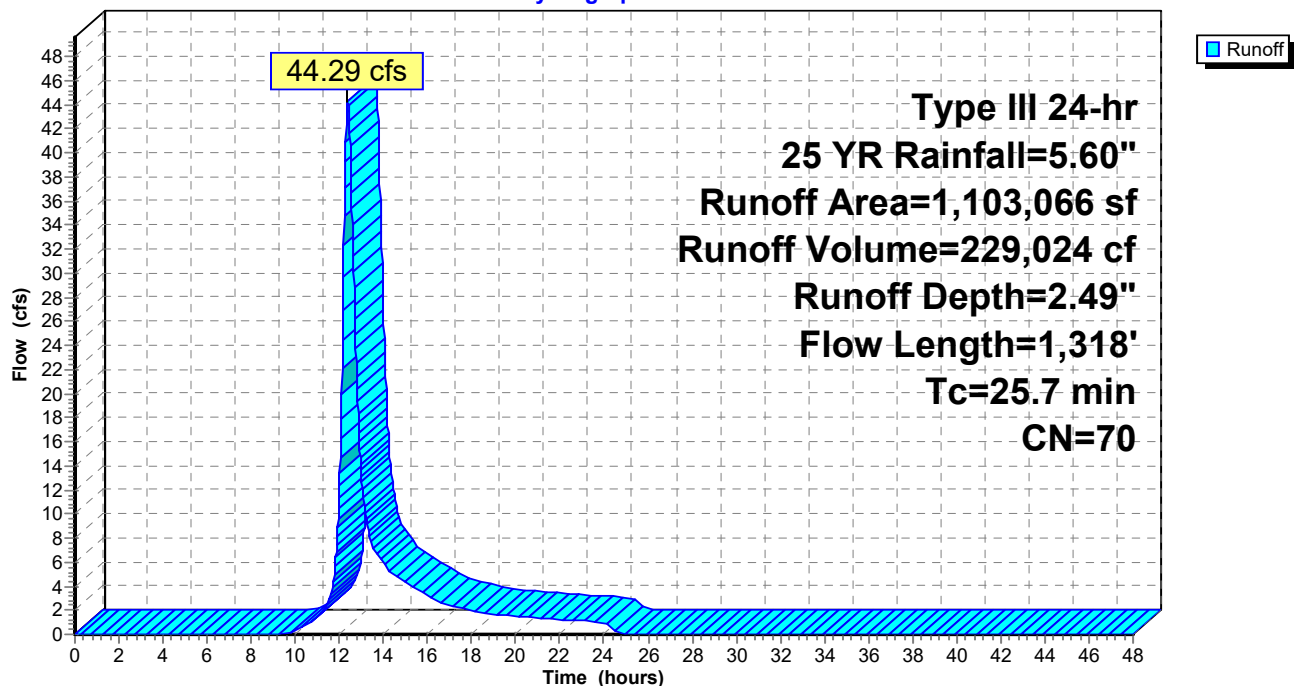
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
1,077,538	70	Woods, Good, HSG C
25,528	89	Gravel roads, HSG C
1,103,066	70	Weighted Average
1,103,066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
10.1	1,268	0.0170	2.10		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
25.7	1,318	Total			

Subcatchment PRE-1: Pre Development Area 1

Hydrograph



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Type III 24-hr 25 YR Rainfall=5.60"

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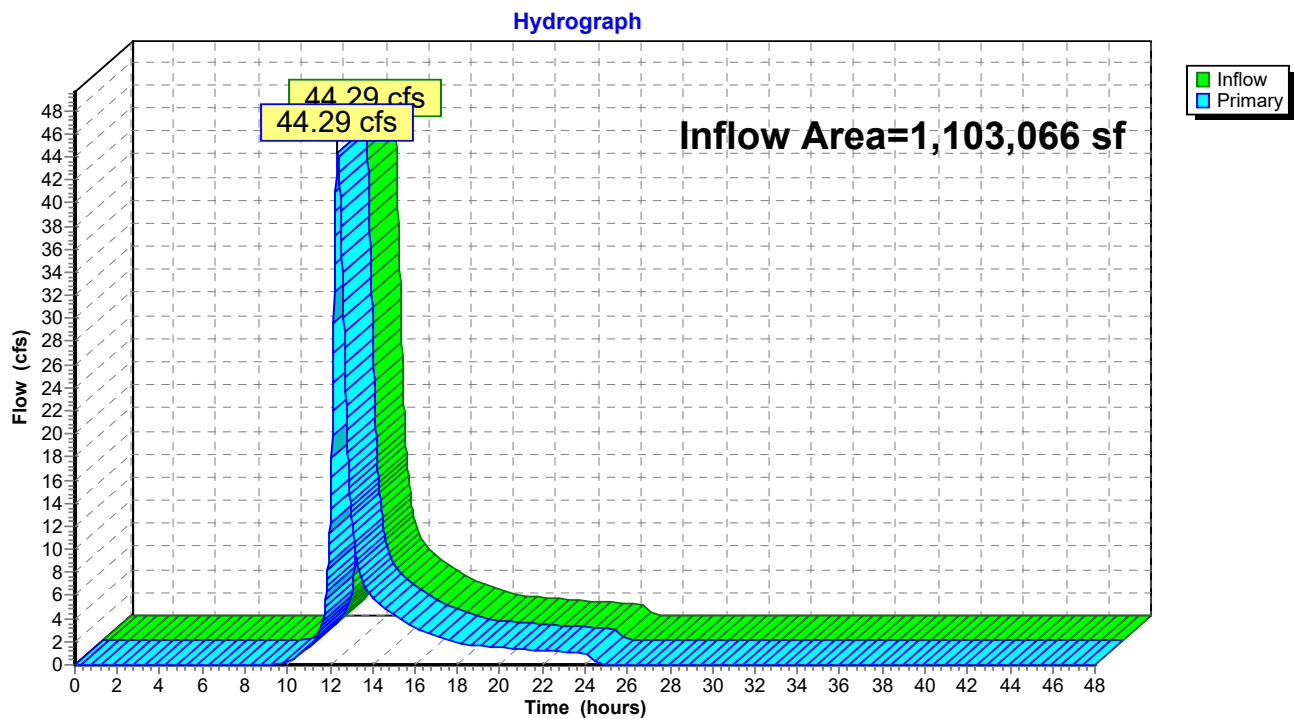
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,103,066 sf, 0.00% Impervious, Inflow Depth = 2.49" for 25 YR event
Inflow = 44.29 cfs @ 12.37 hrs, Volume= 229,024 cf
Primary = 44.29 cfs @ 12.37 hrs, Volume= 229,024 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 100 YR Rainfall=7.00"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PRE-1: Pre Development Runoff Area=1,103,066 sf 0.00% Impervious Runoff Depth=3.62"
Flow Length=1,318' Tc=25.7 min CN=70 Runoff=64.99 cfs 332,611 cf

Pond AP-1: Surrounding Wetland System

Inflow=64.99 cfs 332,611 cf
Primary=64.99 cfs 332,611 cf

Total Runoff Area = 1,103,066 sf Runoff Volume = 332,611 cf Average Runoff Depth = 3.62"
100.00% Pervious = 1,103,066 sf 0.00% Impervious = 0 sf

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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment PRE-1: Pre Development Area 1

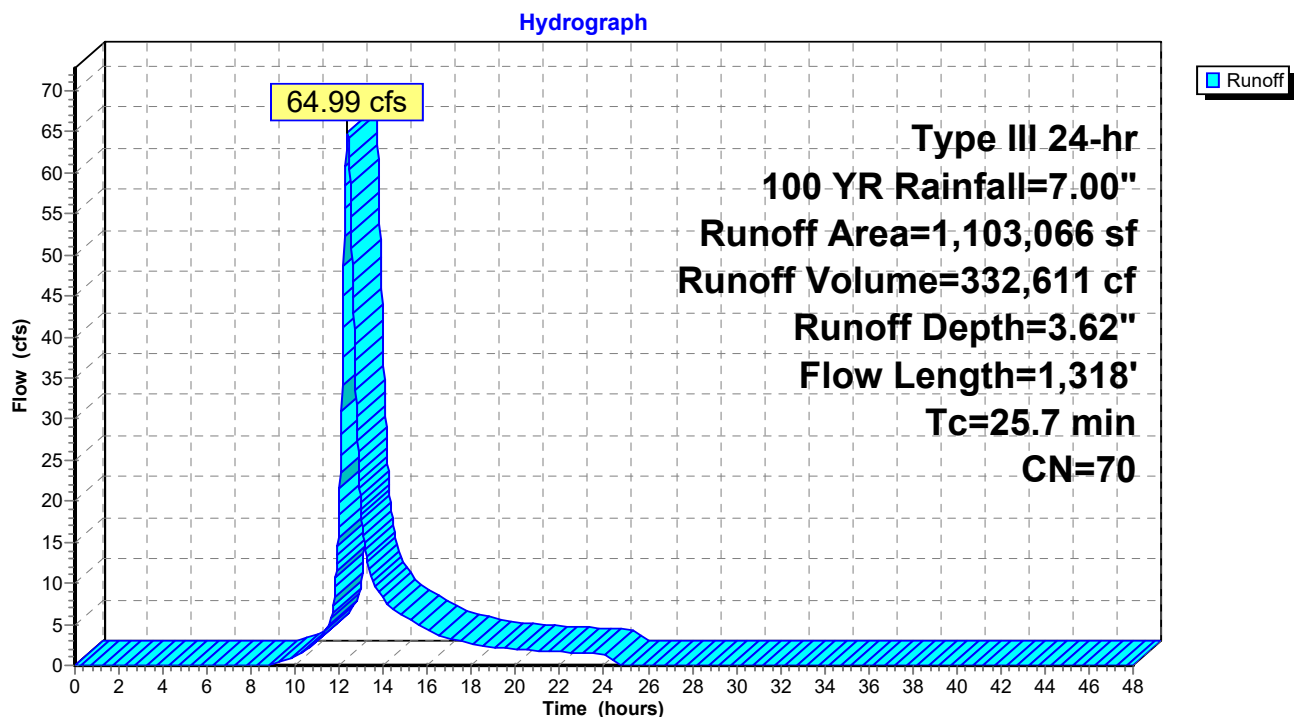
Runoff = 64.99 cfs @ 12.36 hrs, Volume= 332,611 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
1,077,538	70	Woods, Good, HSG C
25,528	89	Gravel roads, HSG C
1,103,066	70	Weighted Average
1,103,066		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.50"
10.1	1,268	0.0170	2.10		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
25.7	1,318	Total			

Subcatchment PRE-1: Pre Development Area 1

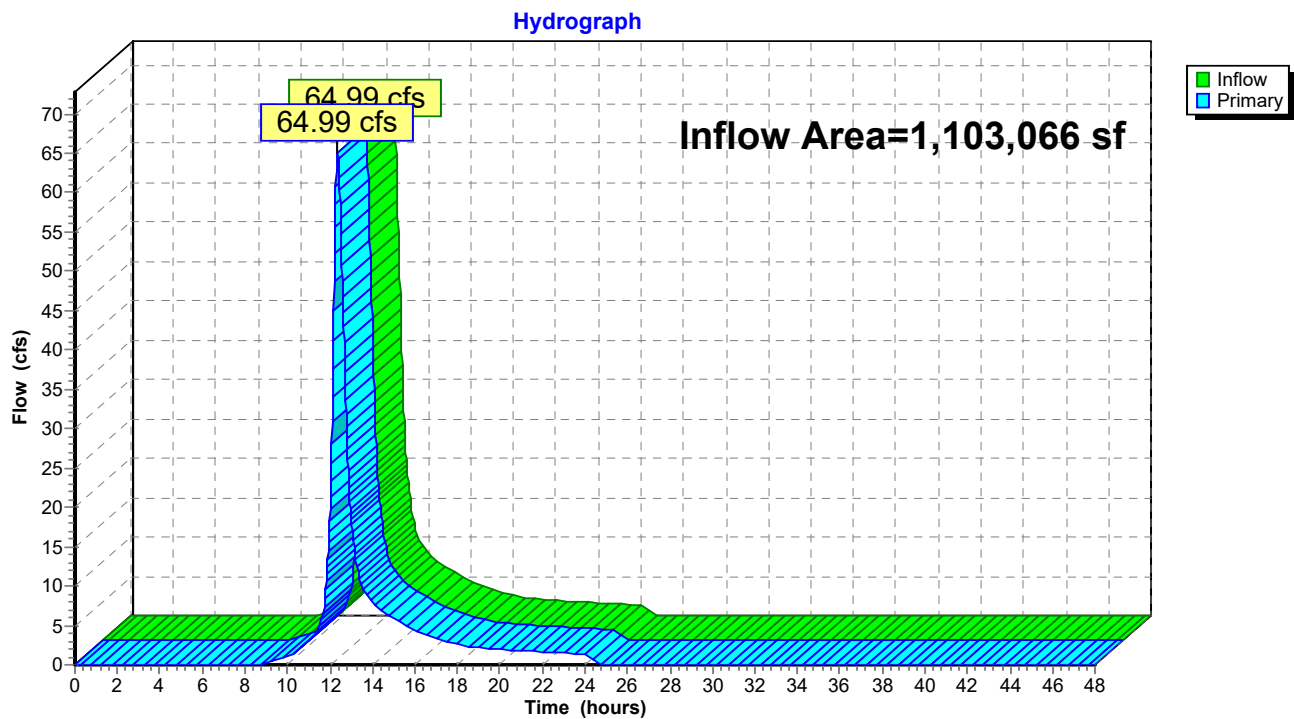


Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

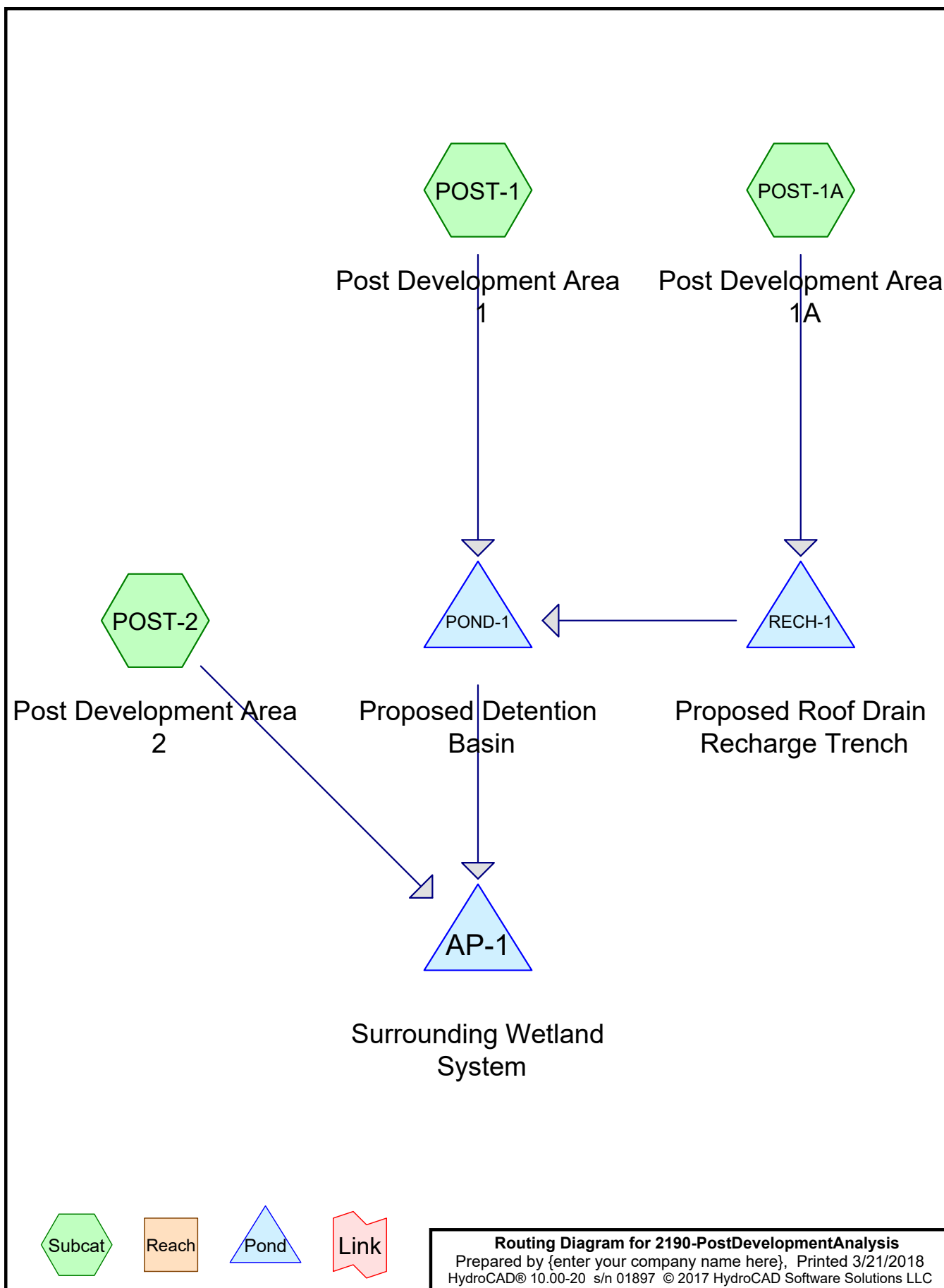
Inflow Area = 1,103,066 sf, 0.00% Impervious, Inflow Depth = 3.62" for 100 YR event
Inflow = 64.99 cfs @ 12.36 hrs, Volume= 332,611 cf
Primary = 64.99 cfs @ 12.36 hrs, Volume= 332,611 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System

Section 3

Post Development Hydrologic Analysis



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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
113,550	74	>75% Grass cover, Good, HSG C (POST-1)
244,724	98	Paved roads w/curbs & sewers, HSG C (POST-1)
156,685	98	Roofs, HSG C (POST-1A)
18,590	70	Woods, Good, HSG C (POST-1)
572,800	72	Woods/grass comb., Good, HSG C (POST-2)
1,106,349	82	TOTAL AREA

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Type III 24-hr 2 YR Rainfall=3.50"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post

Runoff Area=376,864 sf 64.94% Impervious Runoff Depth=2.36"
Flow Length=825' Tc=18.4 min CN=89 Runoff=16.57 cfs 74,028 cf

Subcatchment POST-1A: Post

Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=98 Runoff=12.23 cfs 42,651 cf

Subcatchment POST-2: Post Development

Runoff Area=572,800 sf 0.00% Impervious Runoff Depth=1.12"
Flow Length=780' Tc=22.3 min CN=72 Runoff=10.45 cfs 53,505 cf

Pond AP-1: Surrounding Wetland System

Inflow=10.78 cfs 80,609 cf
Primary=10.78 cfs 80,609 cf

Pond POND-1: Proposed Detention Basin

Peak Elev=79.68' Storage=58,980 cf Inflow=24.04 cfs 111,929 cf
Discarded=1.27 cfs 84,836 cf Primary=1.42 cfs 27,104 cf Outflow=2.70 cfs 111,941 cf

Pond RECH-1: Proposed Roof Drain

Peak Elev=84.96' Storage=2,251 cf Inflow=12.23 cfs 42,651 cf
Discarded=0.05 cfs 4,750 cf Primary=11.90 cfs 37,902 cf Outflow=11.95 cfs 42,651 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 170,183 cf Average Runoff Depth = 1.85"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-1: Post Development Area 1

