Stormwater Permit Application

Littleton, Massachusetts

Taylor Street Well and Raw Water Main

October 16, 2023

JOB NO: ENG23-0679

Weston & Sampson
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
www.westonandsampson.com
Tel: 978-532-1900 Fax: 978-977-0100

Table of Contents

PLANNING BOARD
P.O. Box 1305
Littleton, Massachusetts 01460

STORMWATER PERMIT APPLICATION

1. Property Information

Street Address 153 Taylor Street

Assessor's Map R10 Parcel 14

Deed Reference (Registry Book and Page or Land Court Certificate of Title No.):

BK 79319 PG 596

2. Project Title or Brief Description: Taylor Street Well and Raw Water Main

3. Property Owners: List all property owners and their mailing addresses; for any owner that is an entity (e.g. LLC or corporation), provide the name and title of the individual authorized to sign for the entity.

Littleton Water Department, 39 Ayer Road, Littleton, MA 01460

4. Applicant Information (Individual or Entity to Whom Permit Will Be Issued)

Name: Corey Godfrey

Company (if applicable): Littleton Electric Light & Water Department

Mailing Address: 39 Ayer Road, Littleton, MA 01460

Tel: 978-540-2222 Fax: _____ E-Mail: cgodfrey@lelwd.com

5. Applicant's Authorized Representative to Planning Board (if any):

Name: James Pearson, P.E.

Company (if applicable): Weston & Sampson

Mailing Address: 55 Walkers Brook Drive, Suite 100, Reading, MA 01867

Tel: 978-532-1900 Fax: _____ E-Mail: Pearsonj@wseinc.com

PLANNING BOARD
P.O. Box 1305
Littleton, Massachusetts 01460

6. Other Planning Board Permits or Approvals Required for This Project:

_____

_____

7. Applicant's Certification:

I hereby certify that the information contained in this application (including all required documents submitted herewith) is correct to the best of my knowledge. If I have identified an Authorized Representative above, I authorize that person to serve as my representative to the Planning Board.

Signature of Applicant: _____ Date: 10-27-23

Printed Name: Corey Godfrey

8. Property Owner's Authorization:

I am the owner of the parcel identified as Littleton Assessor's Map R10, Parcel 14, or the authorized signatory for the entity that is the owner of that parcel. I hereby attest that I have knowledge of, and give my consent to, this application. I authorize the Littleton Planning Board and its authorized agents to enter the aforementioned parcel to verify the information contained in this application and associated documents and, if a permit is granted, to inspect for compliance with permit conditions.

Signature of Owner: _____ Date: 10-27-23

Printed Name: Corey Godfrey

Signature of Owner: _____ Date: _____

Printed Name: _____

9. Checklist of Materials to Be Submitted with Application:

X Erosion and Sediment Control Plan

X Certified List of Abutters

X Stormwater Management Plan

X Permit Application Fee

X Operation and Maintenance Plan

****Communications from the Planning Department will be sent to the e-mail addresses provided for the Applicant and the Applicant's Authorized Representative.****

MToohill@littletonma.org

TOWN OF LITTLETON
BOARD OF ASSESSORS
P.O. BOX 1305
LITTLETON, MA 01460
(978) 540-2410
FAX: (978) 952-2321

DATE: October 27, 2023

RE: Certified List of Abutters

APPLICANT: Littleton Electric Light & Water Departments
NAME OF FIRM: Weston & Sampson
MAILING ADDRESS: 39 Ayer Road P.O Box 2406, Littleton MA

SUBJECT PARCEL OWNER: Littleton Water Department
SUBJECT PARCEL LOCATION 153 Taylor St.
SUBJECT PARCEL MAP &PARCEL NO: R10-14-0

This list of abutters is per your request of October 27, 2023 for 300 feet around 153 Taylor St. for the Planning Board, Chapter 38, Storm Water Management and Erosion Control Regulations.

I hereby certify the attached list of abutter (s)

Number of Abutters 14 + 1 for the Applicant requesting the list.

Certified by:

Hanna Axon, Office Assistant

215 TAYLOR ST — R10 10 0

LUC: 104

CHB LITTLETON LLC
20 GARDEN ST
DANVERS, MA 01923

205 TAYLOR ST — R10 11 0

LUC: 316

CMH LITTLETON LLC
20 GARDEN ST
DANVERS, MA 01923

153 TAYLOR ST — R10 14 0

LUC: 930

LITTLETON WATER DEPARTMENT
39 AYER RD
LITTLETON, MA 01460

151 TAYLOR ST — R10 14 1

LUC: 401

LML LITTLETON LLC
401 EDGEWATER PLACE, SUITE 265
WAKEFIELD, MA 01880

1 MONARCH DR — R10 16 0

LUC: 402

CDK REALTY VENTURE ONE LLC
410 BOSTON POST RD STE 28
SUDBURY, MA 01776-3034

2 MONARCH DR — R10 16 A

LUC: 440

VMD INDUSTRIAL V LLC
733 TURNPIKE ST, ROUTE 114
NORTH ANDOVER, MA 01845

MONARCH DR — R10 16 B

LUC: 440

VMD INDUSTRIAL V LLC
733 TURNPIKE ST, ROUTE 114
NORTH ANDOVER, MA 01845

305 FOSTER ST — R10 2 1

LUC: 404

2641-2651 SANTA ANNA AVE LLC
80 ERDMAN WAY SUITE 301
LEOMINSTER, MA 01453

MONARCH DR — R10 4 0

LUC: 601

HARVARD SPORTSMENS CLUB INC
P.O.BOX 114
HARVARD, MA 01451

TAYLOR ST — R10 6 0

LUC: 440

GUTIERREZ ARTURO+CATALDO CLASS
B TRS, SWEENEY D CLASS A TR
C/O THE GUTIERREZ COMPANY
200 WHEELER ROAD
BURLINGTON, MA 01803

219 TAYLOR ST — R10 8 0

LUC: 101

FOSS WILLIAM R, FOSS JANICE M
CHARLTON ELIZABETH A
219 TAYLOR ST
LITTLETON, MA 01460

OFF WHITCOMB AV — R13 13 0

LUC: 601

HARVARD SPORTSMENS CLUB INC
P.O. BOX 114
HARVARD, MA 01451

OFF WHITCOMB AV — R13 3 15

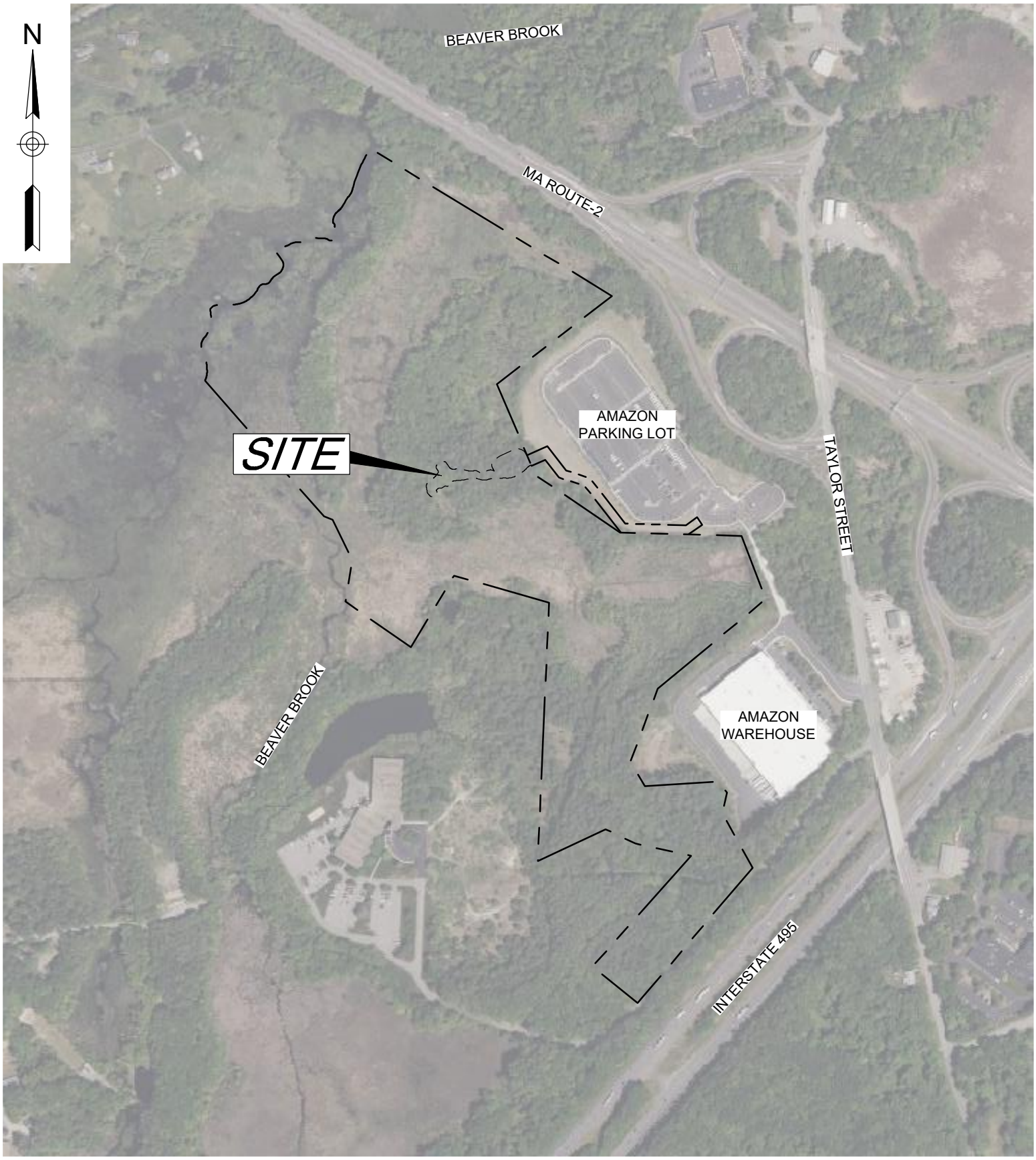
LUC: 930

LITTLETON TOWN OF
P O BOX 1305
LITTLETON, MA 01460

OFF WHITCOMB AV — R13 5 A

LUC: 950

LITTLETON CONSERVATION TRUST
P O BOX 594
LITTLETON, MA 01460



500 250 0 500

SCALE 1"= 500

LOCUS MAP

Weston & Sampson℠

Weston & Sampson Engineers, Inc.

55 Walkers Brook Drive, Suite 100, Reading MA 01867

Erosion and Sediment Control Plan

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

SECTION 1: Introduction

The Littleton Electric Light & Water Department proposes to develop a new drinking water well at a Town owned parcel located off Taylor Street to augment the Town's active water supply sources. Access to the site will be provided through an easement located on abutting property owned by Amazon. Work involved with this project will include the construction of a 1,200-foot± access road, with approximately 800-feet constructed of gravel and 400-feet of asphalt, a well building, a raw water main, and stormwater management infrastructure. Other work will include grading, landscaping, and utilities in support of the well building.

As part of this project, this "Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan" has been created to ensure that onsite erosion is prevented and sediment is controlled to prevent it from leaving the site.

SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the WPA and Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. All pollution prevention and erosion control measures which are required on the site plans and in the SWPPP shall be followed along with the guidance in this document. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. All recommended control practices will comply with the standards set in the MA DEP Stormwater Policy Handbook.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

In order to minimize disturbed areas all work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor shall not disturb native vegetation in the undisturbed wooded area without prior

approval from the Engineer. The Contractor will be responsible to make sure that all workers know the proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project

All construction areas adjacent to drainage features will be lined with compost filter tubes and silt fence. The tubes and silt fence will be inspected daily and accumulated silt will be removed as appropriate. In addition, any storage of material will require a second level of protection by surrounding the areas with another row of compost filter tubes. A stabilized construction entrance/exit is proposed so that equipment visiting the site can remove any accumulated dirt and mud from vehicles to prevent tracking the mud onto public roads.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The Contractor shall take account of the conditions of the soil where erosion control seeding will take place to ensure that materials used for re-vegetation are adaptive to the sediment control.

Following the completion of construction, embankment areas will be finished with topsoil and seed. Slopes in excess of 3H:1V will be stabilized with erosion matting to prevent erosion during the interim period in which vegetation is being established. The overland areas of the proposed construction staging areas will also be re-seeded.

2.4 Proper storage and cover of any stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Engineer.

Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no

sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Storm drain inlets will be protected from sediment.

2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor all erosion control measures. Whenever necessary the Contractor will clear all sediment from the compost filter tubes and silt fence that have been silted up during construction. Daily monitoring should be conducted using the attached Monitoring Form.

The following good housekeeping practices will be followed on-site during the construction project.

2.8 Material Handling and Waste Management

All materials stored on-site will be stored in a neat, orderly manner in appropriate containers. All materials will be kept in their original containers with the original manufacturer's label. Substances will not be mixed with one another unless recommended by the manufacturer.

All waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The contractor will be responsible for all waste removal. Manufacturer's recommendations for proper use and disposal will be followed for all materials. Sanitary waste will be collected from the portable units a minimum of once a week, by a licensed sanitary waste management contractor.

2.9 Designated Washout Areas

The Contractor shall perform washout into contained areas designated for that purpose to prevent cement-laden water from leaving the site.

2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under all equipment during storage. Regular fueling and service of the equipment may be performed using approved methods and with care taken to minimize chance of spills. Any petroleum products will be stored in tightly sealed containers that are clearly labeled.

2.11 Equipment/Vehicle Washing

The Contractor will be responsible to ensure that no equipment is washed on-site.

SECTION 3: Spill Prevention and Control Plan

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state, and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

3.2 Notification

All workers will be directed to inform the on-site supervisor of a spill event. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification is to the DEP. The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all of the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented

to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).

SECTION 4: Contact Information/Responsible Parties

Owner/Operator:
Littleton Water Department
Corey Godfrey
Water & Sewer Superintendent
39 Ayer Road, Littleton, MA 01460
cgodfrey@lelwd.com
978-540-2222

Engineer:
James Pearson, P.E.
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Controls are shown on the project plans. A Stormwater Pollution Prevention Plan (SWPPP) will be required for this project in accordance with EPA regulations. The contractor shall refer to the SWPPP for additional requirements.

SECTION 6: Site Development Plans

A full set of site development plans are included with this submittal.

SECTION 7: Operation and Maintenance of Erosion Control

If there is a failure to the controls the Contractor, under the supervision of the Engineer, will be required to stop work until the failure is repaired.

Periodically throughout the work, whenever the Engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

SECTION 8: Inspection Schedule

During construction the erosion and sedimentation controls will be inspected daily. Once the Contractor is selected, an on-site inspector will be selected to work closely with the Engineer to insure that all erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By: _____ Date: _____ Time: _____

YES	NO	DOES NOT APPLY	ITEM
			Do any erosion/siltation control measures require repair or clean out to maintain adequate function?
			Is there any evidence that sediment is leaving the site and entering the wetlands?
			Are any temporary soil stockpiles or construction materials located in non-approved areas?
			Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them?
			Is there any evidence that sediment is entering stormwater management systems?

Specific location, current weather conditions, and action to be taken:

_____

_____

_____

_____

_____

_____

Other Comments:

_____

_____

_____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature: _____ Date: _____

Site Plans

Stormwater Management Plan

Stormwater Management Plan Summary

October 16, 2023

Applicant/Project Name: Littleton Electric Light & Water Department
Taylor Street Well and Raw Water Main

Project Address: 151 & 153 Taylor Street, Littleton, MA

Application Prepared by:
Firm: Weston & Sampson, Inc.
Registered PE: James Pearson, P.E.

Below is an explanation regarding MassDEP Standards 1-10 as they apply to the Taylor Street Well and Raw Water Main project:

Project Information

The Littleton Electric Light & Water Department proposes to develop a new drinking water well at a Town owned parcel located off Taylor Street to augment the Town's active water supply sources. Access to the site will be provided through an easement located on abutting property owned by Amazon. Work involved with this project will include the construction of a 1,200-foot± access road, with approximately 800-feet constructed of gravel and 400-feet of asphalt, a well building, a raw water main, and stormwater management infrastructure. Other work will include grading, landscaping, and utilities in support of the well building.

The existing site is predominantly wooded and surrounded by a large wetland complex. Terrain is complex, with flat upland grassed areas, and undulating rolling hills located within wooded areas. Elevations range from 237-feet to 233-feet on the grassed portion of the Amazon site, and from 244-feet to 223-feet on the wooded portion located on Town owned property. Resource areas include bordering vegetated wetland, the 100-foot wetland buffer, and a Zone II wellhead protection area. NRCS soil mapping shows the site being comprised primarily of Quonset sandy loam and sandy Udorthents. Numerous well borings throughout the area generally confirm the subsurface conditions.

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. Runoff from approximately 40%± of impervious areas subject to vehicular access will be captured in the stormwater management system and treated prior to discharge while the remaining 60%± of impervious area discharging to the bordering vegetated wetland is considered *De Minimis*. Existing topography, lack of head differential, and the location of the proposed drinking water well in proximity to the wetland preclude the installation of a TSS treatment practice at this location.

Runoff generated from this portion of the site is minimal, equivalent to 0.29-CFS during the 2-year 24-hour storm event, and TSS generated from this untreated portion of pavement will be negligible. Access to the well road will be controlled with extremely limited use, only accessible to employees of the Littleton Water Department and authorized personnel on an infrequent basis to conduct maintenance at the well building.

The proposed treatment practices will remove 90% of TSS from runoff received, and the vast majority of the site will flow overland across grassed and wooded areas, over highly pervious sandy soil (HSG-A), infiltrating much of the runoff, and removing TSS prior to reaching the bordering vegetated wetland.

Standard 2: Peak Rate Attenuation

Existing and proposed conditions were modeled using HydroCAD computer software. A table, summarizing peak discharges for the 2-Yr, 10-Yr, 25-Yr, 50-Yr, and 100-Yr storm events can be found in this Stormwater Management Plan. The proposed design is such that peak discharge rates do not exceed pre-development rates, even in the 100-year storm scenario.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction, as depicted on the site plans.

Standard 3: Recharge

Standard 3 has been met. The required recharge volume has been provided within the proposed stormwater BMP based upon the adjusted capture area calculation, as the BMP only captures 40%± of the impervious area located within the project limits. Supporting calculations are attached in this Stormwater Management Plan.

Standard 4: Water Quality

Standard 4 has been met. Treatment practices have been designed to capture the required water quality volume and provide treatment to remove greater than 44% of TSS prior to entering the infiltration BMP and greater than 80% of TSS overall, based upon 1-IN of runoff volume due to the location of the project within a Zone II. Supporting calculations are attached in this Stormwater Management Plan.

During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion.

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

This site is not considered a LUHPPL, Standard 5 does not apply.

Standard 6: Critical Areas

This project is located within a Zone II of a public water supply.

Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

This is not a redevelopment project, Standard 7 does not apply.

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

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in this application package as part of the Erosion and Sediment Control Plan. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan is included with this application package.

