STORMWATER REPORT

STORMWATER MANAGEMENT PERMIT

FOR

THE PROPERTY LOCATED AT
64 BEAVER BROOK ROAD

IN

LITTLETON,
MASSACHUSETTS

PREPARED BY: DILLIS & ROY
CIVIL DESIGN GROUP, INC.
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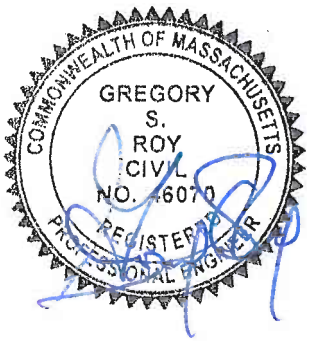

REVISED: SEPTEMBER 15TH, 2025
FEBRUARY 11TH, 2025
CDG PROJECT # 7462

DILLIS & ROY CIVIL DESIGN GROUP
CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS

TABLE OF CONTENTS:

1.0 Project Narrative

1.1 Project Type

The proposed project involves the construction of two single-family dwellings and a shared driveway. The shared driveway will require a wetland crossing and wetland replication area.

1.2 Purpose and Scope

This report has been prepared to comply with the requirements of the Stormwater Management Standards incorporated in the Massachusetts Wetlands Protection Act Regulations, 310 CMR 10.00. These standards are intended to promote increased groundwater recharge and prevent stormwater discharges from causing or contributing to the pollution of surface waters and ground waters of the Commonwealth. The standards aim to accomplish these goals by encouraging the greater use of low impact development techniques and improving the operation and maintenance of stormwater best management practices.

310 CMR 10.05(6)(1) states that the Stormwater Management Standards shall not apply to the development, as it is a development of four (4) or fewer units that does not discharge to critical areas. However, The Town of Littleton's Bylaw (Chapter 38-14) requires compliance with these standards for any land disturbing activity related to development that exceeds one acre. This report addresses compliance with the proposed development with each of the ten stormwater standards, it provides calculations to support the compliance information, and it provides a Long-Term Pollution Prevention Plan and an Operation and Maintenance Plan for the stormwater management system.

1.3 Proposed Development

The proposed project involves the construction of a 16-foot-wide shared driveway (±435 L.F.) to provide access to two residential lots (Lot 1 & Lot 3, as seen on Plan of Land in Littleton, Massachusetts, dated October 18th, 2024, prepared by Dillis and Roy Civil Design Group, Inc.). Both single-family dwellings and their associated private driveways will be located outside of the 100-foot buffer zone. Each dwelling will be serviced by a private septic system and private water supply well. Due to the wetland system which bisects the site, the proposed shared driveway will require a wetland crossing to provide access to the upland area at the rear of the property. The proposed scope of work also includes a wetland replication area to mitigate the direct BVW disturbance. Each dwelling will require separate utility connections and their appurtenances. Two sperate stormwater management areas are proposed to capture and mitigate stormwater runoff associated with the development.

Per the Massachusetts Stormwater Standards Handbook (Volume 1, Chapter1 Page 3), the stormwater standards do not apply to housing development projects comprised of detached single-family dwellings on four or fewer lots provided there is no discharge to critical areas. However, Section §38-14 of the Littleton Town Bylaw requires the filing of a stormwater management permit application for any disturbance over one acre. The disturbance associated with the proposed scope of work exceeds one acre.

The project has been designed to meet the Town of Littleton's local Stormwater Management requirements and the Massachusetts Stormwater Standards to the maximum extent practicable.

1.4 LID Measures

Care has been taken to lay out the proposed site in a manner that works with existing topography. BMPs will be used to manage stormwater runoff and control discharge to the analyzed design point. The proposed project will allow infiltration basins equipped with an emergency spillway or outlet control structure to control the amount of runoff leaving the property.

1.5 Site Description

The subject property is located at 64 Beaver Brook Road and contains approximately ±10.12 acres of land. The property has been previously developed and includes an existing single-family dwelling, paved driveway, on-site private sewage disposal system & private water supply well. The parcel is located within the Residential Zoning District. Multiple Bordering Vegetated Wetland systems are found on-site behind the previous development as shown on the attached Site Plan. The largest BVW area bisects the rear of the lot from Beaver Brook Road. The USDA soil map indicated that the development area is underlain with soils belonging primarily to Hydrologic Soil Group (HSG) C. However, due to recent on-site soil testing, it was confirmed that the underlying soils belong to HSG B. Please refer to the test hole data on the site plans to review soil qualities and properties. The site does not contain any stormwater infrastructure, or conveyance measures on-site. Generally, the stormwater runoff which accumulates on site sheet flows overland towards the wetland resource areas from south to north.

Site visits have been conducted to evaluate the above-mentioned site with regard to the presence of Wetland Resource Areas, as defined by the Massachusetts Wetlands Protection Act (M.G.L. c. 131 s. 40) and Regulations (310 CMR 10.00), and Littleton Wetlands Bylaw.

The existing topography of the site generally slopes from South to North towards the large Bordering Vegetated Wetland system which bisects the site.

Based on the most recently available Flood Insurance Rate map for the Town of Littleton, the project site does not have any areas subject to inundation during the 100-year frequency storm event. This information was obtained from the Federal Flood Insurance Rate (FIRM) Flood Plain Map 25017C0228E June 4, 2010.

In accordance with regulation 310 CMR 10.59, no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species. Specified habitat sites of rare species have been identified by the Massachusetts Natural Heritage and Endangered Species Program of the Division of Fisheries and Wildlife. The Massachusetts Natural Heritage Atlas 13th Edition indicates that the site does not contain areas identified as habitat sites of rare species and wildlife. There are no certified vernal pools on or near the project site.

The NRCS soil survey information indicates that all of the site is underlain by soils classified as belonging to Hydrologic Soil Groups C (Paxton fine sandy loam). Soils belonging to HSG C have a slower infiltration rate and have a high runoff potential.

However, due to recent on-site soil testing, it was confirmed that the underlying soils belong to HSG B. The hydraulic models and stormwater designs have been revised for HSG B soils. Please refer to the test hole data on the attached Site Plans for more information regarding on-site soil analysis.

1.6 Proposed Stormwater Management System

Runoff from the proposed development will be conveyed and treated through a combination of Best Management Practices (BMP's). The following is a brief discussion of each conveyance and treatment BMP proposed.

Infiltration Basins with Sediment Forebay

The proposed infiltration basins were designed to reduce the post-construction runoff rates and increase groundwater recharge rates to the maximum extent practical. The basin will capture runoff associated with a large portion of the private driveway and overland flow from the undisturbed wooded area. The basin has been designed with an emergency overflow weir which will activate during more severe rain events to direct the overflow away from the development. One of the basins has been equipped with an outlet control structure which was designed to provide the stormwater management area with a low-flow outlet during less sever rain events. Riprap will also be installed at the outlet of the emergency weir to control the overflow of stormwater and reduce the potential for scouring. Sediment forebays have been designed at the entrance of each basin to decrease the velocity of flow and increase the settlement of heavy solids prior to entering the basin. Riprap will also be installed at the inlet of the sediment

forebay and the outlet of the basin to control the overflow of stormwater and reduce the potential for scouring.

Deep Sump Hooded Catch Basin

Deep sump hooded catch basins are proposed to convey runoff from the proposed paved areas the infiltration basins. These structures were located to limit any stormwater runoff from entering the right of way. These catch basins will discharge to conventional storm drains.

1.7 Methods of Analysis

United States Department of Agriculture Natural Resources Conservation Service (NRCS) soil cover complex methods (TR-20) were employed to compute runoff quantities for the subject property. HydroCAD 10.0 computer software was employed in this hydrologic analysis. A comparison of pre- and post-development runoff quantities at various analysis points downstream around the site was performed in order to design a stormwater management system that will limit peak rates of runoff from the development to predevelopment levels for 24-hour rainfall events of 2-, 10-, 25-, 50- and 100-year return frequencies. Watershed boundaries for existing conditions are depicted on the attached Predevelopment Watershed Plan. Post-Developed watershed boundaries are indicated on the Post-Development Watershed Plan.

2.0 Stormwater Standards Compliance

2.1 Standard 1 – Untreated Discharges

The stormwater management system for the proposed development will not result in any new discharges of untreated stormwater to wetland resource areas. The stormwater management system has been designed such that there is no erosion or scour to wetland resource areas or waters of the Commonwealth.

2.2 Standard 2 – Peak Rate Attenuation

Hydrologic calculations for existing and proposed site conditions are included in Appendices D and E respectively. Calculations for 24-hour rainfall events of 2-, 10-, 25- and 100-year return frequencies are provided. The following table provides a summary of peak rates of runoff related to each of these storms for the design point through which all runoff from the subject property must flow. For all rainfall events considered, the proposed stormwater management system will control runoff from the development such that corresponding peak flows at the design point will be lower than pre-developed rates.

Table 1: Design Point - A Peak Runoff Rates

	Pre-Developed	**Post-Developed**	**Delta**
2-year	1.63 cfs	1.59 cfs	-0.04 cfs
10-year	11.60 cfs	10.53 cfs	-1.07 cfs
25-year	20.38 cfs	19.26 cfs	-1.12 cfs
50-year	27.63 cfs	25.87 cfs	-1.76 cfs
100-year	39.88 cfs	38.48 cfs	-1.40 cfs

2.1 Standard 3 – Recharge

As discussed in the Introduction, Natural Resource Conservation Service data indicates that the areas within the proposed development consist of soils from Hydrologic Group B, as confirmed with on-site testing. Infiltration Basin# 1 & #2 provide 1,720 CF & 356 CF of recharge volume, respectively. The amount of recharge volume provided exceeds the required 906 CF of recharge volume & 1,477 CF of water quality volume based on a water quality depth of 1”. Recharge and TSS calculations are provided in Appendix F.

Standard 4 – Water Quality

The BMP’s have been designed to meet the 1” required water quality depth for the proposed development. TSS removal calculations have been provided within (Appendix F) showing that the proposed overall TSS removal efficiency from these areas will be 90% utilizing a deep sump catch basin, and a series of

designed sediment forebays which discharge into an infiltration basin for treatment.

2.2 Standard 5 – Land Uses with Higher Pollutant Loads

The current and proposed uses of the subject site do not constitute land use with higher potential pollutant load, thus Standard 5 does not apply to the proposed project.

2.3 Standard 6 – Critical Areas

The proposed project does not include any discharge to any Critical Areas as defined in 310 CMR 10.00.

2.4 Standard 7 – Redevelopment

The proposed project does not meet the standards to be considered a Redevelopment project.

2.5 Standard 8 – Construction Period Pollution Prevention and Erosion and Sediment Control

Because the project is subject to the filing of an Environmental Protection Agency Notice of Intent (EPA NOI), the Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to construction. This document will be prepared to satisfy the requirements of the EPA NOI and the Standard 8 Construction Period Pollution prevention and Erosion and Sedimentation Control Plan.

2.6 Standard 9 – Operation and Maintenance Plan

See Appendix G for the Stormwater Operation & Maintenance Manual documenting operations and maintenance activities for both during and post construction periods.

2.7 Standard 10 – Prohibition of Illicit Discharges

Refer to Appendix J for an illicit discharge statement.

APPENDIX A

Locus Map

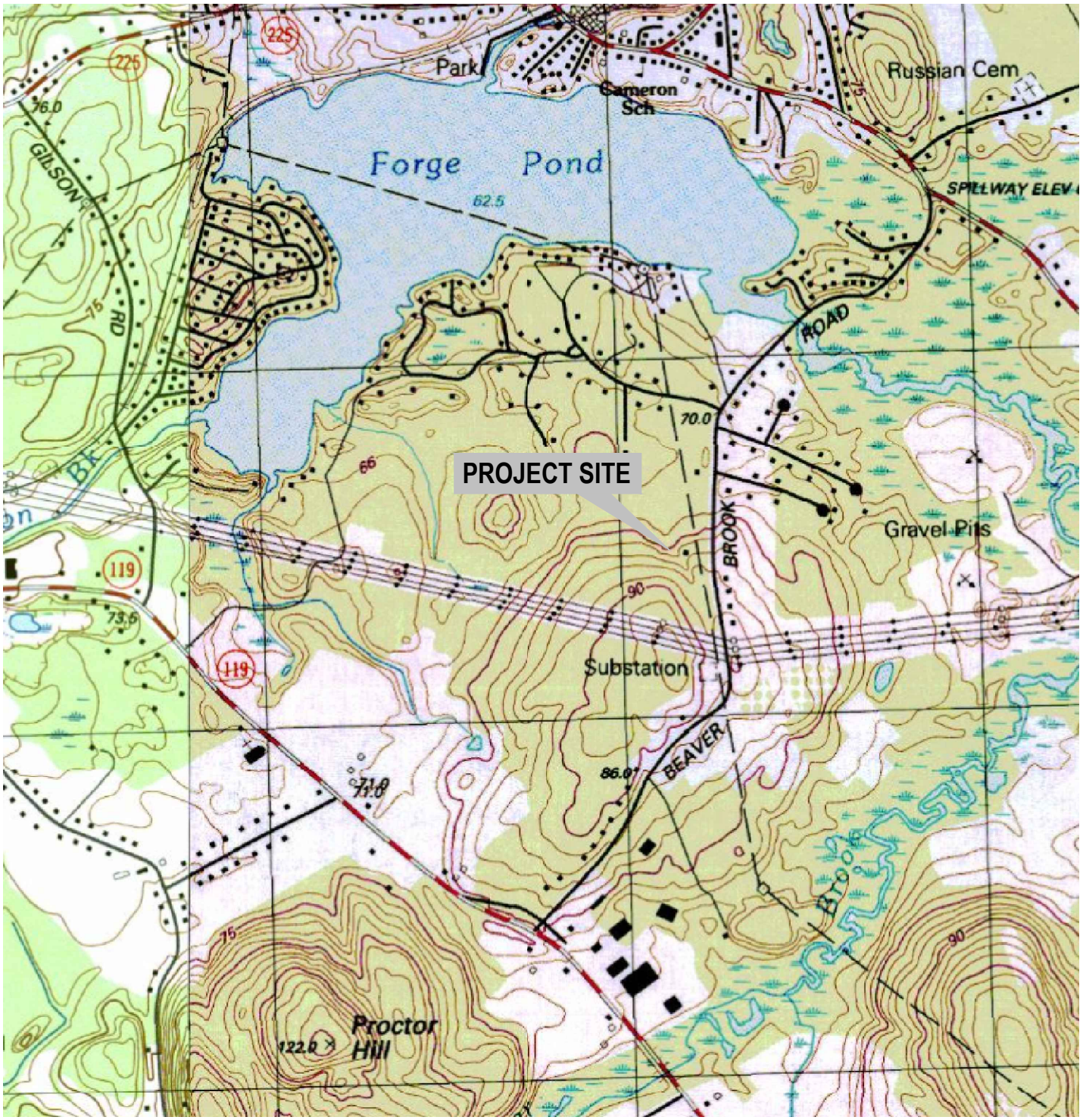

FIGURE 1 - LOCUS MAP

1"=1,000'

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References: 1988 USGS Massachusetts Topographic Map

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APPENDIX B

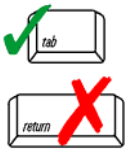
Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

[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.