Runoff = 16.57 cfs @ 12.25 hrs, Volume= 74,028 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,550	74	>75% Grass cover, Good, HSG C
18,590	70	Woods, Good, HSG C
376,864	89	Weighted Average
132,140		35.06% Pervious Area
244,724		64.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.1	25	0.2400	7.89		Shallow Concentrated Flow, C-D Unpaved Kv= 16.1 fps
1.7	650	0.0080	6.44	20.23	Pipe Channel, D-E 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
18.4	825	Total			

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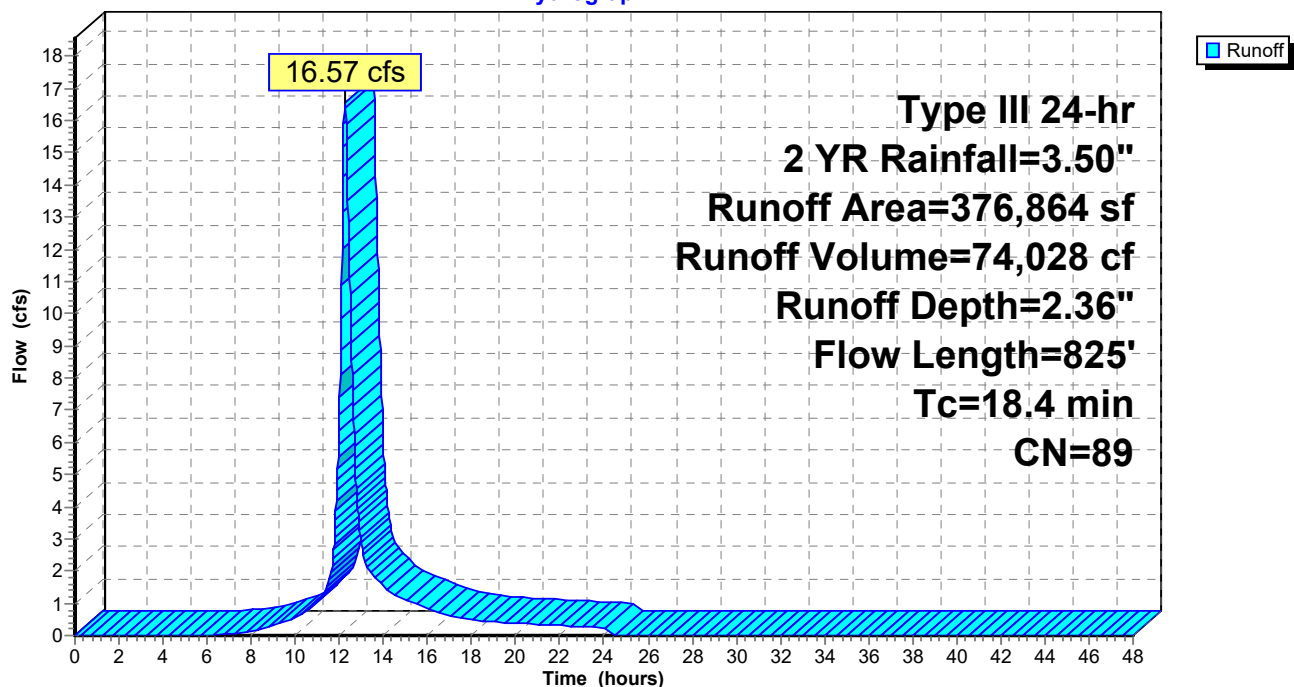
Type III 24-hr 2 YR Rainfall=3.50"

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Subcatchment POST-1: Post Development Area 1

Hydrograph



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-1A: Post Development Area 1A

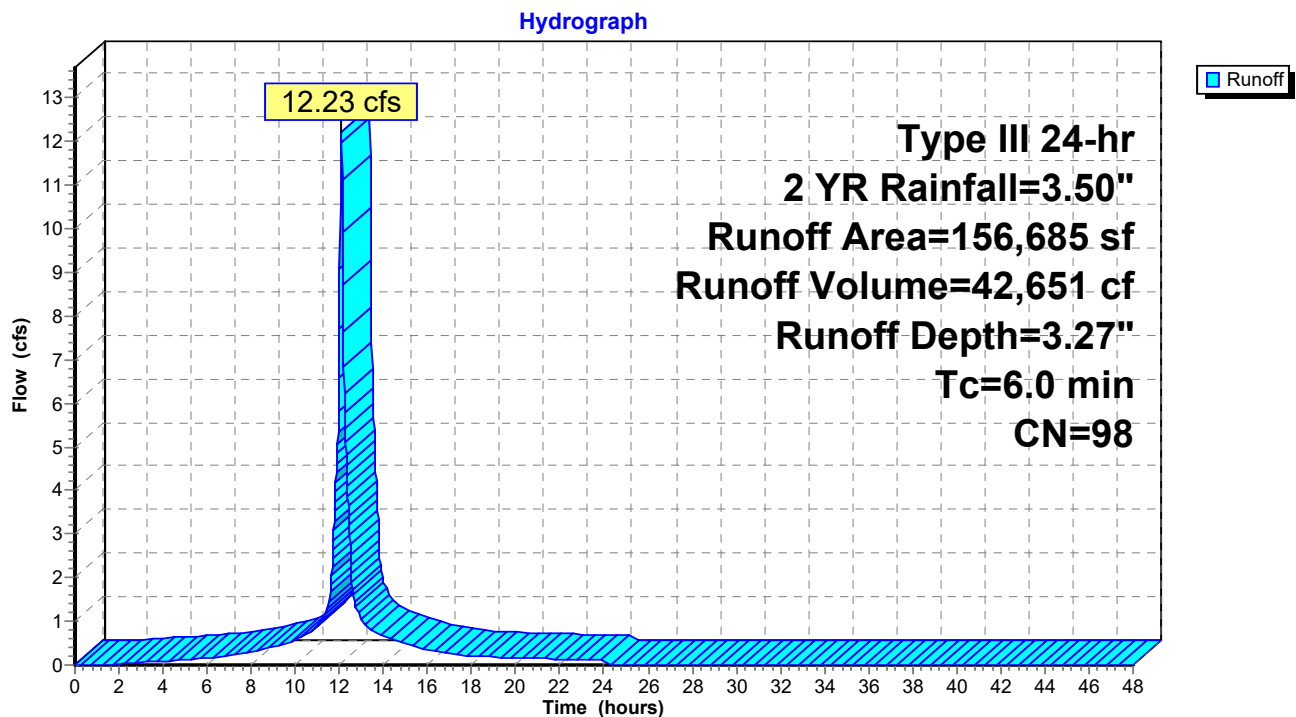
Runoff = 12.23 cfs @ 12.08 hrs, Volume= 42,651 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Subcatchment POST-2: Post Development Area 2

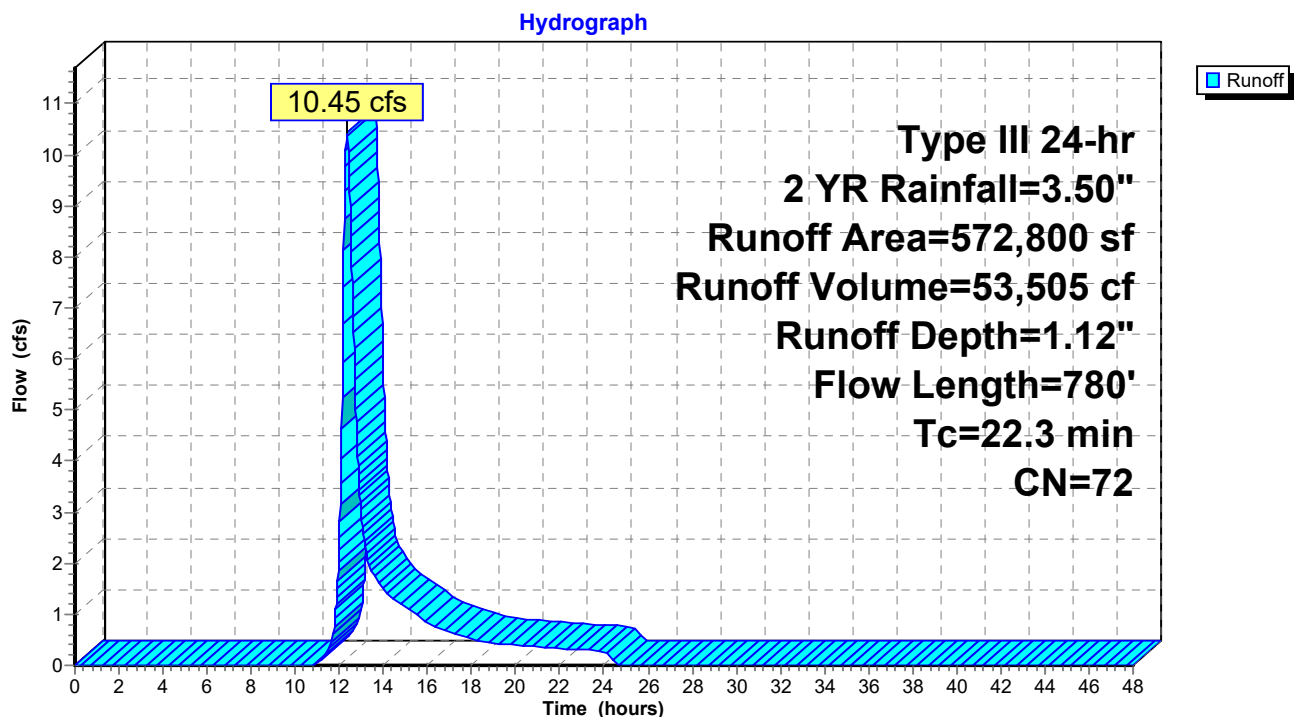
Runoff = 10.45 cfs @ 12.33 hrs, Volume= 53,505 cf, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 2 YR Rainfall=3.50"

Area (sf)	CN	Description
572,800	72	Woods/grass comb., Good, HSG C
572,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 2 YR Rainfall=3.50"

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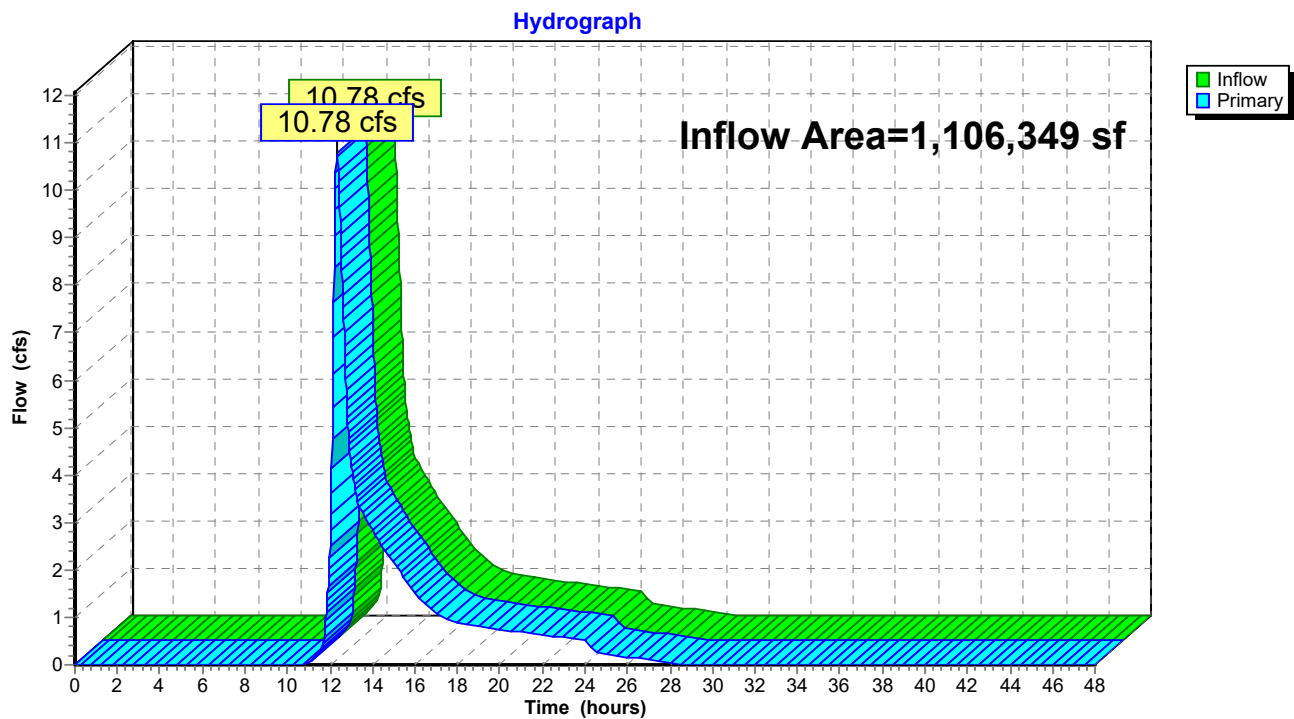
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 0.87" for 2 YR event
Inflow = 10.78 cfs @ 12.34 hrs, Volume= 80,609 cf
Primary = 10.78 cfs @ 12.34 hrs, Volume= 80,609 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 533,549 sf, 75.23% Impervious, Inflow Depth = 2.52" for 2 YR event
Inflow = 24.04 cfs @ 12.15 hrs, Volume= 111,929 cf
Outflow = 2.70 cfs @ 13.43 hrs, Volume= 111,941 cf, Atten= 89%, Lag= 76.8 min
Discarded = 1.27 cfs @ 13.43 hrs, Volume= 84,836 cf
Primary = 1.42 cfs @ 13.43 hrs, Volume= 27,104 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 79.68' @ 13.43 hrs Surf.Area= 53,962 sf Storage= 58,980 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 389.3 min (1,191.0 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	168,392 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	28,379	0	0
79.00	31,416	29,898	29,898
80.00	64,510	47,963	77,861
81.00	37,769	51,140	129,000
82.00	41,014	39,392	168,392

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	18.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.50' S= 0.0167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	78.50'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	79.50'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Discarded	78.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=1.27 cfs @ 13.43 hrs HW=79.68' (Free Discharge)
↑**4=Exfiltration** (Exfiltration Controls 1.27 cfs)

Primary OutFlow Max=1.42 cfs @ 13.43 hrs HW=79.68' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 1.42 cfs of 8.21 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 4.85 fps)
↑**3=Sharp-Crested Rectangular Weir** (Weir Controls 1.00 cfs @ 1.39 fps)

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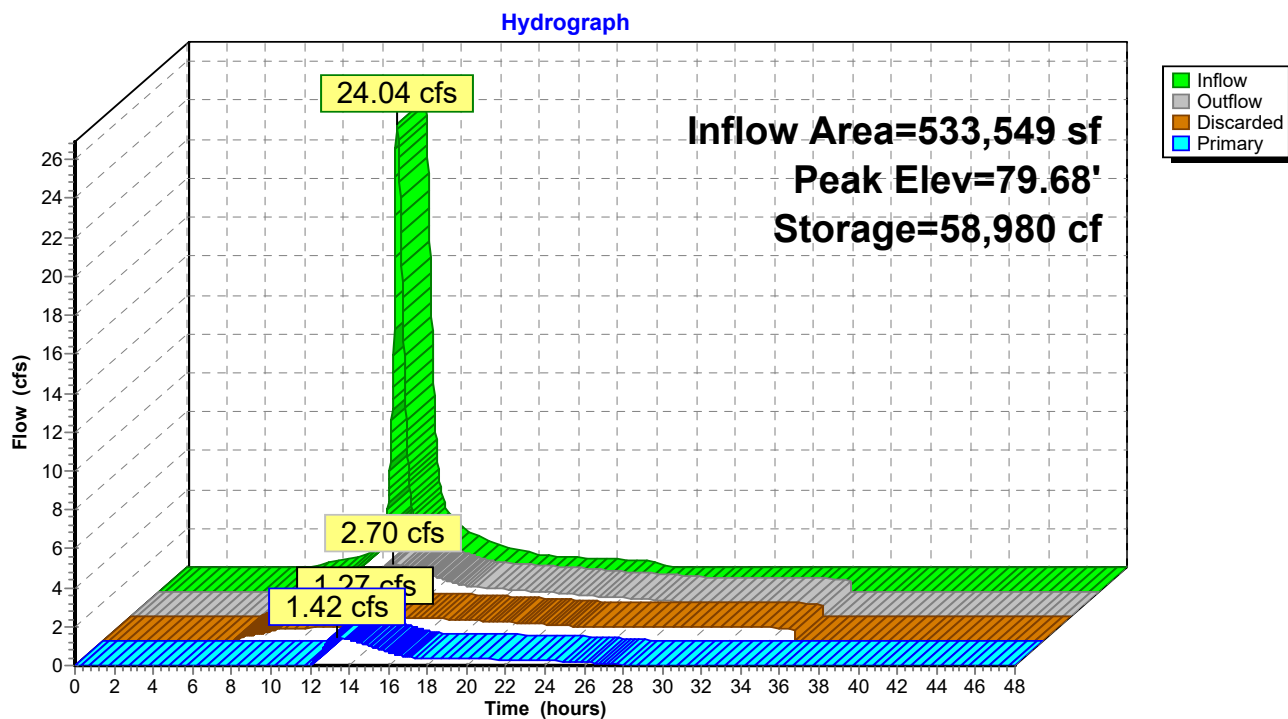
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Pond POND-1: Proposed Detention Basin



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Type III 24-hr 2 YR Rainfall=3.50"

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Summary for Pond RECH-1: Proposed Roof Drain Recharge Trench

Inflow Area = 156,685 sf, 100.00% Impervious, Inflow Depth = 3.27" for 2 YR event
 Inflow = 12.23 cfs @ 12.08 hrs, Volume= 42,651 cf
 Outflow = 11.95 cfs @ 12.10 hrs, Volume= 42,651 cf, Atten= 2%, Lag= 1.1 min
 Discarded = 0.05 cfs @ 3.24 hrs, Volume= 4,750 cf
 Primary = 11.90 cfs @ 12.10 hrs, Volume= 37,902 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 84.96' @ 12.10 hrs Surf.Area= 1,956 sf Storage= 2,251 cf

Plug-Flow detention time= 34.8 min calculated for 42,633 cf (100% of inflow)
 Center-of-Mass det. time= 34.9 min (789.5 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	1,733 cf	4.00'W x 489.00'L x 3.00'H Prismatic 5,868 cf Overall - 1,536 cf Embedded = 4,332 cf x 40.0% Voids
#2	83.50'	1,536 cf	24.0" Round Pipe Storage Inside #1 L= 489.0'
		3,269 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	1.030 in/hr Exfiltration over Surface area
#2	Primary	84.00'	18.0" Round Culvert X 3.00 L= 140.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 80.00' S= 0.0286 ' S= 0.0286 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.05 cfs @ 3.24 hrs HW=83.03' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=11.88 cfs @ 12.10 hrs HW=84.96' TW=78.77' (Dynamic Tailwater)
 ↑ **2=Culvert** (Inlet Controls 11.88 cfs @ 3.33 fps)