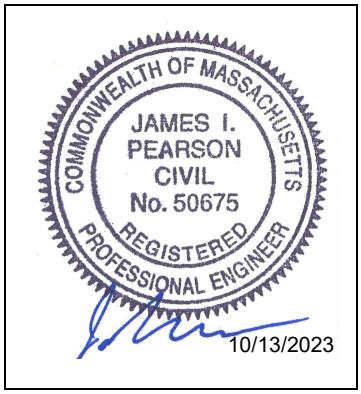
Standard 10: Prohibition of Illicit Discharges

An illicit discharge compliance statement has been included in this Stormwater Management Plan.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including any relevant soil evaluations, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement 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



10/13/2023

Signature and Date

Stormwater Checklist

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

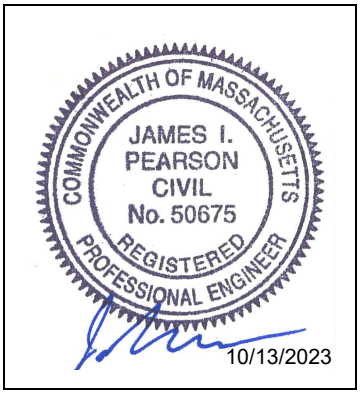
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



10/13/2023
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

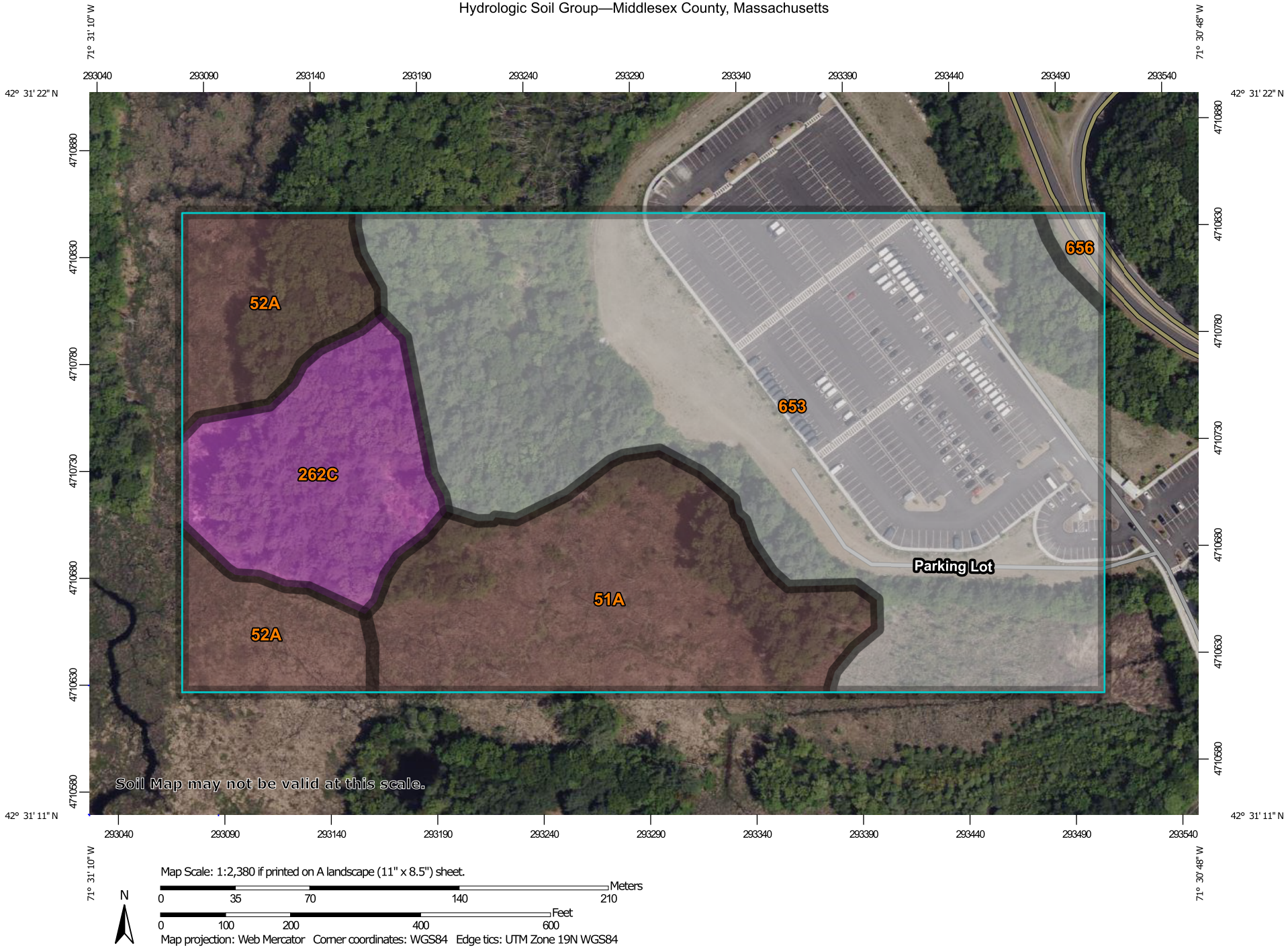
Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

NRCS Soils Map, Soils Report, and HSG Classifications


71° 31' 10" W
71° 30' 48" W
42° 31' 22" N
42° 31' 11" N
293040
293090
293140
293190
293240
293290
293340
293390
293440
293490
293540
4710880
4710830
4710780
4710730
4710680
4710630
4710580
656
52A
653
262C
Parking Lot
51A
52A
Soil Map may not be valid at this scale.
Map Scale: 1:2,380 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 35 70 140 210
Feet
0 100 200 400 600
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 22, Sep 9, 2022

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

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

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
51A	Swansea muck, 0 to 1 percent slopes	B/D	4.6	19.1%
52A	Freetown muck, 0 to 1 percent slopes	B/D	2.9	12.0%
262C	Quonset sandy loam, 8 to 15 percent slopes	A	2.7	11.3%
653	Udorthents, sandy		13.7	56.8%
656	Udorthents-Urban land complex		0.2	0.9%
Totals for Area of Interest			**24.1**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Frimpter Analysis Memorandum

712 Brook Street, Suite 103, Rocky Hill, CT 06067
Tel: 860.513.1473

M E M O R A N D U M

TO:	File
FROM:	Jill Getchell
DATE:	September 29, 2023
SUBJECT:	Seasonal High Groundwater Estimations

Weston & Sampson has evaluated probable high groundwater elevations at the proposed Taylor Street Well Site in Littleton, Massachusetts. Using the data set from the pumping test conducted in September 2022, the Frimpter Method (USGS OFR 80-1205), a method for estimating the seasonal high groundwater elevation for a single point, was conducted on the 200-ft Observation Well located near the proposed Taylor Street Well. The Frimpter method for estimation of probable high groundwater levels (S_h) at unmonitored sites and is represented by the following relationship:

$$S_h = S_c - \frac{S_r}{OW_r}(OW_c - OW_{max})$$

where,

S_c = measured depth to water at site (feet)
S_r = range of water level where the site is located (feet)
OW_r = measured depth to water in well which is used to correlate with the water levels at the site (feet)
OW_c = depth to recorded maximum water level at the observation well which is used to correlate with the water levels at the site (feet)
OW_{max} = recorded upper limit of annual range of water level at the observation well that is used to correlate with the water levels at the site (feet)

The measured depth to water at the site on September 23, 2022 (highest observed static elevation) was used as the basis for the calculation. The site was assumed to be equivalent to a valley flat composed of sand and gravel due to the site's topography. An appropriate range of water levels (S_r) was assumed to be 4.2 feet (Frimpter, 1980). OW_r, OW_c and OW_{max} were each extracted from the nearby USGS monitoring wells (MA-WWW 160 WESTFORD, MA and MA-ACW 158 ACTON, MA). These USGS wells were used for the evaluation based on the distance from the 200-ft observation well and aquifer characteristics. Probable High Groundwater Elevations are summarized in the table below:

	MA-ACW 158 ACTON, MA	MA-WWW 160 WESTFORD, MA
200-ft OB Well DTW (ft btoc)	9.31	
200-ft OB Well Stickup Height (ft)	0.92	
200-ft OB Well TOC Elevation (ft NAVD 88)	230.88	
S_c (ft bg)	8.39	8.39
S_r (ft)	4.2	4.2
OW_c (ft bg)	19.94	12.66
OW_{max} (ft)	13.34	9.56
OW_r (ft bg)	6.35	3.51
S_h (ft bg)	4.03	4.68
S_h Elevation (ft NAVD 88)	225.94	225.28

Therefore, the estimated range of probable high groundwater levels at the site range from 4.03 to 4.68 ft bg (225.28 to 225.94 ft NAVD 88).

HydroCAD Reports

Stormwater Discharge Summary Table

Taylor Street Well and Raw Water Main
Littleton, MA
October 16, 2023

		Peak Discharge (CFS)	
Analysis Point	**24-Hr Storm Event**	**Pre-Development**	**Post-Development**
A	2-YR	0.00	0.00
	10-YR	0.04	0.03
	25-YR	0.19	0.16
	50-YR	0.61	0.50
	100-YR	1.60	1.32

NOAA Atlas 14, Volume 10, Version 3
Location name: Littleton, Massachusetts, USA*
Latitude: 42.5185°, Longitude: -71.5132°
Elevation: 243 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.326** (0.254-0.411)	**0.388** (0.302-0.490)	**0.489** (0.381-0.620)	**0.572** (0.442-0.729)	**0.687** (0.515-0.912)	**0.773** (0.568-1.05)	**0.865** (0.617-1.21)	**0.970** (0.654-1.38)	**1.12** (0.729-1.66)	**1.25** (0.792-1.88)
10-min	**0.462** (0.360-0.583)	**0.549** (0.428-0.694)	**0.692** (0.538-0.877)	**0.811** (0.626-1.03)	**0.974** (0.729-1.29)	**1.10** (0.805-1.48)	**1.23** (0.874-1.72)	**1.38** (0.927-1.96)	**1.59** (1.03-2.34)	**1.77** (1.12-2.66)
15-min	**0.543** (0.424-0.686)	**0.646** (0.504-0.816)	**0.814** (0.633-1.03)	**0.954** (0.737-1.22)	**1.15** (0.858-1.52)	**1.29** (0.947-1.75)	**1.44** (1.03-2.02)	**1.62** (1.09-2.31)	**1.87** (1.21-2.76)	**2.09** (1.32-3.13)
30-min	**0.737** (0.576-0.931)	**0.878** (0.685-1.11)	**1.11** (0.861-1.40)	**1.30** (1.00-1.65)	**1.56** (1.17-2.07)	**1.76** (1.29-2.38)	**1.96** (1.40-2.75)	**2.20** (1.48-3.14)	**2.55** (1.65-3.76)	**2.84** (1.80-4.26)
60-min	**0.932** (0.727-1.18)	**1.11** (0.865-1.40)	**1.40** (1.09-1.77)	**1.64** (1.27-2.09)	**1.97** (1.48-2.62)	**2.22** (1.63-3.01)	**2.48** (1.77-3.49)	**2.79** (1.88-3.98)	**3.23** (2.09-4.76)	**3.60** (2.28-5.40)
2-hr	**1.18** (0.926-1.47)	**1.42** (1.12-1.78)	**1.82** (1.43-2.29)	**2.15** (1.68-2.72)	**2.61** (1.97-3.45)	**2.95** (2.18-3.98)	**3.31** (2.39-4.64)	**3.75** (2.54-5.31)	**4.42** (2.87-6.45)	**4.98** (3.16-7.41)
3-hr	**1.35** (1.07-1.68)	**1.64** (1.30-2.05)	**2.12** (1.67-2.65)	**2.51** (1.96-3.16)	**3.05** (2.32-4.02)	**3.45** (2.57-4.64)	**3.89** (2.82-5.44)	**4.42** (3.00-6.23)	**5.23** (3.41-7.61)	**5.93** (3.77-8.78)
6-hr	**1.72** (1.38-2.13)	**2.10** (1.67-2.60)	**2.72** (2.16-3.37)	**3.23** (2.55-4.02)	**3.93** (3.01-5.13)	**4.45** (3.34-5.94)	**5.02** (3.66-6.97)	**5.71** (3.89-7.98)	**6.78** (4.43-9.77)	**7.70** (4.91-11.3)
12-hr	**2.19** (1.76-2.68)	**2.66** (2.14-3.26)	**3.43** (2.74-4.22)	**4.07** (3.24-5.03)	**4.95** (3.81-6.40)	**5.60** (4.22-7.40)	**6.31** (4.63-8.67)	**7.16** (4.90-9.92)	**8.48** (5.56-12.1)	**9.60** (6.15-14.0)
24-hr	**2.62** (2.13-3.18)	**3.20** (2.59-3.89)	**4.14** (3.35-5.05)	**4.93** (3.95-6.04)	**6.01** (4.66-7.71)	**6.81** (5.17-8.92)	**7.68** (5.67-10.5)	**8.73** (6.00-12.0)	**10.3** (6.82-14.7)	**11.7** (7.54-16.9)
2-day	**2.97** (2.43-3.58)	**3.66** (2.99-4.41)	**4.79** (3.90-5.79)	**5.73** (4.63-6.96)	**7.02** (5.49-8.94)	**7.97** (6.10-10.4)	**9.01** (6.70-12.2)	**10.3** (7.10-14.0)	**12.3** (8.12-17.2)	**14.0** (9.02-20.0)
3-day	**3.24** (2.67-3.88)	**3.98** (3.27-4.78)	**5.20** (4.25-6.25)	**6.20** (5.04-7.50)	**7.58** (5.96-9.61)	**8.60** (6.61-11.1)	**9.72** (7.26-13.1)	**11.1** (7.68-15.0)	**13.2** (8.76-18.5)	**15.1** (9.72-21.4)
4-day	**3.50** (2.89-4.18)	**4.27** (3.52-5.10)	**5.52** (4.53-6.62)	**6.56** (5.35-7.91)	**8.00** (6.30-10.1)	**9.06** (6.98-11.7)	**10.2** (7.63-13.7)	**11.6** (8.07-15.7)	**13.8** (9.16-19.2)	**15.7** (10.1-22.2)
7-day	**4.21** (3.50-4.99)	**5.02** (4.17-5.96)	**6.34** (5.24-7.55)	**7.44** (6.11-8.90)	**8.95** (7.08-11.2)	**10.1** (7.79-12.8)	**11.3** (8.44-14.9)	**12.7** (8.87-17.0)	**14.9** (9.93-20.6)	**16.8** (10.9-23.6)
10-day	**4.89** (4.08-5.77)	**5.72** (4.77-6.76)	**7.08** (5.89-8.40)	**8.21** (6.78-9.78)	**9.77** (7.76-12.1)	**10.9** (8.47-13.8)	**12.2** (9.10-16.0)	**13.6** (9.52-18.1)	**15.7** (10.5-21.6)	**17.5** (11.4-24.5)
20-day	**6.90** (5.81-8.07)	**7.79** (6.56-9.13)	**9.26** (7.76-10.9)	**10.5** (8.71-12.4)	**12.1** (9.69-14.8)	**13.4** (10.4-16.7)	**14.7** (11.0-18.9)	**16.1** (11.3-21.2)	**18.0** (12.1-24.5)	**19.5** (12.7-27.0)
30-day	**8.57** (7.26-9.97)	**9.51** (8.05-11.1)	**11.1** (9.32-12.9)	**12.3** (10.3-14.5)	**14.1** (11.3-17.1)	**15.5** (12.0-19.1)	**16.8** (12.5-21.3)	**18.2** (12.9-23.8)	**19.9** (13.4-26.9)	**21.2** (13.8-29.3)
45-day	**10.6** (9.06-12.3)	**11.7** (9.91-13.5)	**13.3** (11.3-15.5)	**14.7** (12.3-17.1)	**16.6** (13.3-19.9)	**18.0** (14.1-22.0)	**19.5** (14.5-24.4)	**20.8** (14.8-27.0)	**22.4** (15.1-30.1)	**23.5** (15.4-32.2)
60-day	**12.4** (10.6-14.3)	**13.5** (11.5-15.5)	**15.2** (12.9-17.6)	**16.6** (14.0-19.4)	**18.6** (15.0-22.3)	**20.2** (15.8-24.5)	**21.7** (16.1-27.0)	**23.0** (16.4-29.8)	**24.5** (16.6-32.8)	**25.6** (16.7-34.9)

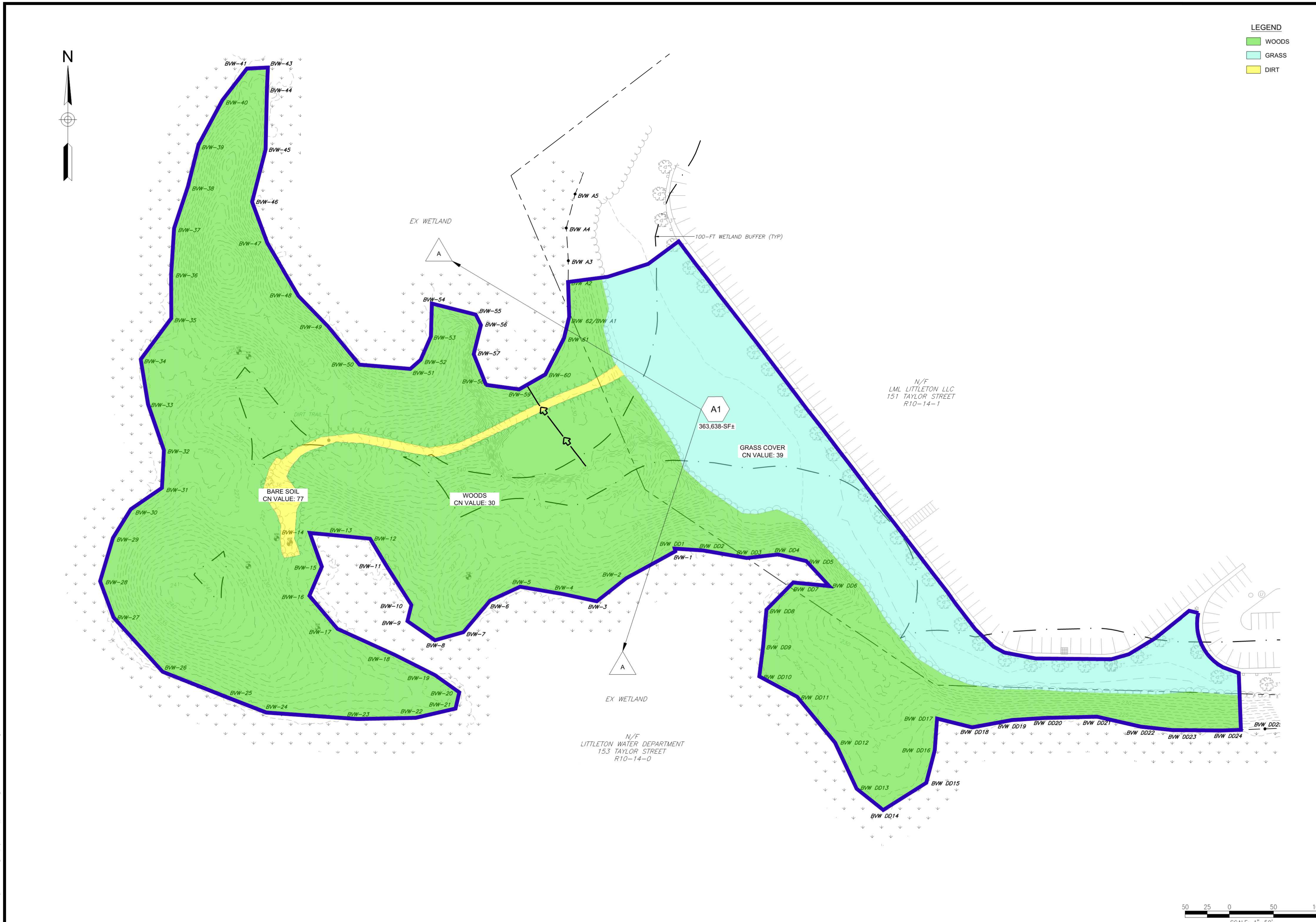
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical



Project:
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Consultants:

Revisions:		
No.	Date	Description

Seal:

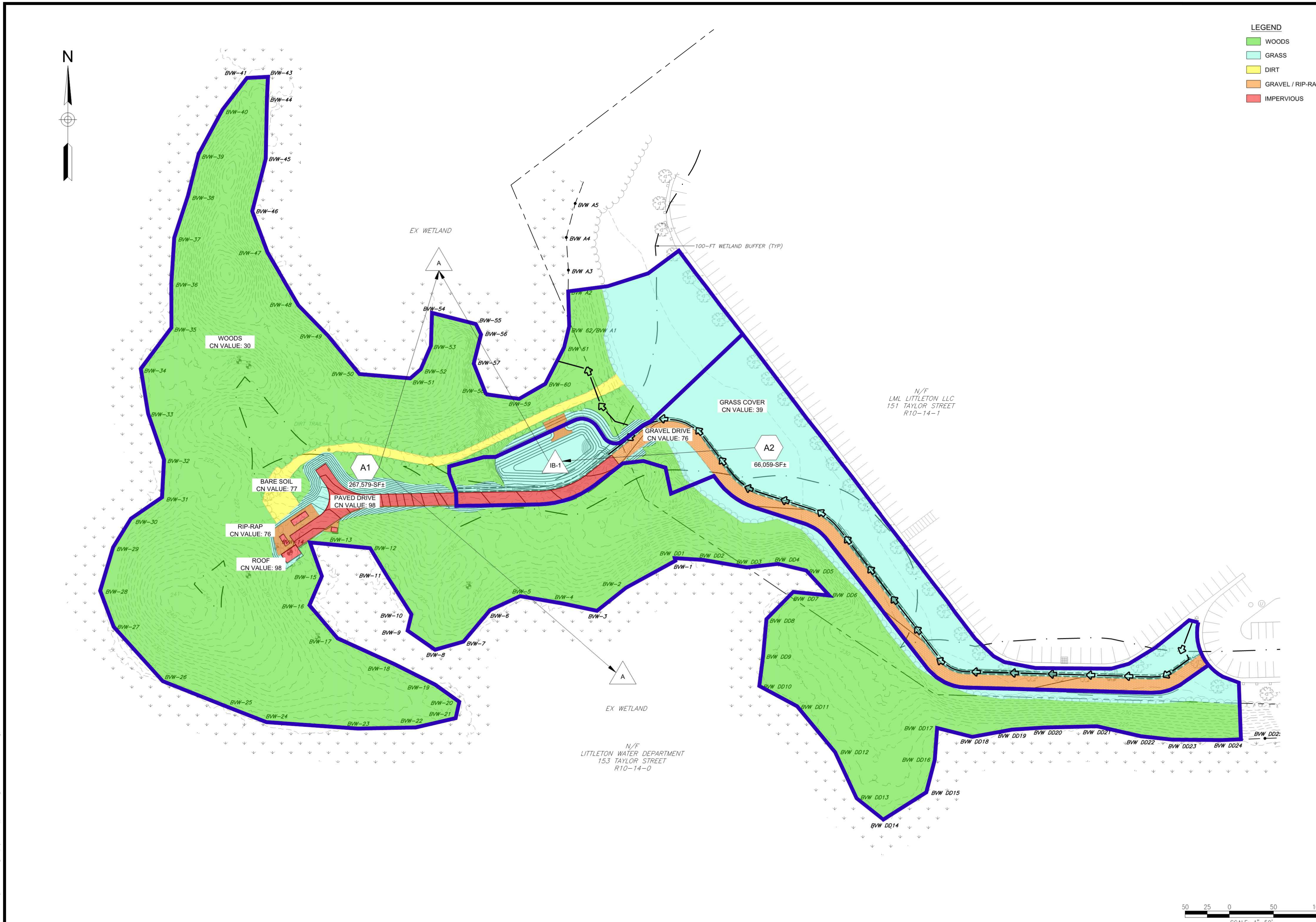
Issued For:
PERMITTING - NOT FOR CONSTRUCTION

Scale:	AS SHOWN
Date:	OCTOBER 16, 2023
Drawn By:	AKG
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG23-0679
W&S File No.:	

Drawing Title:
EXISTING HYDROLOGIC MAP

Sheet Number:
FIG-1

Rev. 1.8 Date: 10/24/2019



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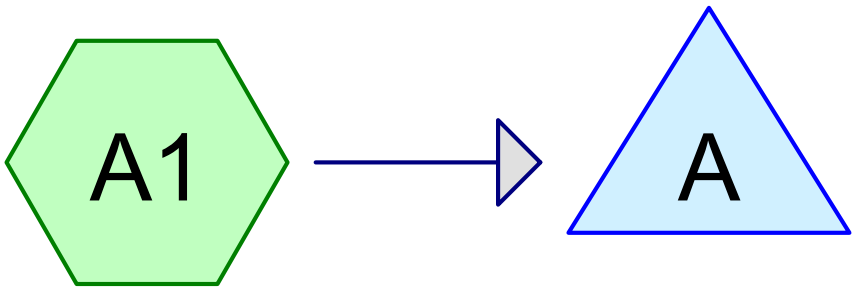
Drawn By:	AKG
Reviewed By:	JIP
Approved By:	JIP
W&S Project No.:	ENG23-0679
W&S File No.:	