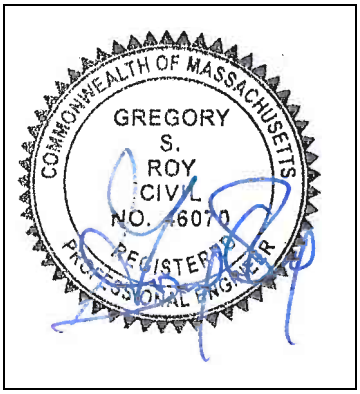
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



This project is considered a "small residential project" (2-4 single family houses) with no discharges to any critical areas. As such, these state standards are not applicable to the proposed development with respect to a filing with DEP. However, the Littleton local Bylaw requires compliance for projects that exceed 1-acre in disturbance. We believe that the proposed stormwater systems & level of treatment provided are consistent with the nature of the proposed work.

Signature and Date

Checklist

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

- [x] 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): Infiltration Basin

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☑ Soil Analysis provided.

☑ Required Recharge Volume calculation provided.

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

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

☑ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

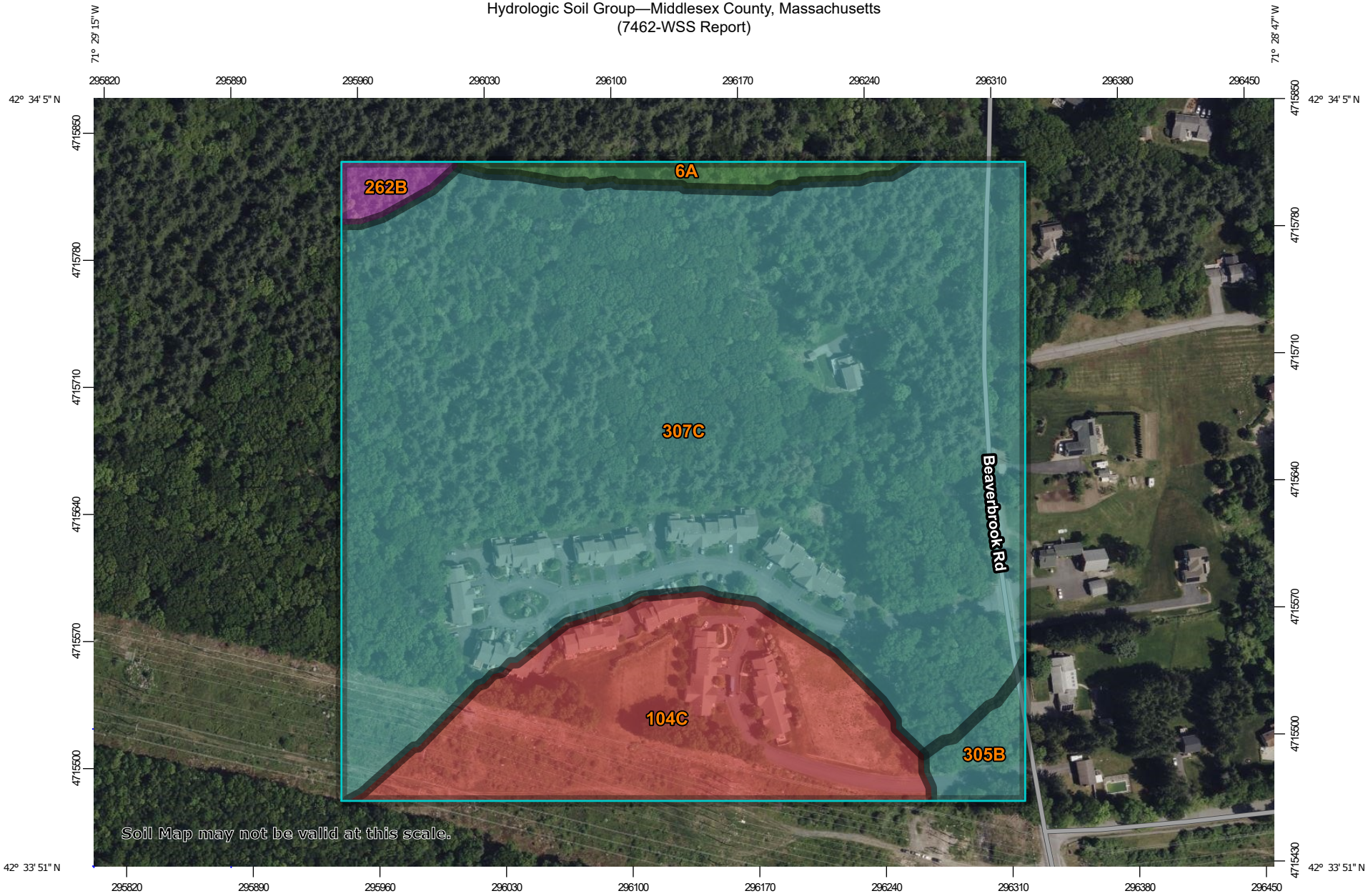
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☑ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX C

NRCS Soils Data



Map Scale: 1:2,980 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

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 1:24,000.

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 24, Aug 27, 2024

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
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	0.7	2.1%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	D	6.0	18.3%
262B	Quonset sandy loam, 3 to 8 percent slopes	A	0.4	1.1%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	0.6	1.9%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	25.3	76.6%
Totals for Area of Interest			**33.0**	**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

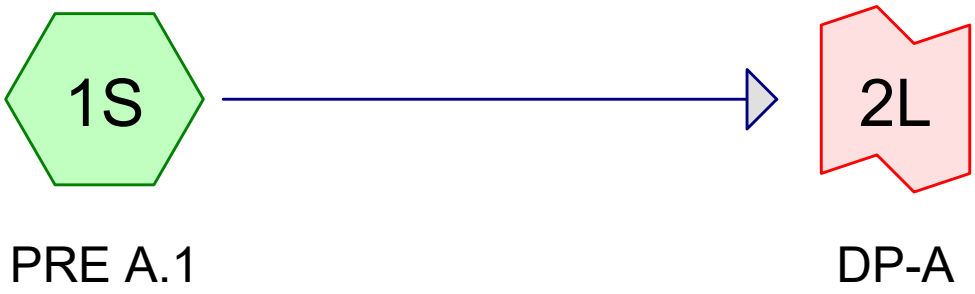
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D

Existing Conditions – Hydrologic Conditions



Subcat Reach Pond Link

Routing Diagram for 7462-PRE REV2
Prepared by Dillis & Roy Civil Design Group, Printed 9/15/2025

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE A.1 Runoff Area=555,200 sf 1.16% Impervious Runoff Depth=0.27"
Tc=19.4 min CN=56 Runoff=1.63 cfs 0.287 af

Link 2L: DP-A Inflow=1.63 cfs 0.287 af
Primary=1.63 cfs 0.287 af

Total Runoff Area = 12.746 ac Runoff Volume = 0.287 af Average Runoff Depth = 0.27"
98.84% Pervious = 12.598 ac 1.16% Impervious = 0.147 ac

Summary for Subcatchment 1S: PRE A.1

Runoff = 1.63 cfs @ 12.21 hrs, Volume= 0.287 af, Depth= 0.27"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.17"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
18,624	61	>75% Grass cover, Good, HSG B
530,158	55	Woods, Good, HSG B
555,200	56	Weighted Average
548,782		98.84% Pervious Area
6,418		1.16% Impervious Area

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

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 1.16% Impervious, Inflow Depth = 0.27" for 2-Year event
Inflow = 1.63 cfs @ 12.21 hrs, Volume= 0.287 af
Primary = 1.63 cfs @ 12.21 hrs, Volume= 0.287 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE A.1 Runoff Area=555,200 sf 1.16% Impervious Runoff Depth=0.99"
Tc=19.4 min CN=56 Runoff=11.60 cfs 1.047 af

Link 2L: DP-A Inflow=11.60 cfs 1.047 af
Primary=11.60 cfs 1.047 af

Total Runoff Area = 12.746 ac Runoff Volume = 1.047 af Average Runoff Depth = 0.99"
98.84% Pervious = 12.598 ac 1.16% Impervious = 0.147 ac

Summary for Subcatchment 1S: PRE A.1

Runoff = 11.60 cfs @ 12.15 hrs, Volume= 1.047 af, Depth= 0.99"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.89"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
18,624	61	>75% Grass cover, Good, HSG B
530,158	55	Woods, Good, HSG B
555,200	56	Weighted Average
548,782		98.84% Pervious Area
6,418		1.16% Impervious Area

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

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 1.16% Impervious, Inflow Depth = 0.99" for 10-Year event
Inflow = 11.60 cfs @ 12.15 hrs, Volume= 1.047 af
Primary = 11.60 cfs @ 12.15 hrs, Volume= 1.047 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE A.1 Runoff Area=555,200 sf 1.16% Impervious Runoff Depth=1.57"
Tc=19.4 min CN=56 Runoff=20.38 cfs 1.670 af

Link 2L: DP-A Inflow=20.38 cfs 1.670 af
Primary=20.38 cfs 1.670 af

Total Runoff Area = 12.746 ac Runoff Volume = 1.670 af Average Runoff Depth = 1.57"
98.84% Pervious = 12.598 ac 1.16% Impervious = 0.147 ac

Summary for Subcatchment 1S: PRE A.1

Runoff = 20.38 cfs @ 12.14 hrs, Volume= 1.670 af, Depth= 1.57"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.96"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
18,624	61	>75% Grass cover, Good, HSG B
530,158	55	Woods, Good, HSG B
555,200	56	Weighted Average
548,782		98.84% Pervious Area
6,418		1.16% Impervious Area

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

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 1.16% Impervious, Inflow Depth = 1.57" for 25-Year event
Inflow = 20.38 cfs @ 12.14 hrs, Volume= 1.670 af
Primary = 20.38 cfs @ 12.14 hrs, Volume= 1.670 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE A.1 Runoff Area=555,200 sf 1.16% Impervious Runoff Depth=2.06"
Tc=19.4 min CN=56 Runoff=27.63 cfs 2.185 af

Link 2L: DP-A Inflow=27.63 cfs 2.185 af
Primary=27.63 cfs 2.185 af

Total Runoff Area = 12.746 ac Runoff Volume = 2.185 af Average Runoff Depth = 2.06"
98.84% Pervious = 12.598 ac 1.16% Impervious = 0.147 ac

Summary for Subcatchment 1S: PRE A.1

Runoff = 27.63 cfs @ 12.14 hrs, Volume= 2.185 af, Depth= 2.06"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-Year Rainfall=6.75"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
18,624	61	>75% Grass cover, Good, HSG B
530,158	55	Woods, Good, HSG B
555,200	56	Weighted Average
548,782		98.84% Pervious Area
6,418		1.16% Impervious Area

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

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 1.16% Impervious, Inflow Depth = 2.06" for 50-Year event
Inflow = 27.63 cfs @ 12.14 hrs, Volume= 2.185 af
Primary = 27.63 cfs @ 12.14 hrs, Volume= 2.185 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: PRE A.1 Runoff Area=555,200 sf 1.16% Impervious Runoff Depth=2.88"
Tc=19.4 min CN=56 Runoff=39.88 cfs 3.058 af

Link 2L: DP-A Inflow=39.88 cfs 3.058 af
Primary=39.88 cfs 3.058 af

Total Runoff Area = 12.746 ac Runoff Volume = 3.058 af Average Runoff Depth = 2.88"
98.84% Pervious = 12.598 ac 1.16% Impervious = 0.147 ac

Summary for Subcatchment 1S: PRE A.1

Runoff = 39.88 cfs @ 12.13 hrs, Volume= 3.058 af, Depth= 2.88"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.98"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
18,624	61	>75% Grass cover, Good, HSG B
530,158	55	Woods, Good, HSG B
555,200	56	Weighted Average
548,782		98.84% Pervious Area
6,418		1.16% Impervious Area