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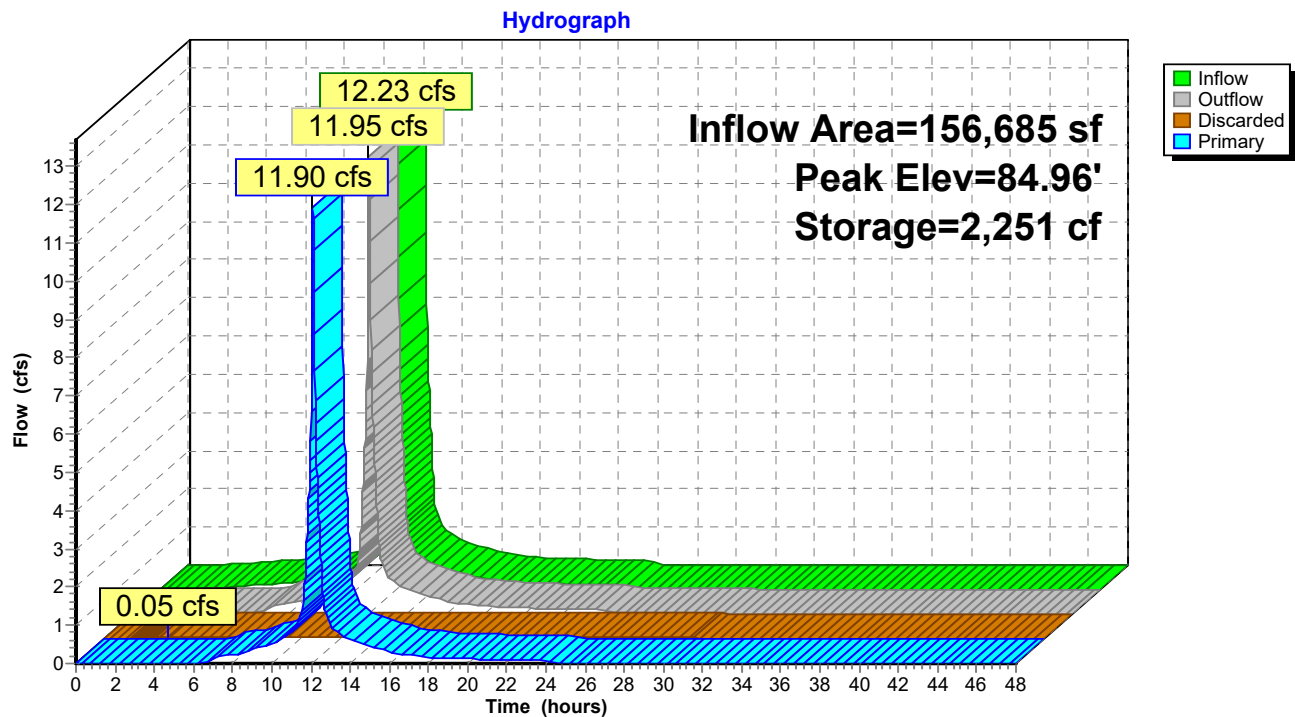
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Type III 24-hr 2 YR Rainfall=3.50"

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Pond RECH-1: Proposed Roof Drain Recharge Trench



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Type III 24-hr 10 YR Rainfall=4.80"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post

Runoff Area=376,864 sf 64.94% Impervious Runoff Depth=3.58"
Flow Length=825' Tc=18.4 min CN=89 Runoff=24.82 cfs 112,454 cf

Subcatchment POST-1A: Post

Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=16.86 cfs 59,586 cf

Subcatchment POST-2: Post Development

Runoff Area=572,800 sf 0.00% Impervious Runoff Depth=2.05"
Flow Length=780' Tc=22.3 min CN=72 Runoff=19.97 cfs 97,615 cf

Pond AP-1: Surrounding Wetland System

Inflow=22.63 cfs 166,510 cf
Primary=22.63 cfs 166,510 cf

Pond POND-1: Proposed Detention Basin

Peak Elev=80.07' Storage=82,079 cf Inflow=34.93 cfs 167,178 cf
Discarded=1.52 cfs 98,289 cf Primary=5.91 cfs 68,895 cf Outflow=7.39 cfs 167,184 cf

Pond RECH-1: Proposed Roof Drain

Peak Elev=85.18' Storage=2,528 cf Inflow=16.86 cfs 59,586 cf
Discarded=0.05 cfs 4,864 cf Primary=16.48 cfs 54,723 cf Outflow=16.52 cfs 59,587 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 269,655 cf Average Runoff Depth = 2.92"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-1: Post Development Area 1

Runoff = 24.82 cfs @ 12.24 hrs, Volume= 112,454 cf, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,550	74	>75% Grass cover, Good, HSG C
18,590	70	Woods, Good, HSG C
376,864	89	Weighted Average
132,140		35.06% Pervious Area
244,724		64.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.1	25	0.2400	7.89		Shallow Concentrated Flow, C-D Unpaved Kv= 16.1 fps
1.7	650	0.0080	6.44	20.23	Pipe Channel, D-E 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
18.4	825	Total			

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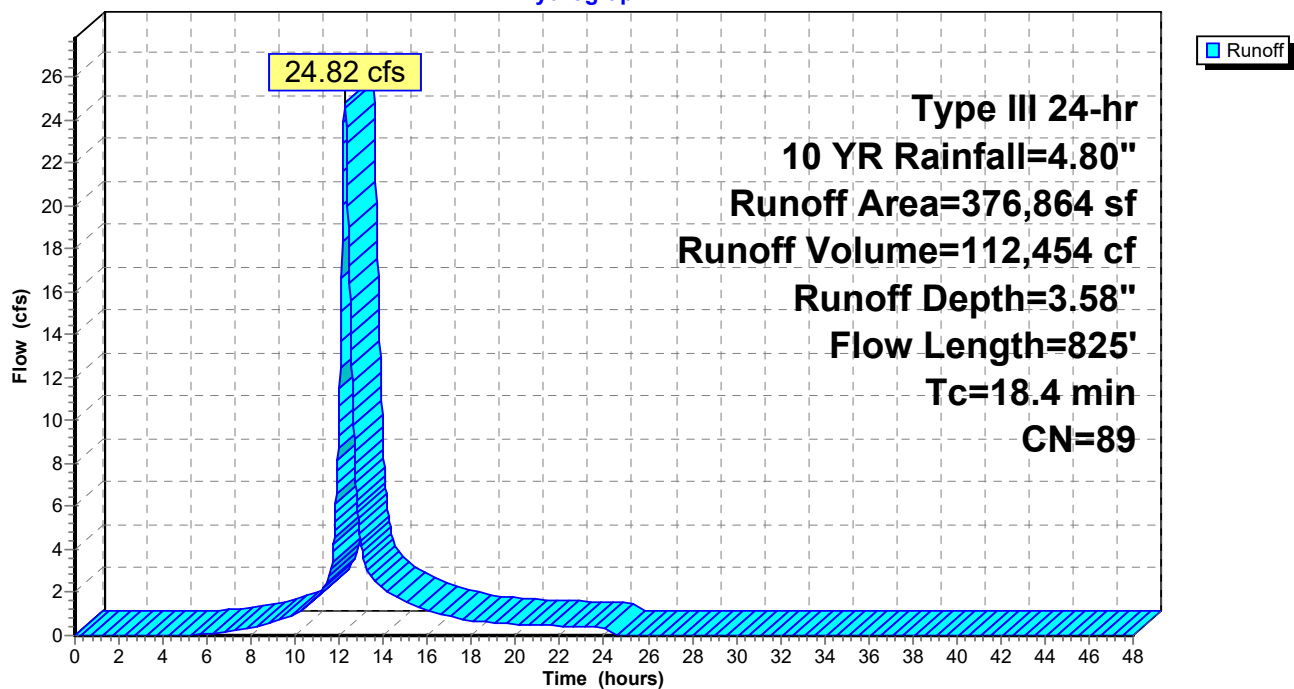
Type III 24-hr 10 YR Rainfall=4.80"

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Subcatchment POST-1: Post Development Area 1

Hydrograph



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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-1A: Post Development Area 1A

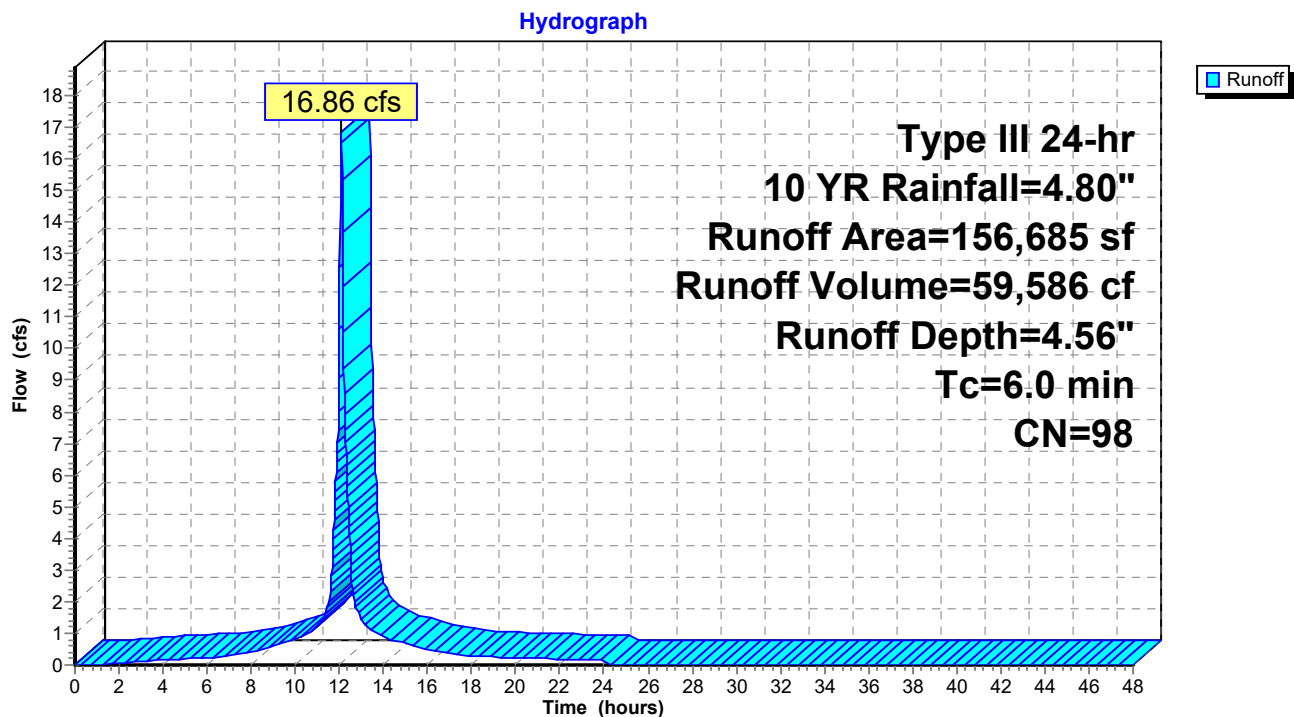
Runoff = 16.86 cfs @ 12.08 hrs, Volume= 59,586 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A



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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Subcatchment POST-2: Post Development Area 2

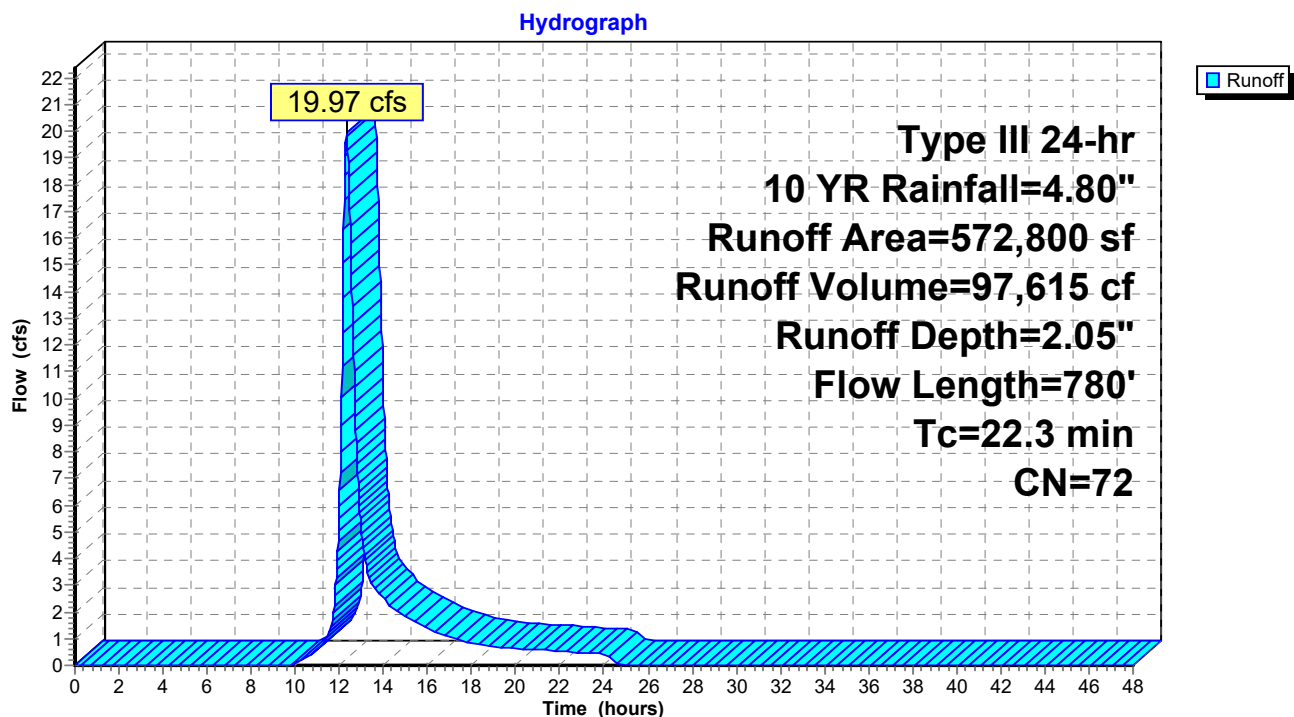
Runoff = 19.97 cfs @ 12.32 hrs, Volume= 97,615 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 10 YR Rainfall=4.80"

Area (sf)	CN	Description
572,800	72	Woods/grass comb., Good, HSG C
572,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 10 YR Rainfall=4.80"

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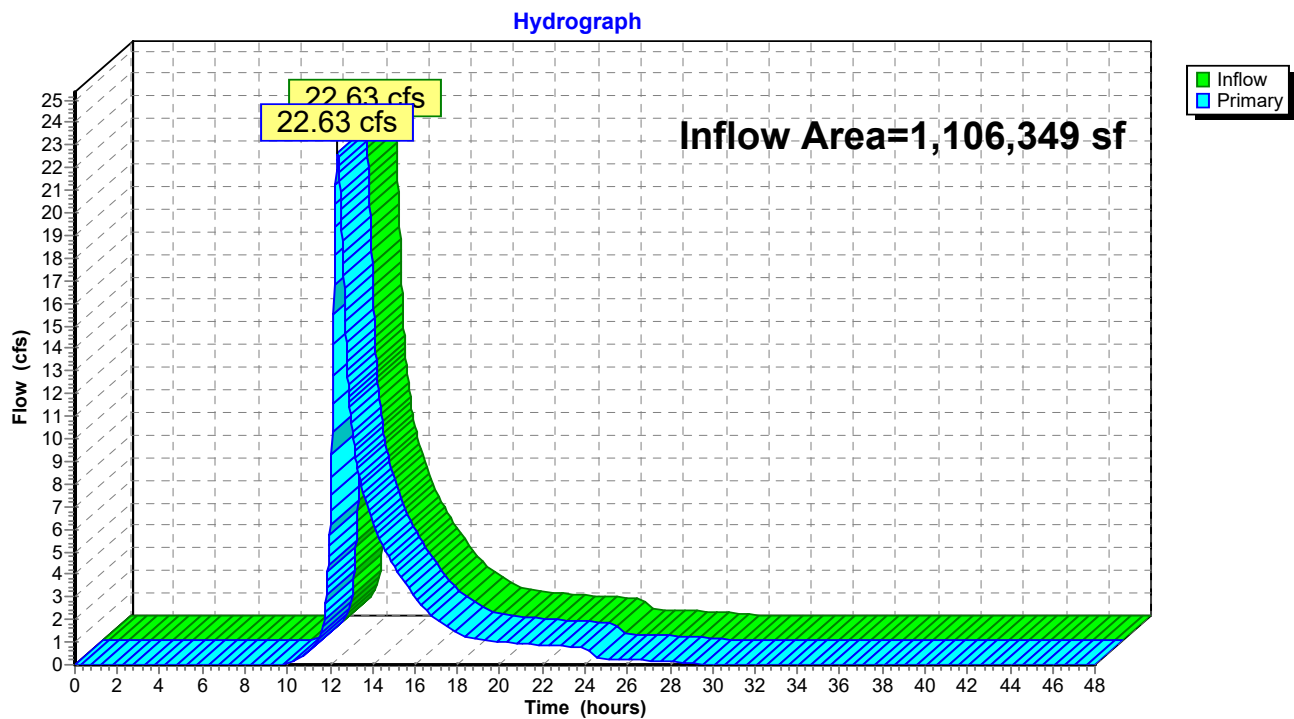
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 1.81" for 10 YR event
Inflow = 22.63 cfs @ 12.36 hrs, Volume= 166,510 cf
Primary = 22.63 cfs @ 12.36 hrs, Volume= 166,510 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 533,549 sf, 75.23% Impervious, Inflow Depth = 3.76" for 10 YR event
Inflow = 34.93 cfs @ 12.15 hrs, Volume= 167,178 cf
Outflow = 7.39 cfs @ 12.82 hrs, Volume= 167,184 cf, Atten= 79%, Lag= 40.2 min
Discarded = 1.52 cfs @ 13.41 hrs, Volume= 98,289 cf
Primary = 5.91 cfs @ 12.82 hrs, Volume= 68,895 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 80.07' @ 12.82 hrs Surf.Area= 62,737 sf Storage= 82,079 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 321.2 min (1,113.4 - 792.2)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	168,392 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	28,379	0	0
79.00	31,416	29,898	29,898
80.00	64,510	47,963	77,861
81.00	37,769	51,140	129,000
82.00	41,014	39,392	168,392

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	18.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.50' S= 0.0167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	78.50'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	79.50'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Discarded	78.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=1.52 cfs @ 13.41 hrs HW=80.00' (Free Discharge)
↑**4=Exfiltration** (Exfiltration Controls 1.52 cfs)

Primary OutFlow Max=5.91 cfs @ 12.82 hrs HW=80.07' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 5.91 cfs of 9.76 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.50 cfs @ 5.70 fps)
↑**3=Sharp-Crested Rectangular Weir** (Weir Controls 5.42 cfs @ 2.46 fps)

