DRAINAGE REPORT

For

PROPOSED

The Commons at River Road

100 Old River Road
Andover, Massachusetts

Prepared by:

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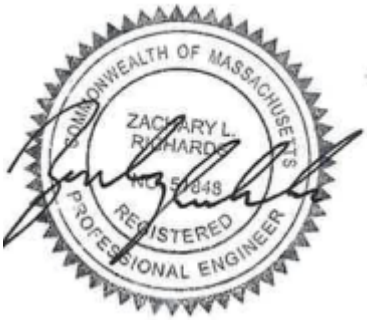

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the development of a proposed mixed use multi-family development located on the southwesterly side of Old River Road in the Town of Andover, Massachusetts. The site, which contains approximately 9.61 acres of land, contains an existing office building and associated parking lot. The remaining portion of the site is undeveloped consisting of wetland and wooded areas.

The proposed project includes the construction of a new 95,200 sf footprint 5-story mixed use multi-family development known as The Commons at River Road along with new structured parking garage. Additionally, the project includes paved surface parking areas, landscaping, storm water management components and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance/management system as illustrated within the accompanying Site Development Plans prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at two (2) "design points" where stormwater runoff currently drains to under existing conditions. These design points are described in further detail in **Section II** below. A summary of the existing and proposed conditions peak runoff rates for the 2-, 10-, 25-, and 100-year storms can be found in **Table 1.1** below. In addition, the project has been designed to meet or exceed the Stormwater Management Standards as detailed herein.

Table 1.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	2.17	2.10	**-0.07**	4.32	3.82	**-0.50**	5.75	4.90	**-0.85**	7.99	7.34	**-0.65**
DP2	14.83	12.93	**-1.90**	25.86	23.73	**-2.13**	32.95	29.71	**-3.24**	43.95	39.10	**-4.85**

**Flows are represented in cubic feet per second (cfs)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The site consists of approximately 9.61 acres of land located along the southwesterly side of Old River Road in the Town of Andover, Massachusetts. The southeast portion of the site contains an existing office building, and the northwest portion of the site contains the associated parking lot. The remaining portion of the site is undeveloped consisting of wetland and wooded areas.

On-Site Soil Information

Soils within the analyzed area consist of the following as classified by the Natural Resource Conservation Service (NRCS):

Table 2.1: Existing Soil Information

Soil Unit Symbol	Soil Name / Description	Hydrologic Soil Group (HSG)
73A	Whitman fine sandy loam	D
256 A	Deerfield loamy fine sand	A
711B	Charlton-Rock outcrop-Hollis complex	A

Onsite soil testing was performed by Bohler on November 5th, 2025. The test pits identified loamy sand on top of glacial till as well as areas of exposed or shallow bedrock. Estimated seasonal high groundwater (ESHGW) was not encountered in some of the test pits and therefore is assumed to be at the bottom of the exploration. ESHGW was observed in test pit 4 approximately 84” below existing grade. Additional sieve analysis was performed on soil samples and as such a Rawl’s Rate of 0.27 in/hour associated with Silty Loam has been used for the analysis. Refer to **Appendix C** for additional information.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at two (2) “design points” as described below where stormwater runoff currently drains to under existing conditions. The existing site was subdivided into two (2) separate sub catchments, as described below, to analyze existing and proposed flow rates at each design point.

The site generally flows from southeast to northwest with a high point near the existing curb cut on Old River Road. The majority of the existing development drain to a series of catch basins in

the parking lot. This catch basin conveys stormwater with no existing attenuation or treatment to one of the two design points outlines below at existing flared end sections.

Design Point #1 (DP1) is the southeast wetland system adjacent to River Road. Under existing conditions, this design point receives stormwater flows from approximately 1.3 acres of land.

Design Point #2 (DP2) is the northwest wetland system adjacent to Old River Road and the I-93 ramp. Under existing conditions, this design point receives stormwater flows from approximately 6.5 acres of land.

Refer to **Table 1.1** for the existing conditions peak rates of runoff. Refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the existing drainage areas.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project includes the construction of a new 95,200 sf footprint 5-story mixed use multi-family development along with new structured parking garage. Additionally, the project includes paved parking areas, landscaping, associated utilities, and a new stormwater management system. The site, including the proposed parking areas, has been designed to drain to deep-sump, hooded catch basins or water quality units. The inlets will capture and convey stormwater runoff, via an underground pipe system, to one of six (6) proposed infiltration systems. Pretreatment of stormwater runoff will be provided by proprietary treatment units/inlets prior to discharge into the proposed infiltration systems. Rooftop runoff has been designed to flow to the basins as well.

Proposed Watersheds and Design Point Information

The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same design points described in **Section II** above. The site was subdivided into eight (8) separate sub catchments for the proposed conditions as described below.

Under proposed conditions DP#1 receives stormwater flows from approximately 1.5 acres of land, designated as watershed “PR-1a” and “PR-1b”.

Under proposed conditions DP#2 receives stormwater flows from approximately 6.3 acres of land, designated as watershed “PR-1a” through “PR-2f”.

Water quality inlets are proposed to collect and route runoff from the paved parking areas to the existing surface basins. Pipes have been designed for the 25-year storm using the Rational Method. Pipe, inlet, and outlet protection sizing calculations are included in **Appendix F**.

The best management practices (BMPs) incorporated into the proposed stormwater management system have been designed to meet, or exceed, the standards set forth in the Massachusetts Department of Environmental Protection Stormwater Handbook standards. Refer to **Section V** for additional information.

Refer to **Table 1.1** for the calculated proposed conditions peak rates of runoff. For additional hydrologic information, refer to **Appendix E** and the Drainage Area Maps in the appendices of this report for a graphical representation of the proposed drainage areas.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in **Table 4.1** for stormwater calculations is based on NOAA. Refer to **Appendix F** for more information.

Table 4.1: NOAA Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.11	4.92	6.05	7.78

*Values derived from NOAA ATLAS

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that proposed impervious areas (including the building roof and paved parking/driveway areas) shall be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 1.1**, the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at all design points.

Standard #3: Recharge

The stormwater runoff from the project will be collected and diverted to the proposed infiltration systems. The project as proposed will involve the creation of 40,293 square feet of new impervious area and is required to infiltrate 853 cubic feet of stormwater as defined in Stormwater Standard 3. The proposed infiltration systems will provide 11,916 cubic feet of volume below the lowest outlet for groundwater recharge. Refer to **Appendix F** of this report for calculations documenting required and provided recharge volumes.

The DEP Stormwater Standards require that the infiltration BMP drains completely within 72 hours of the end of the storm event. Calculations showing that the proposed infiltration systems will drain within 72 hours are included in **Appendix F** of this report. Drawdown times for the six (6) infiltration systems range from 16.2 hours to 70.1 hours.

A groundwater mounding analysis has been provided in **Appendix F** of this report. The analysis shows that the groundwater mound will have no effect on the proposed system.

Standard #4: Water Quality

Water quality treatment is provided via deep sump catch basins or water quality inlets/units and the infiltration systems. This project is considered a LUHPPL per Standard 5 and is required to provide 44% pre-treatment as well as treat the 1.0 inch water quality volume. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will result in a post-construction impervious area of 241,107 sf and is required to treat 20,092 cubic feet of water quality volume (or equivalent water quality flow rate) as defined in Stormwater Standard 4. The

proposed water quality units have been sized to treat the water quality flow rate equivalent to meet the 1.0 inch water quality volume requirement. The removal rates from the manufacturer are included in this report. Per the Town of Andover Stormwater Management and Erosion Control Regulations Section IX.D, this project is required to remove 80% of total suspended solids (TSS) and 50% of total phosphorus (TP). This project is documenting compliance with the use of the EPA Region 1's BMP Accounting and Tracking Tool. Refer to **Appendix F** of this report for calculations documenting required and provided water quality volumes, flow rate equivalents, and pollutant removals.

Standard #5: Land Use with Higher Potential Pollutant Loads

The proposed project involves "Land Uses with Higher Potential Pollutant Loads". Accordingly, the stormwater management system includes an oil-grit separator (water quality units) prior to discharge. In addition, the project will provide 44% TSS removal prior to infiltration and treat the 1.0 in water quality depth, as further illustrated in **Appendix E** of this report.

Standard #6: Critical Areas

Not Applicable for this project.

Standard #7: Redevelopment

The proposed project is a mix of new and re-development; however, the project as been designed to meet the requirements as if it were new development.

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

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets. Additionally, the project is required to file a Notice of Intent with the US EPA and implement a Stormwater Pollution Prevention Plan (SWPPP) during the construction period. The SWPPP will be prepared prior to the start of construction and will be implemented by the site contractor under the guidance and responsibility of the project's proponent. Refer to **Appendix H**.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix G** of this report. The O&M Plan outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties and an estimated budget for inspections and maintenance.

Standard #10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit discharges from prohibited sources. An Illicit Discharge Statement is included in **Appendix G** of this report.

VI. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. In addition, the proposed best management practices will result in an effective removal of total suspended solids and total phosphorus from the post-development runoff. The pre-development versus post-development stormwater discharge comparisons is contained in **Table 1.1**.

As described in the report, the proposed stormwater management system as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year storm events. Additionally, the project meets or exceeds the MADEP Stormwater Management Standards and the Town of Andover Stormwater Management and Erosion Control Regulations as described further herein.

The proposed stormwater management system will provide substantial groundwater recharge and infiltration compared to existing conditions will provide additional benefits to both stormwater runoff quality and quantity.

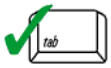
APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

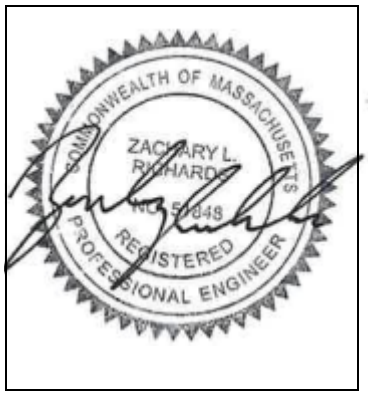
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



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Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Water Quality Units

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☒ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

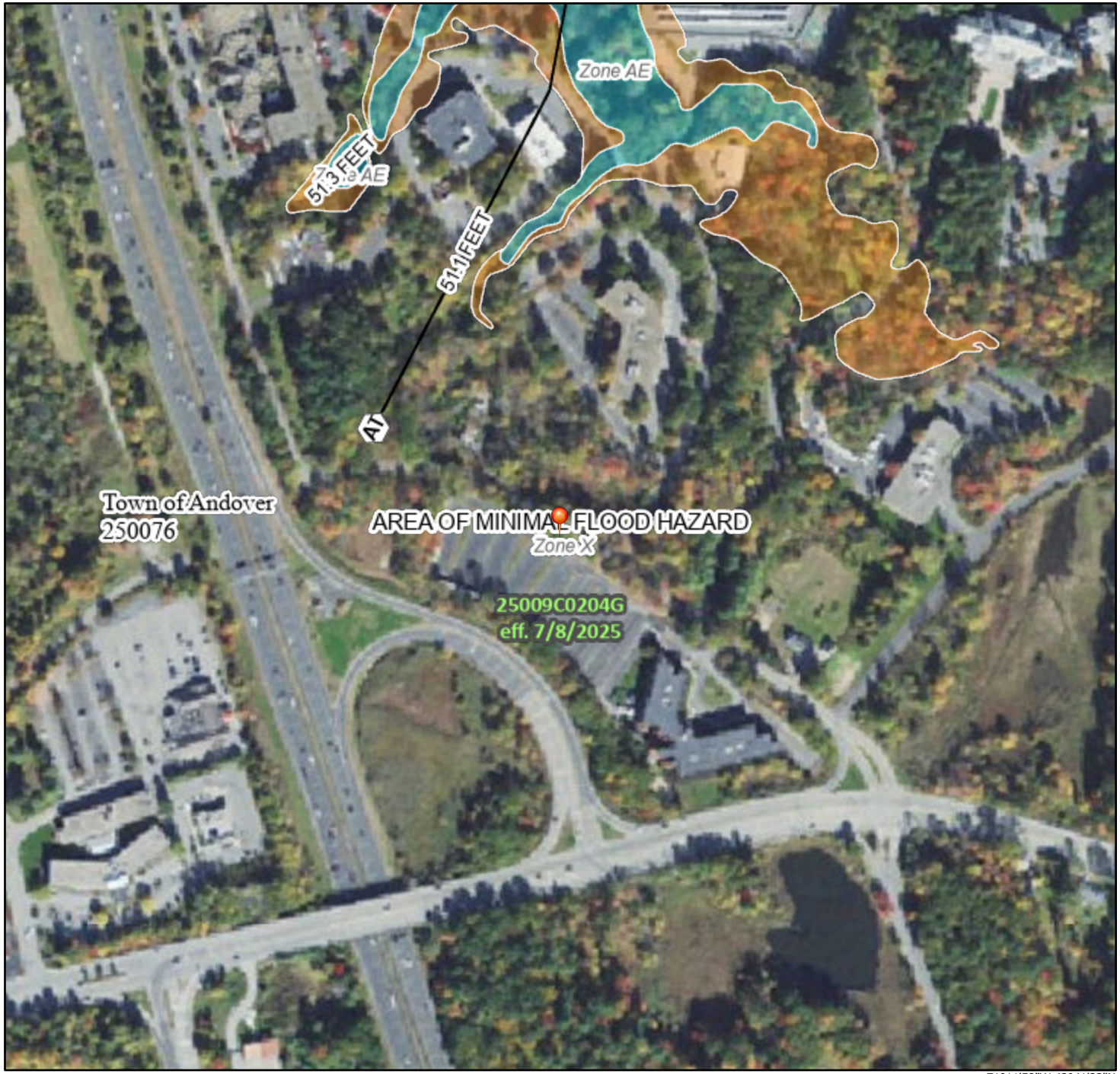
APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*

National Flood Hazard Layer FIRMette

FEMA

71°12'35"W 42°41'49"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

71°11'58"W 42°41'22"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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

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

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

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

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

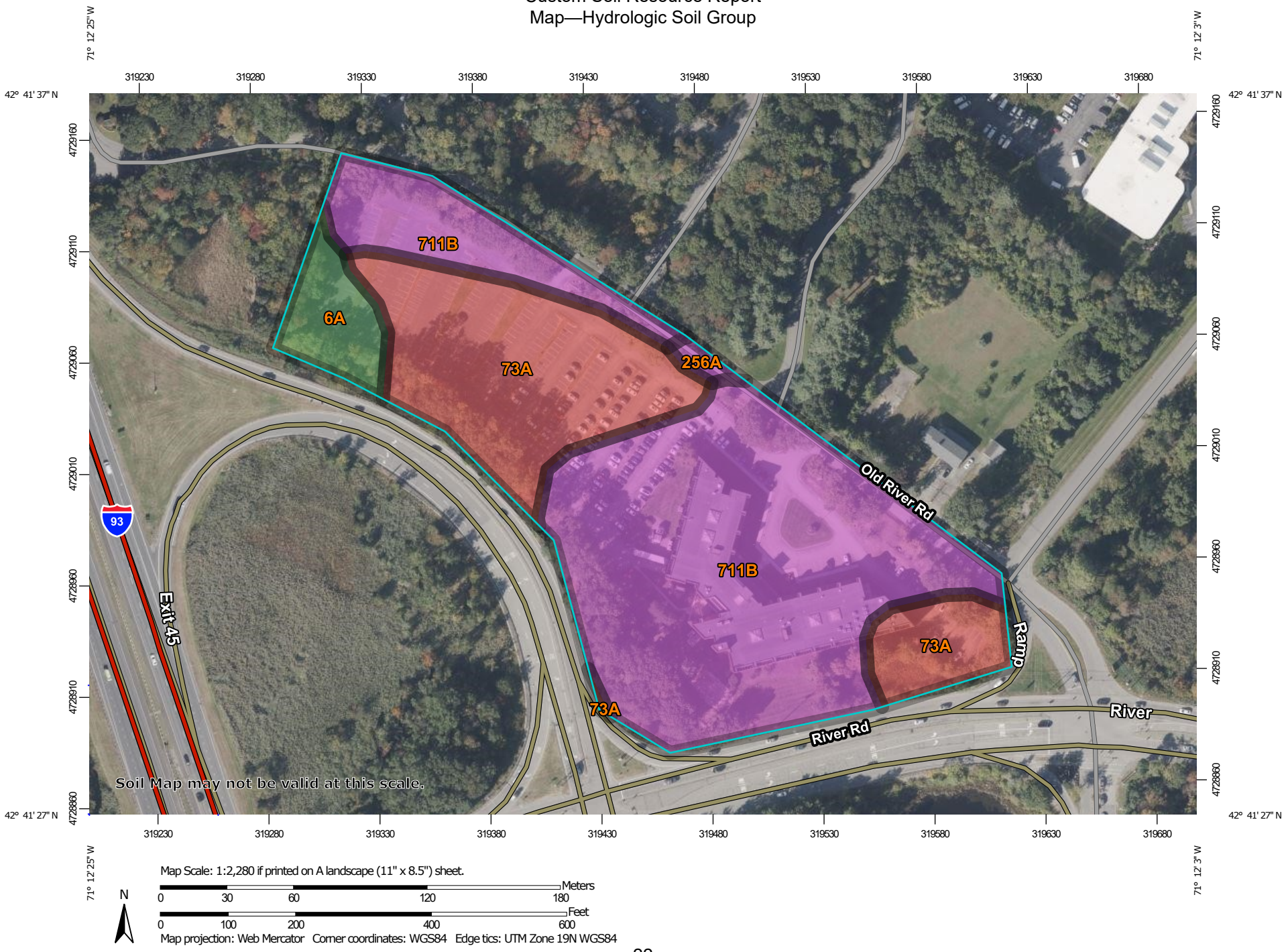
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/30/2025 at 4:22 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *STORMWATER TEST PITS*
- *WETLAND REPORT*

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:2,280 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 21, Sep 5, 2025

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	0.6	5.7%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	3.0	30.5%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	0.1	0.8%
711B	Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes	A	6.2	63.0%
Totals for Area of Interest			**9.9**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

100 Old River Road LLC c/o DND Homes LLC
Owner Name

100 Old River Road
Street Address

Map 143, Lot 8
Map/Lot #

Andover
City

MA
State

01810
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — NRCS WebSoil Survey (Source); 711B; 73A; 6A; 256A (Soil Map Unit); Charlton-Rock outcrop-Hollis complex, 3-8% (Soil Series)

   Ridges, hills
   Landform

   Shallow depth to groundwater table; shallow depth to restrictive features.
   Soil Limitations

   Friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss.
   Soil Parent material

3. Surficial Geological Report — 1958 - Castle (Year Published/Source); Qkt; Qal; Artificial fill (Map Unit)

   Kame terrace deposits - Chiefly sand and pebble to boulder gravel; Local alluvial deposits - Largely muck and sand with lesser amounts of pebbles, cobbles, and boulders; Artificial fill.

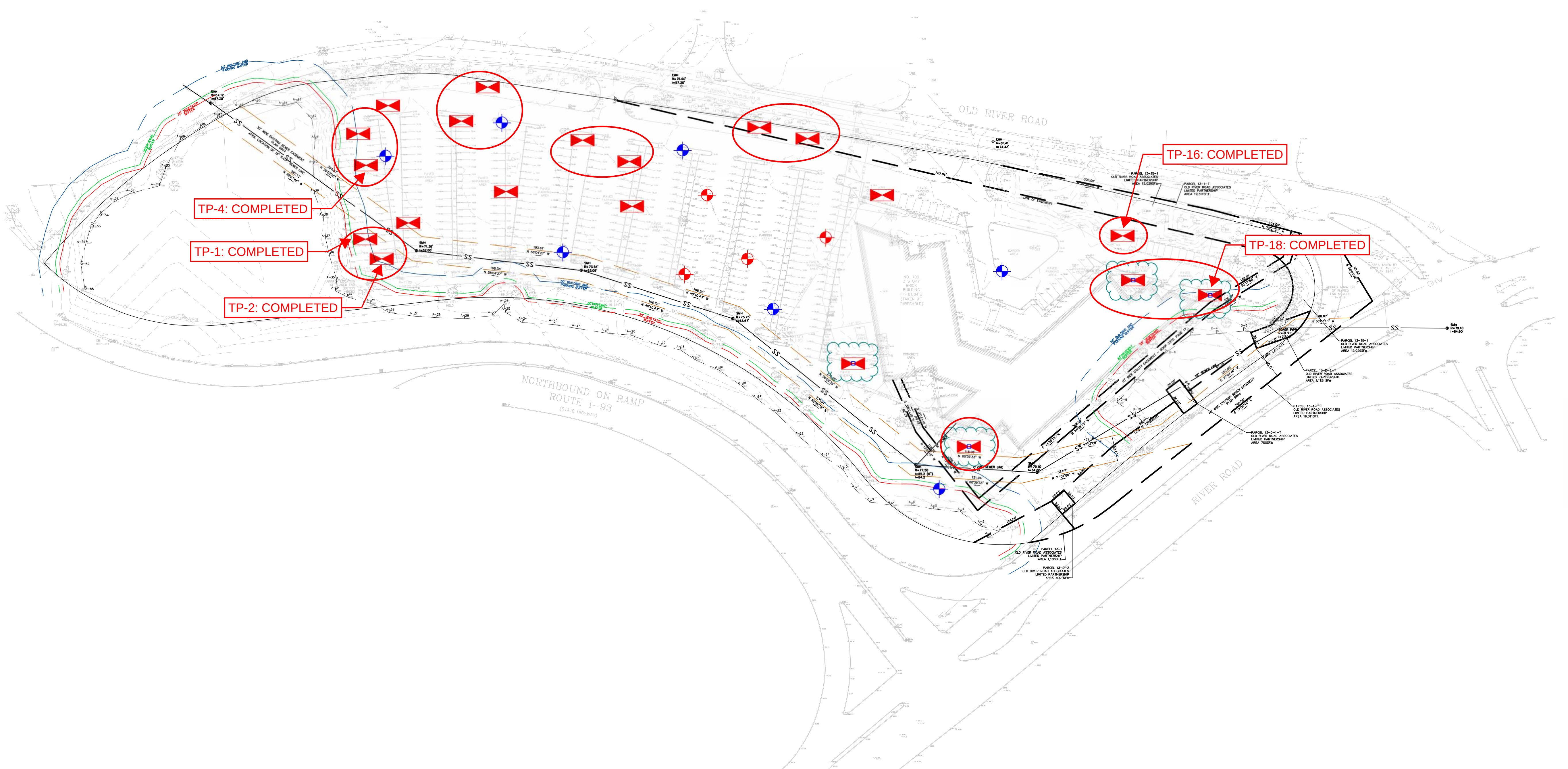
4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No — If yes, MassGIS Wetland Data Layer: Shrub swamp (SS) (Wetland Type)

7. Current Water Resource Conditions (USGS): MA-AJW 462 Andover: 11/4/25 (Month/Day/ Year) Range: ☐ Above Normal ☐ Normal ☒ Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
   Site is not located in Zone I or II, Zone A, B, or C, IWPA, or NHESP Habitat area per MassMapper. There is an irrigation well on the 95 Old River Road property per the EEA Data Portal, but it is over 2,000' from the site.



Completed Boring Locations

Proposed Boring Locations

Proposed Test Pit Locations

THIS PLAN TO BE UTILIZED FOR SITE LAYOUT PURPOSES ONLY

SCALE: 1" = 60'

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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FOR CONCEPT PURPOSES ONLY

THIS DRAWING IS NOT INTENDED AS A CONSTRUCTION DOCUMENT UNLESS INDICATED OTHERWISE.

PROJECT No.:	MAB250074.00-0A
DRAWN BY:	WG/ADT
CHECKED BY:	~ PM / APM / QC ~
DATE:	08/26/2025
CAD I.D.:	P-CIVL-SITE-MAB250074.00

PROJECT:

PROP. SITE PLAN DOCUMENTS

FOR

JOHN M CORCORAN & CO

SV+P

PROPOSED DEVELOPMENT

100 RIVER ROAD
ESSEX COUNTY
TOWN OF ANDOVER, MA 01810
MAP, BLOCK & LOT: 143 - 0 - 8

BOHLER

45 FRANKLIN STREET, 5th FLOOR
BOSTON, MA 02110
Phone: (617) 849-8040

www.BohlerEngineering.com

SHEET TITLE:

SITE PLAN

SHEET NUMBER:

C-301

ORG. DATE - 08/26/2025

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-18 (Hole #) | 11/05/2025 (Date) | 7:30 am (Time) | Overcast 36F (Weather) | 42.6913561 (Latitude) | -71.2107964 (Longitude)

1. Land Use: Parking lot landscaped island (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

Description of Location: Parking lot area on southeastern portion of property

2. Soil Parent Material: Glacial till | N/A (Landform) | N/A (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way >50 feet | Wetlands 46 feet | Property Line >10 feet | Drinking Water Well >100 feet | Other N/A feet

4. Unsuitable Materials Present: ◉ Yes ○ No If Yes: ☑ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ○ Yes ◉ No If yes: N/A Depth to Weeping in Hole** | N/A Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	HTM (Mulch)	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	
6-65+	HTM*	Loamy Sand	10YR 4/4	-	Cnc : - Dpl: -	-	25	50	Massive	Friable	Roots to 21"; top of 12" RCP encountered at 54"
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*Soil horizon appears to be glacial till material that has been reworked as parking lot fill material.