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

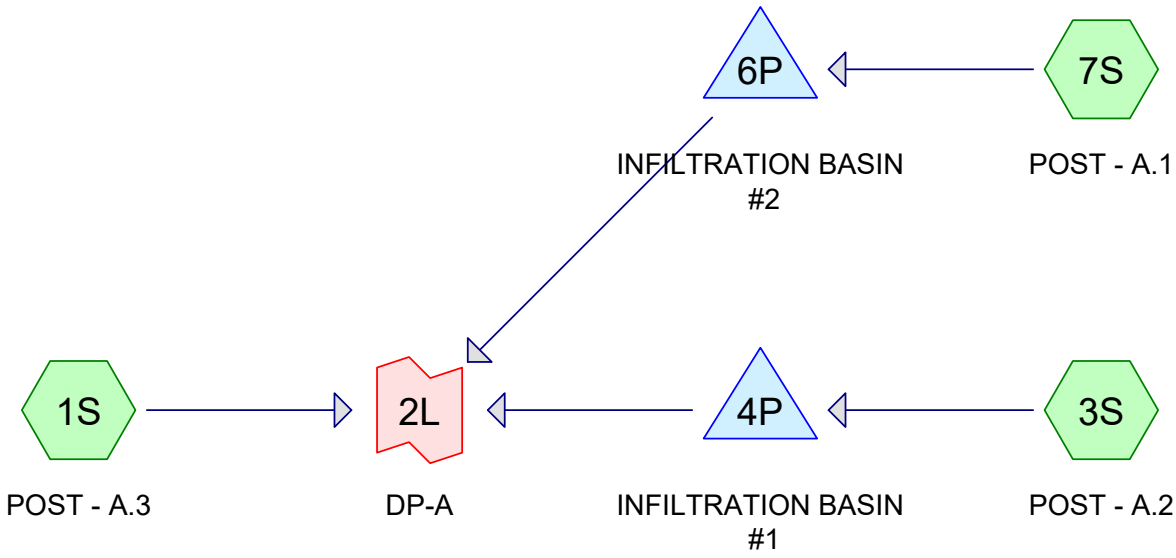
Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 1.16% Impervious, Inflow Depth = 2.88" for 100-Year event
Inflow = 39.88 cfs @ 12.13 hrs, Volume= 3.058 af
Primary = 39.88 cfs @ 12.13 hrs, Volume= 3.058 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX E

Proposed Conditions – Hydrologic Calculations



Subcat Reach Pond Link

Routing Diagram for 7462-POST REV2
Prepared by Dillis & Roy Civil Design Group, Printed 9/15/2025

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST - A.3 Runoff Area=465,154 sf 1.38% Impervious Runoff Depth=0.27"
Flow Length=928' Tc=19.4 min CN=56 Runoff=1.37 cfs 0.240 af

Subcatchment 3S: POST - A.2 Runoff Area=33,306 sf 21.61% Impervious Runoff Depth=0.59"
Flow Length=164' Tc=7.3 min CN=65 Runoff=0.66 cfs 0.037 af

Subcatchment 7S: POST - A.1 Runoff Area=56,761 sf 17.84% Impervious Runoff Depth=0.63"
Flow Length=535' Tc=9.7 min CN=66 Runoff=1.10 cfs 0.068 af

Pond 4P: INFILTRATION BASIN #1 Peak Elev=263.64' Storage=968 cf Inflow=0.66 cfs 0.037 af
Discarded=0.02 cfs 0.037 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.037 af

Pond 6P: INFILTRATION BASIN #2 Peak Elev=239.80' Storage=784 cf Inflow=1.10 cfs 0.068 af
Discarded=0.04 cfs 0.038 af Primary=0.23 cfs 0.030 af Outflow=0.27 cfs 0.068 af

Link 2L: DP-A Inflow=1.59 cfs 0.270 af
Primary=1.59 cfs 0.270 af

Total Runoff Area = 12.746 ac Runoff Volume = 0.346 af Average Runoff Depth = 0.33"
95.72% Pervious = 12.201 ac 4.28% Impervious = 0.545 ac

Summary for Subcatchment 1S: POST - A.3

Runoff = 1.37 cfs @ 12.21 hrs, Volume= 0.240 af, Depth= 0.27"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.17"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
58,463	61	>75% Grass cover, Good, HSG B
400,273	55	Woods, Good, HSG B
465,154	56	Weighted Average
458,736		98.62% Pervious Area
6,418		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
7.0	594	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	59	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	38	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	42	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	145	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	928	Total			

Summary for Subcatchment 3S: POST - A.2

Runoff = 0.66 cfs @ 12.00 hrs, Volume= 0.037 af, Depth= 0.59"
Routed to Pond 4P : INFILTRATION BASIN #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.17"

Area (sf)	CN	Description
7,198	98	Paved parking, HSG B
22,357	55	Woods, Good, HSG B
3,751	61	>75% Grass cover, Good, HSG B
33,306	65	Weighted Average
26,108		78.39% Pervious Area
7,198		21.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.7	85	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	29	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	164	Total			

Summary for Subcatchment 7S: POST - A.1

Runoff = 1.10 cfs @ 12.03 hrs, Volume= 0.068 af, Depth= 0.63"
Routed to Pond 6P : INFILTRATION BASIN #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-Year Rainfall=3.17"

Area (sf)	CN	Description
6,529	98	Paved parking, HSG B
33,026	61	>75% Grass cover, Good, HSG B
13,606	55	Woods, Good, HSG B
3,600	98	Roofs, HSG B
56,761	66	Weighted Average
46,632		82.16% Pervious Area
10,129		17.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.4	57	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	86	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	170	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	144	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	535	Total			

Summary for Pond 4P: INFILTRATION BASIN #1

Inflow Area = 0.765 ac, 21.61% Impervious, Inflow Depth = 0.59" for 2-Year event
Inflow = 0.66 cfs @ 12.00 hrs, Volume= 0.037 af
Outflow = 0.02 cfs @ 19.22 hrs, Volume= 0.037 af, Atten= 97%, Lag= 433.1 min
Discarded = 0.02 cfs @ 19.22 hrs, Volume= 0.037 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 263.64' @ 19.22 hrs Surf.Area= 715 sf Storage= 968 cf

Plug-Flow detention time= 771.7 min calculated for 0.037 af (100% of inflow)
Center-of-Mass det. time= 772.5 min (1,667.6 - 895.1)

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	2,323 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
261.00	98	49.0	0	0	98
262.00	276	71.0	179	179	316
263.00	522	94.0	393	572	630
264.00	835	115.0	672	1,244	994
265.00	1,342	149.0	1,079	2,323	1,720

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	264.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.02 cfs @ 19.22 hrs HW=263.64' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=261.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 6P: INFILTRATION BASIN #2

Inflow Area = 1.303 ac, 17.84% Impervious, Inflow Depth = 0.63" for 2-Year event
Inflow = 1.10 cfs @ 12.03 hrs, Volume= 0.068 af
Outflow = 0.27 cfs @ 12.29 hrs, Volume= 0.068 af, Atten= 75%, Lag= 15.6 min
Discarded = 0.04 cfs @ 12.29 hrs, Volume= 0.038 af
Primary = 0.23 cfs @ 12.29 hrs, Volume= 0.030 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 239.80' @ 12.29 hrs Surf.Area= 1,766 sf Storage= 784 cf

Plug-Flow detention time= 126.9 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 127.0 min (1,019.9 - 892.9)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	7,635 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	370	112.0	0	0	370
240.00	2,281	214.0	1,190	1,190	3,021
241.00	3,177	290.0	2,717	3,907	6,080
242.00	4,308	342.0	3,728	7,635	8,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	241.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	239.50'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.50' / 238.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.04 cfs @ 12.29 hrs HW=239.80' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.23 cfs @ 12.29 hrs HW=239.80' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Culvert** (Inlet Controls 0.23 cfs @ 1.86 fps)

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 4.28% Impervious, Inflow Depth = 0.25" for 2-Year event
Inflow = 1.59 cfs @ 12.21 hrs, Volume= 0.270 af
Primary = 1.59 cfs @ 12.21 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST - A.3 Runoff Area=465,154 sf 1.38% Impervious Runoff Depth=0.99"
Flow Length=928' Tc=19.4 min CN=56 Runoff=9.72 cfs 0.877 af

Subcatchment 3S: POST - A.2 Runoff Area=33,306 sf 21.61% Impervious Runoff Depth=1.58"
Flow Length=164' Tc=7.3 min CN=65 Runoff=2.00 cfs 0.101 af

Subcatchment 7S: POST - A.1 Runoff Area=56,761 sf 17.84% Impervious Runoff Depth=1.65"
Flow Length=535' Tc=9.7 min CN=66 Runoff=3.23 cfs 0.180 af

Pond 4P: INFILTRATION BASIN #1 Peak Elev=264.55' Storage=1,780 cf Inflow=2.00 cfs 0.101 af
Discarded=0.03 cfs 0.065 af Primary=0.34 cfs 0.035 af Outflow=0.36 cfs 0.101 af

Pond 6P: INFILTRATION BASIN #2 Peak Elev=240.49' Storage=2,404 cf Inflow=3.23 cfs 0.180 af
Discarded=0.06 cfs 0.047 af Primary=0.81 cfs 0.132 af Outflow=0.88 cfs 0.180 af

Link 2L: DP-A Inflow=10.53 cfs 1.044 af
Primary=10.53 cfs 1.044 af

Total Runoff Area = 12.746 ac Runoff Volume = 1.157 af Average Runoff Depth = 1.09"
95.72% Pervious = 12.201 ac 4.28% Impervious = 0.545 ac

Summary for Subcatchment 1S: POST - A.3

Runoff = 9.72 cfs @ 12.15 hrs, Volume= 0.877 af, Depth= 0.99"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.89"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
58,463	61	>75% Grass cover, Good, HSG B
400,273	55	Woods, Good, HSG B
465,154	56	Weighted Average
458,736		98.62% Pervious Area
6,418		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
7.0	594	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	59	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	38	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	42	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	145	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	928	Total			

Summary for Subcatchment 3S: POST - A.2

Runoff = 2.00 cfs @ 11.99 hrs, Volume= 0.101 af, Depth= 1.58"
Routed to Pond 4P : INFILTRATION BASIN #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.89"

Area (sf)	CN	Description
7,198	98	Paved parking, HSG B
22,357	55	Woods, Good, HSG B
3,751	61	>75% Grass cover, Good, HSG B
33,306	65	Weighted Average
26,108		78.39% Pervious Area
7,198		21.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.7	85	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	29	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	164	Total			

Summary for Subcatchment 7S: POST - A.1

Runoff = 3.23 cfs @ 12.02 hrs, Volume= 0.180 af, Depth= 1.65"
Routed to Pond 6P : INFILTRATION BASIN #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=4.89"

Area (sf)	CN	Description
6,529	98	Paved parking, HSG B
33,026	61	>75% Grass cover, Good, HSG B
13,606	55	Woods, Good, HSG B
3,600	98	Roofs, HSG B
56,761	66	Weighted Average
46,632		82.16% Pervious Area
10,129		17.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.4	57	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	86	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	170	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	144	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	535	Total			

Summary for Pond 4P: INFILTRATION BASIN #1

Inflow Area = 0.765 ac, 21.61% Impervious, Inflow Depth = 1.58" for 10-Year event
Inflow = 2.00 cfs @ 11.99 hrs, Volume= 0.101 af
Outflow = 0.36 cfs @ 12.27 hrs, Volume= 0.101 af, Atten= 82%, Lag= 16.3 min
Discarded = 0.03 cfs @ 12.27 hrs, Volume= 0.065 af
Primary = 0.34 cfs @ 12.27 hrs, Volume= 0.035 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 264.55' @ 12.27 hrs Surf.Area= 1,101 sf Storage= 1,780 cf

Plug-Flow detention time= 616.2 min calculated for 0.101 af (100% of inflow)
Center-of-Mass det. time= 617.5 min (1,477.6 - 860.1)

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	2,323 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
261.00	98	49.0	0	0	98
262.00	276	71.0	179	179	316
263.00	522	94.0	393	572	630
264.00	835	115.0	672	1,244	994
265.00	1,342	149.0	1,079	2,323	1,720

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	264.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.03 cfs @ 12.27 hrs HW=264.55' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.31 cfs @ 12.27 hrs HW=264.55' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.31 cfs @ 0.59 fps)

Summary for Pond 6P: INFILTRATION BASIN #2

Inflow Area = 1.303 ac, 17.84% Impervious, Inflow Depth = 1.65" for 10-Year event
Inflow = 3.23 cfs @ 12.02 hrs, Volume= 0.180 af
Outflow = 0.88 cfs @ 12.23 hrs, Volume= 0.180 af, Atten= 73%, Lag= 12.5 min
Discarded = 0.06 cfs @ 12.23 hrs, Volume= 0.047 af
Primary = 0.81 cfs @ 12.23 hrs, Volume= 0.132 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 240.49' @ 12.23 hrs Surf.Area= 2,700 sf Storage= 2,404 cf

Plug-Flow detention time= 73.0 min calculated for 0.180 af (100% of inflow)
Center-of-Mass det. time= 72.9 min (932.5 - 859.6)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	7,635 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	370	112.0	0	0	370
240.00	2,281	214.0	1,190	1,190	3,021
241.00	3,177	290.0	2,717	3,907	6,080
242.00	4,308	342.0	3,728	7,635	8,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	241.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	239.50'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.50' / 238.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.06 cfs @ 12.23 hrs HW=240.49' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.81 cfs @ 12.23 hrs HW=240.49' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Culvert** (Inlet Controls 0.81 cfs @ 4.13 fps)

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 4.28% Impervious, Inflow Depth = 0.98" for 10-Year event
Inflow = 10.53 cfs @ 12.16 hrs, Volume= 1.044 af
Primary = 10.53 cfs @ 12.16 hrs, Volume= 1.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST - A.3 Runoff Area=465,154 sf 1.38% Impervious Runoff Depth=1.57"
Flow Length=928' Tc=19.4 min CN=56 Runoff=17.07 cfs 1.400 af