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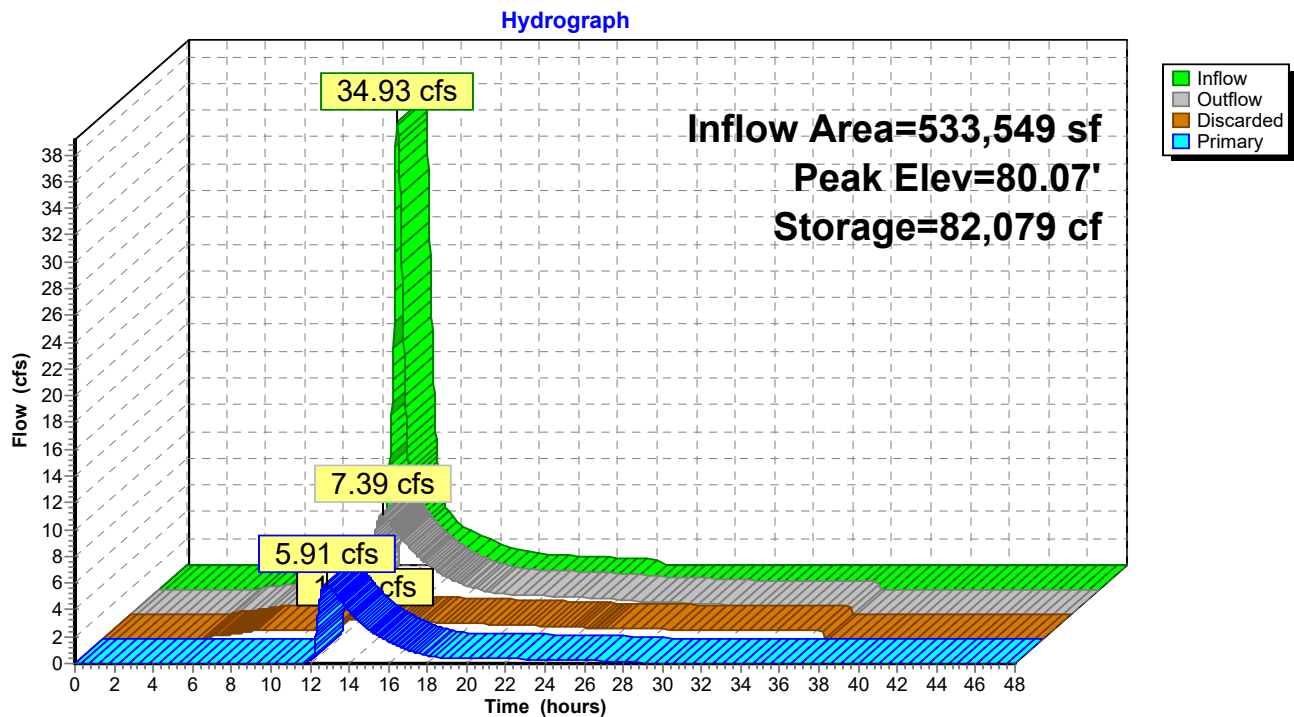
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Type III 24-hr 10 YR Rainfall=4.80"

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Pond POND-1: Proposed Detention Basin



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Type III 24-hr 10 YR Rainfall=4.80"

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Summary for Pond RECH-1: Proposed Roof Drain Recharge Trench

Inflow Area = 156,685 sf, 100.00% Impervious, Inflow Depth = 4.56" for 10 YR event
 Inflow = 16.86 cfs @ 12.08 hrs, Volume= 59,586 cf
 Outflow = 16.52 cfs @ 12.10 hrs, Volume= 59,587 cf, Atten= 2%, Lag= 1.0 min
 Discarded = 0.05 cfs @ 2.20 hrs, Volume= 4,864 cf
 Primary = 16.48 cfs @ 12.10 hrs, Volume= 54,723 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 85.18' @ 12.10 hrs Surf.Area= 1,956 sf Storage= 2,528 cf

Plug-Flow detention time= 27.3 min calculated for 59,562 cf (100% of inflow)
 Center-of-Mass det. time= 27.4 min (776.1 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	1,733 cf	4.00'W x 489.00'L x 3.00'H Prismatoid 5,868 cf Overall - 1,536 cf Embedded = 4,332 cf x 40.0% Voids
#2	83.50'	1,536 cf	24.0" Round Pipe Storage Inside #1 L= 489.0'
		3,269 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	1.030 in/hr Exfiltration over Surface area
#2	Primary	84.00'	18.0" Round Culvert X 3.00 L= 140.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 80.00' S= 0.0286 ' S= 0.0286 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.05 cfs @ 2.20 hrs HW=83.03' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=16.48 cfs @ 12.10 hrs HW=85.18' TW=79.27' (Dynamic Tailwater)
 ↑ **2=Culvert** (Inlet Controls 16.48 cfs @ 3.69 fps)

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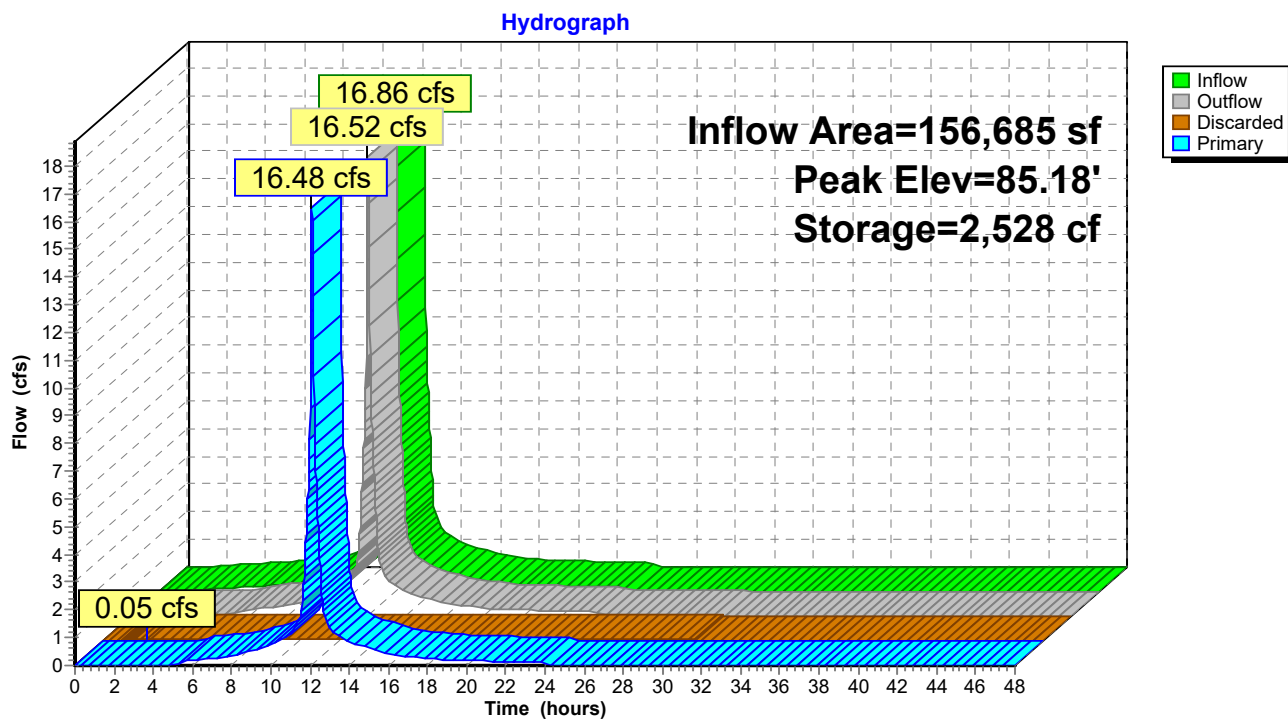
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Type III 24-hr 10 YR Rainfall=4.80"

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Pond RECH-1: Proposed Roof Drain Recharge Trench



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Type III 24-hr 25 YR Rainfall=5.60"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post

Runoff Area=376,864 sf 64.94% Impervious Runoff Depth=4.35"
Flow Length=825' Tc=18.4 min CN=89 Runoff=29.88 cfs 136,572 cf

Subcatchment POST-1A: Post

Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=5.36"
Tc=6.0 min CN=98 Runoff=19.70 cfs 70,016 cf

Subcatchment POST-2: Post Development

Runoff Area=572,800 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=780' Tc=22.3 min CN=72 Runoff=26.34 cfs 127,421 cf

Pond AP-1: Surrounding Wetland System

Inflow=31.88 cfs 225,549 cf
Primary=31.88 cfs 225,549 cf

Pond POND-1: Proposed Detention Basin

Peak Elev=80.30' Storage=96,271 cf Inflow=41.65 cfs 201,686 cf
Discarded=1.52 cfs 103,559 cf Primary=9.60 cfs 98,128 cf Outflow=10.93 cfs 201,687 cf

Pond RECH-1: Proposed Roof Drain

Peak Elev=85.32' Storage=2,692 cf Inflow=19.70 cfs 70,016 cf
Discarded=0.05 cfs 4,904 cf Primary=19.27 cfs 65,114 cf Outflow=19.31 cfs 70,018 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 334,010 cf Average Runoff Depth = 3.62"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-1: Post Development Area 1

Runoff = 29.88 cfs @ 12.24 hrs, Volume= 136,572 cf, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,550	74	>75% Grass cover, Good, HSG C
18,590	70	Woods, Good, HSG C
376,864	89	Weighted Average
132,140		35.06% Pervious Area
244,724		64.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.1	25	0.2400	7.89		Shallow Concentrated Flow, C-D Unpaved Kv= 16.1 fps
1.7	650	0.0080	6.44	20.23	Pipe Channel, D-E 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
18.4	825	Total			

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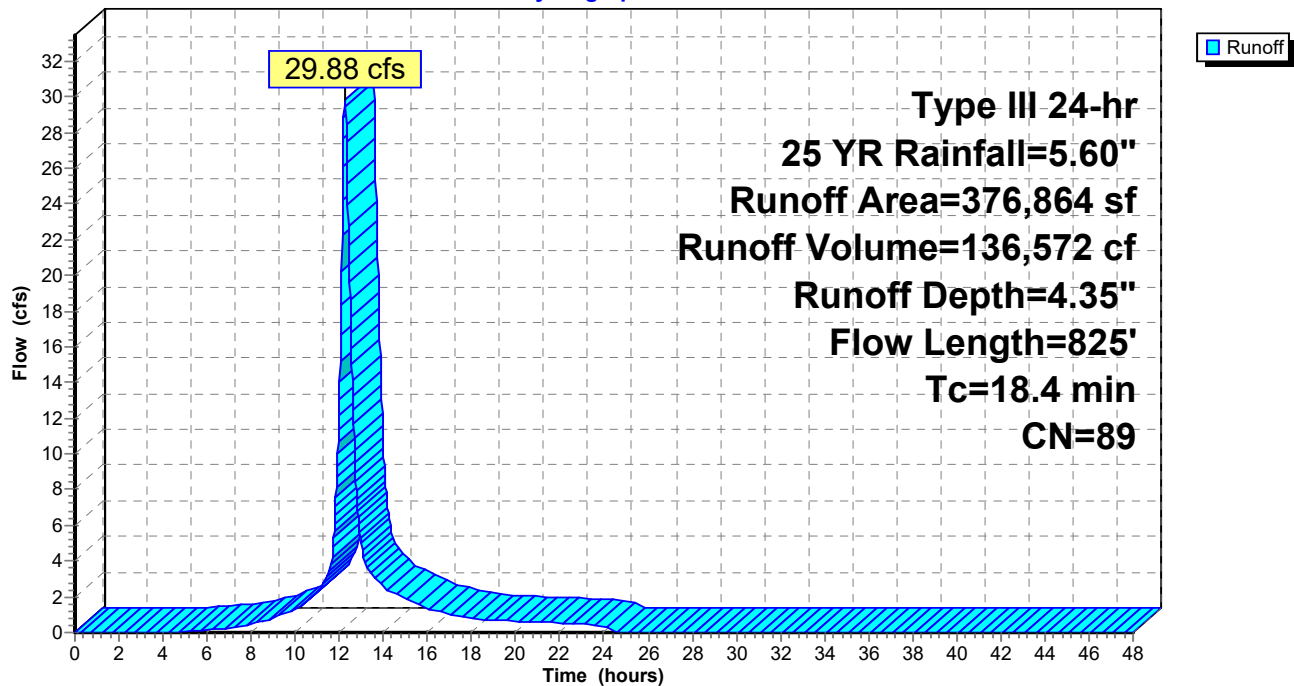
Type III 24-hr 25 YR Rainfall=5.60"

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Subcatchment POST-1: Post Development Area 1

Hydrograph



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-1A: Post Development Area 1A

Runoff = 19.70 cfs @ 12.08 hrs, Volume= 70,016 cf, Depth= 5.36"

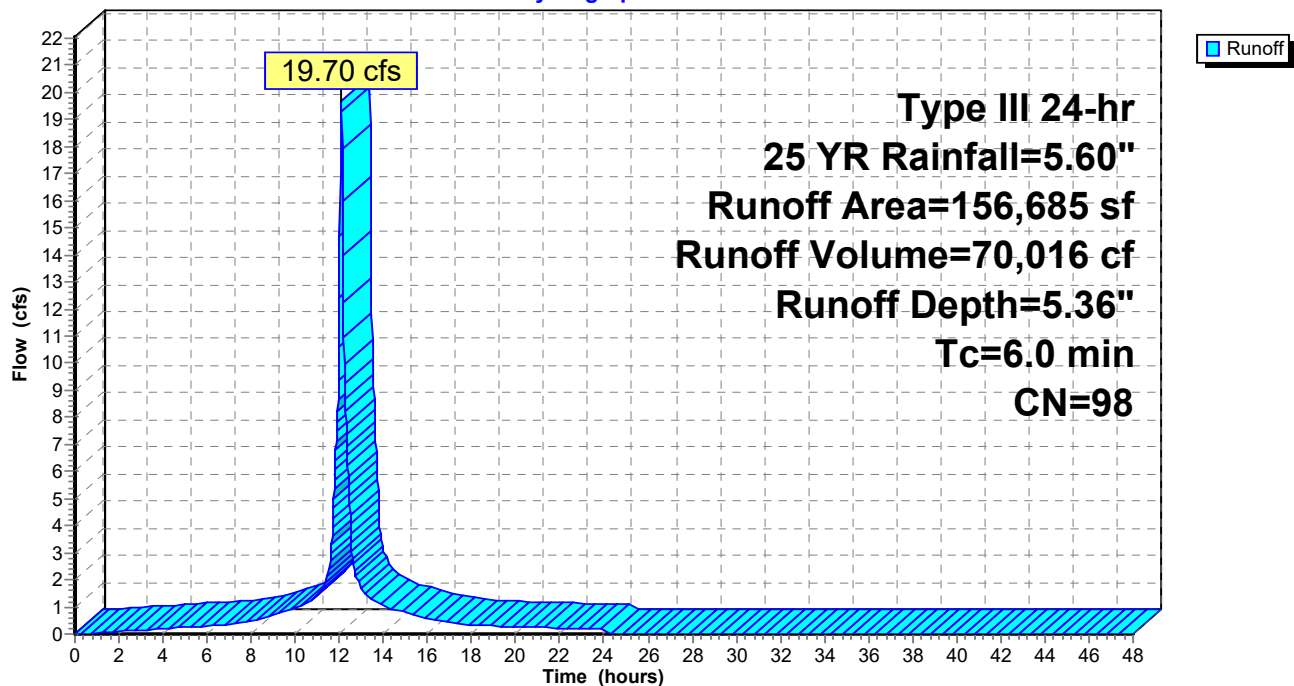
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A

Hydrograph



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Subcatchment POST-2: Post Development Area 2

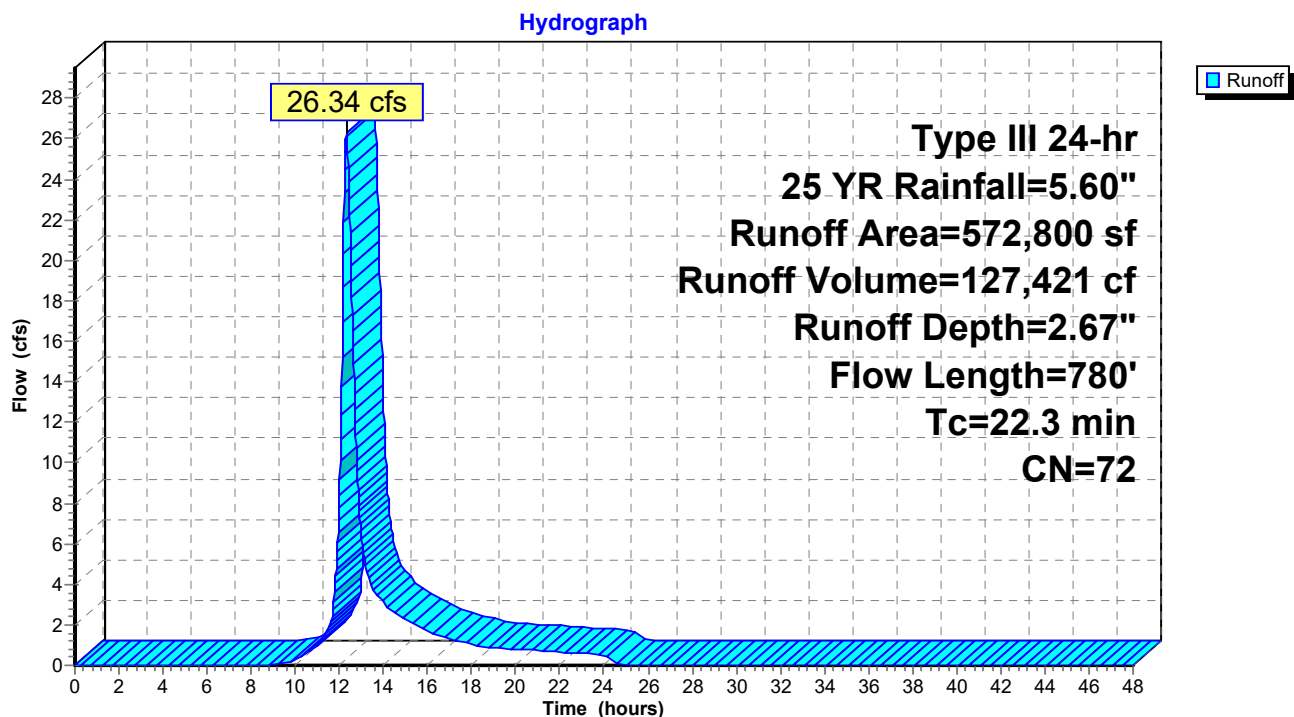
Runoff = 26.34 cfs @ 12.32 hrs, Volume= 127,421 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 25 YR Rainfall=5.60"

Area (sf)	CN	Description
572,800	72	Woods/grass comb., Good, HSG C
572,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		Sheet Flow, A-B
					Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		Shallow Concentrated Flow, B-C
					Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 25 YR Rainfall=5.60"