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-16 (Hole #) | 11/05/2025 (Date) | 8:30 am (Time) | Overcast 37F (Weather) | 42.6913561 (Latitude) | -71.2107964 (Longitude)

1. Land Use: Parking lot landscaped island (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 8-15 (Slope (%))

Description of Location: Parking lot area on northern portion of property

2. Soil Parent Material: Glacial till | N/A (Landform) | N/A (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way >50 feet | Wetlands >100 feet | Property Line 48 feet | Drinking Water Well >100 feet | Other N/A feet

4. Unsuitable Materials Present: ◉ Yes ○ No If Yes: ☑ Disturbed Soil/Fill Material ☑ Weathered/Fractured Rock ☑ Bedrock

5. Groundwater Observed: ○ Yes ◉ No If yes: N/A Depth to Weeping in Hole | N/A Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	HTM (Asphalt)	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	
8-62	HTM*	Loamy Sand	10YR 4/4	-	Cnc : - Dpl: -	-	25	50	SG	Loose	Exposed rock on side of test pit wall at 24"
62+	Cd	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	Refusal (bedrock) at 62"
					Cnc : - Dpl: -	-	-	-	-	-	
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*Soil horizon appears to be glacial till material that has been reworked as parking lot fill material.

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) | 11/05/2025 (Date) | 10:00 am (Time) | Overcast 45F (Weather) | 42.6913561 (Latitude) | -71.2107964 (Longitude)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: Parking lot area on northern portion of property

2. Soil Parent Material: Glacial till | N/A (Landform) | N/A (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way >50 feet | Wetlands 54 feet | Property Line 56 feet | Drinking Water Well >100 feet | Other N/A feet

4. Unsuitable Materials Present: ◉ Yes ○ No If Yes: ☑ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ◉ Yes ○ No If yes: 66" Depth to Weeping in Hole** | N/A Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4	HTM (Asphalt)	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	
4-23	HTM	Sand	10YR 5/6	-	Cnc : - Dpl: -	-	25	-	SG	Loose	
23-62	HTM*	Loamy Sand	10YR 4/4	-	Cnc : - Dpl: -	-	25	25	Massive	Friable	
62-86+	C	Sandy Loam	2.5Y 5/2	-	Cnc : - Dpl: -	-	10	25	Massive	Firm	Digging concluded due to boulders/wall collapse
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*Soil horizon appears to be glacial till material that has been reworked as parking lot fill material.
**Weeping from pit wall face appears to be perched water.

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 (Hole #) | 11/05/2025 (Date) | 12:15 pm (Time) | Overcast 54F (Weather) | 42.6913561 (Latitude) | -71.2107964 (Longitude)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: Parking lot area on northern portion of property

2. Soil Parent Material: Glacial till | N/A (Landform) | N/A (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way >50 feet | Wetlands 54 feet | Property Line 56 feet | Drinking Water Well >100 feet | Other N/A feet

4. Unsuitable Materials Present: ◉ Yes ○ No If Yes: ☑ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ◉ Yes ○ No If yes: 50" Depth to Weeping in Hole** | N/A Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4	HTM (Asphalt)	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	
4-16	HTM	Sand	10YR 5/6	-	Cnc : - Dpl: -	-	25	-	SG	Loose	
16-48	HTM*	Loamy Sand	10YR 4/4	-	Cnc : - Dpl: -	-	25	25	Massive	Friable	
66-96+	Ab	Loamy Sand	10YR 3/2	-	Cnc : - Dpl: -	-	15	-	Massive	Friable	
52-86+	C	Sandy Loam	2.5Y 5/1	-	Cnc : - Dpl: -	-	15	15	Massive	Firm	Digging concluded due to boulders/wall collapse
					Cnc : Dpl:						

Additional Notes:
*Soil horizon appears to be glacial till material that has been reworked as parking lot fill material.
**Weeping from pit wall face appears to be perched water.

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 (Hole #) | 11/05/2025 (Date) | 1:25 pm (Time) | Overcast 55F (Weather) | 42.6913561 (Latitude) | -71.2107964 (Longitude)

1. Land Use: Parking lot (e.g., woodland, agricultural field, vacant lot, etc.) | N/A (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: Parking lot area on northern portion of property

2. Soil Parent Material: Glacial till | N/A (Landform) | N/A (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body >50 feet | Drainage Way >50 feet | Wetlands 63 feet | Property Line 104 feet | Drinking Water Well >100 feet | Other N/A feet

4. Unsuitable Materials Present: ◉ Yes ○ No If Yes: ☑ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ◉ Yes ○ No If yes: 75" Depth to Weeping in Hole** | N/A Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4	HTM (Asphalt)	N/A	N/A	-	Cnc : - Dpl: -	-	-	-	-	-	
4-16	HTM	Sand	10YR 5/6	-	Cnc : - Dpl: -	-	25	-	SG	Loose	
16-66	HTM*	Loamy Sand	10YR 4/4	-	Cnc : - Dpl: -	-	25	25	Massive	Friable	
66-96+	C	Sandy Loam	2.5Y 5/1	84"	Cnc : 5YR 5/8 Dpl: -	50	15	15	Massive	Firm	
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
*Soil horizon appears to be glacial till material that has been reworked as parking lot fill material.
**Weeping from pit wall face appears to be perched water.

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole # TP-4	Obs. Hole #_____
☑ Depth to soil redoximorphic features	84" inches	_____ inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material Not Applicable to Stormwater Testing Observations

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

   ☐ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Andover

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Jared Walsh	11/10/2025
Signature of Soil Evaluator	Date
Jared Walsh / License #14670	6/30/2028
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
N/A	N/A
Name of Approving Authority Witness	Approving Authority

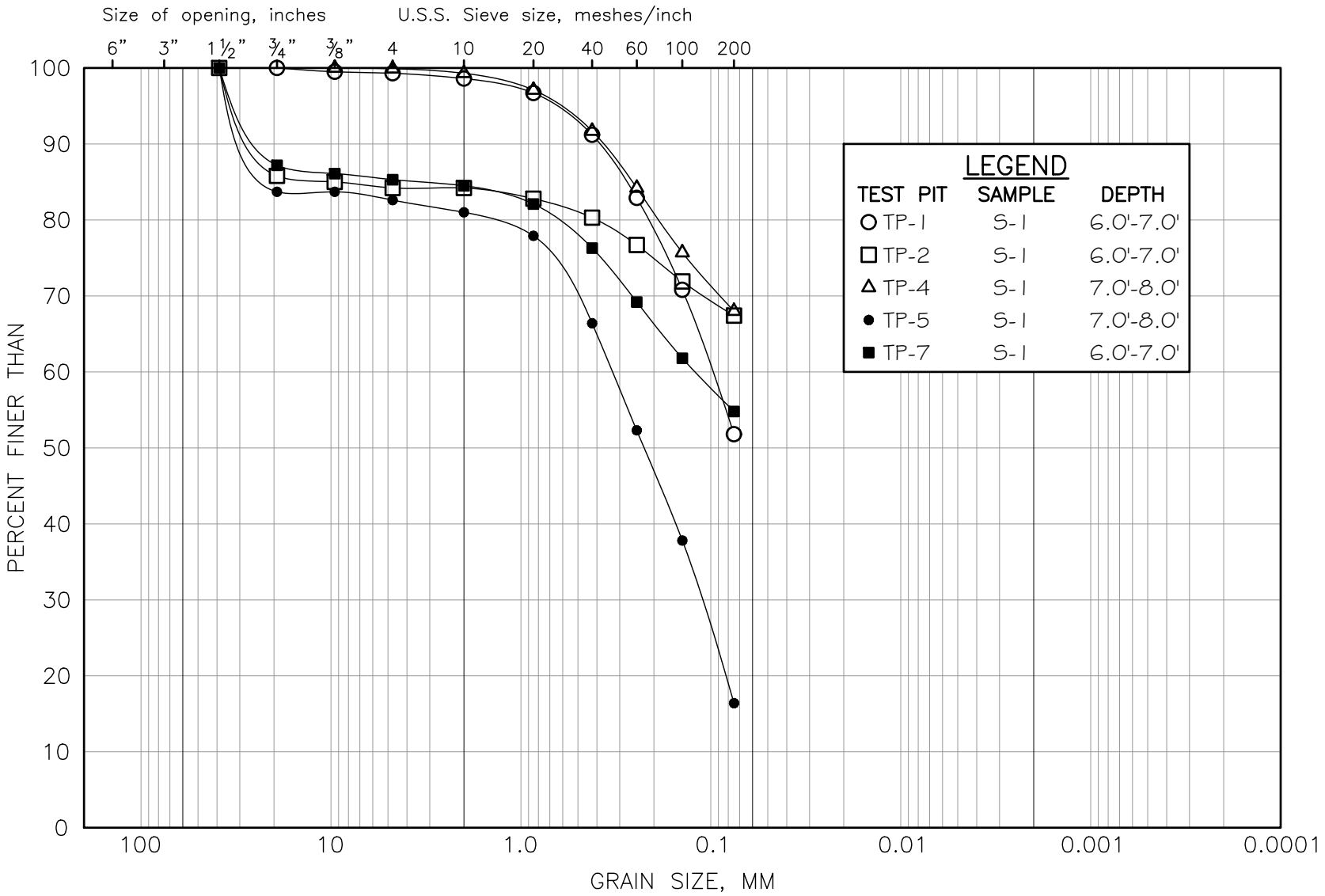
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

FILE NAME: N:\Acad\JOBS\8091\8091-F04_Sieve.dwg

PROJECT No. 8091

M.I.T. GRAIN SIZE SCALE



COBBLE SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED	
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE

McPHAIL ASSOCIATES, LLC

GRAIN SIZE DISTRIBUTION
GLACIAL TILL

FIGURE 4

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*

LEGEND

EXISTING WATERSHED

- DESIGN POINT — DP1 / DP1
- SUBCATCHMENT ID — ED1.1 / ED1.1
- SUBCATCHMENT BOUNDARY
- SOIL BOUNDARY WITH NRCS MAP UNIT AND HYDROLOGIC SOIL GROUP RATING — MapUnit / A

LEGEND

EXISTING COVER TYPES

BUILDING	
PAVEMENT	
CONCRETE / WALK / PATIO PAVER / MISC IMPERVIOUS	
GRASS / SOD / LAWN	

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

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REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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ENTITLEMENT SET

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PROJECT No.:	MAB250074.00-0B
DRAWN BY:	WG/AT
CHECKED BY:	ZLR
DATE:	01/09/2025
CAD I.D.:	P-CIVL-SITE-MAB250074.00

PROJECT:

PROP. SITE PLAN DOCUMENTS

FOR

JOHN M CORCORAN & CO

sv+p

PROPOSED
RESIDENTIAL DEVELOPMENT

100 OLD RIVER ROAD
ESSEX COUNTY
TOWN OF ANDOVER, MA 01810
MAP, BLOCK & LOT: 143 - 0 - 8

BOHLER

45 FRANKLIN STREET, 5th FLOOR
BOSTON, MA 02110
Phone: (617) 849-8040

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M.J. MRVA

REGISTERED LANDSCAPE ARCHITECT
MASSACHUSETTS No. 1217
RHODE ISLAND No. 419
NEW YORK No. 002359
NEW HAMPSHIRE No. 159
CONNECTICUT No. 1359
MAINE No. 4248
VERMONT No. 01337
OHIO No. 250433

SHEET TITLE:

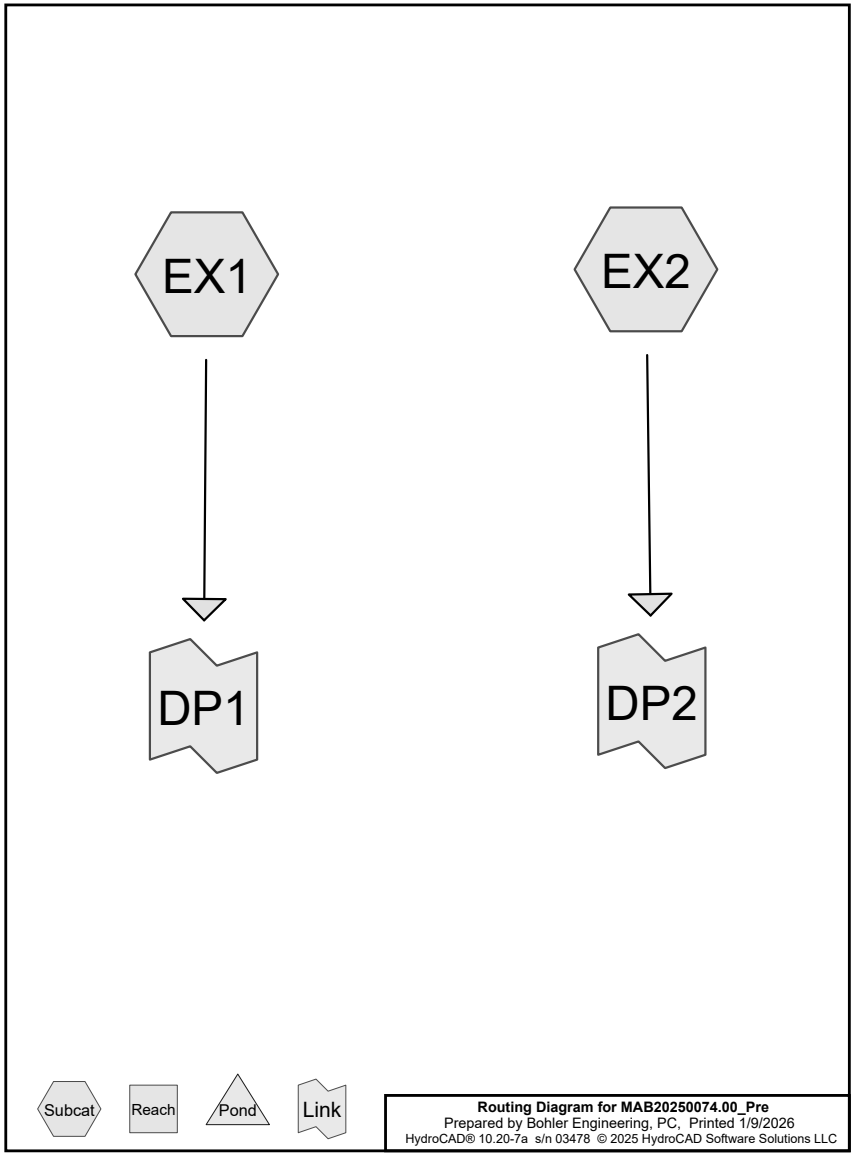
PRE DEVELOPMENT DRAINAGE AREA MAP

SHEET NUMBER:

C-402

ORG. DATE - 01/09/2025

Jan 09, 2026
I:\BOHLER\NG\-NET\SHARE\SMA-PROJECTS\2025\MAB250074.00\CAD\DRAWINGS\PLAN SETS\CIVIL SITE PLANS\P-CIVL-HYDR-MAB250074.00-0B-----LAYOUT: C-402 PRED



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.018	98	Building, HSG C (EX2)
3.592	98	Impervious Area, HSG C (EX1, EX2)
3.243	74	Open Space, HSG C (EX1, EX2)
7.853	**88**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=1.57"
Tc=6.0 min CN=WQ Runoff=2.17 cfs 0.173 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=2.20"
Tc=6.0 min CN=WQ Runoff=14.83 cfs 1.197 af

Link DP1: Inflow=2.17 cfs 0.173 af
Primary=2.17 cfs 0.173 af

Link DP2: Inflow=14.83 cfs 1.197 af
Primary=14.83 cfs 1.197 af

Total Runoff Area = 7.853 ac Runoff Volume = 1.370 af Average Runoff Depth = 2.09"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af, Depth= 1.57"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af, Depth= 2.20"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 1.57" for 2-yr event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af
Primary = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 2.20" for 2-yr event
Inflow = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af
Primary = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=WQ Runoff=4.32 cfs 0.335 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=WQ Runoff=25.86 cfs 2.086 af

Link DP1: Inflow=4.32 cfs 0.335 af
Primary=4.32 cfs 0.335 af

Link DP2: Inflow=25.86 cfs 2.086 af
Primary=25.86 cfs 2.086 af

Total Runoff Area = 7.853 ac Runoff Volume = 2.421 af Average Runoff Depth = 3.70"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af, Depth= 3.04"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af, Depth= 3.83"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af
Primary = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 3.83" for 10-yr event
Inflow = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af
Primary = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=WQ Runoff=5.75 cfs 0.443 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=4.89"
Tc=6.0 min CN=WQ Runoff=32.95 cfs 2.661 af

Link DP1: Inflow=5.75 cfs 0.443 af
Primary=5.75 cfs 0.443 af

Link DP2: Inflow=32.95 cfs 2.661 af
Primary=32.95 cfs 2.661 af

Total Runoff Area = 7.853 ac Runoff Volume = 3.105 af Average Runoff Depth = 4.74"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af, Depth= 4.03"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af, Depth= 4.89"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 4.03" for 25-yr event
Inflow = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af
Primary = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 4.89" for 25-yr event
Inflow = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af
Primary = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=5.61"
Tc=6.0 min CN=WQ Runoff=7.99 cfs 0.616 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=6.54"
Tc=6.0 min CN=WQ Runoff=43.95 cfs 3.558 af

Link DP1: Inflow=7.99 cfs 0.616 af
Primary=7.99 cfs 0.616 af

Link DP2: Inflow=43.95 cfs 3.558 af
Primary=43.95 cfs 3.558 af

Total Runoff Area = 7.853 ac Runoff Volume = 4.175 af Average Runoff Depth = 6.38"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af, Depth= 5.61"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af, Depth= 6.54"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 5.61" for 100-yr event
Inflow = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af
Primary = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 6.54" for 100-yr event
Inflow = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af
Primary = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*

LEGEND

PROPOSED WATERSHED

DESIGN POINT	DP1
SUBCATCHMENT ID	PD1.1
SUBCATCHMENT BOUNDARY	
STORMWATER CONTROL MEASURE OR MODELED DRAINAGE STRUCTURE	P1.1

LEGEND

PROPOSED COVER TYPES

- BUILDING
- PAVEMENT
- CONCRETE / WALK / PATIO PAVERS / MISC IMPERVIOUS
- GRASS / SOD / LAWN

BOHLER

SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

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REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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ENTITLEMENT SET

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PROJECT No.:	MAB250074.00-0B
DRAWN BY:	WG/AT
CHECKED BY:	ZLR
DATE:	01/09/2025
CAD I.D.:	P-CIVL-SITE-MAB250074.00

PROJECT:

PROP. SITE PLAN DOCUMENTS

FOR

JOHN M CORCORAN & CO
SV+P

PROPOSED
RESIDENTIAL DEVELOPMENT

100 OLD RIVER ROAD
ESSEX COUNTY
TOWN OF ANDOVER, MA 01810
MAP, BLOCK & LOT: 143 - 0 - 8

BOHLER
45 FRANKLIN STREET, 5th FLOOR
BOSTON, MA 02110
Phone: (617) 849-8040
www.BohlerEngineering.com

M.J. MRVA
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NEW YORK No. 002359
NEW HAMPSHIRE No. 109
CONNECTICUT No. 1359
MAINE No. 4248
VERMONT No. 01337
OHIO No. 250433

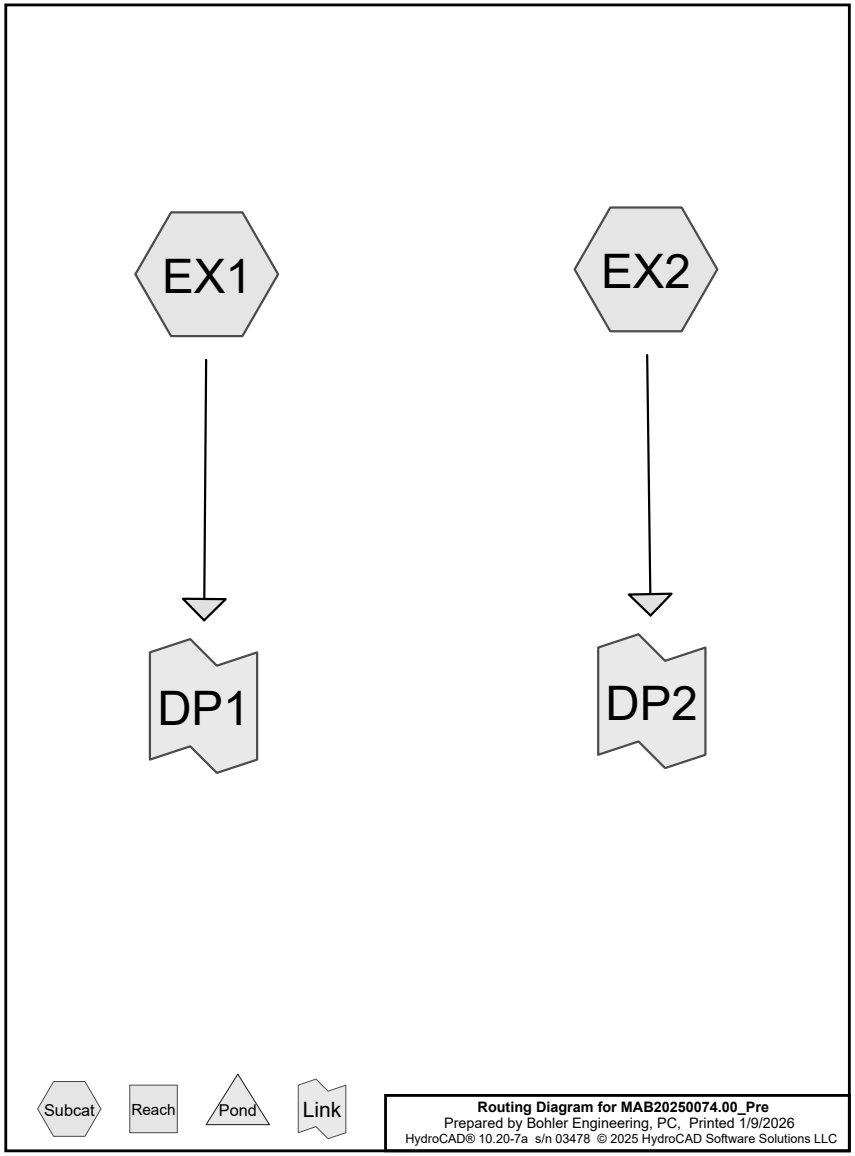
SHEET TITLE:

POST DEVELOPMENT DRAINAGE AREA MAP

SHEET NUMBER:

C-403

ORG. DATE - 01/09/2025



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
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3.592	98	Impervious Area, HSG C (EX1, EX2)
3.243	74	Open Space, HSG C (EX1, EX2)
7.853	**88**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=1.57"
Tc=6.0 min CN=WQ Runoff=2.17 cfs 0.173 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=2.20"
Tc=6.0 min CN=WQ Runoff=14.83 cfs 1.197 af

Link DP1: Inflow=2.17 cfs 0.173 af
Primary=2.17 cfs 0.173 af

Link DP2: Inflow=14.83 cfs 1.197 af
Primary=14.83 cfs 1.197 af

Total Runoff Area = 7.853 ac Runoff Volume = 1.370 af Average Runoff Depth = 2.09"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af, Depth= 1.57"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af, Depth= 2.20"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 1.57" for 2-yr event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af
Primary = 2.17 cfs @ 12.09 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 2.20" for 2-yr event
Inflow = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af
Primary = 14.83 cfs @ 12.09 hrs, Volume= 1.197 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=WQ Runoff=4.32 cfs 0.335 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=WQ Runoff=25.86 cfs 2.086 af