Drawing Title:
PROPOSED HYDROLOGIC MAP

Sheet Number:
FIG-2

Rev. 1.8 Date: 10/24/2019



Subcat Reach Pond Link

Routing Diagram for EX-HydroCAD
Prepared by Weston & Sampson Engineers, Inc, Printed 10/11/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Yr	Type III 24-hr		Default	24.00	1	4.93	2
3	25-Yr	Type III 24-hr		Default	24.00	1	6.01	2
4	50-Yr	Type III 24-hr		Default	24.00	1	6.81	2
5	100-Yr	Type III 24-hr		Default	24.00	1	7.68	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
77,738	39	>75% Grass cover, Good, HSG A (A1)
6,735	77	Bare soil, HSG A (A1)
279,165	30	Woods, Good, HSG A (A1)
363,638	**33**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
363,638	HSG A	A1
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
363,638		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
77,738	0	0	0	0	77,738	>75% Grass cover, Good	
6,735	0	0	0	0	6,735	Bare soil	
279,165	0	0	0	0	279,165	Woods, Good	
363,638	**0**	**0**	**0**	**0**	**363,638**	**TOTAL AREA**	

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=363,638 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=114' Tc=14.0 min CN=33 Runoff=0.00 cfs 0 cf

Pond A: POI-A Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 363,638 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"
100.00% Pervious = 363,638 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

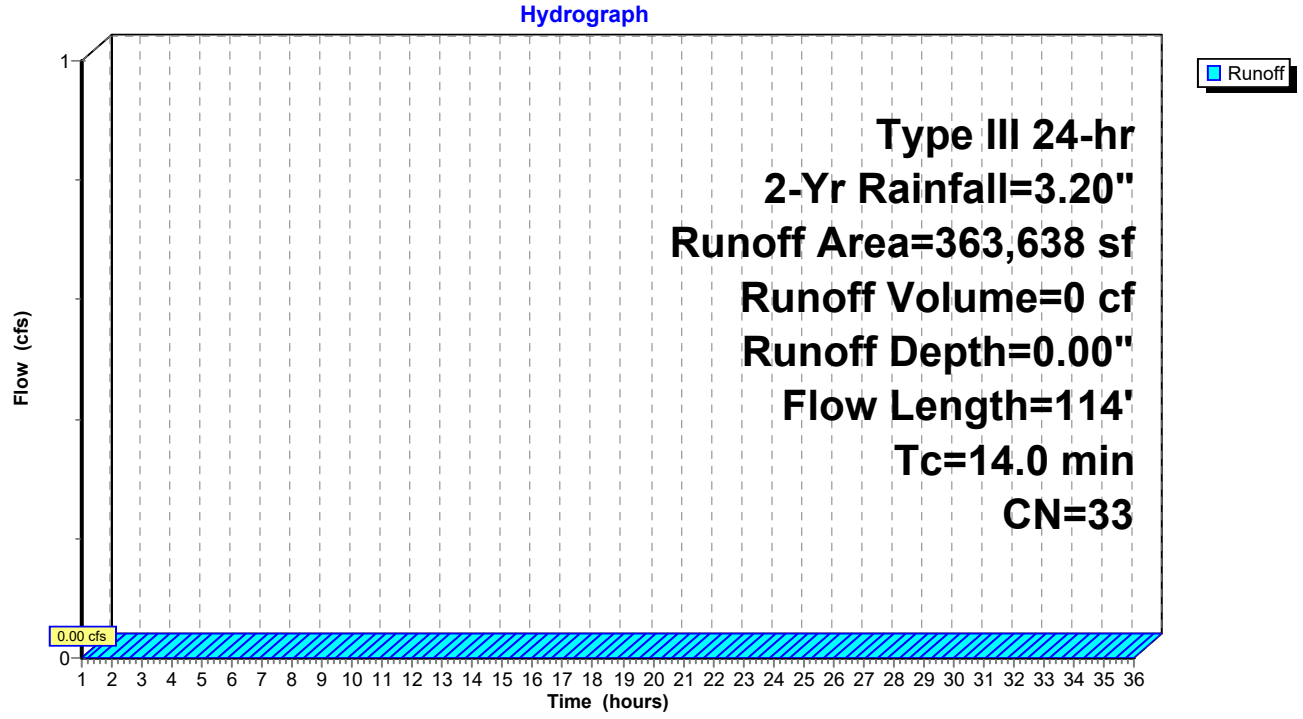
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.20"

	Area (sf)	CN	Description
	279,165	30	Woods, Good, HSG A
	77,738	39	>75% Grass cover, Good, HSG A
*	6,735	77	Bare soil, HSG A
	363,638	33	Weighted Average
	363,638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	43	0.0175	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	0.2850	2.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	114	Total			

Subcatchment A1: SUB-A1

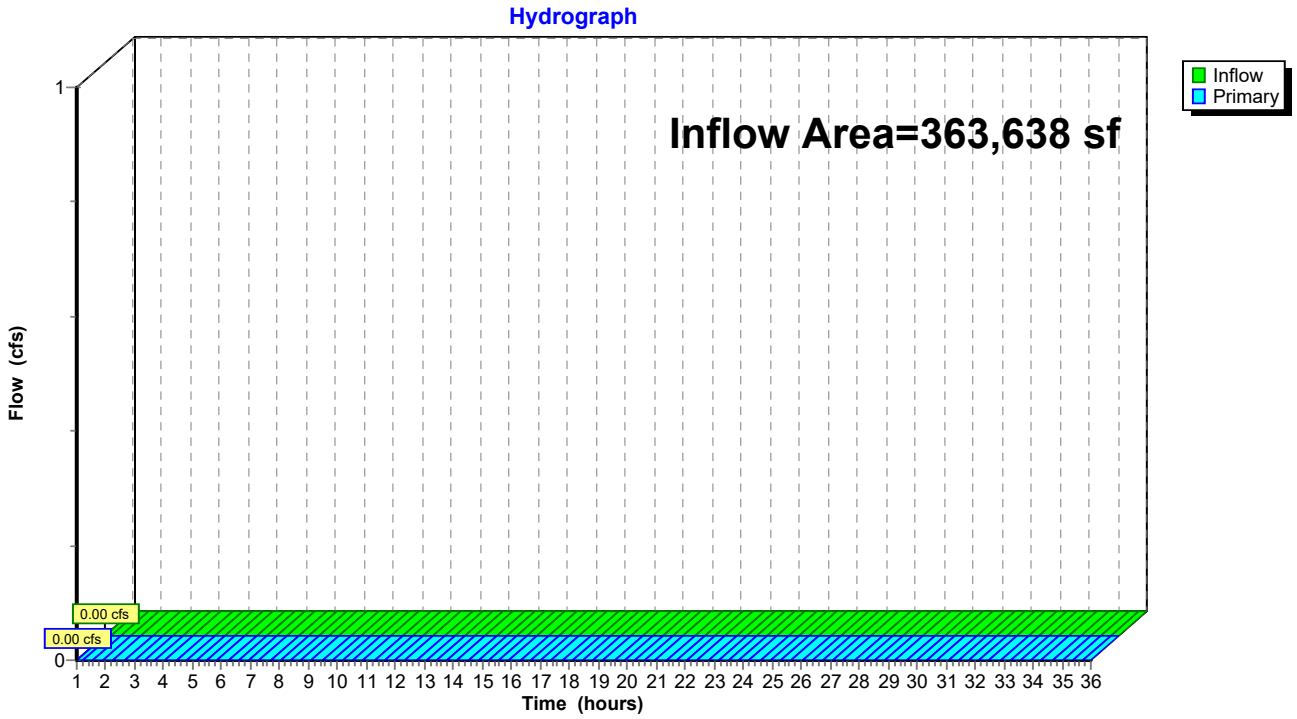


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=363,638 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=114' Tc=14.0 min CN=33 Runoff=0.04 cfs 1,082 cf

Pond A: POI-A Inflow=0.04 cfs 1,082 cf
Primary=0.04 cfs 1,082 cf

Total Runoff Area = 363,638 sf Runoff Volume = 1,082 cf Average Runoff Depth = 0.04"
100.00% Pervious = 363,638 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

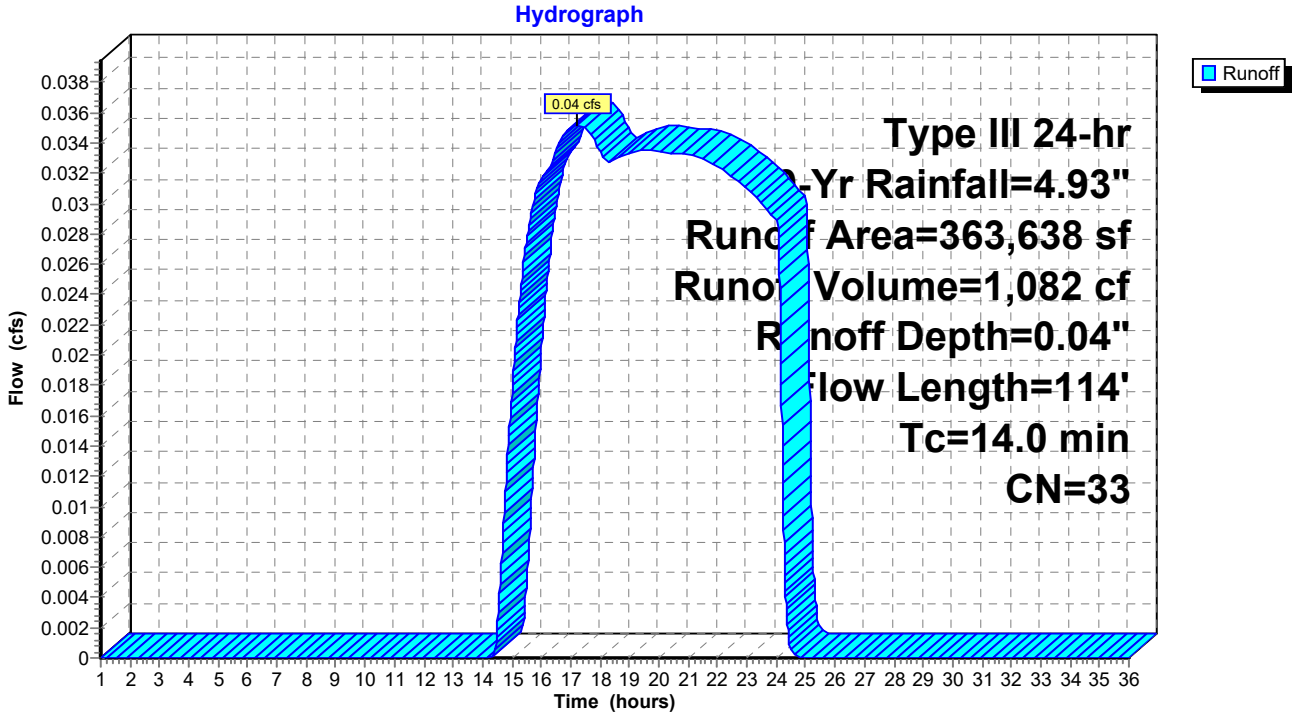
Runoff = 0.04 cfs @ 17.22 hrs, Volume= 1,082 cf, Depth= 0.04"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.93"

	Area (sf)	CN	Description
	279,165	30	Woods, Good, HSG A
	77,738	39	>75% Grass cover, Good, HSG A
*	6,735	77	Bare soil, HSG A
	363,638	33	Weighted Average
	363,638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	43	0.0175	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	0.2850	2.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	114	Total			

Subcatchment A1: SUB-A1

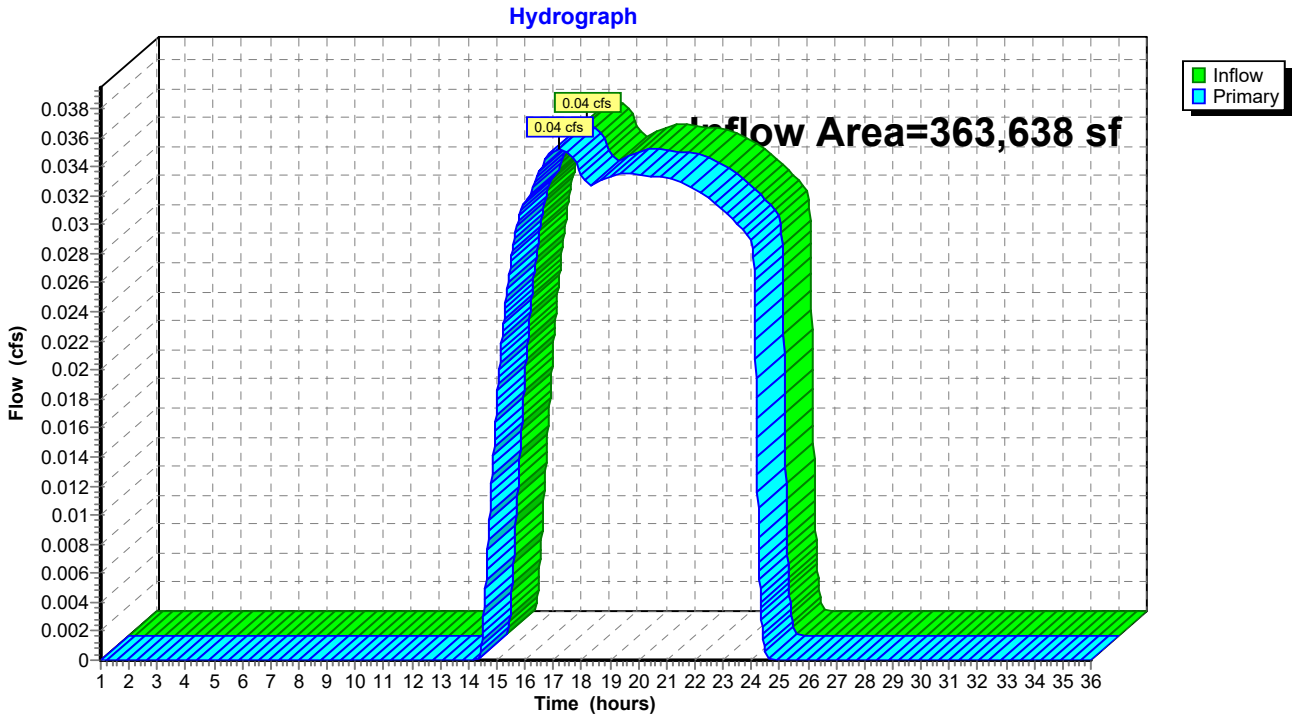


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 0.00% Impervious, Inflow Depth = 0.04" for 10-Yr event
Inflow = 0.04 cfs @ 17.22 hrs, Volume= 1,082 cf
Primary = 0.04 cfs @ 17.22 hrs, Volume= 1,082 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=363,638 sf 0.00% Impervious Runoff Depth=0.17"
Flow Length=114' Tc=14.0 min CN=33 Runoff=0.19 cfs 5,175 cf

Pond A: POI-A Inflow=0.19 cfs 5,175 cf
Primary=0.19 cfs 5,175 cf

Total Runoff Area = 363,638 sf Runoff Volume = 5,175 cf Average Runoff Depth = 0.17"
100.00% Pervious = 363,638 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

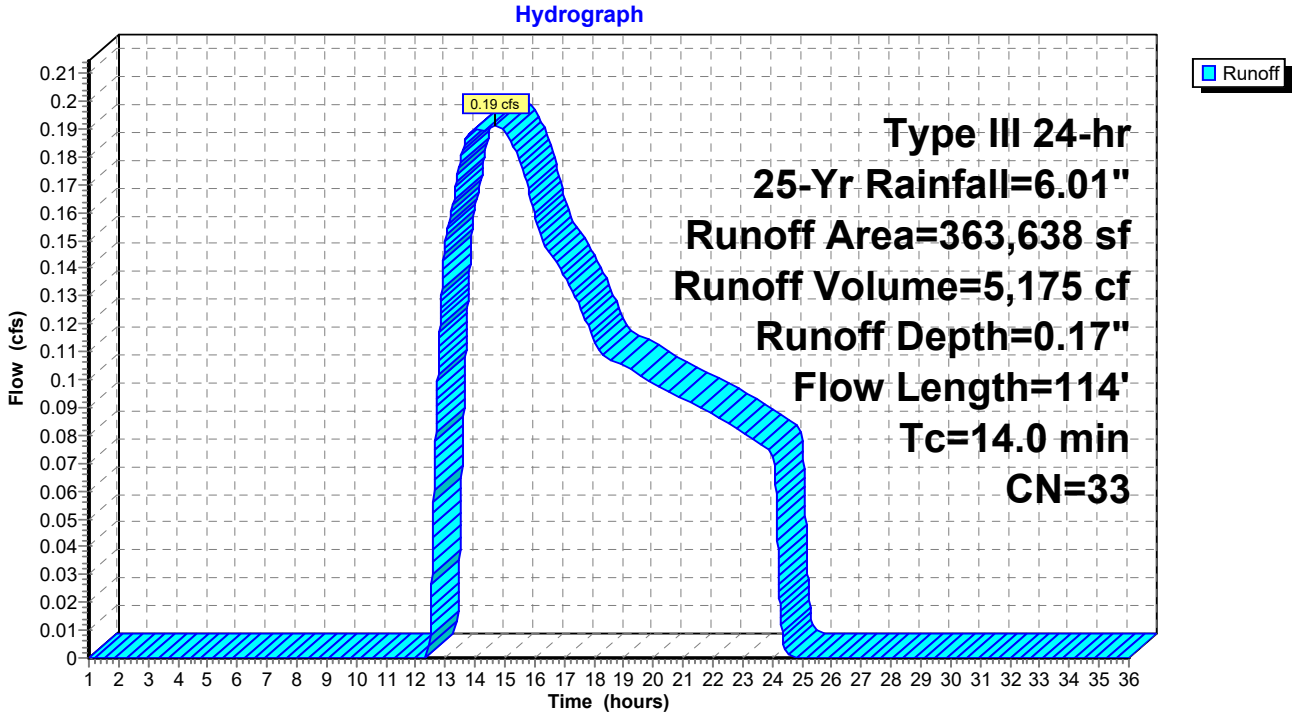
Runoff = 0.19 cfs @ 14.67 hrs, Volume= 5,175 cf, Depth= 0.17"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.01"

	Area (sf)	CN	Description
	279,165	30	Woods, Good, HSG A
	77,738	39	>75% Grass cover, Good, HSG A
*	6,735	77	Bare soil, HSG A
	363,638	33	Weighted Average
	363,638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	43	0.0175	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	0.2850	2.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	114	Total			

Subcatchment A1: SUB-A1

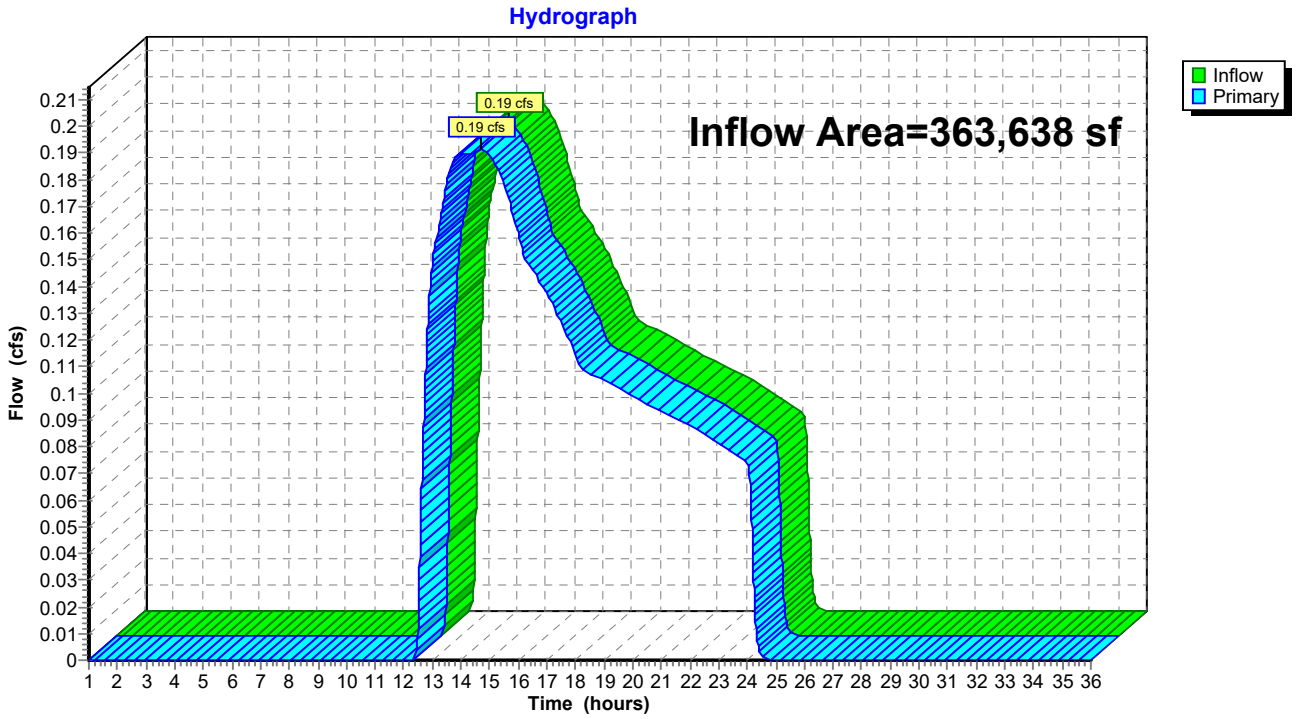


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 0.00% Impervious, Inflow Depth = 0.17" for 25-Yr event
Inflow = 0.19 cfs @ 14.67 hrs, Volume= 5,175 cf
Primary = 0.19 cfs @ 14.67 hrs, Volume= 5,175 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=363,638 sf 0.00% Impervious Runoff Depth=0.33"
Flow Length=114' Tc=14.0 min CN=33 Runoff=0.61 cfs 9,937 cf