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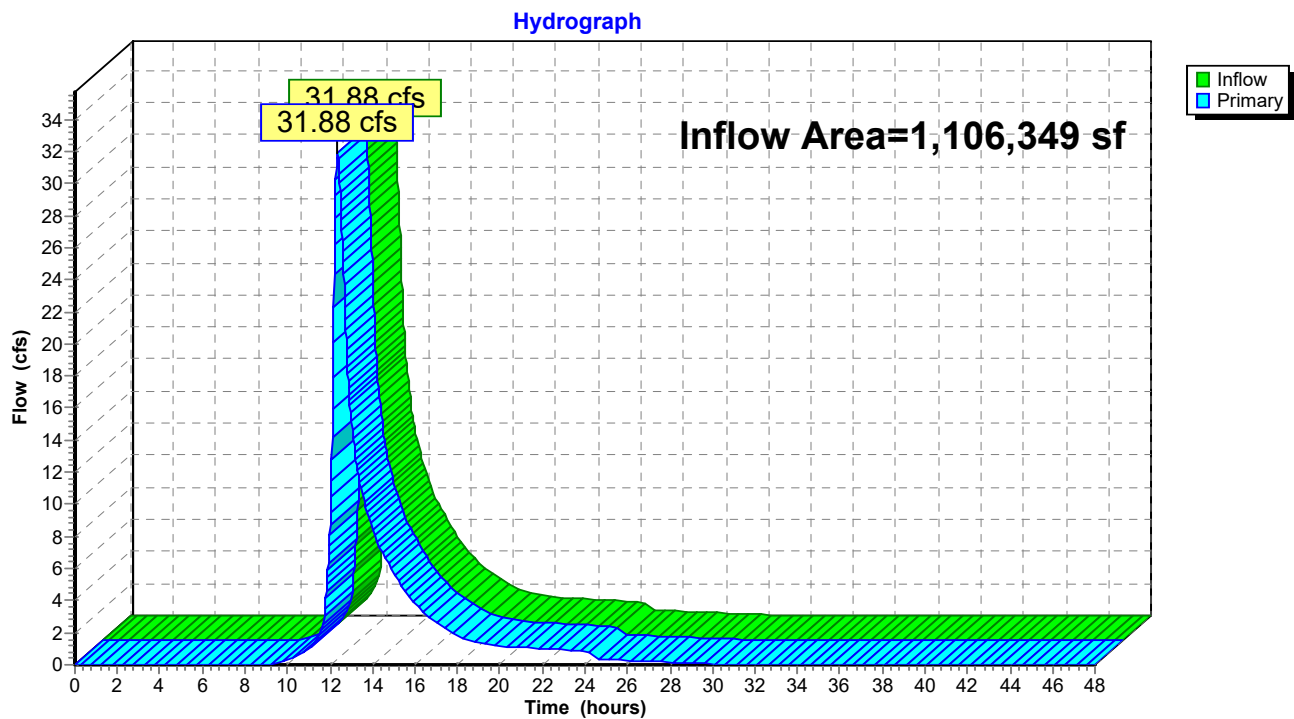
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 2.45" for 25 YR event
Inflow = 31.88 cfs @ 12.36 hrs, Volume= 225,549 cf
Primary = 31.88 cfs @ 12.36 hrs, Volume= 225,549 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 533,549 sf, 75.23% Impervious, Inflow Depth = 4.54" for 25 YR event
Inflow = 41.65 cfs @ 12.15 hrs, Volume= 201,686 cf
Outflow = 10.93 cfs @ 12.73 hrs, Volume= 201,687 cf, Atten= 74%, Lag= 34.6 min
Discarded = 1.52 cfs @ 14.18 hrs, Volume= 103,559 cf
Primary = 9.60 cfs @ 12.73 hrs, Volume= 98,128 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 80.30' @ 12.73 hrs Surf.Area= 56,364 sf Storage= 96,271 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 292.6 min (1,080.3 - 787.7)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	168,392 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	28,379	0	0
79.00	31,416	29,898	29,898
80.00	64,510	47,963	77,861
81.00	37,769	51,140	129,000
82.00	41,014	39,392	168,392

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	18.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.50' S= 0.0167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	78.50'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	79.50'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Discarded	78.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=1.52 cfs @ 14.18 hrs HW=80.00' (Free Discharge)
↑**4=Exfiltration** (Exfiltration Controls 1.52 cfs)

Primary OutFlow Max=9.60 cfs @ 12.73 hrs HW=80.30' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 9.60 cfs of 10.61 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.54 cfs @ 6.16 fps)
↑**3=Sharp-Crested Rectangular Weir** (Weir Controls 9.06 cfs @ 2.93 fps)

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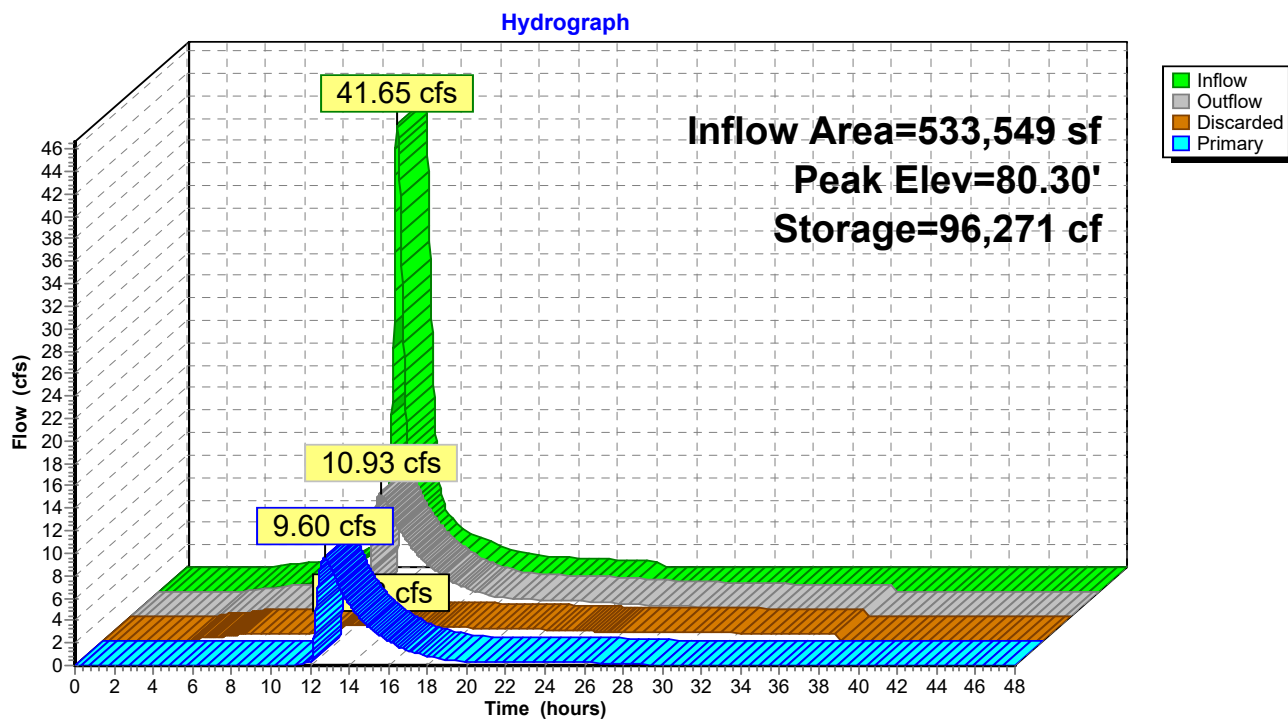
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Type III 24-hr 25 YR Rainfall=5.60"

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Pond POND-1: Proposed Detention Basin



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Type III 24-hr 25 YR Rainfall=5.60"

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Summary for Pond RECH-1: Proposed Roof Drain Recharge Trench

Inflow Area = 156,685 sf, 100.00% Impervious, Inflow Depth = 5.36" for 25 YR event
Inflow = 19.70 cfs @ 12.08 hrs, Volume= 70,016 cf
Outflow = 19.31 cfs @ 12.10 hrs, Volume= 70,018 cf, Atten= 2%, Lag= 1.0 min
Discarded = 0.05 cfs @ 1.78 hrs, Volume= 4,904 cf
Primary = 19.27 cfs @ 12.10 hrs, Volume= 65,114 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 85.32' @ 12.10 hrs Surf.Area= 1,956 sf Storage= 2,692 cf

Plug-Flow detention time= 24.1 min calculated for 69,989 cf (100% of inflow)
Center-of-Mass det. time= 24.3 min (770.5 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	1,733 cf	4.00'W x 489.00'L x 3.00'H Prismatoid 5,868 cf Overall - 1,536 cf Embedded = 4,332 cf x 40.0% Voids
#2	83.50'	1,536 cf	24.0" Round Pipe Storage Inside #1 L= 489.0'
		3,269 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	1.030 in/hr Exfiltration over Surface area
#2	Primary	84.00'	18.0" Round Culvert X 3.00 L= 140.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 80.00' S= 0.0286 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.05 cfs @ 1.78 hrs HW=83.03' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=19.26 cfs @ 12.10 hrs HW=85.32' TW=79.52' (Dynamic Tailwater)
↑**2=Culvert** (Inlet Controls 19.26 cfs @ 3.91 fps)

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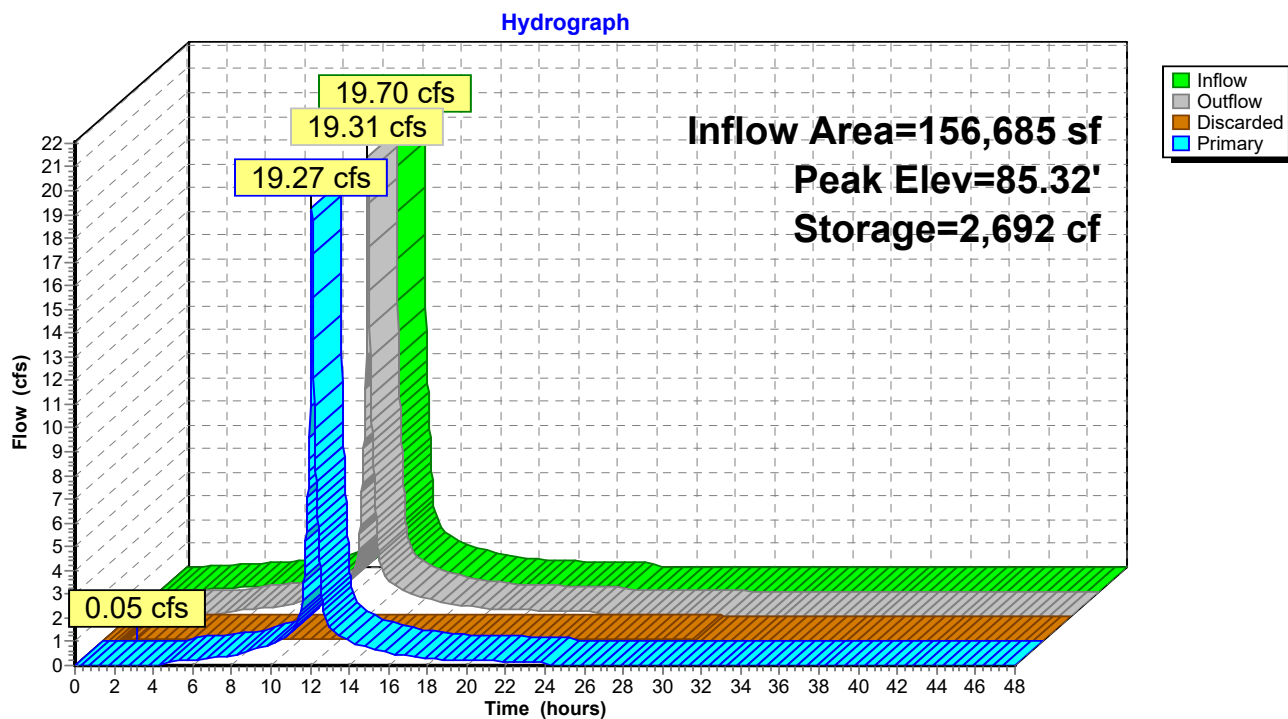
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Type III 24-hr 25 YR Rainfall=5.60"

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Pond RECH-1: Proposed Roof Drain Recharge Trench



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Type III 24-hr 100 YR Rainfall=7.00"

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Time span=0.00-48.00 hrs, dt=0.02 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment POST-1: Post

Runoff Area=376,864 sf 64.94% Impervious Runoff Depth=5.71"
Flow Length=825' Tc=18.4 min CN=89 Runoff=38.70 cfs 179,264 cf

Subcatchment POST-1A: Post

Runoff Area=156,685 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=24.67 cfs 88,278 cf

Subcatchment POST-2: Post Development

Runoff Area=572,800 sf 0.00% Impervious Runoff Depth=3.83"
Flow Length=780' Tc=22.3 min CN=72 Runoff=38.02 cfs 182,774 cf

Pond AP-1: Surrounding Wetland System

Inflow=49.04 cfs 335,509 cf
Primary=49.04 cfs 335,509 cf

Pond POND-1: Proposed Detention

Peak Elev=80.88' Storage=124,411 cf Inflow=53.53 cfs 262,595 cf
Discarded=1.52 cfs 109,871 cf Primary=12.43 cfs 152,735 cf Outflow=13.39 cfs 262,606 cf

Pond RECH-1: Proposed Roof Drain

Peak Elev=85.64' Storage=2,990 cf Inflow=24.67 cfs 88,278 cf
Discarded=0.05 cfs 4,947 cf Primary=24.14 cfs 83,331 cf Outflow=24.18 cfs 88,279 cf

Total Runoff Area = 1,106,349 sf Runoff Volume = 450,315 cf Average Runoff Depth = 4.88"
63.72% Pervious = 704,940 sf 36.28% Impervious = 401,409 sf

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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-1: Post Development Area 1

Runoff = 38.70 cfs @ 12.24 hrs, Volume= 179,264 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
244,724	98	Paved roads w/curbs & sewers, HSG C
113,550	74	>75% Grass cover, Good, HSG C
18,590	70	Woods, Good, HSG C
376,864	89	Weighted Average
132,140		35.06% Pervious Area
244,724		64.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0100	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
0.1	25	0.2400	7.89		Shallow Concentrated Flow, C-D Unpaved Kv= 16.1 fps
1.7	650	0.0080	6.44	20.23	Pipe Channel, D-E 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
18.4	825	Total			

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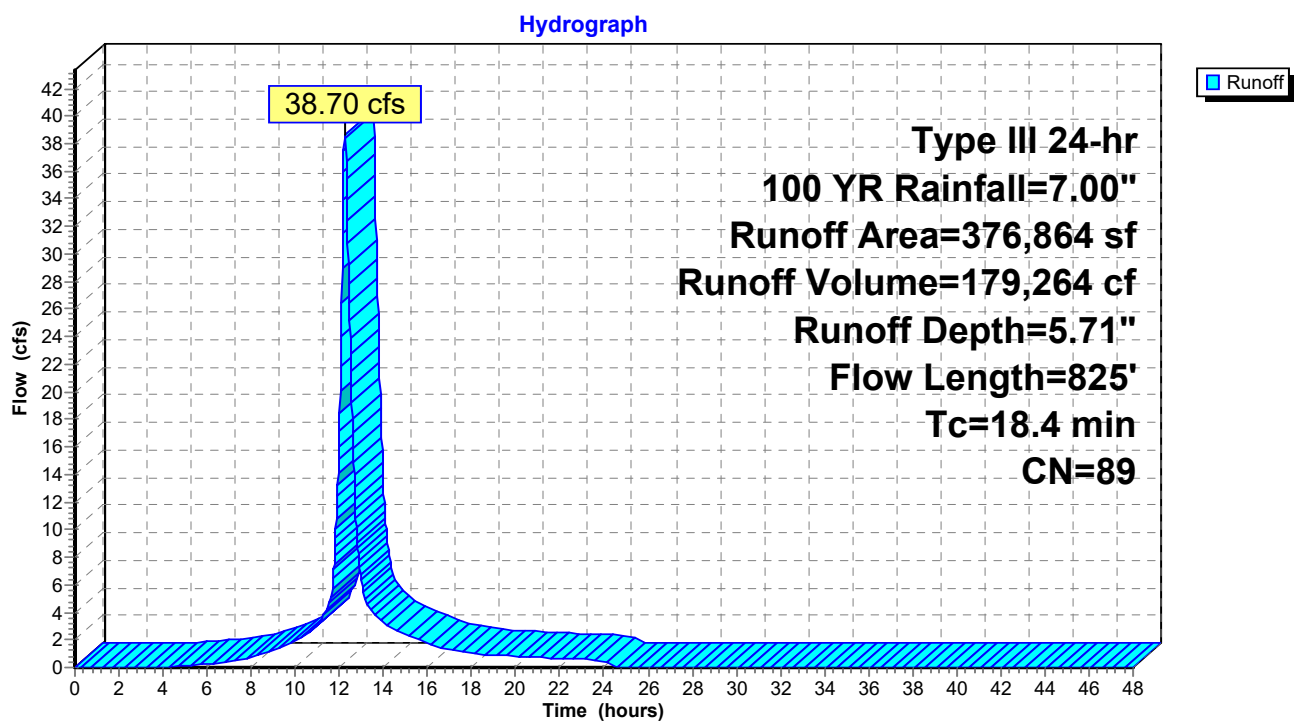
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Type III 24-hr 100 YR Rainfall=7.00"

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Subcatchment POST-1: Post Development Area 1



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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-1A: Post Development Area 1A

Runoff = 24.67 cfs @ 12.08 hrs, Volume= 88,278 cf, Depth= 6.76"

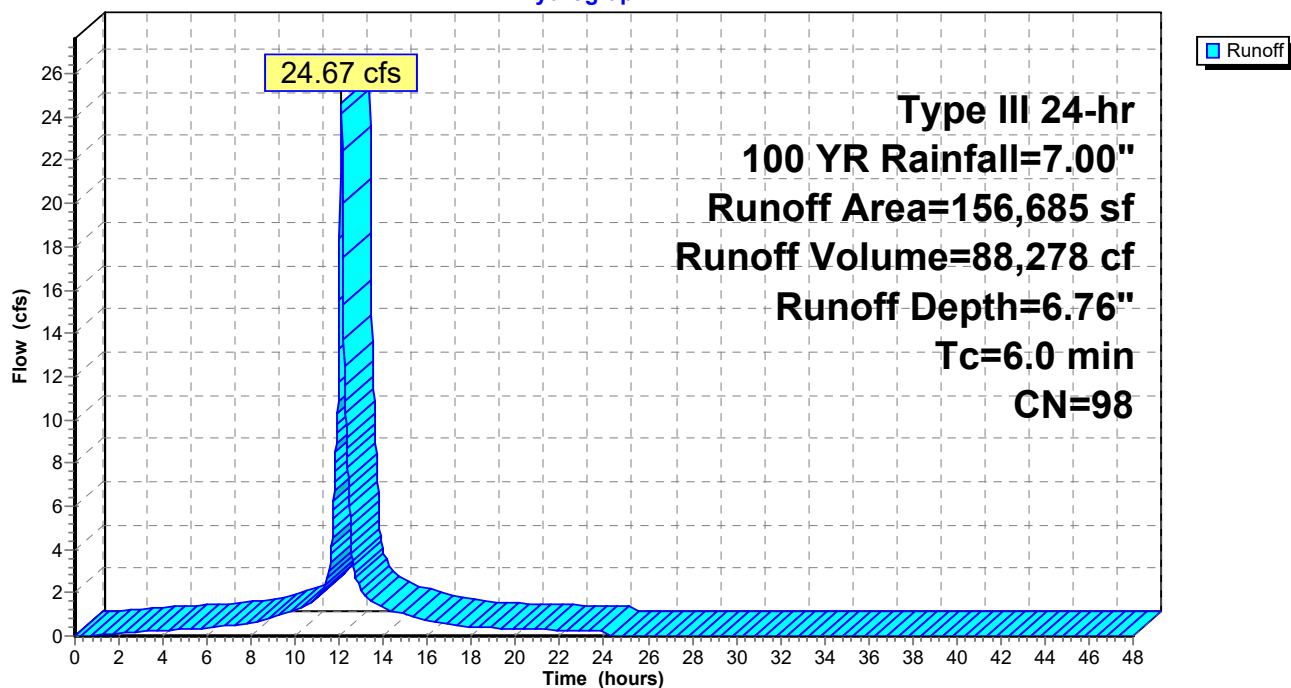
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
156,685	98	Roofs, HSG C
156,685		100.00% Impervious Area