Link DP1: Inflow=4.32 cfs 0.335 af
Primary=4.32 cfs 0.335 af

Link DP2: Inflow=25.86 cfs 2.086 af
Primary=25.86 cfs 2.086 af

Total Runoff Area = 7.853 ac Runoff Volume = 2.421 af Average Runoff Depth = 3.70"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af, Depth= 3.04"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af, Depth= 3.83"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af
Primary = 4.32 cfs @ 12.09 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 3.83" for 10-yr event
Inflow = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af
Primary = 25.86 cfs @ 12.09 hrs, Volume= 2.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=WQ Runoff=5.75 cfs 0.443 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=4.89"
Tc=6.0 min CN=WQ Runoff=32.95 cfs 2.661 af

Link DP1: Inflow=5.75 cfs 0.443 af
Primary=5.75 cfs 0.443 af

Link DP2: Inflow=32.95 cfs 2.661 af
Primary=32.95 cfs 2.661 af

Total Runoff Area = 7.853 ac Runoff Volume = 3.105 af Average Runoff Depth = 4.74"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af, Depth= 4.03"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af, Depth= 4.89"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 4.03" for 25-yr event
Inflow = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af
Primary = 5.75 cfs @ 12.09 hrs, Volume= 0.443 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 4.89" for 25-yr event
Inflow = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af
Primary = 32.95 cfs @ 12.09 hrs, Volume= 2.661 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX1: Runoff Area=57,467 sf 31.20% Impervious Runoff Depth=5.61"
Tc=6.0 min CN=WQ Runoff=7.99 cfs 0.616 af

SubcatchmentEX2: Runoff Area=284,607 sf 64.26% Impervious Runoff Depth=6.54"
Tc=6.0 min CN=WQ Runoff=43.95 cfs 3.558 af

Link DP1: Inflow=7.99 cfs 0.616 af
Primary=7.99 cfs 0.616 af

Link DP2: Inflow=43.95 cfs 3.558 af
Primary=43.95 cfs 3.558 af

Total Runoff Area = 7.853 ac Runoff Volume = 4.175 af Average Runoff Depth = 6.38"
41.30% Pervious = 3.243 ac 58.70% Impervious = 4.610 ac

Summary for Subcatchment EX1:

Runoff = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af, Depth= 5.61"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	39,539	74	Open Space, HSG C
*	17,928	98	Impervious Area, HSG C
	57,467		Weighted Average
	39,539		68.80% Pervious Area
	17,928		31.20% Impervious Area

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

Summary for Subcatchment EX2:

Runoff = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af, Depth= 6.54"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	44,341	98	Building, HSG C
*	101,731	74	Open Space, HSG C
*	138,535	98	Impervious Area, HSG C
	284,607		Weighted Average
	101,731		35.74% Pervious Area
	182,876		64.26% Impervious Area

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

Summary for Link DP1:

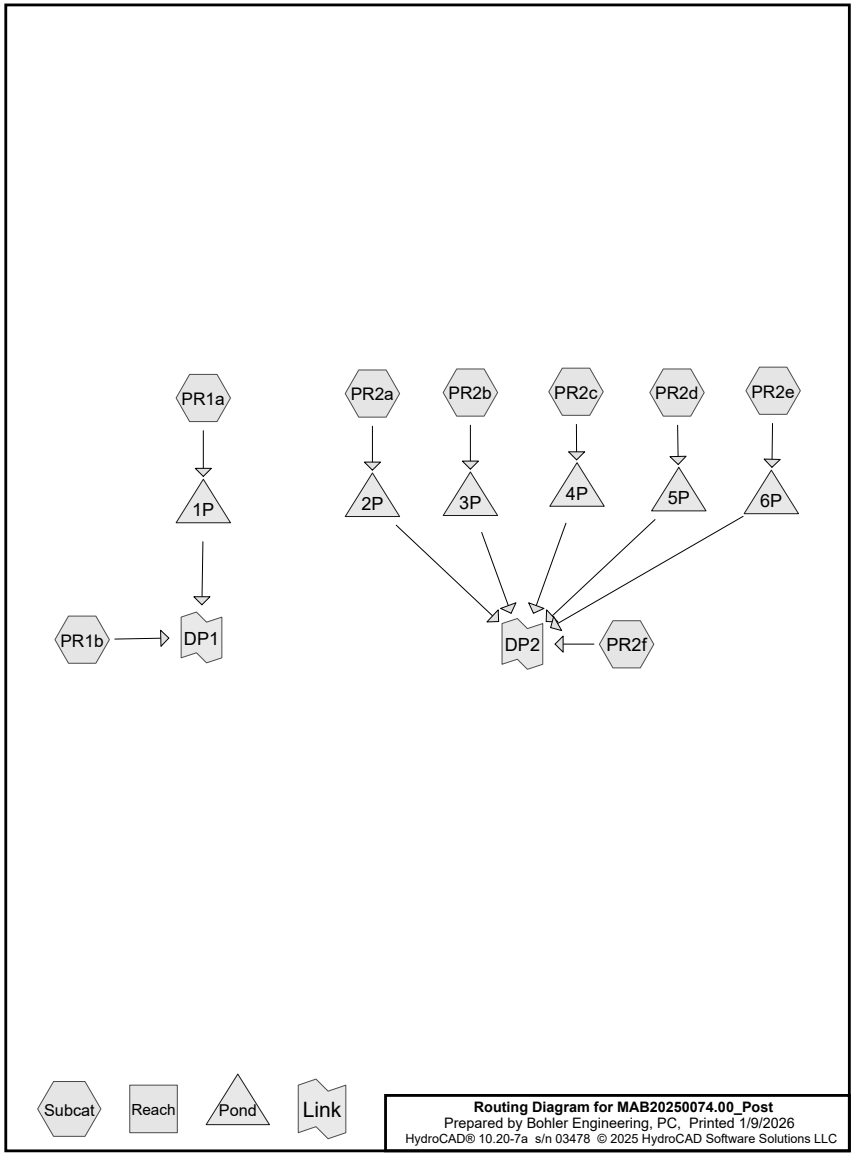
Inflow Area = 1.319 ac, 31.20% Impervious, Inflow Depth = 5.61" for 100-yr event
Inflow = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af
Primary = 7.99 cfs @ 12.09 hrs, Volume= 0.616 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.534 ac, 64.26% Impervious, Inflow Depth = 6.54" for 100-yr event
Inflow = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af
Primary = 43.95 cfs @ 12.09 hrs, Volume= 3.558 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs



Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.099	98	Impervious Area, HSG C (PR1a, PR2b, PR2c, PR2d, PR2e)
1.343	98	Impervious Area, HSG C (south bldg and courtyard) (PR2a)
0.094	98	Impervious, HSG C (PR1b)
1.063	86	Open Space, HSG C (PR1a, PR2a, PR2b, PR2c, PR2e)
0.038	86	OpenSpace, HSG C (PR2d)
1.217	70	Woods, HSG C (PR1b, PR2f)
7.853	**92**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1a: Runoff Area=35,497 sf 64.37% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=WQ Runoff=2.13 cfs 0.168 af

SubcatchmentPR1b: Runoff Area=28,436 sf 14.40% Impervious Runoff Depth=1.08"
Tc=6.0 min CN=WQ Runoff=0.72 cfs 0.059 af

SubcatchmentPR2a: Runoff Area=63,506 sf 92.10% Impervious Runoff Depth=2.79"
Tc=6.0 min CN=WQ Runoff=4.19 cfs 0.339 af

SubcatchmentPR2b: Runoff Area=126,093 sf 95.74% Impervious Runoff Depth=2.83"
Tc=6.0 min CN=WQ Runoff=8.41 cfs 0.683 af

SubcatchmentPR2c: Runoff Area=12,292 sf 97.09% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=WQ Runoff=0.82 cfs 0.067 af

SubcatchmentPR2d: Runoff Area=12,537 sf 86.70% Impervious Runoff Depth=2.73"
Tc=6.0 min CN=WQ Runoff=0.81 cfs 0.065 af

SubcatchmentPR2e: Runoff Area=35,069 sf 34.71% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=WQ Runoff=1.88 cfs 0.144 af

SubcatchmentPR2f: Runoff Area=28,654 sf 0.00% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=70 Runoff=0.52 cfs 0.043 af

Pond 1P: Peak Elev=74.70' Storage=2,036 cf Inflow=2.13 cfs 0.168 af
Discarded=0.02 cfs 0.041 af Primary=1.50 cfs 0.111 af Outflow=1.52 cfs 0.152 af

Pond 2P: Peak Elev=76.80' Storage=2,549 cf Inflow=4.19 cfs 0.339 af
Discarded=0.00 cfs 0.000 af Primary=3.36 cfs 0.324 af Outflow=3.36 cfs 0.324 af

Pond 3P: Peak Elev=69.09' Storage=4,068 cf Inflow=8.41 cfs 0.683 af
Discarded=0.01 cfs 0.028 af Primary=8.20 cfs 0.591 af Outflow=8.21 cfs 0.619 af

Pond 4P: Peak Elev=69.47' Storage=1,216 cf Inflow=0.82 cfs 0.067 af
Discarded=0.01 cfs 0.015 af Primary=0.77 cfs 0.029 af Outflow=0.78 cfs 0.044 af

Pond 5P: Peak Elev=68.72' Storage=841 cf Inflow=0.81 cfs 0.065 af
Discarded=0.01 cfs 0.013 af Primary=0.79 cfs 0.038 af Outflow=0.79 cfs 0.051 af

Pond 6P: Peak Elev=73.25' Storage=3,414 cf Inflow=1.88 cfs 0.144 af
Discarded=0.02 cfs 0.039 af Primary=0.23 cfs 0.041 af Outflow=0.25 cfs 0.080 af

Link DP1: Inflow=2.10 cfs 0.170 af
Primary=2.10 cfs 0.170 af

Link DP2: Inflow=12.93 cfs 1.065 af
Primary=12.93 cfs 1.065 af

Total Runoff Area = 7.853 ac Runoff Volume = 1.567 af Average Runoff Depth = 2.40"
29.51% Pervious = 2.318 ac 70.49% Impervious = 5.536 ac

Summary for Subcatchment PR1a:

Runoff = 2.13 cfs @ 12.09 hrs, Volume= 0.168 af, Depth= 2.48"
Routed to Pond 1P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	12,647	86	Open Space, HSG C
*	22,850	98	Impervious Area, HSG C
	35,497		Weighted Average
	12,647		35.63% Pervious Area
	22,850		64.37% Impervious Area

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

Summary for Subcatchment PR1b:

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 1.08"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	24,342	70	Woods, HSG C
*	4,094	98	Impervious, HSG C
	28,436		Weighted Average
	24,342		85.60% Pervious Area
	4,094		14.40% Impervious Area

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

Summary for Subcatchment PR2a:

Runoff = 4.19 cfs @ 12.09 hrs, Volume= 0.339 af, Depth= 2.79"
Routed to Pond 2P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	58,491	98	Impervious Area, HSG C (south bldg and courtyard)
*	5,015	86	Open Space, HSG C
	63,506		Weighted Average
	5,015		7.90% Pervious Area
	58,491		92.10% Impervious Area

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

Summary for Subcatchment PR2b:

Runoff = 8.41 cfs @ 12.09 hrs, Volume= 0.683 af, Depth= 2.83"
Routed to Pond 3P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	120,717	98	Impervious Area, HSG C
*	5,376	86	Open Space, HSG C
	126,093		Weighted Average
	5,376		4.26% Pervious Area
	120,717		95.74% Impervious Area

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

Summary for Subcatchment PR2c:

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af, Depth= 2.85"
Routed to Pond 4P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	11,934	98	Impervious Area, HSG C
*	358	86	Open Space, HSG C
	12,292		Weighted Average
	358		2.91% Pervious Area
	11,934		97.09% Impervious Area

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

Summary for Subcatchment PR2d:

Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.73"
Routed to Pond 5P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	10,870	98	Impervious Area, HSG C
*	1,667	86	OpenSpace, HSG C
	12,537		Weighted Average
	1,667		13.30% Pervious Area
	10,870		86.70% Impervious Area

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

Summary for Subcatchment PR2e:

Runoff = 1.88 cfs @ 12.09 hrs, Volume= 0.144 af, Depth= 2.15"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	22,895	86	Open Space, HSG C
*	12,174	98	Impervious Area, HSG C
	35,069		Weighted Average
	22,895		65.29% Pervious Area
	12,174		34.71% Impervious Area

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

Summary for Subcatchment PR2f:

Runoff = 0.52 cfs @ 12.11 hrs, Volume= 0.043 af, Depth= 0.78"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.11"

	Area (sf)	CN	Description
*	28,654	70	Woods, HSG C
	28,654		100.00% Pervious Area

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

Summary for Pond 1P:

Inflow Area = 0.815 ac, 64.37% Impervious, Inflow Depth = 2.48" for 2-yr event
Inflow = 2.13 cfs @ 12.09 hrs, Volume= 0.168 af
Outflow = 1.52 cfs @ 12.17 hrs, Volume= 0.152 af, Atten= 29%, Lag= 5.0 min
Discarded = 0.02 cfs @ 6.40 hrs, Volume= 0.041 af
Primary = 1.50 cfs @ 12.17 hrs, Volume= 0.111 af
Routed to Link DP1 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 74.70' @ 12.17 hrs Surf.Area= 3,035 sf Storage= 2,036 cf

Plug-Flow detention time= 139.9 min calculated for 0.152 af (90% of inflow)
Center-of-Mass det. time= 91.5 min (865.3 - 773.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	73.60'	2,090 cf	**29.50'W x 102.88'L x 2.33'H Field A** 7,082 cf Overall - 1,857 cf Embedded = 5,224 cf x 40.0% Voids
#2A	74.10'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 9 Rows
		3,947 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	73.60'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	71.00'	**12.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 71.00' / 70.20' S= 0.0267 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Device 2	75.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	74.30'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 6.40 hrs HW=73.62' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.48 cfs @ 12.17 hrs HW=74.69' (Free Discharge)
└**2=Culvert** (Passes 1.48 cfs of 6.76 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 1.48 cfs @ 2.22 fps)

Summary for Pond 2P:

Inflow Area = 1.458 ac, 92.10% Impervious, Inflow Depth = 2.79" for 2-yr event
Inflow = 4.19 cfs @ 12.09 hrs, Volume= 0.339 af
Outflow = 3.36 cfs @ 12.15 hrs, Volume= 0.324 af, Atten= 20%, Lag= 4.0 min
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 3.36 cfs @ 12.15 hrs, Volume= 0.324 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 76.80' @ 12.15 hrs Surf.Area= 3,120 sf Storage= 2,549 cf

Plug-Flow detention time= 75.4 min calculated for 0.324 af (95% of inflow)
Center-of-Mass det. time= 49.0 min (809.3 - 760.3)

Volume	Invert	Avail.Storage	Storage Description
#1B	75.50'	2,146 cf	**32.58'W x 95.76'L x 2.33'H Field B** 7,280 cf Overall - 1,916 cf Embedded = 5,364 cf x 40.0% Voids
#2B	76.00'	1,916 cf	**ADS_StormTech SC-310 +Cap** x 130 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 130 Chambers in 10 Rows
		4,062 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	75.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	76.00'	**24.0" Round Culvert** L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 76.00' / 75.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 1	76.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=75.50' (Free Discharge)
└**1=Exfiltration** (Passes 0.00 cfs of 0.02 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Primary OutFlow Max=3.34 cfs @ 12.15 hrs HW=76.80' (Free Discharge)
└**2=Culvert** (Barrel Controls 3.34 cfs @ 4.22 fps)

Summary for Pond 3P:

Inflow Area = 2.895 ac, 95.74% Impervious, Inflow Depth = 2.83" for 2-yr event
Inflow = 8.41 cfs @ 12.09 hrs, Volume= 0.683 af
Outflow = 8.21 cfs @ 12.11 hrs, Volume= 0.619 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.01 cfs @ 2.65 hrs, Volume= 0.028 af
Primary = 8.20 cfs @ 12.11 hrs, Volume= 0.591 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.09' @ 12.11 hrs Surf.Area= 1,928 sf Storage= 4,068 cf

Plug-Flow detention time= 95.3 min calculated for 0.619 af (91% of inflow)
Center-of-Mass det. time= 48.0 min (806.7 - 758.8)

Volume	Invert	Avail.Storage	Storage Description
#1B	66.00'	1,384 cf	**22.75'W x 41.55'L x 5.50'H Field B** 5,199 cf Overall - 1,739 cf Embedded = 3,460 cf x 40.0% Voids
#2B	66.75'	1,739 cf	**ADS_StormTech MC-3500 d +Cap** x 15 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 15 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
#3D	66.00'	1,434 cf	**15.58'W x 63.06'L x 5.50'H Field D** 5,405 cf Overall - 1,819 cf Embedded = 3,586 cf x 40.0% Voids
#4D	66.75'	1,819 cf	**ADS_StormTech MC-3500 d +Cap** x 16 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 16 Chambers in 2 Rows Cap Storage= 14.9 cf x 2 x 2 rows = 59.6 cf
		6,376 cf	Total Available Storage

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

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.60'	**24.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.60' / 67.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	68.35'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 2.65 hrs HW=66.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=8.10 cfs @ 12.11 hrs HW=69.08' (Free Discharge)
└**2=Culvert** (Passes 8.10 cfs of 8.17 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 8.10 cfs @ 2.76 fps)

Summary for Pond 4P:

Inflow Area = 0.282 ac, 97.09% Impervious, Inflow Depth = 2.85" for 2-yr event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af
Outflow = 0.78 cfs @ 12.16 hrs, Volume= 0.044 af, Atten= 6%, Lag= 4.6 min
Discarded = 0.01 cfs @ 4.90 hrs, Volume= 0.015 af
Primary = 0.77 cfs @ 12.16 hrs, Volume= 0.029 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.47' @ 12.17 hrs Surf.Area= 1,071 sf Storage= 1,216 cf

Plug-Flow detention time= 225.2 min calculated for 0.044 af (66% of inflow)
Center-of-Mass det. time= 126.6 min (884.8 - 758.2)

Volume	Invert	Avail.Storage	Storage Description
#1C	67.50'	752 cf	**23.33'W x 45.92'L x 2.33'H Field C** 2,500 cf Overall - 619 cf Embedded = 1,881 cf x 40.0% Voids
#2C	68.00'	619 cf	**ADS_StormTech SC-310 +Cap** x 42 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 42 Chambers in 7 Rows
		1,372 cf	Total Available Storage

Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	68.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.00' / 66.70' S= 0.0144 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	69.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 4.90 hrs HW=67.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.68 cfs @ 12.16 hrs HW=69.45' (Free Discharge)
└**2=Culvert** (Passes 0.68 cfs of 2.92 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.68 cfs @ 1.10 fps)

Summary for Pond 5P:

Inflow Area = 0.288 ac, 86.70% Impervious, Inflow Depth = 2.73" for 2-yr event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.79 cfs @ 12.11 hrs, Volume= 0.051 af, Atten= 2%, Lag= 1.3 min
Discarded = 0.01 cfs @ 4.70 hrs, Volume= 0.013 af
Primary = 0.79 cfs @ 12.11 hrs, Volume= 0.038 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 68.72' @ 12.11 hrs Surf.Area= 905 sf Storage= 841 cf

Plug-Flow detention time= 174.5 min calculated for 0.051 af (78% of inflow)
Center-of-Mass det. time= 94.9 min (857.6 - 762.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	67.20'	639 cf	**23.33'W x 38.80'L x 2.33'H Field A** 2,112 cf Overall - 516 cf Embedded = 1,596 cf x 40.0% Voids
#2A	67.70'	516 cf	**ADS_StormTech SC-310 +Cap** x 35 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 35 Chambers in 7 Rows
		1,155 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.20'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.70'	**12.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.20' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	68.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 4.70 hrs HW=67.22' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.77 cfs @ 12.11 hrs HW=68.72' (Free Discharge)
└**2=Culvert** (Passes 0.77 cfs of 2.15 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.77 cfs @ 1.15 fps)

Summary for Pond 6P:

Inflow Area = 0.805 ac, 34.71% Impervious, Inflow Depth = 2.15" for 2-yr event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.144 af
Outflow = 0.25 cfs @ 12.67 hrs, Volume= 0.080 af, Atten= 87%, Lag= 34.6 min
Discarded = 0.02 cfs @ 12.67 hrs, Volume= 0.039 af
Primary = 0.23 cfs @ 12.67 hrs, Volume= 0.041 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 73.25' @ 12.67 hrs Surf.Area= 3,443 sf Storage= 3,414 cf

Plug-Flow detention time= 314.0 min calculated for 0.079 af (55% of inflow)
Center-of-Mass det. time= 201.3 min (994.0 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	72.00'	2,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	72.00'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		6,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	931	0	0
73.00	1,395	1,163	1,163
74.00	1,900	1,648	2,811

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	1,133	0	0
73.00	1,730	1,432	1,432
74.00	2,500	2,115	3,547

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round Culvert** L= 340.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 70.00' / 67.40' S= 0.0076 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	73.20'	**6.0" Horiz. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	72.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.67 hrs HW=73.25' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.22 cfs @ 12.67 hrs HW=73.25' (Free Discharge)
└**1=Culvert** (Passes 0.22 cfs of 3.91 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.22 cfs @ 0.73 fps)

Summary for Link DP1:

Inflow Area = 1.468 ac, 42.14% Impervious, Inflow Depth = 1.39" for 2-yr event
Inflow = 2.10 cfs @ 12.13 hrs, Volume= 0.170 af
Primary = 2.10 cfs @ 12.13 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.385 ac, 77.00% Impervious, Inflow Depth > 2.00" for 2-yr event
Inflow = 12.93 cfs @ 12.13 hrs, Volume= 1.065 af
Primary = 12.93 cfs @ 12.13 hrs, Volume= 1.065 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1a: Runoff Area=35,497 sf 64.37% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=WQ Runoff=3.58 cfs 0.287 af

SubcatchmentPR1b: Runoff Area=28,436 sf 14.40% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=WQ Runoff=1.69 cfs 0.129 af

SubcatchmentPR2a: Runoff Area=63,506 sf 92.10% Impervious Runoff Depth=4.58"
Tc=6.0 min CN=WQ Runoff=6.75 cfs 0.557 af

SubcatchmentPR2b: Runoff Area=126,093 sf 95.74% Impervious Runoff Depth=4.63"
Tc=6.0 min CN=WQ Runoff=13.50 cfs 1.116 af

SubcatchmentPR2c: Runoff Area=12,292 sf 97.09% Impervious Runoff Depth=4.65"
Tc=6.0 min CN=WQ Runoff=1.32 cfs 0.109 af

SubcatchmentPR2d: Runoff Area=12,537 sf 86.70% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=WQ Runoff=1.32 cfs 0.108 af

SubcatchmentPR2e: Runoff Area=35,069 sf 34.71% Impervious Runoff Depth=3.84"
Tc=6.0 min CN=WQ Runoff=3.33 cfs 0.258 af

SubcatchmentPR2f: Runoff Area=28,654 sf 0.00% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=70 Runoff=1.47 cfs 0.108 af

Pond 1P: Peak Elev=75.00' Storage=2,665 cf Inflow=3.58 cfs 0.287 af
Discarded=0.02 cfs 0.043 af Primary=2.33 cfs 0.227 af Outflow=2.35 cfs 0.270 af

Pond 2P: Peak Elev=77.10' Storage=3,119 cf Inflow=6.75 cfs 0.557 af
Discarded=0.02 cfs 0.000 af Primary=5.81 cfs 0.541 af Outflow=5.82 cfs 0.541 af

Pond 3P: Peak Elev=69.62' Storage=4,745 cf Inflow=13.50 cfs 1.116 af
Discarded=0.01 cfs 0.029 af Primary=12.14 cfs 1.024 af Outflow=12.15 cfs 1.052 af

Pond 4P: Peak Elev=69.54' Storage=1,244 cf Inflow=1.32 cfs 0.109 af
Discarded=0.01 cfs 0.016 af Primary=1.30 cfs 0.071 af Outflow=1.31 cfs 0.086 af

Pond 5P: Peak Elev=68.79' Storage=874 cf Inflow=1.32 cfs 0.108 af
Discarded=0.01 cfs 0.013 af Primary=1.30 cfs 0.081 af Outflow=1.31 cfs 0.094 af

Pond 6P: Peak Elev=73.47' Storage=4,216 cf Inflow=3.33 cfs 0.258 af
Discarded=0.02 cfs 0.042 af Primary=1.98 cfs 0.151 af Outflow=2.00 cfs 0.193 af

Link DP1: Inflow=3.82 cfs 0.355 af
Primary=3.82 cfs 0.355 af

Link DP2: Inflow=23.73 cfs 1.976 af
Primary=23.73 cfs 1.976 af

Total Runoff Area = 7.853 ac Runoff Volume = 2.672 af Average Runoff Depth = 4.08"
29.51% Pervious = 2.318 ac 70.49% Impervious = 5.536 ac