Subcatchment 3S: POST - A.2 Runoff Area=33,306 sf 21.61% Impervious Runoff Depth=2.32"
Flow Length=164' Tc=7.3 min CN=65 Runoff=2.97 cfs 0.148 af

Subcatchment 7S: POST - A.1 Runoff Area=56,761 sf 17.84% Impervious Runoff Depth=2.41"
Flow Length=535' Tc=9.7 min CN=66 Runoff=4.79 cfs 0.262 af

Pond 4P: INFILTRATION BASIN #1 Peak Elev=264.73' Storage=1,978 cf Inflow=2.97 cfs 0.148 af
Discarded=0.03 cfs 0.066 af Primary=2.73 cfs 0.082 af Outflow=2.76 cfs 0.148 af

Pond 6P: INFILTRATION BASIN #2 Peak Elev=240.98' Storage=3,849 cf Inflow=4.79 cfs 0.262 af
Discarded=0.07 cfs 0.053 af Primary=1.05 cfs 0.209 af Outflow=1.12 cfs 0.262 af

Link 2L: DP-A Inflow=19.26 cfs 1.691 af
Primary=19.26 cfs 1.691 af

Total Runoff Area = 12.746 ac Runoff Volume = 1.809 af Average Runoff Depth = 1.70"
95.72% Pervious = 12.201 ac 4.28% Impervious = 0.545 ac

Summary for Subcatchment 1S: POST - A.3

Runoff = 17.07 cfs @ 12.14 hrs, Volume= 1.400 af, Depth= 1.57"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.96"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
58,463	61	>75% Grass cover, Good, HSG B
400,273	55	Woods, Good, HSG B
465,154	56	Weighted Average
458,736		98.62% Pervious Area
6,418		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
7.0	594	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	59	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	38	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	42	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	145	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	928	Total			

Summary for Subcatchment 3S: POST - A.2

Runoff = 2.97 cfs @ 11.99 hrs, Volume= 0.148 af, Depth= 2.32"
Routed to Pond 4P : INFILTRATION BASIN #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.96"

Area (sf)	CN	Description
7,198	98	Paved parking, HSG B
22,357	55	Woods, Good, HSG B
3,751	61	>75% Grass cover, Good, HSG B
33,306	65	Weighted Average
26,108		78.39% Pervious Area
7,198		21.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.7	85	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	29	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	164	Total			

Summary for Subcatchment 7S: POST - A.1

Runoff = 4.79 cfs @ 12.02 hrs, Volume= 0.262 af, Depth= 2.41"
Routed to Pond 6P : INFILTRATION BASIN #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-Year Rainfall=5.96"

Area (sf)	CN	Description
6,529	98	Paved parking, HSG B
33,026	61	>75% Grass cover, Good, HSG B
13,606	55	Woods, Good, HSG B
3,600	98	Roofs, HSG B
56,761	66	Weighted Average
46,632		82.16% Pervious Area
10,129		17.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.4	57	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	86	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	170	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	144	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	535	Total			

Summary for Pond 4P: INFILTRATION BASIN #1

Inflow Area = 0.765 ac, 21.61% Impervious, Inflow Depth = 2.32" for 25-Year event
Inflow = 2.97 cfs @ 11.99 hrs, Volume= 0.148 af
Outflow = 2.76 cfs @ 12.06 hrs, Volume= 0.148 af, Atten= 7%, Lag= 4.1 min
Discarded = 0.03 cfs @ 12.06 hrs, Volume= 0.066 af
Primary = 2.73 cfs @ 12.06 hrs, Volume= 0.082 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 264.73' @ 12.06 hrs Surf.Area= 1,192 sf Storage= 1,978 cf

Plug-Flow detention time= 422.3 min calculated for 0.148 af (100% of inflow)
Center-of-Mass det. time= 423.7 min (1,272.1 - 848.4)

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	2,323 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
261.00	98	49.0	0	0	98
262.00	276	71.0	179	179	316
263.00	522	94.0	393	572	630
264.00	835	115.0	672	1,244	994
265.00	1,342	149.0	1,079	2,323	1,720

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	264.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.03 cfs @ 12.06 hrs HW=264.70' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.42 cfs @ 12.06 hrs HW=264.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.42 cfs @ 1.17 fps)

Summary for Pond 6P: INFILTRATION BASIN #2

Inflow Area = 1.303 ac, 17.84% Impervious, Inflow Depth = 2.41" for 25-Year event
Inflow = 4.79 cfs @ 12.02 hrs, Volume= 0.262 af
Outflow = 1.12 cfs @ 12.25 hrs, Volume= 0.262 af, Atten= 77%, Lag= 14.1 min
Discarded = 0.07 cfs @ 12.25 hrs, Volume= 0.053 af
Primary = 1.05 cfs @ 12.25 hrs, Volume= 0.209 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 240.98' @ 12.25 hrs Surf.Area= 3,159 sf Storage= 3,849 cf

Plug-Flow detention time= 65.2 min calculated for 0.262 af (100% of inflow)
Center-of-Mass det. time= 65.5 min (913.7 - 848.2)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	7,635 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	370	112.0	0	0	370
240.00	2,281	214.0	1,190	1,190	3,021
241.00	3,177	290.0	2,717	3,907	6,080
242.00	4,308	342.0	3,728	7,635	8,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	241.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	239.50'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.50' / 238.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.07 cfs @ 12.25 hrs HW=240.98' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.05 cfs @ 12.25 hrs HW=240.98' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Culvert** (Inlet Controls 1.05 cfs @ 5.34 fps)

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 4.28% Impervious, Inflow Depth = 1.59" for 25-Year event
Inflow = 19.26 cfs @ 12.13 hrs, Volume= 1.691 af
Primary = 19.26 cfs @ 12.13 hrs, Volume= 1.691 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST - A.3 Runoff Area=465,154 sf 1.38% Impervious Runoff Depth=2.06"
Flow Length=928' Tc=19.4 min CN=56 Runoff=23.15 cfs 1.831 af

Subcatchment 3S: POST - A.2 Runoff Area=33,306 sf 21.61% Impervious Runoff Depth=2.91"
Flow Length=164' Tc=7.3 min CN=65 Runoff=3.74 cfs 0.185 af

Subcatchment 7S: POST - A.1 Runoff Area=56,761 sf 17.84% Impervious Runoff Depth=3.01"
Flow Length=535' Tc=9.7 min CN=66 Runoff=6.00 cfs 0.327 af

Pond 4P: INFILTRATION BASIN #1 Peak Elev=264.80' Storage=2,060 cf Inflow=3.74 cfs 0.185 af
Discarded=0.03 cfs 0.066 af Primary=3.98 cfs 0.119 af Outflow=4.01 cfs 0.185 af

Pond 6P: INFILTRATION BASIN #2 Peak Elev=241.34' Storage=5,058 cf Inflow=6.00 cfs 0.327 af
Discarded=0.08 cfs 0.057 af Primary=1.19 cfs 0.270 af Outflow=1.28 cfs 0.327 af

Link 2L: DP-A Inflow=25.87 cfs 2.220 af
Primary=25.87 cfs 2.220 af

Total Runoff Area = 12.746 ac Runoff Volume = 2.343 af Average Runoff Depth = 2.21"
95.72% Pervious = 12.201 ac 4.28% Impervious = 0.545 ac

Summary for Subcatchment 1S: POST - A.3

Runoff = 23.15 cfs @ 12.14 hrs, Volume= 1.831 af, Depth= 2.06"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-Year Rainfall=6.75"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
58,463	61	>75% Grass cover, Good, HSG B
400,273	55	Woods, Good, HSG B
465,154	56	Weighted Average
458,736		98.62% Pervious Area
6,418		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
7.0	594	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	59	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	38	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	42	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	145	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	928	Total			

Summary for Subcatchment 3S: POST - A.2

Runoff = 3.74 cfs @ 11.99 hrs, Volume= 0.185 af, Depth= 2.91"
Routed to Pond 4P : INFILTRATION BASIN #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-Year Rainfall=6.75"

Area (sf)	CN	Description
7,198	98	Paved parking, HSG B
22,357	55	Woods, Good, HSG B
3,751	61	>75% Grass cover, Good, HSG B
33,306	65	Weighted Average
26,108		78.39% Pervious Area
7,198		21.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.7	85	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	29	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	164	Total			

Summary for Subcatchment 7S: POST - A.1

Runoff = 6.00 cfs @ 12.02 hrs, Volume= 0.327 af, Depth= 3.01"
Routed to Pond 6P : INFILTRATION BASIN #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 50-Year Rainfall=6.75"

Area (sf)	CN	Description
6,529	98	Paved parking, HSG B
33,026	61	>75% Grass cover, Good, HSG B
13,606	55	Woods, Good, HSG B
3,600	98	Roofs, HSG B
56,761	66	Weighted Average
46,632		82.16% Pervious Area
10,129		17.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.4	57	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	86	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	170	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	144	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	535	Total			

Summary for Pond 4P: INFILTRATION BASIN #1

Inflow Area = 0.765 ac, 21.61% Impervious, Inflow Depth = 2.91" for 50-Year event
Inflow = 3.74 cfs @ 11.99 hrs, Volume= 0.185 af
Outflow = 4.01 cfs @ 12.02 hrs, Volume= 0.185 af, Atten= 0%, Lag= 1.7 min
Discarded = 0.03 cfs @ 12.02 hrs, Volume= 0.066 af
Primary = 3.98 cfs @ 12.02 hrs, Volume= 0.119 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 264.80' @ 12.02 hrs Surf.Area= 1,228 sf Storage= 2,060 cf

Plug-Flow detention time= 340.1 min calculated for 0.185 af (100% of inflow)
Center-of-Mass det. time= 340.0 min (1,181.8 - 841.8)

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	2,323 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
261.00	98	49.0	0	0	98
262.00	276	71.0	179	179	316
263.00	522	94.0	393	572	630
264.00	835	115.0	672	1,244	994
265.00	1,342	149.0	1,079	2,323	1,720

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	264.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.03 cfs @ 12.02 hrs HW=264.76' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=3.49 cfs @ 12.02 hrs HW=264.76' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 3.49 cfs @ 1.33 fps)

Summary for Pond 6P: INFILTRATION BASIN #2

Inflow Area = 1.303 ac, 17.84% Impervious, Inflow Depth = 3.01" for 50-Year event
Inflow = 6.00 cfs @ 12.02 hrs, Volume= 0.327 af
Outflow = 1.28 cfs @ 12.27 hrs, Volume= 0.327 af, Atten= 79%, Lag= 15.2 min
Discarded = 0.08 cfs @ 12.27 hrs, Volume= 0.057 af
Primary = 1.19 cfs @ 12.27 hrs, Volume= 0.270 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 241.34' @ 12.27 hrs Surf.Area= 3,545 sf Storage= 5,058 cf

Plug-Flow detention time= 64.2 min calculated for 0.327 af (100% of inflow)
Center-of-Mass det. time= 64.4 min (906.1 - 841.7)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	7,635 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	370	112.0	0	0	370
240.00	2,281	214.0	1,190	1,190	3,021
241.00	3,177	290.0	2,717	3,907	6,080
242.00	4,308	342.0	3,728	7,635	8,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	241.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	239.50'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.50' / 238.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.08 cfs @ 12.27 hrs HW=241.34' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.19 cfs @ 12.27 hrs HW=241.34' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Culvert** (Inlet Controls 1.19 cfs @ 6.07 fps)

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 4.28% Impervious, Inflow Depth = 2.09" for 50-Year event
Inflow = 25.87 cfs @ 12.12 hrs, Volume= 2.220 af
Primary = 25.87 cfs @ 12.12 hrs, Volume= 2.220 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: POST - A.3 Runoff Area=465,154 sf 1.38% Impervious Runoff Depth=2.88"
Flow Length=928' Tc=19.4 min CN=56 Runoff=33.41 cfs 2.562 af

Subcatchment 3S: POST - A.2 Runoff Area=33,306 sf 21.61% Impervious Runoff Depth=3.88"
Flow Length=164' Tc=7.3 min CN=65 Runoff=4.97 cfs 0.247 af

Subcatchment 7S: POST - A.1 Runoff Area=56,761 sf 17.84% Impervious Runoff Depth=3.99"
Flow Length=535' Tc=9.7 min CN=66 Runoff=7.97 cfs 0.433 af

Pond 4P: INFILTRATION BASIN #1 Peak Elev=264.82' Storage=2,094 cf Inflow=4.97 cfs 0.247 af
Discarded=0.03 cfs 0.067 af Primary=4.78 cfs 0.180 af Outflow=4.81 cfs 0.247 af

Pond 6P: INFILTRATION BASIN #2 Peak Elev=241.69' Storage=6,350 cf Inflow=7.97 cfs 0.433 af
Discarded=0.09 cfs 0.062 af Primary=3.41 cfs 0.371 af Outflow=3.50 cfs 0.433 af

Link 2L: DP-A Inflow=38.48 cfs 3.113 af
Primary=38.48 cfs 3.113 af

Total Runoff Area = 12.746 ac Runoff Volume = 3.242 af Average Runoff Depth = 3.05"
95.72% Pervious = 12.201 ac 4.28% Impervious = 0.545 ac

Summary for Subcatchment 1S: POST - A.3

Runoff = 33.41 cfs @ 12.13 hrs, Volume= 2.562 af, Depth= 2.88"
Routed to Link 2L : DP-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.98"