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

Subcatchment POST-1A: Post Development Area 1A

Hydrograph



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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Subcatchment POST-2: Post Development Area 2

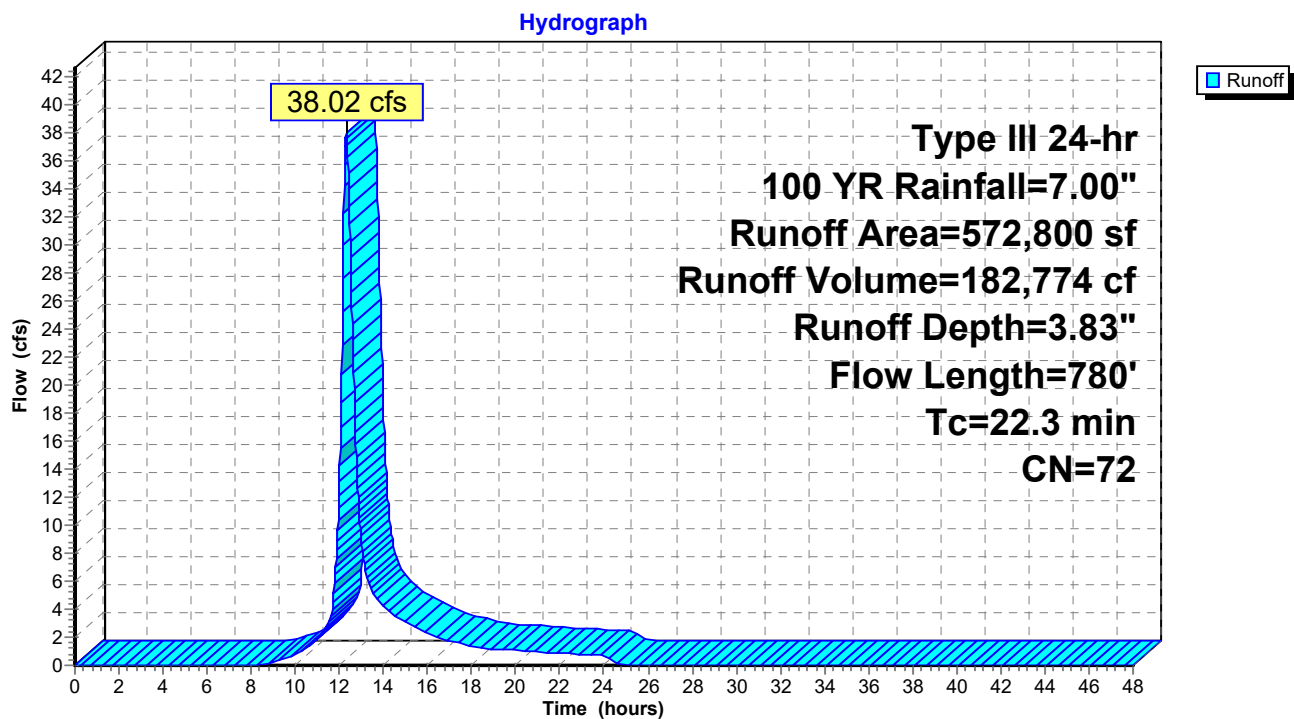
Runoff = 38.02 cfs @ 12.31 hrs, Volume= 182,774 cf, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Type III 24-hr 100 YR Rainfall=7.00"

Area (sf)	CN	Description
572,800	72	Woods/grass comb., Good, HSG C
572,800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0	50	0.0080	0.05		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.50"
5.3	730	0.0200	2.28		Shallow Concentrated Flow, B-C Unpaved Kv= 16.1 fps
22.3	780	Total			

Subcatchment POST-2: Post Development Area 2



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Type III 24-hr 100 YR Rainfall=7.00"

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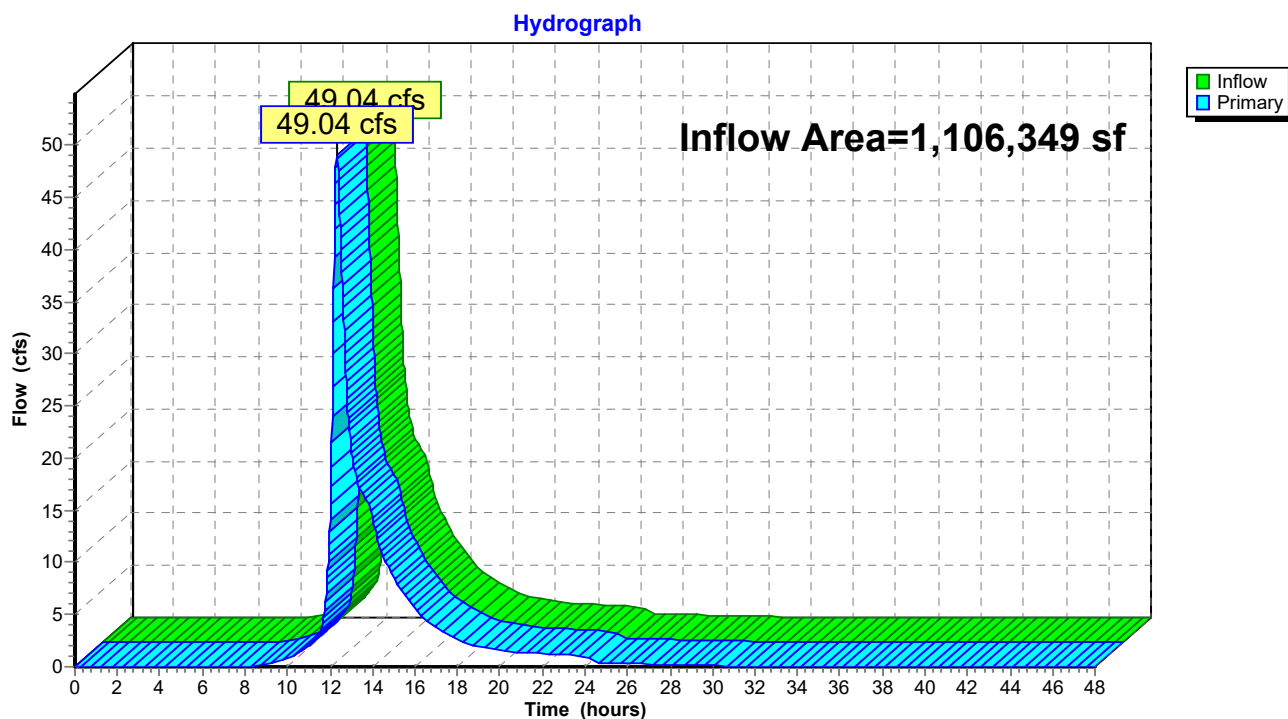
Summary for Pond AP-1: Surrounding Wetland System

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1,106,349 sf, 36.28% Impervious, Inflow Depth = 3.64" for 100 YR event
Inflow = 49.04 cfs @ 12.32 hrs, Volume= 335,509 cf
Primary = 49.04 cfs @ 12.32 hrs, Volume= 335,509 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs

Pond AP-1: Surrounding Wetland System



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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Pond POND-1: Proposed Detention Basin

Inflow Area = 533,549 sf, 75.23% Impervious, Inflow Depth = 5.91" for 100 YR event
Inflow = 53.53 cfs @ 12.16 hrs, Volume= 262,595 cf
Outflow = 13.39 cfs @ 12.74 hrs, Volume= 262,606 cf, Atten= 75%, Lag= 35.2 min
Discarded = 1.52 cfs @ 15.16 hrs, Volume= 109,871 cf
Primary = 12.43 cfs @ 12.74 hrs, Volume= 152,735 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
Peak Elev= 80.88' @ 12.74 hrs Surf.Area= 40,889 sf Storage= 124,411 cf

Plug-Flow detention time= 261.4 min calculated for 262,497 cf (100% of inflow)
Center-of-Mass det. time= 261.7 min (1,043.2 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	168,392 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
78.00	28,379	0	0
79.00	31,416	29,898	29,898
80.00	64,510	47,963	77,861
81.00	37,769	51,140	129,000
82.00	41,014	39,392	168,392

Device	Routing	Invert	Outlet Devices
#1	Primary	78.00'	18.0" Round Culvert L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 78.00' / 77.50' S= 0.0167 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	78.50'	4.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	79.50'	4.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Discarded	78.00'	1.020 in/hr Exfiltration over Surface area

Discarded OutFlow Max=1.52 cfs @ 15.16 hrs HW=80.00' (Free Discharge)
↑**4=Exfiltration** (Exfiltration Controls 1.52 cfs)

Primary OutFlow Max=12.43 cfs @ 12.74 hrs HW=80.88' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 12.43 cfs @ 7.03 fps)
↑**2=Orifice/Grate** (Passes < 0.63 cfs potential flow)
↑**3=Sharp-Crested Rectangular Weir** (Passes < 19.81 cfs potential flow)

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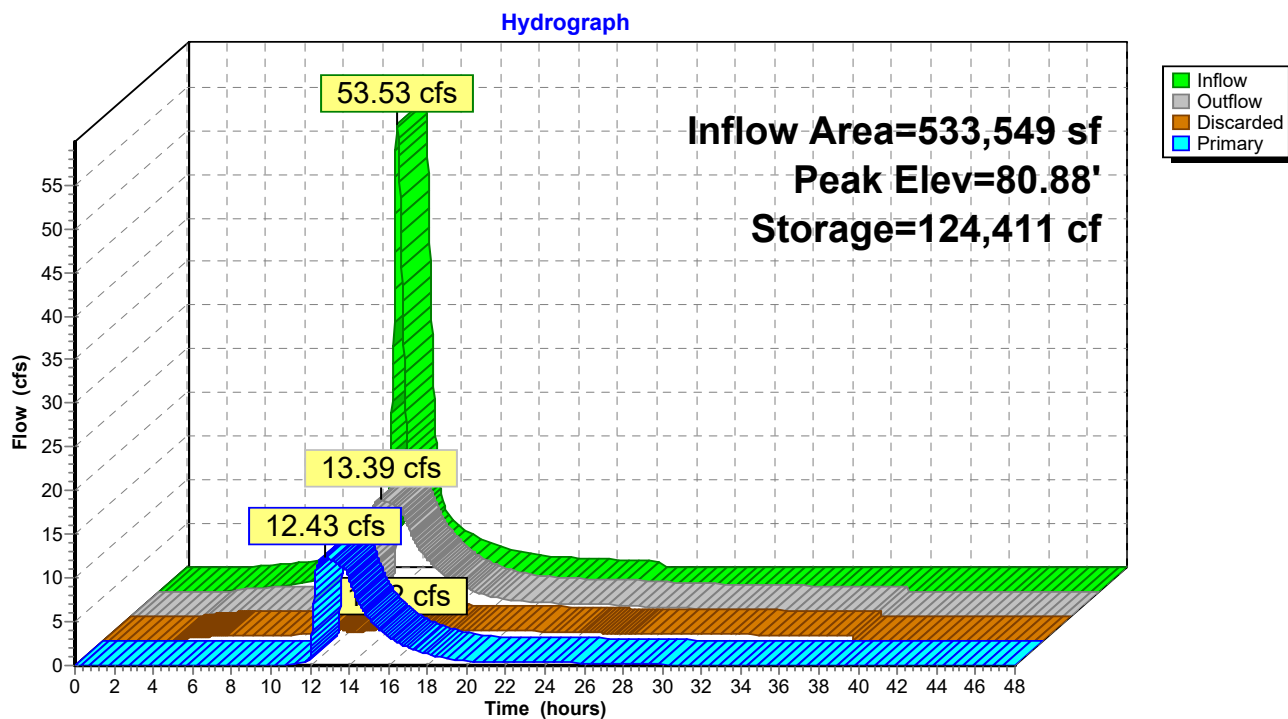
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Type III 24-hr 100 YR Rainfall=7.00"

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Pond POND-1: Proposed Detention Basin



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Type III 24-hr 100 YR Rainfall=7.00"

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Summary for Pond RECH-1: Proposed Roof Drain Recharge Trench

Inflow Area = 156,685 sf, 100.00% Impervious, Inflow Depth = 6.76" for 100 YR event
 Inflow = 24.67 cfs @ 12.08 hrs, Volume= 88,278 cf
 Outflow = 24.18 cfs @ 12.10 hrs, Volume= 88,279 cf, Atten= 2%, Lag= 1.0 min
 Discarded = 0.05 cfs @ 1.34 hrs, Volume= 4,947 cf
 Primary = 24.14 cfs @ 12.10 hrs, Volume= 83,331 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.02 hrs
 Peak Elev= 85.64' @ 12.10 hrs Surf.Area= 1,956 sf Storage= 2,990 cf

Plug-Flow detention time= 20.2 min calculated for 88,242 cf (100% of inflow)
 Center-of-Mass det. time= 20.3 min (763.3 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	1,733 cf	4.00'W x 489.00'L x 3.00'H Prismatic 5,868 cf Overall - 1,536 cf Embedded = 4,332 cf x 40.0% Voids
#2	83.50'	1,536 cf	24.0" Round Pipe Storage Inside #1 L= 489.0'
		3,269 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	1.030 in/hr Exfiltration over Surface area
#2	Primary	84.00'	18.0" Round Culvert X 3.00 L= 140.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 84.00' / 80.00' S= 0.0286 ' S= 0.0286 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Discarded OutFlow Max=0.05 cfs @ 1.34 hrs HW=83.03' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=24.13 cfs @ 12.10 hrs HW=85.64' TW=79.88' (Dynamic Tailwater)
 ↑ **2=Culvert** (Inlet Controls 24.13 cfs @ 4.55 fps)

2190-PostDevelopmentAnalysis

Prepared by {enter your company name here}

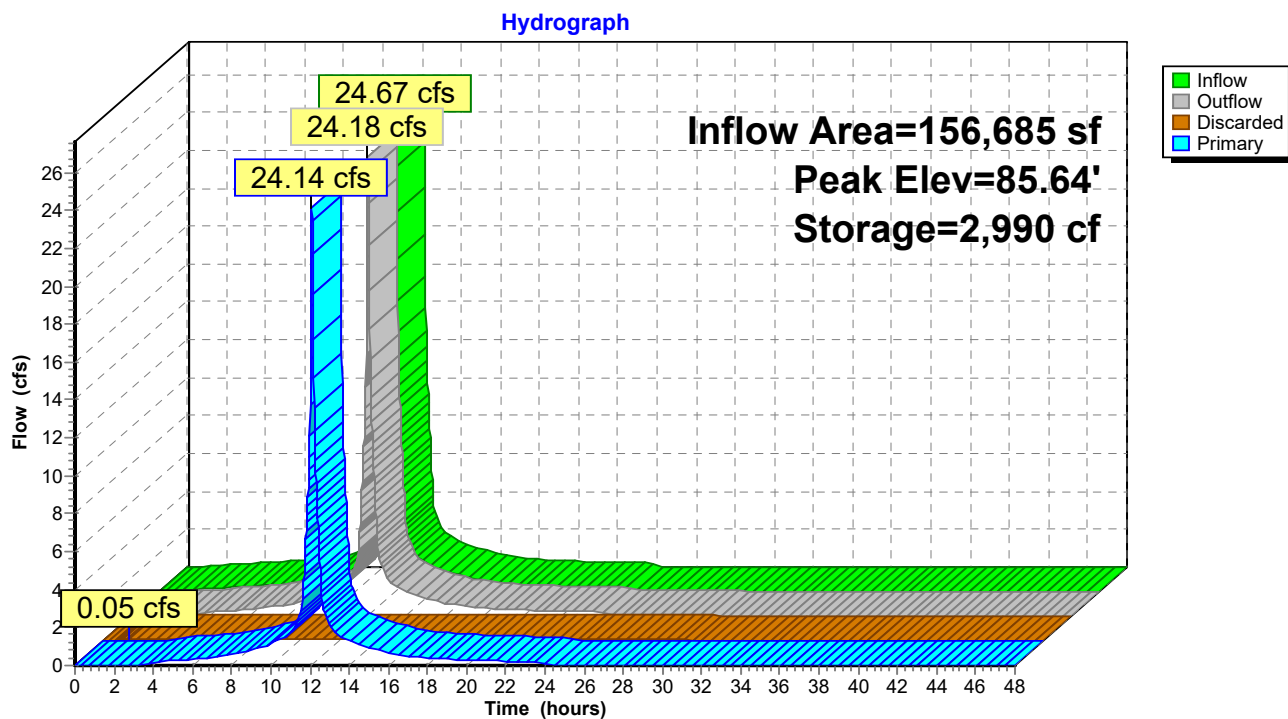
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Type III 24-hr 100 YR Rainfall=7.00"

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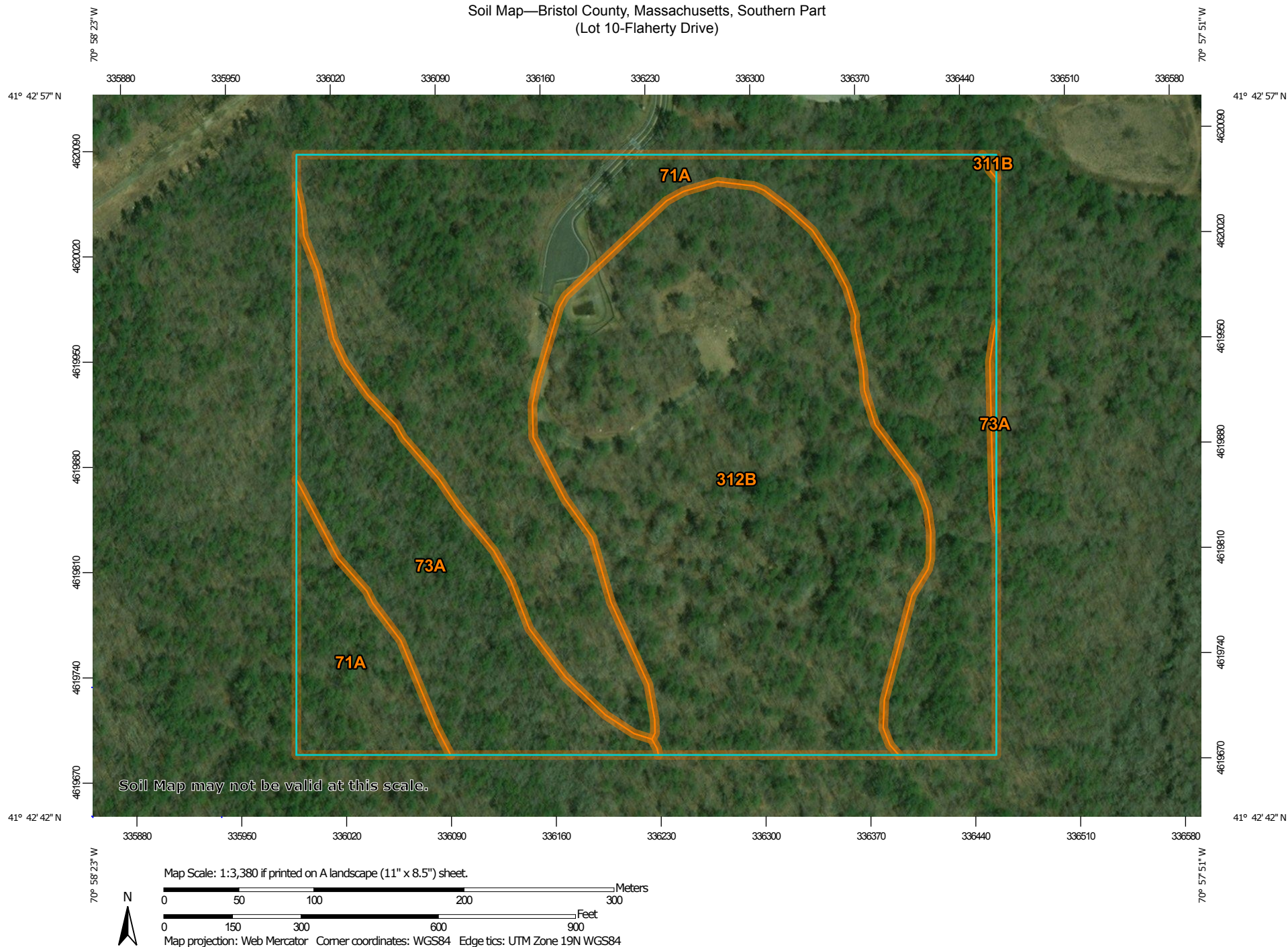
Pond RECH-1: Proposed Roof Drain Recharge Trench



Section 4

Supplemental Data

Soil Map—Bristol County, Massachusetts, Southern Part
(Lot 10-Flaherty Drive)




Soil Map—Bristol County, Massachusetts, Southern Part
(Lot 10-Flaherty Drive)


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 1:20,000.