Summary for Subcatchment PR1a:

Runoff = 3.58 cfs @ 12.09 hrs, Volume= 0.287 af, Depth= 4.22"
Routed to Pond 1P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	12,647	86	Open Space, HSG C
*	22,850	98	Impervious Area, HSG C
	35,497		Weighted Average
	12,647		35.63% Pervious Area
	22,850		64.37% Impervious Area

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

Summary for Subcatchment PR1b:

Runoff = 1.69 cfs @ 12.09 hrs, Volume= 0.129 af, Depth= 2.37"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	24,342	70	Woods, HSG C
*	4,094	98	Impervious, HSG C
	28,436		Weighted Average
	24,342		85.60% Pervious Area
	4,094		14.40% Impervious Area

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

Summary for Subcatchment PR2a:

Runoff = 6.75 cfs @ 12.09 hrs, Volume= 0.557 af, Depth= 4.58"
Routed to Pond 2P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	58,491	98	Impervious Area, HSG C (south bldg and courtyard)
*	5,015	86	Open Space, HSG C
	63,506		Weighted Average
	5,015		7.90% Pervious Area
	58,491		92.10% Impervious Area

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

Summary for Subcatchment PR2b:

Runoff = 13.50 cfs @ 12.09 hrs, Volume= 1.116 af, Depth= 4.63"
Routed to Pond 3P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	120,717	98	Impervious Area, HSG C
*	5,376	86	Open Space, HSG C
	126,093		Weighted Average
	5,376		4.26% Pervious Area
	120,717		95.74% Impervious Area

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

Summary for Subcatchment PR2c:

Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.109 af, Depth= 4.65"
Routed to Pond 4P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	11,934	98	Impervious Area, HSG C
*	358	86	Open Space, HSG C
	12,292		Weighted Average
	358		2.91% Pervious Area
	11,934		97.09% Impervious Area

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

Summary for Subcatchment PR2d:

Runoff = 1.32 cfs @ 12.09 hrs, Volume= 0.108 af, Depth= 4.51"
Routed to Pond 5P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	10,870	98	Impervious Area, HSG C
*	1,667	86	OpenSpace, HSG C
	12,537		Weighted Average
	1,667		13.30% Pervious Area
	10,870		86.70% Impervious Area

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

Summary for Subcatchment PR2e:

Runoff = 3.33 cfs @ 12.09 hrs, Volume= 0.258 af, Depth= 3.84"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	22,895	86	Open Space, HSG C
*	12,174	98	Impervious Area, HSG C
	35,069		Weighted Average
	22,895		65.29% Pervious Area
	12,174		34.71% Impervious Area

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

Summary for Subcatchment PR2f:

Runoff = 1.47 cfs @ 12.10 hrs, Volume= 0.108 af, Depth= 1.98"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.92"

	Area (sf)	CN	Description
*	28,654	70	Woods, HSG C
	28,654		100.00% Pervious Area

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

Summary for Pond 1P:

Inflow Area = 0.815 ac, 64.37% Impervious, Inflow Depth = 4.22" for 10-yr event
Inflow = 3.58 cfs @ 12.09 hrs, Volume= 0.287 af
Outflow = 2.35 cfs @ 12.19 hrs, Volume= 0.270 af, Atten= 34%, Lag= 5.9 min
Discarded = 0.02 cfs @ 3.80 hrs, Volume= 0.043 af
Primary = 2.33 cfs @ 12.19 hrs, Volume= 0.227 af
Routed to Link DP1 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 75.00' @ 12.19 hrs Surf.Area= 3,035 sf Storage= 2,665 cf

Plug-Flow detention time= 99.2 min calculated for 0.270 af (94% of inflow)
Center-of-Mass det. time= 66.2 min (830.7 - 764.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	73.60'	2,090 cf	**29.50'W x 102.88'L x 2.33'H Field A** 7,082 cf Overall - 1,857 cf Embedded = 5,224 cf x 40.0% Voids
#2A	74.10'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 9 Rows
		3,947 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	73.60'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	71.00'	**12.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 71.00' / 70.20' S= 0.0267 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Device 2	75.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	74.30'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 3.80 hrs HW=73.62' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.32 cfs @ 12.19 hrs HW=74.99' (Free Discharge)
└**2=Culvert** (Passes 2.32 cfs of 7.07 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 2.32 cfs @ 3.47 fps)

Summary for Pond 2P:

Inflow Area = 1.458 ac, 92.10% Impervious, Inflow Depth = 4.58" for 10-yr event
Inflow = 6.75 cfs @ 12.09 hrs, Volume= 0.557 af
Outflow = 5.82 cfs @ 12.14 hrs, Volume= 0.541 af, Atten= 14%, Lag= 3.2 min
Discarded = 0.02 cfs @ 12.05 hrs, Volume= 0.000 af
Primary = 5.81 cfs @ 12.14 hrs, Volume= 0.541 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 77.10' @ 12.14 hrs Surf.Area= 3,120 sf Storage= 3,119 cf

Plug-Flow detention time= 55.3 min calculated for 0.541 af (97% of inflow)
Center-of-Mass det. time= 38.0 min (789.6 - 751.6)

Volume	Invert	Avail.Storage	Storage Description
#1B	75.50'	2,146 cf	**32.58'W x 95.76'L x 2.33'H Field B** 7,280 cf Overall - 1,916 cf Embedded = 5,364 cf x 40.0% Voids
#2B	76.00'	1,916 cf	**ADS_StormTech SC-310 +Cap** x 130 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 130 Chambers in 10 Rows
		4,062 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	75.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	76.00'	**24.0" Round Culvert** L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 76.00' / 75.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 1	76.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.05 hrs HW=76.90' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)
└**3=Broad-Crested Rectangular Weir** (Passes 0.02 cfs of 0.14 cfs potential flow)

Primary OutFlow Max=5.72 cfs @ 12.14 hrs HW=77.09' (Free Discharge)
└**2=Culvert** (Barrel Controls 5.72 cfs @ 4.71 fps)

Summary for Pond 3P:

Inflow Area = 2.895 ac, 95.74% Impervious, Inflow Depth = 4.63" for 10-yr event
Inflow = 13.50 cfs @ 12.09 hrs, Volume= 1.116 af
Outflow = 12.15 cfs @ 12.13 hrs, Volume= 1.052 af, Atten= 10%, Lag= 2.3 min
Discarded = 0.01 cfs @ 1.70 hrs, Volume= 0.029 af
Primary = 12.14 cfs @ 12.13 hrs, Volume= 1.024 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.62' @ 12.13 hrs Surf.Area= 1,928 sf Storage= 4,745 cf

Plug-Flow detention time= 68.6 min calculated for 1.051 af (94% of inflow)
Center-of-Mass det. time= 36.7 min (786.8 - 750.1)

Volume	Invert	Avail.Storage	Storage Description
#1B	66.00'	1,384 cf	**22.75'W x 41.55'L x 5.50'H Field B** 5,199 cf Overall - 1,739 cf Embedded = 3,460 cf x 40.0% Voids
#2B	66.75'	1,739 cf	**ADS_StormTech MC-3500 d +Cap** x 15 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 15 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
#3D	66.00'	1,434 cf	**15.58'W x 63.06'L x 5.50'H Field D** 5,405 cf Overall - 1,819 cf Embedded = 3,586 cf x 40.0% Voids
#4D	66.75'	1,819 cf	**ADS_StormTech MC-3500 d +Cap** x 16 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 16 Chambers in 2 Rows Cap Storage= 14.9 cf x 2 x 2 rows = 59.6 cf
		6,376 cf	Total Available Storage

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

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.60'	**24.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.60' / 67.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	68.35'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 1.70 hrs HW=66.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=11.90 cfs @ 12.13 hrs HW=69.59' (Free Discharge)
└**2=Culvert** (Inlet Controls 11.90 cfs @ 3.79 fps)
└**3=Broad-Crested Rectangular Weir** (Passes 11.90 cfs of 18.33 cfs potential flow)

Summary for Pond 4P:

Inflow Area = 0.282 ac, 97.09% Impervious, Inflow Depth = 4.65" for 10-yr event
Inflow = 1.32 cfs @ 12.09 hrs, Volume= 0.109 af
Outflow = 1.31 cfs @ 12.10 hrs, Volume= 0.086 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.01 cfs @ 2.90 hrs, Volume= 0.016 af
Primary = 1.30 cfs @ 12.10 hrs, Volume= 0.071 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.54' @ 12.10 hrs Surf.Area= 1,071 sf Storage= 1,244 cf

Plug-Flow detention time= 166.7 min calculated for 0.086 af (79% of inflow)
Center-of-Mass det. time= 87.3 min (836.8 - 749.5)

Volume	Invert	Avail.Storage	Storage Description
#1C	67.50'	752 cf	**23.33'W x 45.92'L x 2.33'H Field C** 2,500 cf Overall - 619 cf Embedded = 1,881 cf x 40.0% Voids
#2C	68.00'	619 cf	**ADS_StormTech SC-310 +Cap** x 42 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 42 Chambers in 7 Rows
		1,372 cf	Total Available Storage

Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	68.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.00' / 66.70' S= 0.0144 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	69.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 2.90 hrs HW=67.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.29 cfs @ 12.10 hrs HW=69.54' (Free Discharge)
└**2=Culvert** (Passes 1.29 cfs of 3.04 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.29 cfs @ 1.37 fps)

Summary for Pond 5P:

Inflow Area = 0.288 ac, 86.70% Impervious, Inflow Depth = 4.51" for 10-yr event
Inflow = 1.32 cfs @ 12.09 hrs, Volume= 0.108 af
Outflow = 1.31 cfs @ 12.10 hrs, Volume= 0.094 af, Atten= 1%, Lag= 1.0 min
Discarded = 0.01 cfs @ 2.75 hrs, Volume= 0.013 af
Primary = 1.30 cfs @ 12.10 hrs, Volume= 0.081 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 68.79' @ 12.10 hrs Surf.Area= 905 sf Storage= 874 cf

Plug-Flow detention time= 130.6 min calculated for 0.094 af (87% of inflow)
Center-of-Mass det. time= 70.0 min (823.9 - 754.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	67.20'	639 cf	**23.33'W x 38.80'L x 2.33'H Field A** 2,112 cf Overall - 516 cf Embedded = 1,596 cf x 40.0% Voids
#2A	67.70'	516 cf	**ADS_StormTech SC-310 +Cap** x 35 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 35 Chambers in 7 Rows
		1,155 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.20'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.70'	**12.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.20' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	68.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 2.75 hrs HW=67.22' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.29 cfs @ 12.10 hrs HW=68.79' (Free Discharge)
└**2=Culvert** (Passes 1.29 cfs of 2.28 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.29 cfs @ 1.37 fps)

Summary for Pond 6P:

Inflow Area = 0.805 ac, 34.71% Impervious, Inflow Depth = 3.84" for 10-yr event
Inflow = 3.33 cfs @ 12.09 hrs, Volume= 0.258 af
Outflow = 2.00 cfs @ 12.21 hrs, Volume= 0.193 af, Atten= 40%, Lag= 7.0 min
Discarded = 0.02 cfs @ 12.21 hrs, Volume= 0.042 af
Primary = 1.98 cfs @ 12.21 hrs, Volume= 0.151 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 73.47' @ 12.21 hrs Surf.Area= 3,728 sf Storage= 4,216 cf

Plug-Flow detention time= 188.2 min calculated for 0.193 af (75% of inflow)
Center-of-Mass det. time= 102.7 min (883.7 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	72.00'	2,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	72.00'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		6,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	931	0	0
73.00	1,395	1,163	1,163
74.00	1,900	1,648	2,811

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	1,133	0	0
73.00	1,730	1,432	1,432
74.00	2,500	2,115	3,547

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round Culvert** L= 340.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 70.00' / 67.40' S= 0.0076 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	73.20'	**6.0" Horiz. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	72.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.21 hrs HW=73.47' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.97 cfs @ 12.21 hrs HW=73.47' (Free Discharge)
└**1=Culvert** (Passes 1.97 cfs of 4.00 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.97 cfs @ 2.51 fps)

Summary for Link DP1:

Inflow Area = 1.468 ac, 42.14% Impervious, Inflow Depth = 2.91" for 10-yr event
Inflow = 3.82 cfs @ 12.12 hrs, Volume= 0.355 af
Primary = 3.82 cfs @ 12.12 hrs, Volume= 0.355 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.385 ac, 77.00% Impervious, Inflow Depth = 3.71" for 10-yr event
Inflow = 23.73 cfs @ 12.12 hrs, Volume= 1.976 af
Primary = 23.73 cfs @ 12.12 hrs, Volume= 1.976 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1a: Runoff Area=35,497 sf 64.37% Impervious Runoff Depth=5.33"
Tc=6.0 min CN=WQ Runoff=4.48 cfs 0.362 af

SubcatchmentPR1b: Runoff Area=28,436 sf 14.40% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=WQ Runoff=2.36 cfs 0.178 af

SubcatchmentPR2a: Runoff Area=63,506 sf 92.10% Impervious Runoff Depth=5.70"
Tc=6.0 min CN=WQ Runoff=8.35 cfs 0.693 af

SubcatchmentPR2b: Runoff Area=126,093 sf 95.74% Impervious Runoff Depth=5.75"
Tc=6.0 min CN=WQ Runoff=16.66 cfs 1.388 af

SubcatchmentPR2c: Runoff Area=12,292 sf 97.09% Impervious Runoff Depth=5.77"
Tc=6.0 min CN=WQ Runoff=1.63 cfs 0.136 af

SubcatchmentPR2d: Runoff Area=12,537 sf 86.70% Impervious Runoff Depth=5.63"
Tc=6.0 min CN=WQ Runoff=1.64 cfs 0.135 af

SubcatchmentPR2e: Runoff Area=35,069 sf 34.71% Impervious Runoff Depth=4.93"
Tc=6.0 min CN=WQ Runoff=4.24 cfs 0.331 af

SubcatchmentPR2f: Runoff Area=28,654 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=70 Runoff=2.14 cfs 0.156 af

Pond 1P: Peak Elev=75.25' Storage=3,096 cf Inflow=4.48 cfs 0.362 af
Discarded=0.02 cfs 0.044 af Primary=2.83 cfs 0.301 af Outflow=2.85 cfs 0.345 af

Pond 2P: Peak Elev=77.29' Storage=3,377 cf Inflow=8.35 cfs 0.693 af
Discarded=0.02 cfs 0.001 af Primary=7.44 cfs 0.677 af Outflow=7.46 cfs 0.678 af

Pond 3P: Peak Elev=70.12' Storage=5,285 cf Inflow=16.66 cfs 1.388 af
Discarded=0.01 cfs 0.029 af Primary=14.74 cfs 1.295 af Outflow=14.75 cfs 1.324 af

Pond 4P: Peak Elev=69.57' Storage=1,259 cf Inflow=1.63 cfs 0.136 af
Discarded=0.01 cfs 0.016 af Primary=1.61 cfs 0.097 af Outflow=1.62 cfs 0.113 af

Pond 5P: Peak Elev=68.82' Storage=890 cf Inflow=1.64 cfs 0.135 af
Discarded=0.01 cfs 0.013 af Primary=1.62 cfs 0.107 af Outflow=1.63 cfs 0.121 af

Pond 6P: Peak Elev=73.64' Storage=4,846 cf Inflow=4.24 cfs 0.331 af
Discarded=0.02 cfs 0.043 af Primary=2.50 cfs 0.223 af Outflow=2.53 cfs 0.266 af

Link DP1: Inflow=4.90 cfs 0.479 af
Primary=4.90 cfs 0.479 af

Link DP2: Inflow=29.71 cfs 2.555 af
Primary=29.71 cfs 2.555 af

Total Runoff Area = 7.853 ac Runoff Volume = 3.378 af Average Runoff Depth = 5.16"
29.51% Pervious = 2.318 ac 70.49% Impervious = 5.536 ac

Summary for Subcatchment PR1a:

Runoff = 4.48 cfs @ 12.09 hrs, Volume= 0.362 af, Depth= 5.33"
Routed to Pond 1P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	12,647	86	Open Space, HSG C
*	22,850	98	Impervious Area, HSG C
	35,497		Weighted Average
	12,647		35.63% Pervious Area
	22,850		64.37% Impervious Area

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

Summary for Subcatchment PR1b:

Runoff = 2.36 cfs @ 12.09 hrs, Volume= 0.178 af, Depth= 3.27"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	24,342	70	Woods, HSG C
*	4,094	98	Impervious, HSG C
	28,436		Weighted Average
	24,342		85.60% Pervious Area
	4,094		14.40% Impervious Area

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

Summary for Subcatchment PR2a:

Runoff = 8.35 cfs @ 12.09 hrs, Volume= 0.693 af, Depth= 5.70"
Routed to Pond 2P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	58,491	98	Impervious Area, HSG C (south bldg and courtyard)
*	5,015	86	Open Space, HSG C
	63,506		Weighted Average
	5,015		7.90% Pervious Area
	58,491		92.10% Impervious Area

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

Summary for Subcatchment PR2b:

Runoff = 16.66 cfs @ 12.09 hrs, Volume= 1.388 af, Depth= 5.75"
Routed to Pond 3P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	120,717	98	Impervious Area, HSG C
*	5,376	86	Open Space, HSG C
	126,093		Weighted Average
	5,376		4.26% Pervious Area
	120,717		95.74% Impervious Area

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

Summary for Subcatchment PR2c:

Runoff = 1.63 cfs @ 12.09 hrs, Volume= 0.136 af, Depth= 5.77"
Routed to Pond 4P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	11,934	98	Impervious Area, HSG C
*	358	86	Open Space, HSG C
	12,292		Weighted Average
	358		2.91% Pervious Area
	11,934		97.09% Impervious Area

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

Summary for Subcatchment PR2d:

Runoff = 1.64 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 5.63"
Routed to Pond 5P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	10,870	98	Impervious Area, HSG C
*	1,667	86	OpenSpace, HSG C
	12,537		Weighted Average
	1,667		13.30% Pervious Area
	10,870		86.70% Impervious Area

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

Summary for Subcatchment PR2e:

Runoff = 4.24 cfs @ 12.09 hrs, Volume= 0.331 af, Depth= 4.93"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	22,895	86	Open Space, HSG C
*	12,174	98	Impervious Area, HSG C
	35,069		Weighted Average
	22,895		65.29% Pervious Area
	12,174		34.71% Impervious Area

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

Summary for Subcatchment PR2f:

Runoff = 2.14 cfs @ 12.09 hrs, Volume= 0.156 af, Depth= 2.84"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.05"

	Area (sf)	CN	Description
*	28,654	70	Woods, HSG C
	28,654		100.00% Pervious Area

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

Summary for Pond 1P:

Inflow Area = 0.815 ac, 64.37% Impervious, Inflow Depth = 5.33" for 25-yr event
Inflow = 4.48 cfs @ 12.09 hrs, Volume= 0.362 af
Outflow = 2.85 cfs @ 12.19 hrs, Volume= 0.345 af, Atten= 36%, Lag= 6.3 min
Discarded = 0.02 cfs @ 2.90 hrs, Volume= 0.044 af
Primary = 2.83 cfs @ 12.19 hrs, Volume= 0.301 af
Routed to Link DP1 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 75.25' @ 12.19 hrs Surf.Area= 3,035 sf Storage= 3,096 cf

Plug-Flow detention time= 86.0 min calculated for 0.345 af (95% of inflow)
Center-of-Mass det. time= 58.5 min (819.2 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	73.60'	2,090 cf	**29.50'W x 102.88'L x 2.33'H Field A** 7,082 cf Overall - 1,857 cf Embedded = 5,224 cf x 40.0% Voids
#2A	74.10'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 9 Rows
		3,947 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	73.60'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	71.00'	**12.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 71.00' / 70.20' S= 0.0267 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Device 2	75.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	74.30'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 2.90 hrs HW=73.62' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.82 cfs @ 12.19 hrs HW=75.24' (Free Discharge)
└**2=Culvert** (Passes 2.82 cfs of 7.32 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 2.82 cfs @ 4.24 fps)

Summary for Pond 2P:

Inflow Area = 1.458 ac, 92.10% Impervious, Inflow Depth = 5.70" for 25-yr event
Inflow = 8.35 cfs @ 12.09 hrs, Volume= 0.693 af
Outflow = 7.46 cfs @ 12.13 hrs, Volume= 0.678 af, Atten= 11%, Lag= 2.6 min
Discarded = 0.02 cfs @ 12.05 hrs, Volume= 0.001 af
Primary = 7.44 cfs @ 12.13 hrs, Volume= 0.677 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 77.29' @ 12.13 hrs Surf.Area= 3,120 sf Storage= 3,377 cf

Plug-Flow detention time= 47.9 min calculated for 0.678 af (98% of inflow)
Center-of-Mass det. time= 33.7 min (782.0 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1B	75.50'	2,146 cf	**32.58'W x 95.76'L x 2.33'H Field B** 7,280 cf Overall - 1,916 cf Embedded = 5,364 cf x 40.0% Voids
#2B	76.00'	1,916 cf	**ADS_StormTech SC-310 +Cap** x 130 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 130 Chambers in 10 Rows
		4,062 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	75.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	76.00'	**24.0" Round Culvert** L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 76.00' / 75.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 1	76.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.05 hrs HW=77.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)
  └**3=Broad-Crested Rectangular Weir** (Passes 0.02 cfs of 1.03 cfs potential flow)

Primary OutFlow Max=7.28 cfs @ 12.13 hrs HW=77.27' (Free Discharge)
└**2=Culvert** (Barrel Controls 7.28 cfs @ 4.94 fps)

Summary for Pond 3P:

Inflow Area = 2.895 ac, 95.74% Impervious, Inflow Depth = 5.75" for 25-yr event
Inflow = 16.66 cfs @ 12.09 hrs, Volume= 1.388 af
Outflow = 14.75 cfs @ 12.13 hrs, Volume= 1.324 af, Atten= 11%, Lag= 2.7 min
Discarded = 0.01 cfs @ 1.35 hrs, Volume= 0.029 af
Primary = 14.74 cfs @ 12.13 hrs, Volume= 1.295 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 70.12' @ 12.13 hrs Surf.Area= 1,928 sf Storage= 5,285 cf

Plug-Flow detention time= 58.9 min calculated for 1.322 af (95% of inflow)
Center-of-Mass det. time= 32.2 min (779.0 - 746.8)

Volume	Invert	Avail.Storage	Storage Description
#1B	66.00'	1,384 cf	**22.75'W x 41.55'L x 5.50'H Field B** 5,199 cf Overall - 1,739 cf Embedded = 3,460 cf x 40.0% Voids
#2B	66.75'	1,739 cf	**ADS_StormTech MC-3500 d +Cap** x 15 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 15 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
#3D	66.00'	1,434 cf	**15.58'W x 63.06'L x 5.50'H Field D** 5,405 cf Overall - 1,819 cf Embedded = 3,586 cf x 40.0% Voids
#4D	66.75'	1,819 cf	**ADS_StormTech MC-3500 d +Cap** x 16 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 16 Chambers in 2 Rows Cap Storage= 14.9 cf x 2 x 2 rows = 59.6 cf
		6,376 cf	Total Available Storage

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

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.60'	**24.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.60' / 67.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	68.35'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 1.35 hrs HW=66.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=14.47 cfs @ 12.13 hrs HW=70.07' (Free Discharge)
└**2=Culvert** (Inlet Controls 14.47 cfs @ 4.60 fps)
  └**3=Broad-Crested Rectangular Weir** (Passes 14.47 cfs of 29.89 cfs potential flow)

Summary for Pond 4P:

Inflow Area = 0.282 ac, 97.09% Impervious, Inflow Depth = 5.77" for 25-yr event
Inflow = 1.63 cfs @ 12.09 hrs, Volume= 0.136 af
Outflow = 1.62 cfs @ 12.10 hrs, Volume= 0.113 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.01 cfs @ 2.25 hrs, Volume= 0.016 af
Primary = 1.61 cfs @ 12.10 hrs, Volume= 0.097 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.57' @ 12.10 hrs Surf.Area= 1,071 sf Storage= 1,259 cf

Plug-Flow detention time= 147.1 min calculated for 0.113 af (83% of inflow)
Center-of-Mass det. time= 78.0 min (824.2 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1C	67.50'	752 cf	**23.33'W x 45.92'L x 2.33'H Field C** 2,500 cf Overall - 619 cf Embedded = 1,881 cf x 40.0% Voids
#2C	68.00'	619 cf	**ADS_StormTech SC-310 +Cap** x 42 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 42 Chambers in 7 Rows
		1,372 cf	Total Available Storage

Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	68.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.00' / 66.70' S= 0.0144 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	69.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 2.25 hrs HW=67.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.61 cfs @ 12.10 hrs HW=69.57' (Free Discharge)
└**2=Culvert** (Passes 1.61 cfs of 3.09 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.61 cfs @ 1.48 fps)

Summary for Pond 5P:

Inflow Area = 0.288 ac, 86.70% Impervious, Inflow Depth = 5.63" for 25-yr event
Inflow = 1.64 cfs @ 12.09 hrs, Volume= 0.135 af
Outflow = 1.63 cfs @ 12.10 hrs, Volume= 0.121 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.01 cfs @ 2.10 hrs, Volume= 0.013 af
Primary = 1.62 cfs @ 12.10 hrs, Volume= 0.107 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 68.82' @ 12.10 hrs Surf.Area= 905 sf Storage= 890 cf

Plug-Flow detention time= 113.5 min calculated for 0.120 af (89% of inflow)
Center-of-Mass det. time= 62.1 min (812.7 - 750.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	67.20'	639 cf	**23.33'W x 38.80'L x 2.33'H Field A** 2,112 cf Overall - 516 cf Embedded = 1,596 cf x 40.0% Voids
#2A	67.70'	516 cf	**ADS_StormTech SC-310 +Cap** x 35 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 35 Chambers in 7 Rows
		1,155 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.20'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.70'	**12.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.20' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	68.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 2.10 hrs HW=67.22' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.61 cfs @ 12.10 hrs HW=68.82' (Free Discharge)
└**2=Culvert** (Passes 1.61 cfs of 2.35 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 1.61 cfs @ 1.48 fps)

Summary for Pond 6P:

Inflow Area = 0.805 ac, 34.71% Impervious, Inflow Depth = 4.93" for 25-yr event
Inflow = 4.24 cfs @ 12.09 hrs, Volume= 0.331 af
Outflow = 2.53 cfs @ 12.21 hrs, Volume= 0.266 af, Atten= 40%, Lag= 7.0 min
Discarded = 0.02 cfs @ 12.21 hrs, Volume= 0.043 af
Primary = 2.50 cfs @ 12.21 hrs, Volume= 0.223 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 73.64' @ 12.21 hrs Surf.Area= 3,938 sf Storage= 4,846 cf

Plug-Flow detention time= 161.6 min calculated for 0.266 af (80% of inflow)
Center-of-Mass det. time= 85.7 min (861.7 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	72.00'	2,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	72.00'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		6,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	931	0	0
73.00	1,395	1,163	1,163
74.00	1,900	1,648	2,811

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	1,133	0	0
73.00	1,730	1,432	1,432
74.00	2,500	2,115	3,547

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round Culvert** L= 340.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 70.00' / 67.40' S= 0.0076 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	73.20'	**6.0" Horiz. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	72.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 12.21 hrs HW=73.64' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.50 cfs @ 12.21 hrs HW=73.64' (Free Discharge)
└**1=Culvert** (Passes 2.50 cfs of 4.07 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 2.50 cfs @ 3.18 fps)

Summary for Link DP1:

Inflow Area = 1.468 ac, 42.14% Impervious, Inflow Depth = 3.91" for 25-yr event
Inflow = 4.90 cfs @ 12.12 hrs, Volume= 0.479 af
Primary = 4.90 cfs @ 12.12 hrs, Volume= 0.479 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.385 ac, 77.00% Impervious, Inflow Depth = 4.80" for 25-yr event
Inflow = 29.71 cfs @ 12.12 hrs, Volume= 2.555 af
Primary = 29.71 cfs @ 12.12 hrs, Volume= 2.555 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR1a: Runoff Area=35,497 sf 64.37% Impervious Runoff Depth=7.03"
Tc=6.0 min CN=WQ Runoff=5.87 cfs 0.478 af

SubcatchmentPR1b: Runoff Area=28,436 sf 14.40% Impervious Runoff Depth=4.75"
Tc=6.0 min CN=WQ Runoff=3.45 cfs 0.258 af

SubcatchmentPR2a: Runoff Area=63,506 sf 92.10% Impervious Runoff Depth=7.43"
Tc=6.0 min CN=WQ Runoff=10.79 cfs 0.902 af

SubcatchmentPR2b: Runoff Area=126,093 sf 95.74% Impervious Runoff Depth=7.48"
Tc=6.0 min CN=WQ Runoff=21.50 cfs 1.804 af

SubcatchmentPR2c: Runoff Area=12,292 sf 97.09% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=WQ Runoff=2.10 cfs 0.176 af

SubcatchmentPR2d: Runoff Area=12,537 sf 86.70% Impervious Runoff Depth=7.35"
Tc=6.0 min CN=WQ Runoff=2.12 cfs 0.176 af

SubcatchmentPR2e: Runoff Area=35,069 sf 34.71% Impervious Runoff Depth=6.61"
Tc=6.0 min CN=WQ Runoff=5.62 cfs 0.444 af

SubcatchmentPR2f: Runoff Area=28,654 sf 0.00% Impervious Runoff Depth=4.28"
Tc=6.0 min CN=70 Runoff=3.23 cfs 0.234 af

Pond 1P: Peak Elev=75.67' Storage=3,623 cf Inflow=5.87 cfs 0.478 af
Discarded=0.02 cfs 0.045 af Primary=4.60 cfs 0.416 af Outflow=4.62 cfs 0.461 af

Pond 2P: Peak Elev=77.55' Storage=3,712 cf Inflow=10.79 cfs 0.902 af
Discarded=0.02 cfs 0.001 af Primary=10.02 cfs 0.886 af Outflow=10.04 cfs 0.887 af

Pond 3P: Peak Elev=71.14' Storage=6,100 cf Inflow=21.50 cfs 1.804 af
Discarded=0.01 cfs 0.029 af Primary=19.07 cfs 1.711 af Outflow=19.08 cfs 1.740 af

Pond 4P: Peak Elev=69.62' Storage=1,280 cf Inflow=2.10 cfs 0.176 af
Discarded=0.01 cfs 0.016 af Primary=2.08 cfs 0.137 af Outflow=2.09 cfs 0.153 af

Pond 5P: Peak Elev=68.87' Storage=911 cf Inflow=2.12 cfs 0.176 af
Discarded=0.01 cfs 0.014 af Primary=2.11 cfs 0.148 af Outflow=2.12 cfs 0.162 af

Pond 6P: Peak Elev=73.85' Storage=5,706 cf Inflow=5.62 cfs 0.444 af
Discarded=0.03 cfs 0.044 af Primary=3.05 cfs 0.334 af Outflow=3.07 cfs 0.379 af

Link DP1: Inflow=7.34 cfs 0.674 af
Primary=7.34 cfs 0.674 af

Link DP2: Inflow=39.10 cfs 3.452 af
Primary=39.10 cfs 3.452 af

Total Runoff Area = 7.853 ac Runoff Volume = 4.473 af Average Runoff Depth = 6.84"
29.51% Pervious = 2.318 ac 70.49% Impervious = 5.536 ac

Summary for Subcatchment PR1a:

Runoff = 5.87 cfs @ 12.09 hrs, Volume= 0.478 af, Depth= 7.03"
Routed to Pond 1P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	12,647	86	Open Space, HSG C
*	22,850	98	Impervious Area, HSG C
	35,497		Weighted Average
	12,647		35.63% Pervious Area
	22,850		64.37% Impervious Area

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

Summary for Subcatchment PR1b:

Runoff = 3.45 cfs @ 12.09 hrs, Volume= 0.258 af, Depth= 4.75"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	24,342	70	Woods, HSG C
*	4,094	98	Impervious, HSG C
	28,436		Weighted Average
	24,342		85.60% Pervious Area
	4,094		14.40% Impervious Area

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

Summary for Subcatchment PR2a:

Runoff = 10.79 cfs @ 12.09 hrs, Volume= 0.902 af, Depth= 7.43"
Routed to Pond 2P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	58,491	98	Impervious Area, HSG C (south bldg and courtyard)
*	5,015	86	Open Space, HSG C
	63,506		Weighted Average
	5,015		7.90% Pervious Area
	58,491		92.10% Impervious Area

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

Summary for Subcatchment PR2b:

Runoff = 21.50 cfs @ 12.09 hrs, Volume= 1.804 af, Depth= 7.48"
Routed to Pond 3P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	120,717	98	Impervious Area, HSG C
*	5,376	86	Open Space, HSG C
	126,093		Weighted Average
	5,376		4.26% Pervious Area
	120,717		95.74% Impervious Area

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

Summary for Subcatchment PR2c:

Runoff = 2.10 cfs @ 12.09 hrs, Volume= 0.176 af, Depth= 7.50"
Routed to Pond 4P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	11,934	98	Impervious Area, HSG C
*	358	86	Open Space, HSG C
	12,292		Weighted Average
	358		2.91% Pervious Area
	11,934		97.09% Impervious Area

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

Summary for Subcatchment PR2d:

Runoff = 2.12 cfs @ 12.09 hrs, Volume= 0.176 af, Depth= 7.35"
Routed to Pond 5P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	10,870	98	Impervious Area, HSG C
*	1,667	86	OpenSpace, HSG C
	12,537		Weighted Average
	1,667		13.30% Pervious Area
	10,870		86.70% Impervious Area

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

Summary for Subcatchment PR2e:

Runoff = 5.62 cfs @ 12.09 hrs, Volume= 0.444 af, Depth= 6.61"
Routed to Pond 6P :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	22,895	86	Open Space, HSG C
*	12,174	98	Impervious Area, HSG C
	35,069		Weighted Average
	22,895		65.29% Pervious Area
	12,174		34.71% Impervious Area

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

Summary for Subcatchment PR2f:

Runoff = 3.23 cfs @ 12.09 hrs, Volume= 0.234 af, Depth= 4.28"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.78"

	Area (sf)	CN	Description
*	28,654	70	Woods, HSG C
	28,654		100.00% Pervious Area

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

Summary for Pond 1P:

Inflow Area = 0.815 ac, 64.37% Impervious, Inflow Depth = 7.03" for 100-yr event
Inflow = 5.87 cfs @ 12.09 hrs, Volume= 0.478 af
Outflow = 4.62 cfs @ 12.16 hrs, Volume= 0.461 af, Atten= 21%, Lag= 4.5 min
Discarded = 0.02 cfs @ 2.05 hrs, Volume= 0.045 af
Primary = 4.60 cfs @ 12.16 hrs, Volume= 0.416 af
Routed to Link DP1 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 75.67' @ 12.16 hrs Surf.Area= 3,035 sf Storage= 3,623 cf

Plug-Flow detention time= 72.5 min calculated for 0.461 af (96% of inflow)
Center-of-Mass det. time= 50.6 min (806.8 - 756.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	73.60'	2,090 cf	**29.50'W x 102.88'L x 2.33'H Field A** 7,082 cf Overall - 1,857 cf Embedded = 5,224 cf x 40.0% Voids
#2A	74.10'	1,857 cf	**ADS_StormTech SC-310 +Cap** x 126 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 126 Chambers in 9 Rows
		3,947 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	73.60'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	71.00'	**12.0" Round Culvert** L= 30.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 71.00' / 70.20' S= 0.0267 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#3	Device 2	75.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	74.30'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 2.05 hrs HW=73.62' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.43 cfs @ 12.16 hrs HW=75.64' (Free Discharge)
└**2=Culvert** (Passes 4.43 cfs of 7.70 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.95 cfs @ 1.23 fps)
└**4=Orifice/Grate** (Orifice Controls 3.48 cfs @ 5.22 fps)

Summary for Pond 2P:

Inflow Area = 1.458 ac, 92.10% Impervious, Inflow Depth = 7.43" for 100-yr event
Inflow = 10.79 cfs @ 12.09 hrs, Volume= 0.902 af
Outflow = 10.04 cfs @ 12.12 hrs, Volume= 0.887 af, Atten= 7%, Lag= 2.0 min
Discarded = 0.02 cfs @ 11.95 hrs, Volume= 0.001 af
Primary = 10.02 cfs @ 12.12 hrs, Volume= 0.886 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 77.55' @ 12.12 hrs Surf.Area= 3,120 sf Storage= 3,712 cf

Plug-Flow detention time= 39.8 min calculated for 0.886 af (98% of inflow)
Center-of-Mass det. time= 29.1 min (773.7 - 744.6)

Volume	Invert	Avail.Storage	Storage Description
#1B	75.50'	2,146 cf	**32.58'W x 95.76'L x 2.33'H Field B** 7,280 cf Overall - 1,916 cf Embedded = 5,364 cf x 40.0% Voids
#2B	76.00'	1,916 cf	**ADS_StormTech SC-310 +Cap** x 130 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 130 Chambers in 10 Rows
		4,062 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	75.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	76.00'	**24.0" Round Culvert** L= 50.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 76.00' / 75.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 1	76.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 11.95 hrs HW=76.90' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)
└**3=Broad-Crested Rectangular Weir** (Passes 0.02 cfs of 0.14 cfs potential flow)

Primary OutFlow Max=9.71 cfs @ 12.12 hrs HW=77.52' (Free Discharge)
└**2=Culvert** (Barrel Controls 9.71 cfs @ 5.24 fps)

Summary for Pond 3P:

Inflow Area = 2.895 ac, 95.74% Impervious, Inflow Depth = 7.48" for 100-yr event
Inflow = 21.50 cfs @ 12.09 hrs, Volume= 1.804 af
Outflow = 19.08 cfs @ 12.13 hrs, Volume= 1.740 af, Atten= 11%, Lag= 2.6 min
Discarded = 0.01 cfs @ 1.10 hrs, Volume= 0.029 af
Primary = 19.07 cfs @ 12.13 hrs, Volume= 1.711 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 71.14' @ 12.13 hrs Surf.Area= 1,928 sf Storage= 6,100 cf

Plug-Flow detention time= 48.6 min calculated for 1.737 af (96% of inflow)
Center-of-Mass det. time= 27.3 min (770.5 - 743.2)

Volume	Invert	Avail.Storage	Storage Description
#1B	66.00'	1,384 cf	**22.75'W x 41.55'L x 5.50'H Field B** 5,199 cf Overall - 1,739 cf Embedded = 3,460 cf x 40.0% Voids
#2B	66.75'	1,739 cf	**ADS_StormTech MC-3500 d +Cap** x 15 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 15 Chambers in 3 Rows Cap Storage= 14.9 cf x 2 x 3 rows = 89.4 cf
#3D	66.00'	1,434 cf	**15.58'W x 63.06'L x 5.50'H Field D** 5,405 cf Overall - 1,819 cf Embedded = 3,586 cf x 40.0% Voids
#4D	66.75'	1,819 cf	**ADS_StormTech MC-3500 d +Cap** x 16 Inside #3 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 16 Chambers in 2 Rows Cap Storage= 14.9 cf x 2 x 2 rows = 59.6 cf
		6,376 cf	Total Available Storage

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

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.60'	**24.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.60' / 67.10' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	68.35'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 1.10 hrs HW=66.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=18.70 cfs @ 12.13 hrs HW=71.05' (Free Discharge)
└**2=Culvert** (Inlet Controls 18.70 cfs @ 5.95 fps)
└**3=Broad-Crested Rectangular Weir** (Passes 18.70 cfs of 58.97 cfs potential flow)

Summary for Pond 4P:

Inflow Area = 0.282 ac, 97.09% Impervious, Inflow Depth = 7.50" for 100-yr event
Inflow = 2.10 cfs @ 12.09 hrs, Volume= 0.176 af
Outflow = 2.09 cfs @ 12.10 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 1.60 hrs, Volume= 0.016 af
Primary = 2.08 cfs @ 12.10 hrs, Volume= 0.137 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 69.62' @ 12.10 hrs Surf.Area= 1,071 sf Storage= 1,280 cf

Plug-Flow detention time= 127.2 min calculated for 0.153 af (87% of inflow)
Center-of-Mass det. time= 68.3 min (811.0 - 742.7)

Volume	Invert	Avail.Storage	Storage Description
#1C	67.50'	752 cf	**23.33'W x 45.92'L x 2.33'H Field C** 2,500 cf Overall - 619 cf Embedded = 1,881 cf x 40.0% Voids
#2C	68.00'	619 cf	**ADS_StormTech SC-310 +Cap** x 42 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 42 Chambers in 7 Rows
		1,372 cf	Total Available Storage

Storage Group C created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	68.00'	**12.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 68.00' / 66.70' S= 0.0144 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	69.30'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 1.60 hrs HW=67.52' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.08 cfs @ 12.10 hrs HW=69.62' (Free Discharge)
└**2=Culvert** (Passes 2.08 cfs of 3.16 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 2.08 cfs @ 1.62 fps)

Summary for Pond 5P:

Inflow Area = 0.288 ac, 86.70% Impervious, Inflow Depth = 7.35" for 100-yr event
Inflow = 2.12 cfs @ 12.09 hrs, Volume= 0.176 af
Outflow = 2.12 cfs @ 12.10 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.8 min
Discarded = 0.01 cfs @ 1.55 hrs, Volume= 0.014 af
Primary = 2.11 cfs @ 12.10 hrs, Volume= 0.148 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 68.87' @ 12.10 hrs Surf.Area= 905 sf Storage= 911 cf

Plug-Flow detention time= 97.2 min calculated for 0.162 af (92% of inflow)
Center-of-Mass det. time= 53.6 min (800.4 - 746.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	67.20'	639 cf	**23.33'W x 38.80'L x 2.33'H Field A** 2,112 cf Overall - 516 cf Embedded = 1,596 cf x 40.0% Voids
#2A	67.70'	516 cf	**ADS_StormTech SC-310 +Cap** x 35 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 35 Chambers in 7 Rows
		1,155 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	67.20'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	67.70'	**12.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.20' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	68.55'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 1.55 hrs HW=67.22' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.11 cfs @ 12.10 hrs HW=68.87' (Free Discharge)
└**2=Culvert** (Passes 2.11 cfs of 2.45 cfs potential flow)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 2.11 cfs @ 1.63 fps)

Summary for Pond 6P:

Inflow Area = 0.805 ac, 34.71% Impervious, Inflow Depth = 6.61" for 100-yr event
Inflow = 5.62 cfs @ 12.09 hrs, Volume= 0.444 af
Outflow = 3.07 cfs @ 12.22 hrs, Volume= 0.379 af, Atten= 45%, Lag= 7.9 min
Discarded = 0.03 cfs @ 12.22 hrs, Volume= 0.044 af
Primary = 3.05 cfs @ 12.22 hrs, Volume= 0.334 af
Routed to Link DP2 :

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 73.85' @ 12.22 hrs Surf.Area= 4,207 sf Storage= 5,706 cf

Plug-Flow detention time= 136.8 min calculated for 0.379 af (85% of inflow)
Center-of-Mass det. time= 73.1 min (843.1 - 770.0)

Volume	Invert	Avail.Storage	Storage Description
#1	72.00'	2,811 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	72.00'	3,547 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		6,357 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	931	0	0
73.00	1,395	1,163	1,163
74.00	1,900	1,648	2,811

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
72.00	1,133	0	0
73.00	1,730	1,432	1,432
74.00	2,500	2,115	3,547

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round Culvert** L= 340.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 70.00' / 67.40' S= 0.0076 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	73.20'	**6.0" Horiz. Orifice/Grate X 4.00** C= 0.600 Limited to weir flow at low heads
#3	Discarded	72.00'	**0.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.22 hrs HW=73.84' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=3.03 cfs @ 12.22 hrs HW=73.84' (Free Discharge)
└**1=Culvert** (Passes 3.03 cfs of 4.15 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 3.03 cfs @ 3.86 fps)

Summary for Link DP1:

Inflow Area = 1.468 ac, 42.14% Impervious, Inflow Depth = 5.51" for 100-yr event
Inflow = 7.34 cfs @ 12.14 hrs, Volume= 0.674 af
Primary = 7.34 cfs @ 12.14 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Link DP2:

Inflow Area = 6.385 ac, 77.00% Impervious, Inflow Depth = 6.49" for 100-yr event
Inflow = 39.10 cfs @ 12.12 hrs, Volume= 3.452 af
Primary = 39.10 cfs @ 12.12 hrs, Volume= 3.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #3 – RECHARGE AND DRAWDOWN TIME*
- *MA STANDARD #4 – WATER QUALITY AND TSS REMOVAL*
- *NOAA RAINFALL DATA*
- *PIPE SIZING*
- *OUTLET PROTECTION SIZING*
- *MOUNDING ANALYSIS AND NARRATIVE*

Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	4.610
Proposed Site Impervious Area (ac)	5.535
Proposed Increase in Site Impervious Area (ac)	0.925
Recharge Volume Required (cf)	**839**

Total Recharge Volume Required (cf)	**839**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**5.443**
%Impervious Directed to Infiltration BMP	98%
Adjustment Factor	1.02
Adjusted Total Recharge Volume Required (cf)	**853**

Provided Recharge Volume*	
1P	1,105
2P	2,645
3P	3,030
4P	1,143
5P	748
6P	3,245
Total Recharge Volume Provided (cf)	**11,916**

Provided greater than or Equal to Required

*Volume provided below lowest outlet in cubic feet (cf)

Prepared By:
BOHLER
45 Franklin St, Fl. 5
Boston, MA 02110
(617) 849-8040

Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - 1P	
Volume below outlet pipe (Rv) (cf)	1,105
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	3,032
Drawdown time (Hours)*	**16.2**
Drawdown Time - 2P	
Volume below outlet pipe (Rv) (cf)	2,645
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	3,120
Drawdown time (Hours)**	**37.7**
Drawdown Time - 3P	
Volume below outlet pipe (Rv) (cf)	3,030
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	1,920
Drawdown time (Hours)**	**70.1**
Drawdown Time - 4P	
Volume below outlet pipe (Rv) (cf)	1,143
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	1,071
Drawdown time (Hours)**	**47.4**
Drawdown Time - 5P	
Volume below outlet pipe (Rv) (cf)	748
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	904
Drawdown time (Hours)**	**36.8**

Drawdown Time - 6P	
Volume below outlet pipe (Rv) (cf)	3,245
Soil Type	Silt Loam - C
Infiltration rate (K)*	0.27
Bottom Area (sf)	2,064
Drawdown time (Hours)**	**69.9**

*Infiltration Rates taken from Rawls Table
**Drawdown time = Rv / (K) x (bottom area)

Prepared By:
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Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

MA DEP Standard 4: Water Quality Volume Calculations

Water Quality Volume Required	
Water Quality Volume runoff (in.)*	1.0
Total Post Development Impervious Area (sf)	241,107
Required Water Quality Volume (cf)	**20,092**
*Water Quality volume runoff is equal to 1.0 inches of runoff times the total impervious area of the post development project site.	

