DRAINAGE REPORT

For

UNIFIED²
GLOBAL PACKAGING GROUP

PROPOSED

"Proposed Buildings 2 and 3"

UNIFIED Parkway
Sutton, Massachusetts
Worcester County

Prepared by:

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#W211141

BOHLER //

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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 industrial development located on the easterly side of the recently approved subdivision roadway UNIFIED Parkway Town of Sutton, Massachusetts. The overall site contains approximately 448± acres of land. The project, which contains approximately 124.1± acres of land, contains an existing gravel operation accessed by multiple onsite dirt roads. The remaining portion of the site is undeveloped consisting of shrub and wooded areas.

The proposed project includes the construction of a two (2) new industrial buildings totaling 995,736± SF along with new paved 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. This report utilizes the same methodology and expands upon the original report prepared for the development of the subdivision road titled "*Drainage Report for UNIFIED Parkway*" prepared by Bohler, revised through December 16, 2021.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at six (6) "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	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.20	0.20	**0.00**	1.40	1.40	**0.00**
DP2	0.00	0.00	**0.00**	1.50	1.40	**-0.10**	6.00	4.00	**-2.00**	20.90	20.70	**-0.20**
DP3	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.30	0.30	**0.00**	1.70	1.70	**0.00**
DP4	0.00	0.00	**0.00**	0.40	0.40	**0.00**	2.10	1.7	**-0.40**	9.20	7.20	**-2.00**
DP5	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.10	0.10	**0.00**
DP6	0.10	0.10	**0.00**	2.50	2.50	**0.00**	7.20	6.90	**-0.30**	21.00	20.90	**-0.10**

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

Table 1.2 below outlines the change in volume of runoff to Design Point 4 (DP4) which is an existing well/Wellhead Protection Area (Zone I). As shown, there is an increase in volume to the wellhead area and the project is not anticipated to negatively impact the existing well.

Table 1.2: Design Point Volume 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
DP4	0.001	0.001	**0.000**	0.267	0.338	**0.071**	0.722	0.876	**0.154**	1.773	3.823	**2.050**

**Volumes are represented in acre-feet (ac-ft)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The project contains approximately 124.1± acres of land on the easterly side of the recently approved subdivision Road UNIFIED Parkway located between Providence Road and Boston Road in Sutton, Massachusetts. The central portion of the site contains an existing gravel operation accessed by multiple onsite dirt roads. The remaining portion of the site is undeveloped consisting of shrub and wooded areas.

On-Site Soil Information

Majority of the soils at the site are mapped as Hinckley loamy sand and Merrimac fine sandy loam which are classified by the Natural Resource Conservation Service (NRCS) as Hydrologic Soil Group (HSG) “A”. A small portion of the site is mapped as Sudbury fine sandy loam which is classified as HSG “B”. The central portion of the site is mapped as gravel pits with undetermined HSG.

Based upon on-site geotechnical testing which indicated the presence of loamy sand, sandy loam, sand and gravel, majority of the site including areas mapped as gravel pits have been analyzed as HSG “A”, and a small portion of the site has been classified as HSG “B”. For the purposes of this analysis infiltration at proposed BMPs have been modeled based upon the testing performed in each BMP area. Refer to **Appendix C** for additional information.

Existing Collection and Conveyance

The southern portion of the site drains overland to the south to a wetland system located at Boston Road. The northern portion of the site drains overland to the north to a large onsite wetland system. The central portion of the site drains overland to an existing well/Wellhead Protection Area (Zone I) prior to overflowing to the large onsite wetland system to the north. Slopes on the site range from 1%-33% with on-site elevations ranging from 560± in the western portion of the site to 358± adjacent to Providence Road.

It is anticipated that the recently approved subdivision roadway and its associated stormwater infrastructure will be constructed prior to the development of the two (2) proposed buildings. Therefore, the existing model has also incorporated the design of the subdivision roadway.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at six (6) “design points”, as described below, where stormwater runoff currently drains to under existing conditions. The existing site was subdivided into twelve (12) separate sub catchments, as described below, to analyze existing and proposed flow rates at each design point. The minimum time of concentration for all proposed areas is calculated as six (6) minutes (0.1 hr.). There is currently no stormwater infrastructure, flow controls or treatment systems located onsite. Runoff generated onsite flows overland to the design points described below.

Design Point #1 (DP1) is a wetland system located adjacent to Boston Road and located east of the subject site. Under existing conditions this design point receives stormwater flows from approximately 10.6± acres of land designated as watersheds “E1a” and “E1b”. Refer to **Table 2.1** below for additional detail.

Design Point #2 (DP2) is the eastern boundary of the limit of work in the southern portion of the subject site. Under existing conditions this design point receives stormwater flows from approximately 62.9± acres of land designated as watershed “E2”. Refer to **Table 2.**1 below for additional detail.

Design Point #3 (DP3) is the onsite wetland system located in the western portion of the subject site. Under existing conditions this design point receives stormwater flows from approximately 20.9± acres of land designated as watershed “E3”. Refer to **Table 2.**1 below for additional detail.

Design Point #4 (DP4) is the eastern boundary of the limit of work in the central portion of the subject site. Under existing conditions this design point receives stormwater flows from approximately 27.7± acres of land designated as watersheds “E4a”, “E4d.1” and “E4d.2” that ultimately flow to the existing well/Wellhead Protection Area (Zone I). Refer to **Table 2.**1 below for additional detail.

Design Point #5 (DP5) is the western boundary of the limit of work in the northern portion of the subject site. Under existing conditions this design point receives stormwater flows from approximately 0.1± acres of land designated as watershed “E5”. Refer to **Table 2.**1 below for additional detail.

Design Point #6 (DP6) is the northeastern boundary of the limit of work in the northeastern portion of the subject site. Under existing conditions this design point receives stormwater flows from approximately 22.8± acres of land designated as watersheds “E6”, “E4b”, “E4c” and “E4e”. Refer to **Table 2.**1 below for additional detail.

Table 2.2: Existing Sub-Catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description*	Curve Number (CN)	Time of Concentration (Tc, minutes)
E1a	1.3±	Paved parking, grass, basin bottom	85	6.0
E1b	9.3±	Dirt roads, grass, woods	32	26.2
E2	62.9±	Woods, grass, dirt roads, meadow	38	55.0
E3	20.9±	Woods, meadow	30	24.6
E4a	4.3±	Paved parking, grass, basin bottom	89	6.0
E4d.1	3.1±	Dirt Roads, meadow, woods, grass	40	7.2
E4d.2	20.3±	Dirt roads, meadow, woods, grass	36	20.7
E5	0.1±	Grass, meadow	38	6.0
E6	3.7±	Dirt roads, meadow, woods	43	11.3
E4b	3.5±	Paved parking, grass, basin bottom	84	6.0
E4c	1.9±	Paved parking, grass, basin bottom	88	6.0
E4e	13.7±	Grass, dirt roads, meadow, woods	43	8.5

*Paved parking areas are associated with the development of the subdivision road.

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 two (2) new industrial buildings totaling 995,736± SF along with new paved parking areas, landscaping, storm water management components and associated utilities. The site, including the proposed parking areas, has been designed to drain to deep-sump, hooded catch basins. The catch basins will capture and convey stormwater runoff, via an underground pipe system, to one of three (3) proposed underground infiltration basins or one of five (5) surface infiltration basins. Pretreatment of stormwater runoff will be provided by a combination of the deep-sump, hooded catch basins, forebays and isolator rows prior to discharge into the proposed infiltration basins. Rooftop runoff has been designed to flow to the basins as well.

Proposed Development Collection and Conveyance

Deep sump hooded catch basins are proposed to collect and route runoff from the paved parking and drive aisles to the infiltration basins. Pipes have been designed for the 25-year storm using the Rational Method, and culverts at road crossings have been sized for the 100-year storm. 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.

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 twenty-one (21) separate sub catchments for the proposed conditions as described below. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Under proposed conditions the design points receive the following and are detailed further in **Table 3.1** below.

DP#1 receives stormwater flows from approximately 10.6± acres of land, designated as watersheds “P1a” and “P1b”.

DP#2 receives stormwater flows from approximately 21.5± acres of land, designated as watershed “P2X”, “P2d”, “P2e”, and “P3c”.

DP#3 receives stormwater flows from approximately 20.9± acres of land, designated as watershed “P3”.

DP#4 receives stormwater flows from approximately 51.1± acres of land, designated as watershed “P2”, “P2b”, “P2c”, “P3a”, “P3b”, “P4X”, “P4a”, and “P4d.1”.

DP#5 receives stormwater flows from approximately 0.1± acres of land, designated as watershed “P5”.

DP#6 receives stormwater flows from approximately 31.1± acres of land, designated as watershed “P2a”, “P4b”, “P4c”, “P4e”, and “P6X”.

Table 3.1: Proposed Sub-catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)	Hydrologic Routing
P1a	1.4±	Paved parking, grass, basin bottom	85	6.0	Basin #4 / DP#1
P1b	9.3±	Grass, dirt roads, woods	32	26.2	DP#1
P2X	1.4±	Grass	43	6.0	DP#2
P2d	7.3±	Rooftops, paved parking, grass	91	6.0	Basin #2d/ DP#2
P2e	4.8±	Grass, paved parking, meadow	61	6.0	Basin #2e / DP#2
P3c	7.9±	Grass, paved parking, rooftops	85	6.0	Basin #3c / DP#2
P3	20.9±	Woods, Meadow	30	24.6	DP#3
P2	13.9±	Woods, grass, dirt roads, meadow	31	35.3	Basin #3a / DP#4
P2b	2.8±	Rooftops, paved parking, grass,	87	6.0	Basin #2b / DP#4
P2c	8.3±	Rooftops, paved parking, grass	85	6.0	Basin #2c / DP#4
P3a	14.2±	Rooftops, paved parking, grass	70	6.0	Basin #3a / DP#4
P3b	9.8±	Rooftops, paved parking, grass, meadow, dirt roads, gravel roads, woods	64	6.0	Basin #3b & #3a / DP#4
P4X	4.9±	Meadow, Grass	35	6.0	DP#4
P4a	4.3±	Paved parking, grass, basin bottom	89	6.0	Basin #3 / DP#4
P4d.1	3.1±	Dirt roads, meadow, woods, grass	40	7.4	DP#4
P5	0.1±	Grass, meadow	38	6.0	DP#5
P2a	10.8±	Rooftops, paved parking, grass	90	6.0	Basin #2a / DP#6
P4b	3.5±	Paved parking, grass, basin bottom	84	6.0	Basin #2 / DP#6
P4c	1.9±	Paved parking, grass, basin bottom	88	6.0	Basin #1 / DP#6
P4e	13.7±	Grass, dirt roads, meadow, woods	43	8.5	DP#6
P6X	1.2±	Grass	49	6.0	DP#6

Refer to **Table 1.1,** for the calculated proposed conditions peak rates of runoff. For additional hydrologic information, refer to **Appendix D** 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** below 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)	3.27	5.07	6.19	7.92

* Values derived from NOAA ATLAS on 11/02/21 and consistent with previous model prepared for subdivision roadway

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** and **Table 6.1**, 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 one of eight (8) proposed infiltration basins. The project as proposed will involve the creation of 41.8± acres of new impervious area and is required to infiltrate 91,051 cubic feet of stormwater as defined in Stormwater Standard 3. The proposed infiltration basins will provide 489,794 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 basin will drain within 72 hours are included in **Appendix F** of this report.

Basins #2c and #3b have less than four (4) foot separation and infiltration is used to attenuate the 10-year storm or higher. Therefore, a groundwater mounding analysis has been provided for these two basins. The analysis shows that the groundwater mound will have no effect on the proposed systems. Refer to Appendix F for more information.

The remaining basins provide a four (4) foot separation to estimated seasonal high groundwater (ESHGW) or exclude infiltration for peak rate mitigation therefore a groundwater mounding analysis is not required for these basins.

Standard #4: Water Quality

Water quality treatment is provided via deep sump catch basins, forebays, isolator rows and infiltration basins. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will involve the creation of 41.8± acres of new impervious area and is required to treat 151,843 cubic feet of water quality volume as defined in Stormwater Standard 4. The proposed infiltration basins provide 489,794 cubic feet of water quality volume below the lowest outlet for water quality treatment. Refer to **Appendix F** of this report for calculations documenting required and provided water quality volumes.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not Applicable for this project.

Standard #6: Critical Areas

A Zone II has been established for the site which covers the central portion of the site. A Zone I Wellhead Protection Area is located in the eastern portion of the Zone II in the central portion of the site. The project has been designed to provide one (1) inch of water quality volume in accordance with Standard #6 and as outlined in Standard #4 above.

The proposed stormwater management system has been designed to provide at least eighty percent (80%) removal of Total Suspended Solids (TSS) through the use of several Best Management Practices (BMPs), including deep-sump hooded catch basins, forebays, and surface infiltration basins. The deep-sump hooded catch basins, forebays, and isolator rows will provide a minimum of 44% TSS removal prior to all infiltration basins. Refer to **Appendix F** for TSS removal calculations.

Standard #7: Redevelopment

Not Applicable for this project.

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.

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, refer to **table 6.1 below.** In addition, the proposed best management practices will result in an effective removal of total suspended solids from the post-development runoff.

Table 6.1: 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	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.20	0.20	**0.00**	1.40	1.40	**0.00**
DP2	0.00	0.00	**0.00**	1.50	1.40	**-0.10**	6.00	4.00	**-2.00**	20.90	20.70	**-0.20**
DP3	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.30	0.30	**0.00**	1.70	1.70	**0.00**
DP4	0.00	0.00	**0.00**	0.40	0.40	**0.00**	2.10	1.7	**-0.40**	9.20	7.20	**-2.00**
DP5	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.10	0.10	**0.00**
DP6	0.10	0.10	**0.00**	2.50	2.50	**0.00**	7.20	6.90	**-0.30**	21.00	20.90	**-0.10**

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

Table 6.2 below outlines the change in volume of runoff to Design Point 4 (DP4) which is an existing well/Wellhead Protection Area (Zone I). As shown, there is a minor increase in volume to the wellhead area and the project is not anticipated to negatively impact the capacity of the existing well.

Table 6.2: Design Point #4 Volume 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
DP4	0.001	0.001	**0.000**	0.267	0.338	**0.071**	0.722	0.876	**0.154**	1.773	3.823	**2.050**

**Volumes are represented in acre-feet (ac-ft)*

As outlined in the tables above, 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 as described further herein.

APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

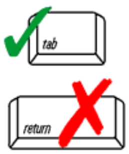
Massachusetts Department of Environmental Protection

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.

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

COMMONWEALTH OF MASSACHUSETTS
JOHN A. KUCICH
CIVIL
No. 41530
REGISTERED PROFESSIONAL ENGINEER

John Kucich March 23, 2022

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 (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): Surface & Subsurface Infiltration Systems

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist (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 (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 (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

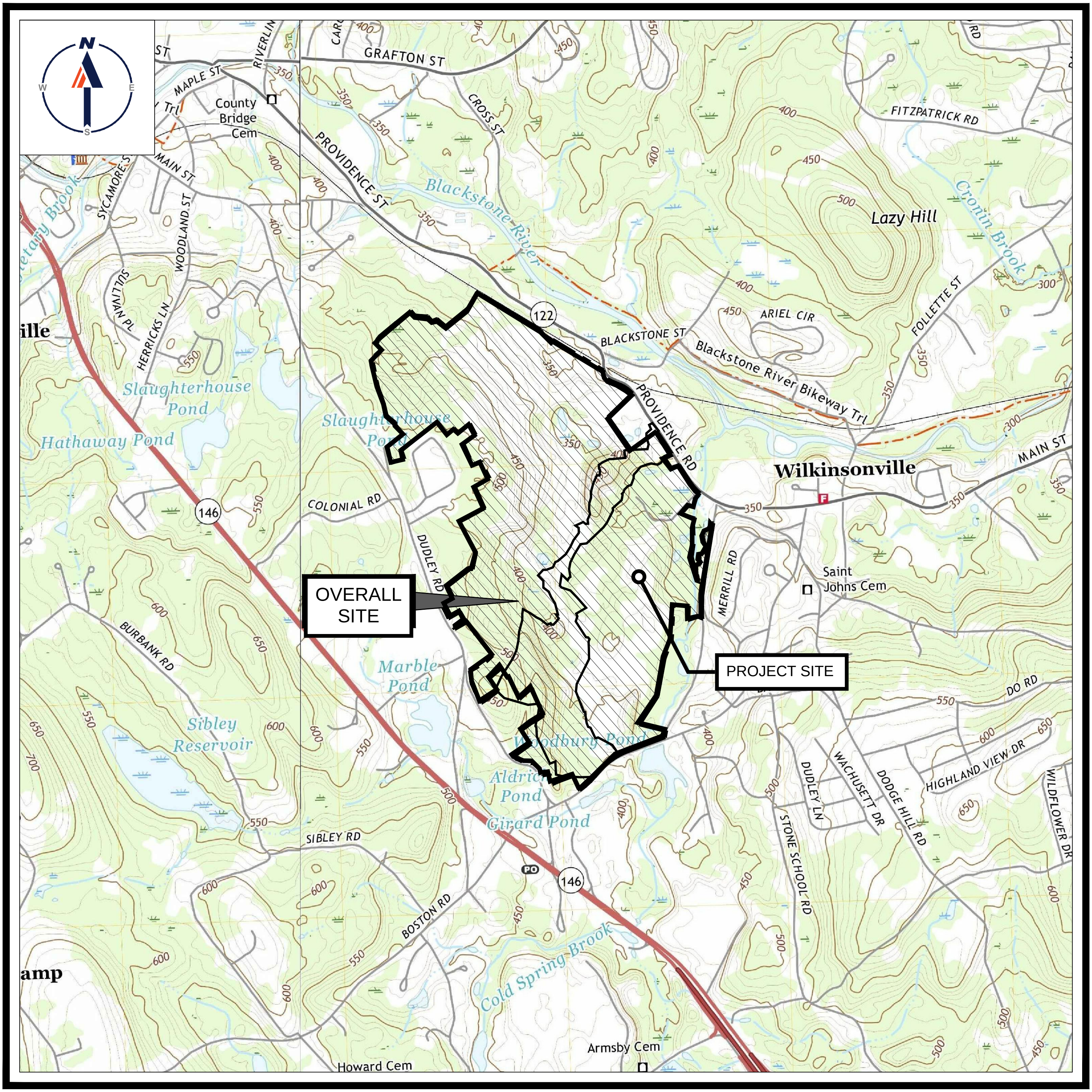
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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

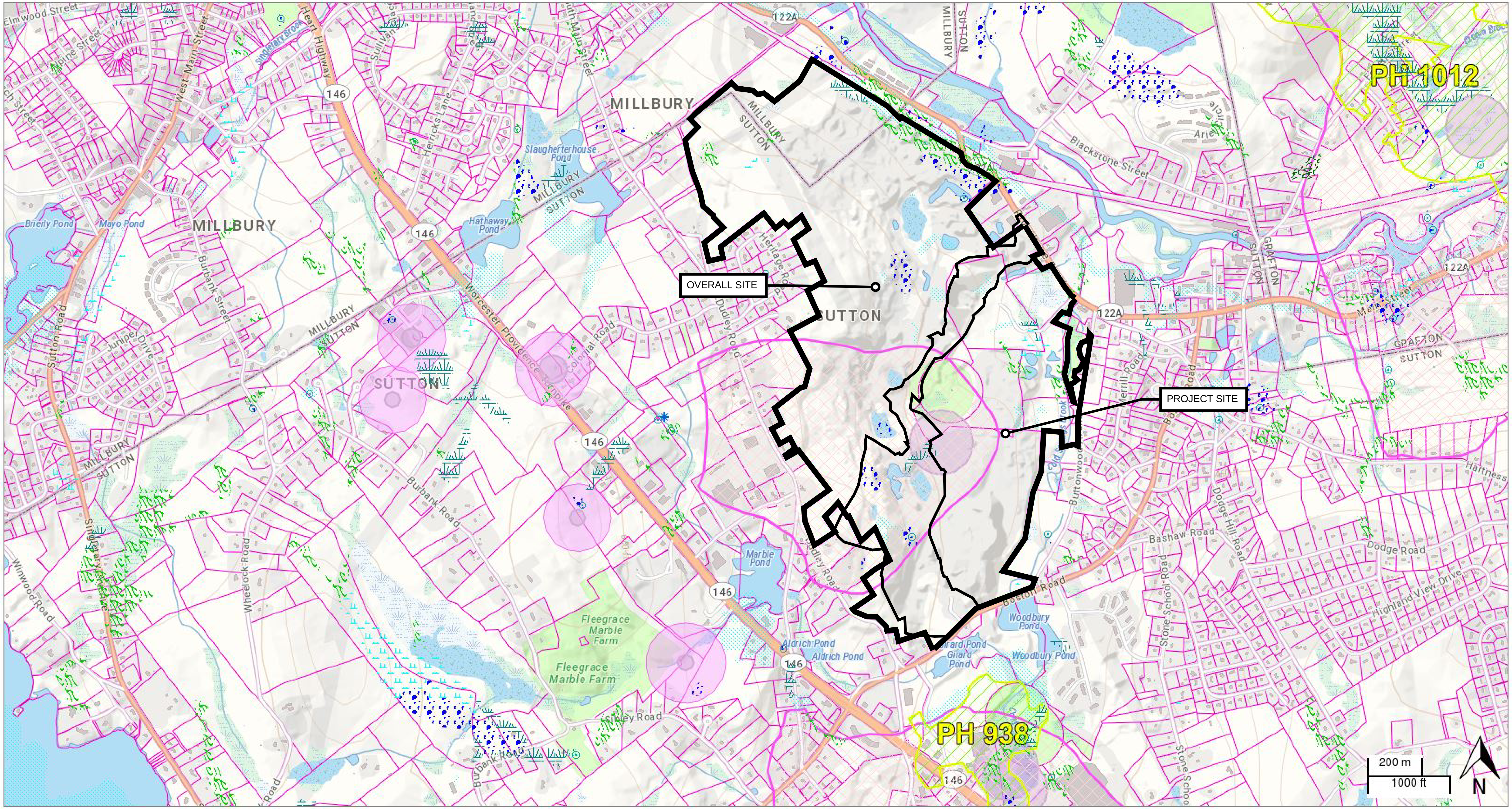
- *USGS MAP*
- *MA GIS MAP*
- *FEMA FIRMETTE*



USGS MAP

SCALE: 1" = 2,000'
SOURCE: WORCESTER SOUTH AND GRAFTON MASSACHUSETTS USGS QUADRANGLE

Oliver MA GIS



DEP Wetlands Detailed
- Barrier Beach System
- Barrier Beach-Deep Marsh
- Barrier Beach-Wooded Swamp Mixed Tr
- Barrier Beach-Coastal Beach
- Barrier Beach-Coastal Dune
- Barrier Beach-Marsh
- Barrier Beach-Salt Marsh
- Barrier Beach-Shrub Swamp
- Barrier Beach-Wooded Swamp Conifero
- Barrier Beach-Wooded Swamp Deciduo
- Bog
- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees

Zone C

Zone B

Zone A

Areas of Critical Environmental Concern ACECs

NHESP Ecoregions

NHESP Estimated Habitats of Rare Wildlife

NHESP Natural Communities

NHESP Priority Habitats of Rare Species

Potential Vernal Pools

NHESP Certified Vernal Pools

Zone IIs

Zone Is

IWPAs

Tax Parcels for Query

Detailed Features

Tax Parcels for Display

Structures

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Massachusetts State Plane Mainland Zone (FIPS zone 2001). The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography. Base map files were provided in digital format by Massachusetts Geographic Information Systems (MassGIS). Ortho imagery was produced at a scale of 1:5,000. Aerial photography is dated April 2005.

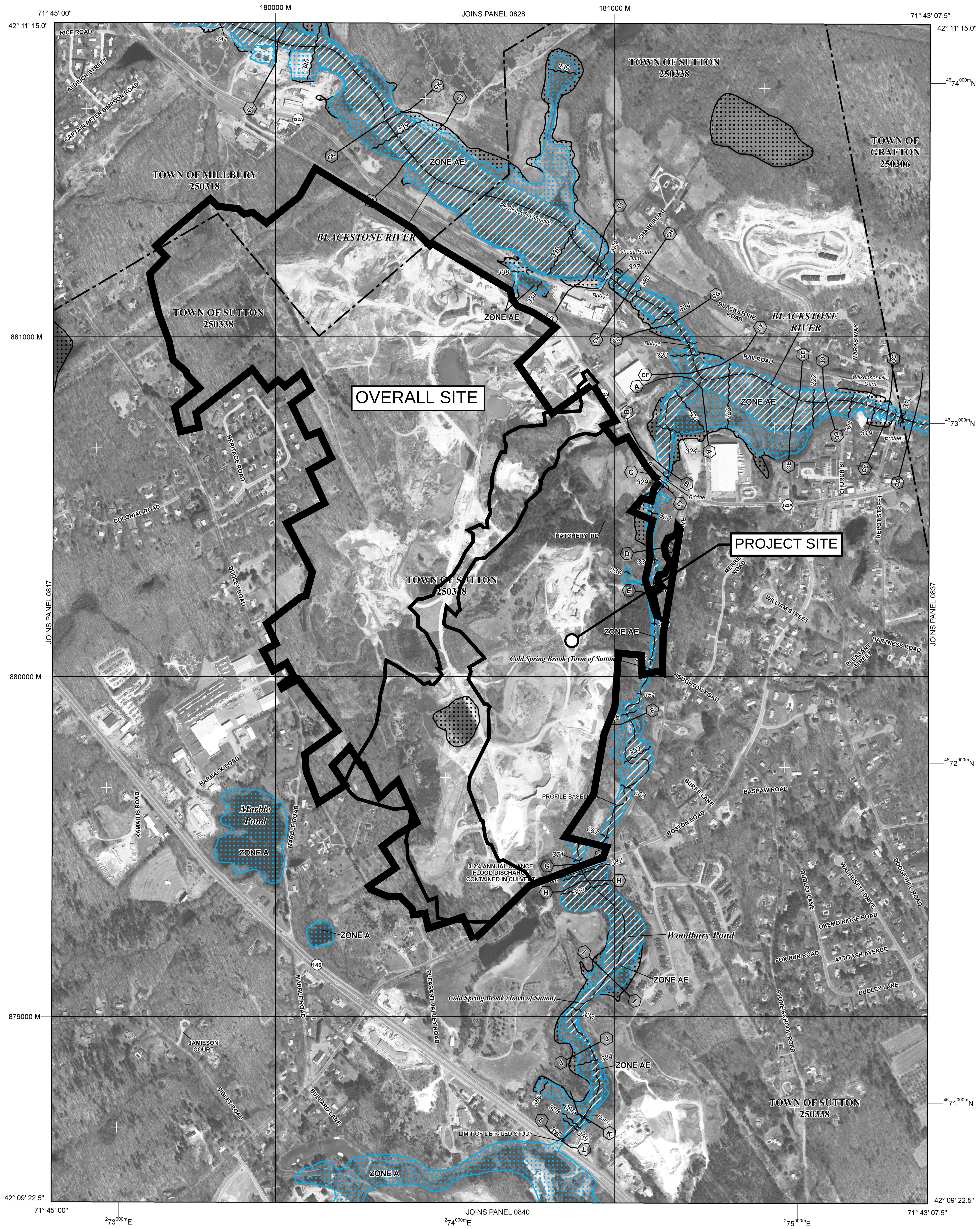
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - - 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000 M	1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection
$^{49}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 19N
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
July 4, 2011

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0836E

FIRM
FLOOD INSURANCE RATE MAP
WORCESTER COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 836 OF 1075
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GRAFTON, TOWN OF	250306	0836	E
MILLBURY, TOWN OF	250318	0836	E
SUTTON, TOWN OF	250338	0836	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25027C0836E

EFFECTIVE DATE
JULY 4, 2011

Federal Emergency Management Agency

APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *WETLAND/WATERCOURSES SKETCH*
- *ON SITE SOIL TESTING INFORMATION*