Area (sf)	CN	Description
4,339	98	Paved parking, HSG B
2,079	98	Roofs, HSG B
58,463	61	>75% Grass cover, Good, HSG B
400,273	55	Woods, Good, HSG B
465,154	56	Weighted Average
458,736		98.62% Pervious Area
6,418		1.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
7.0	594	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.5	59	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	38	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	42	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.7	145	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.4	928	Total			

Summary for Subcatchment 3S: POST - A.2

Runoff = 4.97 cfs @ 11.99 hrs, Volume= 0.247 af, Depth= 3.88"
Routed to Pond 4P : INFILTRATION BASIN #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.98"

Area (sf)	CN	Description
7,198	98	Paved parking, HSG B
22,357	55	Woods, Good, HSG B
3,751	61	>75% Grass cover, Good, HSG B
33,306	65	Weighted Average
26,108		78.39% Pervious Area
7,198		21.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.7	85	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	29	0.3300	4.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.3	164	Total			

Summary for Subcatchment 7S: POST - A.1

Runoff = 7.97 cfs @ 12.01 hrs, Volume= 0.433 af, Depth= 3.99"
Routed to Pond 6P : INFILTRATION BASIN #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=7.98"

Area (sf)	CN	Description
6,529	98	Paved parking, HSG B
33,026	61	>75% Grass cover, Good, HSG B
13,606	55	Woods, Good, HSG B
3,600	98	Roofs, HSG B
56,761	66	Weighted Average
46,632		82.16% Pervious Area
10,129		17.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.1400	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.17"
0.4	57	0.1800	2.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	28	0.1800	2.97		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	86	0.0600	4.97		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	170	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.8	144	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.7	535	Total			

Summary for Pond 4P: INFILTRATION BASIN #1

Inflow Area = 0.765 ac, 21.61% Impervious, Inflow Depth = 3.88" for 100-Year event
Inflow = 4.97 cfs @ 11.99 hrs, Volume= 0.247 af
Outflow = 4.81 cfs @ 12.00 hrs, Volume= 0.247 af, Atten= 3%, Lag= 0.6 min
Discarded = 0.03 cfs @ 12.00 hrs, Volume= 0.067 af
Primary = 4.78 cfs @ 12.00 hrs, Volume= 0.180 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 264.82' @ 12.00 hrs Surf.Area= 1,244 sf Storage= 2,094 cf

Plug-Flow detention time= 257.9 min calculated for 0.247 af (100% of inflow)
Center-of-Mass det. time= 257.8 min (1,091.2 - 833.5)

Volume	Invert	Avail.Storage	Storage Description
#1	261.00'	2,323 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
261.00	98	49.0	0	0	98
262.00	276	71.0	179	179	316
263.00	522	94.0	393	572	630
264.00	835	115.0	672	1,244	994
265.00	1,342	149.0	1,079	2,323	1,720

Device	Routing	Invert	Outlet Devices
#1	Discarded	261.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	264.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.03 cfs @ 12.00 hrs HW=264.82' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=4.77 cfs @ 12.00 hrs HW=264.82' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 4.77 cfs @ 1.48 fps)

Summary for Pond 6P: INFILTRATION BASIN #2

Inflow Area = 1.303 ac, 17.84% Impervious, Inflow Depth = 3.99" for 100-Year event
Inflow = 7.97 cfs @ 12.01 hrs, Volume= 0.433 af
Outflow = 3.50 cfs @ 12.16 hrs, Volume= 0.433 af, Atten= 56%, Lag= 8.9 min
Discarded = 0.09 cfs @ 12.16 hrs, Volume= 0.062 af
Primary = 3.41 cfs @ 12.16 hrs, Volume= 0.371 af
Routed to Link 2L : DP-A

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 241.69' @ 12.16 hrs Surf.Area= 3,937 sf Storage= 6,350 cf

Plug-Flow detention time= 59.3 min calculated for 0.433 af (100% of inflow)
Center-of-Mass det. time= 59.1 min (892.7 - 833.6)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	7,635 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	370	112.0	0	0	370
240.00	2,281	214.0	1,190	1,190	3,021
241.00	3,177	290.0	2,717	3,907	6,080
242.00	4,308	342.0	3,728	7,635	8,714

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**1.020 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	241.50'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#3	Primary	239.50'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 239.50' / 238.00' S= 0.0500 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Discarded OutFlow Max=0.09 cfs @ 12.16 hrs HW=241.68' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=3.28 cfs @ 12.16 hrs HW=241.68' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Weir Controls 1.97 cfs @ 1.09 fps)
└**3=Culvert** (Inlet Controls 1.31 cfs @ 6.69 fps)

Summary for Link 2L: DP-A

Inflow Area = 12.746 ac, 4.28% Impervious, Inflow Depth = 2.93" for 100-Year event
Inflow = 38.48 cfs @ 12.13 hrs, Volume= 3.113 af
Primary = 38.48 cfs @ 12.13 hrs, Volume= 3.113 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX F

Recharge / WQV / TSS Calculations

NOAA Atlas 14, Volume 10, Version 3
Location name: Littleton, Massachusetts, USA*
Latitude: 42.5669°, Longitude: -71.4826°
Elevation: 253 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

7.98" used in model per Littleton Cons Comm.

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	**0.322** (0.255-0.404)	**0.383** (0.303-0.481)	**0.482** (0.379-0.607)	**0.564** (0.441-0.713)	**0.677** (0.512-0.892)	**0.761** (0.564-1.02)	**0.851** (0.611-1.18)	**0.955** (0.645-1.35)	**1.11** (0.718-1.61)	**1.23** (0.781-1.83)
10-min	**0.457** (0.361-0.573)	**0.542** (0.429-0.681)	**0.682** (0.536-0.858)	**0.799** (0.625-1.01)	**0.959** (0.726-1.26)	**1.08** (0.799-1.45)	**1.20** (0.866-1.68)	**1.35** (0.915-1.91)	**1.57** (1.02-2.29)	**1.75** (1.11-2.60)
15-min	**0.537** (0.425-0.674)	**0.638** (0.504-0.801)	**0.803** (0.632-1.01)	**0.940** (0.735-1.19)	**1.13** (0.854-1.49)	**1.27** (0.940-1.70)	**1.42** (1.02-1.97)	**1.59** (1.08-2.25)	**1.84** (1.20-2.69)	**2.06** (1.30-3.05)
30-min	**0.732** (0.579-0.918)	**0.870** (0.688-1.09)	**1.10** (0.863-1.38)	**1.28** (1.00-1.62)	**1.54** (1.17-2.03)	**1.74** (1.28-2.33)	**1.94** (1.39-2.70)	**2.18** (1.47-3.08)	**2.53** (1.64-3.68)	**2.82** (1.78-4.18)
60-min	**0.927** (0.734-1.16)	**1.10** (0.871-1.38)	**1.39** (1.09-1.75)	**1.63** (1.27-2.06)	**1.96** (1.48-2.58)	**2.20** (1.63-2.96)	**2.46** (1.77-3.43)	**2.76** (1.87-3.90)	**3.21** (2.08-4.67)	**3.58** (2.26-5.31)
2-hr	**1.17** (0.933-1.46)	**1.41** (1.12-1.76)	**1.81** (1.44-2.26)	**2.14** (1.69-2.69)	**2.59** (1.98-3.40)	**2.93** (2.19-3.92)	**3.29** (2.39-4.58)	**3.73** (2.53-5.24)	**4.40** (2.86-6.37)	**4.98** (3.16-7.33)
3-hr	**1.34** (1.08-1.66)	**1.63** (1.30-2.02)	**2.10** (1.68-2.62)	**2.50** (1.98-3.12)	**3.03** (2.33-3.97)	**3.43** (2.58-4.58)	**3.86** (2.82-5.37)	**4.40** (2.99-6.14)	**5.22** (3.40-7.52)	**5.93** (3.77-8.69)
6-hr	**1.71** (1.38-2.10)	**2.08** (1.68-2.56)	**2.70** (2.17-3.33)	**3.21** (2.56-3.98)	**3.91** (3.02-5.07)	**4.42** (3.34-5.87)	**4.99** (3.67-6.89)	**5.69** (3.88-7.88)	**6.77** (4.43-9.67)	**7.70** (4.91-11.2)
12-hr	**2.16** (1.76-2.64)	**2.63** (2.14-3.21)	**3.40** (2.75-4.16)	**4.04** (3.24-4.96)	**4.91** (3.82-6.32)	**5.56** (4.23-7.31)	**6.26** (4.62-8.56)	**7.13** (4.89-9.80)	**8.45** (5.55-12.0)	**9.60** (6.14-13.8)
24-hr	**2.59** (2.12-3.13)	**3.17** (2.59-3.83)	**4.11** (3.35-4.99)	**4.89** (3.96-5.96)	**5.96** (4.66-7.61)	**6.75** (5.16-8.80)	**7.61** (5.65-10.3)	**8.67** (5.97-11.8)	**10.3** (6.78-14.5)	**11.7** (7.50-16.7)
2-day	**2.95** (2.44-3.54)	**3.63** (3.00-4.36)	**4.75** (3.90-5.72)	**5.68** (4.64-6.87)	**6.96** (5.48-8.82)	**7.90** (6.08-10.2)	**8.92** (6.67-12.0)	**10.2** (7.05-13.8)	**12.2** (8.04-17.0)	**13.9** (8.92-19.7)
3-day	**3.22** (2.68-3.85)	**3.96** (3.28-4.73)	**5.15** (4.26-6.18)	**6.15** (5.04-7.41)	**7.51** (5.94-9.47)	**8.52** (6.59-11.0)	**9.62** (7.21-12.9)	**11.0** (7.62-14.8)	**13.1** (8.66-18.1)	**14.9** (9.60-21.0)
4-day	**3.48** (2.90-4.14)	**4.24** (3.53-5.05)	**5.48** (4.54-6.55)	**6.51** (5.35-7.82)	**7.92** (6.28-9.95)	**8.97** (6.95-11.5)	**10.1** (7.58-13.5)	**11.5** (7.99-15.4)	**13.6** (9.05-18.8)	**15.5** (10.0-21.8)
7-day	**4.20** (3.52-4.97)	**5.00** (4.18-5.91)	**6.30** (5.25-7.48)	**7.38** (6.11-8.80)	**8.86** (7.06-11.0)	**9.97** (7.75-12.7)	**11.2** (8.38-14.7)	**12.6** (8.78-16.7)	**14.7** (9.80-20.2)	**16.5** (10.7-23.1)
10-day	**4.88** (4.10-5.74)	**5.70** (4.79-6.71)	**7.04** (5.89-8.32)	**8.15** (6.77-9.68)	**9.68** (7.73-12.0)	**10.8** (8.42-13.6)	**12.0** (9.03-15.7)	**13.4** (9.42-17.8)	**15.5** (10.4-21.2)	**17.3** (11.2-24.0)
20-day	**6.87** (5.83-8.02)	**7.75** (6.57-9.06)	**9.20** (7.76-10.8)	**10.4** (8.71-12.2)	**12.0** (9.67-14.7)	**13.3** (10.4-16.5)	**14.6** (10.9-18.6)	**16.0** (11.3-20.9)	**17.8** (12.0-24.1)	**19.3** (12.5-26.6)
30-day	**8.52** (7.27-9.90)	**9.46** (8.05-11.0)	**11.0** (9.32-12.8)	**12.3** (10.3-14.4)	**14.0** (11.3-16.9)	**15.4** (12.0-18.9)	**16.7** (12.5-21.1)	**18.0** (12.8-23.5)	**19.7** (13.3-26.6)	**21.0** (13.7-28.8)
45-day	**10.6** (9.07-12.2)	**11.6** (9.92-13.4)	**13.2** (11.3-15.4)	**14.6** (12.3-17.0)	**16.5** (13.3-19.8)	**17.9** (14.1-21.9)	**19.4** (14.4-24.2)	**20.7** (14.7-26.8)	**22.3** (15.1-29.8)	**23.4** (15.3-31.9)
60-day	**12.3** (10.6-14.2)	**13.4** (11.5-15.4)	**15.1** (12.9-17.5)	**16.6** (14.0-19.2)	**18.5** (15.0-22.1)	**20.1** (15.8-24.4)	**21.6** (16.1-26.8)	**22.9** (16.3-29.5)	**24.5** (16.6-32.6)	**25.5** (16.7-34.6)