Pond A: POI-A Inflow=0.61 cfs 9,937 cf
Primary=0.61 cfs 9,937 cf

Total Runoff Area = 363,638 sf Runoff Volume = 9,937 cf Average Runoff Depth = 0.33"
100.00% Pervious = 363,638 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

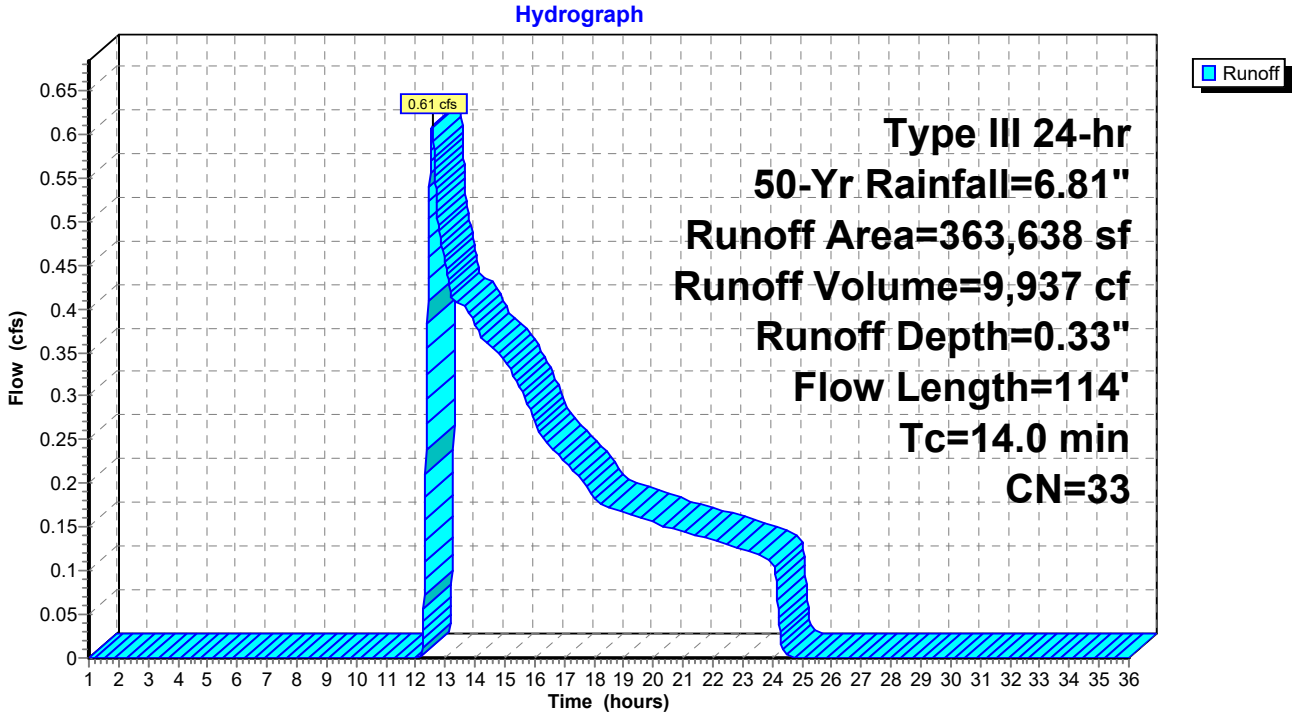
Runoff = 0.61 cfs @ 12.55 hrs, Volume= 9,937 cf, Depth= 0.33"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=6.81"

	Area (sf)	CN	Description
	279,165	30	Woods, Good, HSG A
	77,738	39	>75% Grass cover, Good, HSG A
*	6,735	77	Bare soil, HSG A
	363,638	33	Weighted Average
	363,638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	43	0.0175	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	0.2850	2.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	114	Total			

Subcatchment A1: SUB-A1

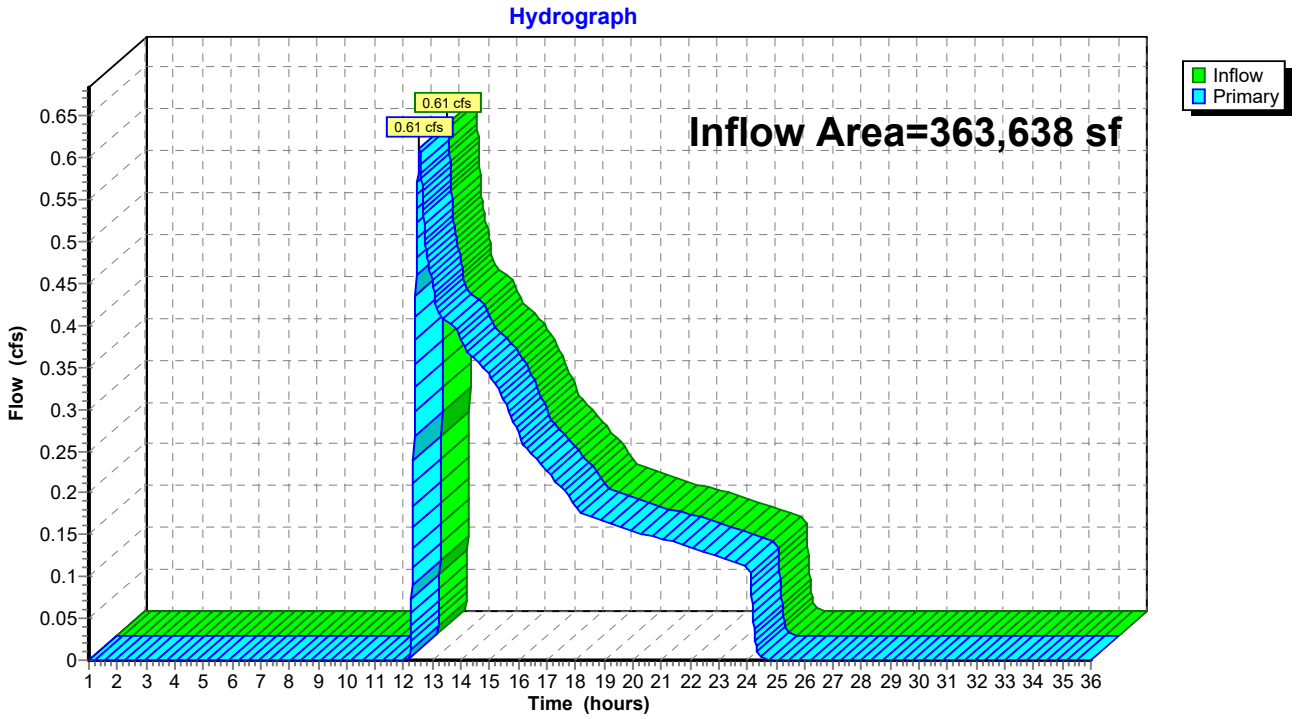


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 0.00% Impervious, Inflow Depth = 0.33" for 50-Yr event
Inflow = 0.61 cfs @ 12.55 hrs, Volume= 9,937 cf
Primary = 0.61 cfs @ 12.55 hrs, Volume= 9,937 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=363,638 sf 0.00% Impervious Runoff Depth=0.55"
Flow Length=114' Tc=14.0 min CN=33 Runoff=1.60 cfs 16,594 cf

Pond A: POI-A Inflow=1.60 cfs 16,594 cf
Primary=1.60 cfs 16,594 cf

Total Runoff Area = 363,638 sf Runoff Volume = 16,594 cf Average Runoff Depth = 0.55"
100.00% Pervious = 363,638 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

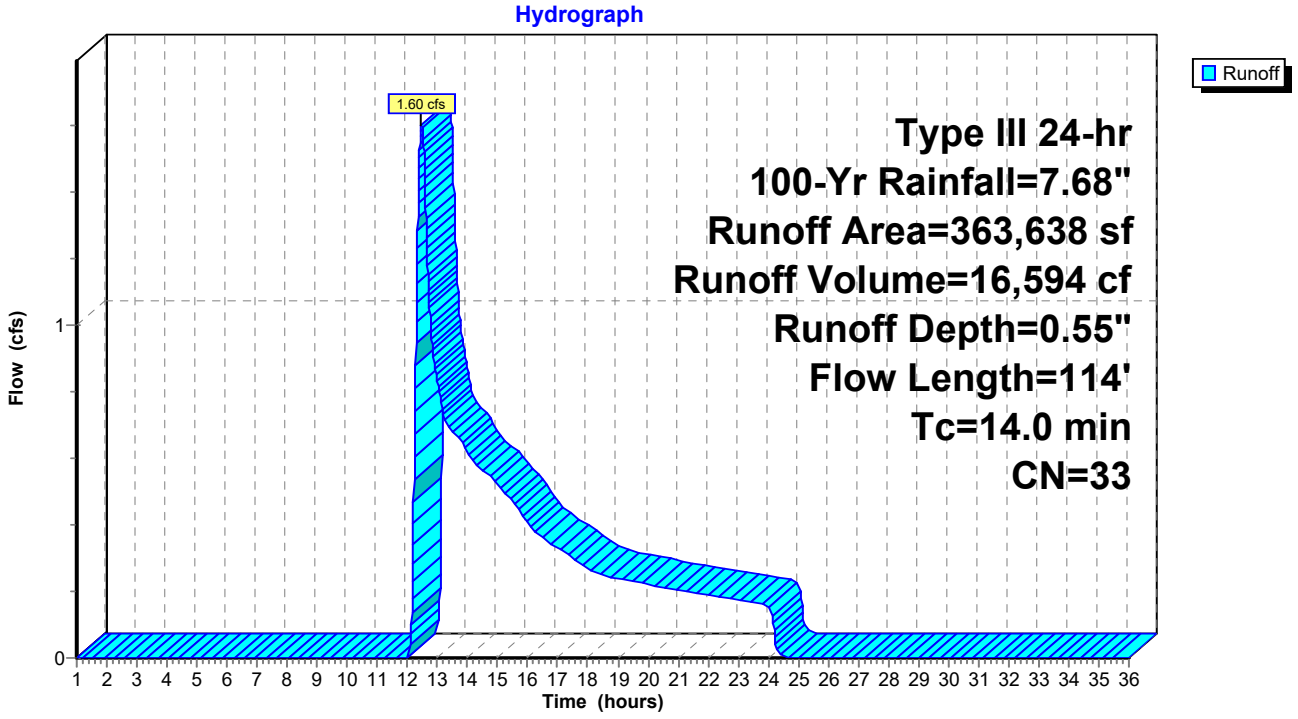
Runoff = 1.60 cfs @ 12.48 hrs, Volume= 16,594 cf, Depth= 0.55"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.68"

	Area (sf)	CN	Description
	279,165	30	Woods, Good, HSG A
	77,738	39	>75% Grass cover, Good, HSG A
*	6,735	77	Bare soil, HSG A
	363,638	33	Weighted Average
	363,638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
1.1	43	0.0175	0.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	21	0.2850	2.67		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.0	114	Total			

Subcatchment A1: SUB-A1

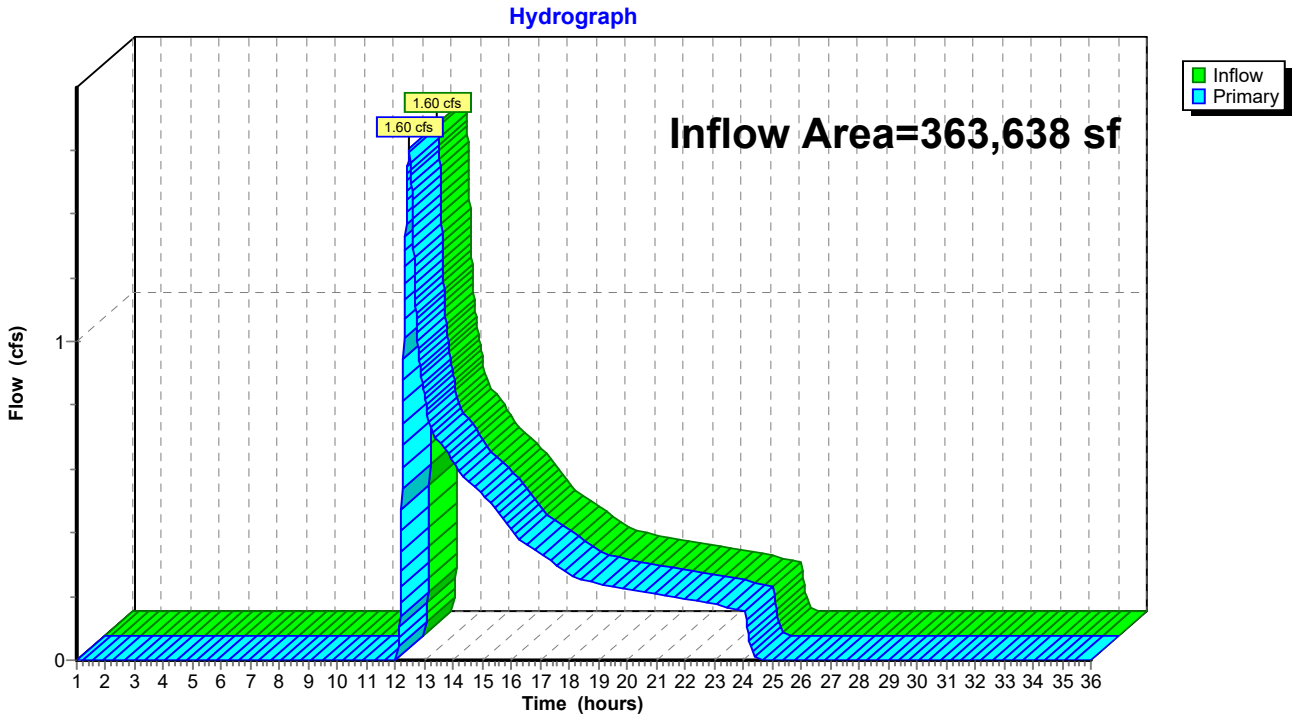


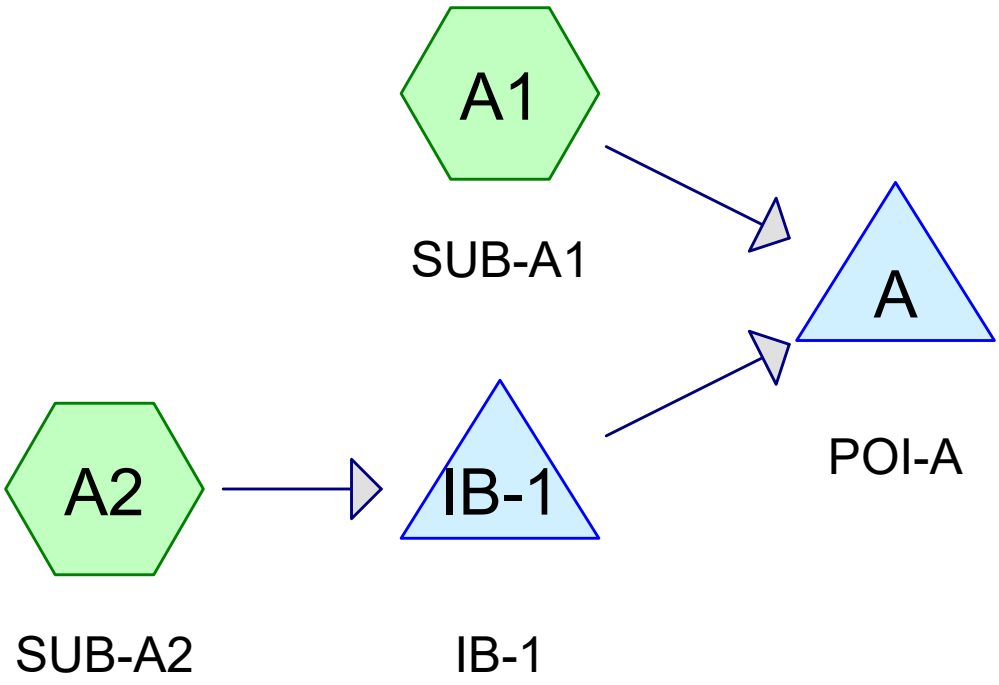
Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 0.00% Impervious, Inflow Depth = 0.55" for 100-Yr event
Inflow = 1.60 cfs @ 12.48 hrs, Volume= 16,594 cf
Primary = 1.60 cfs @ 12.48 hrs, Volume= 16,594 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A





Subcat Reach Pond Link

Routing Diagram for PR-HydroCAD
Prepared by Weston & Sampson Engineers, Inc, Printed 10/11/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Yr	Type III 24-hr		Default	24.00	1	4.93	2
3	25-Yr	Type III 24-hr		Default	24.00	1	6.01	2
4	50-Yr	Type III 24-hr		Default	24.00	1	6.81	2
5	100-Yr	Type III 24-hr		Default	24.00	1	7.68	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
78,653	39	>75% Grass cover, Good, HSG A (A1, A2)
5,518	77	Bare soil, HSG A (A1)
11,455	76	Gravel driveway, HSG A (A2)
6,762	98	Paved driveway, HSG A (A1, A2)
1,768	76	Rip-rap, HSG A (A1, A2)
240	98	Roofs, HSG A (A1)
259,242	30	Woods, Good, HSG A (A1, A2)
363,638	**36**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
363,638	HSG A	A1, A2
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
363,638		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
78,653	0	0	0	0	78,653	>75% Grass cover, Good	
5,518	0	0	0	0	5,518	Bare soil	
11,455	0	0	0	0	11,455	Gravel driveway	
6,762	0	0	0	0	6,762	Paved driveway	
1,768	0	0	0	0	1,768	Rip-rap	
240	0	0	0	0	240	Roofs	
259,242	0	0	0	0	259,242	Woods, Good	
363,638	**0**	**0**	**0**	**0**	**363,638**	**TOTAL AREA**	

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=297,579 sf 1.40% Impervious Runoff Depth=0.00"
Flow Length=116' Tc=13.8 min CN=33 Runoff=0.00 cfs 0 cf

SubcatchmentA2: SUB-A2 Runoff Area=66,059 sf 4.31% Impervious Runoff Depth=0.09"
Flow Length=840' Tc=15.9 min CN=48 Runoff=0.02 cfs 495 cf

Pond A: POI-A Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Pond IB-1: IB-1 Peak Elev=229.00' Storage=3 cf Inflow=0.02 cfs 495 cf
Discarded=0.02 cfs 495 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 495 cf

Total Runoff Area = 363,638 sf Runoff Volume = 495 cf Average Runoff Depth = 0.02"
98.07% Pervious = 356,636 sf 1.93% Impervious = 7,002 sf

Summary for Subcatchment A1: SUB-A1

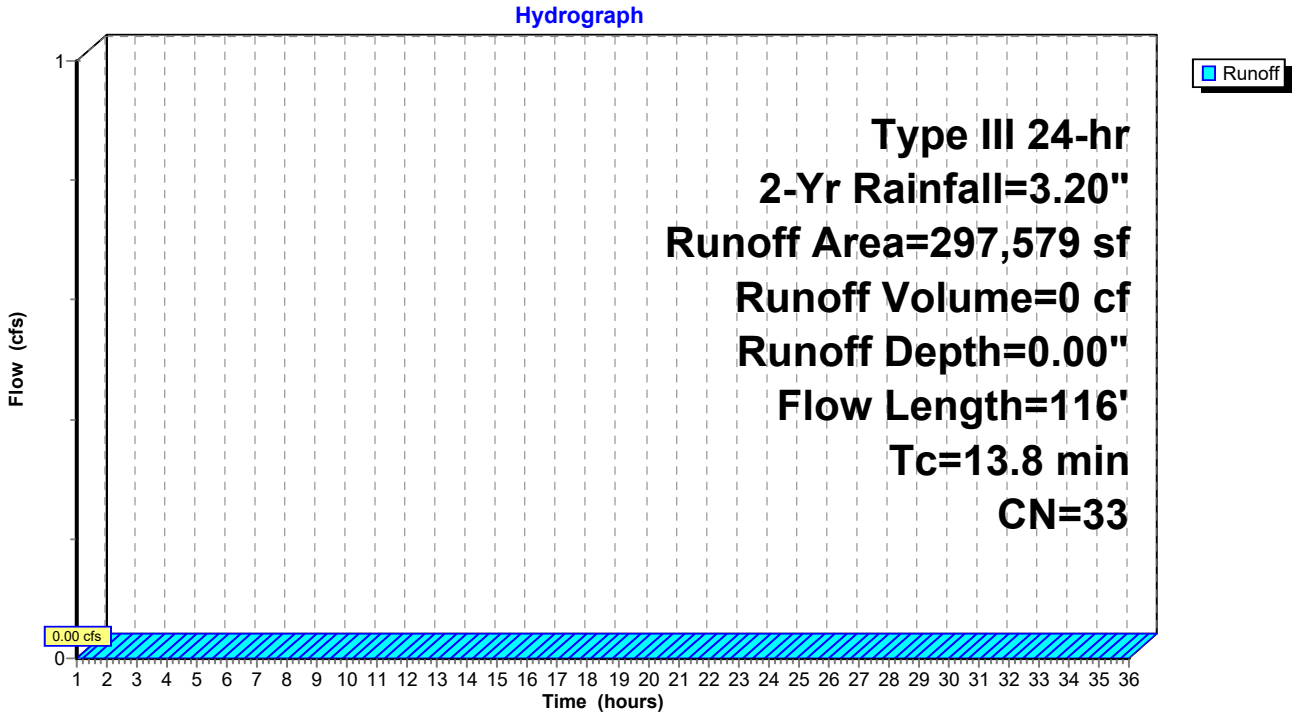
Runoff = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.20"

	Area (sf)	CN	Description
	256,279	30	Woods, Good, HSG A
	30,079	39	>75% Grass cover, Good, HSG A
*	5,518	77	Bare soil, HSG A
*	3,916	98	Paved driveway, HSG A
*	1,547	76	Rip-rap, HSG A
	240	98	Roofs, HSG A
	297,579	33	Weighted Average
	293,423		98.60% Pervious Area
	4,156		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	42	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.3400	2.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.8	116	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