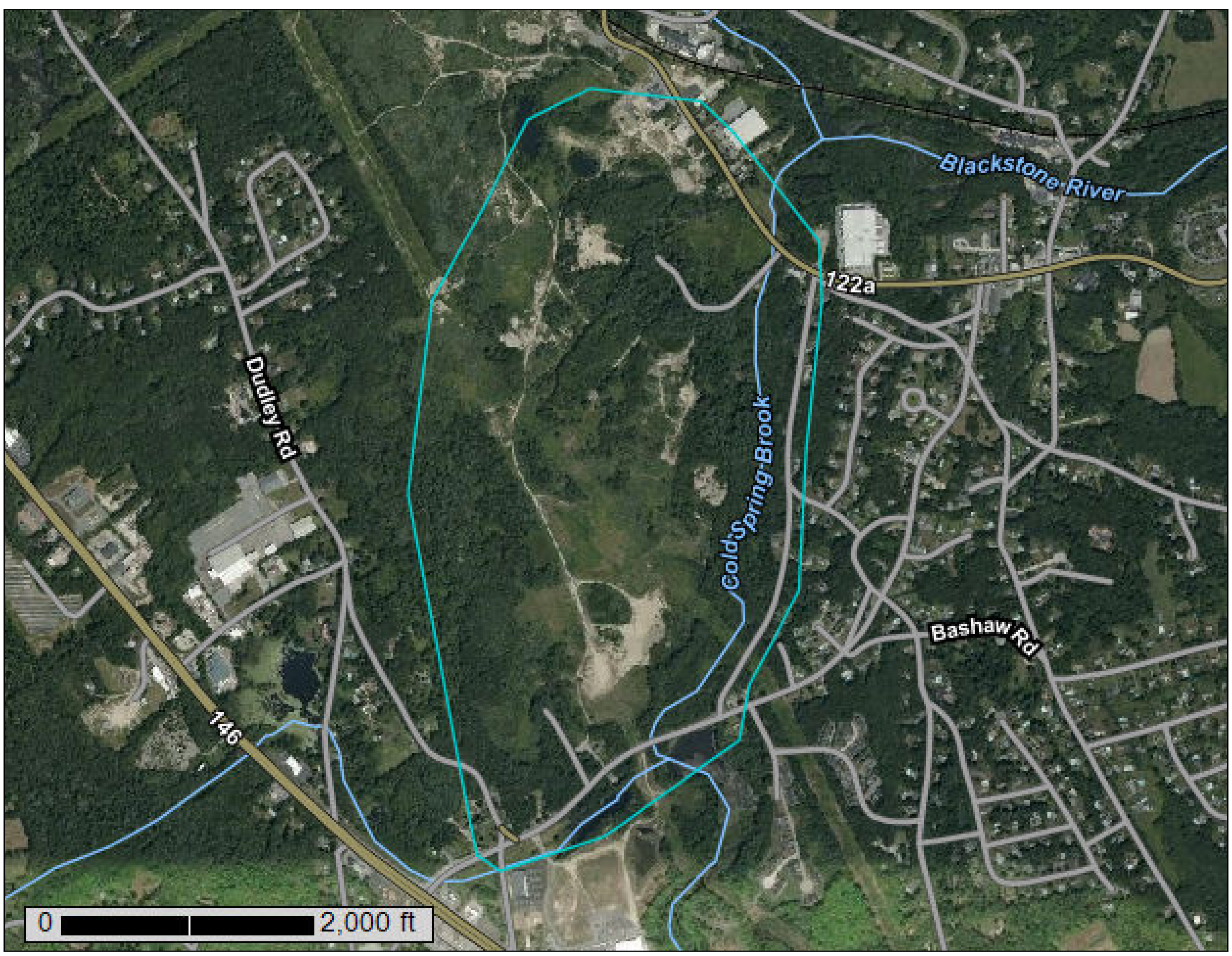
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Worcester County, Massachusetts, Southern Part



October 4, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 14, Sep 3, 2021

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

Date(s) aerial images were photographed: May 18, 2019—Oct 5, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	5.9	1.7%
3A	Scarboro and Walpole soils, 0 to 3 percent slopes	23.4	6.7%
245B	Hinckley loamy sand, 3 to 8 percent slopes	7.1	2.1%
245C	Hinckley loamy sand, 8 to 15 percent slopes	33.4	9.6%
245E	Hinckley loamy sand, 15 to 35 percent slopes	51.9	14.9%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	77.2	22.2%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	0.9	0.3%
255C	Windsor loamy sand, 8 to 15 percent slopes	1.8	0.5%
255D	Windsor loamy sand, 15 to 25 percent slopes	4.3	1.2%
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	10.8	3.1%
260B	Sudbury fine sandy loam,3 to 8 percent slopes	3.7	1.1%
600	Pits, gravel	108.2	31.1%
651	Udorthents, smoothed	19.4	5.6%
Totals for Area of Interest		**348.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Worcester County, Massachusetts, Southern Part

1—Water

Map Unit Setting

National map unit symbol: 9bgp
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Water

Setting

Landform: Lakes

3A—Scarboro and Walpole soils, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svks
Elevation: 160 to 480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 45 percent
Walpole and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Drainageways, depressions, outwash deltas, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam

Cg1 - 11 to 21 inches: sand
Cg2 - 21 to 65 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Description of Walpole

Setting

Landform: Depressions on outwash plains, drainageways on outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

O - 0 to 2 inches: muck
A - 2 to 11 inches: fine sandy loam
Bg - 11 to 24 inches: fine sandy loam
Bw - 24 to 28 inches: sandy loam
Cg - 28 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D

Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent
Landform: Swamps, bogs
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wareham

Percent of map unit: 10 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

245B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

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

Map Unit Composition

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

Description of Hinckley

Setting

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

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

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

Sudbury

Percent of map unit: 5 percent
Landform: Outwash deltas, outwash terraces, moraines, outwash plains, kame terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Head slope, side slope, base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Concave, convex, linear

Across-slope shape: Convex, linear, concave
Hydric soil rating: No

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Outwash deltas, moraines, outwash plains, kame terraces, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

245E—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd
Elevation: 0 to 860 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

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

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear

Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Outwash deltas, outwash plains, kame terraces, outwash terraces, moraines
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

254C—Merrimac fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tyqt
Elevation: 0 to 1,030 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Eskers, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury
Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley
Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor
Percent of map unit: 5 percent
Landform: Outwash plains, dunes, deltas, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

255C—Windsor loamy sand, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2svkq
Elevation: 0 to 1,260 feet
Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor

Setting

Landform: — error in exists on —
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Ap - 1 to 11 inches: loamy sand
Bw - 11 to 31 inches: loamy sand
C - 31 to 65 inches: sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Hydric soil rating: No

Deerfield

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

255D—Windsor loamy sand, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2svlb
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Windsor and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: Outwash terraces, outwash plains, dunes, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley
Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Merrimac
Percent of map unit: 5 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

260A—Sudbury fine sandy loam, 0 to 3 percent slopes

Map Unit Setting
National map unit symbol: 9bbd
Elevation: 0 to 2,100 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Sudbury and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Terraces, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits derived from granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 8 inches: sandy loam
H3 - 8 to 20 inches: sandy loam
H4 - 20 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 20 percent
Hydric soil rating: No

Walpole

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

260B—Sudbury fine sandy loam,3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9bbf

Elevation: 0 to 2,100 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Sudbury

Setting

Landform: Terraces, depressions
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits derived from granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 8 inches: sandy loam
H3 - 8 to 20 inches: sandy loam
H4 - 20 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 0 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 15 percent
Hydric soil rating: No

Walpole

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

600—Pits, gravel

Map Unit Setting

National map unit symbol: 9bf6
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits, gravel: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Gravel

Setting

Parent material: Loose sandy and gravelly glaciofluvial deposits

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

651—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9bfc
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 80 percent
Urban land: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Parent material: Made land over firm coarse-loamy basal till and/or dense coarse-loamy lodgment till

Typical profile

H1 - 0 to 6 inches: variable

H2 - 6 to 60 inches: variable

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

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SANBORN HEAD

Building Trust. Engineering Success.

SUBSURFACE EVALUATION FOR STORMWATER

South Parcel – 105 Providence Street
Sutton, Massachusetts

Prepared for: UGPG RE LLC
File No. 4853.02
March 11, 2022

SANBORN HEAD
Building Trust. Engineering Success.

1 Technology Park Drive
Westford, MA 01886

UGPG RE LLC
Attn: Art Mahassel
223 Worcester Providence Turnpike
Sutton, MA 01590

March 11, 2022
File No. 4853.02

Re: Subsurface Evaluation for Stormwater
South Parcel – 105 Providence Street
Sutton, Massachusetts

Dear Art:

This data report summarizes the results of subsurface explorations completed to support design of the proposed stormwater systems for the two (2) proposed warehouse buildings within the southern portion of the Site (South Parcel) in Sutton, Massachusetts (Site) as shown on the Locus Plan in Figure 1. We understand this information will be used by Bohler Engineering (Bohler) and the project team to design the surface stormwater infiltration systems.

This report has been prepared by Sanborn, Head & Associates, Inc. (Sanborn Head) on behalf of UGPG RE LLC (Client) in accordance with our proposal dated August 14, 2020 and subsequent contract amendments. This report is subject to the Limitations stated in Attachment A.

SITE AND PROJECT DESCRIPTION

Based on our knowledge of the area, the Site was formerly owned by Aggregate Industries and was operated as a sand/gravel mine and stone quarry; as a result, there is significant disturbance and re-grading of the landscape made during the former borrow operations. Topographic data for the Site, provided by UGPG, indicates the ground surface elevation generally undulates between approximately El. 330 to 500 feet, with highest grades typically in the southwestern portion of the Site and lowest grades typically in the eastern portion of the Site.

Based on our review of proposed project information provided, we understand the Southern Parcel includes the construction of two (2) warehouse buildings identified as Building 2 (approximately 653,000 square-feet (SF); finished floor elevation (FFE) = 387.0 feet) and Building 3 (approximately 343,400 SF; FFE = 396.0 feet), paved surface parking and loading docks, and drive aisles, and stormwater management systems. The proposed Building 2 and Building 3 footprints and locations of the proposed stormwater systems are shown on the Exploration Location Plan, Figure 2.

Elevations in this report are in feet and referenced to the project datum on the drawings titled "Existing Conditions Survey" by WSP USA, Inc. of Merrimack, New Hampshire and dated December 4, 2020, and provided to us by UGPG.

SUBSURFACE EXPLORATION PROGRAM

Between October 13, 2020 and January 14, 2022, Sanborn Head completed multiple series of subsurface explorations, which included a total of nineteen (19) stormwater test pits and one (1) test boring located in the general areas of the eight (8) proposed stormwater infiltration systems:

Building 2:

- Surface Basin (B2a) – SH-2-110 (boring), TP-280;
- Surface Basin (B2b) – TP-278 and TP-279;
- Surface Basin (B2c) – SH-TP-2-109, TP-266, TP-267, and TP-268B;
- UG Basin (UG2d) – TP-231, TP-275, and TP-276; and,
- UG Basin (UG2e) – TP-228 and TP-274.

Building 3:

- Surface Basin (B3a) – SH-TP-2-110, TP-263, and TP-264;
- Surface Basin (B3b) – TP-271 and TP-272; and,
- UG Basin (UG3c) – TP-225 and TP-273.

Stormwater test pits designated SH-TP-2-109 and SH-TP-2-110 were excavated by Walsh Contracting Corporation (Walsh) of Attleboro, MA between September 15 and 20, 2021 to depths ranging from approximately 7.0 to 8.0 feet below ground surface (bgs).

Stormwater test pits designated TP-216 through TP-280 were excavated by Walsh between September 22, 2021 and January 26, 2022 to depths ranging from approximately 2.0 to 23.0 feet bgs.

Test boring designated SH-2-110 was advanced by Soil X Corporation (Soil X) of Leominster, Massachusetts on October 12, 2021 to a depth of approximately 12.0 feet bgs.

The explorations were observed by Sanborn Head personnel on a full-time basis. Logs of the subsurface explorations were prepared by a Soil Evaluator certified in Massachusetts. Soil samples were field classified based on visual estimates of grain size distribution and plasticity using both the Modified Burmister System and the United States Department of Agriculture (USDA) Textural Classification System. A legend is also provided in Appendix B that describes the Modified Burmister classification system. Additional soil characteristics such as density and consistency (based on Standard Penetration Test data), color and moisture were noted on the logs included in Appendix B.

SUBSURFACE CONDITIONS

The explorations generally encountered a surface layer of either organic topsoil approximately 4 to 12 inches thick or variable thickness fill ranging from sand to silt with varying amounts of gravel (SH-TP-2-110, TP-263, TP-264, and TP-272).

The natural soil below the fill/topsoil layer consists of a natural sand to silt loam with varying amounts of gravel and cobbles. In general, the natural soils tend to increase in silt content with depth.

Refusal on probable bedrock was occasionally encountered in the South Parcel including at SH-2-110 at approximately 12.0 feet bgs (corresponding to approximate El. 358.2 feet). Refusal on probable bedrock was not observed in the remaining test pits that were evaluated for stormwater. Refusal on probable boulders was encountered at SH-TP-2-109, TP-231, and TP-276 at depths of 8.0 to 18.0 feet.

Stabilized groundwater was encountered throughout the South Parcel at depths from 10.0 to 18.0 feet bgs (corresponding to approximately El. 353.5 feet to 370.5 feet). Generally, the elevation of groundwater increases with toward the southwestern portion of the Site. Redoximorphic features indicative of seasonal high groundwater were observed in TP-228 at 13.0 feet bgs (corresponding to approximately El. 362.8 feet).

It should be noted that groundwater levels will vary depending on seasonal variations in temperature and precipitation and may be influenced by topography, nearby utilities, and other subsurface structures.

SUMMARY OF RESULTS

Based on the results summarized above, we recommend using the following stormwater design values:

Building 2

Basin ID	Bottom of System Elevation[1] (feet)	Test Pit	USDA Soil Texture	Hydrologic Soil Group (HSG)	Infiltration Rate[2] (in/hr)	ESHGW (feet)
Surface Basin (B2a)	346.0	SH-2-110	Cobbly Gravelly SAND	A	8.27	<340.6
		TP-280	Gravelly LOAMY SAND	A	2.41	<337.8
Surface Basin (B2b)	366.5	TP-278	Cobbly Gravelly SAND	A	8.27	353.9
		TP-279	LOAMY SAND	A	2.41	353.5
Surface Basin (B2c)	374.0	SH-TP-2-109	SAND	A	8.27	<372.2
		TP-266	LOAMY SAND	A	2.41	363.9
		TP-267	Gravelly SAND	A	8.27	369.7
		TP-268B	LOAMY SAND	A	2.41	370.5

[1] Bottom of System Elevations provided by Bohler on Site Plans, dated February 18, 2022.

[2] *Massachusetts Stormwater Handbook, Table 2.3.3:* Sands are classified in Hydrologic Soil Group (HSG) A with a Rawl's infiltration rate of 8.27 in/hr, Loamy Sands are classified in HSG A with a Rawl's infiltration rate of 2.41 in/hr, and Sandy Loams are classified in HSG B with a Rawl's infiltration rate of 1.02 in/hr.

Building 2						
Basin ID	Bottom of System Elevation[3] (feet)	Test Pit	USDA Soil Texture	Hydrologic Soil Group (HSG)	Infiltration Rate[4] (in/hr)	ESHGW (feet)
UG Basin (UG2d)	371.0	TP-231	Gravelly LOAMY SAND	A	2.41	<336.4
		TP-275	LOAMY SAND	A	2.41	<349.0
		TP-276	LOAMY SAND	A	2.41	<354.1
UG Basin (UG2e)	374.3	TP-228	LOAMY SAND	A	2.41	362.8
		TP-274	LOAMY SAND	A	2.41	359.0

Building 3						
Basin ID	Bottom of System Elevation (feet)	Locations	USDA Soil Texture	Hydrologic Soil Group (HSG)	Infiltration Rate (in/hr)	ESHGW (feet)
Surface Basin (B3a)	373.0	SH-TP-2-110	SANDY LOAM	B	1.02	<368.5
		TP-263	SANDY LOAM	B	1.02	<367.6
		TP-264	SANDY LOAM	B	1.02	370.0
Surface Basin (B3b)	383.0	TP-271	SAND	A	8.27	<380.0
		TP-272	SAND	A	8.27	<380.8
UG Basin (UG3c)	379.0	TP-225	LOAMY SAND	A	2.41	365.0
		TP-273	LOAMY SAND	A	2.41	367.6

We trust this data report meets the current needs of the project. If you should have any questions, please call us at (978) 392-0900.

[3] Bottom of System Elevations provided by Bohler on Site Plans, dated February 18, 2022.
[4] *Massachusetts Stormwater Handbook, Table 2.3.3:* Sands are classified in Hydrologic Soil Group (HSG) A with a Rawl's infiltration rate of 8.27 in/hr, Loamy Sands are classified in HSG A with a Rawl's infiltration rate of 2.41 in/hr, and Sandy Loams are classified in HSG B with a Rawl's infiltration rate of 1.02 in/hr.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Luke Norton, P.E.
Project Director

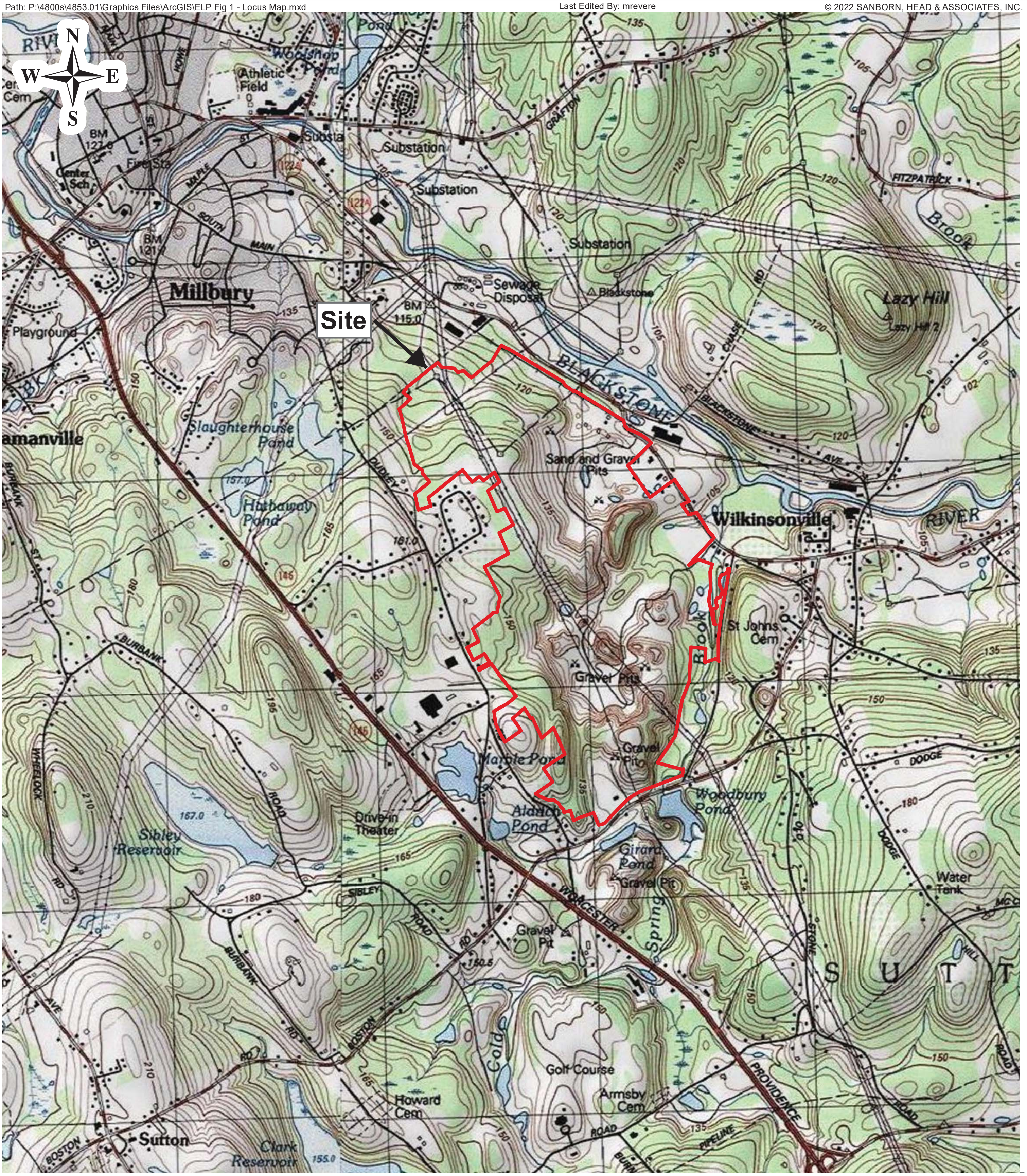
JTM/LCF/LDN: jtm

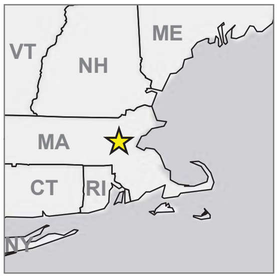
Encl. Figure 1 – Locus Plan
Figure 2 – Exploration Location Plan
Attachment A – Limitations
Attachment B – Subsurface Exploration Logs
Attachment B.1 – Test Pit Logs
Attachment B.2 – Test Boring Logs

P:\4800s\4853.00\Source Files\SW Memo - South Site\20220311 South Site Stormwater Report.docx

FIGURES

Path: P:\4800s\4853.01\Graphics Files\ArcGIS\ELP Fig 1 - Locus Map.mxd   Last Edited By: mrevere





Drawn By: M. Revere
Designed By: J. McCarthy
Reviewed By: L. Norton
Project No: 4853.02
Date: March 2022

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

SANBORN HEAD

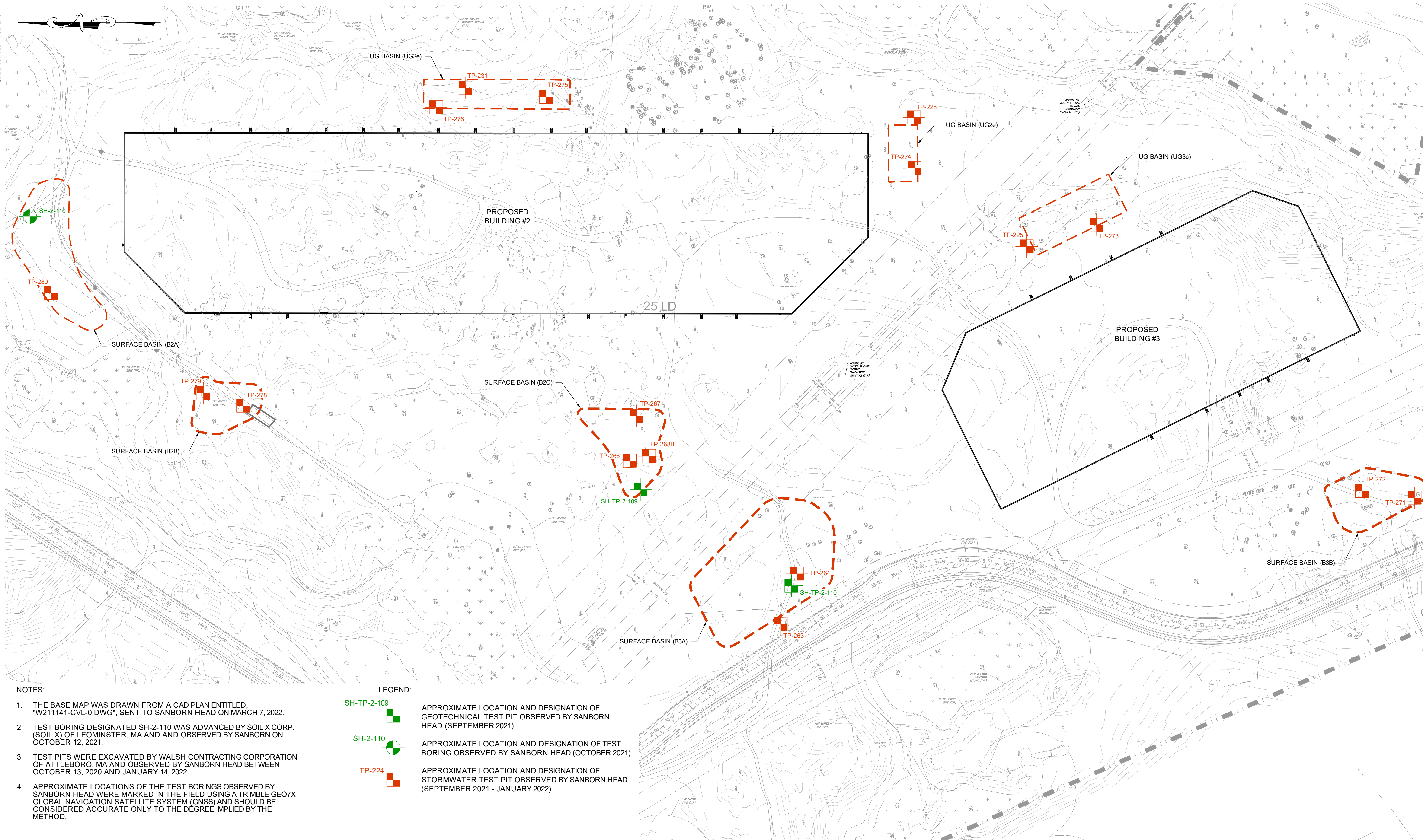
Figure 1

Locus Plan

Geotechnical Engineering Services

105 Providence Road

Sutton, Massachusetts



NOTES:

1. THE BASE MAP WAS DRAWN FROM A CAD PLAN ENTITLED, "W211141-CVL-0.DWG", SENT TO SANBORN HEAD ON MARCH 7, 2022.
2. TEST BORING DESIGNATED SH-2-110 WAS ADVANCED BY SOIL X CORP. (SOIL X) OF LEOMINSTER, MA AND AND OBSERVED BY SANBORN ON OCTOBER 12, 2021.
3. TEST PITS WERE EXCAVATED BY WALSH CONTRACTING CORPORATION OF ATTLEBORO, MA AND OBSERVED BY SANBORN HEAD BETWEEN OCTOBER 13, 2020 AND JANUARY 14, 2022.
4. APPROXIMATE LOCATIONS OF THE TEST BORINGS OBSERVED BY SANBORN HEAD WERE MARKED IN THE FIELD USING A TRIMBLE GEO7X GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD.

LEGEND:

SH-TP-2-109	APPROXIMATE LOCATION AND DESIGNATION OF GEOTECHNICAL TEST PIT OBSERVED BY SANBORN HEAD (SEPTEMBER 2021)
SH-2-110	APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING OBSERVED BY SANBORN HEAD (OCTOBER 2021)
TP-224	APPROXIMATE LOCATION AND DESIGNATION OF STORMWATER TEST PIT OBSERVED BY SANBORN HEAD (SEPTEMBER 2021 - JANUARY 2022)

SANBORN HEAD

GRAPHICAL SCALE

120' 60' 0' 120' 240'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: M. REVERE
DESIGNED BY: J. MCCARTHY
REVIEWED BY: L. NORTON
PROJECT MGR: L. NORTON
PIC: K. STETSON
DATE: MARCH 2022

SUBSURFACE EVALUATION FOR STORMWATER
105 PROVIDENCE ROAD
SUTTON, MASSACHUSETTS

EXPLORATION LOCATION PLAN

PROJECT NUMBER: 4853.02

SHEET NUMBER: 2

ATTACHMENT A

LIMITATIONS

ATTACHMENT A
LIMITATIONS

1. The analyses, recommendations, and designs submitted in this report are based in part on the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and have been developed by interpretation of widely spaced explorations and samples; actual soil transitions may be more or less gradual than indicated. For specific information, refer to the test boring logs.

3. Water level readings have been made in the explorations at the times and under the conditions stated on the test pit logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors differing from those occurring at the time measurements were made.

4. In the event that any changes in the nature, design, or location of the proposed building are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of the report modified or verified in writing by Sanborn Head.

5. It is recommended that this firm be retained to provide soil engineering services during the excavation and earthwork construction phases of the work. This is to observe compliance with the design concepts, specifications, or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to the start of construction.

6. This report has been prepared for the exclusive use of UGPG RE LLC for the warehouse building complex at 105 Providence Road in Sutton, MA in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

7. This soil engineering report has been prepared for this project by Sanborn Head for design purposes only and is not sufficient to prepare an accurate bid. Contractors wishing a copy of this report may secure it with the understanding that its scope is limited to design considerations only.

ATTACHMENT B

SUBSURFACE EXPLORATION LOGS

Description and Classification of Soil

1. Density or Consistency: The density or consistency of a soil sample is based on the Standard Penetration Test N-value according to the following table:

Density of Granular Soil	SPT N-Value		Consistency of Cohesive Soil
Very Loose	0-4	<2	Very Soft
Loose	5-10	2-4	Soft
Medium Dense	11-30	5-8	Medium Stiff
Dense	31-50	9-15	Stiff
Very Dense	>50	16-30	Very Stiff
		>30	Hard

The Standard Penetration Resistance, or N-value in blows per foot, is the sum of the blows recorded over the second and third 6-inch interval.

A number followed by "/3" indicates the distance that the sampler advanced. For example "100/4" indicates that 100 blows of a 140 pound hammer falling 30 inches advanced the sampler 4 inches. "WOR/24" indicates the weight of the drilling rods without the hammer caused the sampler to advance 24 inches.

"WOH" indicates the static weight of the 140 pound hammer and the drilling rods attached to the split spoon sampler were sufficient to cause the sampler to advance.

"WOR" indicates the static weight of the drilling rods attached to the split spoon sampler was sufficient to cause the sampler to advance.

2. Color: The color of a soil sample is based on visual observation.

3. Soil Components

A. Description: The components of a soil sample are described by visually estimating the percentage of each component by weight of the total sample using a Modified Burmister System.

i. Major Component: The major soil component is written with upper case letters for granular soil (e.g., SAND, GRAVEL) and a combination of upper and lower case letters for fine grained soil (e.g., Silty CLAY, Clayey SILT).

ii. Minor Component: The minor soil components are written with the first letter of each soil type in upper case, and the remaining letters in lower case (e.g., Gravel, Silt). The minor components are identified and prefaced in the description based on the following percentages:

Preface	Percentage
and	35-50
some	20-35
little	10-20
trace	0-10

iii. Note: The actual percentages of gravel soil may differ from that measured when sampling with a standard split spoon sampler because of the relatively small sampler diameter. Also, it is not possible to identify the presence of boulders and cobbles using a standard split spoon sampler.