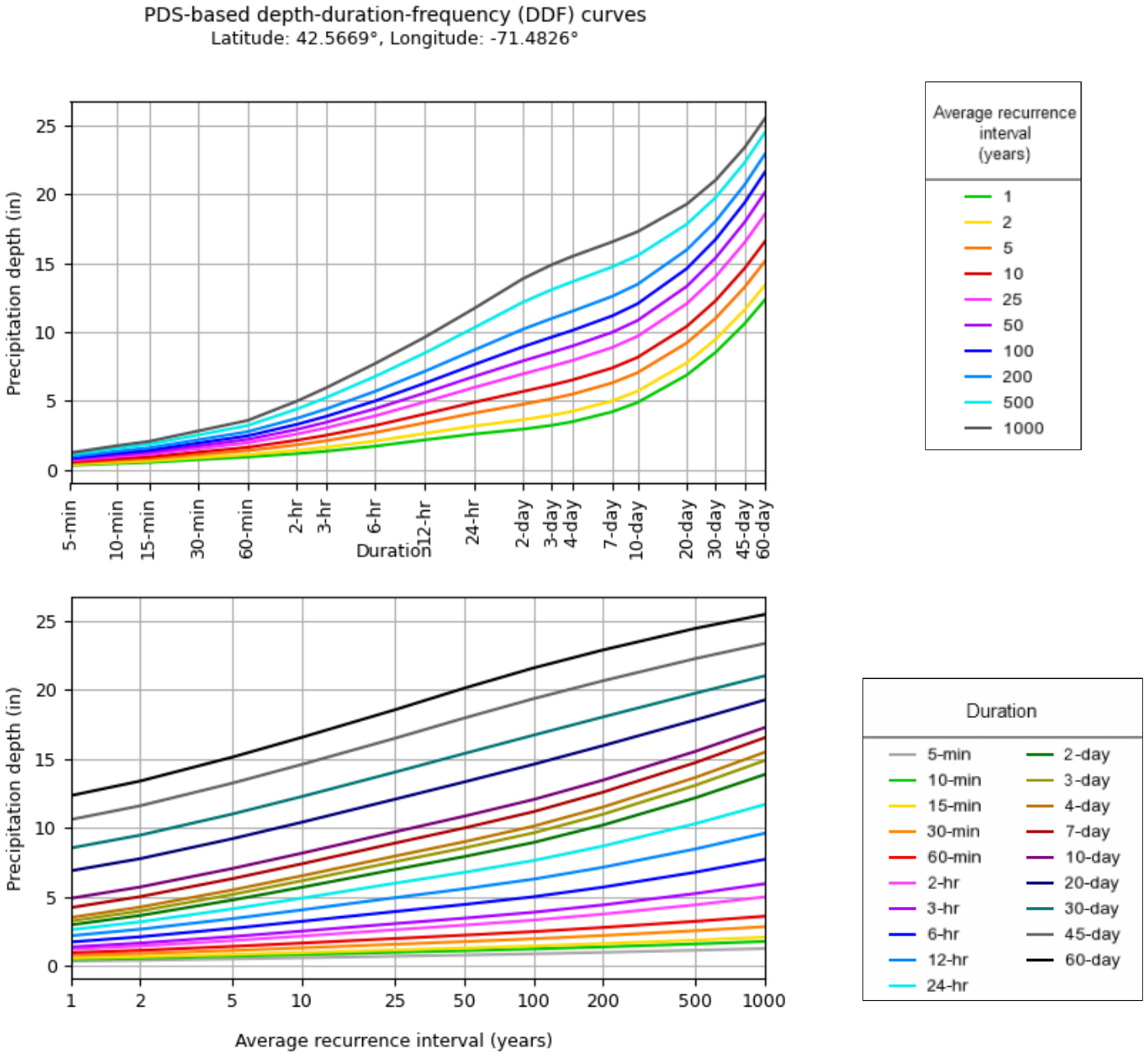
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

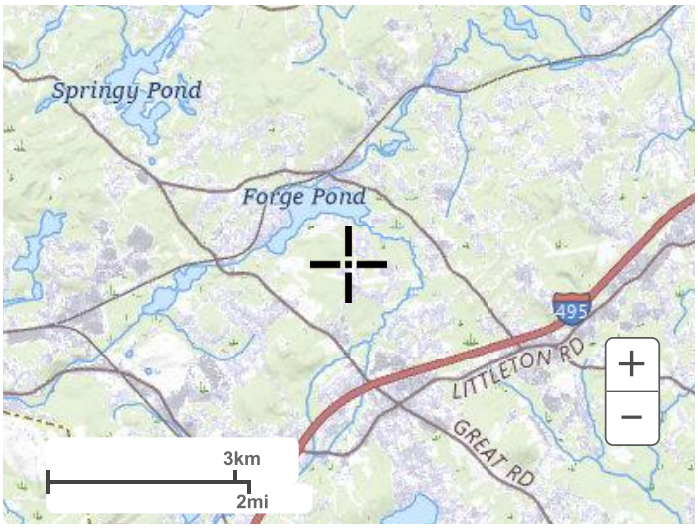


NOAA Atlas 14, Volume 10, Version 3 Created (GMT): Mon Jun 9 16:19:23 2025

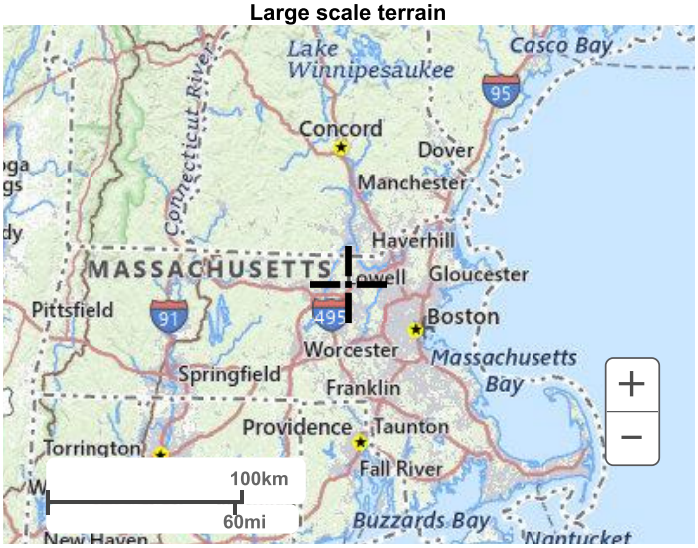
Back to Top

Maps & aerials

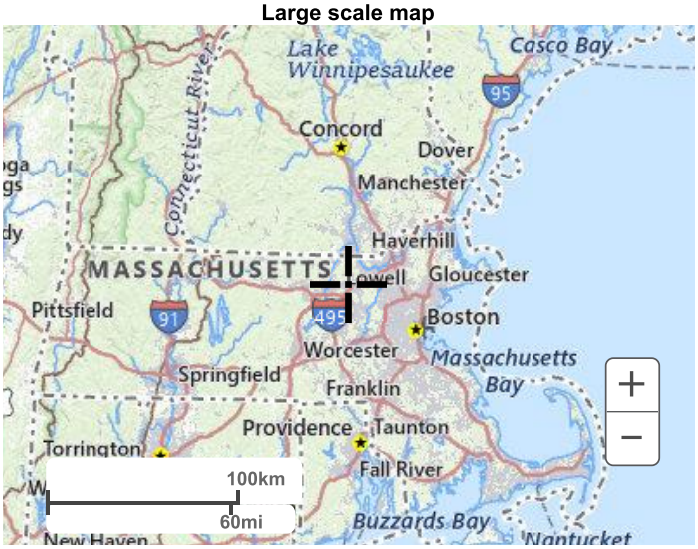
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

64 Beaver Brook Road
Littleton, MA

September 12, 2025
7462

Infiltration Basin #1

Stormwater Recharge Calculations

CALCULATIONS

Recharge Volume, Rv:

$R_v = A_C x F$

Hydrologic Soil Group	Impervious Area (Ac) [1]	Target Depth (F)	Recharge Volume (Rv) Ac-feet
B	0.165	0.35	0.005
Total	**0.165**		**0.005**

Total Recharge Volume Required = 0.005 Ac-ft
Total Recharge Volume Required (Rv) = 210 C.ft
***Recharge Vol. Provided (from Infil. Basin 2) =** 1,720.0 **C.ft**

*Stage Area Storage at elevation below lowest outlet = 264.50 (See Attached HydroCAD Storage Table)

Required Sediment Forebay vol, Fv:

$F_v = A_C(cu.ft)x0.1inch$ of impervious area

[1] Imp. area captured by ponds, Ap = 0.165 Ac
Required Sediment Forebay vol, Fv= 60 C.ft

Sediment Forebay Volume Provided = 128.0 **C.ft**

REFERENCES

Table 2.3.2: Recharge Target Depth by Hydrologic Soil Group

NRCS Hydrologic Soil Group	Approx. Soil Texture	Target Depth Factor (F)
A	sand	0.6 inch
B	loam	0.35 inch
C	silty loam	0.25 inch
D	clay	0.1 inch

Drawdown Calculations

CALCULATIONS

Proposed Infiltration Area Calculations:

$$Drawdown = \frac{R_V}{(Rawls\ Rate)(Bottom\ Area)}$$

Drawdown Calculations:

Soil Texture: 3 Sandy Loam

Bottom Surface Area (A): 98 SF
Rawls Rate: 1.02 in/hr
Total Recharge Volume Required = 210 C.ft
Drawdown: 25.17 hr
Drawdown is less than 72 Hours as Required

REFERENCES

Table 2.3.3: 1982 Rawls Rates

Texture Class	NRCS Hydrologic Soil Group	Infiltration Rate
1 Sand	A	8.27 in/hr
2 Loamy Sand	A	2.41 in/hr
3 Sandy Loam	B	1.02 in/hr
4 Loam	B	0.52 in/hr
5 Silt Loam	C	0.27 in/hr
6 Sandy Clay Loam	C	0.17 in/hr
7 Clay Loam	D	0.09 in/hr
8 Silty Clay Loam	D	0.06 in/hr
9 Sandy Clay	D	0.05 in/hr
10 Silty Clay	D	0.04 in/hr
11 Clay	D	0.02 in/hr

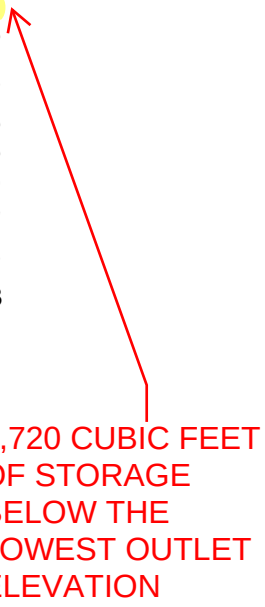
NOTES:

Input Values

[1] = Refer to Proposed Conditions HydroCAD modeling report

Stage-Area-Storage for Pond 4P: INFILTRATION BASIN #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
261.00	98	0
261.05	105	5
261.10	112	10
261.15	119	16
261.20	126	22
261.25	134	29
261.30	142	36
261.35	150	43
261.40	158	51
261.45	167	59
261.50	176	67
261.55	185	77
261.60	194	86
261.65	203	96
261.70	213	106
261.75	223	117
261.80	233	129
261.85	244	141
261.90	254	153
261.95	265	166
262.00	276	179
262.05	286	194
262.10	297	208
262.15	308	223
262.20	319	239
262.25	330	255
262.30	342	272
262.35	353	289
262.40	365	307
262.45	377	326
262.50	389	345
262.55	402	365
262.60	414	385
262.65	427	406
262.70	440	428
262.75	453	450
262.80	467	473
262.85	480	497
262.90	494	521
262.95	508	546
263.00	522	572
263.05	536	598
263.10	550	626
263.15	564	653
263.20	579	682
263.25	593	711
263.30	608	741
263.35	623	772
263.40	638	804
263.45	654	836
263.50	669	869
263.55	685	903
263.60	701	938
263.65	717	973
263.70	733	1,009
263.75	750	1,046
263.80	767	1,084
263.85	783	1,123
263.90	800	1,163
263.95	818	1,203
264.00	835	1,244
264.05	858	1,287
264.10	880	1,330
264.15	903	1,375
264.20	927	1,421
264.25	951	1,467
264.30	975	1,516
264.35	999	1,565
264.40	1,023	1,615
264.45	1,048	1,667
264.50	1,074	1,720
264.55	1,099	1,775
264.60	1,125	1,830
264.65	1,151	1,887
264.70	1,177	1,945
264.75	1,204	2,005
264.80	1,231	2,066
264.85	1,258	2,128
264.90	1,286	2,192
264.95	1,314	2,257
265.00	**1,342**	**2,323**



64 Beaver Brook Road
Littleton, MA

September 12, 2025
7462

Infiltration Basin #2

Stormwater Recharge Calculations

CALCULATIONS

Recharge Volume, Rv:

$R_v = A_C x F$

Hydrologic Soil Group	Impervious Area (Ac) [1]	Target Depth (F)	Recharge Volume (Rv) Ac-feet
B	0.233	0.35	0.007
Total	**0.233**		**0.007**

Total Recharge Volume Required = 0.007 Ac-ft
Total Recharge Volume Required (Rv) = 296 C.ft
***Recharge Vol. Provided (from Infil. Basin 1) =** 356.0 **C.ft**

*Stage Area Storage at elevation below lowest outlet = 239.50 (See Attached HydroCAD Storage Table)

Required Sediment Forebay vol, Fv:

$F_v = A_C(cu.ft)x0.1inch$ of impervious area

[1] Imp. area captured by ponds, Ap = 0.233 Ac
Required Sediment Forebay vol, Fv= 85 C.ft

Sediment Forebay Volume Provided = 253.0 **C.ft**

REFERENCES

Table 2.3.2: Recharge Target Depth by Hydrologic Soil Group

NRCS Hydrologic Soil Group	Approx. Soil Texture	Target Depth Factor (F)
A	sand	0.6 inch
B	loam	0.35 inch
C	silty loam	0.25 inch
D	clay	0.1 inch

Drawdown Calculations

CALCULATIONS

Proposed Infiltration Area Calculations:

$$Drawdown = \frac{R_V}{(Rawls\ Rate)(Bottom\ Area)}$$

Drawdown Calculations:

Soil Texture: 3 Sandy Loam

Bottom Surface Area (A): 370 SF
Rawls Rate: 1.02 in/hr
Total Recharge Volume Required = 296 C.ft
Drawdown: 9.41 hr
Drawdown is less than 72 Hours as Required

REFERENCES

Table 2.3.3: 1982 Rawls Rates

Texture Class	NRCS Hydrologic Soil Group	Infiltration Rate
1 Sand	A	8.27 in/hr
2 Loamy Sand	A	2.41 in/hr
3 Sandy Loam	B	1.02 in/hr
4 Loam	B	0.52 in/hr
5 Silt Loam	C	0.27 in/hr
6 Sandy Clay Loam	C	0.17 in/hr
7 Clay Loam	D	0.09 in/hr
8 Silty Clay Loam	D	0.06 in/hr
9 Sandy Clay	D	0.05 in/hr
10 Silty Clay	D	0.04 in/hr
11 Clay	D	0.02 in/hr