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: Bristol County, Massachusetts, Southern Part

Survey Area Data: Version 11, 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: Dec 31, 2009—Jun 7, 2016

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	22.0	47.6%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	6.5	14.0%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	0.0	0.0%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	17.7	38.3%
Totals for Area of Interest		46.3	100.0%

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/31/2016
Drilling Foreman: George Guinto	Date Completed: 3/31/2016
LGCI Engineer: Todd Dwyer	Location: Western side of proposed footprint
Ground Surface El: 95.5 feet, see remark 1	Total Depth: 25 feet
Groundwater Depth: 5' based on sample moisture	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	WOH	1	7	15	24	18		Forest Mat/ Subsoil ~2.0'	S1 - Top 6": Forest Mat Mid 6": Silty SAND (SM), fine to medium, trace coarse, 40-45% fines, 0-5% fine gravel, <5% organics, orange brown, moist Bot. 6": Silty SAND (SM) fine to medium, 40-45% fines, orange brown, moist
	2 - 4	S2	14	20	21	21	24	15			S2 - Silty SAND (SM), fine to medium, 40-45% fines, 0-5% fine gravel, light gray, moist S3 - Silty SAND (SM), fine to medium, trace coarse, 30-35% fines, gray, wet
	5 - 7	S3	10	11	15	18	24	12			
10ft	10-12	S4	17	46	36	21	24	14		Sand	S4 - Silty SAND (SM), fine to medium, ~5% coarse, 25-30% fines, 5-10% fine to coarse gravel, gray, wet
15ft	15-17	S5	13	14	19	26	24	15			S5 - Silty SAND (SM), fine to medium, 25-30% fines, 10-15% fine to coarse gravel, gray, wet
20ft	20-20.4	S6	65/5"				5	5	3	20.4' Weathered Bedrock	S6 - Similar to S5, weathered rock fragments in sampler tip - possible weathered bedrock
									3		End of boring at 25 feet. Backfilled borehole with drill cuttings.

Remarks:

- 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.
- 2 - Boring performed in excavator track approximately 12 inches below adjacent ground surface.
- 3 - Apparent weathered bedrock at about 20.4 feet based on drill action. Advanced HSA to 25 feet

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/30/2016
Drilling Foreman: George Guinto	Date Completed: 3/30/2016
LGCI Engineer: Todd Dwyer	Location: Northern side of proposed footprint
Ground Surface El: 94.5 feet, see remark 1	Total Depth: 20.3 feet
Groundwater Depth: 5 feet, with water visibly flowing into borehole upon completion.	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	1	1	1	1	24	4	2	Forest Mat/ Subsoil ~3.0'	Top 8": Forest Mat S1 - Silty SAND (SM), fine to medium, 35-40% fines, orange brown, moist to wet S2 - Top 4": Similar to S1
	2 - 4	S2	2	3	20	24	24	8			Bot. 4": Silty SAND (SM), fine to medium, trace coarse, 35-40% fines, 10-15% fine gravel, light gray, wet
											S3 - Similar to S2, bot. 4".
	5 - 7	S3	13	18	21	20	24	20			
10ft									Sand	20.4'	S3 - Similar to S2, bot. 4".
	10-12	S4	10	13	15	15	24	14			
15ft											
	15-17	S5	19	30	28	27	24	18			S5 - Silty SAND (SM), fine to coarse, 25-30% fines with occasional silt seams up to 1" thick, ~5% fine gravel, gray, wet
20ft											
	20-20.3	S6	70/4"				4	4			S6 - Silty SAND with Gravel (SM), fine to medium, trace coarse, 25-30% fines, 15-20% fine gravel, gray, wet
											End of Boring at 20.3 feet. Backfilled borehole with drill cuttings.

Remarks:

- 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation
- 2 - Bottom of subsoil at 3 feet based on SPT N-values.
- 3 - Rock fragment (granite) in sampler tip, possible boulder.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/30/2016
Drilling Foreman: George Guinto	Date Completed: 3/30/2016
LGCI Engineer: Todd Dwyer	Location: Eastern side of proposed footprint
Ground Surface El: 88 feet, see remark 1	Total Depth: 22 feet
Groundwater Depth: 3 feet upon completion of drilling, water weeping into hole at 2 feet.	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	1	1	4	6	24	10	2	Forest Mat/ Subsoil ~2.0'	Top 6": Forest Mat S1 - Silty SAND (SM), fine to medium, 35-40% fines, orange brown, moist
	2 - 4	S2	17	25	31	21	24	18		Sand	S2 - Silty SAND with Gravel (SM), fine to medium, trace coarse, 35-40% fines, 20-25% fine to coarse gravel, light gray, wet
											S3 - Similar to S2
	5 - 7	S3	15	21	17	23	24	13			
10ft											
	10-12	S4	8	11	13	13	24	20			S4 - Similar to S2, 15-20% fine gravel, occasional silt seams up to 1" thick
15ft											
	15-17	S5	18	22	28	42	24	15			S5 - Silty SAND (SM), fine to medium, 25-30% fines, 5-10% fine gravel, gray, wet
20ft											
	20-22	S6	18	34	29	31	24	18			S6 - Similar to S5
										22.0'	
											End of Boring at 22 feet. Backfilled borehole with drill cuttings.

Remarks:

- 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation
- 2 - Cobbles and boulders based on drill action.
- 3 - Auger refusal on boulder, offset 6 feet southwest and resumed sampling at 10 feet.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/30/2016
Drilling Foreman: George Guinto	Date Completed: 3/30/2016
LGCI Engineer: Todd Dwyer	Location: Southern side of proposed footprint
Ground Surface El: 92 feet, see remark 1	Total Depth: 21.5 feet
Groundwater Depth: 5' and rising upon completion of drilling	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	1	1	1	1	24	2	1	Forest Mat/ Subsoil ~2.0'	Top 8": Forest Mat
											S1 - Silty SAND (SM), fine to medium, 25-30% fines, 5-10% fine gravel, orange brown, moist to wet
	2 - 4	S2	9	26	30	26	24	17			S2 - Silty SAND with Gravel (SM), fine to medium, trace coarse, 25-30% fines, 25-30% fine to coarse gravel, gray, wet
											S3 - Similar to S2, 20-25% fines
10ft	5 - 7	S3	15	14	15	31	24	20	3	Sand	
15ft	10-12	S4	15	15	18	26	24	18			S4 - Similar to S2, 30-35% fines, occasional silt seams up to 1" thick, light brown to gray
20ft	15-17	S5	24	42	47	48	24	22			S5 - Silty SAND with Gravel (SM), fine to medium, 20-25% fines with occasional silt seams up to 1 inch thick, 15-20% fine to coarse gravel, light gray, wet
	20-21.5	S6	15	20	75/6"		18	12			S6 - Silty SAND (SM) fine to medium, 30-35% fines, 5-10% fine gravel, cobble at sampler tip, gray, wet
											End of Boring at 21.5 feet. Backfilled borehole with drill cuttings.

Remarks:

- 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation
- 2 - Cobbles below 2 feet based on drill action.
- 3 - 50 blows for last 2 inches.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/30/2016
Drilling Foreman: George Guinto	Date Completed: 3/31/2016
LGCI Engineer: Todd Dwyer	Location: Center of proposed footprint
Ground Surface El: 93 feet, see remark 1	Total Depth: 35 feet
Groundwater Depth: 4.5' upon completion of drilling	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description		
			0-6	6-12	12-18	18-24							
5ft	0 - 2	S1	1	1	1	4	24	4	Forest Mat/ Subsoil ~2.0'	Forest Mat/ Subsoil ~2.0'	Top 8": Forest Mat S1 - Silty SAND (SM), fine to medium, 35-40% fines, 0-5% fine gravel, orange brown, wet		
	2 - 4	S2	14	17	17	20	24	10		Sand	S2 - Silty SAND with Gravel (SM), fine to medium, 25-30% fines, 15-20% fine to coarse gravel, gray, wet		
	5 - 7	S3	10	15	20	22	24	12			S3 - Similar to S2		
10ft	10-12	S4	14	13	15	25	24	24			S4 - Silty SAND (SM), fine to coarse, 25-30% fines with occasional silt seams up to 2" thick, 5-10% fine gravel, gray, wet		
15ft	15-17	S5	6	11	12	21	24	12			S5 - Similar to S4, 10-15% fine gravel		
20ft	20-21.3	S6	22	69	64/4"		16	12	S6 - Silty SAND with Gravel (SM) fine to coarse, 25-30% fines with occasional silt seams up to 2" thick, 15-20% fine gravel, gray, wet				

Remarks:
 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project:	Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA		
Client:	Raw Seafoods, Inc.		LGCI Project No.: 1611

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
30 ft	25-26.6	S7	13	21	62	30/1"	19	12		Weathered Bedrock	S7 - Silty SAND (SM) fine, trace medium, 40-45% fines, 5-10% fine gravel, orange brown, wet (highly weathered rock)
35 ft	30-30.3	S8	60/4"				4	4		~35.04	S8 - Silty SAND (SM) fine to medium, 35-40% fines, 0-5% fine gravel, orange brown, wet (highly weathered rock)
40 ft	35	S9	50/0.5"				0.5	0.5			S9 - Similar to S8
45 ft											Bottom of the borehole at 35.04 feet. The borehole was backfilled using drill cuttings.
50 ft											

Remarks:

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/31/2016
Drilling Foreman: George Guinto	Date Completed: 3/31/2016
LGCI Engineer: Todd Dwyer	Location: NE corner of proposed footprint
Ground Surface El: 90 feet, see remark 1	Total Depth: 12 feet
Groundwater Depth: 4' upon completion of drilling	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	WOH	1	WOH	1	24	10		Forest Mat/ Subsoil	S1 - Top 6": Forest Mat Bot. 4": Silty SAND (SM), fine to medium, ~ 30% fines, 5-10% fine gravel, orange brown, wet
	2 - 4	S2	3	17	34	31	24	18		~2.5'	S2 - Top 2": Similar S1, bot. 4". Bot. 14": Silty SAND with Gravel (SM), fine to coarse, 25-30% fines, 15-20% fine gravel, gray, wet
	5 - 6.8	S3	28	16	17	50/3"	21	12		Sand	S3 - Similar to S2, Bot. 16".
10ft	10-12	S4	8	12	15	20	24	16			S4 - Similar to S2, Bot. 16".
15ft										12.0'	
20ft											
											End of Boring at 12 feet. Backfilled borehole with drill cuttings.

Remarks:

1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/31/2016
Drilling Foreman: George Guinto	Date Completed: 3/31/2016
LGCI Engineer: Todd Dwyer/A. M. Lahlaf	Location: SE corner of proposed footprint
Ground Surface El: 86 feet, see remark 1	Total Depth: 12 feet
Groundwater Depth: 5' based on sample moisture	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	1	4	9	19	24	12		Forest Mat/ Subsoil ~2.0'	S1 - Top 6": Silty SAND (SM), fine, 35-40% fines, trace organics, dark brown, moist Bot. 6": Silty SAND (SM), fine to medium, 35-40% fines, 5-10% fine gravel, orange brown, moist
	2 - 4	S2	15	22	31	28	24	15			S2 - Silty SAND with Gravel (SM), fine to coarse, 35-40% fines, 15-20% fine gravel, gray, wet
	5 - 7	S3	25	28	28	25	24	2		Sand 12.0'	S3 - Similar to S2, cobble in sampler tip.
10ft	10-12	S4	9	18	24	23	24	22			S4 - Silty SAND (SM), fine, trace medium, 40-45% fines, ~5% fine gravel, gray, wet
15ft											End of Boring at 12 feet. Backfilled borehole with drill cuttings.
20ft											

Remarks:

- 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.
- 2 - Boring located on logging road.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/31/2016
Drilling Foreman: George Guito	Date Completed: 3/31/2016
LGCI Engineer: A. M. Lahlaf	Location: SW corner of proposed footprint
Ground Surface El: 93 feet, see remark 1	Total Depth: 7 feet
Groundwater Depth: 5' based on sample moisture	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: 1N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	2	1	1	1	24	18		Forest Mat/ Subsoil ~2.8'	S1 - Top 8": Forest Mat Bot. 10": Silty SAND (SM), fine, trace medium, ~ 40% fines, traces of roots and organics, orange brown, wet S2 - Top 8": Similar to bot. 10" of S1
	2 - 4	S2	19	30	23	18	24	22			Bot. 14": Silty SAND (SM), fine to medium, trace coarse, 30-35% fines, 5-10% fine gravel, gray, moist
	5 - 7	S3	12	20	20	20	24	16		Sand 7.0'	S3 - Silty SAND (SM), fine, trace medium, trace coarse, 30-35% fines, gray, wet
10ft											End of Boring at 7 feet. Backfilled borehole with drill cuttings.
15ft											
20ft											

Remarks:

1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Drilling Subcontractor: Soil Exploration Corp.	Date Started: 3/31/2016
Drilling Foreman: George Guito	Date Completed: 3/31/2016
LGCI Engineer: A. M. Lahlaf	Location: NW corner of proposed footprint
Ground Surface El: 98 feet, see remark 1	Total Depth: 7 feet
Groundwater Depth: 5' based on sample moisture	Drill Rig Type: CME 750 ATV
	Drilling Method: 4 1/4" Hollow Stem Augers
Hammer Weight: 140 lbs	Split Spoon Diameter: ID - 1.375", OD - 2"
Hammer Type: Automatic	Rock Core Barrel Size: N/A
Drop: 30 inches	

Depth Scale	Sample Depth (ft)	Sample No	Blows per 6 inches				Pen (in)	Rec (in)	Remarks	Strata	Sample Description
			0-6	6-12	12-18	18-24					
5ft	0 - 2	S1	1	2	2	1	24	7		Forest Mat/ Subsoil	S1 - Forest Mat
										~2.2'	
	2 - 4	S2	14	18	20	13	24	12		Sand	S2 - Top 2": Silty SAND (SM) fine, ~ 30% fines, traces of roots, gray to orange brown (subsoil). Bot. 12": Silty SAND with Gravel (SM), fine to medium, 25-30% fines, ~ 15% fine to coarse gravel, gray, moist
10ft	5 - 7	S3	12	20	20	17	24	14			S3 - Silty SAND (SM), fine to medium, trace coarse, 15-20% fines, ~ 10% fine gravel, gray, wet
15ft										7.0'	End of Boring at 7 feet. Backfilled borehole with drill cuttings.
20ft											

Remarks:

1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project:	Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA		
Client:	Raw Seafoods Inc.		LGCI Project No.: 1611
Excavation Subcontractor: Craftmasters	Date Started: 03/30/16		
Excavation Foreman: Robert Kelliher	Date Completed: 03/30/16		
LGCI Engineer: Todd Dwyer	Location: NW corner of proposed footprint		
Ground Surface El: 98 feet, see remark 1	Total Depth: 4 feet		
Groundwater Depth: Weeping from sides at 2.9'.	Excavator Type: Komatsu PC300LC		
	Test Pit Dimensions: 5.5' x 15.5'		

Depth Scale	Exc. Effort	Strata	Soil Description
5 ft	E	Forest Mat/ Subsoil ~2.9'	0-10": Forest Material 6"
	E		10"-2.9' - Silty SAND (SM), fine to medium 40-45% fines, 0-5% fine gravel, trace root hairs, orange brown, moist
	E		
	M	Sand ~4'	3' - 12': Silty SAND with Gravel (SM), fine to medium, 35-40% fines, 15-20% fine to coarse gravel, ~5% cobbles, gray, wet
			Bottom of test pit at 4 feet. Backfilled with excavated soil and leveled with excavator bucket.
10 ft			
15 ft			

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult
 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Excavation Subcontractor: Craftmasters	Date Started: 03/30/16
Excavation Foreman: Robert Kelliher	Date Completed: 03/30/16
LGCI Engineer: Todd Dwyer	Location: NE corner of proposed footprint
Ground Surface El: 90 feet, see remark 1	Total Depth: 9 feet
Groundwater Depth: 2.5' at subsoil/sand interface.	Excavator Type: Komatsu PC300LC
	Test Pit Dimensions: 5.5' x 15'

Depth Scale	Exc. Effort	Strata	Soil Description
5 ft	E	Forest Mat/ Subsoil	0-10": Forest Material ~6"
	E		10"-2.5' - Silty SAND (SM), fine to medium, 40-45% fines, 5-10% fine gravel, orange brown, moist to wet within 6 inches of subsoil/sand interface ~2'
	E/M	~2.5'	
	M	Sand	2.5' - 9': Silty SAND (SM), fine to medium, trace coarse, 35-40% fines, 10-15% fine gravel, 5-10% cobbles and boulders <1' in diameter, light gray, wet
	M		
	M		
	M		
	M		
10 ft	M	~9'	
			Bottom of test pit at 9 feet. Backfilled with excavated soil and leveled with excavator bucket.
15 ft			

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Excavation Subcontractor: Craftmasters	Date Started: 03/30/16
Excavation Foreman: Robert Kelliher	Date Completed: 03/30/16
LGCI Engineer: Todd Dwyer	Location: SW corner of proposed footprint
Ground Surface El: 93 feet, see remark 1	Total Depth: 3.5 feet
Groundwater Depth: Weeping from sides at 2 feet.	Excavator Type: Komatsu PC300LC
Test Pit Dimensions: 5.5' x 14'	

Depth Scale	Exc. Effort	Strata	Soil Description
5 ft	E	Forest Mat/ Subsoil ~3.2'	0-10": Forest Material 6"
	E		10"-3.2': Silty SAND (SM), fine to medium, 35-40% fines, trace root hairs, orange brown, moist to wet below 2 feet.
	E		3.2' 2.5' 3.2' 2.8'
	E/M	Sand	3.2'-3.5': Silty SAND (SM), fine to medium, 35-40% fines, 10-15% fine to coarse gravel, 5-10% cobbles, light gray, wet
10 ft			Bottom of test pit at 3.5 feet. Backfilled with excavated soil and leveled with excavator bucket.
15 ft			

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult

1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

Project: Proposed Frozen Storage Building, Flaherty Drive Site, New Bedford, MA	
Client: Raw Seafoods Inc.	LGCI Project No.: 1611
Excavation Subcontractor: Craftmasters	Date Started: 03/30/16
Excavation Foreman: Robert Kelliher	Date Completed: 03/30/16
LGCI Engineer: Todd Dwyer	Location: SE corner of proposed footprint
Ground Surface El: 84 feet, see remark 1	Total Depth: 5.5 feet
Groundwater Depth: 2' at subsoil/glacial till interface.	Excavator Type: Komatsu PC300LC
	Test Pit Dimensions: 5.5' x 13'

Depth Scale	Exc. Effort	Strata	Soil Description
5 ft	E	Forest Mat/ Subsoil ~2.0'	0-6": Forest Material
	E		0.5' - 3': Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, ~10% organic fines, orange brown, moist to wet within 6 inches of subsoil/sand interface
	M	Sand ~5.5'	2'-5.5-: Silty SAND with Gravel (SM), fine to coarse, 35-40% fines, 15-20% fine to coarse gravel, 10-15% cobbles and boulders <1' in diameter, gray, wet
	M		
	M		
	M		
10 ft			Bottom of test pit at 5.5 feet. Backfilled with excavated soil and leveled with excavator bucket.
15 ft			

Remarks: E = Easy, M = Moderate, D = Difficult, V = Very Difficult
 1 - Ground surface elevations were estimated by plotting the boring/test pit locations on the plan titled: "Site Plan, Site Schematic, Raw Seafoods, Inc., Flaherty Drive Extension, New Bedford, Massachusetts, prepared by Field Engineering Co. Inc., dated 2/18/16; and interpolating between elevation contours to the nearest 1/2 foot.