B. Definitions

i. Granular Soil: A granular soil sample is defined by the following particle sizes as referenced to a standard sieve:

Material	Description	Standard Sieve Limit	
		Upper	Lower
Boulders	C-sized	--	36 inch
	B-sized	36 inch	24 inch
	A-sized	24 inch	12 inch
Cobbles	--	12 inch	3 inch
Gravel	coarse	3 inch	3/4 inch
	fine	3/4 inch	No. 4
Sand	coarse	No. 4	No. 10
	medium	No. 10	No. 40
	fine	No. 40	No. 200

ii. Fine Grained Soil: The degree of plasticity of fine-grained soils is defined as follows:

Material	Degree of Plasticity	Plasticity Index (PI)	Smallest Thread Diameter (in.)
SILT	Non-Plastic	0	None
Clayey SILT	Slight	1 to 5	1/4
SILT & CLAY	Low	5 to 10	1/8
CLAY & SILT	Medium	10 to 20	1/16
Silty CLAY	High	20 to 40	1/32
CLAY	Very High	40+	1/64

iii. Organic Soil: An organic soil sample is classified by observation of the sample structure as follows:

Material	Description
TOPSOIL	Surficial soils that support plant life and which contain organic matter.
SUBSOIL	Soil underlying the topsoil which may contain roots or plant fibers.
PEAT	Deposits of plant remains in which the original plant fibers or root structure are visible.
ORGANIC SILT	Deposit of plant remains in which the original plant fibers or root structure have decomposed.

iv. Non-Soil Constituents: Non-soil constituents (artificial or anthropogenic material, organic materials, cobbles and boulders) are described as follows:

The following terminology is used to denote size ranges of non-soil constituents such as man-made objects or fill material:

Descriptive Term	Size Range	Comparative Term
Specks	< No. 200 Sieve	Silt and Clay fines
Particles	No. 200 Sieve to No. 4 Sieve	Sand
Fragments	No. 4 Sieve to 3 in.	Gravel
Pieces	3 in. to 12 in.	Cobbles
Blocks	> 12 in.	Boulders

The following terminology is used to describe the frequency that a non-soil constituent is observed by estimating the percentage of the constituent by weight of the total sample:

Descriptor	Percentage
very few	0-5
few	5-10
common	10-20
frequent	20-35
numerous	35-50

4. Moisture Content: The moisture content of a soil sample is based on the observable presence of water according to the following table:

Dry	Moisture is not apparent, dusty.
Moist	No visible water.
Wet	Visible free water.

5. Other Pertinent Characteristics: Pertinent characteristics observed in a soil sample should be noted according to the following table:

Soil Structure Produced by Deposition of Sediments	
Stratified	Random soil deposits of varying components of color.
Varved	Alternating soil deposits of varying thickness (i.e., clays or silts).
Stratum	Soil deposit > 12 inches thick.
Layer	Soil deposit 3 inches to 12 inches thick.
Seam	Soil deposit 1/8 inch to 3 inches thick.
Parting/Lens	Soil deposit <1/8 inch thick.

ATTACHMENT B.1

TEST PIT LOGS

SANBORN ||| HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. SH-TP-2-109

Ground Elevation: 380.2 ± feet
Datum: Project Datum (December 2020)

Date: 09/20/21
Time Started: 14:00
Time Finished: 14:30

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 75°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
09/20/21	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: D. Cash
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL.	0			
		0.5	Light brown, fine to coarse SAND, little Boulders, trace Silt, trace Gravel, few Organic particles. Moist. [SAND].	0.5		1A 1B 1C (0 to 8 ft)	
2							
4							
6							
8		8	Test pit terminated at 8 feet due to refusal on probable boulders. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	8			
10							
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

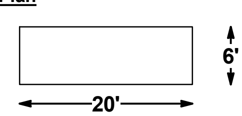
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. SH-TP-2-110

Ground Elevation: 387.0 ± feet
Datum: Project Datum (December 2020)

Date: 09/15/21
Time Started: 12:20
Time Finished: 12:50

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 75°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
09/15/21	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: D. Cash
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL.	0	M		
		0.5	Light brown, fine to coarse SAND, little Silt, trace Gravel, trace Boulders. Moist. FILL. [LOAMY SAND].	0.5	E	1A	
		7	Light brown, fine SAND, some Silt, trace Gravel. Moist. [SANDY LOAM].	7			
		18.5	Test pit terminated at 18.5 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	18.5			
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

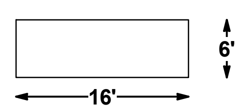
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN | HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-225

Ground Elevation: 381.0 ± feet
Datum: Project Datum (December 2020)

Date: 10/19/21
Time Started: 13:45
Time Finished: 14:05

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 65°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/19/21	---	16'	Ground Surface	17.5'	5 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0	E (0 - 13)		
		0.5	Light brown/light gray, fine to coarse SAND, little Silt, trace Gravel. Moist. [LOAMY SAND].	0.5			
2		3	Brown, fine to coarse SAND, little Gravel, trace Silt. Moist. [Gravelly SAND].	3			
4		5	Light brown/light gray, fine to coarse SAND, little Silt, trace Gravel. Moist. [LOAMY SAND].	5			
6							
8							
10							
12		12	Brown, fine to coarse SAND, little Gravel, trace Silt. Moist. [Gravelly SAND].	12			
		13	Light brown/light gray, fine to coarse SAND, little Silt, trace Gravel, trace Boulder. Moist to wet. [LOAMY SAND].	13	M (13 - 17.5)	1C (13 - 17.5)	
14							
16							
		17.5	Test pit terminated at 17.5 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	17.5			
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

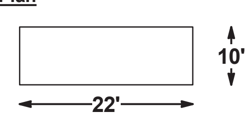
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

TEST PIT P:\4800S\4853.00\WORK\LOGS\4853.00 LOGS.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 2/24/22

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-228

Ground Elevation: 375.8 ± feet
Datum: Project Datum (December 2020)

Date: 10/20/21
Time Started: 10:15
Time Finished: 10:35

Logged By: Z. White
Checked By: L. Norton

Weather: Partly Cloudy, 60°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/20/21	---	No Groundwater Encountered		20'	<5 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0			
		1	Light brown, fine SAND, little Silt. Moist. [LOAMY SAND].	1			
2							
4							
6							
8		8	Light brown, fine to coarse SAND, little Silt, trace Gravel. Moist to wet. [LOAMY SAND].	8			
10					E		
12							Redoximorphioc features observed at 13 feet bgs.
14							
16							
18							
20		20	Test pit terminated at 20 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	20			
22							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

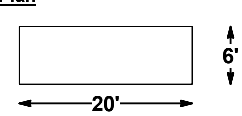
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

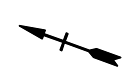
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-231

Ground Elevation: 354.4 ± feet
Datum: Project Datum (December 2020)

Date: 10/20/21
Time Started: 13:00
Time Finished: 13:20

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 65°F

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/20/21	---	No Groundwater Encountered			

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0			
		1	Light brown, fine to coarse SAND, little Silt, little Gravel. Moist. [Gravelly LOAMY SAND].	1			
2							
4							
6		6	Dark brown, fine to coarse SAND, little Gravel, little Cobbles, little Boulder, trace Silt. Moist. [Gravelly SAND].	6		1B 1C	
8							
10							
12							
14							
16							
18		18	Test pit terminated at 18 feet due to refusal on probable boulders. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	18			
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

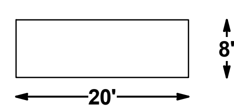
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

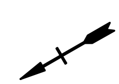
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-263

Ground Elevation: 386.6 ± feet
Datum: Project Datum (December 2020)

Date: 10/18/21
Time Started: 07:45
Time Finished: 08:10

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 55°F

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/18/21	---	No Groundwater Encountered			

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Dark brown, fine to coarse SAND, some Silt, trace Gravel, very few Organic particles. Moist. FILL. [SANDY LOAM].	0	E		
2		2	Dark brown, fine to coarse SAND, little Silt, trace Gravel, trace Cobble. Moist. [LOAMY SAND].	2			
11		11	Light brown, fine to coarse SAND, some Silt, trace Gravel. Moist. [SANDY LOAM].	11			
19		19	Test pit terminated at 19 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	19			

Excavation Effort

E	Easy
M	Moderate
D	Difficult

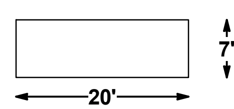
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

Sheet: 1 of 1

TEST PIT P:\4800S\4853.00\WORK\LOGS\4853.00 LOGS.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 2/24/22

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-264

Ground Elevation: 387.5 ± feet
Datum: Project Datum (December 2020)

Date: 10/18/21
Time Started: 08:15
Time Finished: 08:45

Logged By: Z. White
Checked By: L. Norton

Weather: Clear, 55°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/18/21	---	17.5'	Ground Surface	18'	<5 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Light brown, fine to coarse SAND, little Gravel, trace Silt, trace Cobble. Moist. FILL. [Gravelly SAND].	0	E (0–18 ft)		
2		2	Light brown, fine to coarse SAND, some Silt, trace Gravel. Moist to wet. [SANDY LOAM].	2			
4							
6							
8							
10							
12							
14							
16							
18		18	Test pit terminated at 18 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	18			
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

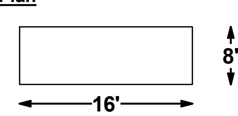
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

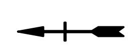
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-266

Ground Elevation: 379.9 ± feet
Datum: Project Datum (December 2020)

Date: 10/18/21
Time Started: 12:50
Time Finished: 13:30

Logged By: Z. White
Checked By: L. Norton

Weather: Partly Cloudy, 60°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/18/21	---	16'	Ground Surface	17'	<5 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0			
		0.5	Light brown, fine to coarse SAND, some Silt, trace Gravel, trace Cobble, trace Boulder. Moist to wet. [LOAMY SAND].	0.5	E	1A	
17		17	Test pit terminated at 17 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	17			

Excavation Effort

E	Easy
M	Moderate
D	Difficult

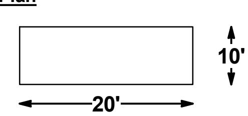
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-267

Ground Elevation: 379.7 ± feet
Datum: Project Datum (December 2020)

Date: 10/18/21
Time Started: 13:25
Time Finished: 13:45

Logged By: Z. White
Checked By: L. Norton

Weather: Partly Cloudy, 60°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
10/18/21	---	10'	Ground Surface	10.5'	5 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: T. Girvan
Reach: 25 ft

Make: CAT
Model: 235C
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0			
		0.5	Light brown, fine to coarse SAND, little Silt, trace Cobbles, trace Gravel. Moist. [LOAMY SAND].	0.5	E		
6		6	Dark brown, fine to coarse SAND, little Cobbles, little Gravel, trace Boulder, trace Silt. Moist to wet. [Gravelly SAND].	6	M	1B 1C	
10		10.5	Test pit terminated at 10.5 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	10.5			

Depth scale (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Excavation Effort

E	Easy
M	Moderate
D	Difficult

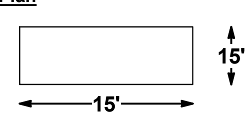
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

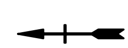
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



TEST PIT P:\4800S\4853.00\WORK\LOGS\4853.00 LOGS.GPJ 2017 SANBORN HEAD V1.GLB 2010 SANBORN HEAD V2.GDT 2/24/22

SANBORN | HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-268B

Ground Elevation: 379.0 ± feet
Datum: Project Datum (December 2020)

Date: 01/26/22
Time Started: 12:00
Time Finished: 12:30

Logged By: Z. White
Checked By: L. Norton

Weather:

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/26/22	12:15	8.5'	Ground Surface	12'	15 Minutes

Excavation Equipment

Contractor: Walsh Contracting
Operator: Fran
Reach: 25 ft

Make: CAT
Model: 349F
Bucket Capacity: 2 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	TOPSOIL. [LOAMY SAND].	0	D		Offset approximately 50 feet from TP-268 in the direction towards TP-266. Difficult excavation effort at surface due to frost at ground surface.
		0.5	Light brown, fine to coarse SAND, some Silt, trace Gravel. Moist. [LOAMY SAND].	0.5			
2							
4							
6							
8		8	Dark brown, fine to coarse SAND, little Gravel, trace Silt. Moist to wet. [SAND].	8			
10							
12		12	Test pit terminated at 12 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	12			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

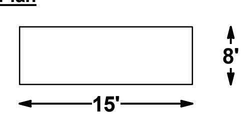
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN ||| HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-271 (Revised on 1/26/22)

Ground Elevation: 400.0 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 08:00
Time Finished: 08:20

Logged By: M. Reisenauer/Z. White
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	No Groundwater Encountered		20'	

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0 / 0.4	Tan, fine to medium SAND, little Silt. Moist. TOPSOIL. [SANDY LOAM].	0 / 0.4			
			Gray, fine to coarse SAND, little Gravel, trace Silt, trace Cobbles, trace Boulders. Moist. [SAND].				
2							
4							
6							
8							
10					E	3A	
12							
14							
16							
18							
20		20	Test pit terminated at 20 feet. No refusal encountered.	20			
			NOTES: 1. USDA textural soil classifications are shown in brackets [ ].				
22							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

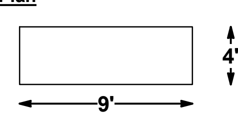
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

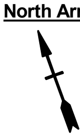
Soil Description Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-272

Ground Elevation: 399.1 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 08:25
Time Finished: 08:40

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, little Silt. Moist. TOPSOIL. [SANDY LOAM].	0	E		
		0.6	Brown, fine to coarse SAND, little Gravel, little Silt. Moist. FILL. [Gravelly LOAMY SAND].	0.6			
2							
4							
6							
8							
10							
		10.6	Dark brown, fine to coarse SAND, little Gravel, trace Silt. Moist. [SAND].	10.6			
12							
14							
16							
18							
		18.3	Test pit terminated at 18.3 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	18.3			
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

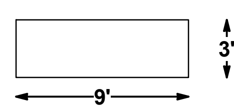
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

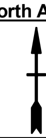
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-273

Ground Elevation: 380.6 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 08:45
Time Finished: 09:05

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	13'	Ground Surface	13'	

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, little Silt. Moist. TOPSOIL. [SANDY LOAM].	0	E (0–13)		
		0.8	Tan, fine to coarse SAND, little Silt, trace Gravel. Stratified. Moist. [LOAMY SAND].	0.8			
2							
4							
6		6	Gray/brown, fine to coarse SAND, little Silt, trace Gravel. Moist to wet. [LOAMY SAND].	6			
8							
10							
12							
		13	Test pit terminated at 13 feet due to repeated collapse. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	13			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

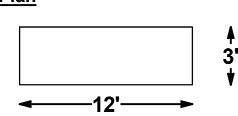
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-274

Ground Elevation: 377.0 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 09:10
Time Finished: 09:25

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	18'	Ground Surface	18'	

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, little Silt, few Roots. Moist. TOPSOIL. [LOAMY SAND].	0	E		
		0.6	Tan, fine to coarse SAND, little Silt, trace Gravel. Moist. [LOAMY SAND].	0.6			
2							
4							
6							
8							
10							
12							
14							
16							
18		18	Test pit terminated at 18 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	18			
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

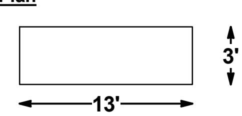
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN ||| HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-275

Ground Elevation: 366.5 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 12:45
Time Finished: 13:10

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, little Silt, few Roots. Moist. TOPSOIL. [LOAMY SAND].	0	E		
		1.2	Gray/tan, fine to coarse SAND, little Sand, trace Gravel. Moist. [LOAMY SAND].	1.2			
2							
4							
6							
8							
10							
12							
14							
16							
		17.5	Test pit terminated at 17.5 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	17.5			
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

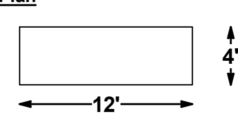
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

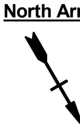
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN HEAD Sanborn, Head & Associates, Inc.	Project: 105 Providence Road Location: Sutton/Millbury, MA Project No.: 4853.00	Test Pit No. TP-276 Ground Elevation: 366.1 ± feet Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 13:15
Time Finished: 13:35

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to medium SAND, common Roots, little Silt. Moist. TOPSOIL. [LOAMY SAND].	0	E		TP-276 relocated to top of slope due to access, approximately 80 feet west of original location.
		0.9	Brown, fine to coarse SAND, little Silt, few Roots, trace Gravel, trace Cobbles, trace Boulders. Moist. [LOAMY SAND].	0.9	M	3A	
2							
4							
6							
8							
10							
12		12	Test pit terminated at 12 feet due to refusal on probable boulders. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	12			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan

North Arrow

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-278

Ground Elevation: 363.9 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 10:05
Time Finished: 10:15

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 30°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	10:12	10'	Ground Surface	10'	

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0 0.3	Brown, fine to medium SAND, little Silt, few Roots. Moist. TOPSOIL. [LOAMY SAND].	0 0.3	E	1A	
			Brown, fine to coarse SAND, little Gravel, trace Cobbles, trace Silt, trace Boulders. Moist. [Cobbly Gravelly SAND].				
10		10	Test pit terminated at 10 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	10			

Excavation Effort

E	Easy
M	Moderate
D	Difficult

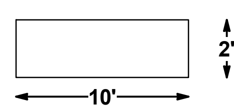
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow

SANBORN HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-279

Ground Elevation: 363.5 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 10:18
Time Finished: 10:30

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 40°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	10:22	10'	Ground Surface	10'	

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Reddish brown, fine to coarse SAND, little Silt, few Roots, trace Gravel. Moist. TOPSOIL. [LOAMY SAND].	0	E		
		0.9	Tan, fine to coarse SAND, little Silt, trace Gravel. Moist. [LOAMY SAND].	0.9			
2							
4							
6							
8							
		8.5	Brown, fine to coarse SAND, little Gravel, trace Cobbles, trace Silt. Moist to wet. [Gravelly SAND].	8.5			
10		10	Test pit terminated at 10 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	10			
12							
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

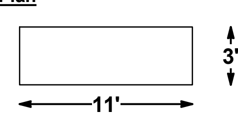
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

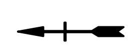
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



SANBORN ||| HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Test Pit No. TP-280

Ground Elevation: 350.8 ± feet
Datum: Project Datum (December 2020)

Date: 01/14/22
Time Started: 10:35
Time Finished: 11:00

Logged By: M. Reisenauer
Checked By: L. Norton

Weather: Cloudy, 40°F

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Test Pit	Stab. Time
01/14/22	---	No Groundwater Encountered			

Excavation Equipment

Contractor: Walsh Contracting
Operator: J. Walsh
Reach: 18 ft

Make: CAT
Model: 336FL
Bucket Capacity: 1.5 CY

Depth (ft)	Field Testing Data	Strata Depth (ft)	Geologic Description	Strata Depth (ft)	Excv. Effort	Boulder Qty & Class	Remarks
0		0	Brown, fine to coarse SAND, little Silt, few Roots. Moist. TOPSOIL. [LOAMY SAND].	0	E (0 to 13)	2A (0 to 13)	
2		1.9	Reddish tan, fine to coarse SAND, little Silt, trace Gravel, trace Cobbles. Moist. [LOAMY SAND].	1.9			Redoximorphic features encountered from 1.9 to 4 feet; not interpreted as ESHGW.
4		4	Gray, fine to coarse SAND, little Silt, little Gravel, trace Cobbles, trace Boulders. Moist. [Gravelly LOAMY SAND].	4			
6							
8							
10							
12							
		13	Test pit terminated at 13 feet. No refusal encountered. NOTES: 1. USDA textural soil classifications are shown in brackets [ ].	13			
14							
16							
18							
20							

Excavation Effort

E	Easy
M	Moderate
D	Difficult

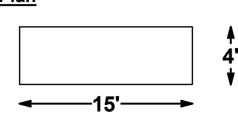
Boulder Size Classification

12" - 24"	A
24" - 36"	B
36" and larger	C

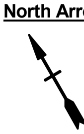
Soil Description
Minor Component Proportions

trace	0 - 10%
little	10 - 20%
some	20 - 35%
and	35 - 50%

Test Pit Plan



North Arrow



Sheet: 1 of 1

ATTACHMENT B.2

TEST BORING LOGS

SANBORN | HEAD

Sanborn, Head & Associates, Inc.

Project: 105 Providence Road
Location: Sutton/Millbury, MA
Project No.: 4853.00

Log of Boring SH-2-110

Ground Elevation: 352.6 ± feet
Datum: Project Datum (December 2020)

Drilling Method: 4¼" OD Hollow Stem Auger and ATV Mounted Acker

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

Drilling Company: Soil X Corp.
Foreman: G. Guinto
Date Started: 10/12/21 Date Finished: 10/12/21
Logged By: Z. White Checked By: L. Norton

Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
10/12/21	---	No Groundwater Encountered				

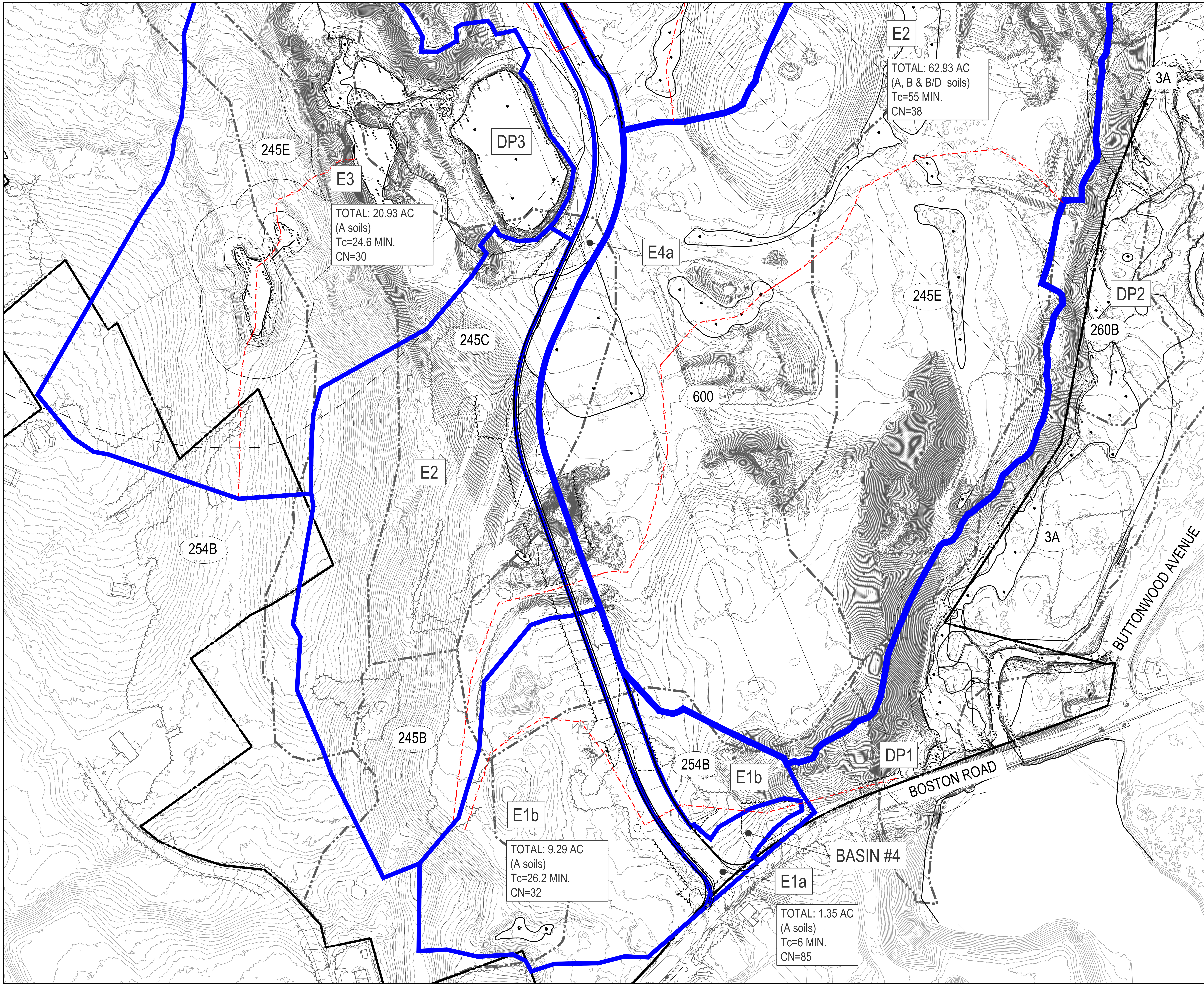
Depth (ft)	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Stratum Description	Geologic Description	Remarks
0	S-1	0 - 2	9 10 14 15	24/17		-----0'----- TOPSOIL -----0.5'----- SUBSOIL	S-1 (0 to 2'): Medium dense, dark brown, fine to coarse SAND, little Silt, trace Gravel. Moist. TOPSOIL. [LOAMY SAND].	
2	S-2	2 - 4	5 7 15 25	24/16		-----3'-----	S-2A (2 to 3'): Medium dense, dark brown, fine to medium SAND, some Silt, trace Gravel. Moist. SUBSOIL. [SANDY LOAM]. S-2B (3 to 4'): Medium dense, light gray, fine to coarse SAND, little Gravel, trace Silt. Moist. [Gravelly SAND].	Drilling action indicates the presence of oversized materials from 3 to 4 feet bgs.
4	S-3	4 - 6	14 20 40 50/5"	24/15		SAND & GRAVEL	S-3 (4 to 6'): Very dense, light gray, fine to coarse GRAVEL, little Silt, trace Sand, few Rock fragments. Moist. [Cobbly, Extremely Gravelly LOAMY SAND].	
6								Drilling action indicates the presence of oversized materials from 6 to 8 feet bgs.
8	S-4	8 - 8.3	60/3"	3/3		-----8'-----	S-4 (8 to 8.3'): Very dense, light gray, fine to coarse GRAVEL, little Sand, little Silt. Moist. [Extremely Gravelly LOAMY SAND].	
10	S-5	10 - 11.8	43 34 21 50/4"	22/15		GRAVEL	S-5 (10 to 11.8'): Very dense, light gray, fine to coarse GRAVEL, little Sand, little Silt. Moist. [Cobbly, Extremely Gravelly LOAMY SAND].	Drilling action indicates the presence of oversized materials from 10 to 12 feet bgs.
12						-----12'-----	Boring terminated at 12 feet due to refusal on probable bedrock. NOTES: USDA textural soil classifications are shown in brackets [ ].	
14								
16								
18								
20								
22								
24								
26								

BORING LOG P:\4800S\4853.00\WORK\LOGS\4853.00 LOGS.GPJ 2017 SANBORN HEAD V1.GLB 2017 SANBORN HEAD V1.GDT 3/10/22


LEGEND
UNIFIED Property Line
Sutton/Millbury Town Line
Boarding Vegetated Wetland
Isolated Vegetated Wetland
Isolated Vegetated Wetland - Possible ILSF
AA
Wetland Flag Designation
ROUTE 122A
BUTTONWOOD RD.
BOSTON ROAD
Existing Wash Ponds & Related Areas To Be Filled
Town of Sutton
Whittinsville Water District
HERITAGE RD.
DUDLEY RD.
MARBLE RD.
AD "Dog"
CA "Duck"
0
500
1000
Feet
UGPG RE Sutton LLC
Existing Wetland
Mapping & Designation
Overall Site Plan
03.15.21
Sheet 1 of 1

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

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



N
W
E
S

KEY

654	SOIL GROUP
	SOIL BOUNDARY
	TIME OF CONCENTRATION
E1	PROPOSED WATERSHED
DP1	DESIGN POINT

100 50 25 0 100
1"= 100'

PRE-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER

SCALE:1"=100' DATE: 02/15/2022

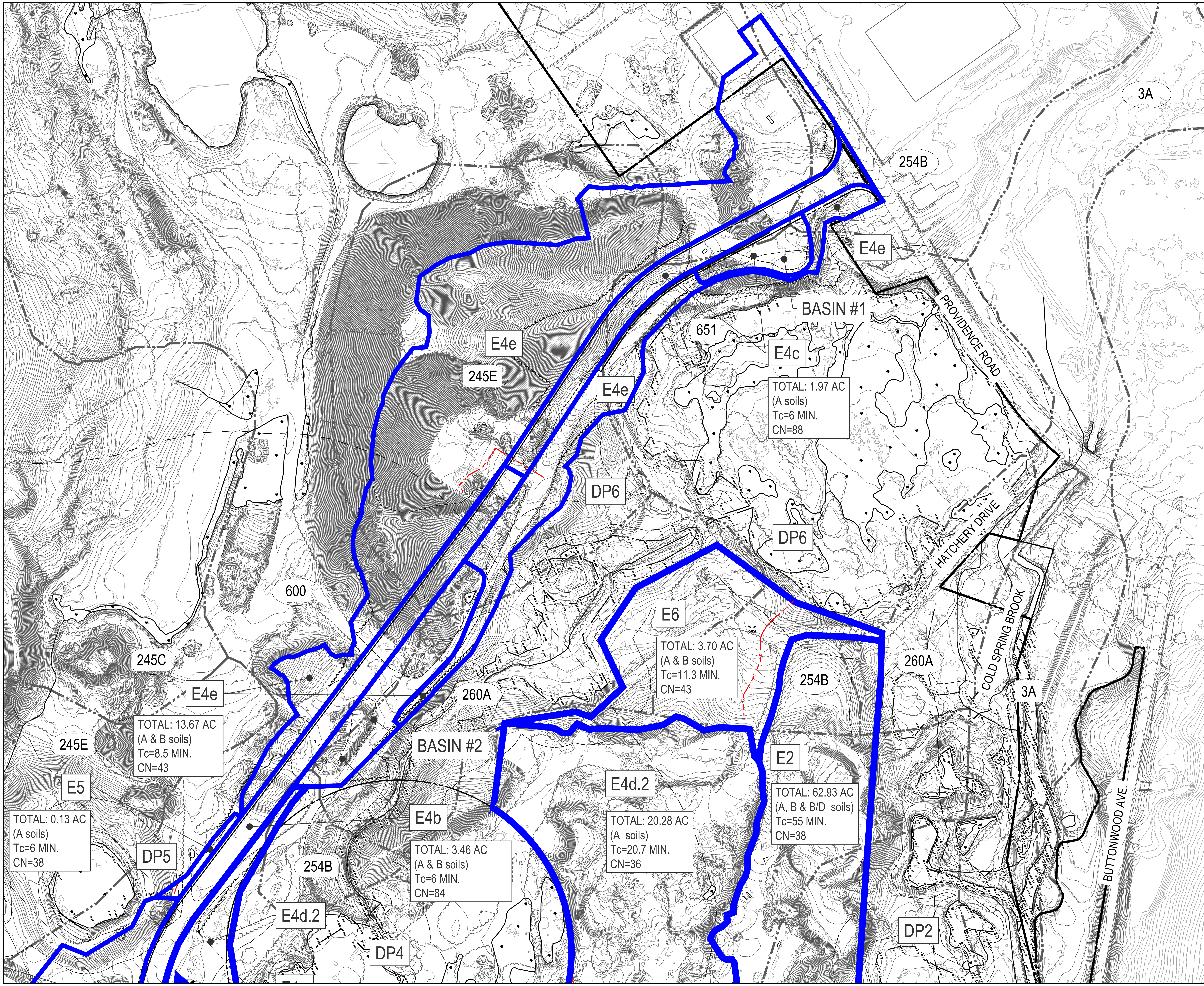
PRE-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER

SCALE:1"=100' DATE: 02/15/2022



KEY

654	SOIL GROUP
	SOIL BOUNDARY
	TIME OF CONCENTRATION
E1	EXISTING WATERSHED
DP1	DESIGN POINT

100 50 25 0 100

1"= 100'

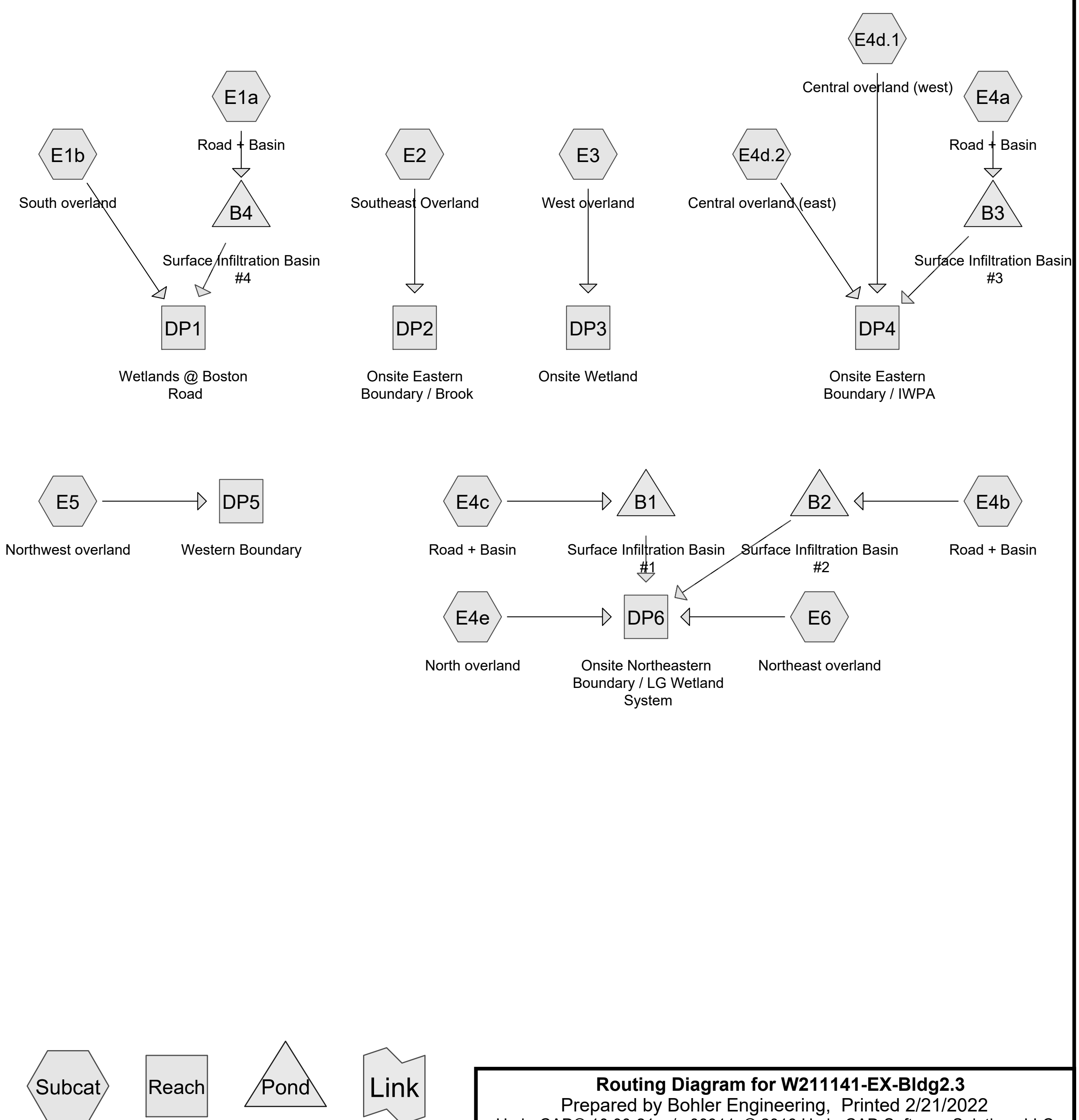
PRE-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER

SCALE:1"=100' DATE: 02/15/2022



Routing Diagram for W211141-EX-Bldg2.3
Prepared by Bohler Engineering, Printed 2/21/2022
HydroCAD® 10.00-21 s/n 08311 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
11.908	39	>75% Grass cover, Good, HSG A (E1a, E1b, E2, E4a, E4b, E4c, E4d.1, E4d.2, E4e, E5)
0.690	61	>75% Grass cover, Good, HSG B (E4b, E4e)
0.987	98	Bot. Basin, 0% imp, HSG A (E1a, E4a, E4c)
0.373	98	Bot. Basin, 0% imp, HSG B (E4b)
17.173	72	Dirt roads, HSG A (E1b, E2, E4d.1, E4d.2, E4e, E6)
0.089	82	Dirt roads, HSG B (E6)
42.735	30	Meadow, non-grazed, HSG A (E2, E3, E4d.1, E4d.2, E4e, E5, E6)
0.865	58	Meadow, non-grazed, HSG B (E2, E6)
0.199	78	Meadow, non-grazed, HSG D (E2)
7.421	98	Paved parking, HSG A (E1a, E4a, E4b, E4c)
61.162	30	Woods, Good, HSG A (E1b, E2, E3, E4d.1, E4d.2, E4e, E6)
1.226	55	Woods, Good, HSG B (E2, E6)
0.339	77	Woods, Good, HSG D (E2)
145.167	**41**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
141.386	HSG A	E1a, E1b, E2, E3, E4a, E4b, E4c, E4d.1, E4d.2, E4e, E5, E6
3.243	HSG B	E2, E4b, E4e, E6
0.000	HSG C	
0.538	HSG D	E2
0.000	Other	
145.167		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
11.908	0.690	0.000	0.000	0.000	12.598	>75% Grass cover, Good	E1a, E1b, E2, E4a, E4b, E4c, E4d.1, E4d.2, E4e, E5
0.987	0.373	0.000	0.000	0.000	1.360	Bot. Basin, 0% imp	E1a, E4a, E4b, E4c
17.173	0.089	0.000	0.000	0.000	17.262	Dirt roads	E1b, E2, E4d.1, E4d.2, E4e, E6
42.735	0.865	0.000	0.199	0.000	43.799	Meadow, non-grazed	E2, E3, E4d.1, E4d.2, E4e, E5, E6
7.421	0.000	0.000	0.000	0.000	7.421	Paved parking	E1a, E4a, E4b, E4c
61.162	1.226	0.000	0.339	0.000	62.727	Woods, Good	E1b, E2, E3, E4d.1, E4d.2, E4e, E6
141.386	**3.243**	**0.000**	**0.538**	**0.000**	**145.167**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	E1b	0.00	0.00	592.0	0.0270	0.013	24.0	0.0	0.0
2	E2	0.00	0.00	119.0	0.0168	0.013	18.0	0.0	0.0
3	E4d.1	0.00	0.00	75.0	0.0060	0.013	15.0	0.0	0.0
4	E4d.1	0.00	0.00	117.0	0.0090	0.013	15.0	0.0	0.0
5	E4d.1	0.00	0.00	88.0	0.0150	0.013	15.0	0.0	0.0
6	E4e	0.00	0.00	132.0	0.0300	0.013	15.0	0.0	0.0
7	B1	353.00	352.00	29.0	0.0345	0.013	18.0	0.0	0.0
8	B2	363.00	362.00	38.0	0.0263	0.013	12.0	0.0	0.0
9	B3	373.00	372.00	33.0	0.0303	0.013	12.0	0.0	0.0
10	B4	392.00	386.00	286.0	0.0210	0.013	24.0	0.0	0.0

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

Subcatchment E1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=85 Runoff=2.8 cfs 0.205 af

Subcatchment E1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.0 cfs 0.000 af

Subcatchment E2: Southeast Overland Runoff Area=62.932 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,509' Tc=55.0 min CN=38 Runoff=0.0 cfs 0.000 af

Subcatchment E3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.0 cfs 0.000 af

Subcatchment E4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=89 Runoff=10.5 cfs 0.771 af

Subcatchment E4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=84 Runoff=6.9 cfs 0.503 af

Subcatchment E4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=88 Runoff=4.6 cfs 0.338 af

Subcatchment E4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=704' Tc=7.2 min CN=40 Runoff=0.0 cfs 0.001 af

Subcatchment E4d.2: Central overland Runoff Area=20.281 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=723' Tc=20.7 min CN=36 Runoff=0.0 cfs 0.000 af

Subcatchment E4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=270' Tc=8.5 min CN=43 Runoff=0.0 cfs 0.031 af

Subcatchment E5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.000 af

Subcatchment E6: Northeast overland Runoff Area=3.697 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=307' Tc=11.3 min CN=43 Runoff=0.0 cfs 0.009 af

Reach DP1: Wetlands @ Boston Road Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP3: Onsite Wetland Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=0.0 cfs 0.001 af
Outflow=0.0 cfs 0.001 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=0.1 cfs 0.040 af
Outflow=0.1 cfs 0.040 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=354.12' Storage=6,262 cf Inflow=4.6 cfs 0.338 af
Discarded=0.4 cfs 0.338 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.4 cfs 0.338 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=363.46' Storage=7,194 cf Inflow=6.9 cfs 0.503 af
Discarded=0.9 cfs 0.503 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.9 cfs 0.503 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=373.35' Storage=5,783 cf Inflow=10.5 cfs 0.771 af
Discarded=3.3 cfs 0.775 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=3.3 cfs 0.775 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=393.65' Storage=2,096 cf Inflow=2.8 cfs 0.205 af
Discarded=0.7 cfs 0.206 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.7 cfs 0.206 af

Total Runoff Area = 145.167 ac Runoff Volume = 1.857 af Average Runoff Depth = 0.15"
94.89% Pervious = 137.746 ac 5.11% Impervious = 7.421 ac

Summary for Subcatchment E1a: Road + Basin

Runoff = 2.8 cfs @ 12.09 hrs, Volume= 0.205 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment E1b: South overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment E2: Southeast Overland

Runoff = 0.0 cfs @ 24.60 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
10.516	72	Dirt roads, HSG A
1.133	39	>75% Grass cover, Good, HSG A
12.710	30	Woods, Good, HSG A
24.063	30	Meadow, non-grazed, HSG A
0.265	58	Meadow, non-grazed, HSG B
0.314	55	Woods, Good, HSG B
0.339	77	Woods, Good, HSG D
0.199	78	Meadow, non-grazed, HSG D
62.932	38	Weighted Average
62.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
8.4	348	0.0098	0.69		**Shallow Concentrated Flow, 399 to 395.6** Short Grass Pasture Kv= 7.0 fps
5.4	227	0.0100	0.70		**Shallow Concentrated Flow, 395.6-393.3** Short Grass Pasture Kv= 7.0 fps
0.3	40	0.0825	2.01		**Shallow Concentrated Flow, 393.3-390** Short Grass Pasture Kv= 7.0 fps
6.8	270	0.0176	0.66		**Shallow Concentrated Flow, 390-385.25** Woodland Kv= 5.0 fps
0.4	22	0.0160	0.89		**Shallow Concentrated Flow, 385.25-384.9** Short Grass Pasture Kv= 7.0 fps
0.9	43	0.0023	0.77		**Shallow Concentrated Flow, 384.9-384.8** Unpaved Kv= 16.1 fps
18.8	790	0.0100	0.70		**Shallow Concentrated Flow, 384.8-377** Short Grass Pasture Kv= 7.0 fps
55.0	2,509	Total			

Summary for Subcatchment E3: West overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment E4a: Road + Basin

Runoff = 10.5 cfs @ 12.09 hrs, Volume= 0.771 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment E4b: Road + Basin

Runoff = 6.9 cfs @ 12.09 hrs, Volume= 0.503 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment E4c: Road + Basin

Runoff = 4.6 cfs @ 12.09 hrs, Volume= 0.338 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment E4d.1: Central overland (west)

Runoff = 0.0 cfs @ 23.35 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	88	0.0150	6.45	7.91	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.6	97	0.0200	0.99		**Shallow Concentrated Flow, 376-374** Short Grass Pasture Kv= 7.0 fps
7.2	704	Total			

Summary for Subcatchment E4d.2: Central overland (east)

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
2.536	72	Dirt roads, HSG A
10.662	30	Meadow, non-grazed, HSG A
6.064	30	Woods, Good, HSG A
1.019	39	>75% Grass cover, Good, HSG A
20.281	36	Weighted Average
20.281		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0250	0.16		**Sheet Flow, 386-384.75** Grass: Short n= 0.150 P2= 3.00"
8.8	276	0.0109	0.52		**Shallow Concentrated Flow, 385-382** Woodland Kv= 5.0 fps
0.5	40	0.0060	1.25		**Shallow Concentrated Flow, 382-381.75** Unpaved Kv= 16.1 fps
4.9	292	0.0200	0.99		**Shallow Concentrated Flow, 381.75-376** Short Grass Pasture Kv= 7.0 fps
1.2	65	0.0310	0.88		**Shallow Concentrated Flow, 376-374** Woodland Kv= 5.0 fps
20.7	723	Total			

Summary for Subcatchment E4e: North overland

Runoff = 0.0 cfs @ 16.92 hrs, Volume= 0.031 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment E5: Northwest overland

Runoff = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment E6: Northeast overland

Runoff = 0.0 cfs @ 16.96 hrs, Volume= 0.009 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.123	72	Dirt roads, HSG A
0.384	30	Meadow, non-grazed, HSG A
1.589	30	Woods, Good, HSG A
0.089	82	Dirt roads, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.912	55	Woods, Good, HSG B
3.697	43	Weighted Average
3.697		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.10		**Sheet Flow, 364-361** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	141	0.0530	1.15		**Shallow Concentrated Flow, 361-353.5** Woodland Kv= 5.0 fps
0.2	15	0.0500	1.57		**Shallow Concentrated Flow, 353.5-352.75** Short Grass Pasture Kv= 7.0 fps
0.1	13	0.0460	3.45		**Shallow Concentrated Flow, 352.75-352.15** Unpaved Kv= 16.1 fps
0.3	39	0.1320	2.54		**Shallow Concentrated Flow, 352.15-347** Short Grass Pasture Kv= 7.0 fps
0.5	49	0.1220	1.75		**Shallow Concentrated Flow, 347-341** Woodland Kv= 5.0 fps
11.3	307	Total			

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 62.932 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 24.60 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 24.60 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area =	27.743 ac, 10.46% Impervious,	Inflow Depth = 0.00"	for 2-YR event	
Inflow =	0.0 cfs @ 23.35 hrs,	Volume=	0.001 af	
Outflow =	0.0 cfs @ 23.35 hrs,	Volume=	0.001 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area =	0.125 ac, 0.00% Impervious,	Inflow Depth = 0.00"	for 2-YR event	
Inflow =	0.0 cfs @ 24.03 hrs,	Volume=	0.000 af	
Outflow =	0.0 cfs @ 24.03 hrs,	Volume=	0.000 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area =	22.792 ac, 15.58% Impervious,	Inflow Depth = 0.02"	for 2-YR event	
Inflow =	0.1 cfs @ 16.93 hrs,	Volume=	0.040 af	
Outflow =	0.1 cfs @ 16.93 hrs,	Volume=	0.040 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area =	1.966 ac, 75.13% Impervious,	Inflow Depth = 2.06"	for 2-YR event	
Inflow =	4.6 cfs @ 12.09 hrs,	Volume=	0.338 af	
Outflow =	0.4 cfs @ 13.49 hrs,	Volume=	0.338 af,	Atten= 92%, Lag= 83.8 min
Discarded =	0.4 cfs @ 13.49 hrs,	Volume=	0.338 af	
Primary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 354.12' @ 13.49 hrs Surf.Area= 6,340 sf Storage= 6,262 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 168.5 min (982.7 - 814.2)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.4 cfs @ 13.49 hrs HW=354.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area = 3.464 ac, 59.90% Impervious, Inflow Depth = 1.74" for 2-YR event
Inflow = 6.9 cfs @ 12.09 hrs, Volume= 0.503 af
Outflow = 0.9 cfs @ 12.74 hrs, Volume= 0.503 af, Atten= 87%, Lag= 38.8 min
Discarded = 0.9 cfs @ 12.74 hrs, Volume= 0.503 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 363.46' @ 12.74 hrs Surf.Area= 16,433 sf Storage= 7,194 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.1 min (888.6 - 828.6)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900

			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.9 cfs @ 12.74 hrs HW=363.46' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.9 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area =	4.310 ac, 67.33% Impervious, Inflow Depth = 2.15" for 2-YR event			
Inflow =	10.5 cfs @	12.09 hrs, Volume=	0.771 af	
Outflow =	3.3 cfs @	12.42 hrs, Volume=	0.775 af,	Atten= 69%, Lag= 19.5 min
Discarded =	3.3 cfs @	12.42 hrs, Volume=	0.775 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 373.35' @ 12.42 hrs Surf.Area= 17,274 sf Storage= 5,783 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.8 min (819.0 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert**
			L= 33.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=3.3 cfs @ 12.42 hrs HW=373.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 3.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area = 1.353 ac, 71.47% Impervious, Inflow Depth = 1.82" for 2-YR event
Inflow = 2.8 cfs @ 12.09 hrs, Volume= 0.205 af
Outflow = 0.7 cfs @ 12.50 hrs, Volume= 0.206 af, Atten= 76%, Lag= 24.6 min
Discarded = 0.7 cfs @ 12.50 hrs, Volume= 0.206 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 393.65' @ 12.50 hrs Surf.Area= 3,551 sf Storage= 2,096 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.4 min (843.5 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.7 cfs @ 12.50 hrs HW=393.65' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└—**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └—**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└—**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment E1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=3.43"
Tc=6.0 min CN=85 Runoff=5.3 cfs 0.387 af

Subcatchment E1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.0 cfs 0.024 af

Subcatchment E2: Southeast Overland Runoff Area=62.932 ac 0.00% Impervious Runoff Depth=0.18"
Flow Length=2,509' Tc=55.0 min CN=38 Runoff=1.5 cfs 0.945 af

Subcatchment E3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.0 cfs 0.012 af

Subcatchment E4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=3.84"
Tc=6.0 min CN=89 Runoff=18.4 cfs 1.379 af

Subcatchment E4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=3.33"
Tc=6.0 min CN=84 Runoff=13.2 cfs 0.963 af

Subcatchment E4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=3.74"
Tc=6.0 min CN=88 Runoff=8.2 cfs 0.612 af

Subcatchment E4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=704' Tc=7.2 min CN=40 Runoff=0.2 cfs 0.066 af

Subcatchment E4d.2: Central overland Runoff Area=20.281 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=723' Tc=20.7 min CN=36 Runoff=0.3 cfs 0.201 af

Subcatchment E4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=270' Tc=8.5 min CN=43 Runoff=2.0 cfs 0.425 af

Subcatchment E5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.18"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.002 af

Subcatchment E6: Northeast overland Runoff Area=3.697 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=307' Tc=11.3 min CN=43 Runoff=0.5 cfs 0.115 af

Reach DP1: Wetlands @ Boston Road Inflow=0.0 cfs 0.024 af
Outflow=0.0 cfs 0.024 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=1.5 cfs 0.945 af
Outflow=1.5 cfs 0.945 af

Reach DP3: Onsite Wetland Inflow=0.0 cfs 0.012 af
Outflow=0.0 cfs 0.012 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=0.4 cfs 0.267 af
Outflow=0.4 cfs 0.267 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.002 af
Outflow=0.0 cfs 0.002 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=2.5 cfs 0.540 af
Outflow=2.5 cfs 0.540 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=355.08' Storage=13,297 cf Inflow=8.2 cfs 0.612 af
Discarded=0.5 cfs 0.612 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.612 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=364.05' Storage=17,507 cf Inflow=13.2 cfs 0.963 af
Discarded=1.0 cfs 0.964 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.0 cfs 0.964 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=373.89' Storage=15,692 cf Inflow=18.4 cfs 1.379 af
Discarded=3.8 cfs 1.380 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=3.8 cfs 1.380 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=394.45' Storage=5,307 cf Inflow=5.3 cfs 0.387 af
Discarded=0.9 cfs 0.388 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.9 cfs 0.388 af

Total Runoff Area = 145.167 ac Runoff Volume = 5.130 af Average Runoff Depth = 0.42"
94.89% Pervious = 137.746 ac 5.11% Impervious = 7.421 ac

Summary for Subcatchment E1a: Road + Basin

Runoff = 5.3 cfs @ 12.09 hrs, Volume= 0.387 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment E1b: South overland

Runoff = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment E2: Southeast Overland

Runoff = 1.5 cfs @ 14.48 hrs, Volume= 0.945 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
10.516	72	Dirt roads, HSG A
1.133	39	>75% Grass cover, Good, HSG A
12.710	30	Woods, Good, HSG A
24.063	30	Meadow, non-grazed, HSG A
0.265	58	Meadow, non-grazed, HSG B
0.314	55	Woods, Good, HSG B
0.339	77	Woods, Good, HSG D
0.199	78	Meadow, non-grazed, HSG D
62.932	38	Weighted Average
62.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
8.4	348	0.0098	0.69		**Shallow Concentrated Flow, 399 to 395.6** Short Grass Pasture Kv= 7.0 fps
5.4	227	0.0100	0.70		**Shallow Concentrated Flow, 395.6-393.3** Short Grass Pasture Kv= 7.0 fps
0.3	40	0.0825	2.01		**Shallow Concentrated Flow, 393.3-390** Short Grass Pasture Kv= 7.0 fps
6.8	270	0.0176	0.66		**Shallow Concentrated Flow, 390-385.25** Woodland Kv= 5.0 fps
0.4	22	0.0160	0.89		**Shallow Concentrated Flow, 385.25-384.9** Short Grass Pasture Kv= 7.0 fps
0.9	43	0.0023	0.77		**Shallow Concentrated Flow, 384.9-384.8** Unpaved Kv= 16.1 fps
18.8	790	0.0100	0.70		**Shallow Concentrated Flow, 384.8-377** Short Grass Pasture Kv= 7.0 fps
55.0	2,509	Total			

Summary for Subcatchment E3: West overland

Runoff = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment E4a: Road + Basin

Runoff = 18.4 cfs @ 12.09 hrs, Volume= 1.379 af, Depth= 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment E4b: Road + Basin

Runoff = 13.2 cfs @ 12.09 hrs, Volume= 0.963 af, Depth= 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment E4c: Road + Basin

Runoff = 8.2 cfs @ 12.09 hrs, Volume= 0.612 af, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment E4d.1: Central overland (west)

Runoff = 0.2 cfs @ 12.45 hrs, Volume= 0.066 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	88	0.0150	6.45	7.91	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.6	97	0.0200	0.99		**Shallow Concentrated Flow, 376-374** Short Grass Pasture Kv= 7.0 fps
7.2	704	Total			

Summary for Subcatchment E4d.2: Central overland (east)

Runoff = 0.3 cfs @ 14.99 hrs, Volume= 0.201 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
2.536	72	Dirt roads, HSG A
10.662	30	Meadow, non-grazed, HSG A
6.064	30	Woods, Good, HSG A
1.019	39	>75% Grass cover, Good, HSG A
20.281	36	Weighted Average
20.281		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0250	0.16		**Sheet Flow, 386-384.75** Grass: Short n= 0.150 P2= 3.00"
8.8	276	0.0109	0.52		**Shallow Concentrated Flow, 385-382** Woodland Kv= 5.0 fps
0.5	40	0.0060	1.25		**Shallow Concentrated Flow, 382-381.75** Unpaved Kv= 16.1 fps
4.9	292	0.0200	0.99		**Shallow Concentrated Flow, 381.75-376** Short Grass Pasture Kv= 7.0 fps
1.2	65	0.0310	0.88		**Shallow Concentrated Flow, 376-374** Woodland Kv= 5.0 fps
20.7	723	Total			

Summary for Subcatchment E4e: North overland

Runoff = 2.0 cfs @ 12.39 hrs, Volume= 0.425 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment E5: Northwest overland

Runoff = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment E6: Northeast overland

Runoff = 0.5 cfs @ 12.43 hrs, Volume= 0.115 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.123	72	Dirt roads, HSG A
0.384	30	Meadow, non-grazed, HSG A
1.589	30	Woods, Good, HSG A
0.089	82	Dirt roads, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.912	55	Woods, Good, HSG B
3.697	43	Weighted Average
3.697		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.10		**Sheet Flow, 364-361** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	141	0.0530	1.15		**Shallow Concentrated Flow, 361-353.5** Woodland Kv= 5.0 fps
0.2	15	0.0500	1.57		**Shallow Concentrated Flow, 353.5-352.75** Short Grass Pasture Kv= 7.0 fps
0.1	13	0.0460	3.45		**Shallow Concentrated Flow, 352.75-352.15** Unpaved Kv= 16.1 fps
0.3	39	0.1320	2.54		**Shallow Concentrated Flow, 352.15-347** Short Grass Pasture Kv= 7.0 fps
0.5	49	0.1220	1.75		**Shallow Concentrated Flow, 347-341** Woodland Kv= 5.0 fps
11.3	307	Total			

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.03" for 10-YR event
Inflow = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af
Outflow = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 62.932 ac, 0.00% Impervious, Inflow Depth = 0.18" for 10-YR event
Inflow = 1.5 cfs @ 14.48 hrs, Volume= 0.945 af
Outflow = 1.5 cfs @ 14.48 hrs, Volume= 0.945 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.01" for 10-YR event
Inflow = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af
Outflow = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 27.743 ac, 10.46% Impervious, Inflow Depth = 0.12" for 10-YR event
Inflow = 0.4 cfs @ 14.82 hrs, Volume= 0.267 af
Outflow = 0.4 cfs @ 14.82 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area = 0.125 ac, 0.00% Impervious, Inflow Depth = 0.18" for 10-YR event
Inflow = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af
Outflow = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area = 22.792 ac, 15.58% Impervious, Inflow Depth = 0.28" for 10-YR event
Inflow = 2.5 cfs @ 12.40 hrs, Volume= 0.540 af
Outflow = 2.5 cfs @ 12.40 hrs, Volume= 0.540 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area = 1.966 ac, 75.13% Impervious, Inflow Depth = 3.74" for 10-YR event
Inflow = 8.2 cfs @ 12.09 hrs, Volume= 0.612 af
Outflow = 0.5 cfs @ 14.09 hrs, Volume= 0.612 af, Atten= 94%, Lag= 119.9 min
Discarded = 0.5 cfs @ 14.09 hrs, Volume= 0.612 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 355.08' @ 14.09 hrs Surf.Area= 8,284 sf Storage= 13,297 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 303.0 min (1,100.4 - 797.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 14.09 hrs HW=355.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area =	3.464 ac, 59.90% Impervious, Inflow Depth = 3.33"	for 10-YR event	
Inflow =	13.2 cfs @ 12.09 hrs, Volume=	0.963 af	
Outflow =	1.0 cfs @ 13.37 hrs, Volume=	0.964 af,	Atten= 92%, Lag= 77.0 min
Discarded =	1.0 cfs @ 13.37 hrs, Volume=	0.964 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 364.05' @ 13.37 hrs Surf.Area= 18,441 sf Storage= 17,507 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 156.1 min (966.1 - 810.0)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900

			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.0 cfs @ 13.37 hrs HW=364.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area =	4.310 ac, 67.33% Impervious, Inflow Depth = 3.84" for 10-YR event			
Inflow =	18.4 cfs @	12.09 hrs, Volume=	1.379 af	
Outflow =	3.8 cfs @	12.52 hrs, Volume=	1.380 af,	Atten= 79%, Lag= 25.7 min
Discarded =	3.8 cfs @	12.52 hrs, Volume=	1.380 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 373.89' @ 12.52 hrs Surf.Area= 19,741 sf Storage= 15,692 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.1 min (819.0 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert**
			L= 33.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=3.8 cfs @ 12.52 hrs HW=373.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 3.8 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area =	1.353 ac, 71.47% Impervious, Inflow Depth = 3.43" for 10-YR event		
Inflow =	5.3 cfs @ 12.09 hrs,	Volume=	0.387 af
Outflow =	0.9 cfs @ 12.57 hrs,	Volume=	0.388 af, Atten= 83%, Lag= 28.9 min
Discarded =	0.9 cfs @ 12.57 hrs,	Volume=	0.388 af
Primary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af
Secondary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 394.45' @ 12.57 hrs Surf.Area= 4,613 sf Storage= 5,307 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.9 min (852.9 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.9 cfs @ 12.57 hrs HW=394.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.9 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment E1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=85 Runoff=6.8 cfs 0.505 af

Subcatchment E1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.16"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.2 cfs 0.126 af

Subcatchment E2: Southeast Overland Runoff Area=62.932 ac 0.00% Impervious Runoff Depth=0.45"
Flow Length=2,509' Tc=55.0 min CN=38 Runoff=6.0 cfs 2.335 af

Subcatchment E3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.3 cfs 0.163 af