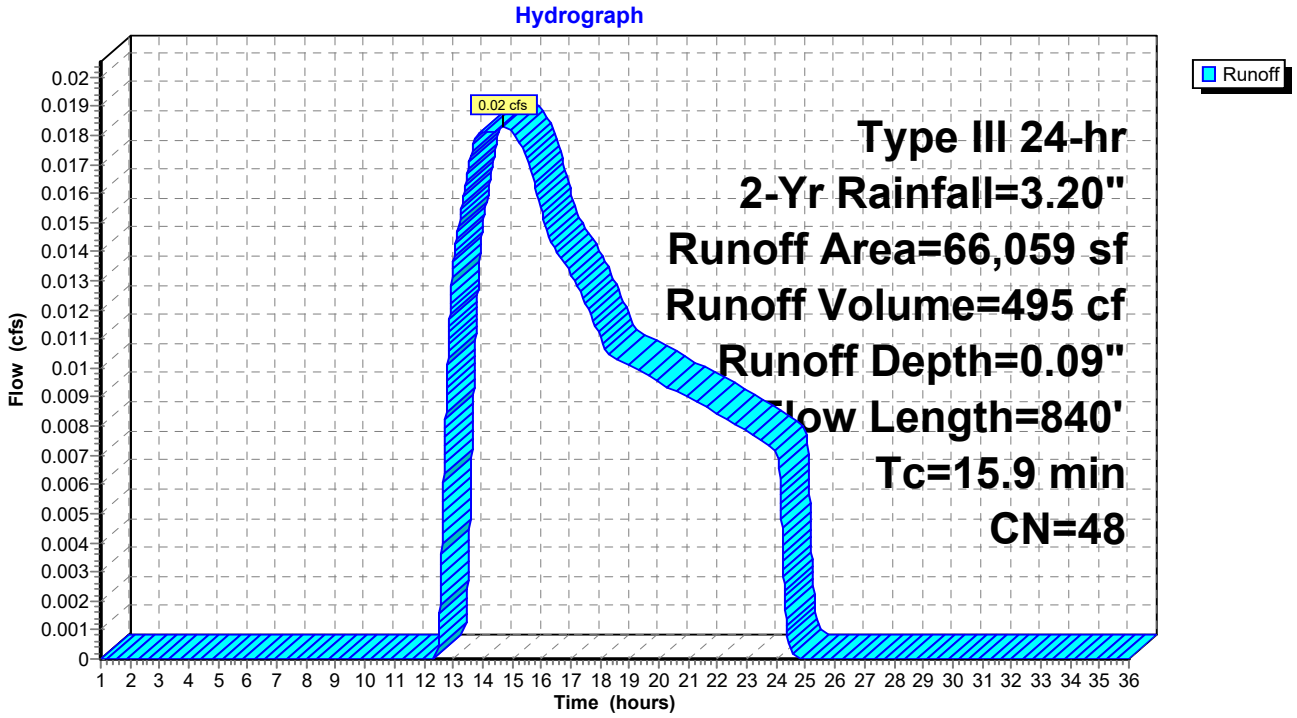
Runoff = 0.02 cfs @ 14.68 hrs, Volume= 495 cf, Depth= 0.09"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.20"

	Area (sf)	CN	Description
	48,574	39	>75% Grass cover, Good, HSG A
*	11,455	76	Gravel driveway, HSG A
	2,963	30	Woods, Good, HSG A
*	2,846	98	Paved driveway, HSG A
*	221	76	Rip-rap, HSG A
	66,059	48	Weighted Average
	63,213		95.69% Pervious Area
	2,846		4.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
10.8	795	0.0050	1.23	1.23	**Channel Flow,** Area= 1.0 sf Perim= 4.8' r= 0.21' n= 0.030 Earth, grassed & winding
15.9	840	Total			

Subcatchment A2: SUB-A2

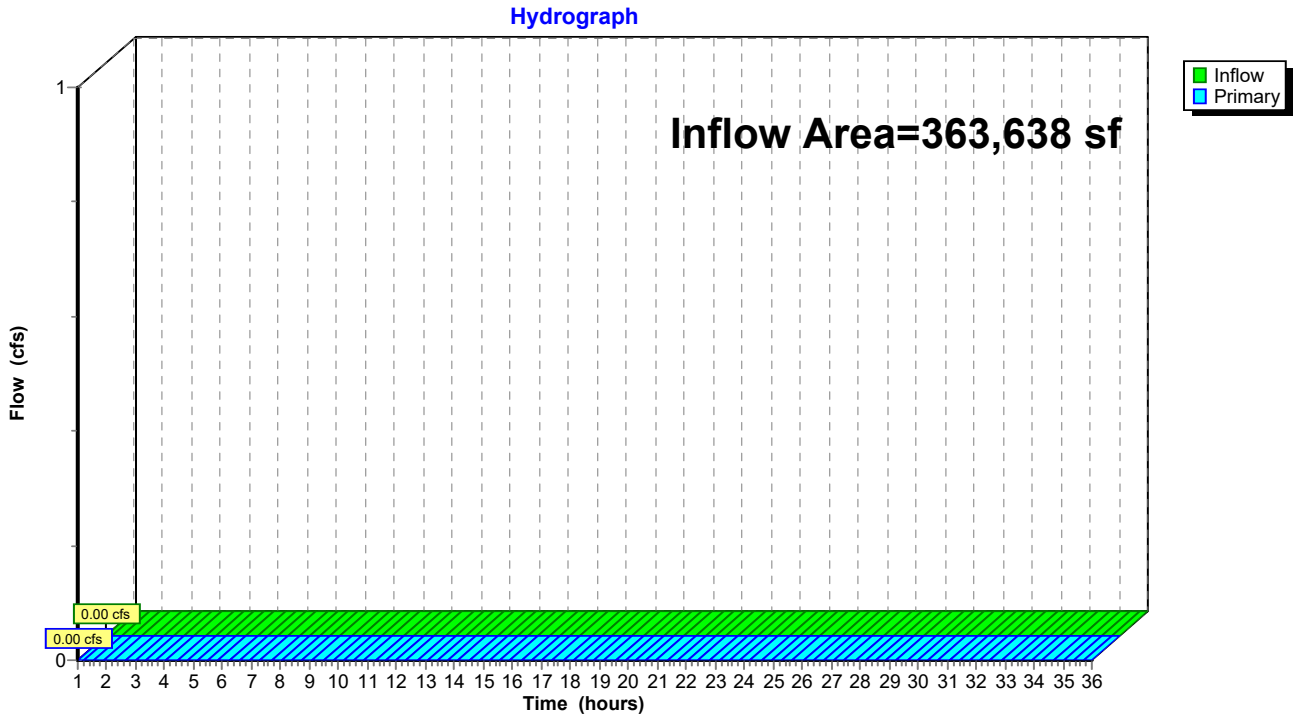


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 1.93% Impervious, Inflow Depth = 0.00" for 2-Yr event
Inflow = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Summary for Pond IB-1: IB-1

Inflow Area = 66,059 sf, 4.31% Impervious, Inflow Depth = 0.09" for 2-Yr event
Inflow = 0.02 cfs @ 14.68 hrs, Volume= 495 cf
Outflow = 0.02 cfs @ 14.76 hrs, Volume= 495 cf, Atten= 0%, Lag= 4.7 min
Discarded = 0.02 cfs @ 14.76 hrs, Volume= 495 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 229.00' @ 14.76 hrs Surf.Area= 1,711 sf Storage= 3 cf

Plug-Flow detention time= 3.0 min calculated for 495 cf (100% of inflow)
Center-of-Mass det. time= 3.0 min (1,053.8 - 1,050.8)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	12,812 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

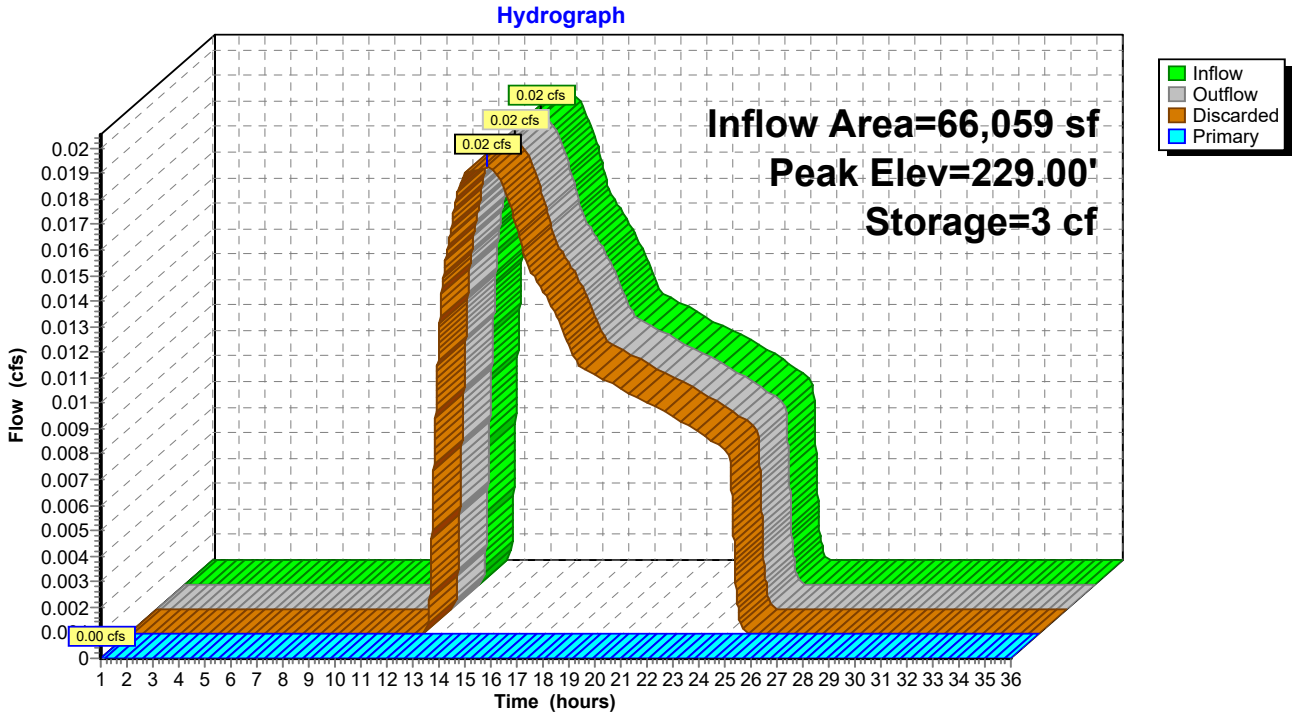
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,710	0	0
230.00	2,426	2,068	2,068
231.00	3,173	2,800	4,868
232.00	3,963	3,568	8,436
233.00	4,789	4,376	12,812

Device	Routing	Invert	Outlet Devices
#1	Discarded	229.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	231.85'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.02 cfs @ 14.76 hrs HW=229.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
Inflow Area=66,059 sf
Peak Elev=229.00'
Storage=3 cf
0.02 cfs
0.02 cfs
0.02 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=297,579 sf 1.40% Impervious Runoff Depth=0.04"
Flow Length=116' Tc=13.8 min CN=33 Runoff=0.03 cfs 885 cf

SubcatchmentA2: SUB-A2 Runoff Area=66,059 sf 4.31% Impervious Runoff Depth=0.56"
Flow Length=840' Tc=15.9 min CN=48 Runoff=0.41 cfs 3,092 cf

Pond A: POI-A Inflow=0.03 cfs 885 cf
Primary=0.03 cfs 885 cf

Pond IB-1: IB-1 Peak Elev=229.35' Storage=645 cf Inflow=0.41 cfs 3,092 cf
Discarded=0.11 cfs 3,092 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 3,092 cf

Total Runoff Area = 363,638 sf Runoff Volume = 3,977 cf Average Runoff Depth = 0.13"
98.07% Pervious = 356,636 sf 1.93% Impervious = 7,002 sf

Summary for Subcatchment A1: SUB-A1

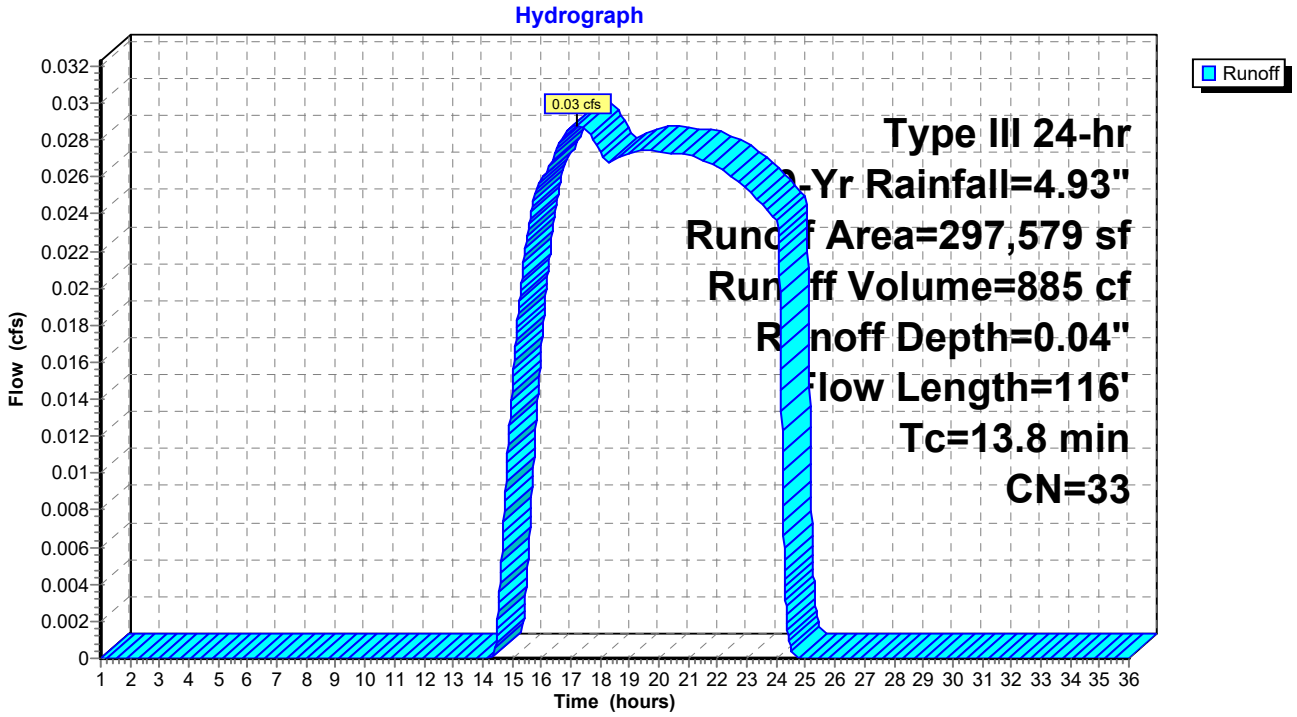
Runoff = 0.03 cfs @ 17.22 hrs, Volume= 885 cf, Depth= 0.04"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.93"

	Area (sf)	CN	Description
	256,279	30	Woods, Good, HSG A
	30,079	39	>75% Grass cover, Good, HSG A
*	5,518	77	Bare soil, HSG A
*	3,916	98	Paved driveway, HSG A
*	1,547	76	Rip-rap, HSG A
	240	98	Roofs, HSG A
	297,579	33	Weighted Average
	293,423		98.60% Pervious Area
	4,156		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	42	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.3400	2.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.8	116	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

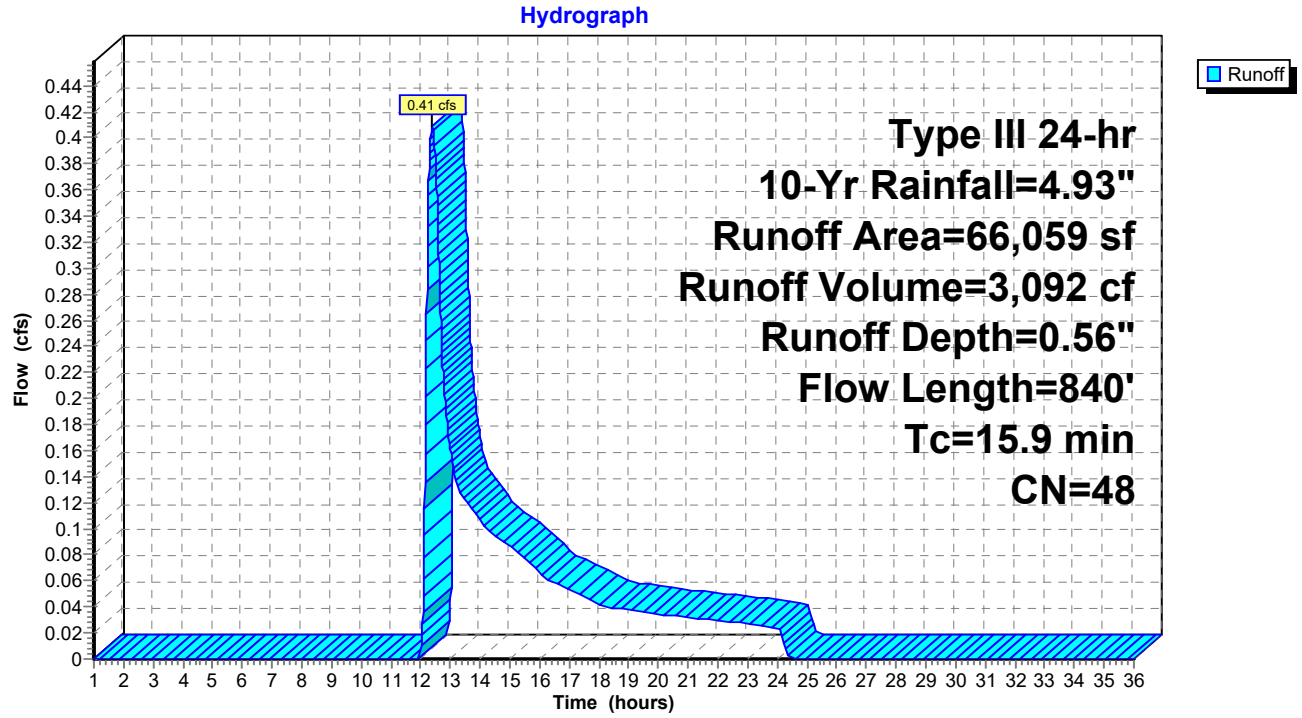
Runoff = 0.41 cfs @ 12.39 hrs, Volume= 3,092 cf, Depth= 0.56"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.93"

	Area (sf)	CN	Description
	48,574	39	>75% Grass cover, Good, HSG A
*	11,455	76	Gravel driveway, HSG A
	2,963	30	Woods, Good, HSG A
*	2,846	98	Paved driveway, HSG A
*	221	76	Rip-rap, HSG A
	66,059	48	Weighted Average
	63,213		95.69% Pervious Area
	2,846		4.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
10.8	795	0.0050	1.23	1.23	**Channel Flow,** Area= 1.0 sf Perim= 4.8' r= 0.21' n= 0.030 Earth, grassed & winding
15.9	840	Total			

Subcatchment A2: SUB-A2

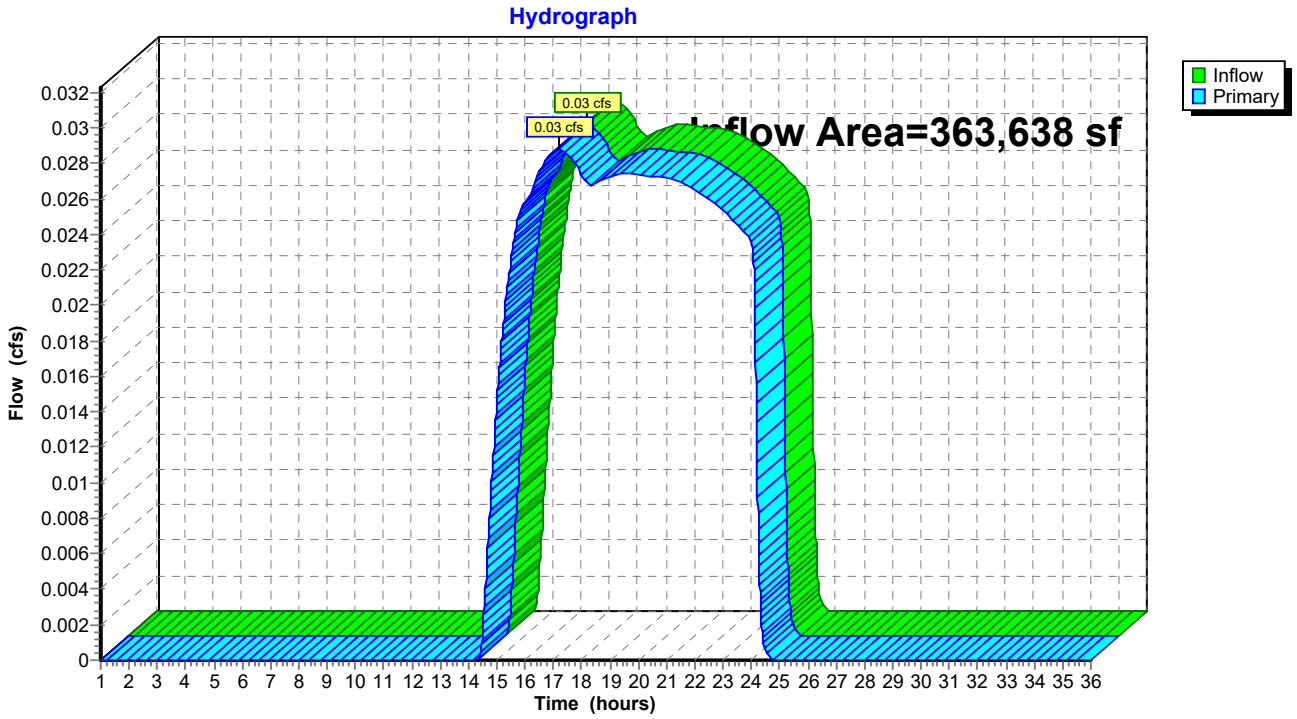


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 1.93% Impervious, Inflow Depth = 0.03" for 10-Yr event
Inflow = 0.03 cfs @ 17.22 hrs, Volume= 885 cf
Primary = 0.03 cfs @ 17.22 hrs, Volume= 885 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Summary for Pond IB-1: IB-1