Water Quality Volume Provided*[1]	
Stormceptor and Cascade Water Quality Units sized for the 1.0 inch Volume	
Total Provided Water Quality Volume (cf)	**>20,092**

*An additional 11,916 cf of recharge volume is provided below lowest outlet pipe in cubic feet (cf)
[1] Required Water Quality Volume is met with the equivalent Water Qaulity Flow Rate

Prepared By:
BOHLER
45 Franklin St, Fl. 5
Boston, MA 02110
(617) 849-8040

Project: 100 Old River Road
Location: Andover, MA
Prepared For: Bohler

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 3 or Table in Figure 4. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
WQU 1	0.40	0.0006277	6.0	0.100	1.00	774.00	0.49
WQI 1	0.08	0.0001255	6.0	0.100	1.00	774.00	0.10
WQI 2	0.10	0.0001507	6.0	0.100	1.00	774.00	0.12
WQI 3	0.11	0.0001722	6.0	0.100	1.00	774.00	0.13
WQI 4	0.47	0.0007282	6.0	0.100	1.00	774.00	0.56
WQI 5	0.25	0.0003838	6.0	0.100	1.00	774.00	0.30
WQI 6	0.25	0.0003874	6.0	0.100	1.00	774.00	0.30
WQI 7	0.12	0.0001937	6.0	0.100	1.00	774.00	0.15
WQI 8	0.08	0.0001220	6.0	0.100	1.00	774.00	0.09

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

100 OLD RIVER ROAD
ANDOVER, MA

Area	0.40 ac	Unit Site Designation	WQU 1
Weighted C	0.90	Rainfall Station #	69
t_c	6 min		
Cascade Model	CS-3	Cascade Treatment Capacity	1.0 cfs

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.46	10.2
0.04	9.6%	19.8%	0.01	0.92	9.6
0.06	9.4%	29.3%	0.02	1.38	9.4
0.08	7.7%	37.0%	0.03	1.84	7.7
0.10	8.6%	45.6%	0.04	2.30	8.6
0.12	6.3%	51.9%	0.04	2.76	6.3
0.14	4.7%	56.5%	0.05	3.21	4.7
0.16	4.6%	61.2%	0.06	3.67	4.6
0.18	3.5%	64.7%	0.07	4.13	3.5
0.20	4.3%	69.1%	0.07	4.59	4.3
0.25	8.0%	77.1%	0.09	5.74	8.0
0.30	5.6%	82.7%	0.11	6.89	5.6
0.35	4.4%	87.0%	0.13	8.04	4.4
0.40	2.5%	89.5%	0.14	9.18	2.5
0.45	2.5%	92.1%	0.16	10.33	2.5
0.50	1.4%	93.5%	0.18	11.48	1.4
0.75	5.0%	98.5%	0.27	17.22	4.8
1.00	1.0%	99.5%	0.36	22.96	0.9
1.50	0.0%	99.5%	0.54	34.44	0.0
2.00	0.0%	99.5%	0.72	45.92	0.0
3.00	0.5%	100.0%	1.00	63.50	0.2
					99.4
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.5%
				Predicted Net Annual Load Removal Efficiency =	**93.0%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Brief Stormceptor Sizing Report - WQI 1

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 1
Target TSS Removal (%)	80
TSS Removal (%) Provided	97
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	97
STC 900	98
STC 1200	98
STC 1800	99
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	100
STC 11000	100
STC 13000	100
STC 16000	100

Stormceptor®

CONTECH ENGINEERED SOLUTIONS
A FORTERRA COMPANY

Sizing Details

Drainage Area	
Total Area (acres)	0.08
Imperviousness %	100.0

Rainfall	
Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - WQI 2

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 2
Target TSS Removal (%)	80
TSS Removal (%) Provided	96
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	96
STC 900	98
STC 1200	98
STC 1800	98
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	100
STC 13000	100
STC 16000	100

Sizing Details

Drainage Area

Total Area (acres)	0.10
Imperviousness %	100.0

Rainfall

Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - WQI 3

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 3
Target TSS Removal (%)	80
TSS Removal (%) Provided	96
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	96
STC 900	98
STC 1200	98
STC 1800	98
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	100
STC 13000	100
STC 16000	100

Sizing Details

Drainage Area

Total Area (acres)	0.11
Imperviousness %	100.0

Rainfall

Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

CONTECH ENGINEERED SOLUTIONS

CASCADE separator™

CASCADE ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

100 OLD RIVER ROAD
ANDOVER, MA

Area	**0.47 ac**	Unit Site Designation	**WQI 4**
Weighted C	**0.90**	Rainfall Station #	**69**
t_c	**6 min**		
Cascade Model	**CS-3**	Cascade Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Treated Flowrate (cfs)	Hydraulic Loading Rate (gpm/ft2)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.53	10.2
0.04	9.6%	19.8%	0.02	1.07	9.6
0.06	9.4%	29.3%	0.03	1.60	9.4
0.08	7.7%	37.0%	0.03	2.13	7.7
0.10	8.6%	45.6%	0.04	2.66	8.6
0.12	6.3%	51.9%	0.05	3.20	6.3
0.14	4.7%	56.5%	0.06	3.73	4.7
0.16	4.6%	61.2%	0.07	4.26	4.6
0.18	3.5%	64.7%	0.08	4.79	3.5
0.20	4.3%	69.1%	0.08	5.33	4.3
0.25	8.0%	77.1%	0.10	6.66	8.0
0.30	5.6%	82.7%	0.13	7.99	5.6
0.35	4.4%	87.0%	0.15	9.32	4.4
0.40	2.5%	89.5%	0.17	10.65	2.5
0.45	2.5%	92.1%	0.19	11.98	2.5
0.50	1.4%	93.5%	0.21	13.32	1.4
0.75	5.0%	98.5%	0.31	19.97	4.7
1.00	1.0%	99.5%	0.42	26.63	0.9
1.50	0.0%	99.5%	0.63	39.95	0.0
2.00	0.0%	99.5%	0.84	53.26	0.0
3.00	0.5%	100.0%	1.00	63.50	0.2
					99.2
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.4%
				Predicted Net Annual Load Removal Efficiency =	**92.8%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Brief Stormceptor Sizing Report - WQI 5

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 5
Target TSS Removal (%)	80
TSS Removal (%) Provided	92
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	92
STC 900	96
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	98
STC 4800	98
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

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Sizing Details

Drainage Area

Total Area (acres)	0.25
Imperviousness %	100.0

Rainfall

Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - WQI 6

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 6
Target TSS Removal (%)	80
TSS Removal (%) Provided	92
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	92
STC 900	96
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	98
STC 4800	98
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99

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Sizing Details

Drainage Area

Total Area (acres)	0.25
Imperviousness %	100.0

Rainfall

Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage

Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - WQI 7

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 7
Target TSS Removal (%)	80
TSS Removal (%) Provided	95
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	95
STC 900	98
STC 1200	98
STC 1800	98
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	100
STC 13000	100
STC 16000	100

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Sizing Details

Drainage Area	
Total Area (acres)	0.12
Imperviousness %	100.0

Rainfall	
Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

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

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - WQI 8

Project Information & Location			
Project Name	100 Old River Road	**Project Number**	885594
City	Andover	**State/ Province**	Massachusetts
Country	United States of America	**Date**	1/2/2026
Designer Information		**EOR Information (optional)**	
Name	David Adams	**Name**	
Company	Contech Engineered Solutions	**Company**	Bohler
Phone #	207-885-6191	**Phone #**	
Email	dadams@conteches.com	**Email**	

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

Site Name	WQI 8
Target TSS Removal (%)	80
TSS Removal (%) Provided	97
Recommended Stormceptor Model	STC 450i

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

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	97
STC 900	98
STC 1200	98
STC 1800	99
STC 2400	99
STC 3600	99
STC 4800	99
STC 6000	99
STC 7200	100
STC 11000	100
STC 13000	100
STC 16000	100

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Sizing Details

Drainage Area	
Total Area (acres)	0.08
Imperviousness %	100.0

Rainfall	
Station Name	BOSTON WSFO AP
State/Province	Massachusetts
Station ID #	0770
Years of Records	58
Latitude	42°21'38"N
Longitude	71°0'38"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

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

OK-110

Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
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For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

JOB NO. **MAB250074.00**
CALCULATED BY **WNG** DATE **01-09-26**
CHECKED BY **ZLR**

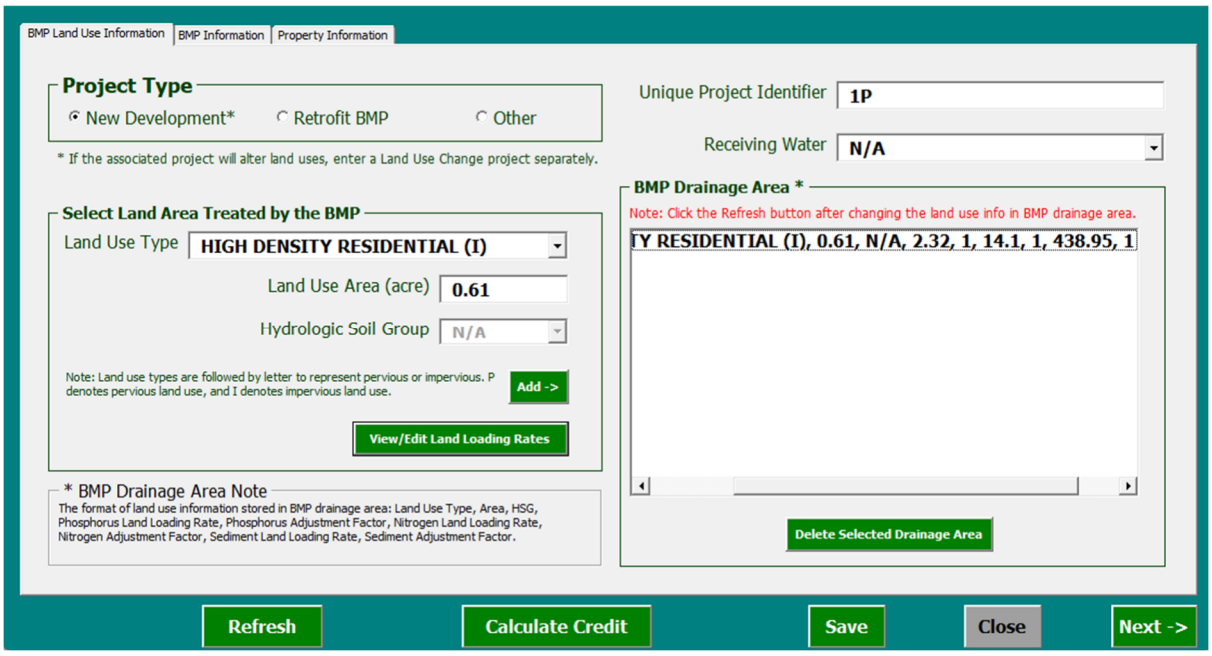
Proposed Mixed Use Multi-Family Development
100 Old River Road
Andover, MA

Post-Construction Phosphorus Reduction Calculation

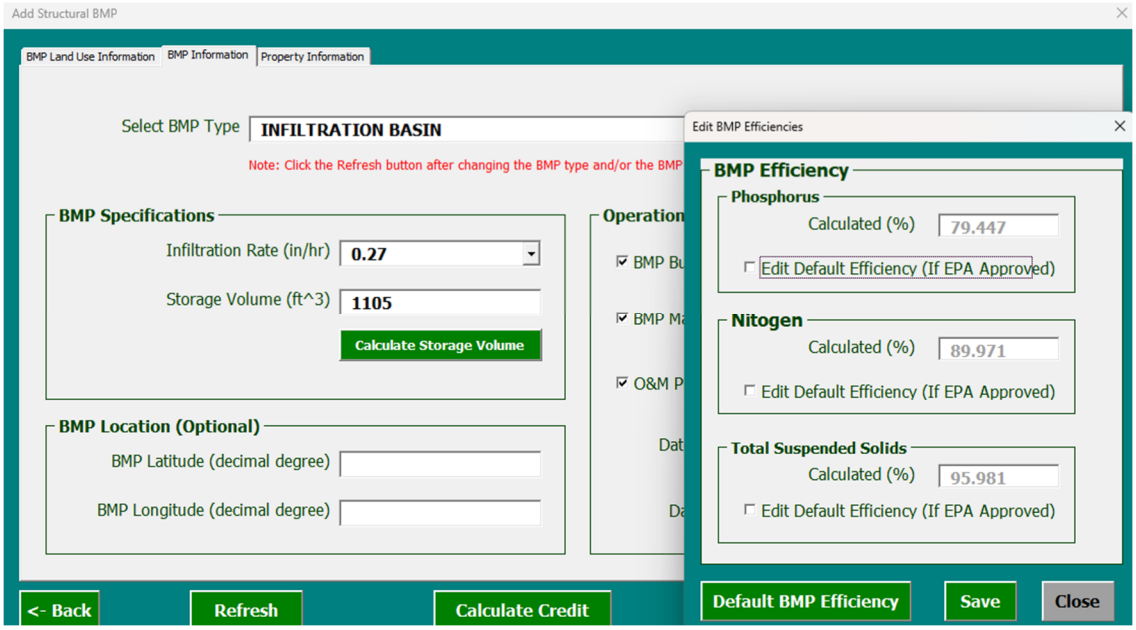
Objective: Determine the reduction in total phosphorus (TP) loading for a given post-construction land use following the installation of stormwater Best Management Practices. Percent reduction shall be greater than or equal to 50%, as required under Town of Andover Stormwater Management and Erosion Control Regulations Section IX.D

Methodology: Output from the U.S. EPA "BMP Accounting and Tracking Tool (BATT) version 2.1".

Subcatchment PR-1a to Infiltration System – 1P



JOB NO. **MAB250074.00**
CALCULATED BY **WNG** DATE **01-09-26**
CHECKED BY **ZLR**

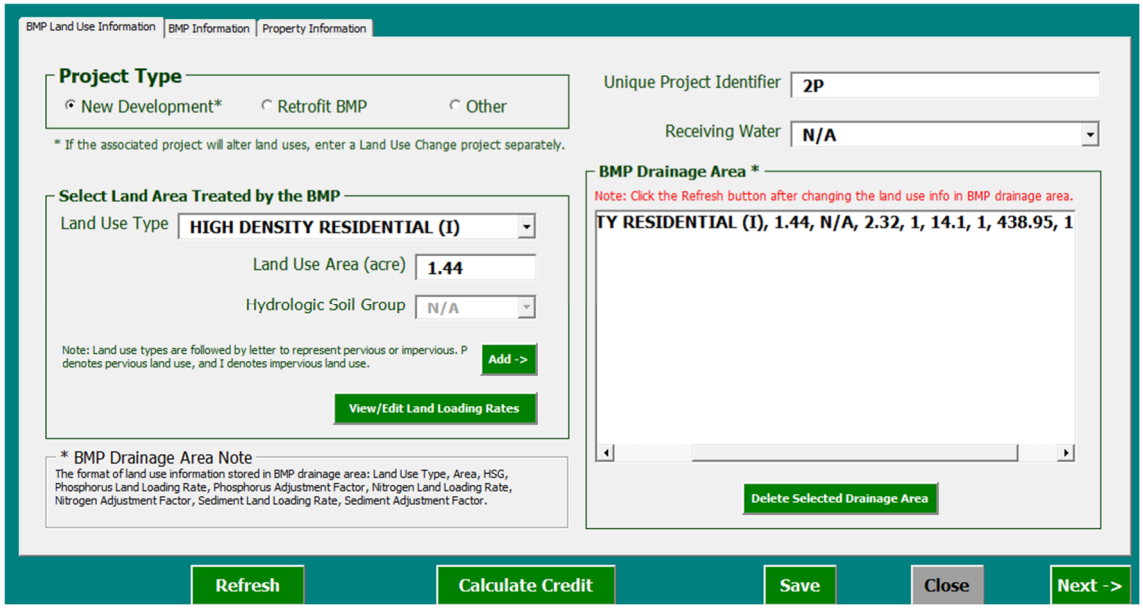


Subsurface Infiltration System-1P: Storage Volume

Basin Volume (Per HydroCAD) = 1,105 CF
Total = 1,105 CF

Removal Phosphorus Load = 1.12 lb/yr (79.4%)

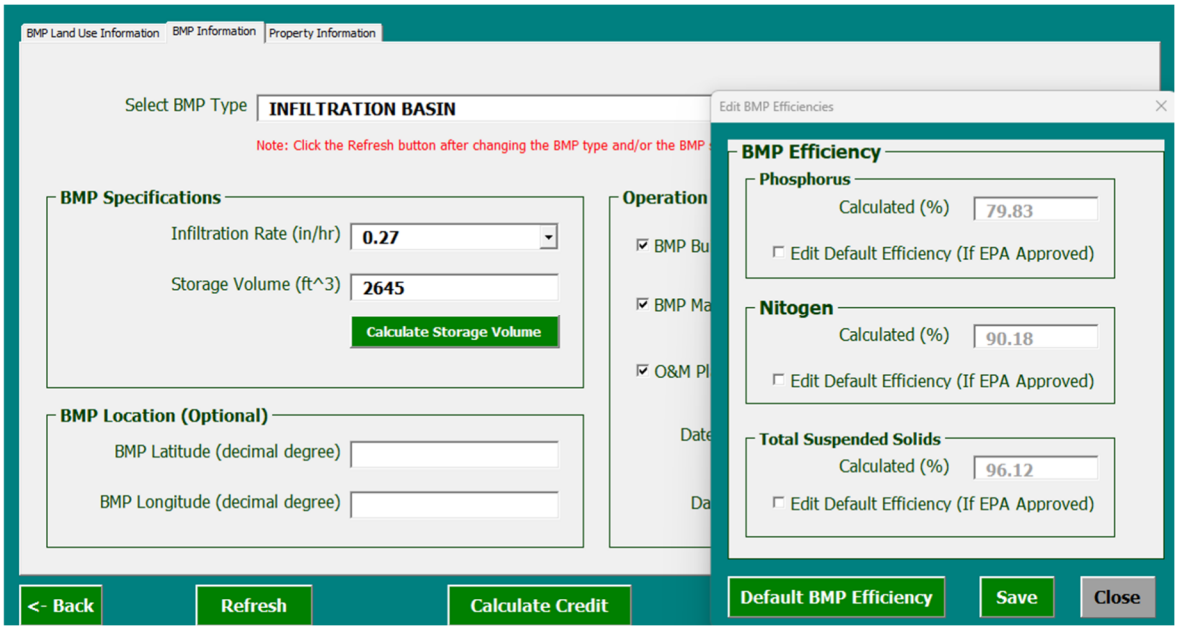
Subcatchment PR-2a to Infiltration System – 2P



Subcatchment PR-2a: Phosphorus Loading

High Density Residential (Impervious Area) = 1.44 ac x 2.32 lb/year/ac = 3.34 lb/year
Total = 3.31 lb/year

JOB NO. **MAB250074.00**
CALCULATED BY **WNG** DATE **01-09-26**
CHECKED BY **ZLR**

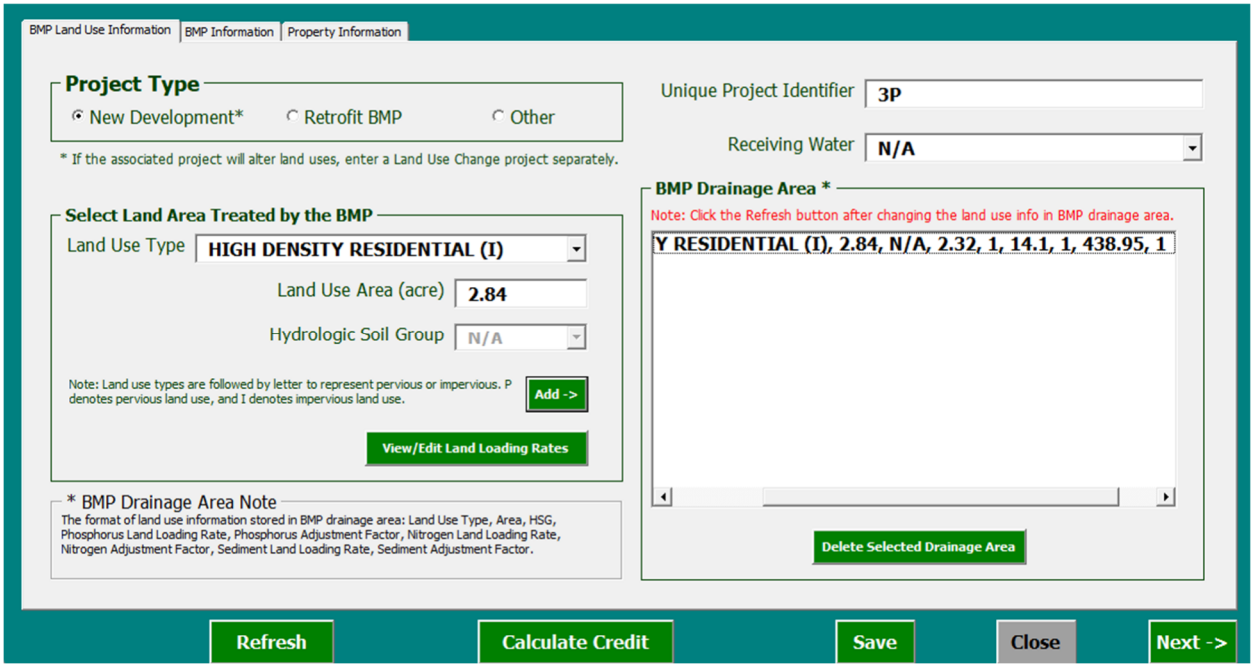


Subsurface Infiltration System-2P: Storage Volume

Basin Volume (Per HydroCAD) = 2,645 CF
Total = 2,645 CF

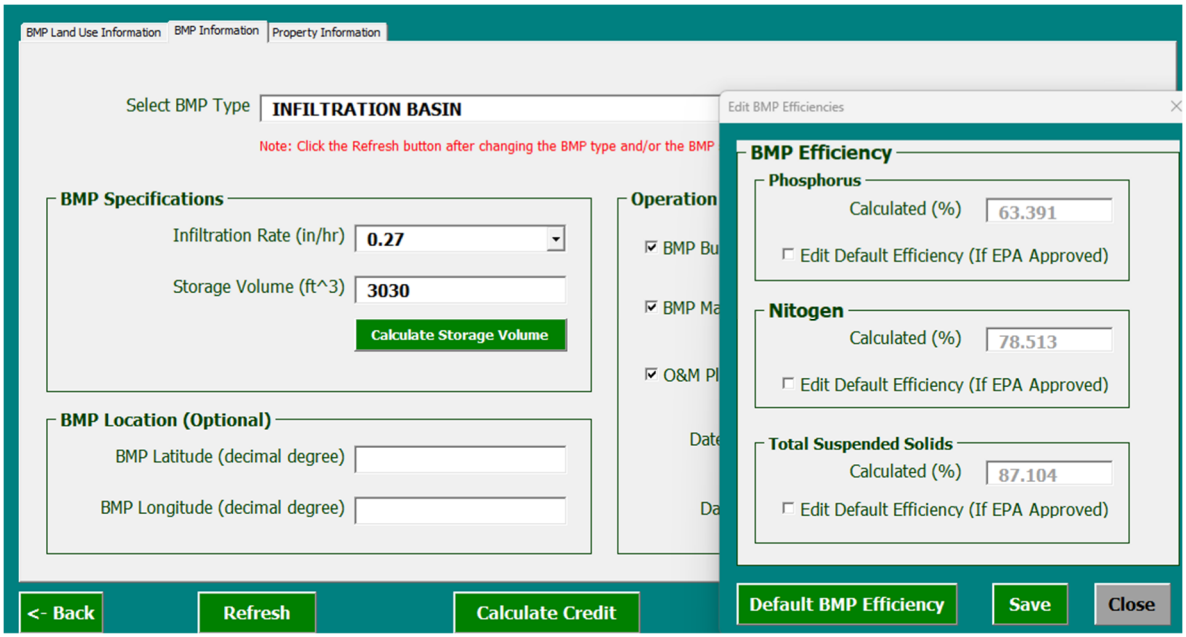
Removal Phosphorus Load = 2.64 lb/yr (79.8%)

Subcatchment PR-2b to Infiltration System – 3P



Subcatchment PR-2b: Phosphorus Loading

High Density Residential (Impervious Area) = 2.84 ac x 2.32 lb/year/ac = 6.58 lb/year
Total = 6.58 lb/year

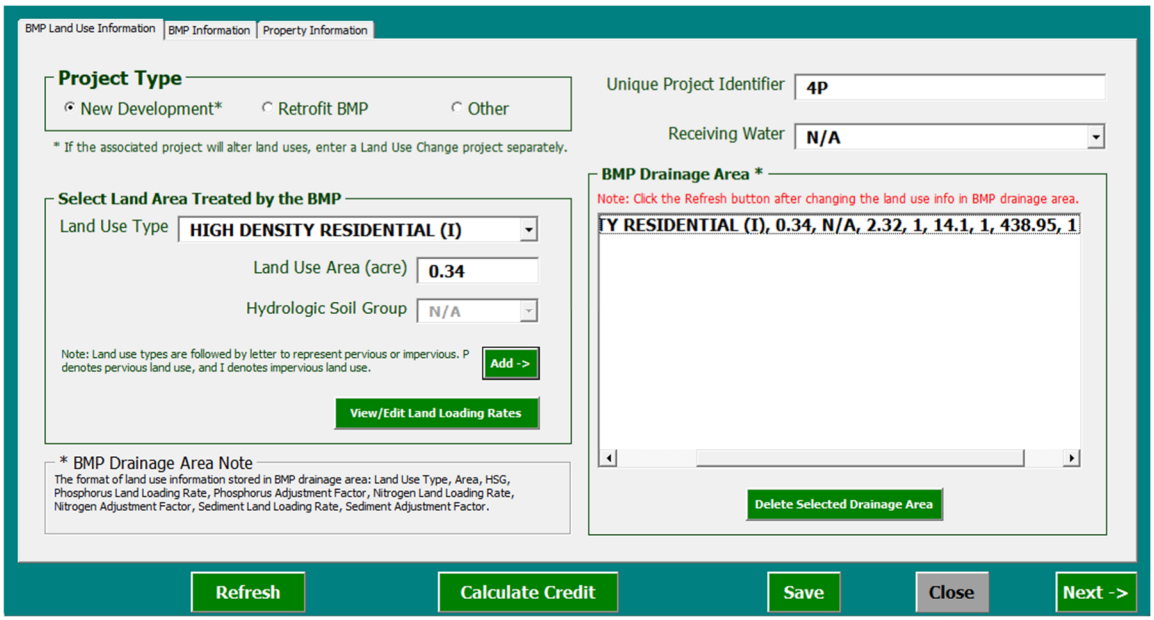


Infiltration System-3P: Storage Volume

Basin Volume (Per HydroCAD) = 3,030 CF
Total = 3,030 CF

Removal Phosphorus Load = 4.71 lb/yr (63.3%)