Subcatchment E4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=89 Runoff=23.3 cfs 1.767 af

Subcatchment E4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=84 Runoff=17.1 cfs 1.263 af

Subcatchment E4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=88 Runoff=10.4 cfs 0.788 af

Subcatchment E4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.56"
Flow Length=704' Tc=7.2 min CN=40 Runoff=0.8 cfs 0.147 af

Subcatchment E4d.2: Central overland Runoff Area=20.281 ac 0.00% Impervious Runoff Depth=0.34"
Flow Length=723' Tc=20.7 min CN=36 Runoff=1.6 cfs 0.575 af

Subcatchment E4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.75"
Flow Length=270' Tc=8.5 min CN=43 Runoff=5.8 cfs 0.849 af

Subcatchment E5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.005 af

Subcatchment E6: Northeast overland Runoff Area=3.697 ac 0.00% Impervious Runoff Depth=0.75"
Flow Length=307' Tc=11.3 min CN=43 Runoff=1.5 cfs 0.230 af

Reach DP1: Wetlands @ Boston Road Inflow=0.2 cfs 0.126 af
Outflow=0.2 cfs 0.126 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=6.0 cfs 2.335 af
Outflow=6.0 cfs 2.335 af

Reach DP3: Onsite Wetland Inflow=0.3 cfs 0.163 af
Outflow=0.3 cfs 0.163 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=2.1 cfs 0.722 af
Outflow=2.1 cfs 0.722 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.005 af
Outflow=0.0 cfs 0.005 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=7.2 cfs 1.079 af
Outflow=7.2 cfs 1.079 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=355.64' Storage=18,181 cf Inflow=10.4 cfs 0.788 af
Discarded=0.5 cfs 0.788 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.788 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=364.44' Storage=24,931 cf Inflow=17.1 cfs 1.263 af
Discarded=1.1 cfs 1.264 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.1 cfs 1.264 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=374.22' Storage=22,413 cf Inflow=23.3 cfs 1.767 af
Discarded=4.0 cfs 1.770 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=4.0 cfs 1.770 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=394.88' Storage=7,441 cf Inflow=6.8 cfs 0.505 af
Discarded=1.0 cfs 0.506 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.0 cfs 0.506 af

Total Runoff Area = 145.167 ac Runoff Volume = 8.751 af Average Runoff Depth = 0.72"
94.89% Pervious = 137.746 ac 5.11% Impervious = 7.421 ac

Summary for Subcatchment E1a: Road + Basin

Runoff = 6.8 cfs @ 12.09 hrs, Volume= 0.505 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment E1b: South overland

Runoff = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment E2: Southeast Overland

Runoff = 6.0 cfs @ 13.14 hrs, Volume= 2.335 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
10.516	72	Dirt roads, HSG A
1.133	39	>75% Grass cover, Good, HSG A
12.710	30	Woods, Good, HSG A
24.063	30	Meadow, non-grazed, HSG A
0.265	58	Meadow, non-grazed, HSG B
0.314	55	Woods, Good, HSG B
0.339	77	Woods, Good, HSG D
0.199	78	Meadow, non-grazed, HSG D
62.932	38	Weighted Average
62.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
8.4	348	0.0098	0.69		**Shallow Concentrated Flow, 399 to 395.6** Short Grass Pasture Kv= 7.0 fps
5.4	227	0.0100	0.70		**Shallow Concentrated Flow, 395.6-393.3** Short Grass Pasture Kv= 7.0 fps
0.3	40	0.0825	2.01		**Shallow Concentrated Flow, 393.3-390** Short Grass Pasture Kv= 7.0 fps
6.8	270	0.0176	0.66		**Shallow Concentrated Flow, 390-385.25** Woodland Kv= 5.0 fps
0.4	22	0.0160	0.89		**Shallow Concentrated Flow, 385.25-384.9** Short Grass Pasture Kv= 7.0 fps
0.9	43	0.0023	0.77		**Shallow Concentrated Flow, 384.9-384.8** Unpaved Kv= 16.1 fps
18.8	790	0.0100	0.70		**Shallow Concentrated Flow, 384.8-377** Short Grass Pasture Kv= 7.0 fps
55.0	2,509	Total			

Summary for Subcatchment E3: West overland

Runoff = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	18.741	30	Woods, Good, HSG A
	2.189	30	Meadow, non-grazed, HSG A
	20.930	30	Weighted Average
	20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment E4a: Road + Basin

Runoff = 23.3 cfs @ 12.09 hrs, Volume= 1.767 af, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment E4b: Road + Basin

Runoff = 17.1 cfs @ 12.09 hrs, Volume= 1.263 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment E4c: Road + Basin

Runoff = 10.4 cfs @ 12.09 hrs, Volume= 0.788 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment E4d.1: Central overland (west)

Runoff = 0.8 cfs @ 12.32 hrs, Volume= 0.147 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	88	0.0150	6.45	7.91	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.6	97	0.0200	0.99		**Shallow Concentrated Flow, 376-374** Short Grass Pasture Kv= 7.0 fps
7.2	704	Total			

Summary for Subcatchment E4d.2: Central overland (east)

Runoff = 1.6 cfs @ 12.63 hrs, Volume= 0.575 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
2.536	72	Dirt roads, HSG A
10.662	30	Meadow, non-grazed, HSG A
6.064	30	Woods, Good, HSG A
1.019	39	>75% Grass cover, Good, HSG A
20.281	36	Weighted Average
20.281		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0250	0.16		**Sheet Flow, 386-384.75** Grass: Short n= 0.150 P2= 3.00"
8.8	276	0.0109	0.52		**Shallow Concentrated Flow, 385-382** Woodland Kv= 5.0 fps
0.5	40	0.0060	1.25		**Shallow Concentrated Flow, 382-381.75** Unpaved Kv= 16.1 fps
4.9	292	0.0200	0.99		**Shallow Concentrated Flow, 381.75-376** Short Grass Pasture Kv= 7.0 fps
1.2	65	0.0310	0.88		**Shallow Concentrated Flow, 376-374** Woodland Kv= 5.0 fps
20.7	723	Total			

Summary for Subcatchment E4e: North overland

Runoff = 5.8 cfs @ 12.20 hrs, Volume= 0.849 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment E5: Northwest overland

Runoff = 0.0 cfs @ 12.35 hrs, Volume= 0.005 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment E6: Northeast overland

Runoff = 1.5 cfs @ 12.27 hrs, Volume= 0.230 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.123	72	Dirt roads, HSG A
0.384	30	Meadow, non-grazed, HSG A
1.589	30	Woods, Good, HSG A
0.089	82	Dirt roads, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.912	55	Woods, Good, HSG B
3.697	43	Weighted Average
3.697		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.10		**Sheet Flow, 364-361** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	141	0.0530	1.15		**Shallow Concentrated Flow, 361-353.5** Woodland Kv= 5.0 fps
0.2	15	0.0500	1.57		**Shallow Concentrated Flow, 353.5-352.75** Short Grass Pasture Kv= 7.0 fps
0.1	13	0.0460	3.45		**Shallow Concentrated Flow, 352.75-352.15** Unpaved Kv= 16.1 fps
0.3	39	0.1320	2.54		**Shallow Concentrated Flow, 352.15-347** Short Grass Pasture Kv= 7.0 fps
0.5	49	0.1220	1.75		**Shallow Concentrated Flow, 347-341** Woodland Kv= 5.0 fps
11.3	307	Total			

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.14" for 25-YR event
Inflow = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af
Outflow = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 62.932 ac, 0.00% Impervious, Inflow Depth = 0.45" for 25-YR event
Inflow = 6.0 cfs @ 13.14 hrs, Volume= 2.335 af
Outflow = 6.0 cfs @ 13.14 hrs, Volume= 2.335 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.09" for 25-YR event
Inflow = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af
Outflow = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 27.743 ac, 10.46% Impervious, Inflow Depth = 0.31" for 25-YR event
Inflow = 2.1 cfs @ 12.58 hrs, Volume= 0.722 af
Outflow = 2.1 cfs @ 12.58 hrs, Volume= 0.722 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area = 0.125 ac, 0.00% Impervious, Inflow Depth = 0.45" for 25-YR event
Inflow = 0.0 cfs @ 12.35 hrs, Volume= 0.005 af
Outflow = 0.0 cfs @ 12.35 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area = 22.792 ac, 15.58% Impervious, Inflow Depth = 0.57" for 25-YR event
Inflow = 7.2 cfs @ 12.21 hrs, Volume= 1.079 af
Outflow = 7.2 cfs @ 12.21 hrs, Volume= 1.079 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area = 1.966 ac, 75.13% Impervious, Inflow Depth = 4.81" for 25-YR event
Inflow = 10.4 cfs @ 12.09 hrs, Volume= 0.788 af
Outflow = 0.5 cfs @ 14.45 hrs, Volume= 0.788 af, Atten= 95%, Lag= 141.7 min
Discarded = 0.5 cfs @ 14.45 hrs, Volume= 0.788 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 355.64' @ 14.45 hrs Surf.Area= 9,400 sf Storage= 18,181 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 372.5 min (1,162.9 - 790.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 14.45 hrs HW=355.64' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.0 cfs)
  ↑—**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area =	3.464 ac, 59.90% Impervious, Inflow Depth = 4.37" for 25-YR event		
Inflow =	17.1 cfs @ 12.09 hrs, Volume=	1.263 af	
Outflow =	1.1 cfs @ 13.77 hrs, Volume=	1.264 af,	Atten= 93%, Lag= 100.8 min
Discarded =	1.1 cfs @ 13.77 hrs, Volume=	1.264 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 364.44' @ 13.77 hrs Surf.Area= 20,069 sf Storage= 24,931 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 216.1 min (1,018.4 - 802.3)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900

			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.1 cfs @ 13.77 hrs HW=364.44' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area = 4.310 ac, 67.33% Impervious, Inflow Depth = 4.92" for 25-YR event
Inflow = 23.3 cfs @ 12.09 hrs, Volume= 1.767 af
Outflow = 4.0 cfs @ 12.56 hrs, Volume= 1.770 af, Atten= 83%, Lag= 28.2 min
Discarded = 4.0 cfs @ 12.56 hrs, Volume= 1.770 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.22' @ 12.56 hrs Surf.Area= 20,796 sf Storage= 22,413 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 36.4 min (823.6 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert**
			L= 33.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=4.0 cfs @ 12.56 hrs HW=374.22' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 4.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area =	1.353 ac, 71.47% Impervious, Inflow Depth = 4.48" for 25-YR event		
Inflow =	6.8 cfs @ 12.09 hrs,	Volume=	0.505 af
Outflow =	1.0 cfs @ 12.60 hrs,	Volume=	0.506 af, Atten= 85%, Lag= 30.8 min
Discarded =	1.0 cfs @ 12.60 hrs,	Volume=	0.506 af
Primary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af
Secondary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 394.88' @ 12.60 hrs Surf.Area= 5,303 sf Storage= 7,441 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.0 min (859.5 - 799.5)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.0 cfs @ 12.60 hrs HW=394.88' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment E1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=85 Runoff=9.2 cfs 0.692 af

Subcatchment E1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.54"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=1.4 cfs 0.419 af

Subcatchment E2: Southeast Overland Runoff Area=62.932 ac 0.00% Impervious Runoff Depth=1.03"
Flow Length=2,509' Tc=55.0 min CN=38 Runoff=20.9 cfs 5.423 af

Subcatchment E3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.40"
Flow Length=926' Tc=24.6 min CN=30 Runoff=1.7 cfs 0.694 af

Subcatchment E4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=6.61"
Tc=6.0 min CN=89 Runoff=30.7 cfs 2.373 af

Subcatchment E4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=6.02"
Tc=6.0 min CN=84 Runoff=23.2 cfs 1.737 af

Subcatchment E4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=6.49"
Tc=6.0 min CN=88 Runoff=13.9 cfs 1.063 af

Subcatchment E4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=1.22"
Flow Length=704' Tc=7.2 min CN=40 Runoff=2.9 cfs 0.319 af

Subcatchment E4d.2: Central overland Runoff Area=20.281 ac 0.00% Impervious Runoff Depth=0.86"
Flow Length=723' Tc=20.7 min CN=36 Runoff=7.6 cfs 1.454 af

Subcatchment E4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=1.50"
Flow Length=270' Tc=8.5 min CN=43 Runoff=16.9 cfs 1.707 af

Subcatchment E5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=38 Runoff=0.1 cfs 0.011 af

Subcatchment E6: Northeast overland Runoff Area=3.697 ac 0.00% Impervious Runoff Depth=1.50"
Flow Length=307' Tc=11.3 min CN=43 Runoff=4.2 cfs 0.462 af

Reach DP1: Wetlands @ Boston Road Inflow=1.4 cfs 0.419 af
Outflow=1.4 cfs 0.419 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=20.9 cfs 5.423 af
Outflow=20.9 cfs 5.423 af

Reach DP3: Onsite Wetland Inflow=1.7 cfs 0.694 af
Outflow=1.7 cfs 0.694 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=9.2 cfs 1.773 af
Outflow=9.2 cfs 1.773 af

Reach DP5: Western Boundary Inflow=0.1 cfs 0.011 af
Outflow=0.1 cfs 0.011 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=21.0 cfs 2.168 af
Outflow=21.0 cfs 2.168 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=356.42' Storage=26,195 cf Inflow=13.9 cfs 1.063 af
Discarded=0.6 cfs 1.064 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.6 cfs 1.064 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=365.03' Storage=37,544 cf Inflow=23.2 cfs 1.737 af
Discarded=1.3 cfs 1.739 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.3 cfs 1.739 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=374.73' Storage=33,371 cf Inflow=30.7 cfs 2.373 af
Discarded=4.2 cfs 2.377 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=4.2 cfs 2.377 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=395.49' Storage=10,983 cf Inflow=9.2 cfs 0.692 af
Discarded=1.2 cfs 0.692 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.2 cfs 0.692 af

Total Runoff Area = 145.167 ac Runoff Volume = 16.354 af Average Runoff Depth = 1.35"
94.89% Pervious = 137.746 ac 5.11% Impervious = 7.421 ac

Summary for Subcatchment E1a: Road + Basin

Runoff = 9.2 cfs @ 12.09 hrs, Volume= 0.692 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment E1b: South overland

Runoff = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment E2: Southeast Overland

Runoff = 20.9 cfs @ 12.95 hrs, Volume= 5.423 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
10.516	72	Dirt roads, HSG A
1.133	39	>75% Grass cover, Good, HSG A
12.710	30	Woods, Good, HSG A
24.063	30	Meadow, non-grazed, HSG A
0.265	58	Meadow, non-grazed, HSG B
0.314	55	Woods, Good, HSG B
0.339	77	Woods, Good, HSG D
0.199	78	Meadow, non-grazed, HSG D
62.932	38	Weighted Average
62.932		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
8.4	348	0.0098	0.69		**Shallow Concentrated Flow, 399 to 395.6** Short Grass Pasture Kv= 7.0 fps
5.4	227	0.0100	0.70		**Shallow Concentrated Flow, 395.6-393.3** Short Grass Pasture Kv= 7.0 fps
0.3	40	0.0825	2.01		**Shallow Concentrated Flow, 393.3-390** Short Grass Pasture Kv= 7.0 fps
6.8	270	0.0176	0.66		**Shallow Concentrated Flow, 390-385.25** Woodland Kv= 5.0 fps
0.4	22	0.0160	0.89		**Shallow Concentrated Flow, 385.25-384.9** Short Grass Pasture Kv= 7.0 fps
0.9	43	0.0023	0.77		**Shallow Concentrated Flow, 384.9-384.8** Unpaved Kv= 16.1 fps
18.8	790	0.0100	0.70		**Shallow Concentrated Flow, 384.8-377** Short Grass Pasture Kv= 7.0 fps
55.0	2,509	Total			

Summary for Subcatchment E3: West overland

Runoff = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment E4a: Road + Basin

Runoff = 30.7 cfs @ 12.09 hrs, Volume= 2.373 af, Depth= 6.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment E4b: Road + Basin

Runoff = 23.2 cfs @ 12.09 hrs, Volume= 1.737 af, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment E4c: Road + Basin

Runoff = 13.9 cfs @ 12.09 hrs, Volume= 1.063 af, Depth= 6.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment E4d.1: Central overland (west)

Runoff = 2.9 cfs @ 12.15 hrs, Volume= 0.319 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	88	0.0150	6.45	7.91	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
1.6	97	0.0200	0.99		**Shallow Concentrated Flow, 376-374** Short Grass Pasture Kv= 7.0 fps
7.2	704	Total			

Summary for Subcatchment E4d.2: Central overland (east)

Runoff = 7.6 cfs @ 12.48 hrs, Volume= 1.454 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
2.536	72	Dirt roads, HSG A
10.662	30	Meadow, non-grazed, HSG A
6.064	30	Woods, Good, HSG A
1.019	39	>75% Grass cover, Good, HSG A
20.281	36	Weighted Average
20.281		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0250	0.16		**Sheet Flow, 386-384.75** Grass: Short n= 0.150 P2= 3.00"
8.8	276	0.0109	0.52		**Shallow Concentrated Flow, 385-382** Woodland Kv= 5.0 fps
0.5	40	0.0060	1.25		**Shallow Concentrated Flow, 382-381.75** Unpaved Kv= 16.1 fps
4.9	292	0.0200	0.99		**Shallow Concentrated Flow, 381.75-376** Short Grass Pasture Kv= 7.0 fps
1.2	65	0.0310	0.88		**Shallow Concentrated Flow, 376-374** Woodland Kv= 5.0 fps
20.7	723	Total			

Summary for Subcatchment E4e: North overland

Runoff = 16.9 cfs @ 12.15 hrs, Volume= 1.707 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment E5: Northwest overland

Runoff = 0.1 cfs @ 12.14 hrs, Volume= 0.011 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment E6: Northeast overland

Runoff = 4.2 cfs @ 12.20 hrs, Volume= 0.462 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.123	72	Dirt roads, HSG A
0.384	30	Meadow, non-grazed, HSG A
1.589	30	Woods, Good, HSG A
0.089	82	Dirt roads, HSG B
0.600	58	Meadow, non-grazed, HSG B
0.912	55	Woods, Good, HSG B
3.697	43	Weighted Average
3.697		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0600	0.10		**Sheet Flow, 364-361** Woods: Light underbrush n= 0.400 P2= 3.00"
2.0	141	0.0530	1.15		**Shallow Concentrated Flow, 361-353.5** Woodland Kv= 5.0 fps
0.2	15	0.0500	1.57		**Shallow Concentrated Flow, 353.5-352.75** Short Grass Pasture Kv= 7.0 fps
0.1	13	0.0460	3.45		**Shallow Concentrated Flow, 352.75-352.15** Unpaved Kv= 16.1 fps
0.3	39	0.1320	2.54		**Shallow Concentrated Flow, 352.15-347** Short Grass Pasture Kv= 7.0 fps
0.5	49	0.1220	1.75		**Shallow Concentrated Flow, 347-341** Woodland Kv= 5.0 fps
11.3	307	Total			

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.47" for 100-YR event
Inflow = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af
Outflow = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 62.932 ac, 0.00% Impervious, Inflow Depth = 1.03" for 100-YR event
Inflow = 20.9 cfs @ 12.95 hrs, Volume= 5.423 af
Outflow = 20.9 cfs @ 12.95 hrs, Volume= 5.423 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.40" for 100-YR event
Inflow = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af
Outflow = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

```
Inflow Area =      27.743 ac,  10.46% Impervious,  Inflow Depth =  0.77"   for  100-YR event
Inflow      =         9.2 cfs @  12.44 hrs,  Volume=        1.773 af
Outflow     =         9.2 cfs @  12.44 hrs,  Volume=        1.773 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

```
Inflow Area =       0.125 ac,   0.00% Impervious,  Inflow Depth =  1.03"   for  100-YR event
Inflow      =         0.1 cfs @  12.14 hrs,  Volume=        0.011 af
Outflow     =         0.1 cfs @  12.14 hrs,  Volume=        0.011 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

```
Inflow Area =      22.792 ac,  15.58% Impervious,  Inflow Depth =  1.14"   for  100-YR event
Inflow      =        21.0 cfs @  12.16 hrs,  Volume=        2.168 af
Outflow     =        21.0 cfs @  12.16 hrs,  Volume=        2.168 af,  Atten= 0%,  Lag= 0.0 min
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

```
Inflow Area =       1.966 ac,  75.13% Impervious,  Inflow Depth =  6.49"   for  100-YR event
Inflow      =        13.9 cfs @  12.09 hrs,  Volume=        1.063 af
Outflow     =         0.6 cfs @  14.83 hrs,  Volume=        1.064 af,  Atten= 96%,  Lag= 164.7 min
Discarded   =         0.6 cfs @  14.83 hrs,  Volume=        1.064 af
Primary     =         0.0 cfs @   0.00 hrs,  Volume=        0.000 af
Secondary   =         0.0 cfs @   0.00 hrs,  Volume=        0.000 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 356.42' @ 14.83 hrs Surf.Area= 11,043 sf Storage= 26,195 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 467.4 min (1,249.7 - 782.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.6 cfs @ 14.83 hrs HW=356.42' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└—**2=Culvert** (Controls 0.0 cfs)
  └—**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└—**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area =	3.464 ac, 59.90% Impervious, Inflow Depth = 6.02"	for 100-YR event	
Inflow =	23.2 cfs @ 12.09 hrs, Volume=	1.737 af	
Outflow =	1.3 cfs @ 14.16 hrs, Volume=	1.739 af,	Atten= 95%, Lag= 124.4 min
Discarded =	1.3 cfs @ 14.16 hrs, Volume=	1.739 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 365.03' @ 14.16 hrs Surf.Area= 22,568 sf Storage= 37,544 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 301.3 min (1,094.7 - 793.4)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900

			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.3 cfs @ 14.16 hrs HW=365.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area = 4.310 ac, 67.33% Impervious, Inflow Depth = 6.61" for 100-YR event
Inflow = 30.7 cfs @ 12.09 hrs, Volume= 2.373 af
Outflow = 4.2 cfs @ 12.62 hrs, Volume= 2.377 af, Atten= 86%, Lag= 31.7 min
Discarded = 4.2 cfs @ 12.62 hrs, Volume= 2.377 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.73' @ 12.62 hrs Surf.Area= 22,050 sf Storage= 33,371 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 55.2 min (834.5 - 779.4)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=4.2 cfs @ 12.62 hrs HW=374.73' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 4.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area = 1.353 ac, 71.47% Impervious, Inflow Depth = 6.14" for 100-YR event
Inflow = 9.2 cfs @ 12.09 hrs, Volume= 0.692 af
Outflow = 1.2 cfs @ 12.65 hrs, Volume= 0.692 af, Atten= 87%, Lag= 33.6 min
Discarded = 1.2 cfs @ 12.65 hrs, Volume= 0.692 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 395.49' @ 12.65 hrs Surf.Area= 6,282 sf Storage= 10,983 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 80.0 min (870.8 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

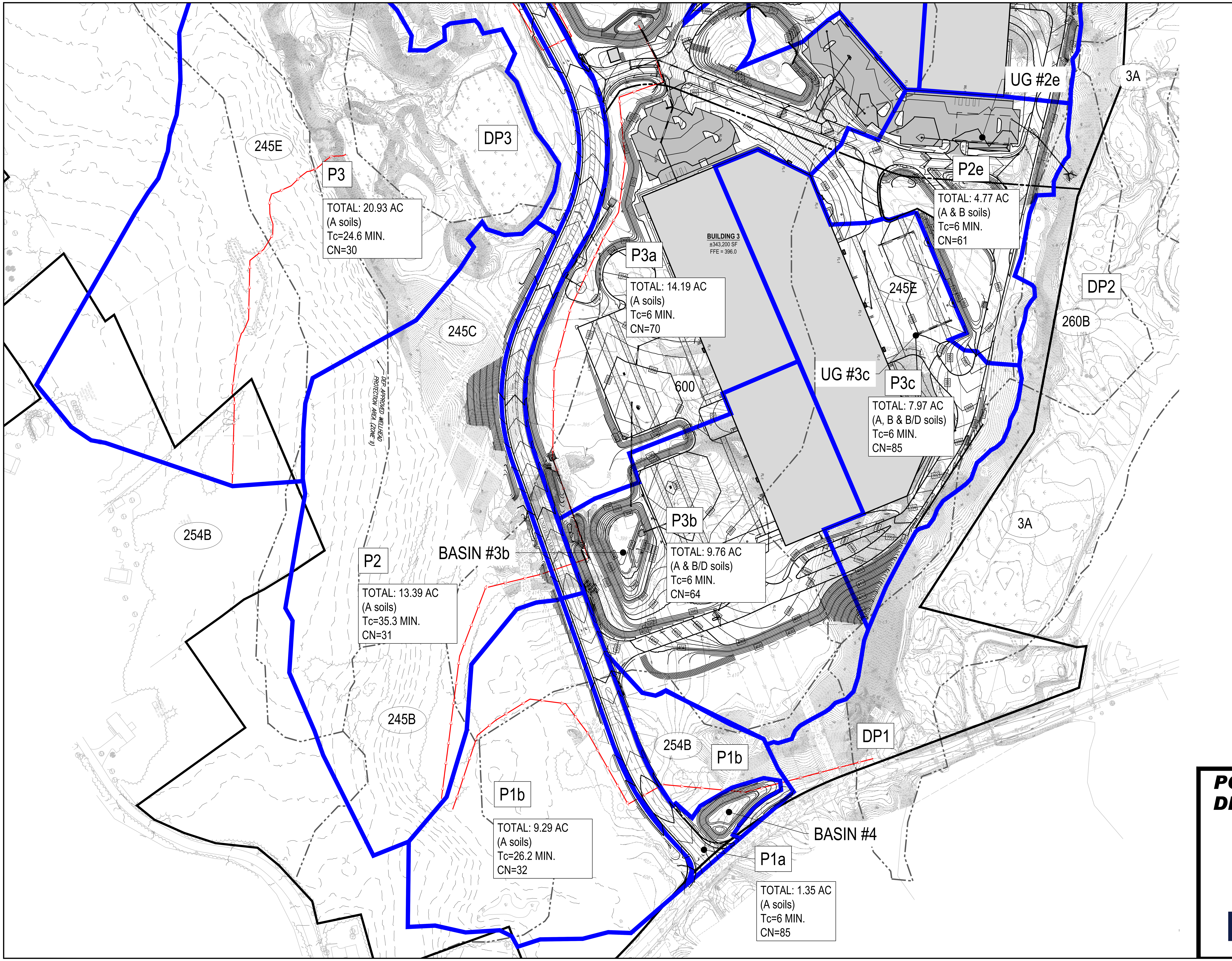
Discarded OutFlow Max=1.2 cfs @ 12.65 hrs HW=395.49' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

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



KEY

654	SOIL GROUP
	SOIL BOUNDARY
	TIME OF CONCENTRATION
P1	PROPOSED WATERSHED
DP1	DESIGN POINT

100 50 25 0 100
1"= 100'