Inflow Area = 66,059 sf, 4.31% Impervious, Inflow Depth = 0.56" for 10-Yr event
Inflow = 0.41 cfs @ 12.39 hrs, Volume= 3,092 cf
Outflow = 0.11 cfs @ 13.95 hrs, Volume= 3,092 cf, Atten= 73%, Lag= 93.9 min
Discarded = 0.11 cfs @ 13.95 hrs, Volume= 3,092 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 229.35' @ 13.95 hrs Surf.Area= 1,962 sf Storage= 645 cf

Plug-Flow detention time= 54.9 min calculated for 3,091 cf (100% of inflow)
Center-of-Mass det. time= 54.9 min (992.3 - 937.3)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	12,812 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

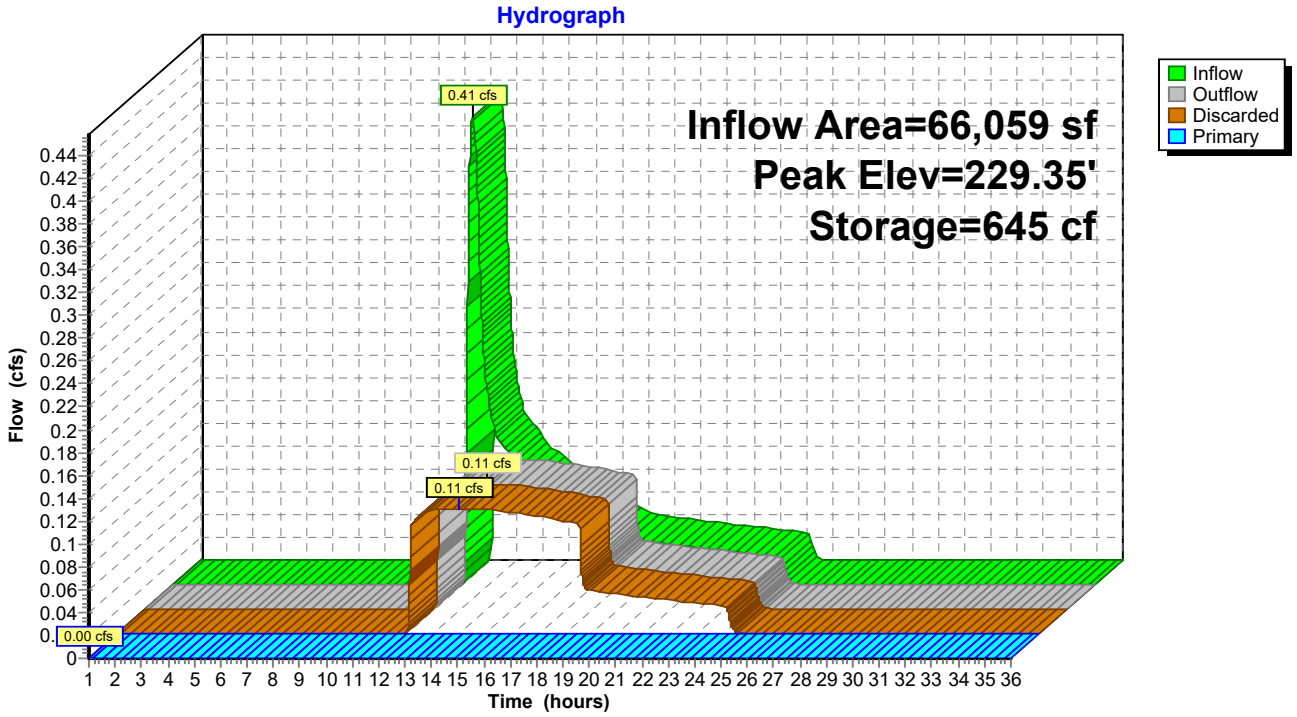
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,710	0	0
230.00	2,426	2,068	2,068
231.00	3,173	2,800	4,868
232.00	3,963	3,568	8,436
233.00	4,789	4,376	12,812

Device	Routing	Invert	Outlet Devices
#1	Discarded	229.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	231.85'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.11 cfs @ 13.95 hrs HW=229.35' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
Inflow Area=66,059 sf
Peak Elev=229.35'
Storage=645 cf
Inflow
Outflow
Discarded
Primary
0.41 cfs
0.11 cfs
0.11 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=297,579 sf 1.40% Impervious Runoff Depth=0.17"
Flow Length=116' Tc=13.8 min CN=33 Runoff=0.16 cfs 4,235 cf

SubcatchmentA2: SUB-A2 Runoff Area=66,059 sf 4.31% Impervious Runoff Depth=1.01"
Flow Length=840' Tc=15.9 min CN=48 Runoff=0.96 cfs 5,540 cf

Pond A: POI-A Inflow=0.16 cfs 4,235 cf
Primary=0.16 cfs 4,235 cf

Pond IB-1: IB-1 Peak Elev=229.98' Storage=2,025 cf Inflow=0.96 cfs 5,540 cf
Discarded=0.13 cfs 5,540 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 5,540 cf

Total Runoff Area = 363,638 sf Runoff Volume = 9,775 cf Average Runoff Depth = 0.32"
98.07% Pervious = 356,636 sf 1.93% Impervious = 7,002 sf

Summary for Subcatchment A1: SUB-A1

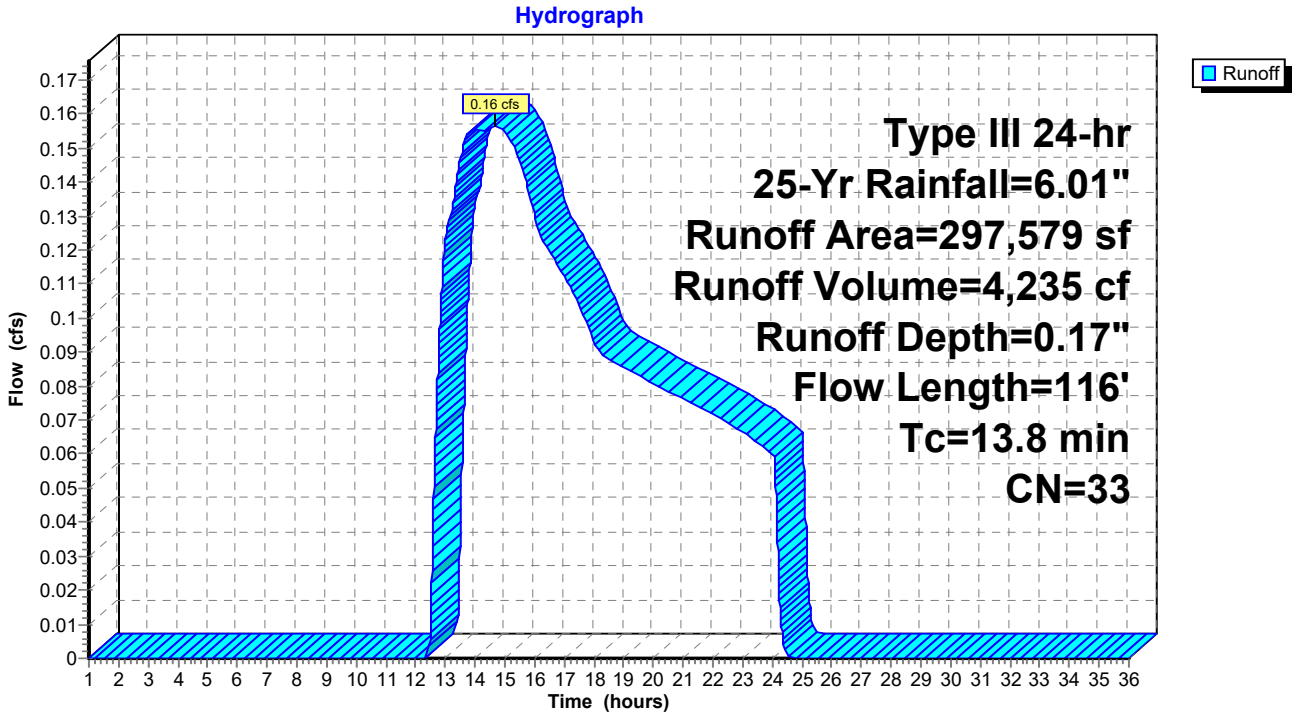
Runoff = 0.16 cfs @ 14.64 hrs, Volume= 4,235 cf, Depth= 0.17"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.01"

	Area (sf)	CN	Description
	256,279	30	Woods, Good, HSG A
	30,079	39	>75% Grass cover, Good, HSG A
*	5,518	77	Bare soil, HSG A
*	3,916	98	Paved driveway, HSG A
*	1,547	76	Rip-rap, HSG A
	240	98	Roofs, HSG A
	297,579	33	Weighted Average
	293,423		98.60% Pervious Area
	4,156		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	42	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.3400	2.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.8	116	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

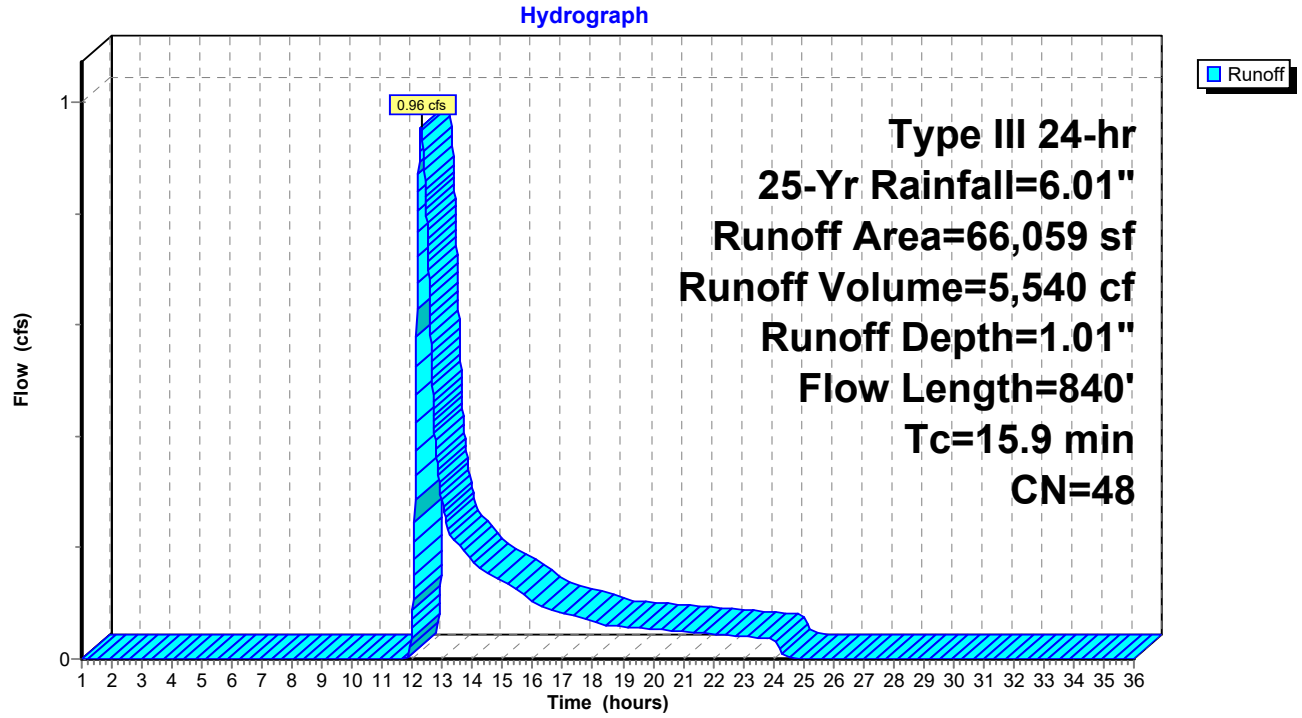
Runoff = 0.96 cfs @ 12.28 hrs, Volume= 5,540 cf, Depth= 1.01"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=6.01"

	Area (sf)	CN	Description
	48,574	39	>75% Grass cover, Good, HSG A
*	11,455	76	Gravel driveway, HSG A
	2,963	30	Woods, Good, HSG A
*	2,846	98	Paved driveway, HSG A
*	221	76	Rip-rap, HSG A
	66,059	48	Weighted Average
	63,213		95.69% Pervious Area
	2,846		4.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
10.8	795	0.0050	1.23	1.23	**Channel Flow,** Area= 1.0 sf Perim= 4.8' r= 0.21' n= 0.030 Earth, grassed & winding
15.9	840	Total			

Subcatchment A2: SUB-A2

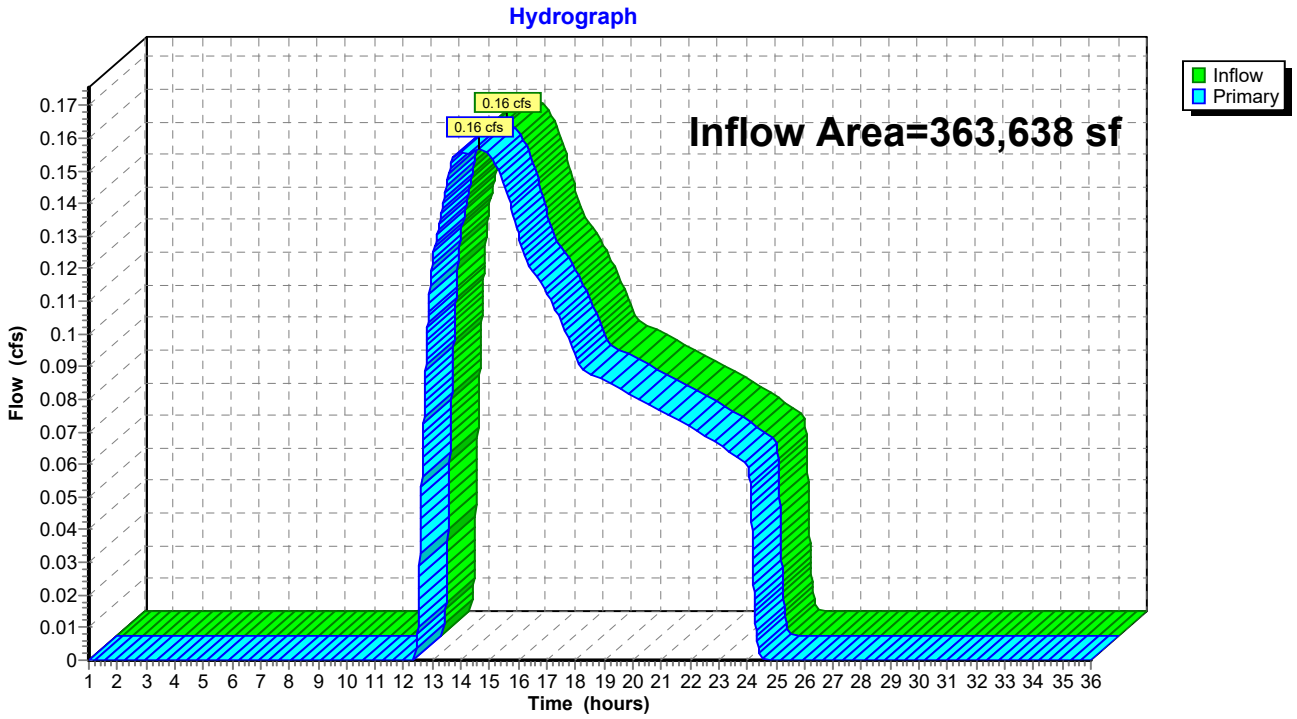


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 1.93% Impervious, Inflow Depth = 0.14" for 25-Yr event
Inflow = 0.16 cfs @ 14.64 hrs, Volume= 4,235 cf
Primary = 0.16 cfs @ 14.64 hrs, Volume= 4,235 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Summary for Pond IB-1: IB-1

Inflow Area = 66,059 sf, 4.31% Impervious, Inflow Depth = 1.01" for 25-Yr event
Inflow = 0.96 cfs @ 12.28 hrs, Volume= 5,540 cf
Outflow = 0.13 cfs @ 15.17 hrs, Volume= 5,540 cf, Atten= 86%, Lag= 173.6 min
Discarded = 0.13 cfs @ 15.17 hrs, Volume= 5,540 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 229.98' @ 15.17 hrs Surf.Area= 2,413 sf Storage= 2,025 cf

Plug-Flow detention time= 174.7 min calculated for 5,539 cf (100% of inflow)
Center-of-Mass det. time= 174.6 min (1,086.3 - 911.7)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	12,812 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

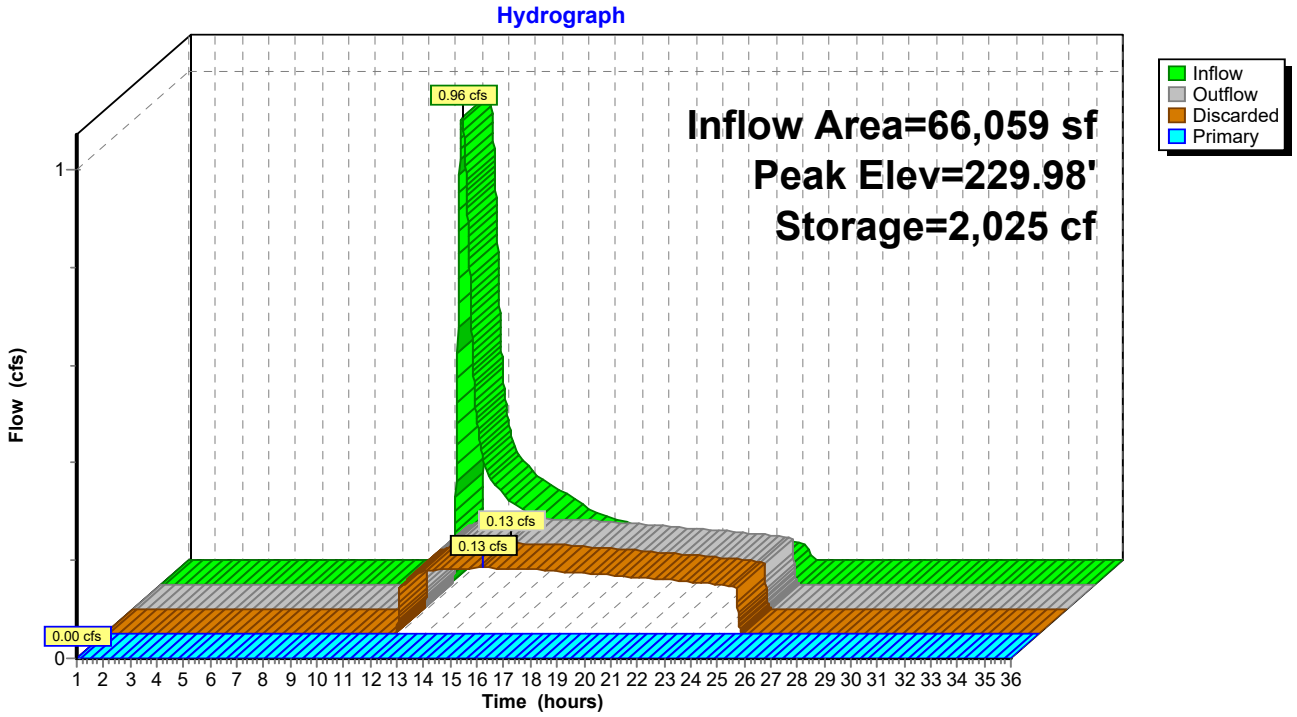
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,710	0	0
230.00	2,426	2,068	2,068
231.00	3,173	2,800	4,868
232.00	3,963	3,568	8,436
233.00	4,789	4,376	12,812

Device	Routing	Invert	Outlet Devices
#1	Discarded	229.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	231.85'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.13 cfs @ 15.17 hrs HW=229.98' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=66,059 sf
Peak Elev=229.98'
Storage=2,025 cf
0.96 cfs
0.13 cfs
0.13 cfs
0.00 cfs
Flow (cfs)
0
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=297,579 sf 1.40% Impervious Runoff Depth=0.33"
Flow Length=116' Tc=13.8 min CN=33 Runoff=0.50 cfs 8,132 cf

SubcatchmentA2: SUB-A2 Runoff Area=66,059 sf 4.31% Impervious Runoff Depth=1.39"
Flow Length=840' Tc=15.9 min CN=48 Runoff=1.48 cfs 7,669 cf

Pond A: POI-A Inflow=0.50 cfs 8,132 cf
Primary=0.50 cfs 8,132 cf

Pond IB-1: IB-1 Peak Elev=230.49' Storage=3,352 cf Inflow=1.48 cfs 7,669 cf
Discarded=0.16 cfs 7,669 cf Primary=0.00 cfs 0 cf Outflow=0.16 cfs 7,669 cf

Total Runoff Area = 363,638 sf Runoff Volume = 15,801 cf Average Runoff Depth = 0.52"
98.07% Pervious = 356,636 sf 1.93% Impervious = 7,002 sf