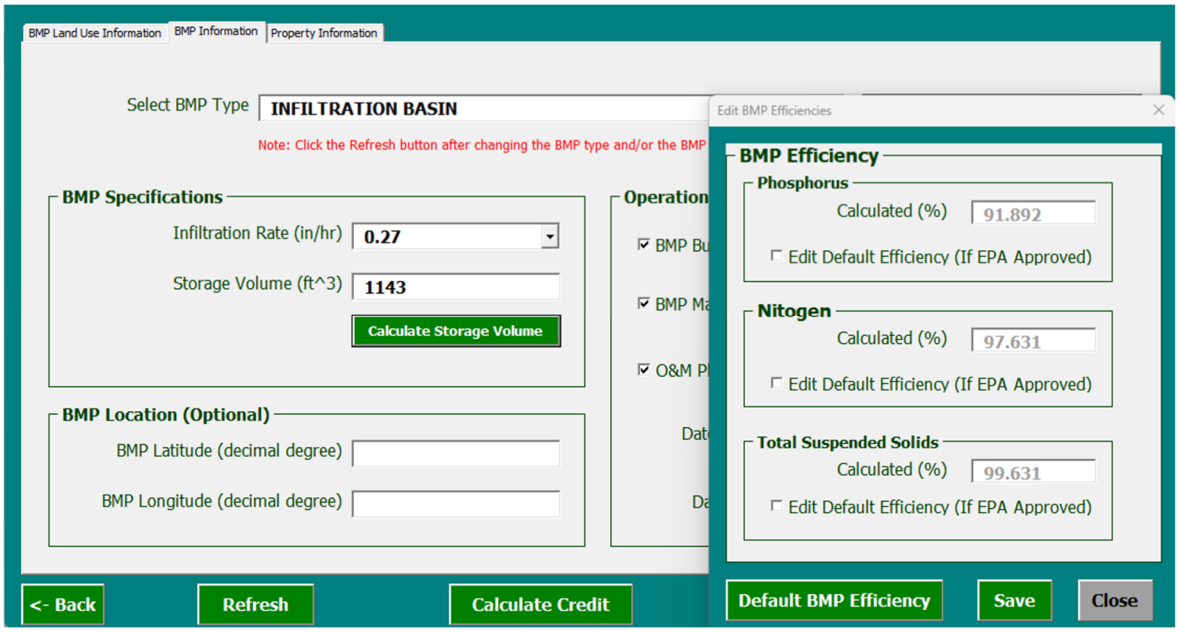
Subcatchment PR-2c to Infiltration System – 4P



Subcatchment PR-2c: Phosphorus Loading

High Density Residential (Impervious Area) = 0.34 ac x 2.32 lb/year/ac = 0.78 lb/year
Total = 0.78 lb/year

JOB NO. **MAB250074.00**
CALCULATED BY **WNG** DATE **01-09-26**
CHECKED BY **ZLR**

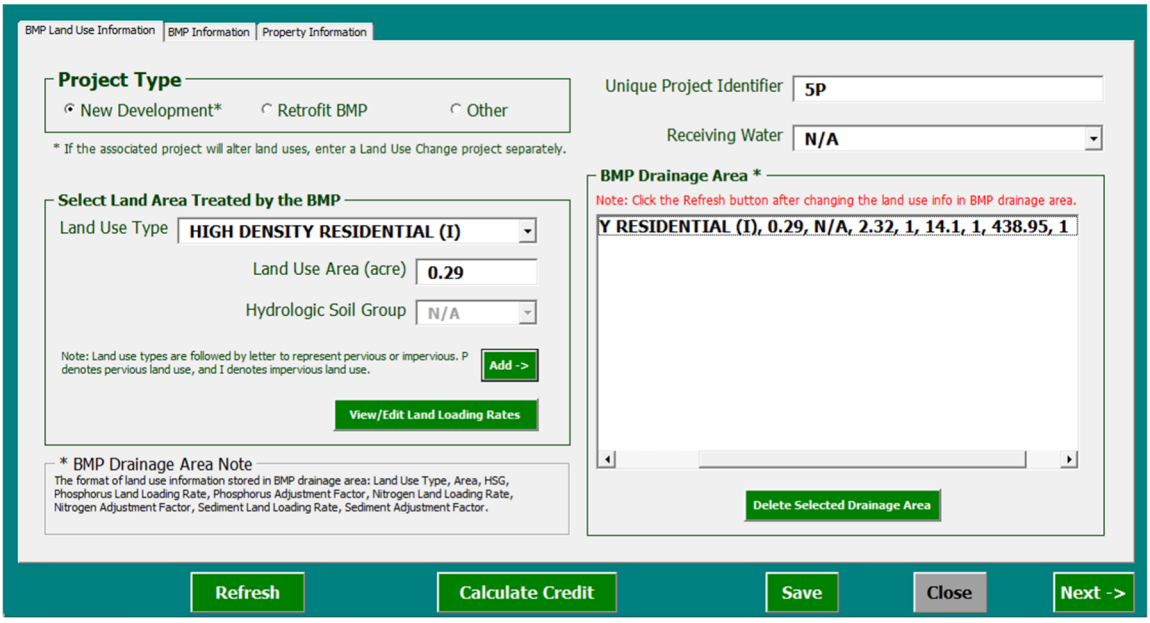


Infiltration System-4P: Storage Volume

Basin Volume (Per HydroCAD) = 1,143 CF
Total = 1,143 CF

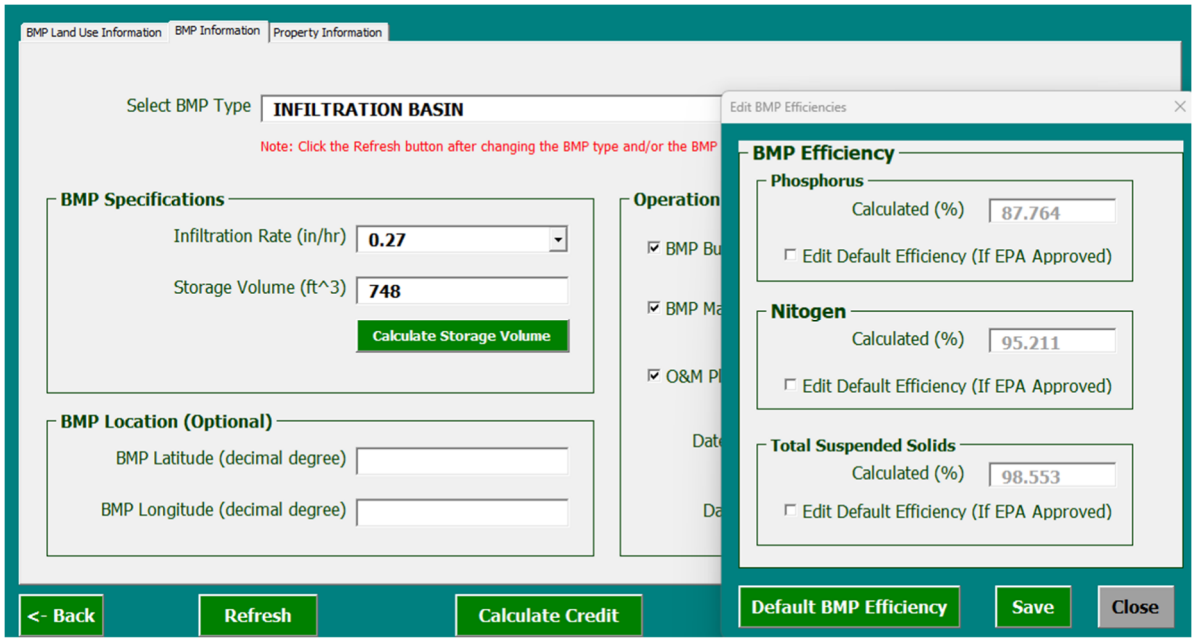
Removal Phosphorus Load = 0.71 lb/yr (91.8%)

Subcatchment PR-2d to Infiltration System – 5P



Subcatchment PR-2d: Phosphorus Loading

High Density Residential (Impervious Area) = 0.29 ac x 2.32 lb/year/ac = 0.67 lb/year
Total = 0.67 lb/year

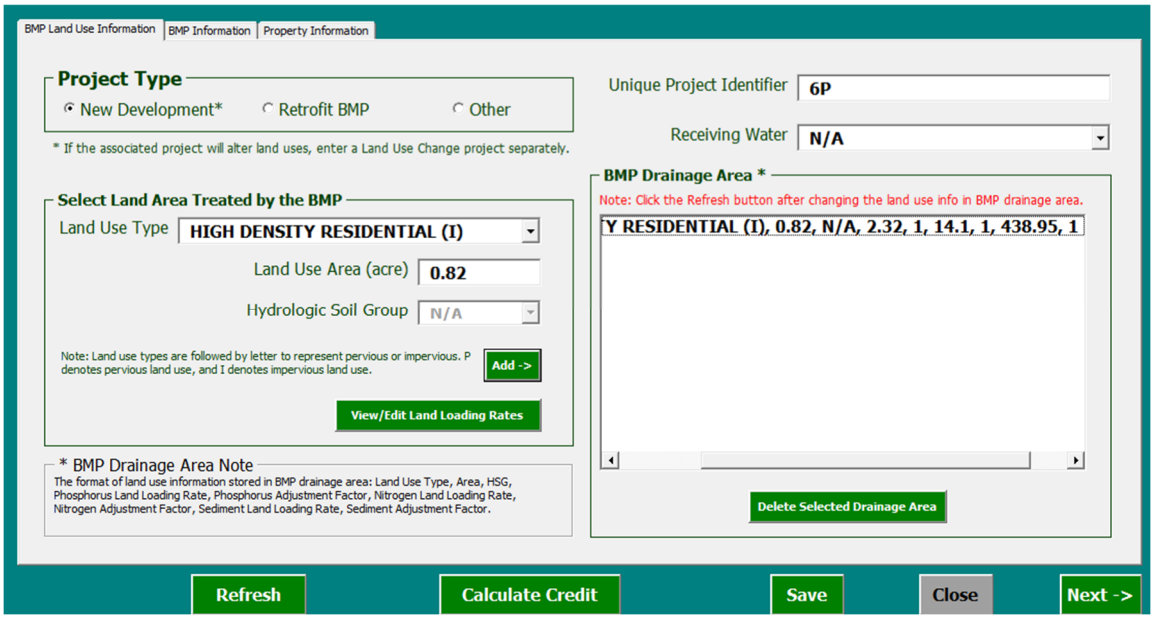


Infiltration System-5P: Storage Volume

Basin Volume (Per HydroCAD) = 748 CF
Total = 748 CF

Removal Phosphorus Load = 0.58 lb/yr (87.7%)

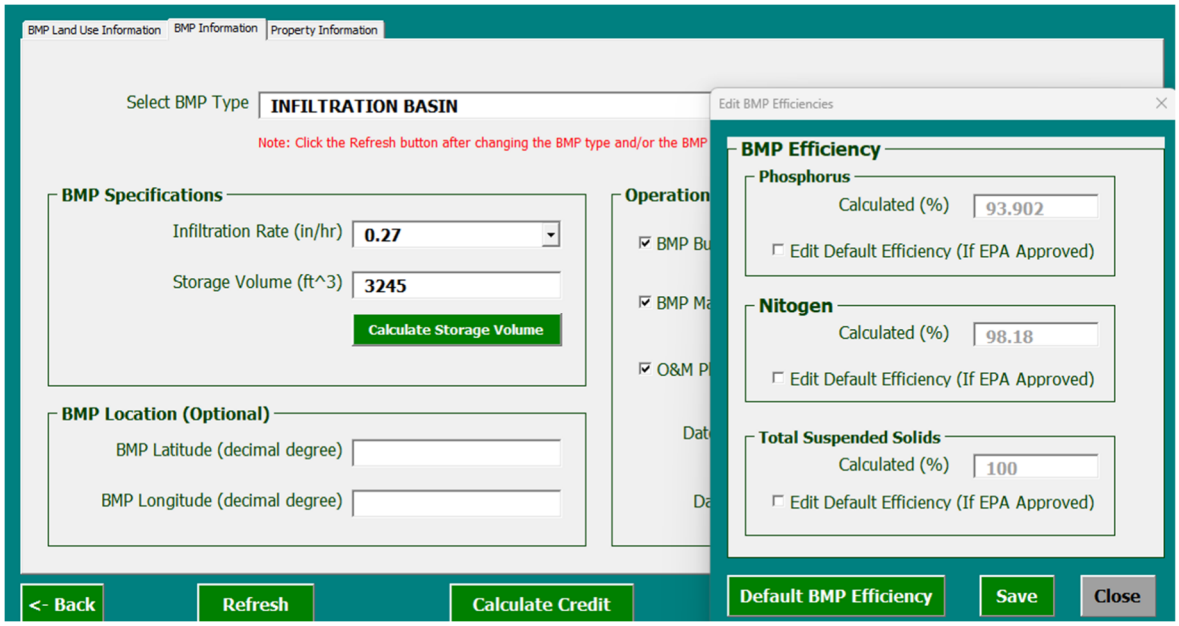
Subcatchment PR-2e to Infiltration System – 6P



Subcatchment PR-2e: Phosphorus Loading

High Density Residential (Impervious Area) = 0.82 ac x 2.32 lb/year/ac = 1.90 lb/year
Total = 1.90 lb/year

JOB NO. **MAB250074.00**
CALCULATED BY **WNG** DATE **01-09-26**
CHECKED BY **ZLR**



Infiltration System-6P: Storage Volume

Basin Volume (Per HydroCAD) = 3,245 CF
Total = 3,245 CF

Removal Phosphorus Load = 1.88 lb/yr (93.9%)

Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

MA DEP Standard 4: Weighted TSS Removal Rate

BMP	TSS Removal (%)*	Treated Area (ac)	TP Removal (%)*	Treated Area (ac)
1P	95	0.610	79	0.610
2P	96	1.440	79	1.440
3P	87	2.840	63	2.840
4P	99	0.340	91	0.340
5P	98	0.290	87	0.290
6P	100	0.826	93	0.826
WQI-2	90	0.150	0	0.150
Weighted TSS Removal Rate	**93**	**Weighted TP Removal Rate**	**73**	

*Removal Rates based on EPA Region 1's BMP Accounting and Tracking Tool (BATT)

Prepared By:
BOHLER
45 Franklin St, Fl. 5
Boston, MA 02110
(617) 849-8040

NOAA Atlas 14, Volume 10, Version 3
Location name: Andover, Massachusetts, USA*
Latitude: 42.6924°, Longitude: -71.2041°
Elevation: 76 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.310** (0.244-0.385)	**0.370** (0.291-0.459)	**0.467** (0.366-0.582)	**0.547** (0.426-0.687)	**0.658** (0.495-0.861)	**0.742** (0.546-0.990)	**0.829** (0.591-1.15)	**0.926** (0.625-1.31)	**1.06** (0.690-1.56)	**1.18** (0.744-1.76)
10-min	**0.440** (0.346-0.546)	**0.524** (0.412-0.651)	**0.661** (0.518-0.824)	**0.775** (0.604-0.972)	**0.932** (0.701-1.22)	**1.05** (0.773-1.40)	**1.17** (0.838-1.62)	**1.31** (0.886-1.86)	**1.51** (0.978-2.21)	**1.66** (1.05-2.49)
15-min	**0.517** (0.407-0.642)	**0.616** (0.484-0.765)	**0.778** (0.609-0.970)	**0.912** (0.710-1.14)	**1.10** (0.825-1.44)	**1.24** (0.910-1.65)	**1.38** (0.986-1.91)	**1.54** (1.04-2.19)	**1.77** (1.15-2.60)	**1.96** (1.24-2.93)
30-min	**0.712** (0.560-0.884)	**0.848** (0.667-1.05)	**1.07** (0.838-1.34)	**1.26** (0.977-1.57)	**1.51** (1.14-1.98)	**1.70** (1.25-2.27)	**1.90** (1.36-2.64)	**2.13** (1.44-3.02)	**2.44** (1.58-3.58)	**2.70** (1.71-4.04)
60-min	**0.907** (0.714-1.13)	**1.08** (0.850-1.34)	**1.36** (1.07-1.70)	**1.60** (1.25-2.01)	**1.93** (1.45-2.52)	**2.17** (1.60-2.90)	**2.43** (1.73-3.36)	**2.71** (1.83-3.84)	**3.11** (2.02-4.57)	**3.44** (2.18-5.15)
2-hr	**1.16** (0.920-1.43)	**1.39** (1.10-1.72)	**1.78** (1.40-2.20)	**2.09** (1.64-2.61)	**2.53** (1.92-3.30)	**2.85** (2.12-3.81)	**3.20** (2.32-4.46)	**3.62** (2.45-5.10)	**4.25** (2.77-6.20)	**4.79** (3.04-7.12)
3-hr	**1.34** (1.07-1.64)	**1.61** (1.28-1.98)	**2.07** (1.64-2.55)	**2.44** (1.92-3.03)	**2.96** (2.26-3.86)	**3.34** (2.50-4.46)	**3.75** (2.74-5.23)	**4.26** (2.90-5.99)	**5.05** (3.29-7.35)	**5.73** (3.64-8.50)
6-hr	**1.70** (1.37-2.08)	**2.07** (1.66-2.52)	**2.66** (2.13-3.27)	**3.16** (2.51-3.90)	**3.84** (2.96-4.98)	**4.34** (3.28-5.77)	**4.89** (3.59-6.79)	**5.58** (3.80-7.79)	**6.65** (4.35-9.61)	**7.58** (4.84-11.2)
12-hr	**2.13** (1.73-2.59)	**2.60** (2.11-3.16)	**3.38** (2.72-4.12)	**4.02** (3.22-4.93)	**4.91** (3.80-6.32)	**5.56** (4.22-7.34)	**6.27** (4.63-8.65)	**7.16** (4.90-9.93)	**8.53** (5.60-12.2)	**9.72** (6.22-14.2)
24-hr	**2.51** (2.05-3.03)	**3.11** (2.54-3.76)	**4.10** (3.33-4.96)	**4.92** (3.97-5.99)	**6.05** (4.72-7.75)	**6.87** (5.26-9.03)	**7.78** (5.79-10.7)	**8.93** (6.14-12.3)	**10.7** (7.06-15.3)	**12.3** (7.88-17.9)
2-day	**2.80** (2.31-3.36)	**3.54** (2.91-4.24)	**4.74** (3.89-5.71)	**5.74** (4.68-6.95)	**7.12** (5.61-9.10)	**8.12** (6.27-10.7)	**9.24** (6.95-12.7)	**10.7** (7.38-14.7)	**13.0** (8.60-18.5)	**15.1** (9.71-21.8)
3-day	**3.07** (2.54-3.67)	**3.86** (3.19-4.61)	**5.15** (4.24-6.18)	**6.22** (5.09-7.50)	**7.70** (6.09-9.80)	**8.77** (6.80-11.5)	**9.97** (7.53-13.7)	**11.5** (7.98-15.8)	**14.1** (9.30-19.9)	**16.3** (10.5-23.4)
4-day	**3.34** (2.77-3.97)	**4.15** (3.44-4.95)	**5.48** (4.53-6.55)	**6.58** (5.40-7.92)	**8.10** (6.43-10.3)	**9.21** (7.16-12.0)	**10.4** (7.90-14.3)	**12.1** (8.36-16.4)	**14.7** (9.71-20.7)	**17.0** (11.0-24.3)
7-day	**4.07** (3.40-4.82)	**4.91** (4.10-5.82)	**6.29** (5.23-7.48)	**7.43** (6.14-8.88)	**9.00** (7.18-11.3)	**10.2** (7.92-13.1)	**11.4** (8.67-15.5)	**13.1** (9.11-17.7)	**15.7** (10.5-22.0)	**18.1** (11.7-25.8)
10-day	**4.73** (3.97-5.58)	**5.60** (4.69-6.61)	**7.01** (5.86-8.31)	**8.18** (6.79-9.75)	**9.80** (7.84-12.3)	**11.0** (8.58-14.1)	**12.3** (9.31-16.5)	**13.9** (9.74-18.8)	**16.5** (11.0-23.1)	**18.8** (12.2-26.8)
20-day	**6.61** (5.60-7.75)	**7.56** (6.40-8.87)	**9.12** (7.69-10.7)	**10.4** (8.71-12.3)	**12.2** (9.79-15.1)	**13.5** (10.6-17.1)	**14.9** (11.2-19.6)	**16.6** (11.7-22.1)	**18.9** (12.7-26.2)	**20.8** (13.5-29.4)
30-day	**8.18** (6.97-9.55)	**9.21** (7.83-10.8)	**10.9** (9.22-12.8)	**12.3** (10.3-14.5)	**14.2** (11.4-17.4)	**15.7** (12.3-19.6)	**17.2** (12.9-22.2)	**18.7** (13.3-24.9)	**20.9** (14.1-28.8)	**22.6** (14.7-31.8)
45-day	**10.2** (8.72-11.8)	**11.3** (9.66-13.2)	**13.1** (11.2-15.3)	**14.6** (12.4-17.2)	**16.7** (13.5-20.3)	**18.3** (14.4-22.7)	**19.9** (14.9-25.4)	**21.5** (15.3-28.4)	**23.5** (15.8-32.2)	**24.9** (16.3-34.9)
60-day	**11.9** (10.2-13.8)	**13.1** (11.2-15.2)	**15.0** (12.8-17.5)	**16.6** (14.1-19.5)	**18.8** (15.2-22.8)	**20.6** (16.1-25.3)	**22.2** (16.6-28.2)	**23.8** (16.9-31.4)	**25.7** (17.4-35.1)	**27.0** (17.7-37.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

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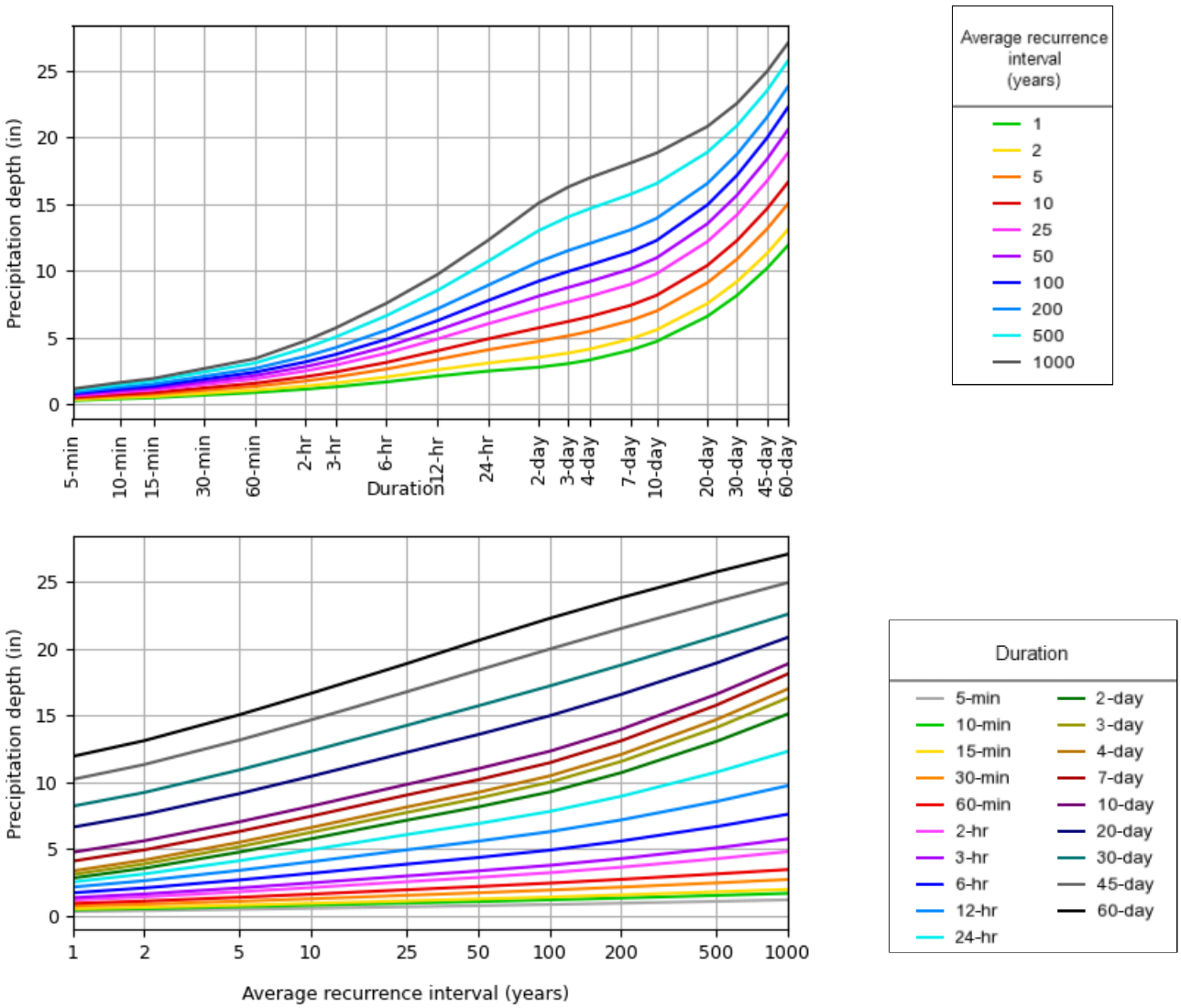
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.6924°, Longitude: -71.2041°