POST-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER

SCALE:1"=100' DATE: 02/22/2022

POST-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER //

SCALE:1"=100' DATE: 02/22/2022

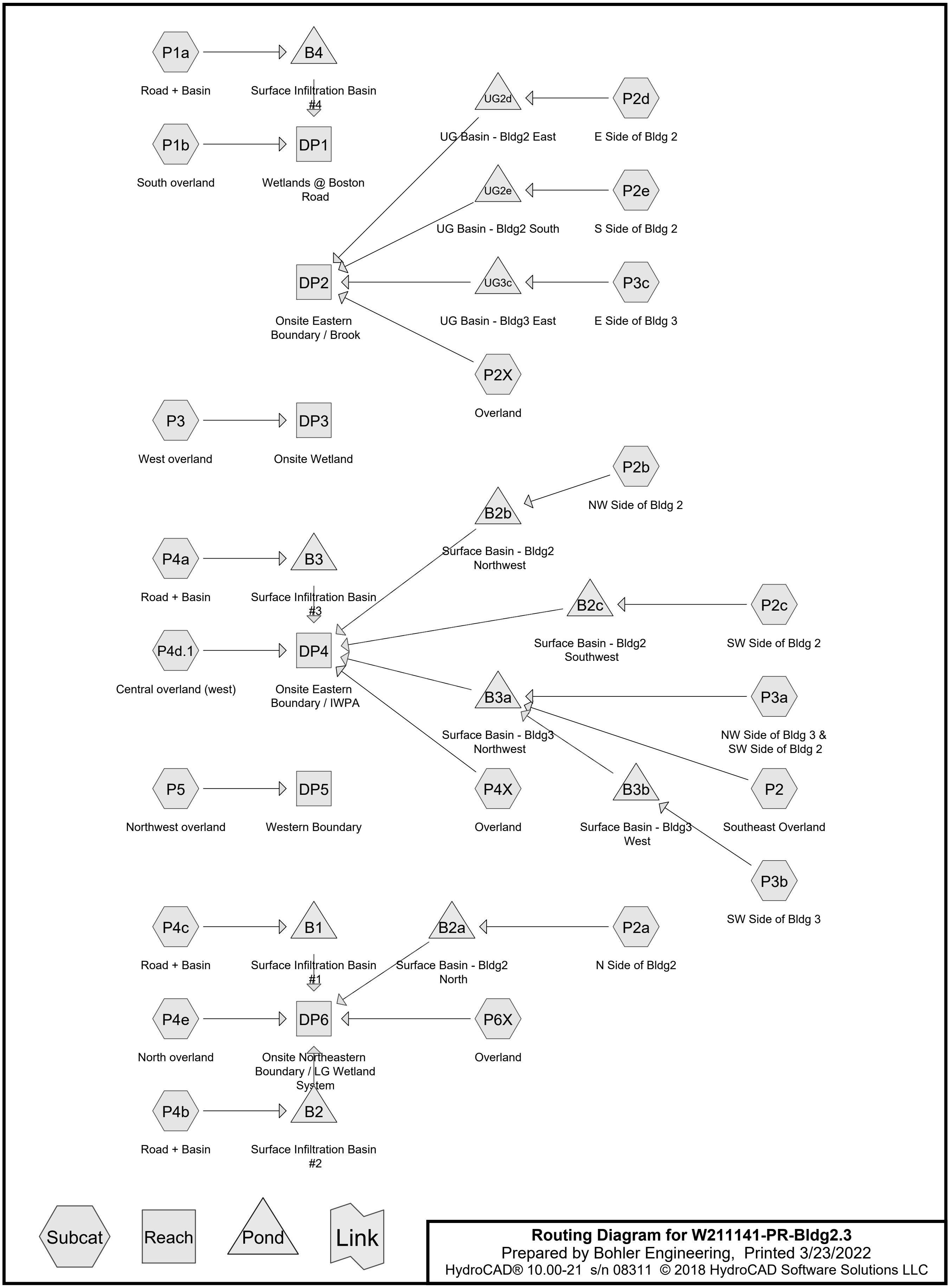
POST-DEVELOPMENT DRAINAGE ANALYSIS EXHIBIT BUILDINGS 2&3

UNIFIED PARKWAY
PROVIDENCE ROAD @ BOSTON ROAD
SUTTON, MA

PREPARED BY

BOHLER

SCALE:1"=100' DATE: 02/22/2022



Routing Diagram for W211141-PR-Bldg2.3
Prepared by Bohler Engineering, Printed 3/23/2022
HydroCAD® 10.00-21 s/n 08311 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
31.941	39	>75% Grass cover, Good, HSG A (P1a, P1b, P2, P2a, P2b, P2c, P2d, P2e, P2X, P3a, P3b, P3c, P4a, P4b, P4c, P4d.1, P4e, P4X, P5, P6X)
2.499	61	>75% Grass cover, Good, HSG B (P2a, P2e, P2X, P3c, P4b, P4e, P6X)
0.347	80	>75% Grass cover, Good, HSG D (P3c)
0.987	98	Bot. Basin, 0% imp, HSG A (P1a, P4a, P4c)
0.373	98	Bot. Basin, 0% imp, HSG B (P4b)
4.027	72	Dirt roads, HSG A (P1b, P2, P3b, P4d.1, P4e)
0.088	76	Gravel roads, HSG A (P3b)
12.471	30	Meadow, non-grazed, HSG A (P2, P2e, P3, P3b, P4d.1, P4e, P4X, P5)
0.191	78	Meadow, non-grazed, HSG D (P3b)
26.306	98	Paved parking, HSG A (P1a, P2a, P2b, P2c, P2d, P2e, P3a, P3b, P3c, P4a, P4b, P4c)
0.060	98	Paved parking, HSG B (P2a)
22.880	98	Roofs, HSG A (P2a, P2b, P2c, P2d, P3a, P3b, P3c)
1.707	98	Water Surface, 0% imp, HSG A (P2b, P2c, P3a, P3b)
0.440	98	Water Surface, 0% imp, HSG B (P2a)
40.850	30	Woods, Good, HSG A (P1b, P2, P3, P3b, P4d.1, P4e)
145.167	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
141.257	HSG A	P1a, P1b, P2, P2a, P2b, P2c, P2d, P2e, P2X, P3, P3a, P3b, P3c, P4a, P4b, P4c, P4d.1, P4e, P4X, P5, P6X
3.372	HSG B	P2a, P2e, P2X, P3c, P4b, P4e, P6X
0.000	HSG C	
0.538	HSG D	P3b, P3c
0.000	Other	
145.167		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
31.941	2.499	0.000	0.347	0.000	34.787	>75% Grass cover, Good	P1a, P1b, P2, P2a, P2b, P2c, P2d, P2e, P2X, P3a, P3b, P3c, P4a, P4b, P4c, P4d.1, P4e, P4X, P5, P6X
0.987	0.373	0.000	0.000	0.000	1.360	Bot. Basin, 0% imp	P1a, P4a, P4b, P4c
4.027	0.000	0.000	0.000	0.000	4.027	Dirt roads	P1b, P2, P3b, P4d.1, P4e
0.088	0.000	0.000	0.000	0.000	0.088	Gravel roads	P3b
12.471	0.000	0.000	0.191	0.000	12.662	Meadow, non-grazed	P2, P2e, P3, P3b, P4d.1, P4e, P4X, P5
26.306	0.060	0.000	0.000	0.000	26.366	Paved parking	P1a, P2a, P2b, P2c, P2d, P2e, P3a, P3b, P3c, P4a, P4b, P4c
22.880	0.000	0.000	0.000	0.000	22.880	Roofs	P2a, P2b, P2c, P2d, P3a, P3b, P3c

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.707	0.440	0.000	0.000	0.000	2.147	Water Surface, 0% imp	P2a, P2b, P2c, P3a, P3b
40.850	0.000	0.000	0.000	0.000	40.850	Woods, Good	P1b, P2, P3, P3b, P4d.1, P4e
141.257	**3.372**	**0.000**	**0.538**	**0.000**	**145.167**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P1b	0.00	0.00	592.0	0.0270	0.013	24.0	0.0	0.0
2	P2	0.00	0.00	119.0	0.0168	0.013	18.0	0.0	0.0
3	P2	0.00	0.00	249.0	0.0120	0.012	18.0	0.0	0.0
4	P2	0.00	0.00	34.0	0.0300	0.012	18.0	0.0	0.0
5	P2	0.00	0.00	54.0	0.0074	0.012	24.0	0.0	0.0
6	P2	0.00	0.00	95.0	0.0053	0.012	36.0	0.0	0.0
7	P4d.1	0.00	0.00	75.0	0.0060	0.013	15.0	0.0	0.0
8	P4d.1	0.00	0.00	117.0	0.0090	0.013	15.0	0.0	0.0
9	P4d.1	0.00	0.00	168.0	0.0077	0.013	15.0	0.0	0.0
10	P4d.1	0.00	0.00	124.0	0.0072	0.013	15.0	0.0	0.0
11	P4d.1	0.00	0.00	248.0	0.0077	0.013	15.0	0.0	0.0
12	P4d.1	0.00	0.00	27.0	0.0334	0.013	15.0	0.0	0.0
13	P4e	0.00	0.00	132.0	0.0300	0.013	15.0	0.0	0.0
14	B1	353.00	352.00	29.0	0.0345	0.013	18.0	0.0	0.0
15	B2	363.00	362.00	38.0	0.0263	0.013	12.0	0.0	0.0
16	B2a	346.00	345.00	71.0	0.0141	0.013	18.0	0.0	0.0
17	B2b	366.50	365.00	49.3	0.0304	0.013	12.0	0.0	0.0
18	B2c	374.00	373.00	40.1	0.0249	0.013	12.0	0.0	0.0
19	B3	373.00	372.00	33.0	0.0303	0.013	12.0	0.0	0.0
20	B3a	374.65	374.30	49.2	0.0071	0.013	15.0	0.0	0.0
21	B3b	383.00	381.00	246.0	0.0081	0.013	24.0	0.0	0.0
22	B4	392.00	386.00	286.0	0.0210	0.013	24.0	0.0	0.0
23	UG2d	371.75	369.61	142.0	0.0151	0.013	24.0	0.0	0.0
24	UG2e	375.00	374.10	75.3	0.0120	0.013	12.0	0.0	0.0
25	UG3c	379.15	375.10	238.6	0.0170	0.013	18.0	0.0	0.0

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

Subcatchment P1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=85 Runoff=2.8 cfs 0.205 af

Subcatchment P1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.0 cfs 0.000 af

Subcatchment P2: Southeast Overland Runoff Area=13.393 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=2,175' Tc=35.3 min CN=31 Runoff=0.0 cfs 0.000 af

Subcatchment P2a: N Side of Bldg2 Runoff Area=10.783 ac 80.75% Impervious Runoff Depth=2.23"
Tc=6.0 min CN=90 Runoff=27.3 cfs 2.007 af

Subcatchment P2b: NW Side of Bldg 2 Runoff Area=2.831 ac 77.50% Impervious Runoff Depth=1.98"
Tc=6.0 min CN=87 Runoff=6.4 cfs 0.466 af

Subcatchment P2c: SW Side of Bldg 2 Runoff Area=8.264 ac 73.98% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=85 Runoff=17.3 cfs 1.252 af

Subcatchment P2d: E Side of Bldg 2 Runoff Area=7.312 ac 88.40% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=91 Runoff=19.1 cfs 1.416 af

Subcatchment P2e: S Side of Bldg 2 Runoff Area=4.769 ac 37.95% Impervious Runoff Depth=0.47"
Tc=6.0 min CN=61 Runoff=1.7 cfs 0.188 af

Subcatchment P2X: Overland Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=43 Runoff=0.0 cfs 0.003 af

Subcatchment P3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.0 cfs 0.000 af

Subcatchment P3a: NW Side of Bldg 3 & Runoff Area=14.190 ac 46.22% Impervious Runoff Depth=0.87"
Tc=6.0 min CN=70 Runoff=12.9 cfs 1.028 af

Subcatchment P3b: SW Side of Bldg 3 Runoff Area=9.762 ac 41.71% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=64 Runoff=5.1 cfs 0.482 af

Subcatchment P3c: E Side of Bldg 3 Runoff Area=7.969 ac 74.10% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=85 Runoff=16.6 cfs 1.207 af

Subcatchment P4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=2.15"
Tc=6.0 min CN=89 Runoff=10.5 cfs 0.771 af

Subcatchment P4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=84 Runoff=6.9 cfs 0.503 af

Subcatchment P4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=88 Runoff=4.6 cfs 0.338 af

Subcatchment P4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=1,086' Tc=7.4 min CN=40 Runoff=0.0 cfs 0.001 af

Subcatchment P4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=270' Tc=8.5 min CN=43 Runoff=0.0 cfs 0.031 af

Subcatchment P4X: Overland Runoff Area=4.942 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=35 Runoff=0.0 cfs 0.000 af

Subcatchment P5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.000 af

Subcatchment P6X: Overland Runoff Area=1.210 ac 0.00% Impervious Runoff Depth=0.12"
Tc=6.0 min CN=49 Runoff=0.0 cfs 0.012 af

Reach DP1: Wetlands @ Boston Road Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=0.0 cfs 0.004 af
Outflow=0.0 cfs 0.004 af

Reach DP3: Onsite Wetland Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=0.0 cfs 0.001 af
Outflow=0.0 cfs 0.001 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.000 af
Outflow=0.0 cfs 0.000 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=0.1 cfs 0.044 af
Outflow=0.1 cfs 0.044 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=354.12' Storage=6,262 cf Inflow=4.6 cfs 0.338 af
Discarded=0.4 cfs 0.338 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.4 cfs 0.338 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=363.46' Storage=7,194 cf Inflow=6.9 cfs 0.503 af
Discarded=0.9 cfs 0.503 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.9 cfs 0.503 af

Pond B2a: Surface Basin - Bldg2 North Peak Elev=347.94' Storage=43,546 cf Inflow=27.3 cfs 2.007 af
Discarded=1.4 cfs 2.009 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.4 cfs 2.009 af

Pond B2b: Surface Basin - Bldg2 Northwest Peak Elev=367.98' Storage=8,920 cf Inflow=6.4 cfs 0.466 af
Discarded=0.5 cfs 0.467 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.467 af

Pond B2c: Surface Basin - Bldg2 Southwest Peak Elev=375.77' Storage=26,562 cf Inflow=17.3 cfs 1.252 af
Discarded=1.0 cfs 1.252 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.0 cfs 1.252 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=373.35' Storage=5,783 cf Inflow=10.5 cfs 0.771 af
Discarded=3.3 cfs 0.775 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=3.3 cfs 0.775 af

Pond B3a: Surface Basin - Bldg3 Northwest Peak Elev=373.88' Storage=44,768 cf Inflow=12.9 cfs 1.028 af
Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.0 cfs 0.000 af

Pond B3b: Surface Basin - Bldg3 West Peak Elev=383.72' Storage=4,275 cf Inflow=5.1 cfs 0.482 af
Discarded=1.3 cfs 0.482 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.3 cfs 0.482 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=393.65' Storage=2,096 cf Inflow=2.8 cfs 0.205 af
Discarded=0.7 cfs 0.206 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.7 cfs 0.206 af

Pond UG2d: UG Basin - Bldg2 East Peak Elev=372.87' Storage=27,138 cf Inflow=19.1 cfs 1.416 af
Discarded=1.2 cfs 1.417 af Primary=0.0 cfs 0.000 af Outflow=1.2 cfs 1.417 af

Pond UG2e: UG Basin - Bldg2 South Peak Elev=374.66' Storage=1,367 cf Inflow=1.7 cfs 0.188 af
Discarded=0.5 cfs 0.188 af Primary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.188 af

Pond UG3c: UG Basin - Bldg3 East Peak Elev=380.67' Storage=22,683 cf Inflow=16.6 cfs 1.207 af
Discarded=1.2 cfs 1.208 af Primary=0.0 cfs 0.000 af Outflow=1.2 cfs 1.208 af

Total Runoff Area = 145.167 ac Runoff Volume = 9.910 af Average Runoff Depth = 0.82"
66.08% Pervious = 95.921 ac 33.92% Impervious = 49.246 ac

Summary for Subcatchment P1a: Road + Basin

Runoff = 2.8 cfs @ 12.09 hrs, Volume= 0.205 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment P1b: South overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment P2: Southeast Overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
13.393	31	Weighted Average
13.393		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	249	0.0120	7.05	12.47	**Pipe Channel, 399 to 396** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
20.3	974	0.0130	0.80		**Shallow Concentrated Flow, 396 to 383** Short Grass Pasture Kv= 7.0 fps
0.1	34	0.0300	11.15	19.71	**Pipe Channel, 378-377** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.1	54	0.0074	6.71	21.08	**Pipe Channel, 374-373.6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.2	95	0.0053	7.44	52.60	**Pipe Channel, 373.5-373** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
35.3	2,175	Total			

Summary for Subcatchment P2a: N Side of Bldg2

Runoff = 27.3 cfs @ 12.09 hrs, Volume= 2.007 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
5.620	98	Roofs, HSG A
3.027	98	Paved parking, HSG A
0.958	39	>75% Grass cover, Good, HSG A
0.440	98	Water Surface, 0% imp, HSG B
0.060	98	Paved parking, HSG B
0.678	61	>75% Grass cover, Good, HSG B
10.783	90	Weighted Average
2.076		19.25% Pervious Area
8.707		80.75% Impervious Area

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

Summary for Subcatchment P2b: NW Side of Bldg 2

Runoff = 6.4 cfs @ 12.09 hrs, Volume= 0.466 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
1.890	98	Roofs, HSG A
0.304	98	Paved parking, HSG A
0.509	39	>75% Grass cover, Good, HSG A
0.128	98	Water Surface, 0% imp, HSG A
2.831	87	Weighted Average
0.637		22.50% Pervious Area
2.194		77.50% Impervious Area

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

Summary for Subcatchment P2c: SW Side of Bldg 2

Runoff = 17.3 cfs @ 12.09 hrs, Volume= 1.252 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
3.570	98	Roofs, HSG A
2.544	98	Paved parking, HSG A
1.805	39	>75% Grass cover, Good, HSG A
0.345	98	Water Surface, 0% imp, HSG A
8.264	85	Weighted Average
2.150		26.02% Pervious Area
6.114		73.98% Impervious Area

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

Summary for Subcatchment P2d: E Side of Bldg 2

Runoff = 19.1 cfs @ 12.09 hrs, Volume= 1.416 af, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
3.890	98	Roofs, HSG A
2.574	98	Paved parking, HSG A
0.848	39	>75% Grass cover, Good, HSG A
7.312	91	Weighted Average
0.848		11.60% Pervious Area
6.464		88.40% Impervious Area

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

Summary for Subcatchment P2e: S Side of Bldg 2

Runoff = 1.7 cfs @ 12.12 hrs, Volume= 0.188 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
2.039	39	>75% Grass cover, Good, HSG A
1.810	98	Paved parking, HSG A
0.677	30	Meadow, non-grazed, HSG A
0.243	61	>75% Grass cover, Good, HSG B
4.769	61	Weighted Average
2.959		62.05% Pervious Area
1.810		37.95% Impervious Area

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

Summary for Subcatchment P2X: Overland

Runoff = 0.0 cfs @ 16.87 hrs, Volume= 0.003 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
1.183	39	>75% Grass cover, Good, HSG A
0.302	61	>75% Grass cover, Good, HSG B
1.485	43	Weighted Average
1.485		100.00% Pervious Area

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

Summary for Subcatchment P3: West overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment P3a: NW Side of Bldg 3 & SW Side of Bldg 2

Runoff = 12.9 cfs @ 12.10 hrs, Volume= 1.028 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
2.293	98	Roofs, HSG A
5.718	39	>75% Grass cover, Good, HSG A
2.599	98	Paved parking, HSG A
1.010	98	Water Surface, 0% imp, HSG A
0.862	98	Paved parking, HSG A
0.795	39	>75% Grass cover, Good, HSG A
0.805	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
14.190	70	Weighted Average
7.631		53.78% Pervious Area
6.559		46.22% Impervious Area

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

Summary for Subcatchment P3b: SW Side of Bldg 3

Runoff = 5.1 cfs @ 12.11 hrs, Volume= 0.482 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
3.317	39	>75% Grass cover, Good, HSG A
0.224	98	Water Surface, 0% imp, HSG A
1.780	98	Roofs, HSG A
2.292	98	Paved parking, HSG A
1.790	30	Meadow, non-grazed, HSG A
0.051	30	Woods, Good, HSG A
0.029	72	Dirt roads, HSG A
0.088	76	Gravel roads, HSG A
0.191	78	Meadow, non-grazed, HSG D
9.762	64	Weighted Average
5.690		58.29% Pervious Area
4.072		41.71% Impervious Area

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

Summary for Subcatchment P3c: E Side of Bldg 3

Runoff = 16.6 cfs @ 12.09 hrs, Volume= 1.207 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	1.702	39	>75% Grass cover, Good, HSG A
	0.347	80	>75% Grass cover, Good, HSG D
	2.068	98	Paved parking, HSG A
	3.837	98	Roofs, HSG A
	0.015	61	>75% Grass cover, Good, HSG B
	7.969	85	Weighted Average
	2.064		25.90% Pervious Area
	5.905		74.10% Impervious Area

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

Summary for Subcatchment P4a: Road + Basin

Runoff = 10.5 cfs @ 12.09 hrs, Volume= 0.771 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment P4b: Road + Basin

Runoff = 6.9 cfs @ 12.09 hrs, Volume= 0.503 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment P4c: Road + Basin

Runoff = 4.6 cfs @ 12.09 hrs, Volume= 0.338 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment P4d.1: Central overland (west)

Runoff = 0.0 cfs @ 23.36 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.6	168	0.0077	4.62	5.67	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	124	0.0072	4.47	5.48	**Pipe Channel, 375.9-375** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.9	248	0.0077	4.62	5.67	**Pipe Channel, 374.9-373** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.0	27	0.0334	9.62	11.81	**Pipe Channel, 372.9-372** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
7.4	1,086	Total			

Summary for Subcatchment P4e: North overland

Runoff = 0.0 cfs @ 16.92 hrs, Volume= 0.031 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment P4X: Overland

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
2.378	30	Meadow, non-grazed, HSG A
2.564	39	>75% Grass cover, Good, HSG A
4.942	35	Weighted Average
4.942		100.00% Pervious Area

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

Summary for Subcatchment P5: Northwest overland

Runoff = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment P6X: Overland

Runoff = 0.0 cfs @ 12.50 hrs, Volume= 0.012 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.27"

Area (ac)	CN	Description
0.639	39	>75% Grass cover, Good, HSG A
0.571	61	>75% Grass cover, Good, HSG B
1.210	49	Weighted Average
1.210		100.00% Pervious Area

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

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 21.535 ac, 65.84% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 13.85 hrs, Volume= 0.004 af
Outflow = 0.0 cfs @ 13.85 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 60.844 ac, 35.90% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 23.36 hrs, Volume= 0.001 af
Outflow = 0.0 cfs @ 23.36 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area = 0.125 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area = 31.088 ac, 39.43% Impervious, Inflow Depth = 0.02" for 2-YR event
Inflow = 0.1 cfs @ 15.71 hrs, Volume= 0.044 af
Outflow = 0.1 cfs @ 15.71 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area = 1.966 ac, 75.13% Impervious, Inflow Depth = 2.06" for 2-YR event
Inflow = 4.6 cfs @ 12.09 hrs, Volume= 0.338 af
Outflow = 0.4 cfs @ 13.49 hrs, Volume= 0.338 af, Atten= 92%, Lag= 83.8 min
Discarded = 0.4 cfs @ 13.49 hrs, Volume= 0.338 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 354.12' @ 13.49 hrs Surf.Area= 6,340 sf Storage= 6,262 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 168.5 min (982.7 - 814.2)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.4 cfs @ 13.49 hrs HW=354.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area = 3.464 ac, 59.90% Impervious, Inflow Depth = 1.74" for 2-YR event
Inflow = 6.9 cfs @ 12.09 hrs, Volume= 0.503 af
Outflow = 0.9 cfs @ 12.74 hrs, Volume= 0.503 af, Atten= 87%, Lag= 38.8 min
Discarded = 0.9 cfs @ 12.74 hrs, Volume= 0.503 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 363.46' @ 12.74 hrs Surf.Area= 16,433 sf Storage= 7,194 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.1 min (888.6 - 828.6)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.9 cfs @ 12.74 hrs HW=363.46' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.9 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2a: Surface Basin - Bldg2 North

Inflow Area =	10.783 ac, 80.75% Impervious,	Inflow Depth = 2.23"	for 2-YR event	
Inflow =	27.3 cfs @	12.09 hrs, Volume=	2.007 af	
Outflow =	1.4 cfs @	14.50 hrs, Volume=	2.009 af,	Atten= 95%, Lag= 144.7 min
Discarded =	1.4 cfs @	14.50 hrs, Volume=	2.009 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 347.94' @ 14.50 hrs Surf.Area= 25,545 sf Storage= 43,546 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 306.4 min (1,112.4 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	346.00'	167,790 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
346.00	19,435	0	0
348.00	25,746	45,181	45,181
350.00	30,605	56,351	101,532
351.00	33,119	31,862	133,394
352.00	35,673	34,396	167,790

Device	Routing	Invert	Outlet Devices
#1	Discarded	346.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	346.00'	**18.0" Round Culvert** L= 71.0' Ke= 0.900 Inlet / Outlet Invert= 346.00' / 345.00' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	348.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	349.35'	**20.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	350.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	351.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.4 cfs @ 14.50 hrs HW=347.94' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.4 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=346.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
 ├─**3=Orifice/Grate** (Controls 0.0 cfs)
 ├─**4=Orifice/Grate** (Controls 0.0 cfs)
 └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=346.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2b: Surface Basin - Bldg2 Northwest

Inflow Area = 2.831 ac, 77.50% Impervious, Inflow Depth = 1.98" for 2-YR event
Inflow = 6.4 cfs @ 12.09 hrs, Volume= 0.466 af
Outflow = 0.5 cfs @ 13.51 hrs, Volume= 0.467 af, Atten= 92%, Lag= 85.4 min
Discarded = 0.5 cfs @ 13.51 hrs, Volume= 0.467 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 367.98' @ 13.51 hrs Surf.Area= 8,843 sf Storage= 8,920 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 207.5 min (1,025.5 - 818.0)

Volume	Invert	Avail.Storage	Storage Description
#1	366.50'	69,219 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.50	6,480	0	0
367.00	3,971	2,613	2,613
368.00	8,921	6,446	9,059
370.00	11,322	20,243	29,302
372.00	13,948	25,270	54,572
373.00	15,346	14,647	69,219

Device	Routing	Invert	Outlet Devices
#1	Discarded	366.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	366.50'	**12.0" Round Culvert** L= 49.3' Ke= 0.900 Inlet / Outlet Invert= 366.50' / 365.00' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	371.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	372.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 13.51 hrs HW=367.98' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2c: Surface Basin - Bldg2 Southwest

Inflow Area =	8.264 ac, 73.98% Impervious, Inflow Depth = 1.82" for 2-YR event			
Inflow =	17.3 cfs @	12.09 hrs, Volume=	1.252 af	
Outflow =	1.0 cfs @	14.37 hrs, Volume=	1.252 af,	Atten= 94%, Lag= 136.5 min
Discarded =	1.0 cfs @	14.37 hrs, Volume=	1.252 af	
Primary =	0.0 cfs @	14.37 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 375.77' @ 14.37 hrs Surf.Area= 18,240 sf Storage= 26,562 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 280.1 min (1,105.2 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	374.00'	124,553 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.00	11,840	0	0
376.00	19,088	30,928	30,928
378.00	23,422	42,510	73,438
380.00	27,693	51,115	124,553

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	374.00'	**12.0" Round Culvert** L= 40.1' Ke= 0.900 Inlet / Outlet Invert= 374.00' / 373.00' S= 0.0249 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	375.75'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	377.30'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	378.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	379.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.0 cfs @ 14.37 hrs HW=375.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 14.37 hrs HW=375.77' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 3.4 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 0.43 fps)
  ├─**4=Orifice/Grate** (Controls 0.0 cfs)
  └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area = 4.310 ac, 67.33% Impervious, Inflow Depth = 2.15" for 2-YR event
Inflow = 10.5 cfs @ 12.09 hrs, Volume= 0.771 af
Outflow = 3.3 cfs @ 12.42 hrs, Volume= 0.775 af, Atten= 69%, Lag= 19.5 min
Discarded = 3.3 cfs @ 12.42 hrs, Volume= 0.775 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 373.35' @ 12.42 hrs Surf.Area= 17,274 sf Storage= 5,783 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 8.8 min (819.0 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=3.3 cfs @ 12.42 hrs HW=373.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 3.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3a: Surface Basin - Bldg3 Northwest

Inflow Area = 37.345 ac, 28.47% Impervious, Inflow Depth = 0.33" for 2-YR event
Inflow = 12.9 cfs @ 12.10 hrs, Volume= 1.028 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 373.88' @ 24.40 hrs Surf.Area= 51,878 sf Storage= 44,768 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	295,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	49,471	0	0
374.00	52,195	50,833	50,833
376.00	62,191	114,386	165,219
378.00	68,093	130,284	295,503

Device	Routing	Invert	Outlet Devices
#1	Primary	374.65'	**15.0" Round Culvert** L= 49.2' Ke= 0.900 Inlet / Outlet Invert= 374.65' / 374.30' S= 0.0071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	376.60'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	377.15'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3b: Surface Basin - Bldg3 West

Inflow Area = 9.762 ac, 41.71% Impervious, Inflow Depth = 0.59" for 2-YR event
Inflow = 5.1 cfs @ 12.11 hrs, Volume= 0.482 af
Outflow = 1.3 cfs @ 12.62 hrs, Volume= 0.482 af, Atten= 75%, Lag= 30.6 min
Discarded = 1.3 cfs @ 12.62 hrs, Volume= 0.482 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 383.72' @ 12.62 hrs Surf.Area= 6,604 sf Storage= 4,275 cf

Plug-Flow detention time= 23.0 min calculated for 0.481 af (100% of inflow)
Center-of-Mass det. time= 23.0 min (920.6 - 897.6)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	95,627 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	5,248	0	0
384.00	7,128	6,188	6,188
386.00	13,250	20,378	26,566
388.00	16,920	30,170	56,736
390.00	21,971	38,891	95,627

Device	Routing	Invert	Outlet Devices
#1	Discarded	383.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	383.00'	**24.0" Round Culvert** L= 246.0' Ke= 0.900 Inlet / Outlet Invert= 383.00' / 381.00' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	386.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	389.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.3 cfs @ 12.62 hrs HW=383.72' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area =	1.353 ac, 71.47% Impervious,	Inflow Depth = 1.82"	for 2-YR event	
Inflow =	2.8 cfs @ 12.09 hrs,	Volume=	0.205 af	
Outflow =	0.7 cfs @ 12.50 hrs,	Volume=	0.206 af,	Atten= 76%, Lag= 24.6 min
Discarded =	0.7 cfs @ 12.50 hrs,	Volume=	0.206 af	
Primary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 393.65' @ 12.50 hrs Surf.Area= 3,551 sf Storage= 2,096 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.4 min (843.5 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.7 cfs @ 12.50 hrs HW=393.65' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2d: UG Basin - Bldg2 East

```
Inflow Area =      7.312 ac, 88.40% Impervious, Inflow Depth =  2.32"   for 2-YR event
Inflow      =     19.1 cfs @  12.09 hrs, Volume=         1.416 af
Outflow     =      1.2 cfs @  13.85 hrs, Volume=         1.417 af, Atten= 94%, Lag= 105.4 min
Discarded   =      1.2 cfs @  11.55 hrs, Volume=         1.417 af
Primary     =      0.0 cfs @  13.85 hrs, Volume=         0.000 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 372.87' @ 13.85 hrs Surf.Area= 21,589 sf Storage= 27,138 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 199.4 min (1,001.0 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	371.00'	29,576 cf	**65.75'W x 328.35'L x 5.50'H Field A** 118,740 cf Overall - 44,799 cf Embedded = 73,941 cf x 40.0% Voids
#2A	371.75'	44,799 cf	**ADS_StormTech MC-3500 d +Cap** x 405 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 9 Rows of 45 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		74,375 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	371.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	371.75'	**24.0" Round Culvert** L= 142.0' Ke= 0.900 Inlet / Outlet Invert= 371.75' / 369.61' S= 0.0151 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	372.85'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 2	374.20'	**12.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	375.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 11.55 hrs HW=371.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 13.85 hrs HW=372.87' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.1 cfs potential flow)
 ├─**3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 0.43 fps)
 ├─**4=Orifice/Grate** (Controls 0.0 cfs)
 └─**5=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2e: UG Basin - Bldg2 South