Summary for Subcatchment A1: SUB-A1

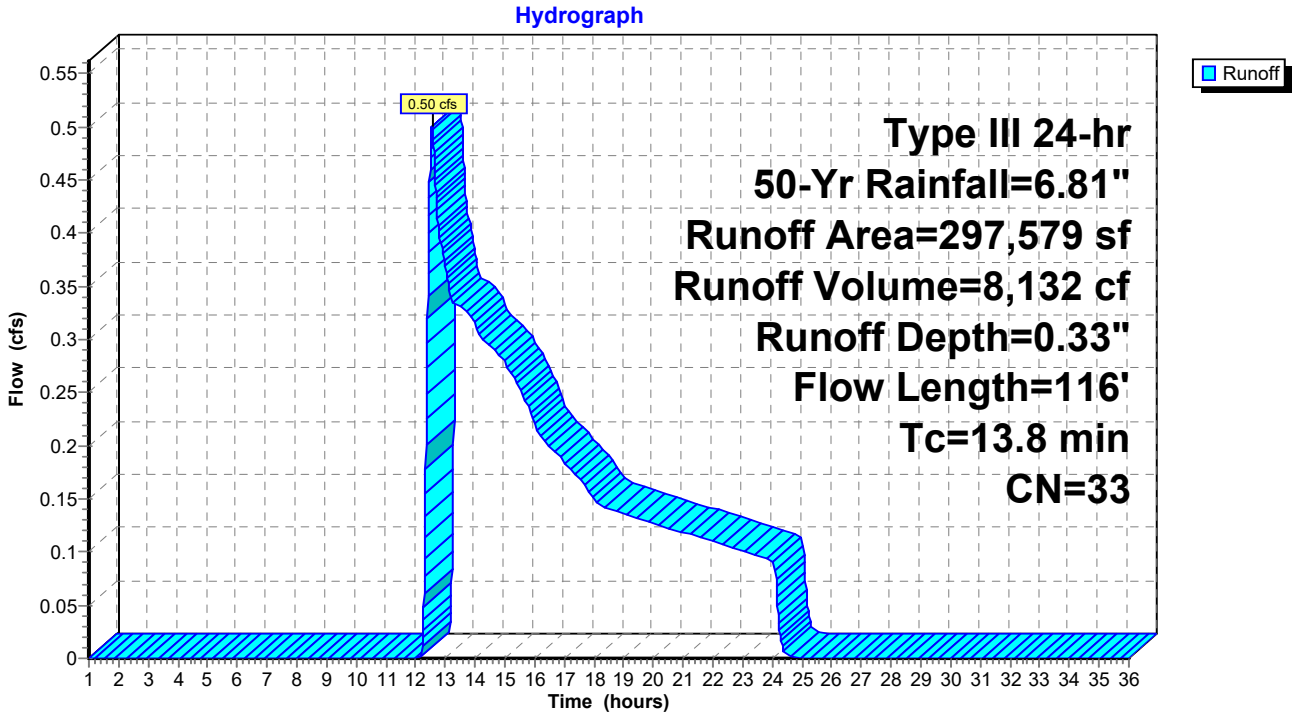
Runoff = 0.50 cfs @ 12.56 hrs, Volume= 8,132 cf, Depth= 0.33"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=6.81"

	Area (sf)	CN	Description
	256,279	30	Woods, Good, HSG A
	30,079	39	>75% Grass cover, Good, HSG A
*	5,518	77	Bare soil, HSG A
*	3,916	98	Paved driveway, HSG A
*	1,547	76	Rip-rap, HSG A
	240	98	Roofs, HSG A
	297,579	33	Weighted Average
	293,423		98.60% Pervious Area
	4,156		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	42	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.3400	2.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.8	116	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

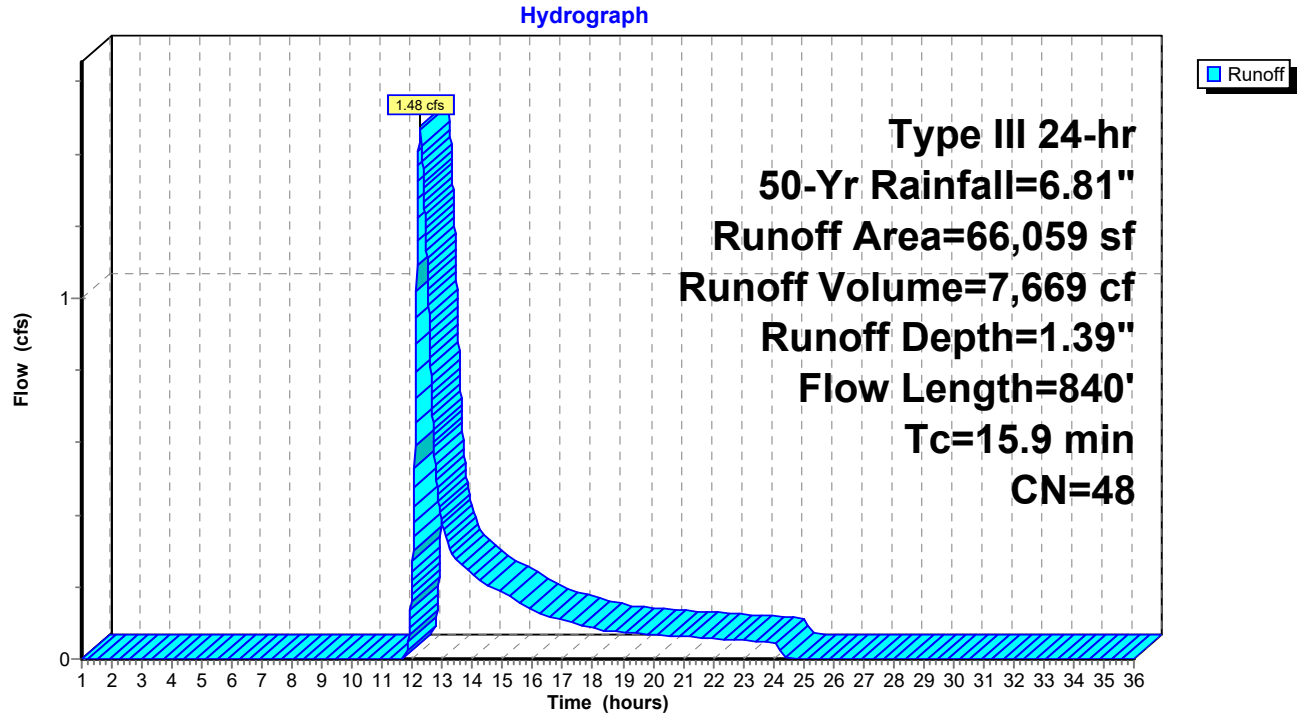
Runoff = 1.48 cfs @ 12.26 hrs, Volume= 7,669 cf, Depth= 1.39"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=6.81"

	Area (sf)	CN	Description
	48,574	39	>75% Grass cover, Good, HSG A
*	11,455	76	Gravel driveway, HSG A
	2,963	30	Woods, Good, HSG A
*	2,846	98	Paved driveway, HSG A
*	221	76	Rip-rap, HSG A
	66,059	48	Weighted Average
	63,213		95.69% Pervious Area
	2,846		4.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
10.8	795	0.0050	1.23	1.23	**Channel Flow,** Area= 1.0 sf Perim= 4.8' r= 0.21' n= 0.030 Earth, grassed & winding
15.9	840	Total			

Subcatchment A2: SUB-A2

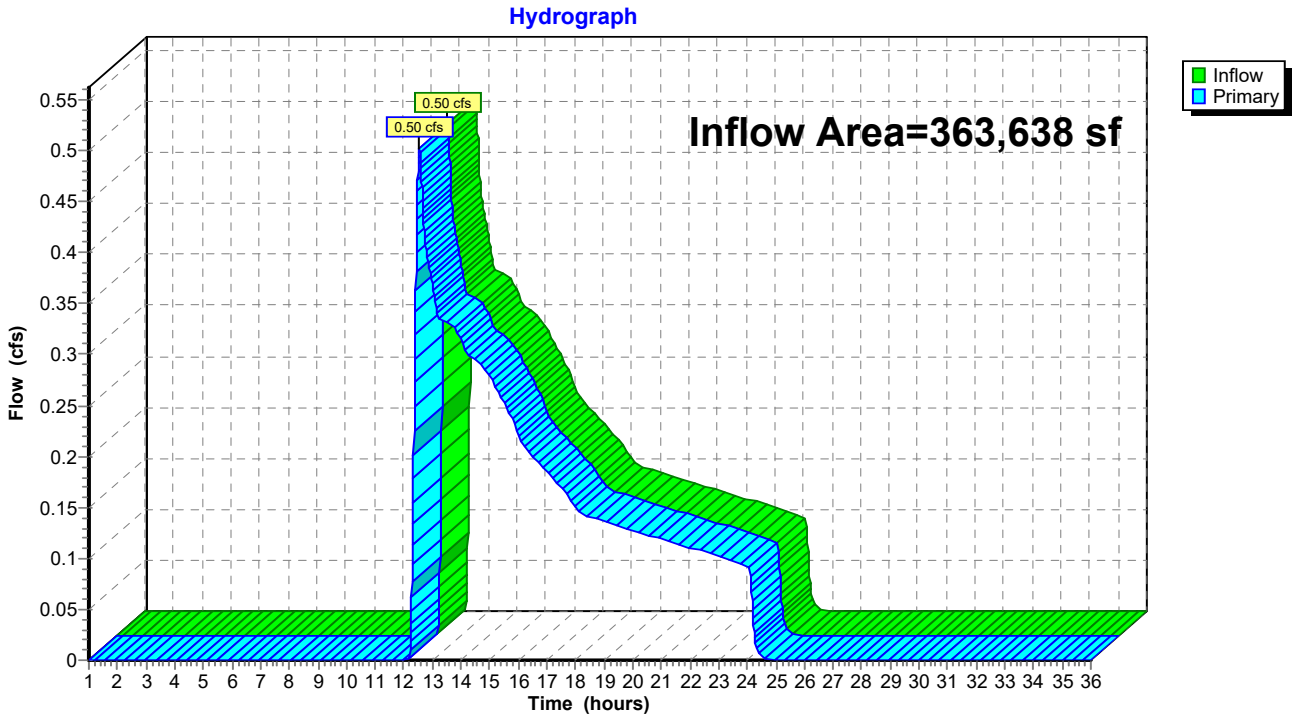


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 1.93% Impervious, Inflow Depth = 0.27" for 50-Yr event
Inflow = 0.50 cfs @ 12.56 hrs, Volume= 8,132 cf
Primary = 0.50 cfs @ 12.56 hrs, Volume= 8,132 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Summary for Pond IB-1: IB-1

Inflow Area = 66,059 sf, 4.31% Impervious, Inflow Depth = 1.39" for 50-Yr event
Inflow = 1.48 cfs @ 12.26 hrs, Volume= 7,669 cf
Outflow = 0.16 cfs @ 15.60 hrs, Volume= 7,669 cf, Atten= 89%, Lag= 200.1 min
Discarded = 0.16 cfs @ 15.60 hrs, Volume= 7,669 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 230.49' @ 15.60 hrs Surf.Area= 2,794 sf Storage= 3,352 cf

Plug-Flow detention time= 260.7 min calculated for 7,667 cf (100% of inflow)
Center-of-Mass det. time= 260.7 min (1,159.9 - 899.2)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	12,812 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

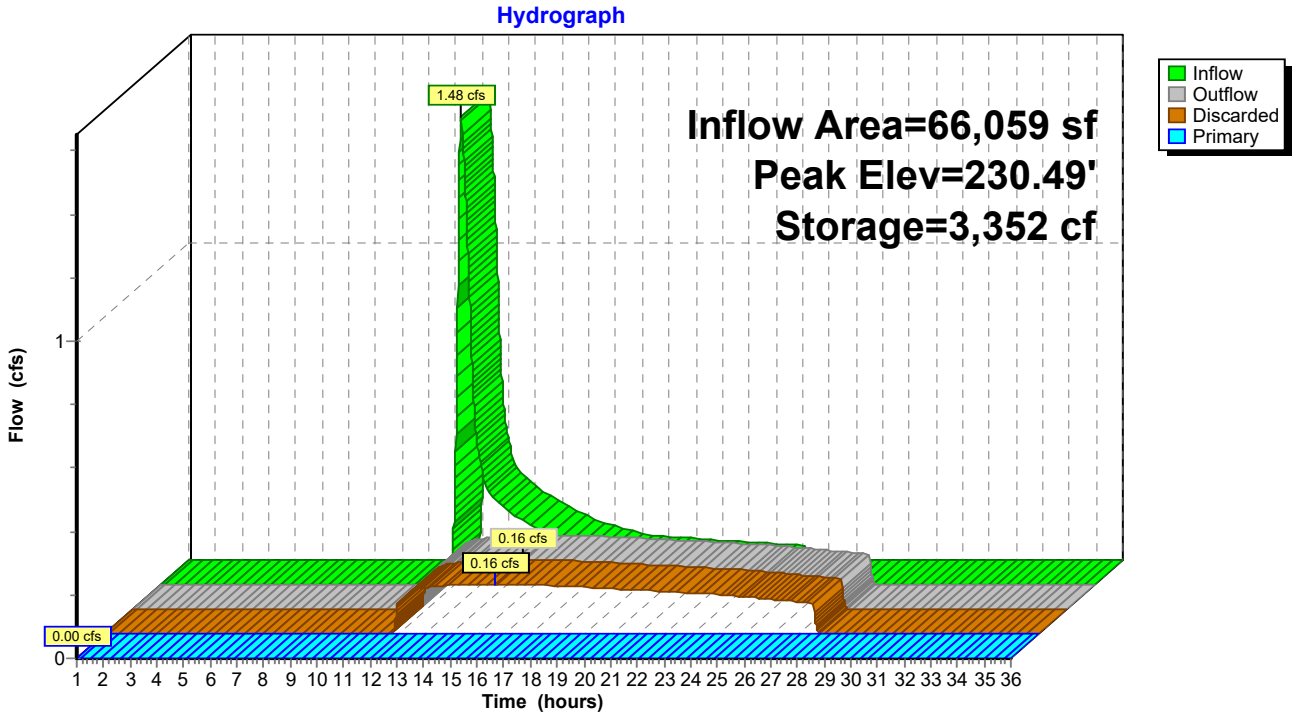
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,710	0	0
230.00	2,426	2,068	2,068
231.00	3,173	2,800	4,868
232.00	3,963	3,568	8,436
233.00	4,789	4,376	12,812

Device	Routing	Invert	Outlet Devices
#1	Discarded	229.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	231.85'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.16 cfs @ 15.60 hrs HW=230.49' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
Inflow Area=66,059 sf
Peak Elev=230.49'
Storage=3,352 cf
Inflow
Outflow
Discarded
Primary
1.48 cfs
0.16 cfs
0.16 cfs
0.00 cfs
Flow (cfs)
0
1
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=297,579 sf 1.40% Impervious Runoff Depth=0.55"
Flow Length=116' Tc=13.8 min CN=33 Runoff=1.32 cfs 13,580 cf

SubcatchmentA2: SUB-A2 Runoff Area=66,059 sf 4.31% Impervious Runoff Depth=1.86"
Flow Length=840' Tc=15.9 min CN=48 Runoff=2.11 cfs 10,236 cf

Pond A: POI-A Inflow=1.32 cfs 13,580 cf
Primary=1.32 cfs 13,580 cf

Pond IB-1: IB-1 Peak Elev=231.05' Storage=5,028 cf Inflow=2.11 cfs 10,236 cf
Discarded=0.18 cfs 10,236 cf Primary=0.00 cfs 0 cf Outflow=0.18 cfs 10,236 cf

Total Runoff Area = 363,638 sf Runoff Volume = 23,816 cf Average Runoff Depth = 0.79"
98.07% Pervious = 356,636 sf 1.93% Impervious = 7,002 sf

Summary for Subcatchment A1: SUB-A1

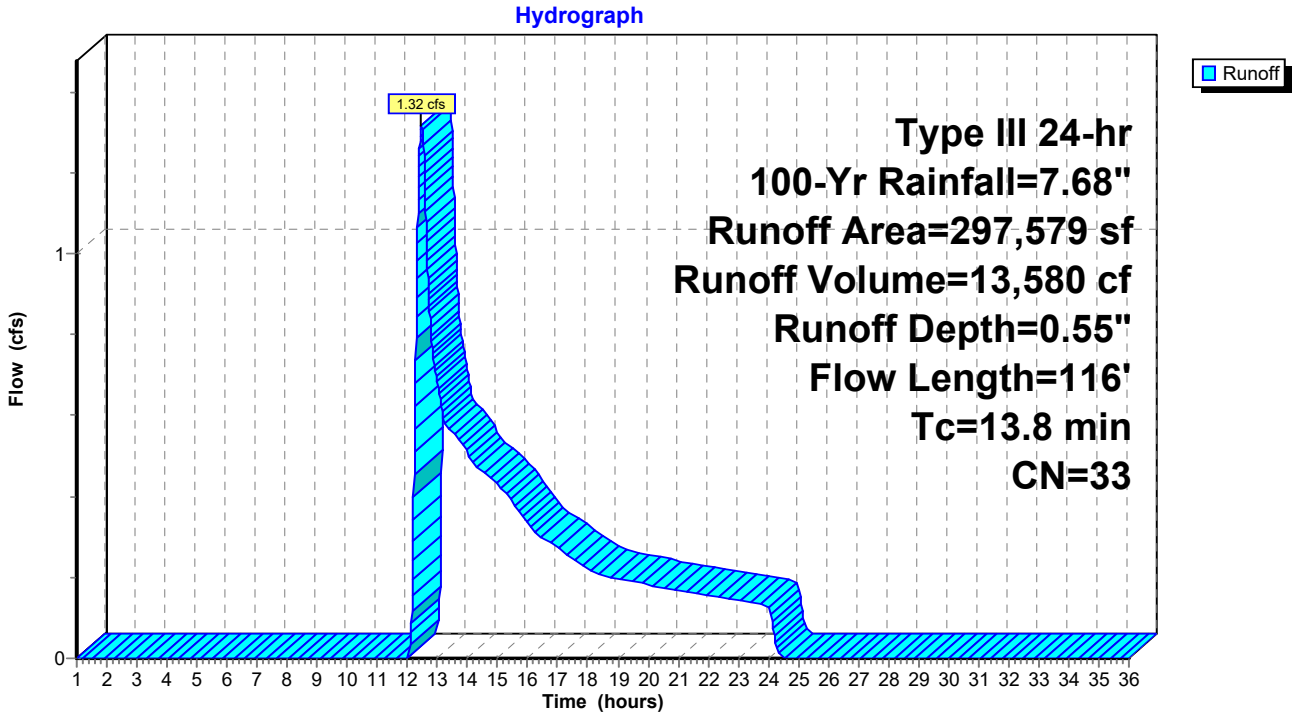
Runoff = 1.32 cfs @ 12.47 hrs, Volume= 13,580 cf, Depth= 0.55"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.68"

	Area (sf)	CN	Description
	256,279	30	Woods, Good, HSG A
	30,079	39	>75% Grass cover, Good, HSG A
*	5,518	77	Bare soil, HSG A
*	3,916	98	Paved driveway, HSG A
*	1,547	76	Rip-rap, HSG A
	240	98	Roofs, HSG A
	297,579	33	Weighted Average
	293,423		98.60% Pervious Area
	4,156		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	50	0.0175	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.9	42	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.3400	2.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.8	116	Total			

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

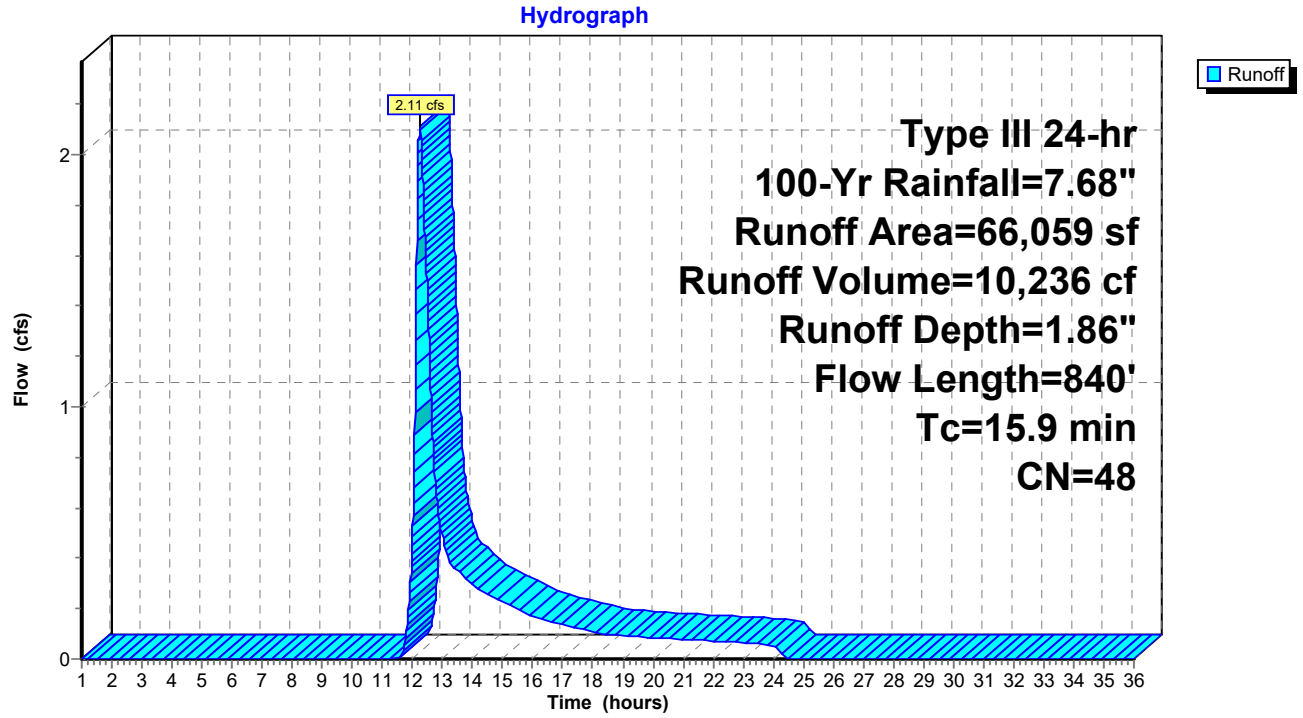
Runoff = 2.11 cfs @ 12.25 hrs, Volume= 10,236 cf, Depth= 1.86"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=7.68"

	Area (sf)	CN	Description
	48,574	39	>75% Grass cover, Good, HSG A
*	11,455	76	Gravel driveway, HSG A
	2,963	30	Woods, Good, HSG A
*	2,846	98	Paved driveway, HSG A
*	221	76	Rip-rap, HSG A
	66,059	48	Weighted Average
	63,213		95.69% Pervious Area
	2,846		4.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	45	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.30"
10.8	795	0.0050	1.23	1.23	**Channel Flow,** Area= 1.0 sf Perim= 4.8' r= 0.21' n= 0.030 Earth, grassed & winding
15.9	840	Total			