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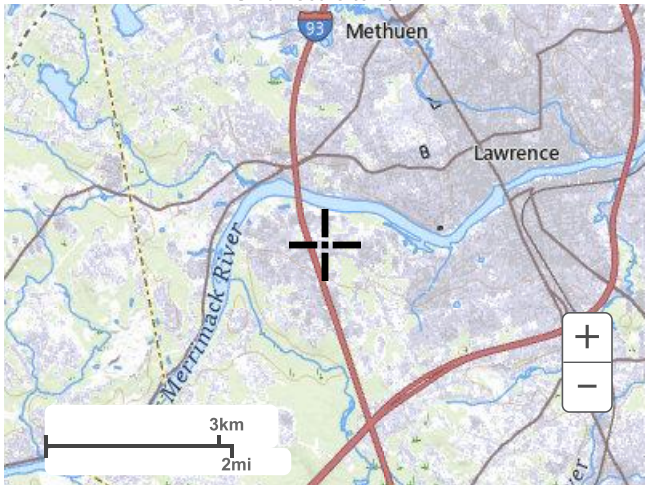
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

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

Disclaimer

Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

Rational Pipe Sizing Calculations

Design Period Storm:		25	Year	Design Period Intensity*			7.9	in/hr									
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Material	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
CB-1	WQU-1	0.14	0.95	0.13	0.03	0.30	0.01	0.14	5	7.9	1.12	12	0.010	HDPE	0.012	3.86	4.91
CB-2	WQU-1	0.27	0.95	0.26	0.06	0.30	0.02	0.27	5	7.9	2.17	12	0.010	HDPE	0.012	3.86	4.91
WQU-1	1P	0.41	0.95	0.39	0.09	0.30	0.03	0.42	5	7.9	3.29	12	0.010	HDPE	0.012	3.86	4.91
WQI-1	1P	0.08	0.95	0.08	0.03	0.30	0.01	0.09	5	7.9	0.67	12	0.010	HDPE	0.012	3.86	4.91
1P	OCS-1	From HydroCAD									2.90	12	0.010	HDPE	0.012	3.86	4.91
WQI-2	EX CB	0.10	0.95	0.10	0.05	0.30	0.02	0.11	5	7.9	0.87	12	0.010	HDPE	0.012	3.86	4.91
OCS-1	EX FES 1										3.77	12	0.010	HDPE	0.012	3.86	4.91
RD-1	2P	0.85	0.95	0.81	0.00	0.30	0.00	0.81	5	7.9	6.38	15	0.010	HDPE	0.012	7.00	5.70
DMH-2	2P	0.35	0.95	0.33	0.11	0.30	0.03	0.37	5	7.9	2.89	12	0.010	HDPE	0.012	3.86	4.91
WQI-3	2P	0.11	0.95	0.10	0.02	0.30	0.01	0.11	5	7.9	0.87	12	0.010	HDPE	0.012	3.86	4.91
OCS-2	FES-1	From HydroCAD									8.47	18	0.010	HDPE	0.012	11.38	6.44
RD-2	DMH-4	0.38	0.95	0.36	0.00	0.30	0.00	0.36	5	7.9	2.85	12	0.010	HDPE	0.012	3.86	4.91
RD-3	DMH-4	0.63	0.95	0.60	0.00	0.30	0.00	0.60	5	7.9	4.73	15	0.010	HDPE	0.012	7.00	5.70
DMH-4	DMH-3	1.01	0.95	0.96	0.00	0.30	0.00	0.96	5	7.9	7.58	18	0.010	HDPE	0.012	11.38	6.44
WQI-4	DMH-3	0.46	0.95	0.44	0.11	0.30	0.03	0.47	5	7.9	3.71	12	0.010	HDPE	0.012	3.86	4.91
DMH-3	DMH-6	1.47	0.95	1.40	0.11	0.30	0.03	1.43	5	7.9	11.29	18	0.010	HDPE	0.012	11.38	6.44
RD-4	DMH-6	0.35	0.95	0.33	0.00	0.30	0.00	0.33	5	7.9	2.63	12	0.010	HDPE	0.012	3.86	4.91
WQI-5	DMH-6	0.25	0.95	0.24	0.03	0.30	0.01	0.25	5	7.9	1.95	12	0.010	HDPE	0.012	3.86	4.91
DMH-6	DMH-7	2.07	0.95	1.97	0.14	0.30	0.04	2.01	5	7.9	15.87	24	0.010	HDPE	0.012	24.51	7.80
RD-5	DMH-7	0.33	0.95	0.31	0.00	0.30	0.00	0.31	5	7.9	2.48	12	0.010	HDPE	0.012	3.86	4.91
DMH-7	3P	2.40	0.95	2.28	0.14	0.30	0.04	2.32	5	7.9	18.34	24	0.010	HDPE	0.012	24.51	7.80

Rational Pipe Sizing Calculations

Design Period Storm:		25	Year	Design Period Intensity*			7.9	in/hr									
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Material	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
WQI-6	3P	0.25	0.95	0.24	0.05	0.30	0.02	0.25	5	7.9	1.99	12	0.010	HDPE	0.012	3.86	4.91
3P	DOGHOUSE	From HydroCAD									14.12	24	0.010	HDPE	0.012	24.51	7.80
RD-6	4P	0.21	0.95	0.20	0.00	0.30	0.00	0.20	5	7.9	1.58	12	0.010	HDPE	0.012	3.86	4.91
WQI-7	4P	0.12	0.95	0.11	0.01	0.30	0.00	0.12	5	7.9	0.92	12	0.010	HDPE	0.012	3.86	4.91
4P	DOGHOUSE	From HydroCAD									1.74	12	0.010	HDPE	0.012	3.86	4.91
RD-7	5P	0.19	0.95	0.18	0.00	0.30	0.00	0.18	5	7.9	1.43	12	0.010	HDPE	0.012	3.86	4.91
WQI-8	5P	0.10	0.95	0.10	0.00	0.30	0.00	0.10	5	7.9	0.75	12	0.010	HDPE	0.012	3.86	4.91
5P	DMH-12	From HydroCAD									1.74	12	0.010	HDPE	0.012	3.86	4.91
CO	DMH-12										2.56	12	0.010	HDPE	0.012	3.86	4.91
DMH-12	FES-2										4.30	15	0.010	HDPE	0.012	7.00	5.70

Prepared By:
BOHLER
45 Franklin St, Fl. 5
Boston, MA 02110
(617) 849-8040

Mixed Use Multi-Family
100 Old River Road
Andover, MA
Bohler Job Number: MAB250074.00
January 9, 2026

Rip Rap Sizing Calculations

Design Period Storm: 25 **Year**

Rip Rap Apron Sizing Calculations											
Location	Pipe Size (in.)	Pipe Size (ft.)	Q (cfs)	TW (ft.)	V (fps)	W1 (ft.)	La (ft.)	W2 (ft.)	W3 (ft.)	Apron Type	Rip Rap Type
EX-1	12	1.0	3.70	0.10	4.91	3.00	8	9	NA	A	Modified
FES 1	18	1.5	8.47	0.10	6.44	4.50	8	10	NA	A	Modified
EX-2	24	2.0	15.86	0.10	8.00	6.00	8	12	NA	A	Modified
FES 2	15	1.3	4.30	0.10	5.70	3.75	8	9	NA	A	Modified

Based ConnDOT Drainage Manual - Type A, B, and C Riprap Aprons

Outlet Velocity (fps)
0-8 - Modified
8-10 - Intermediate
10-14 - Standard

Prepared By:
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45 Franklin St, Fl. 5
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GROUNDWATER MOUNDING CALCULATIONS

Proposed Mixed Use Multi-family
100 Old River Road – Andover, MA
BE Project No.: MAB250074.00

Methodology

Infiltration Systems 1-6 for this project are designed with less than 4 feet of groundwater separation. They are also designed to attenuate the 10-year storm event or larger. Therefore, groundwater mounding calculations are required according to MA DEP Stormwater Management Guidelines. The purpose of the calculations is to ensure that the mound will not prevent the full draining of the basin. The mounding analysis must show that the recharge volume will exfiltrate within seventy-two (72) hours. Additionally, it should be verified that the mounding effect will not cause stormwater to surge above the lowest discharge point out of a basin (during the 24-hour storm event period) or raise the water elevation in a nearby resource area.

The groundwater mounding analysis was performed by a proprietary program using the Hantush Method with Glover's Solution. Input parameters are site specific and determined based on existing and proposed conditions. The required input parameters are the following: application rate; duration of application; fillable porosity; hydraulic conductivity; initial saturated thickness; length of application area; width of application area; and distance to closest resource area (constant head boundary).

Calculations using the Hantush Method are considered conservative due to the fact that the unsaturated soil zone is not incorporated. In practice, this zone will have a significant positive effect on reducing the groundwater mounding under an infiltration basin by allowing horizontal migration. The unsaturated zones for the infiltration systems 1-6 are outlined below in the table. Additionally, for all systems, the lowest outlet is above the unsaturated zone, resulting in additional available space before groundwater mounding would impact peak rate attenuation. Please refer to the table below:

Stormwater Basin	Unsaturated Zone (FT)	Depth Below Lowest Outlet (FT)	Mounding Storage Provided (FT)	Groundwater Mounding - Δh (FT)
1P	2.0	0.7	2.7	1.79
2P	2.0	1.3	3.3	1.93
3P	2.0	2.3	4.3	0.85
4P	2.0	1.8	3.8	1.09
5P	2.0	1.3	3.3	0.94
6P	2.0	1.2	3.2	0.71

A minimum of a 2-foot unsaturated zone has been provided in each basin and the mounding in each basin (Δh) falls below the lowest outlet in each basin ensuring that stormwater will not bypass the basin floor and discharge though the outlet device.

The application rate used is converted from the Rawls value selected for an exfiltration rate in HydroCAD. The duration of application used for the analysis is the 24-hour based duration of the storm event. The fillable porosity, hydraulic conductivity, and initial saturated thickness used for the analysis are based on the existing soil conditions.

Results

Based on the criteria mentioned above, the analysis (see attached) indicates the mound in each stormwater basin falls below the mounding storage provided. Given these results, we feel as though the basins recharge the stormwater volume within 72 hours as required.

INFILTRATION SYSTEM - 1P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	***R***	**Recharge (infiltration) rate (feet/day)**
0.080	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
48.000	**x**	**1/2 length of basin (x direction, in feet)**
17.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
30.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

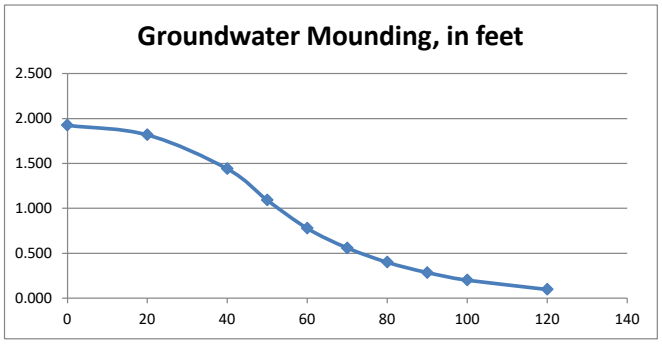
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

31.926	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.926	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.926	0
1.819	20
1.441	40
1.092	50
0.778	60
0.558	70
0.400	80
0.285	90
0.202	100
0.098	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

INFILTRATION SYSTEM - 2P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	***R***	**Recharge (infiltration) rate (feet/day)**
0.080	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
52.000	**x**	**1/2 length of basin (x direction, in feet)**
15.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
30.000	**hi(0)**	**initial thickness of saturated zone (feet)**

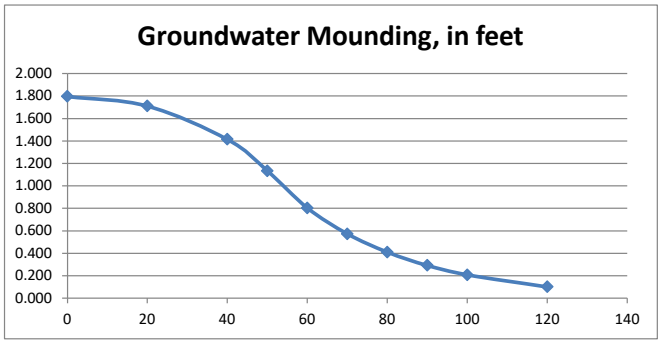
Conversion Table	
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

31.796	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.796	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.796	**0**
1.712	**20**
1.415	**40**
1.134	**50**
0.804	**60**
0.573	**70**
0.410	**80**
0.292	**90**
0.207	**100**
0.101	**120**

Re-Calculate Now



Disclaimer

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INFILTRATION SYSTEM - 3P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	*R*	**Recharge (infiltration) rate (feet/day)**
0.080	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
24.000	x	**1/2 length of basin (x direction, in feet)**
13.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
30.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

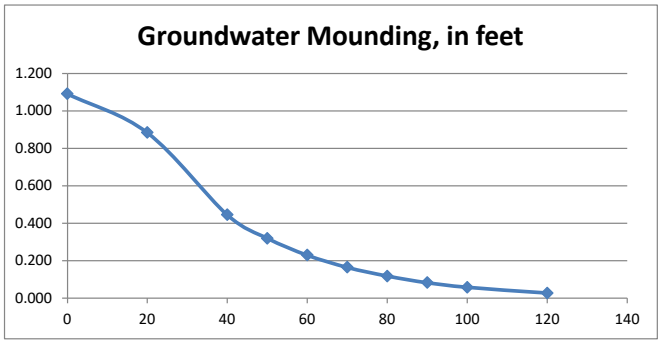
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

31.092	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.092	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.092	0
0.885	20
0.445	40
0.319	50
0.230	60
0.165	70
0.117	80
0.083	90
0.058	100
0.028	120

Re-Calculate Now



Disclaimer

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INFILTRATION SYSTEM - 4P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	***R***	**Recharge (infiltration) rate (feet/day)**
0.080	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
19.000	**x**	**1/2 length of basin (x direction, in feet)**
13.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
30.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

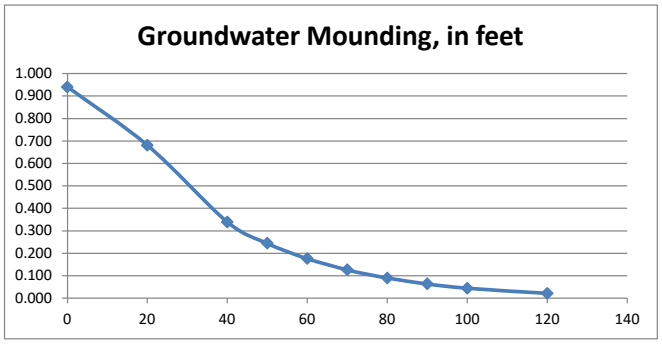
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

30.941	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.941	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.941	0
0.681	20
0.339	40
0.244	50
0.176	60
0.126	70
0.090	80
0.063	90
0.044	100
0.021	120

Re-Calculate Now



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INFILTRATION SYSTEM - 5P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	***R***	**Recharge (infiltration) rate (feet/day)**
0.080	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
32.000	**x**	**1/2 length of basin (x direction, in feet)**
8.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
30.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

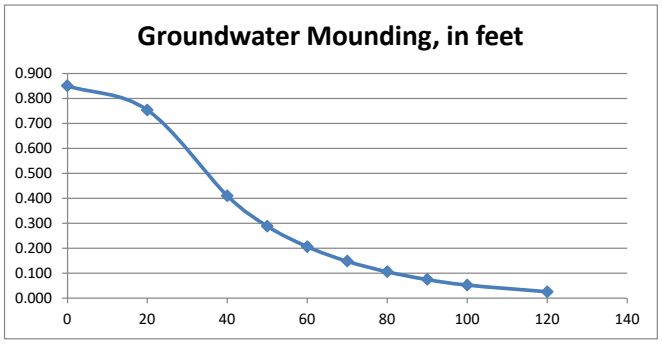
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

30.851	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.851	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.851	0
0.754	20
0.410	40
0.289	50
0.206	60
0.148	70
0.105	80
0.075	90
0.053	100
0.026	120

Re-Calculate Now



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INFILTRATION SYSTEM - 6P

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.5400	*R*	**Recharge (infiltration) rate (feet/day)**
0.080	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
5.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
23.000	x	**1/2 length of basin (x direction, in feet)**
8.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
30.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

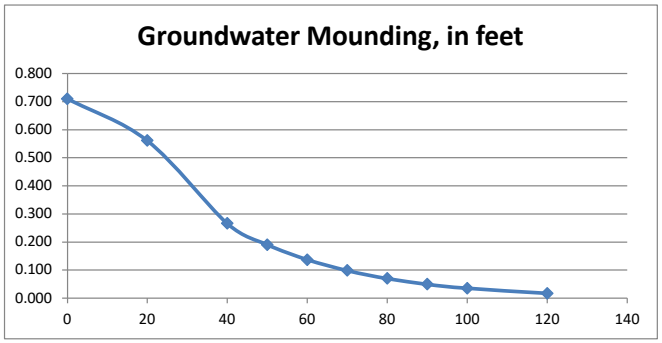
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

30.710	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.710	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.710	0
0.561	20
0.266	40
0.191	50
0.137	60
0.098	70
0.070	80
0.050	90
0.035	100
0.017	120

Re-Calculate Now



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APPENDIX G: OPERATION AND MAINTENANCE

- *STORMWATER OPERATION AND MAINTENANCE PLAN*
- *INSPECTION REPORT*
- *INSPECTION AND MAINTENANCE LOG FORM*
- *LONG-TERM POLLUTION PREVENTION PLAN*
- *ILLICIT DISCHARGE STATEMENT*
- *SPILL PREVENTION*
- *PROPOSED OPERATION AND MAINTENANCE MAP*
- *MANUFACTURER'S INSPECTION AND MAINTENANCE MANUALS*

STORMWATER OPERATION AND MAINTENANCE PLAN

John M Corcoran & Co; SV&P
100 Old River Road
Andover, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

John M Corcoran & Co; SV&P
100 Grandview Road Suite 205
Braintree, MA

RESPONSIBLE PARTY POST CONSTRUCTION:

John M Corcoran & Co; SV&P
100 Grandview Road Suite 205
Braintree, MA

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit and the Stormwater Pollution Prevention Plan (SWPPP). Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the SWPPP for this site. The SWPPP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the Town/City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots: Sweep at least two (2) times per year and on a more frequent basis depending on sanding operations Swept areas shall include all parking, drive aisles, and access aisles All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $1,000/year

2. Catch basins, yard drains, trench drains, manholes and piping: Inspect two (2) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned two (2) times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed

and properly disposed of off-site in accordance with MADEP and other applicable requirements.

Approximate Maintenance Budget: $500/year per structure.

3. Riprap apron / Scour Hole: Riprap and scour holes should be checked at least annually and after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap is damaged, it should be repaired before further damage can take place. Note and repair any erosion, stone displacement or low spots in the areas. Woody vegetation should be removed from the riprap annually.

   Approximate Maintenance Budget: $250/year per location.

4. Water Quality Unit (Proprietary Separator): Follow manufacturer's recommendations (attached).

   Approximate Maintenance Budget: $1,000/year per unit.

5. Underground Infiltration Basins: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and riprap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: Cleaning - $1,000/year, Inspection - $200/year

6. Bioretention Areas: shall be inspected and cleared of trashed monthly; mowed 2 to 12 times per year; mulched annually; fertilized annually; dead vegetation removed annually; pruned annually; replace entire media and all vegetation as needed. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $2,000/year per area

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

Mixed Use Multi-family
100 Old River Road
Andover, MA

RESPONSIBLE PARTY:

John M Corcoran & Co; SV&P
100 Grandview Road Suite 205
Braintree, MA

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Discharge Points/ Flared End Sections / Rip Rap:	
Infiltration Basin:	
Water Quality Units:	
Other:	

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins:
Discharge Points / Flared End Sections / Rip Rap:
Infiltration Basin:
Water Quality Units:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

Mixed Use Multi-family
100 Old River Road - Andover, MA

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

John M Corcoran & Co; SV&P
100 Old River Road
Andover, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

John M Corcoran & Co; SV&P
100 Grandview Road Suite 205
Braintree, MA

RESPONSIBLE PARTY POST CONSTRUCTION:

John M Corcoran & Co; SV&P
100 Grandview Road Suite 205
Braintree, MA

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste (dumpsters).
- Sweeping of parking lots, drive aisles and access aisles a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner. Snow shall not be plowed, dumped and/or placed in forebays, infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- No outdoor maintenance or washing of vehicles allowed.
- Trash and other debris shall be removed from all areas of the site at least twice yearly.
- Reseed any bare areas as soon as they occur. Erosion control measures shall be installed in these areas to prevent deposits of sediment from entering the drainage system.

- Plants shall be pruned as necessary.

- The use of fertilizers will be kept at a level consistent with typical residential use. Fertilizer will be applied a maximum of once to twice per year during the initial planting and stabilization of landscaped areas. Once plants are established and growing well fertilizer will be applied judiciously.

- The use of pesticides will be kept at a level consistent with typical residential use. Where possible mechanical methods (i.e. pest traps) or biological methods (i.e. beneficial insects) of pest control shall be implemented. If pesticides (insecticide, herbicide, and fungicide) are required to be used, a pesticide which poses the lowest risk to public health and the environment shall be used.

- Pet waste shall be disposed of in accordance with local regulations. Pet waste shall not be disposed of in a storm drain or catch basin.

- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter into the soil, leaving behind sand and debris which can be removed in the springtime.

- In no case shall snow be disposed of or stored in resource areas (wetlands, floodplain, streams, or other water bodies).

- In no case shall snow be disposed of or stored in the detention basins, infiltration basins or bioretention areas.

- If necessary, stockpiled snow will be removed from the Site and disposed of at an off-site location in accordance with all local, state and federal regulations.

- The amount of sand and deicing chemicals shall be kept at the minimum amount required to provide safe pedestrian and vehicle travel.

- Deicing chemicals are recommended as a pretreatment to storm events to minimize the amount of applied sand.

- The primary agents used for deicing at parking lots, sidewalks and the access roads shall consist of salt alternatives such as calcium carbonate (CaCO3) or potassium chloride (KCl).

- Recycle materials whenever possible. Provide separate containers for recycle materials. Recycling products will be removed by a certified waste hauler.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan:

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

Discuss the Spill Prevention and Response Procedures:

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

Duly Acknowledged:

_____

Name & Title Date

SPILL PREVENTION AND RESPONSE PROCEDURES (POST CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

SPILL PREVENTION CONTROL AND COUNTERMEASURE FORM

Mixed Use Multi-family
100 Old River Road
Andover, MA

Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Immediately notify The Town Fire Department (at **9-1-1**)

2. All measures must be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

3. Notify the Town Health Department at (978) 623-8640 and the Town Conservation Commission at (978) 623-8630.

4. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the Town Health Department and Conservation Commission.

Date of spill:_____ Time:_____ Reported By:_____

Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill: _____

_____

Measures Taken to Clean up Spill: _____

_____

Type of equipment: _____ Make: _____ Size: _____

License or S/N: _____

Location and Method of Disposal _____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring: _____

_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) EMERGENCY PHONE: 1-888-304-1133
- NATIONAL RESPONSE CENTER PHONE: (800) 424-8802
- U.S. ENVIRONMENTAL PROTECTION AGENCY PHONE: (888) 372-7341

CONTECH®
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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.