```
Inflow Area =      4.769 ac, 37.95% Impervious, Inflow Depth =  0.47"   for 2-YR event
Inflow      =      1.7 cfs @  12.12 hrs, Volume=         0.188 af
Outflow     =      0.5 cfs @  12.10 hrs, Volume=         0.188 af, Atten= 72%, Lag= 0.0 min
Discarded   =      0.5 cfs @  12.10 hrs, Volume=         0.188 af
Primary     =      0.0 cfs @   0.00 hrs, Volume=         0.000 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.66' @ 12.67 hrs Surf.Area= 8,389 sf Storage= 1,367 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 17.7 min (929.8 - 912.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	374.25'	11,620 cf	**65.75'W x 127.59'L x 5.50'H Field A** 46,140 cf Overall - 17,091 cf Embedded = 29,049 cf x 40.0% Voids
#2A	375.00'	17,091 cf	**ADS_StormTech MC-3500 d +Cap** x 153 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 9 Rows of 17 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		28,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	375.00'	**12.0" Round Culvert** L= 75.3' Ke= 0.900 Inlet / Outlet Invert= 375.00' / 374.10' S= 0.0120 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.60'	**5.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	378.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.5 cfs @ 12.10 hrs HW=374.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.25' TW=0.00' (Dynamic Tailwater)
2=Culvert (Controls 0.0 cfs)
3=Orifice/Grate (Controls 0.0 cfs)
4=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Summary for Pond UG3c: UG Basin - Bldg3 East

Inflow Area =	7.969 ac, 74.10% Impervious, Inflow Depth = 1.82" for 2-YR event			
Inflow =	16.6 cfs @	12.09 hrs, Volume=	1.207 af	
Outflow =	1.2 cfs @	11.75 hrs, Volume=	1.208 af,	Atten= 93%, Lag= 0.0 min
Discarded =	1.2 cfs @	11.75 hrs, Volume=	1.208 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 380.67' @ 13.87 hrs Surf.Area= 20,670 sf Storage= 22,683 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 182.8 min (1,008.0 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	379.00'	32,520 cf	**92.08'W x 224.47'L x 6.75'H Field A** 139,520 cf Overall - 58,219 cf Embedded = 81,301 cf x 40.0% Voids
#2A	379.75'	58,219 cf	**ADS_StormTech MC-4500 +Cap** x 540 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 10 Rows of 54 Chambers Cap Storage= +35.7 cf x 2 x 10 rows = 714.0 cf
		90,739 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	379.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	379.15'	**18.0" Round Culvert** L= 238.6' Ke= 0.900 Inlet / Outlet Invert= 379.15' / 375.10' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	384.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 11.75 hrs HW=379.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=379.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment P1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=3.43"
Tc=6.0 min CN=85 Runoff=5.3 cfs 0.387 af

Subcatchment P1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.0 cfs 0.024 af

Subcatchment P2: Southeast Overland Runoff Area=13.393 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=2,175' Tc=35.3 min CN=31 Runoff=0.0 cfs 0.019 af

Subcatchment P2a: N Side of Bldg2 Runoff Area=10.783 ac 80.75% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=90 Runoff=47.0 cfs 3.544 af

Subcatchment P2b: NW Side of Bldg 2 Runoff Area=2.831 ac 77.50% Impervious Runoff Depth=3.63"
Tc=6.0 min CN=87 Runoff=11.6 cfs 0.857 af

Subcatchment P2c: SW Side of Bldg 2 Runoff Area=8.264 ac 73.98% Impervious Runoff Depth=3.43"
Tc=6.0 min CN=85 Runoff=32.2 cfs 2.364 af

Subcatchment P2d: E Side of Bldg 2 Runoff Area=7.312 ac 88.40% Impervious Runoff Depth=4.05"
Tc=6.0 min CN=91 Runoff=32.5 cfs 2.468 af

Subcatchment P2e: S Side of Bldg 2 Runoff Area=4.769 ac 37.95% Impervious Runoff Depth=1.41"
Tc=6.0 min CN=61 Runoff=7.1 cfs 0.561 af

Subcatchment P2X: Overland Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=43 Runoff=0.2 cfs 0.046 af

Subcatchment P3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.01"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.0 cfs 0.012 af

Subcatchment P3a: NW Side of Bldg 3 & Runoff Area=14.190 ac 46.22% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=70 Runoff=33.6 cfs 2.469 af

Subcatchment P3b: SW Side of Bldg 3 Runoff Area=9.762 ac 41.71% Impervious Runoff Depth=1.63"
Tc=6.0 min CN=64 Runoff=17.3 cfs 1.323 af

Subcatchment P3c: E Side of Bldg 3 Runoff Area=7.969 ac 74.10% Impervious Runoff Depth=3.43"
Tc=6.0 min CN=85 Runoff=31.0 cfs 2.280 af

Subcatchment P4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=3.84"
Tc=6.0 min CN=89 Runoff=18.4 cfs 1.379 af

Subcatchment P4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=3.33"
Tc=6.0 min CN=84 Runoff=13.2 cfs 0.963 af

Subcatchment P4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=3.74"
Tc=6.0 min CN=88 Runoff=8.2 cfs 0.612 af

Subcatchment P4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.25"
Flow Length=1,086' Tc=7.4 min CN=40 Runoff=0.2 cfs 0.066 af

Subcatchment P4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.37"
Flow Length=270' Tc=8.5 min CN=43 Runoff=2.0 cfs 0.425 af

Subcatchment P4X: Overland Runoff Area=4.942 ac 0.00% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=35 Runoff=0.1 cfs 0.038 af

Subcatchment P5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.18"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.002 af

Subcatchment P6X: Overland Runoff Area=1.210 ac 0.00% Impervious Runoff Depth=0.67"
Tc=6.0 min CN=49 Runoff=0.5 cfs 0.067 af

Reach DP1: Wetlands @ Boston Road Inflow=0.0 cfs 0.024 af
Outflow=0.0 cfs 0.024 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=1.4 cfs 0.590 af
Outflow=1.4 cfs 0.590 af

Reach DP3: Onsite Wetland Inflow=0.0 cfs 0.012 af
Outflow=0.0 cfs 0.012 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=0.4 cfs 0.338 af
Outflow=0.4 cfs 0.338 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.002 af
Outflow=0.0 cfs 0.002 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=2.5 cfs 0.712 af
Outflow=2.5 cfs 0.712 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=355.08' Storage=13,297 cf Inflow=8.2 cfs 0.612 af
Discarded=0.5 cfs 0.612 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.612 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=364.05' Storage=17,507 cf Inflow=13.2 cfs 0.963 af
Discarded=1.0 cfs 0.964 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.0 cfs 0.964 af

Pond B2a: Surface Basin - Bldg2 North Peak Elev=349.51' Storage=86,830 cf Inflow=47.0 cfs 3.544 af
Discarded=1.6 cfs 3.326 af Primary=0.6 cfs 0.220 af Secondary=0.0 cfs 0.000 af Outflow=2.2 cfs 3.545 af

Pond B2b: Surface Basin - Bldg2 Northwest Peak Elev=369.11' Storage=19,720 cf Inflow=11.6 cfs 0.857 af
Discarded=0.6 cfs 0.857 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.6 cfs 0.857 af

Pond B2c: Surface Basin - Bldg2 Southwest Peak Elev=377.29' Storage=57,334 cf Inflow=32.2 cfs 2.364 af
Discarded=1.2 cfs 2.131 af Primary=0.3 cfs 0.234 af Secondary=0.0 cfs 0.000 af Outflow=1.5 cfs 2.365 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=373.89' Storage=15,692 cf Inflow=18.4 cfs 1.379 af
Discarded=3.8 cfs 1.380 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=3.8 cfs 1.380 af

Pond B3a: Surface Basin - Bldg3 Peak Elev=375.05' Storage=108,384 cf Inflow=33.6 cfs 2.488 af
Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.0 cfs 0.000 af

Pond B3b: Surface Basin - Bldg3 West Peak Elev=385.49' Storage=20,233 cf Inflow=17.3 cfs 1.323 af
Discarded=2.2 cfs 1.323 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=2.2 cfs 1.323 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=394.45' Storage=5,307 cf Inflow=5.3 cfs 0.387 af
Discarded=0.9 cfs 0.388 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.9 cfs 0.388 af

Pond UG2d: UG Basin - Bldg2 East Peak Elev=374.18' Storage=49,288 cf Inflow=32.5 cfs 2.468 af
Discarded=1.2 cfs 1.926 af Primary=1.3 cfs 0.544 af Outflow=2.5 cfs 2.470 af

Pond UG2e: UG Basin - Bldg2 South Peak Elev=376.21' Storage=11,089 cf Inflow=7.1 cfs 0.561 af
Discarded=0.5 cfs 0.561 af Primary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.561 af

Pond UG3c: UG Basin - Bldg3 East Peak Elev=382.57' Storage=54,898 cf Inflow=31.0 cfs 2.280 af
Discarded=1.2 cfs 2.280 af Primary=0.0 cfs 0.000 af Outflow=1.2 cfs 2.280 af

Total Runoff Area = 145.167 ac Runoff Volume = 19.905 af Average Runoff Depth = 1.65"
66.08% Pervious = 95.921 ac 33.92% Impervious = 49.246 ac

Summary for Subcatchment P1a: Road + Basin

Runoff = 5.3 cfs @ 12.09 hrs, Volume= 0.387 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment P1b: South overland

Runoff = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment P2: Southeast Overland

Runoff = 0.0 cfs @ 22.41 hrs, Volume= 0.019 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
13.393	31	Weighted Average
13.393		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	249	0.0120	7.05	12.47	**Pipe Channel, 399 to 396** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
20.3	974	0.0130	0.80		**Shallow Concentrated Flow, 396 to 383** Short Grass Pasture Kv= 7.0 fps
0.1	34	0.0300	11.15	19.71	**Pipe Channel, 378-377** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.1	54	0.0074	6.71	21.08	**Pipe Channel, 374-373.6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.2	95	0.0053	7.44	52.60	**Pipe Channel, 373.5-373** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
35.3	2,175	Total			

Summary for Subcatchment P2a: N Side of Bldg2

Runoff = 47.0 cfs @ 12.09 hrs, Volume= 3.544 af, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
5.620	98	Roofs, HSG A
3.027	98	Paved parking, HSG A
0.958	39	>75% Grass cover, Good, HSG A
0.440	98	Water Surface, 0% imp, HSG B
0.060	98	Paved parking, HSG B
0.678	61	>75% Grass cover, Good, HSG B
10.783	90	Weighted Average
2.076		19.25% Pervious Area
8.707		80.75% Impervious Area

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

Summary for Subcatchment P2b: NW Side of Bldg 2

Runoff = 11.6 cfs @ 12.09 hrs, Volume= 0.857 af, Depth= 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
1.890	98	Roofs, HSG A
0.304	98	Paved parking, HSG A
0.509	39	>75% Grass cover, Good, HSG A
0.128	98	Water Surface, 0% imp, HSG A
2.831	87	Weighted Average
0.637		22.50% Pervious Area
2.194		77.50% Impervious Area

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

Summary for Subcatchment P2c: SW Side of Bldg 2

Runoff = 32.2 cfs @ 12.09 hrs, Volume= 2.364 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
3.570	98	Roofs, HSG A
2.544	98	Paved parking, HSG A
1.805	39	>75% Grass cover, Good, HSG A
0.345	98	Water Surface, 0% imp, HSG A
8.264	85	Weighted Average
2.150		26.02% Pervious Area
6.114		73.98% Impervious Area

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

Summary for Subcatchment P2d: E Side of Bldg 2

Runoff = 32.5 cfs @ 12.09 hrs, Volume= 2.468 af, Depth= 4.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
3.890	98	Roofs, HSG A
2.574	98	Paved parking, HSG A
0.848	39	>75% Grass cover, Good, HSG A
7.312	91	Weighted Average
0.848		11.60% Pervious Area
6.464		88.40% Impervious Area

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

Summary for Subcatchment P2e: S Side of Bldg 2

Runoff = 7.1 cfs @ 12.10 hrs, Volume= 0.561 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
2.039	39	>75% Grass cover, Good, HSG A
1.810	98	Paved parking, HSG A
0.677	30	Meadow, non-grazed, HSG A
0.243	61	>75% Grass cover, Good, HSG B
4.769	61	Weighted Average
2.959		62.05% Pervious Area
1.810		37.95% Impervious Area

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

Summary for Subcatchment P2X: Overland

Runoff = 0.2 cfs @ 12.35 hrs, Volume= 0.046 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
1.183	39	>75% Grass cover, Good, HSG A
0.302	61	>75% Grass cover, Good, HSG B
1.485	43	Weighted Average
1.485		100.00% Pervious Area

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

Summary for Subcatchment P3: West overland

Runoff = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment P3a: NW Side of Bldg 3 & SW Side of Bldg 2

Runoff = 33.6 cfs @ 12.10 hrs, Volume= 2.469 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
2.293	98	Roofs, HSG A
5.718	39	>75% Grass cover, Good, HSG A
2.599	98	Paved parking, HSG A
1.010	98	Water Surface, 0% imp, HSG A
0.862	98	Paved parking, HSG A
0.795	39	>75% Grass cover, Good, HSG A
0.805	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
14.190	70	Weighted Average
7.631		53.78% Pervious Area
6.559		46.22% Impervious Area

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

Summary for Subcatchment P3b: SW Side of Bldg 3

Runoff = 17.3 cfs @ 12.10 hrs, Volume= 1.323 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
3.317	39	>75% Grass cover, Good, HSG A
0.224	98	Water Surface, 0% imp, HSG A
1.780	98	Roofs, HSG A
2.292	98	Paved parking, HSG A
1.790	30	Meadow, non-grazed, HSG A
0.051	30	Woods, Good, HSG A
0.029	72	Dirt roads, HSG A
0.088	76	Gravel roads, HSG A
0.191	78	Meadow, non-grazed, HSG D
9.762	64	Weighted Average
5.690		58.29% Pervious Area
4.072		41.71% Impervious Area

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

Summary for Subcatchment P3c: E Side of Bldg 3

Runoff = 31.0 cfs @ 12.09 hrs, Volume= 2.280 af, Depth= 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	1.702	39	>75% Grass cover, Good, HSG A
	0.347	80	>75% Grass cover, Good, HSG D
	2.068	98	Paved parking, HSG A
	3.837	98	Roofs, HSG A
	0.015	61	>75% Grass cover, Good, HSG B
	7.969	85	Weighted Average
	2.064		25.90% Pervious Area
	5.905		74.10% Impervious Area

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

Summary for Subcatchment P4a: Road + Basin

Runoff = 18.4 cfs @ 12.09 hrs, Volume= 1.379 af, Depth= 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment P4b: Road + Basin

Runoff = 13.2 cfs @ 12.09 hrs, Volume= 0.963 af, Depth= 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment P4c: Road + Basin

Runoff = 8.2 cfs @ 12.09 hrs, Volume= 0.612 af, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment P4d.1: Central overland (west)

Runoff = 0.2 cfs @ 12.45 hrs, Volume= 0.066 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.6	168	0.0077	4.62	5.67	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	124	0.0072	4.47	5.48	**Pipe Channel, 375.9-375** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.9	248	0.0077	4.62	5.67	**Pipe Channel, 374.9-373** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.0	27	0.0334	9.62	11.81	**Pipe Channel, 372.9-372** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
7.4	1,086	Total			

Summary for Subcatchment P4e: North overland

Runoff = 2.0 cfs @ 12.39 hrs, Volume= 0.425 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment P4X: Overland

Runoff = 0.1 cfs @ 15.04 hrs, Volume= 0.038 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
2.378	30	Meadow, non-grazed, HSG A
2.564	39	>75% Grass cover, Good, HSG A
4.942	35	Weighted Average
4.942		100.00% Pervious Area

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

Summary for Subcatchment P5: Northwest overland

Runoff = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment P6X: Overland

Runoff = 0.5 cfs @ 12.14 hrs, Volume= 0.067 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.07"

Area (ac)	CN	Description
0.639	39	>75% Grass cover, Good, HSG A
0.571	61	>75% Grass cover, Good, HSG B
1.210	49	Weighted Average
1.210		100.00% Pervious Area

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

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.03" for 10-YR event
Inflow = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af
Outflow = 0.0 cfs @ 21.07 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 21.535 ac, 65.84% Impervious, Inflow Depth = 0.33" for 10-YR event
Inflow = 1.4 cfs @ 12.95 hrs, Volume= 0.590 af
Outflow = 1.4 cfs @ 12.95 hrs, Volume= 0.590 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.01" for 10-YR event
Inflow = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af
Outflow = 0.0 cfs @ 23.74 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 60.844 ac, 35.90% Impervious, Inflow Depth = 0.07" for 10-YR event
Inflow = 0.4 cfs @ 14.60 hrs, Volume= 0.338 af
Outflow = 0.4 cfs @ 14.60 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area = 0.125 ac, 0.00% Impervious, Inflow Depth = 0.18" for 10-YR event
Inflow = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af
Outflow = 0.0 cfs @ 13.62 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area = 31.088 ac, 39.43% Impervious, Inflow Depth = 0.27" for 10-YR event
Inflow = 2.5 cfs @ 12.38 hrs, Volume= 0.712 af
Outflow = 2.5 cfs @ 12.38 hrs, Volume= 0.712 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area = 1.966 ac, 75.13% Impervious, Inflow Depth = 3.74" for 10-YR event
Inflow = 8.2 cfs @ 12.09 hrs, Volume= 0.612 af
Outflow = 0.5 cfs @ 14.09 hrs, Volume= 0.612 af, Atten= 94%, Lag= 119.9 min
Discarded = 0.5 cfs @ 14.09 hrs, Volume= 0.612 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 355.08' @ 14.09 hrs Surf.Area= 8,284 sf Storage= 13,297 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 303.0 min (1,100.4 - 797.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 14.09 hrs HW=355.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area =	3.464 ac, 59.90% Impervious, Inflow Depth = 3.33"	for 10-YR event	
Inflow =	13.2 cfs @ 12.09 hrs, Volume=	0.963 af	
Outflow =	1.0 cfs @ 13.37 hrs, Volume=	0.964 af,	Atten= 92%, Lag= 77.0 min
Discarded =	1.0 cfs @ 13.37 hrs, Volume=	0.964 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 364.05' @ 13.37 hrs Surf.Area= 18,441 sf Storage= 17,507 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 156.1 min (966.1 - 810.0)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.0 cfs @ 13.37 hrs HW=364.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2a: Surface Basin - Bldg2 North

Inflow Area = 10.783 ac, 80.75% Impervious, Inflow Depth = 3.94" for 10-YR event
Inflow = 47.0 cfs @ 12.09 hrs, Volume= 3.544 af
Outflow = 2.2 cfs @ 14.70 hrs, Volume= 3.545 af, Atten= 95%, Lag= 156.9 min
Discarded = 1.6 cfs @ 14.70 hrs, Volume= 3.326 af
Primary = 0.6 cfs @ 14.70 hrs, Volume= 0.220 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 349.51' @ 14.70 hrs Surf.Area= 29,415 sf Storage= 86,830 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 489.9 min (1,280.1 - 790.3)

Volume	Invert	Avail.Storage	Storage Description
#1	346.00'	167,790 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
346.00	19,435	0	0
348.00	25,746	45,181	45,181
350.00	30,605	56,351	101,532
351.00	33,119	31,862	133,394
352.00	35,673	34,396	167,790

Device	Routing	Invert	Outlet Devices
#1	Discarded	346.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	346.00'	**18.0" Round Culvert** L= 71.0' Ke= 0.900 Inlet / Outlet Invert= 346.00' / 345.00' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	348.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	349.35'	**20.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	350.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	351.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.6 cfs @ 14.70 hrs HW=349.51' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.6 cfs)

Primary OutFlow Max=0.6 cfs @ 14.70 hrs HW=349.51' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.6 cfs of 11.2 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.2 cfs @ 4.53 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.3 cfs @ 1.28 fps)
  └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=346.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2b: Surface Basin - Bldg2 Northwest

Inflow Area = 2.831 ac, 77.50% Impervious, Inflow Depth = 3.63" for 10-YR event
Inflow = 11.6 cfs @ 12.09 hrs, Volume= 0.857 af
Outflow = 0.6 cfs @ 14.63 hrs, Volume= 0.857 af, Atten= 95%, Lag= 152.7 min
Discarded = 0.6 cfs @ 14.63 hrs, Volume= 0.857 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 369.11' @ 14.63 hrs Surf.Area= 10,256 sf Storage= 19,720 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 362.2 min (1,162.9 - 800.7)

Volume	Invert	Avail.Storage	Storage Description
#1	366.50'	69,219 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.50	6,480	0	0
367.00	3,971	2,613	2,613
368.00	8,921	6,446	9,059
370.00	11,322	20,243	29,302
372.00	13,948	25,270	54,572
373.00	15,346	14,647	69,219

Device	Routing	Invert	Outlet Devices
#1	Discarded	366.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	366.50'	**12.0" Round Culvert** L= 49.3' Ke= 0.900 Inlet / Outlet Invert= 366.50' / 365.00' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	371.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	372.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.6 cfs @ 14.63 hrs HW=369.11' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2c: Surface Basin - Bldg2 Southwest

Inflow Area = 8.264 ac, 73.98% Impervious, Inflow Depth = 3.43" for 10-YR event
Inflow = 32.2 cfs @ 12.09 hrs, Volume= 2.364 af
Outflow = 1.5 cfs @ 14.94 hrs, Volume= 2.365 af, Atten= 95%, Lag= 170.8 min
Discarded = 1.2 cfs @ 14.94 hrs, Volume= 2.131 af
Primary = 0.3 cfs @ 14.94 hrs, Volume= 0.234 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 377.29' @ 14.94 hrs Surf.Area= 21,881 sf Storage= 57,334 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 434.4 min (1,241.4 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1	374.00'	124,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.00	11,840	0	0
376.00	19,088	30,928	30,928
378.00	23,422	42,510	73,438
380.00	27,693	51,115	124,553

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	374.00'	**12.0" Round Culvert** L= 40.1' Ke= 0.900 Inlet / Outlet Invert= 374.00' / 373.00' S= 0.0249 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	375.75'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	377.30'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	378.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	379.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.2 cfs @ 14.94 hrs HW=377.29' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.3 cfs @ 14.94 hrs HW=377.29' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.3 cfs of 5.0 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.3 cfs @ 5.73 fps)
  ├─**4=Orifice/Grate** (Controls 0.0 cfs)
  └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area = 4.310 ac, 67.33% Impervious, Inflow Depth = 3.84" for 10-YR event
Inflow = 18.4 cfs @ 12.09 hrs, Volume= 1.379 af
Outflow = 3.8 cfs @ 12.52 hrs, Volume= 1.380 af, Atten= 79%, Lag= 25.7 min
Discarded = 3.8 cfs @ 12.52 hrs, Volume= 1.380 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 373.89' @ 12.52 hrs Surf.Area= 19,741 sf Storage= 15,692 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.1 min (819.0 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=3.8 cfs @ 12.52 hrs HW=373.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 3.8 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3a: Surface Basin - Bldg3 Northwest

Inflow Area = 37.345 ac, 28.47% Impervious, Inflow Depth = 0.80" for 10-YR event
Inflow = 33.6 cfs @ 12.10 hrs, Volume= 2.488 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 375.05' @ 26.00 hrs Surf.Area= 57,442 sf Storage= 108,384 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	295,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	49,471	0	0
374.00	52,195	50,833	50,833
376.00	62,191	114,386	165,219
378.00	68,093	130,284	295,503

Device	Routing	Invert	Outlet Devices
#1	Primary	374.65'	**15.0" Round Culvert** L= 49.2' Ke= 0.900 Inlet / Outlet Invert= 374.65' / 374.30' S= 0.0071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	376.60'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	377.15'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3b: Surface Basin - Bldg3 West

Inflow Area = 9.762 ac, 41.71% Impervious, Inflow Depth = 1.63" for 10-YR event
Inflow = 17.3 cfs @ 12.10 hrs, Volume= 1.323 af
Outflow = 2.2 cfs @ 12.98 hrs, Volume= 1.323 af, Atten= 87%, Lag= 52.5 min
Discarded = 2.2 cfs @ 12.98 hrs, Volume= 1.323 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 385.49' @ 12.98 hrs Surf.Area= 11,696 sf Storage= 20,233 cf

Plug-Flow detention time= 96.0 min calculated for 1.322 af (100% of inflow)
Center-of-Mass det. time= 95.9 min (958.7 - 862.7)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	95,627 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	5,248	0	0
384.00	7,128	6,188	6,188
386.00	13,250	20,378	26,566
388.00	16,920	30,170	56,736
390.00	21,971	38,891	95,627

Device	Routing	Invert	Outlet Devices
#1	Discarded	383.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	383.00'	**24.0" Round Culvert** L= 246.0' Ke= 0.900 Inlet / Outlet Invert= 383.00' / 381.00' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	386.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	389.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=2.2 cfs @ 12.98 hrs HW=385.49' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area = 1.353 ac, 71.47% Impervious, Inflow Depth = 3.43" for 10-YR event
Inflow = 5.3 cfs @ 12.09 hrs, Volume= 0.387 af
Outflow = 0.9 cfs @ 12.57 hrs, Volume= 0.388 af, Atten= 83%, Lag= 28.9 min
Discarded = 0.9 cfs @ 12.57 hrs, Volume= 0.388 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 394.45' @ 12.57 hrs Surf.Area= 4,613 sf Storage= 5,307 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 45.9 min (852.9 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.9 cfs @ 12.57 hrs HW=394.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.9 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2d: UG Basin - Bldg2 East

Inflow Area =	7.312 ac, 88.40% Impervious,	Inflow Depth = 4.05"	for 10-YR event	
Inflow =	32.5 cfs @	12.09 hrs, Volume=	2.468 af	
Outflow =	2.5 cfs @	13.19 hrs, Volume=	2.470 af,	Atten= 92%, Lag= 66.1 min
Discarded =	1.2 cfs @	10.65 hrs, Volume=	1.926 af	
Primary =	1.3 cfs @	13.19 hrs, Volume=	0.544 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.18' @ 13.19 hrs Surf.Area= 21,589 sf Storage= 49,288 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 238.9 min (1,025.3 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	371.00'	29,576 cf	**65.75'W x 328.35'L x 5.50'H Field A** 118,740 cf Overall - 44,799 cf Embedded = 73,941 cf x 40.0% Voids
#2A	371.75'	44,799 cf	**ADS_StormTech MC-3500 d +Cap** x 405 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 9 Rows of 45 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		74,375 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	371.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	371.75'	**24.0" Round Culvert** L= 142.0' Ke= 0.900 Inlet / Outlet Invert= 371.75' / 369.61' S= 0.0151 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	372.85'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 2	374.20'	**12.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	375.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 10.65 hrs HW=371.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=1.3 cfs @ 13.19 hrs HW=374.18' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.3 cfs of 14.3 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.3 cfs @ 5.28 fps)
  ├─**4=Orifice/Grate** (Controls 0.0 cfs)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2e: UG Basin - Bldg2 South

Inflow Area =	4.769 ac, 37.95% Impervious,	Inflow Depth = 1.41"	for 10-YR event	
Inflow =	7.1 cfs @	12.10 hrs, Volume=	0.561 af	
Outflow =	0.5 cfs @	11.85 hrs, Volume=	0.561 af,	Atten= 93%, Lag= 0.0 min
Discarded =	0.5 cfs @	11.85 hrs, Volume=	0.561 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 376.21' @ 15.29 hrs Surf.Area= 8,389 sf Storage= 11,089 cf

Plug-Flow detention time= 255.8 min calculated for 0.561 af (100% of inflow)
Center-of-Mass det. time= 256.0 min (1,127.4 - 871.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	374.25'	11,620 cf	**65.75'W x 127.59'L x 5.50'H Field A** 46,140 cf Overall - 17,091 cf Embedded = 29,049 cf x 40.0% Voids
#2A	375.00'	17,091 cf	**ADS_StormTech MC-3500 d +Cap** x 153 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 9 Rows of 17 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		28,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	375.00'	**12.0" Round Culvert** L= 75.3' Ke= 0.900 Inlet / Outlet Invert= 375.00' / 374.10' S= 0.0120 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.60'	**5.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	378.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.5 cfs @ 11.85 hrs HW=374.31' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.25' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  ├─**3=Orifice/Grate** (Controls 0.0 cfs)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG3c: UG Basin - Bldg3 East

Inflow Area =	7.969 ac, 74.10% Impervious, Inflow Depth = 3.43"	for 10-YR event	
Inflow =	31.0 cfs @ 12.09 hrs, Volume=	2.280 af	
Outflow =	1.2 cfs @ 11.10 hrs, Volume=	2.280 af,	Atten= 96%, Lag= 0.0 min
Discarded =	1.2 cfs @ 11.10 hrs, Volume=	2.280 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 382.57' @ 15.64 hrs Surf.Area= 20,670 sf Storage= 54,898 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 452.8 min (1,259.8 - 807.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	379.00'	32,520 cf	**92.08'W x 224.47'L x 6.75'H Field A** 139,520 cf Overall - 58,219 cf Embedded = 81,301 cf x 40.0% Voids
#2A	379.75'	58,219 cf	**ADS_StormTech MC-4500 +Cap** x 540 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 10 Rows of 54 Chambers Cap Storage= +35.7 cf x 2 x 10 rows = 714.0 cf
		90,739 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	379.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	379.15'	**18.0" Round Culvert** L= 238.6' Ke= 0.900 Inlet / Outlet Invert= 379.15' / 375.10' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	384.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 11.10 hrs HW=379.07' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=379.00' TW=0.00' (Dynamic Tailwater)
└—**2=Culvert** (Controls 0.0 cfs)
  └—**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment P1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=85 Runoff=6.8 cfs 0.505 af