Subcatchment A2: SUB-A2

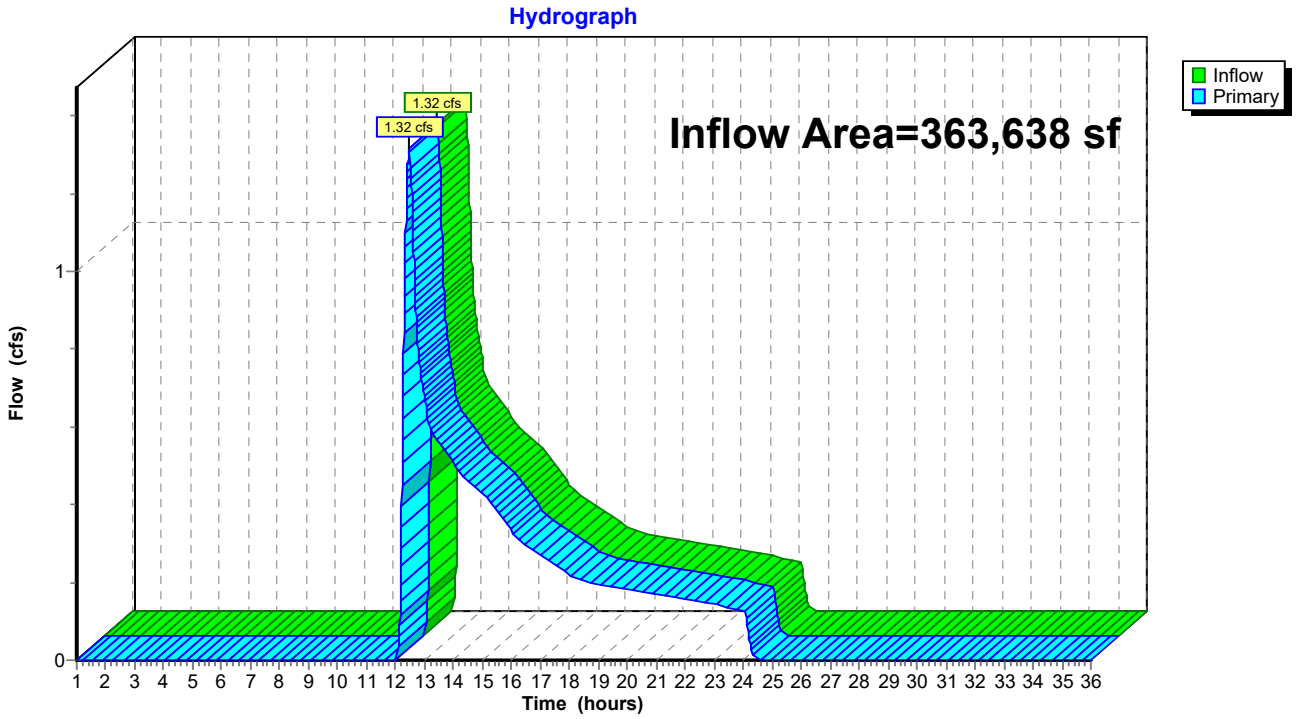


Summary for Pond A: POI-A

Inflow Area = 363,638 sf, 1.93% Impervious, Inflow Depth = 0.45" for 100-Yr event
Inflow = 1.32 cfs @ 12.47 hrs, Volume= 13,580 cf
Primary = 1.32 cfs @ 12.47 hrs, Volume= 13,580 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A



Summary for Pond IB-1: IB-1

Inflow Area = 66,059 sf, 4.31% Impervious, Inflow Depth = 1.86" for 100-Yr event
Inflow = 2.11 cfs @ 12.25 hrs, Volume= 10,236 cf
Outflow = 0.18 cfs @ 15.88 hrs, Volume= 10,236 cf, Atten= 92%, Lag= 217.8 min
Discarded = 0.18 cfs @ 15.88 hrs, Volume= 10,236 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 231.05' @ 15.88 hrs Surf.Area= 3,213 sf Storage= 5,028 cf

Plug-Flow detention time= 343.9 min calculated for 10,236 cf (100% of inflow)
Center-of-Mass det. time= 343.9 min (1,232.9 - 888.9)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	12,812 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

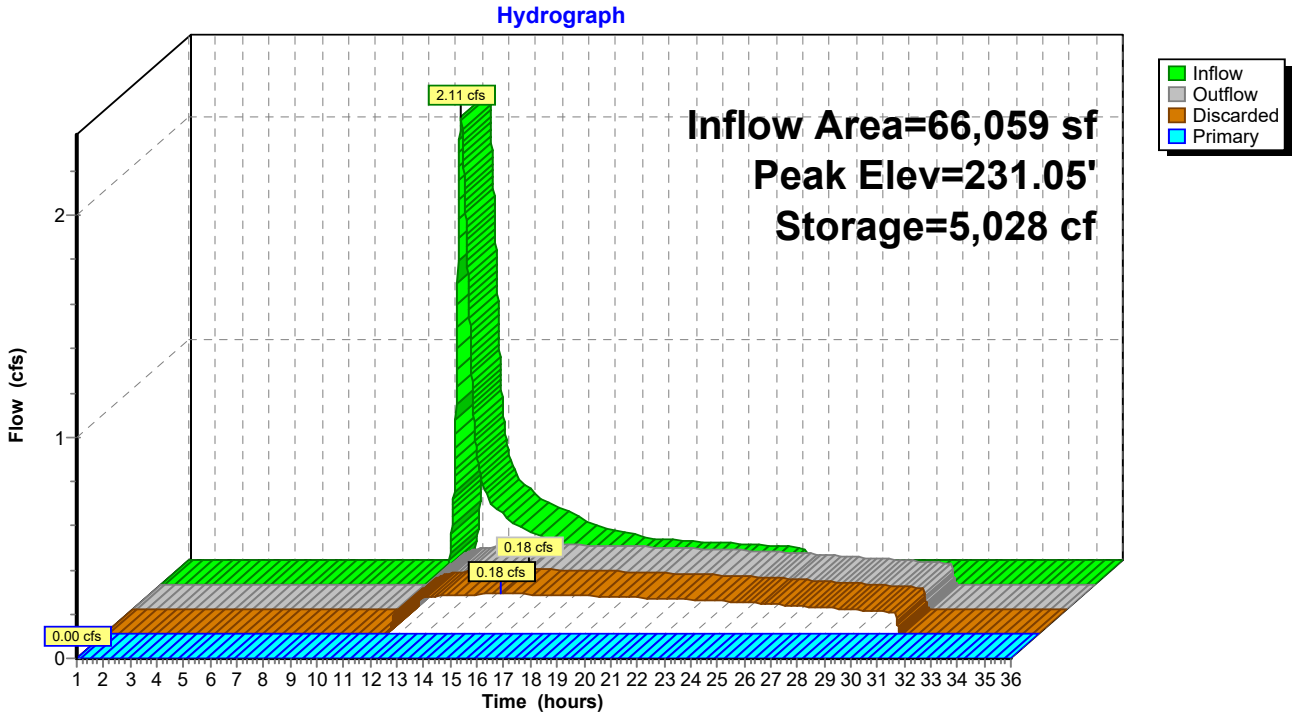
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,710	0	0
230.00	2,426	2,068	2,068
231.00	3,173	2,800	4,868
232.00	3,963	3,568	8,436
233.00	4,789	4,376	12,812

Device	Routing	Invert	Outlet Devices
#1	Discarded	229.00'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	231.85'	**20.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Discarded OutFlow Max=0.18 cfs @ 15.88 hrs HW=231.05' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
Inflow Area=66,059 sf
Peak Elev=231.05'
Storage=5,028 cf
Inflow
Outflow
Discarded
Primary
2.11 cfs
0.18 cfs
0.18 cfs
0.00 cfs
Flow (cfs)
0
1
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Supplemental Calculations

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: Infiltration Basin with Sediment Forebay

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Grass Channel	0.50	1.00	0.50	0.50
Infiltration Basin	0.80	0.50	0.40	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

Total TSS Removal = 90%

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

Project: Taylor Street Well and Raw Water Supply, Littleton MA
Prepared By: Aaron Guazzaloca
Date: 10/16/2023

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

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

Recharge Volume Calculations (Static Method)

Taylor Street Well and Raw Water Main
Littleton, MA
October 16, 2023

Infiltration Basin Required Recharge Volume Hydrologic Soils Group:	A	B	C	D	Total	
Total Proposed Impervious Area:	2,846	0	0	0	2,846	(SF)
Target Factor:	0.60	0.35	0.25	0.10		
Recharge Volume:	142	0	0	0	142	(CF)
Adjusted Recharge Volume*:					370	(CF)

* 2,846-SF out of 7,002-SF of proposed impervious area will be captured by the recharge BMP

Provided Recharge Volume		
Elevation of Lowest Invert:	231.85	(FT)
Volume Below Lowest Outlet:	7,850	(CF)

Drawdown Time		
Saturated Hydraulic Conductivity (Rawls Rate):	2.41	(IN/HR)
Bottom Area of Infiltration Basin:	1,710	(SF)
Drawdown Time:	22.9	(HRS)

Water Quality Volume Calculations

Taylor Street Well and Raw Water Main
Littleton, MA
October 16, 2023

Required Water Quality Storage Calculation

Proposed Impervious Area (SF) x 1-IN x 1-FT/12-IN = Required WQV

Location	Area (SF)	Required WQV (CF)	Provided WQV (CF)	BMP Description
Roadway Basin	2,846	237	7,850	Infiltration Basin

Stage-Area-Storage for Pond IB-1: IB-1 (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
231.08	3,236	5,124
231.09	3,244	5,156
231.10	3,252	5,189
231.11	3,260	5,221
231.12	3,268	5,254
231.13	3,276	5,287
231.14	3,284	5,319
231.15	3,292	5,352
231.16	3,299	5,385
231.17	3,307	5,418
231.18	3,315	5,451
231.19	3,323	5,485
231.20	3,331	5,518
231.21	3,339	5,551
231.22	3,347	5,585
231.23	3,355	5,618
231.24	3,363	5,652
231.25	3,371	5,685
231.26	3,378	5,719
231.27	3,386	5,753
231.28	3,394	5,787
231.29	3,402	5,821
231.30	3,410	5,855
231.31	3,418	5,889
231.32	3,426	5,923
231.33	3,434	5,958
231.34	3,442	5,992
231.35	3,449	6,026
231.36	3,457	6,061
231.37	3,465	6,096
231.38	3,473	6,130
231.39	3,481	6,165
231.40	3,489	6,200
231.41	3,497	6,235
231.42	3,505	6,270
231.43	3,513	6,305
231.44	3,521	6,340
231.45	3,528	6,375
231.46	3,536	6,411
231.47	3,544	6,446
231.48	3,552	6,482
231.49	3,560	6,517
231.50	3,568	6,553
231.51	3,576	6,588
231.52	3,584	6,624
231.53	3,592	6,660
231.54	3,600	6,696
231.55	3,608	6,732
231.56	3,615	6,768
231.57	3,623	6,804
231.58	3,631	6,841
231.59	3,639	6,877
231.60	3,647	6,913
231.61	3,655	6,950
231.62	3,663	6,987
231.63	3,671	7,023
231.64	3,679	7,060
231.65	3,687	7,097
231.66	3,694	7,134
231.67	3,702	7,171
231.68	3,710	7,208
231.69	3,718	7,245
231.70	3,726	7,282
231.71	3,734	7,319
231.72	3,742	7,357
231.73	3,750	7,394
231.74	3,758	7,432
231.75	3,766	7,469
231.76	3,773	7,507
231.77	3,781	7,545
231.78	3,789	7,583
231.79	3,797	7,621
231.80	3,805	7,659
231.81	3,813	7,697
231.82	3,821	7,735
231.83	3,829	7,773
231.84	3,837	7,812
231.85	3,844	7,850
231.86	3,852	7,888
231.87	3,860	7,927
231.88	3,868	7,966
231.89	3,876	8,004
231.90	3,884	8,043
231.91	3,892	8,082
231.92	3,900	8,121
231.93	3,908	8,160
231.94	3,916	8,199
231.95	3,923	8,238
231.96	3,931	8,278
231.97	3,939	8,317
231.98	3,947	8,356
231.99	3,955	8,396
232.00	3,963	8,436
232.01	3,971	8,475
232.02	3,980	8,515
232.03	3,988	8,555
232.04	3,996	8,595
232.05	4,004	8,635
232.06	4,013	8,675
232.07	4,021	8,715
232.08	4,029	8,755
232.09	4,037	8,796
232.10	4,046	8,836
232.11	4,054	8,876

VOLUME BELOW LOWEST OUTLET

Sediment Forebay Sizing Calculations

Taylor Street Well and Raw Water Main
Littleton, MA
October 16, 2023

Forebay Volume:

Minimum Required Volume = 0.1-IN x Impervious Area

Impervious Area:	2,846	(SF)
Volume Required:	24	(CF)
Volume Provided:	61	(CF)

Volume Calculation			
Elevation (FT)	**Area (SF)**	**Incremental Volume (CF)**	**Cumulative Volume (CF)**
229	25	0	0
230	97	61	**61**

Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify the proper procedures of practices for source control and pollution prevention.

Storage and Handling of Oil and other Hazardous Materials

Any hazardous materials that will be used ancillary to the site will be stored inside, or off site.

Spill Prevention/Response

Spill kits will be kept at a local Town facility, and spills shall be cleaned up immediately. Spills of any hazardous material over 10 gallons will be reported to the Massachusetts Department of Environmental Protection within 24 hours.

Operation and Maintenance of Stormwater Control Structures

Included in this application package is the Operation and Maintenance plan for this site, which includes periodic cleaning of stormwater infrastructure. The Littleton Water Department (LWD) will be responsible for the implementation of the plan.

Landscaping

Maintenance of landscaped areas shall be the responsibility of the LWD. Use of fertilizers, herbicides, and pesticides shall not be allowed on site.

Septic System

There will be no onsite septic facilities.

Vehicle Washing

Vehicle washing shall not be performed on site. Vehicles can be rinsed with a high volume of water at low pressure. This is considered dust water by the DEP and accounts for what may be rinsed off the vehicle when it rains.

Non-Hazardous Waste Management/Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The LWD shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers.

Prohibition of Illicit Discharges

Illicit discharges to the onsite stormwater management system shall be strictly prohibited. Illicit discharges are defined as any direct or indirect non-stormwater discharge to the onsite stormwater system. Requirements related to Illicit Discharges are further detailed in the attached Illicit Discharge Compliance Statement of this Stormwater Management Plan.

De-icing & Snow Disposal

Salt and sand shall not be used to treat the existing paved surfaces of the site during snow and ice events. Snow will be temporarily stored within peripheral areas of the site and allowed to melt and drain back to onsite stormwater systems. When needed, snow shall be removed from the site and disposed of in accordance with all local, state, and federal regulations. Snow storage shall be prohibited within all wetlands.

Emergency Contact Information

Owner/Operator:
Littleton Water Department
Corey Godfrey
Water & Sewer Superintendent
39 Ayer Road, Littleton, MA 01460
cgodfrey@lelwd.com
978-540-2222

Engineer:
James Pearson, P.E.
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement

Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the site to the maximum extent practicable, as required by federal and state law. To the best of our knowledge and belief, there are no illicit discharges occurring under existing conditions on this site within the meaning expressed under Standard 10 of the Massachusetts Stormwater Handbook. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section II - Definitions

For the purposes of this statement, the following shall mean:

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Connection: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater

discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or

b. Any pipe, open channel, drain or conveyance connected to the Town of Littleton storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Illicit Discharge: Any direct or indirect non-stormwater discharge to the Town of Littleton stormwater treatment system, except as exempted in Section III of this ordinance.

Industrial Activity: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Town of Littleton Stormwater Treatment System: Any facility, owned or maintained by the Town of Littleton, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, Town of Littleton streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of stormwater.

Person: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, interstate body, or any other legal entity.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

Pollution: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid,

gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Stormwater: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation and resulting from such precipitation.

Wastewater: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

Section III - Prohibitions

Prohibition of Illicit Discharges:

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into the Town of Littleton stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. It is to the best knowledge and belief of the project proponent that no illicit discharges currently exist at the project site. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by the Town of Littleton as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires notification to the Town of Littleton prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to the Town of Littleton stormwater treatment system.

Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Town of Littleton prior to allowing discharges to the Town of Littleton stormwater treatment system.

Section V - Notification of Spills and Accidental Discharges

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, the Town of Littleton stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Town of Littleton DPW in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to the Town of Littleton DPW within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the _____ day of _____, _____.

_____

Operations & Maintenance Plan

Operations & Maintenance Plan

1.0 Introduction

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

2.0 Purpose

This Operations & Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of the BMP type and an inspection form for the BMP. The Littleton Water Department (LWD) is the owner and operator of the system and is responsible for its upkeep and maintenance. This work will be funded on an annual basis through the owner's operating budget.

In the event the Owner sells the property, it is the Owner's responsibility to transfer this plan as well as the past operation and maintenance records to the new property owner.

3.0 BMP Descriptions

3.1 Infiltration Basins

Infiltration basins are used to provide stormwater treatment, detention, and groundwater recharge to mitigate peak stormwater discharges and remove total suspended solids from the stormwater runoff.

3.2 Sediment Forebays

Sediment forebays are designed to allow temporary ponding of stormwater runoff which allows sedimentation of total suspended solids. The bay is typically lined with stone riprap but can also be grassed and contains a stone check dam to release retained water.

3.3 Grassed Swales

Grassed swales treat stormwater runoff by providing long retention times for the water travelling through it so that total suspended solids are allowed

to settle. The swales also contains stone check dams to increase retention time.

4.0 Inspection, Maintenance Checklist, and Schedule

4.1 Infiltration Basins

Infiltration basins shall be inspected every three months during the first year, and annually thereafter. Inspection shall include all items noted below.

All accumulated sediment and debris in the stormwater infiltration basins should be removed and disposed of according to local, state, and federal regulations. The basin bottom and side slopes shall be mowed as needed, and at least twice a year at a minimum. Any grassed areas of the basin, which are near any paved areas that use salt in deicing applications should be re-seeded in the spring. Vegetation in infiltration basin bottoms shall likewise be inspected for degradation. Any accumulated sediment shall be removed, and bare spots should be re-seeded as needed.

Pipe inlets and outfalls from stormwater infiltration basins shall be inspected for plugging or damage and cleaned or repaired immediately. Any vegetation, soil or debris that forms a barrier to flow shall be removed. If any soil erosion is noted, erosion shall be repaired, and bare spots shall be armored with stone riprap. Embankments, spillways, and swales that affect the operation of the basin shall likewise be inspected for blockage or damage. Any accumulated debris that may impede stormwater flow shall be removed, and any noted erosion shall be repaired with stone riprap.

4.2 Sediment Forebays

Sediment forebays shall be inspected on a monthly basis and shall be cleaned four times per year. Check the sediment forebay for accumulated trash and debris at least once per month and remove by hand. Sediment shall be removed as needed and at least four times per year by hand or by using a vacuum truck. Check for signs of erosion and rilling in the forebay when removing sediments, and repair with stone riprap, or re-seed as needed.

4.3 Grassed Swales

Grassed swales must be inspected at least once a year for signs of erosion, sediment accumulation, vegetation loss and for the presence of invasive species. Any debris or sedimentation must be removed, and all areas of vegetation loss must be repaired. Periodic mowing of the swales is also required and at least 4-IN of grass must be maintained in the bottom of the swale. Repair check dams with stone as needed.

4.4 Inspections and Record Keeping

- An inspection form should be filled out each, and every time maintenance work is performed.
- A binder should be kept that contains all of the completed inspection forms and any other related materials.
- A review of Operation & Maintenance actions should take place annually such that the Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.
- Operation & Maintenance log forms for the last three years, at a minimum, shall be kept on site.
- The inspection and maintenance schedule may be refined in the future based on the findings and results of this Operation & Maintenance program or policy.

5.0 Stormwater Management System Owner/Responsible Party

The stormwater management system shall be owned and maintained by the following party or its future designee/assigns:

Littleton Water Department
Corey Godfrey
Water & Sewer Superintendent
39 Ayer Road, Littleton, MA 01460
cgodfrey@lelwd.com
978-540-2222

This operation and Maintenance Plan will be recorded with the registry of deeds so that current and future owners are aware of the requirement for proper operation and maintenance of the onsite stormwater system.

6.0 General Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The owner shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers.

7.0 Estimated Operations and Maintenance Budget

The estimated budget for annual operations and maintenance of this stormwater system is $1,000 per year.

Infiltration Basins

Frequency: Inspect every three months during the first year and annually thereafter. Mow basins at least twice a year at a minimum.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Inspect grassed area. Mow grass as needed in infiltration basins. Remove accumulated trash and debris. Remove sediment and re-seed bare spots as needed, including in basin bottom. Inspect pipe inlets/outfalls for damage, erosion, or blockage, remove blockage as needed, repair erosion with riprap. Inspect embankments, spillways and swales for erosion or blockage. Repair erosion with riprap, remove blockage as needed. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

Sediment Forebays

Frequency: Inspect monthly for trash and debris accumulation, remove as needed. Four times a year at a minimum, remove sediments.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Check for accumulation of sediment, trash, and debris monthly and remove trash and debris as needed. Every three months, remove sediments from forebay by hand or with a vacuum truck. Remove any vegetative growth or debris that restricts flow through the check dam. Check for signs of erosion and repair or replace any lost stone in the forebay or check dam with 4-6” riprap.

Grassed Swales

Frequency: Inspect quarterly in the first year and then annually during the spring each year after.

Structure Number: _____

Inspected By: _____ Date: _____

Observations: _____
_____
_____

Actions Taken: _____
_____
_____

Instructions: Check for accumulation of sediment, signs of erosion and loss of vegetation. Remove sediment and debris that restricts flow. Mow as needed to maintain a minimum of 4-IN of grass in the swale and repair any areas of vegetation loss. Repair any check dams with stone as needed. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

Site Plans