FIELD ENGINEERING, INC.

MATTAPOISETT, MA

RECHARGE VOLUME CALCULATIONS

Client:	PLUMBERS SUPPLY COMPANY, INC.	Job No.	2190
Project:	PROPOSED OFFICE/WAREHOUSE	Date:	3/20/2018
Location:	FLAHERTY DRIVE EXTENSION	Design by:	R. RICCIO

RECHARGE VOLUME CALCULATIONS

HYDROLOGIC SOIL GROUP	C
UNIT VOLUME (in.) =	0.25
IMPERVIOUS AREA (s.f.) =	401,409
RECHARGE VOLUME (cu.ft.) =	8,363

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
78.0	28,379.0	0.0	0.0	0.000
78.50	29,898.0	14,569.3	14,569.3	0.334
RECHARGE VOLUME PROVIDED			14,569.3	0.334
RECHARGE VOLUME REQUIRED			8,362.7	0.192

DRAWDOWN TIME CALCULATION

DRAWDOWN TIME=(REQ.RECH. VOL.)/(DES. INFILTRATION RATE "K"*BOTTOM AREA)

RECHARGE VOLUME PROVIDED (CF)=	14,569.3	
DESIGN INFILTRATION RATE (IN/HR)=	1.0	
BOTTOM AREA(SF)=	28,379.0	
DRAWDOWN TIME (HRS)=	6.0	OK

FIELD ENGINEERING, INC.

MATTAPOISETT, MA

WATER QUALITY VOLUME CALCULATIONS

Client:	PLUMBERS SUPPLY COMPANY, INC.	Job No.	2190
Project:	PROPOSED OFFICE/WAREHOUSE	Date:	3/20/2018
Location:	FLAHERTY DRIVE EXTENSION	Design by:	R. RICCIO

REQUIRED WATER QUALITY VOLUME-POST-1

UNIT VOLUME (in.) =	1.00
IMPERVIOUS AREA (s.f.) =	226,004
WATER QUALITY VOLUME (cu.ft.) =	18,834

AVAILABLE VOLUME CALCULATION (POND-1)

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
78.0	28,379.0	0.0	0.0	0.000
79.00	31,416.0	29,897.5	29,897.5	0.686

WATER QUALITY VOLUME PROVIDED =	29,897.5	0.686	
WATER QUALITY VOLUME REQUIRED =	18,833.7	0.432	OK

FIELD ENGINEERING, INC.

MATTAPOISETT, MA

SEDIMENT FOREBAY SIZING CALCULATION

Client:	PLUMBERS SUPPLY COMPANY, INC.	Job No.	2190
Project:	PROPOSED OFFICE/WAREHOUSE	Date:	3/20/2018
Location:	FLAHERTY DRIVE EXTENSION	Design by:	R. RICCIO

REQUIRED SEDIMENT FOREBAY SIZING-DETENTION BASIN 1

TOTAL CONTRIBUTING AREA (acre) =	12.2
MINIMUM FOREBAY SIZE (in. per acre) =	0.10
FOREBAY REQUIRED CAPACITY (cu. ft.) =	4,429

AVAILABLE VOLUME CALCULATION- FOREBAY 1

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
78.0	3,138.0	0.0	0.0	0.000
80.0	4,282.0	7,420.0	7,420.0	0.170

AVAILABLE VOLUME CALCULATION-FOREBAY 2

ELEV (ft.)	AREA (s.f.)	VOL (cu.ft.)	CUM. VOL (cu.ft.)	CUM. VOL (ac.ft.)
**	**			
78.0	2,540.0	0.0	0.0	0.000
80.0	3,776.0	6,316.0	6,316.0	0.145

FOREBAY VOLUME PROVIDED	13,736.0	0.315	
FOREBAY VOLUME REQUIRED	4,428.6	0.102	OK

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: Off Flaherty Drive, New Bedford, MA

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Street Sweeping - 5%	0.05	1.00	0.05	0.95
	Deep Sump and Hooded Catch Basin	0.25	0.95	0.24	0.71
	Infiltration Basin	0.80	0.71	0.57	0.14
		0.00	0.14	0.00	0.14
		0.00	0.14	0.00	0.14

Total TSS Removal =

86%

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

Project: PLUMBERS SUPPLY
Prepared By: RRR
Date: 3/16/2018

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

FIELD ENGINEERING CO. INC.

MATTAPOISETT, MA

RUN-OFF COEFFICIENT CALCULATIONS

Client:	Plumbers Supply Company	Job No.	2190
Project:	Proposed Site Development	Date:	3/20/2018
Location:	Flaherty Drive, NBBP	Calcs by:	R. Riccio

Coefficient (C) factor:

Impervious areas (Roofs and paved areas)	0.90
Pervious areas (landscaped;lawn areas)	0.40
Pervious areas (undisturbed;wooded)	0.30

AREA NO.	LAWN AREA (ac.)	WOODED AREA (ac.)	IMPERV. AREA (ac.)	TOTAL AREA (ac.)	COMPOSITE FACTOR "C"
CB1	0.09	0.00	0.23	0.32	0.76
DCB2	0.10	0.00	0.23	0.33	0.75
DCB3	0.07	0.00	0.69	0.76	0.85
CB4	0.09	0.00	0.20	0.29	0.74
CB5	0.28	0.00	0.26	0.54	0.64
DCB6	0.05	0.00	1.12	1.17	0.88
DCB7	0.50	0.00	1.21	1.71	0.75
DCB8	0.72	0.00	0.41	1.13	0.58
YD-2	0.23	0.00	0.04	0.27	0.47
YD-1	0.22	0.00	0.00	0.22	0.70

FIELD ENGINEERING CO., INC. MATTAPOISETT, MA

STORM DRAINAGE DESIGN DATA
Rational Method Q=CIA
Design Storm 100 YEAR

Client: Plumbers Supply Co. Job No: 2190
Project: Proposed Site Development Date: 3/20/2018
Location: Flaherty Drive, NBBP Cal By: R. Riccio

NOTE: Data entry columns headed by double asterisk. **

From MH	Inv. Elev.	To MH	Inv. Elev.	Length (ft)	Slope (%)	Area Inc. (ac.)	Area Total (ac.)	Runoff Inc. "C"	Coef. Ave. "C"	Int. (in/hr) "I"	Inlet Time (min)	Pipe Time (min)	Total Time (min)	Flow Inc. (cfs)	Flow Total (cfs)	Pipe Dia. (in)	"n"	Slope (ft/ft)	Flow Full (cfs)	Vel. Full (ft/s)
** CB1	** 95.00	** DMH1	** 94.00	** 52	1.92%	** 0.32	0.32	** 0.76	0.76	** 7.5	** 5.00	0.12	5.00	1.82	1.82	** 12	** 0.011	0.0192	5.80	7.39
** YD1	** 89.50	** DMH1	** 88.50	** 50	2.00%	** 0.22	0.22	** 0.70	0.70	** 7.5	** 5.00	0.11	5.00	1.16	1.16	12 **	** 0.011	0.0200	5.92	7.54
** DMH1	** 88.40	** DMH2	** 87.50	** 40	2.25%	** 0.00	0.54	** 0.00	0.74	** 7.5	** 5.00	0.08	5.12	0.00	2.98	12 **	** 0.011	0.0225	6.28	7.99
** DMH2	** 87.40	** DMH5	** 84.60	** 115	2.43%	** 0.00	0.54	** 0.00	0.74	** 7.5	** 0.00	0.23	5.20	0.00	2.98	12 **	** 0.011	0.0243	6.53	8.32
** DCB2	** 87.75	** DMH3	** 87.65	** 5	2.00%	** 0.33	0.33	** 0.75	0.75	** 7.5	** 5.00	0.01	5.01	1.86	1.86	12 **	** 0.011	0.0200	5.92	7.54
** RD	** 88.50	** DMH3	** 87.50	** 40	2.50%	** 0.33	0.33	** 0.90	0.90	** 7.5	** 5.00	0.08	5.00	2.23	2.23	12 **	** 0.011	0.0250	6.62	8.43
** DMH3	** 87.40	** DMH4	** 86.30	** 122	0.90%	** 0.00	0.66	** 0.00	0.83	** 7.5	** 5.00	0.35	5.35	0.00	4.08	15 **	** 0.011	0.0090	7.21	5.87
** DCB3	** 87.00	** DMH4	** 86.90	** 5	2.00%	** 0.76	0.76	** 0.85	0.85	** 7.5	** 5.00	0.01	5.00	4.85	4.85	12 **	** 0.011	0.0200	5.92	7.54
** RD	** 88.50	** DMH4	** 87.50	** 65	1.54%	** 0.14	0.14	** 0.90	0.90	** 7.5	** 5.00	0.16	5.00	0.95	0.95	12 **	** 0.011	0.0154	5.19	6.61
** DMH4	** 86.05	** DMH5	** 84.20	** 200	0.92%	** 0.00	1.56	** 0.00	0.84	** 7.3	** 0.00	0.50	5.84	0.00	9.61	18 **	** 0.011	0.0092	11.87	6.72
** YD2	** 85.60	** DMH5	** 84.60	** 72	1.39%	** 0.27	0.27	** 0.47	0.47	** 7.5	** 5.00	0.19	5.00	0.95	0.95	12 **	** 0.011	0.0139	4.93	6.28
** DMH5	** 84.10	** DMH6	** 82.75	** 92	1.47%	** 0.00	2.37	** 0.00	0.78	** 7.2	** 5.00	0.18	6.02	0.00	13.25	18 **	** 0.011	0.0147	14.95	8.46
** CB4	** 88.00	** DMH6	** 87.90	** 5	2.00%	** 0.56	0.56	** 0.71	0.71	** 7.5	** 5.00	0.01	5.00	2.98	2.98	12 **	** 0.011	0.0200	5.92	7.54
** DMH6	** 82.25	** DMH7	** 79.95	** 318	0.72%	** 0.00	2.93	** 0.00	0.76	** 6.9	** 0.00	0.74	6.76	0.00	15.44	24 **	** 0.011	0.0072	22.60	7.19
** CB5	** 84.00	** DMH7	** 83.50	** 22	2.27%	** 0.54	0.54	** 0.64	0.64	** 7.0	** 5.00	0.05	5.00	2.42	2.42	12 **	** 0.011	0.0227	6.31	8.03
** DMH7	** 79.85	** DMH8	** 79.50	** 51	0.69%	** 0.00	3.47	** 0.00	0.74	** 6.9	** 0.00	0.12	6.88	0.00	17.83	24 **	** 0.011	0.0069	22.02	7.01
DMH8	79.40	FE	78.40	187	0.53%	0.00	3.47	0.00	0.74	6.9	0.00	0.50	7.00	0.00	17.83	24	0.011	0.0053	19.43	6.19

FIELD ENGINEERING CO., INC.

MATTAPOISETT, MA

STORM DRAINAGE DESIGN DATA
Rational Method Q=CIA
Design Storm 100 YEAR

Client: Plumbers Supply Co.

Job No: 2190

Project: Proposed Site Development

Date: 3/20/2018

Location: Flaherty Drive, NBBP

Cal By: R. Riccio

NOTE: Data entry columns headed by double asterisk. **

From MH	Inv. Elev.	To MH	Inv. Elev.	Length (ft)	Slope (%)	Area Inc. (ac.)	Area Total (ac.)	Runoff Inc. "C"	Coef. Ave. "C"	Int. (in/hr) "I"	Inlet Time (min)	Pipe Time (min)	Total Time (min)	Flow Inc. (cfs)	Flow Total (cfs)	Pipe Dia. (in)	"n"	Slope (ft/ft)	Flow Full (cfs)	Vel. Full (ft/s)
**	**	**	**	**		**		**		**	**					**	**			
DCB6	80.00	FE	79.50	20	2.50%	1.17	1.17	0.88	0.88	7.5	5.00	0.03	5.00	7.72	7.72	15	0.011	0.0250	12.00	9.78
**	**	**	**	**		**		**		**	**					**	**			
DCB7	80.00	FE	79.50	20	2.50%	1.71	1.71	0.75	0.75	7.5	5.00	0.03	5.00	9.62	9.62	15	0.011	0.0250	12.00	9.78
**	**	**	**	**		**		**		**	**					**	**			
DCB8	81.00	FE	79.50	70	2.14%	1.13	1.13	0.58	0.58	7.5	5.00	0.13	5.00	4.92	4.92	15	0.011	0.0214	11.11	9.05
**	**	**	**	**		**		**		**	**					**	**			

Appendix A

Pre and Post Development Watershed Plans

Appendix B

Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan
Proposed Office/Warehouse Facility
Plumbers Supply Company Inc.
New Bedford, MA

1.0 Introduction

This Long Term Pollution Prevention Plan has been prepared in accordance with the Massachusetts Stormwater Handbook for Compliance with Stormwater Standards 4-6.

2.0 Good Housekeeping Practices/Storage Provisions

Good housekeeping practices including periodic inspections of stormwater management system components will be performed in accordance with the Stormwater Management System Operation and Maintenance Plan. It is not anticipated that any high pollutant materials would be stored on site in areas that would discharge directly to the wetland systems. It would be anticipated that a property manager would be on-site and trained in the proper storage of materials and waste products on site.

3.0 Routine Maintenance of Stormwater BMP's

The Stormwater BMP's including the extended detention/infiltration basin, sediment forebays, catch basins will all be operated and maintained in accordance with the Stormwater Management System Operation and Maintenance Plan which is discussed on the Site Development Plans.

4.0 Spill Prevention and Response Plans

It is anticipated that a property manager would be under contract and on site on a regular basis trained in spill prevention and response. MSDS sheets are required to be on site for the handling of any chemicals or compounds that may be associated with any of the approved uses at the site. Emergency contact numbers will be posted and provided to the various tenants that may occupy the building with a 24-hour contact number in the event of any spills on-site.

5.0 Landscaping Provisions

The landscaping on site will be maintained with generally accepted industry practices. Landscaping companies servicing the facility will be notified of the sensitivity of the wetland resource areas and stormwater management systems on site. Disposal of lawn and garden waste will be prohibited from any areas being used for stormwater management as well as in the wetland resource areas. Additionally, provisions shall be made to minimize the amount of fertilizers and other materials that will be allowed to be discharged within the landscaped areas on the site.

6.0 Pet Waste Management Provisions

It is not anticipated that there would be any pets on site at this commercial facility.

7.0 Provisions for Solid Waste Management

Dumpsters will be provided on-site for the disposal of solid waste. These dumpsters will be enclosed in fencing and emptied on a regular basis in accordance with Board of Health regulations and the Conditions of Site Plan Review approval.

8.0 Snow Disposal Guidelines

Plowing directly into the wetland resource areas will not be permitted. All snow stored on site will melt and flow through the stormwater management system. No snow shall be stored in the bottom area of the proposed extended detention/infiltration basin shown on the site plans.

9.0 Winter Road Salt and Sand Use

The use of road salt will not be allowed on the site. Sand will be used wherever possible. It is not anticipated that large quantities of road salt and/or sand will be stored on site.

10.0 Street Sweeping Schedule

Sweeping of the parking lots will be performed twice annually. Sweeping shall occur in the spring following the winter season and again in the fall.

11.0 Illicit Discharge Prevention

Illicit connections to the stormwater management system will be strictly prohibited. Any contractors performing work at the site will be notified of the prohibition of any illicit connections to the stormwater management system. All work done on site shall be per the approved design plans.

12.0 Training for Staff

It is expected that a Property Management Company would be contracted to manage the site property as a whole. Included in this contract would be the operation and maintenance of the Stormwater Management System. Any Site Management Staff would be properly trained in the operation and maintenance of the Stormwater Management System.

13.0 Emergency Contacts

The applicants of the project, Plumbers Supply Company Inc. would be the emergency contacts for any implementation measures that may be required on this Long-Term Pollution Prevention Plan. It would be anticipated that emergency contact numbers would be posted throughout the site building and facilities should any situations arise.

Appendix C

Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement
Proposed Office/Warehouse Facility
Plumbers Supply Company Inc.
New Bedford, Massachusetts

1.0 Description of Illicit Discharges

Illicit discharges are discharges to the stormwater management system that are not entirely composed of stormwater. Illicit discharges include (but are not limited to) wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

2.0 Illicit Discharge Prevention

The project, as designed, does not provide for any illicit connections to the proposed stormwater management system. As part of the long-term pollution prevention plan that will be on file at the City and with the Owners, illicit connections to the stormwater management system will be strictly prohibited. Any contractors performing work at the site will be notified of the prohibition of any illicit connections to the stormwater management system.

3.0 Training for Staff

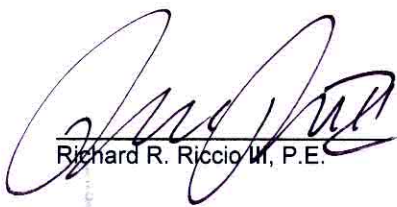
The property owner/managers responsible for the maintenance of the stormwater management system will be properly trained as required to detect any unauthorized illicit discharges to the stormwater management system and eliminate them as soon as possible. It is anticipated that staff will be performing routine maintenance on the stormwater management system and at this time would be able to detect any unauthorized illicit discharges.

4.0 Site Map

Refer to Proposed Site Development Plans prepared for Plumbers Supply Company Inc. by Field Engineering for locations and information on the proposed stormwater management system associated with this project.

5.0 Certification

As the design plans show, there are no provisions for illicit discharges to the stormwater management system being proposed. Additionally, there are no proposed connections between any stormwater and wastewater management systems. Illicit discharges will be prohibited to the new stormwater management system associated with the proposed project and the property owners have been notified to not allow any unauthorized illicit discharges.



Richard R. Riccio III, P.E.