NOTES:

Input Values

[1] = Refer to Proposed Conditions HydroCAD modeling report

Stage-Area-Storage for Pond 6P: INFILTRATION BASIN #2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
239.00	370	0
239.05	427	20
239.10	488	43
239.15	553	69
239.20	622	98
239.25	695	131
239.30	772	168
239.35	854	208
239.40	939	253
239.45	1,029	302
239.50	1,122	356
239.55	1,220	415
239.60	1,321	478
239.65	1,427	547
239.70	1,537	621
239.75	1,651	701
239.80	1,769	786
239.85	1,891	877
239.90	2,017	975
239.95	2,147	1,079
240.00	2,281	1,190
240.05	2,322	1,305
240.10	2,364	1,422
240.15	2,406	1,541
240.20	2,448	1,663
240.25	2,491	1,786
240.30	2,534	1,912
240.35	2,578	2,040
240.40	2,622	2,170
240.45	2,666	2,302
240.50	2,710	2,436
240.55	2,755	2,573
240.60	2,801	2,712
240.65	2,847	2,853
240.70	2,893	2,996
240.75	2,939	3,142
240.80	2,986	3,290
240.85	3,033	3,441
240.90	3,081	3,594
240.95	3,129	3,749
241.00	3,177	3,907
241.05	3,229	4,067
241.10	3,282	4,230
241.15	3,336	4,395
241.20	3,389	4,563
241.25	3,444	4,734
241.30	3,498	4,907
241.35	3,553	5,084
241.40	3,609	5,263
241.45	3,665	5,445
241.50	3,721	5,629
241.55	3,778	5,817
241.60	3,835	6,007

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
241.65	3,893	6,200
241.70	3,951	6,396
241.75	4,009	6,595
241.80	4,068	6,797
241.85	4,127	7,002
241.90	4,187	7,210
241.95	4,247	7,421
242.00	**4,308**	**7,635**

64 Beaver Brook Road
Littleton, MA

September 12, 2025
7462

Adjusted Recharge/WQV Calcs

Stormwater Recharge Calculations

Capture Area Adjustment, Rvadj:

$$R_v adj = \frac{A_t}{A_p} x R_v$$

[1] Imp. area captured by ponds, Ap =	0.398	Ac	
[1] Total impervious area on site, AT =	0.407	Ac	Proposed impervious area
Recharge volume required, Rv =	886	C.ft	(omits existing dwelling and driveway
Capture Rate=	**98%**	OK	
Capture Area Adjustment Factor=	**1.02**		
Adjusted Recharge Volume Required Rvadj =	**906**	**C.ft**	
Total Recharge Volume Provided =	2,076.0	**C.ft**	

NOTES:

Input Values

Water Quality Calculations

CALCULATIONS

Water Quality Calculation:

$$V_{WQ} = D_{WQ}(ft) x\ A_T(ft^2)$$

Water Quality Depth =	1	in
Water Quality Depth , DwQ =	**0.08**	**ft.**
Total impervious area on site, AT =	0.407	Ac.
AT =	**17,729**	**ft²**
Required Water Quality Volume, VwQ =	**1,477**	**C.ft.**

REFERENCES

1 inch depth
Zone II discharges
IWPA discharges
Critical Area
Runoff from LUHPPL
Infiltration rate >2.4 inches/hour
1/2 inch depth
Discharge to other ares
8 inch
9 inch
10 inch

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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.

Location: Infiltration Basin #1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Sediment Forebay	0.25	0.56	0.14	0.42
Infiltration Basin	0.80	0.42	0.34	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal = 92%

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

Project: 64 Beaver Brook Road
Prepared By: RPV
Date: 15-Sep-25

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

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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.

Location: Infiltration Basin #2

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)
Drainage Channel	0.00	1.00	0.00	1.00
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Sediment Forebay	0.25	0.56	0.14	0.42
Infiltration Basin	0.80	0.42	0.34	0.08

Total TSS Removal = 92%

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

Project: 64 Beaver Brook Road
Prepared By: RPV
Date: 15-Sep-25

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

Groundwater Mounding Calculations for Infiltration Basin #2

MOUNDSOLV
GROUNDWATER MOUNDING ANALYSIS
FOR A SLOPING WATER-TABLE AQUIFER
ZLOTNIK ET AL. (2017) SOLUTION

Solution Method

Zlotnik et al. (2017) transient solution for a rectangular source (linearization method 1)

Site Description

Aquifer Data

Property	Value
Horizontal hydraulic conductivity, K (ft/d)	20.4
Specific yield, Sy	0.25
Initial saturated thickness, h_0 (ft)	10
Maximum allowable water-table rise, σ (ft)	2.4
Dip, i (ft/ft)	0
Slope rotation from x axis, γ (°)	0

Recharge Sources

Property	Source 1
X coordinate at center, X (ft)	0
Y coordinate at center, Y (ft)	0
Dimension along x* axis, L (ft)	150
Dimension along y* axis, W (ft)	30
Rotation from slope direction, ϕ (°)	0
Recharge rate, Q (ft³/d)	9180
Infiltration rate, q (ft/d)	2.04
Recharge duration, t_0 (d)	1.29

Monitoring Points

Elapsed Time, t = 3 d

Name	x (ft)	y (ft)	s (ft)	h (ft)	z (ft)
Source 1	0	0	1.582	11.58	0

There is an expected 1.58-foot rise in GW table below the subject basin. This will not result in the groundwater table breaking through the bottom of the basin.

APPENDIX G

Stormwater Operation & Maintenance Manual

STORMWATER OPERATION & MAINTENANCE MANUAL

FOR

THE PROPERTY LOCATED AT
64 BEAVER BROOK ROAD

IN

LITTLETON,
MASSACHUSETTS

PREPARED BY: DILLIS & ROY
CIVIL DESIGN GROUP, INC.
1 Main Street, Suite #1
Lunenburg, MA 01462

PREPARED FOR: MICHAEL & HANNAH GRUAR
64 BEAVER BROOK ROAD
LITTLETON, MA 01460

REVISED: SEPTEMBER 15TH, 2025
JANUARY 15TH, 2025
CDG PROJECT # 7462

DILLIS & ROY CIVIL DESIGN GROUP
CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS

TABLE OF CONTENTS:

1.0 Project Narrative

1.1 Proposed Stormwater Management System

The proposed stormwater management system was designed to reduce the peak rate of stormwater leaving the site, promote groundwater recharge, and increase the water quality. The following are the controls used in the stormwater management system and the roles they play within the system.

Infiltration Basins with Sediment Forebay

The proposed infiltration basins were designed to reduce the post-construction runoff rates and increase groundwater recharge rates to the maximum extent practical. The basin will capture runoff associated with a large portion of the private driveway and overland flow from the undisturbed wooded area. The basin has been designed with an emergency overflow weir which will activate during more severe rain events to direct the overflow away from the development. One of the basins has been equipped with an outlet control structure which was designed to provide the stormwater management area with a low-flow outlet during less sever rain events. Riprap will also be installed at the outlet of the emergency weir to control the overflow of stormwater and reduce the potential for scouring. Sediment forebays have been designed at the entrance of each basin to decrease the velocity of flow and increase the settlement of heavy solids prior to entering the basin. Riprap will also be installed at the inlet of the sediment forebay and the outlet of the basin to control the overflow of stormwater and reduce the potential for scouring.

Deep Sump Hooded Catch Basin

Deep sump hooded catch basins are proposed to convey runoff from the proposed paved areas the infiltration basins. These structures were located to limit any stormwater runoff from entering the right of way. These catch basins will discharge to conventional storm drains.

1.2 Construction Period Operation & Maintenance Tasks

The following activities shall be performed routinely during the period of active construction to allow for proper functioning of the Soil Erosion and Sediment Control system. The following are guidelines referring to each major component.

Siltation Barriers

Siltation Barriers shall be inspected on a weekly basis and after every storm event in excess of 0.25 inches. Any damaged siltation barrier shall be repaired or replaced promptly. Sediment shall be removed and properly disposed of once it reaches a height of 18-inches.

Maintain siltation barriers as depicted on the site plan for the duration of the construction period.

Straw Wattles

Straw Wattles shall be inspected on a weekly basis and after every storm event in excess of 0.25 inches. Any damaged erosion control barrier shall be repaired or replaced promptly. Sediment shall be removed and properly disposed of once it reaches a height of 3-inches.

Straw Wattles are to be temporary in nature and are to be used only as needed to temporarily stabilize areas of active construction.

Storm Drain Lines

Storm drainage inlets and outlets should be inspected incidentally with all structure inspections. Evidence of debris intrusion or excessive siltation or sedimentation could result in the need to clean a storm drain line. Flushing or jetting should be performed as required. All flushing and jetting should be performed in the direction away from any outlet devices. A vacuum truck should be used at the opposite end of the flushing or jetting to remove any silt or sediment that is cleaned from the storm drain.

Infiltration Basins

Infiltration basins are stormwater runoff impoundments that are constructed over permeable soils and require pretreatment from sediment forebays. Runoff from the design storm is stored until it exfiltrates through the soil of the basin floor. The basins were located to capture most of the runoff from the impervious areas of the site.

Infiltration basins are prone to clogging and failure if proper maintenance is not scheduled. The basin should be inspected at least twice per year or after a major storm event to ensure that the basin is operating as intended. The outlet structures should be inspected for clogging or overflow release velocities that are causing scouring or erosion. The upper stage, side slopes, embankments and emergency spillway should be mowed twice a year.

Sediment forebay

A sediment forebay is required as a pretreatment device prior to discharging stormwater to the swale. It will provide pretreatment by slowing stormwater runoff and increasing settlement of the sediment. The sediment forebay should be inspected monthly and cleaned of accumulated sediment on a quarterly basis. After sediment removal,

repair any damaged vegetation by reseeding or resodding. Maintain grass at a height of 4-6 inches.

Stone Rip Rap

The proposed swales have been designed with angular stone riprap. The stone riprap will be placed approximately 1-foot deep over Tencate Mirafi filter fabric.

Rip Rap should be inspected periodically for signs of failure. Such signs would include, undermining, high velocity wear (displacement of stones downstream), sliding, settlement, siltation, etc. Riprap should be repaired immediately upon the observation of such conditions mentioned.

Periodically, rip rap should be cleaned of silt. Siltation will be most prevalent in low velocity areas (such as directly up-stream of outlet control structures). Silt and sediment should be removed from these areas by hand.

Grass Swales

Swales should be checked for scouring, sloughing, erosion and/or accumulation of silt. The vegetation helps reduce velocity of runoff, which helps to maintain the swale, and encourages the sedimentation filtrations prior to exfiltration. Grass should be mowed and kept below 6 inches. Debris and trash should be removed as encountered.

Catch Basins

Catch basin structures shall be inspected at least semi-annually for signs of wear, settling, cracking or other fatigue. The devices should be inspected for signs of root intrusion, or significant water infiltration. Sumps should be checked for silt/sediment buildup and cleaned as necessary. The sumps shall be cleaned before the sump becomes half full. Cleaning should be performed by a vacuum truck. These structures should be resealed as required and outlets should be inspected incidentally with all structure inspections.

1.3 Spill Prevention and Control Plan

A spill contingency plan will be implemented during construction, including the following provisions:

- Equipment necessary to quickly attend to inadvertent spills will be stored on-site in a secure but accessible location. Such equipment will include:
  - Safety goggles
  - Chemically resistant gloves and overshoe boots
  - Water and chemical fire extinguishers
  - Sand and shovels
  - Suitable absorbent materials (speed dry, absorbent pads)
  - Storage containers
  - First aid equipment
- Spills or leaks will be treated properly in accordance with material type, volume of spillage, and location of the spill. Mitigation will include
  - Prevention of further spillage
  - Containment of the spilled material in the smallest practical area
  - Removal of spilled material immediately in a safe and environmentally sound manner
  - Mitigation of any damage to the environment
- Contractor shall notify the Engineer and Owner immediately upon knowledge of any spill of any quantity/volume.
- For spills less than the reportable quantity (RQ), as established in the Massachusetts Contingency Plan (MCP), the Contractor shall proceed with source control, containment, and clean up with absorbent materials or other applicable means, unless an imminent hazard or if other circumstances dictate the spill shall be treated by a professional response contractor.
- Spills of toxic or hazardous materials greater than the reportable quantity shall be reported to the appropriate Federal, State, and/or Local government agency.

1.4 O&M Schedule

	O&M Task	Monthly	Quarterly	Spring	Fall	2-years	As-required
1.	**Infiltration Basin**						
	Inspection			x	x		x
	Mowing	**3-4 times during the growing season**					
	Remove Debris			x	x		x
	Remove Sediment						x
	Re-seed						x
2.	**Sediment Forebay**						
	Inspection	x		x	x		x
	Mowing	**3-4 times during the growing season**					
	Remove Debris		x				x
	Remove Sediment		x				x
	Re-seed						x
3.	**Stone Rip Rap**						
	Inspection			x			
	Remove Debris			x			x
	Remove Silt/Sediment					x	x
	Repair						x
4.	**Storm drain Lines**						
	Inspection			x			x
	Clean						x
5.	**Grass Swales**						
	Inspection			x			x
	Clean			x			x
6.	**Catch Basins**						
	Inspect grate			x	x		
	Inspect inside/inlet and outlet pipes					x	
	Remove sediment					x	x

APPENDIX A

Stormwater Management System Owners/Operators

Stormwater Management System Owners/Operators

1.	Stormwater Management System Owners:	TBD
2.	Current and future operators:	TBD
3.	Emergency contact information:	TBD
4.	Change of trustee:	TBD
5.	Financial Responsible Party:	TBD
6.	Routine Maintenance:	TBD
7.	O&M activities:	TBD
8.	Record keeping	TBD

NOTE: STORMWATER MANAGEMENT SYSTEM OWNERSHIP AND OPERATION RESPONSIBILITIES SHALL TRANSFER WITH SALE OF PROPERTY TO FUTURE PROPERTY OWNERS.

APPENDIX H

Long Term Pollution Prevention Plan

LONG-TERM POLLUTION PREVENTION PLAN

FOR

THE PROPERTY LOCATED AT
64 BEAVER BROOK ROAD

IN

LITTLETON,
MASSACHUSETTS

PREPARED BY: DILLIS & ROY
CIVIL DESIGN GROUP, INC.
1 Main Street, Suite #1
Lunenburg, MA 01462

PREPARED FOR: MICHAEL & HANNAH GRUAR
64 BEAVER BROOK ROAD
LITTLETON, MA 01460

JANUARY 15TH, 2025
CDG PROJECT # 7462

DILLIS & ROY CIVIL DESIGN GROUP
CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS

1.0 Summary

This Long-Term Pollution Prevention Plan (LTPPP) has been prepared by Dillis & Roy Civil Design Group, Inc. pursuant to the Massachusetts Stormwater Regulations. The proposed project involves the construction of a 16-foot-wide shared driveway (±435 L.F.) to provide access to two residential lots. Each dwelling will be serviced by a private septic system and private water supply well. Due to the wetland system which bisects the site, the proposed shared driveway will require a wetland crossing to provide access to the upland area at the rear of the property. Each dwelling will require separate utility connections and their appurtenances. Two sperate stormwater management areas are proposed to capture and mitigate stormwater runoff associated with the development.

2.0 Spill Prevention Plan

No hazardous materials other than normal cleaning items are expected to be stored on site after the construction period has ended.

It is expected that normal DEP notification procedures would be triggered for major spills such as heating oil or propane and natural gas leaks.

3.0 Stormwater System O&M

A Stormwater Operation & Maintenance plan has been prepared for the proposed stormwater management system. Refer to this document for details pertaining to the required inspections, routine maintenance and operation details.

4.0 Fertilizers, herbicides, and pesticides

Application of fertilizer, herbicides and pesticides shall be performed in a manner consistent with the industry standards for the application.

No application of chemicals is to be performed within the stormwater management areas on the site.

5.0 Snow/Salt Management

5.1 Snow Plowing

It is expected that the driveway will be plowed or snow blown by the owner or a private contractor.

5.2 Salt/Sand Usage

It is expected that sanding and salting will be performed on an infrequent basis during times when unusually icy conditions persist for periods of time.

6.0 Waste Management

6.1 Solid Waste

A dumpster will be located on the site during construction. This area will be the primary area for the on-site storage of solid waste prior to pick-up by a waste management company.

APPENDIX I

Illicit Discharge Statement

DILLIS & ROY
CIVIL DESIGN GROUP

WWW.DILLISANDROY.COM
PH. 978.779.6091
F. 978.779.0260

ENGINEERING LAND SURVEYING WETLAND CONSULTING

08/01/2024
#6136

Illicit Discharge Statement

SITE ADDRESS: 64 BEAVER BROOK ROAD, LITTLETON, MASSACHUSETTS
PLAN REFERENCE: SHARED RESIDENTIAL DRIVEWAY PLAN PREPARED BY DILLIS & ROY CIVIL DESIGN GROUP, DATED 09/15/2025
OWNER: MICHAEL & HANNAH GRUAR
APPLICANT: MICHAEL & HANNAH GRUAR

As required by Standard 10 of the Massachusetts Stormwater Standards, I, the undersigned, being the authorized owner/responsible party of the above referenced property do hereby certify that no illicit discharges exist on the site and that the stormwater management system, as shown on the above referenced plan, does not contain or permit any illicit discharges to enter the stormwater management system. Furthermore, discharges from interior building drains or plumbing within the buildings are prohibited. Illicit discharges do not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. The pollution prevention plan measures to implements in this project to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease, include:

1. Identifying the responsible personnel for the implementation of an effective Illicit Discharge Detection and Elimination [IDDE] program.
2. Identify potential sources of Illicit Discharges.
3. Implement the Spill Prevention and Control Plan contained in the property Construction Period Pollution Prevention Plan [CPPPP]. Further, I certify that the stormwater management system as shown on the referenced plan will be maintained in accordance with the conditions of the Long Term Pollution Prevention Plan.

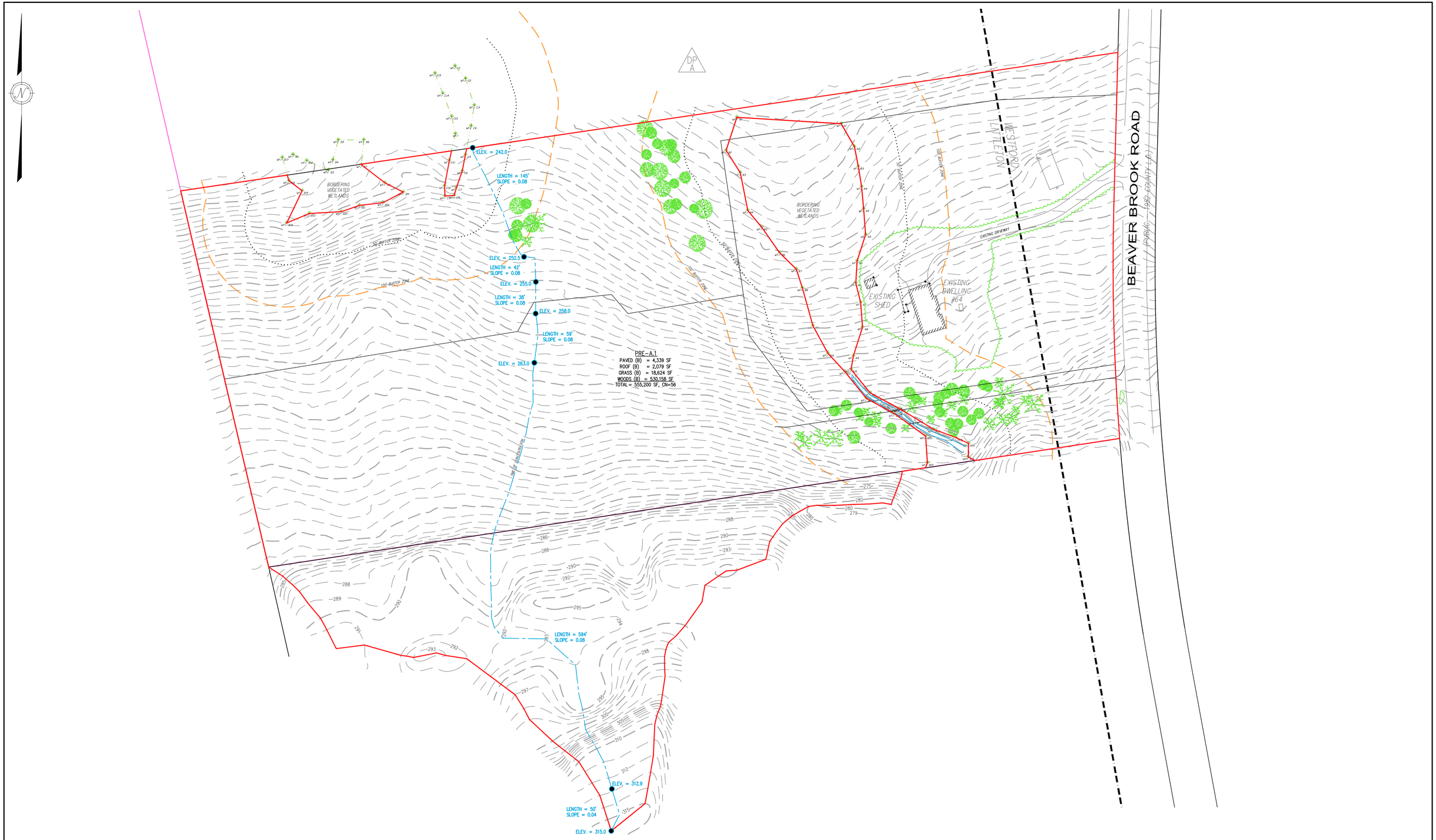
NAME: _____

SIGNED: _____

DATE: _____

4.0 Plans

Pre-development Watershed Plan



PREPARED BY:

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LITTLETON, MASSACHUSETTS 01460

APPLICANT:
MICHAEL & HANNAH GRUAR
64 BEAVER BROOK ROAD
LITTLETON, MASSACHUSETTS 01460

SCALE:
50 0 25 50 100 200
1 in. = 50 ft.

DIG SAFE 1-888-344-7233

DATE: 02/11/25
DESIGN BY: RPV
DRAWN BY: RPV
CHECKED BY: GSR

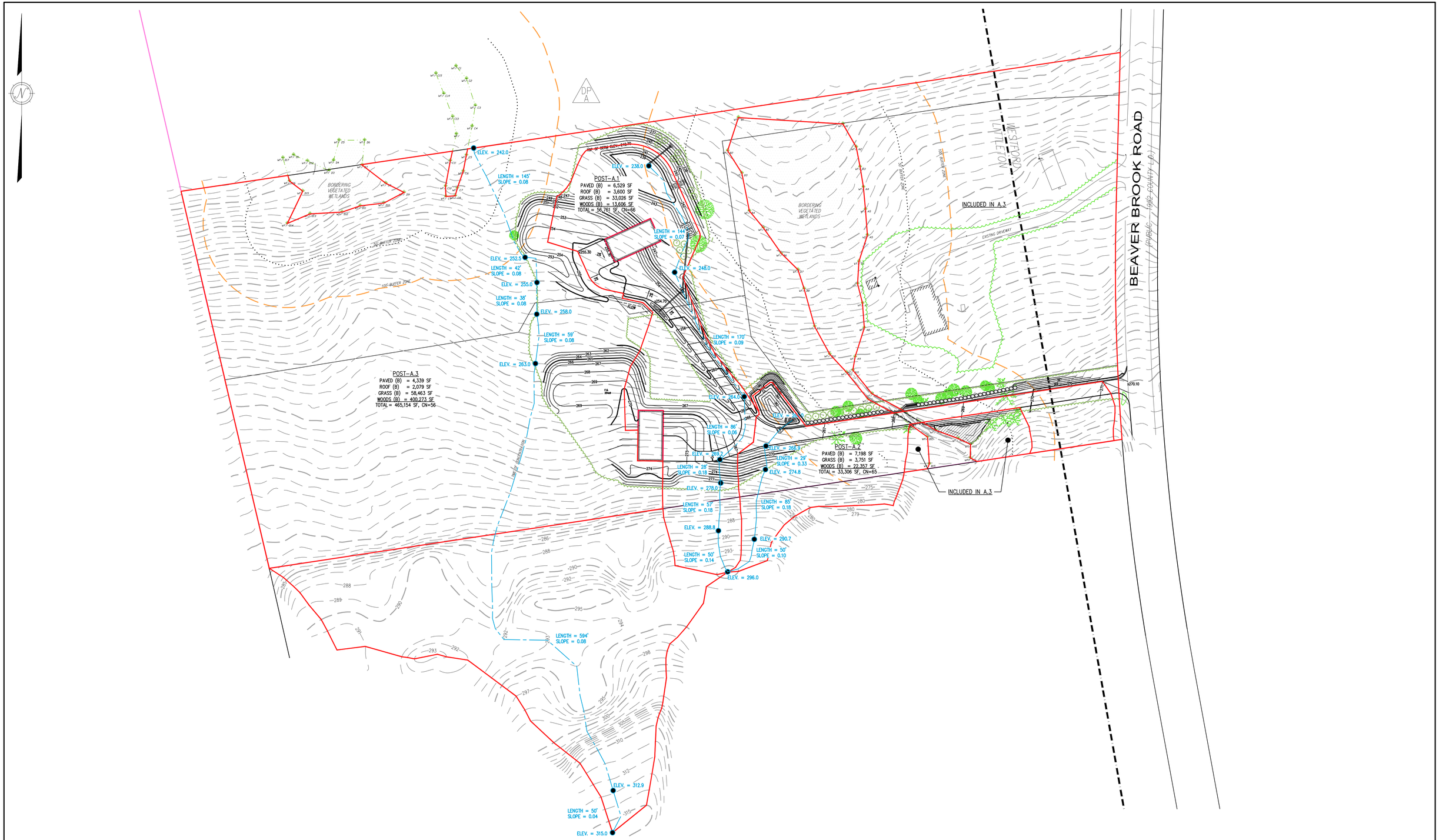
PRE-DEVELOPED WATERSHED MAP

BEAVER BROOK RD. (M:R19 P:18)
LITTLETON, MASSACHUSETTS 01460

NO.	DATE	DESCRIPTION	BY
1.	6/18/25	REVISED PER CONSERVATION COMMISSION & DEP	RPV
2.	9/15/25	REVISED PER ENGINEERING PEER REVIEW	RPV

JOB NO. 7462
DRAWING NO. 7462-PRE
SHEET NO. DRN

Post-development Watershed Plan



PREPARED BY:

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50 0 25 50 100 200
1 in. = 50 ft.

DIG SAFE 1-888-344-7233

DATE: 01/15/25
DESIGN BY: RPV
DRAWN BY: RPV
CHECKED BY: GSR

POST-DEVELOPED WATERSHED MAP

BEAVER BROOK RD. (M:R19 P:18)
LITTLETON, MASSACHUSETTS 01460

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JOB NO. 7462
DRAWING NO. 7462-POST
SHEET NO. DRN