Subcatchment P1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.16"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=0.2 cfs 0.126 af

Subcatchment P2: Southeast Overland Runoff Area=13.393 ac 0.00% Impervious Runoff Depth=0.13"
Flow Length=2,175' Tc=35.3 min CN=31 Runoff=0.2 cfs 0.141 af

Subcatchment P2a: N Side of Bldg2 Runoff Area=10.783 ac 80.75% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=90 Runoff=59.1 cfs 4.521 af

Subcatchment P2b: NW Side of Bldg 2 Runoff Area=2.831 ac 77.50% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=87 Runoff=14.8 cfs 1.109 af

Subcatchment P2c: SW Side of Bldg 2 Runoff Area=8.264 ac 73.98% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=85 Runoff=41.6 cfs 3.087 af

Subcatchment P2d: E Side of Bldg 2 Runoff Area=7.312 ac 88.40% Impervious Runoff Depth=5.14"
Tc=6.0 min CN=91 Runoff=40.7 cfs 3.134 af

Subcatchment P2e: S Side of Bldg 2 Runoff Area=4.769 ac 37.95% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=61 Runoff=11.3 cfs 0.848 af

Subcatchment P2X: Overland Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=0.75"
Tc=6.0 min CN=43 Runoff=0.7 cfs 0.092 af

Subcatchment P3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=926' Tc=24.6 min CN=30 Runoff=0.3 cfs 0.163 af

Subcatchment P3a: NW Side of Bldg 3 & Runoff Area=14.190 ac 46.22% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=70 Runoff=48.1 cfs 3.496 af

Subcatchment P3b: SW Side of Bldg 3 Runoff Area=9.762 ac 41.71% Impervious Runoff Depth=2.40"
Tc=6.0 min CN=64 Runoff=26.4 cfs 1.952 af

Subcatchment P3c: E Side of Bldg 3 Runoff Area=7.969 ac 74.10% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=85 Runoff=40.1 cfs 2.976 af

Subcatchment P4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=89 Runoff=23.3 cfs 1.767 af

Subcatchment P4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=84 Runoff=17.1 cfs 1.263 af

Subcatchment P4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=88 Runoff=10.4 cfs 0.788 af

Subcatchment P4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=0.56"
Flow Length=1,086' Tc=7.4 min CN=40 Runoff=0.8 cfs 0.147 af

Subcatchment P4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=0.75"
Flow Length=270' Tc=8.5 min CN=43 Runoff=5.8 cfs 0.849 af

Subcatchment P4X: Overland Runoff Area=4.942 ac 0.00% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=35 Runoff=0.4 cfs 0.120 af

Subcatchment P5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=38 Runoff=0.0 cfs 0.005 af

Subcatchment P6X: Overland Runoff Area=1.210 ac 0.00% Impervious Runoff Depth=1.16"
Tc=6.0 min CN=49 Runoff=1.3 cfs 0.117 af

Reach DP1: Wetlands @ Boston Road Inflow=0.2 cfs 0.126 af
Outflow=0.2 cfs 0.126 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=4.0 cfs 1.246 af
Outflow=4.0 cfs 1.246 af

Reach DP3: Onsite Wetland Inflow=0.3 cfs 0.163 af
Outflow=0.3 cfs 0.163 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=1.7 cfs 0.876 af
Outflow=1.7 cfs 0.876 af

Reach DP5: Western Boundary Inflow=0.0 cfs 0.005 af
Outflow=0.0 cfs 0.005 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=6.9 cfs 1.840 af
Outflow=6.9 cfs 1.840 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=355.64' Storage=18,181 cf Inflow=10.4 cfs 0.788 af
Discarded=0.5 cfs 0.788 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.5 cfs 0.788 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=364.44' Storage=24,931 cf Inflow=17.1 cfs 1.263 af
Discarded=1.1 cfs 1.264 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.1 cfs 1.264 af

Pond B2a: Surface Basin - Bldg2 North Peak Elev=350.16' Storage=106,552 cf Inflow=59.1 cfs 4.521 af
Discarded=1.7 cfs 3.648 af Primary=2.0 cfs 0.874 af Secondary=0.0 cfs 0.000 af Outflow=3.7 cfs 4.522 af

Pond B2b: Surface Basin - Bldg2 Northwest Peak Elev=369.84' Storage=27,478 cf Inflow=14.8 cfs 1.109 af
Discarded=0.6 cfs 1.109 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.6 cfs 1.109 af

Pond B2c: Surface Basin - Bldg2 Southwest Peak Elev=378.05' Storage=74,599 cf Inflow=41.6 cfs 3.087 af
Discarded=1.3 cfs 2.479 af Primary=1.0 cfs 0.609 af Secondary=0.0 cfs 0.000 af Outflow=2.3 cfs 3.088 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=374.22' Storage=22,413 cf Inflow=23.3 cfs 1.767 af
Discarded=4.0 cfs 1.770 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=4.0 cfs 1.770 af

Pond B3a: Surface Basin - Bldg3 Peak Elev=375.92' Storage=160,392 cf Inflow=48.1 cfs 3.682 af
Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.0 cfs 0.000 af

Pond B3b: Surface Basin - Bldg3 West Peak Elev=386.45' Storage=32,714 cf Inflow=26.4 cfs 1.952 af
Discarded=2.7 cfs 1.907 af Primary=0.8 cfs 0.045 af Secondary=0.0 cfs 0.000 af Outflow=3.5 cfs 1.952 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=394.88' Storage=7,441 cf Inflow=6.8 cfs 0.505 af
Discarded=1.0 cfs 0.506 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.0 cfs 0.506 af

Pond UG2d: UG Basin - Bldg2 East Peak Elev=375.07' Storage=61,597 cf Inflow=40.7 cfs 3.134 af
Discarded=1.2 cfs 2.107 af Primary=3.6 cfs 1.029 af Outflow=4.8 cfs 3.136 af

Pond UG2e: UG Basin - Bldg2 South Peak Elev=377.15' Storage=17,284 cf Inflow=11.3 cfs 0.848 af
Discarded=0.5 cfs 0.723 af Primary=0.4 cfs 0.125 af Outflow=0.9 cfs 0.848 af

Pond UG3c: UG Basin - Bldg3 East Peak Elev=384.27' Storage=78,164 cf Inflow=40.1 cfs 2.976 af
Discarded=1.2 cfs 2.978 af Primary=0.0 cfs 0.000 af Outflow=1.2 cfs 2.978 af

Total Runoff Area = 145.167 ac Runoff Volume = 27.205 af Average Runoff Depth = 2.25"
66.08% Pervious = 95.921 ac 33.92% Impervious = 49.246 ac

Summary for Subcatchment P1a: Road + Basin

Runoff = 6.8 cfs @ 12.09 hrs, Volume= 0.505 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment P1b: South overland

Runoff = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment P2: Southeast Overland

Runoff = 0.2 cfs @ 15.38 hrs, Volume= 0.141 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
13.393	31	Weighted Average
13.393		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	249	0.0120	7.05	12.47	**Pipe Channel, 399 to 396** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
20.3	974	0.0130	0.80		**Shallow Concentrated Flow, 396 to 383** Short Grass Pasture Kv= 7.0 fps
0.1	34	0.0300	11.15	19.71	**Pipe Channel, 378-377** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.1	54	0.0074	6.71	21.08	**Pipe Channel, 374-373.6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.2	95	0.0053	7.44	52.60	**Pipe Channel, 373.5-373** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
35.3	2,175	Total			

Summary for Subcatchment P2a: N Side of Bldg2

Runoff = 59.1 cfs @ 12.09 hrs, Volume= 4.521 af, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
5.620	98	Roofs, HSG A
3.027	98	Paved parking, HSG A
0.958	39	>75% Grass cover, Good, HSG A
0.440	98	Water Surface, 0% imp, HSG B
0.060	98	Paved parking, HSG B
0.678	61	>75% Grass cover, Good, HSG B
10.783	90	Weighted Average
2.076		19.25% Pervious Area
8.707		80.75% Impervious Area

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

Summary for Subcatchment P2b: NW Side of Bldg 2

Runoff = 14.8 cfs @ 12.09 hrs, Volume= 1.109 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
1.890	98	Roofs, HSG A
0.304	98	Paved parking, HSG A
0.509	39	>75% Grass cover, Good, HSG A
0.128	98	Water Surface, 0% imp, HSG A
2.831	87	Weighted Average
0.637		22.50% Pervious Area
2.194		77.50% Impervious Area

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

Summary for Subcatchment P2c: SW Side of Bldg 2

Runoff = 41.6 cfs @ 12.09 hrs, Volume= 3.087 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
3.570	98	Roofs, HSG A
2.544	98	Paved parking, HSG A
1.805	39	>75% Grass cover, Good, HSG A
0.345	98	Water Surface, 0% imp, HSG A
8.264	85	Weighted Average
2.150		26.02% Pervious Area
6.114		73.98% Impervious Area

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

Summary for Subcatchment P2d: E Side of Bldg 2

Runoff = 40.7 cfs @ 12.09 hrs, Volume= 3.134 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
3.890	98	Roofs, HSG A
2.574	98	Paved parking, HSG A
0.848	39	>75% Grass cover, Good, HSG A
7.312	91	Weighted Average
0.848		11.60% Pervious Area
6.464		88.40% Impervious Area

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

Summary for Subcatchment P2e: S Side of Bldg 2

Runoff = 11.3 cfs @ 12.10 hrs, Volume= 0.848 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
2.039	39	>75% Grass cover, Good, HSG A
1.810	98	Paved parking, HSG A
0.677	30	Meadow, non-grazed, HSG A
0.243	61	>75% Grass cover, Good, HSG B
4.769	61	Weighted Average
2.959		62.05% Pervious Area
1.810		37.95% Impervious Area

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

Summary for Subcatchment P2X: Overland

Runoff = 0.7 cfs @ 12.15 hrs, Volume= 0.092 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
1.183	39	>75% Grass cover, Good, HSG A
0.302	61	>75% Grass cover, Good, HSG B
1.485	43	Weighted Average
1.485		100.00% Pervious Area

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

Summary for Subcatchment P3: West overland

Runoff = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment P3a: NW Side of Bldg 3 & SW Side of Bldg 2

Runoff = 48.1 cfs @ 12.09 hrs, Volume= 3.496 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
2.293	98	Roofs, HSG A
5.718	39	>75% Grass cover, Good, HSG A
2.599	98	Paved parking, HSG A
1.010	98	Water Surface, 0% imp, HSG A
0.862	98	Paved parking, HSG A
0.795	39	>75% Grass cover, Good, HSG A
0.805	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
14.190	70	Weighted Average
7.631		53.78% Pervious Area
6.559		46.22% Impervious Area

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

Summary for Subcatchment P3b: SW Side of Bldg 3

Runoff = 26.4 cfs @ 12.10 hrs, Volume= 1.952 af, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
3.317	39	>75% Grass cover, Good, HSG A
0.224	98	Water Surface, 0% imp, HSG A
1.780	98	Roofs, HSG A
2.292	98	Paved parking, HSG A
1.790	30	Meadow, non-grazed, HSG A
0.051	30	Woods, Good, HSG A
0.029	72	Dirt roads, HSG A
0.088	76	Gravel roads, HSG A
0.191	78	Meadow, non-grazed, HSG D
9.762	64	Weighted Average
5.690		58.29% Pervious Area
4.072		41.71% Impervious Area

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

Summary for Subcatchment P3c: E Side of Bldg 3

Runoff = 40.1 cfs @ 12.09 hrs, Volume= 2.976 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	1.702	39	>75% Grass cover, Good, HSG A
	0.347	80	>75% Grass cover, Good, HSG D
	2.068	98	Paved parking, HSG A
	3.837	98	Roofs, HSG A
	0.015	61	>75% Grass cover, Good, HSG B
	7.969	85	Weighted Average
	2.064		25.90% Pervious Area
	5.905		74.10% Impervious Area

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

Summary for Subcatchment P4a: Road + Basin

Runoff = 23.3 cfs @ 12.09 hrs, Volume= 1.767 af, Depth= 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment P4b: Road + Basin

Runoff = 17.1 cfs @ 12.09 hrs, Volume= 1.263 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment P4c: Road + Basin

Runoff = 10.4 cfs @ 12.09 hrs, Volume= 0.788 af, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment P4d.1: Central overland (west)

Runoff = 0.8 cfs @ 12.32 hrs, Volume= 0.147 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.6	168	0.0077	4.62	5.67	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	124	0.0072	4.47	5.48	**Pipe Channel, 375.9-375** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.9	248	0.0077	4.62	5.67	**Pipe Channel, 374.9-373** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.0	27	0.0334	9.62	11.81	**Pipe Channel, 372.9-372** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
7.4	1,086	Total			

Summary for Subcatchment P4e: North overland

Runoff = 5.8 cfs @ 12.20 hrs, Volume= 0.849 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment P4X: Overland

Runoff = 0.4 cfs @ 12.44 hrs, Volume= 0.120 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
2.378	30	Meadow, non-grazed, HSG A
2.564	39	>75% Grass cover, Good, HSG A
4.942	35	Weighted Average
4.942		100.00% Pervious Area

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

Summary for Subcatchment P5: Northwest overland

Runoff = 0.0 cfs @ 12.35 hrs, Volume= 0.005 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment P6X: Overland

Runoff = 1.3 cfs @ 12.11 hrs, Volume= 0.117 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.19"

Area (ac)	CN	Description
0.639	39	>75% Grass cover, Good, HSG A
0.571	61	>75% Grass cover, Good, HSG B
1.210	49	Weighted Average
1.210		100.00% Pervious Area

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

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.14" for 25-YR event
Inflow = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af
Outflow = 0.2 cfs @ 14.94 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 21.535 ac, 65.84% Impervious, Inflow Depth = 0.69" for 25-YR event
Inflow = 4.0 cfs @ 12.85 hrs, Volume= 1.246 af
Outflow = 4.0 cfs @ 12.85 hrs, Volume= 1.246 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.09" for 25-YR event
Inflow = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af
Outflow = 0.3 cfs @ 15.54 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 60.844 ac, 35.90% Impervious, Inflow Depth = 0.17" for 25-YR event
Inflow = 1.7 cfs @ 12.46 hrs, Volume= 0.876 af
Outflow = 1.7 cfs @ 12.46 hrs, Volume= 0.876 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area =	0.125 ac,	0.00% Impervious,	Inflow Depth = 0.45"	for 25-YR event	
Inflow =	0.0 cfs @	12.35 hrs,	Volume=	0.005 af	
Outflow =	0.0 cfs @	12.35 hrs,	Volume=	0.005 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area =	31.088 ac,	39.43% Impervious,	Inflow Depth = 0.71"	for 25-YR event	
Inflow =	6.9 cfs @	12.18 hrs,	Volume=	1.840 af	
Outflow =	6.9 cfs @	12.18 hrs,	Volume=	1.840 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area =	1.966 ac,	75.13% Impervious,	Inflow Depth = 4.81"	for 25-YR event	
Inflow =	10.4 cfs @	12.09 hrs,	Volume=	0.788 af	
Outflow =	0.5 cfs @	14.45 hrs,	Volume=	0.788 af,	Atten= 95%, Lag= 141.7 min
Discarded =	0.5 cfs @	14.45 hrs,	Volume=	0.788 af	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 355.64' @ 14.45 hrs Surf.Area= 9,400 sf Storage= 18,181 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 372.5 min (1,162.9 - 790.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.5 cfs @ 14.45 hrs HW=355.64' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area = 3.464 ac, 59.90% Impervious, Inflow Depth = 4.37" for 25-YR event
Inflow = 17.1 cfs @ 12.09 hrs, Volume= 1.263 af
Outflow = 1.1 cfs @ 13.77 hrs, Volume= 1.264 af, Atten= 93%, Lag= 100.8 min
Discarded = 1.1 cfs @ 13.77 hrs, Volume= 1.264 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 364.44' @ 13.77 hrs Surf.Area= 20,069 sf Storage= 24,931 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 216.1 min (1,018.4 - 802.3)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.1 cfs @ 13.77 hrs HW=364.44' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2a: Surface Basin - Bldg2 North

Inflow Area = 10.783 ac, 80.75% Impervious, Inflow Depth = 5.03" for 25-YR event
Inflow = 59.1 cfs @ 12.09 hrs, Volume= 4.521 af
Outflow = 3.7 cfs @ 13.77 hrs, Volume= 4.522 af, Atten= 94%, Lag= 100.7 min
Discarded = 1.7 cfs @ 13.77 hrs, Volume= 3.648 af
Primary = 2.0 cfs @ 13.77 hrs, Volume= 0.874 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 350.16' @ 13.77 hrs Surf.Area= 31,015 sf Storage= 106,552 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 460.7 min (1,244.4 - 783.7)

Volume	Invert	Avail.Storage	Storage Description
#1	346.00'	167,790 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
346.00	19,435	0	0
348.00	25,746	45,181	45,181
350.00	30,605	56,351	101,532
351.00	33,119	31,862	133,394
352.00	35,673	34,396	167,790

Device	Routing	Invert	Outlet Devices
#1	Discarded	346.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	346.00'	**18.0" Round Culvert** L= 71.0' Ke= 0.900 Inlet / Outlet Invert= 346.00' / 345.00' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	348.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	349.35'	**20.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	350.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	351.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.7 cfs @ 13.77 hrs HW=350.16' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.7 cfs)

Primary OutFlow Max=2.0 cfs @ 13.77 hrs HW=350.16' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 2.0 cfs of 12.4 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.3 cfs @ 5.97 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 1.7 cfs @ 3.99 fps)
  └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=346.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2b: Surface Basin - Bldg2 Northwest

Inflow Area =	2.831 ac, 77.50% Impervious,	Inflow Depth = 4.70"	for 25-YR event	
Inflow =	14.8 cfs @	12.09 hrs, Volume=	1.109 af	
Outflow =	0.6 cfs @	15.13 hrs, Volume=	1.109 af,	Atten= 96%, Lag= 182.3 min
Discarded =	0.6 cfs @	15.13 hrs, Volume=	1.109 af	
Primary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 369.84' @ 15.13 hrs Surf.Area= 11,127 sf Storage= 27,478 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 467.0 min (1,260.6 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1	366.50'	69,219 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.50	6,480	0	0
367.00	3,971	2,613	2,613
368.00	8,921	6,446	9,059
370.00	11,322	20,243	29,302
372.00	13,948	25,270	54,572
373.00	15,346	14,647	69,219

Device	Routing	Invert	Outlet Devices
#1	Discarded	366.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	366.50'	**12.0" Round Culvert** L= 49.3' Ke= 0.900 Inlet / Outlet Invert= 366.50' / 365.00' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	371.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	372.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.6 cfs @ 15.13 hrs HW=369.84' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2c: Surface Basin - Bldg2 Southwest

Inflow Area =	8.264 ac, 73.98% Impervious, Inflow Depth = 4.48" for 25-YR event			
Inflow =	41.6 cfs @	12.09 hrs, Volume=	3.087 af	
Outflow =	2.3 cfs @	14.18 hrs, Volume=	3.088 af,	Atten= 94%, Lag= 125.2 min
Discarded =	1.3 cfs @	14.18 hrs, Volume=	2.479 af	
Primary =	1.0 cfs @	14.18 hrs, Volume=	0.609 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 378.05' @ 14.18 hrs Surf.Area= 23,528 sf Storage= 74,599 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 451.0 min (1,250.5 - 799.5)

Volume	Invert	Avail.Storage	Storage Description
#1	374.00'	124,553 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.00	11,840	0	0
376.00	19,088	30,928	30,928
378.00	23,422	42,510	73,438
380.00	27,693	51,115	124,553

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	374.00'	**12.0" Round Culvert** L= 40.1' Ke= 0.900 Inlet / Outlet Invert= 374.00' / 373.00' S= 0.0249 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	375.75'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	377.30'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	378.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	379.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.3 cfs @ 14.18 hrs HW=378.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.3 cfs)

Primary OutFlow Max=1.0 cfs @ 14.18 hrs HW=378.05' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.0 cfs of 5.6 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.3 cfs @ 7.10 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.6 cfs @ 3.80 fps)
  └─**5=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area =	4.310 ac, 67.33% Impervious, Inflow Depth = 4.92"	for 25-YR event	
Inflow =	23.3 cfs @ 12.09 hrs, Volume=	1.767 af	
Outflow =	4.0 cfs @ 12.56 hrs, Volume=	1.770 af,	Atten= 83%, Lag= 28.2 min
Discarded =	4.0 cfs @ 12.56 hrs, Volume=	1.770 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.22' @ 12.56 hrs Surf.Area= 20,796 sf Storage= 22,413 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 36.4 min (823.6 - 787.1)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=4.0 cfs @ 12.56 hrs HW=374.22' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 4.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3a: Surface Basin - Bldg3 Northwest

Inflow Area = 37.345 ac, 28.47% Impervious, Inflow Depth = 1.18" for 25-YR event
Inflow = 48.1 cfs @ 12.09 hrs, Volume= 3.682 af
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 375.92' @ 26.00 hrs Surf.Area= 61,802 sf Storage= 160,392 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	295,503 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	49,471	0	0
374.00	52,195	50,833	50,833
376.00	62,191	114,386	165,219
378.00	68,093	130,284	295,503

Device	Routing	Invert	Outlet Devices
#1	Primary	374.65'	**15.0" Round Culvert** L= 49.2' Ke= 0.900 Inlet / Outlet Invert= 374.65' / 374.30' S= 0.0071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	376.60'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	377.15'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.0 cfs)
  └─**2=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3b: Surface Basin - Bldg3 West

Inflow Area =	9.762 ac, 41.71% Impervious, Inflow Depth = 2.40" for 25-YR event			
Inflow =	26.4 cfs @	12.10 hrs, Volume=	1.952 af	
Outflow =	3.5 cfs @	12.86 hrs, Volume=	1.952 af,	Atten= 87%, Lag= 45.7 min
Discarded =	2.7 cfs @	12.86 hrs, Volume=	1.907 af	
Primary =	0.8 cfs @	12.86 hrs, Volume=	0.045 af	
Secondary =	0.0 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 386.45' @ 12.86 hrs Surf.Area= 14,076 sf Storage= 32,714 cf

Plug-Flow detention time= 130.1 min calculated for 1.951 af (100% of inflow)
Center-of-Mass det. time= 130.0 min (980.8 - 850.9)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	95,627 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	5,248	0	0
384.00	7,128	6,188	6,188
386.00	13,250	20,378	26,566
388.00	16,920	30,170	56,736
390.00	21,971	38,891	95,627

Device	Routing	Invert	Outlet Devices
#1	Discarded	383.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	383.00'	**24.0" Round Culvert** L= 246.0' Ke= 0.900 Inlet / Outlet Invert= 383.00' / 381.00' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	386.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	389.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=2.7 cfs @ 12.86 hrs HW=386.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.7 cfs)

Primary OutFlow Max=0.8 cfs @ 12.86 hrs HW=386.45' TW=374.68' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.8 cfs of 18.7 cfs potential flow)
  └─**3=Orifice/Grate** (Weir Controls 0.8 cfs @ 1.03 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area =	1.353 ac, 71.47% Impervious, Inflow Depth = 4.48" for 25-YR event		
Inflow =	6.8 cfs @ 12.09 hrs, Volume=	0.505 af	
Outflow =	1.0 cfs @ 12.60 hrs, Volume=	0.506 af,	Atten= 85%, Lag= 30.8 min
Discarded =	1.0 cfs @ 12.60 hrs, Volume=	0.506 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 394.88' @ 12.60 hrs Surf.Area= 5,303 sf Storage= 7,441 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.0 min (859.5 - 799.5)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.0 cfs @ 12.60 hrs HW=394.88' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2d: UG Basin - Bldg2 East

Inflow Area =	7.312 ac, 88.40% Impervious,	Inflow Depth = 5.14"	for 25-YR event	
Inflow =	40.7 cfs @	12.09 hrs, Volume=	3.134 af	
Outflow =	4.8 cfs @	12.71 hrs, Volume=	3.136 af,	Atten= 88%, Lag= 37.1 min
Discarded =	1.2 cfs @	9.95 hrs, Volume=	2.107 af	
Primary =	3.6 cfs @	12.71 hrs, Volume=	1.029 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 375.07' @ 12.71 hrs Surf.Area= 21,589 sf Storage= 61,597 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 230.3 min (1,010.4 - 780.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	371.00'	29,576 cf	**65.75'W x 328.35'L x 5.50'H Field A** 118,740 cf Overall - 44,799 cf Embedded = 73,941 cf x 40.0% Voids
#2A	371.75'	44,799 cf	**ADS_StormTech MC-3500 d +Cap** x 405 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 9 Rows of 45 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		74,375 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	371.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	371.75'	**24.0" Round Culvert** L= 142.0' Ke= 0.900 Inlet / Outlet Invert= 371.75' / 369.61' S= 0.0151 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	372.85'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 2	374.20'	**12.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	375.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 9.95 hrs HW=371.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=3.6 cfs @ 12.71 hrs HW=375.07' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 3.6 cfs of 18.2 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.7 cfs @ 6.97 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 1.9 cfs @ 3.77 fps)
  └─**5=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2e: UG Basin - Bldg2 South

Inflow Area =	4.769 ac, 37.95% Impervious,	Inflow Depth = 2.13"	for 25-YR event	
Inflow =	11.3 cfs @	12.10 hrs, Volume=	0.848 af	
Outflow =	0.9 cfs @	14.25 hrs, Volume=	0.848 af,	Atten= 92%, Lag= 128.8 min
Discarded =	0.5 cfs @	11.75 hrs, Volume=	0.723 af	
Primary =	0.4 cfs @	14.25 hrs, Volume=	0.125 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 377.15' @ 14.25 hrs Surf.Area= 8,389 sf Storage= 17,284 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 321.8 min (1,180.1 - 858.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	374.25'	11,620 cf	**65.75'W x 127.59'L x 5.50'H Field A** 46,140 cf Overall - 17,091 cf Embedded = 29,049 cf x 40.0% Voids
#2A	375.00'	17,091 cf	**ADS_StormTech MC-3500 d +Cap** x 153 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 9 Rows of 17 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		28,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	375.00'	**12.0" Round Culvert** L= 75.3' Ke= 0.900 Inlet / Outlet Invert= 375.00' / 374.10' S= 0.0120 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.60'	**5.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	378.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.5 cfs @ 11.75 hrs HW=374.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.4 cfs @ 14.25 hrs HW=377.15' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.4 cfs of 3.8 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 2.81 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG3c: UG Basin - Bldg3 East

Inflow Area = 7.969 ac, 74.10% Impervious, Inflow Depth = 4.48" for 25-YR event
Inflow = 40.1 cfs @ 12.09 hrs, Volume= 2.976 af
Outflow = 1.2 cfs @ 10.50 hrs, Volume= 2.978 af, Atten= 97%, Lag= 0.0 min
Discarded = 1.2 cfs @ 10.50 hrs, Volume= 2.978 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 384.27' @ 16.33 hrs Surf.Area= 20,670 sf Storage= 78,164 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 635.2 min (1,434.7 - 799.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	379.00'	32,520 cf	**92.08'W x 224.47'L x 6.75'H Field A** 139,520 cf Overall - 58,219 cf Embedded = 81,301 cf x 40.0% Voids
#2A	379.75'	58,219 cf	**ADS_StormTech MC-4500 +Cap** x 540 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 10 Rows of 54 Chambers Cap Storage= +35.7 cf x 2 x 10 rows = 714.0 cf
		90,739 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	379.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	379.15'	**18.0" Round Culvert** L= 238.6' Ke= 0.900 Inlet / Outlet Invert= 379.15' / 375.10' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	384.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 10.50 hrs HW=379.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=379.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

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

Subcatchment P1a: Road + Basin Runoff Area=1.353 ac 71.47% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=85 Runoff=9.2 cfs 0.692 af

Subcatchment P1b: South overland Runoff Area=9.292 ac 0.00% Impervious Runoff Depth=0.54"
Flow Length=1,347' Tc=26.2 min CN=32 Runoff=1.4 cfs 0.419 af

Subcatchment P2: Southeast Overland Runoff Area=13.393 ac 0.00% Impervious Runoff Depth=0.47"
Flow Length=2,175' Tc=35.3 min CN=31 Runoff=1.3 cfs 0.522 af

Subcatchment P2a: N Side of Bldg2 Runoff Area=10.783 ac 80.75% Impervious Runoff Depth=6.73"
Tc=6.0 min CN=90 Runoff=77.7 cfs 6.045 af

Subcatchment P2b: NW Side of Bldg 2 Runoff Area=2.831 ac 77.50% Impervious Runoff Depth=6.37"
Tc=6.0 min CN=87 Runoff=19.7 cfs 1.503 af

Subcatchment P2c: SW Side of Bldg 2 Runoff Area=8.264 ac 73.98% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=85 Runoff=56.1 cfs 4.226 af

Subcatchment P2d: E Side of Bldg 2 Runoff Area=7.312 ac 88.40% Impervious Runoff Depth=6.85"
Tc=6.0 min CN=91 Runoff=53.2 cfs 4.171 af

Subcatchment P2e: S Side of Bldg 2 Runoff Area=4.769 ac 37.95% Impervious Runoff Depth=3.38"
Tc=6.0 min CN=61 Runoff=18.3 cfs 1.345 af

Subcatchment P2X: Overland Runoff Area=1.485 ac 0.00% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=43 Runoff=2.0 cfs 0.185 af

Subcatchment P3: West overland Runoff Area=20.930 ac 0.00% Impervious Runoff Depth=0.40"
Flow Length=926' Tc=24.6 min CN=30 Runoff=1.7 cfs 0.694 af

Subcatchment P3a: NW Side of Bldg 3 & Runoff Area=14.190 ac 46.22% Impervious Runoff Depth=4.40"
Tc=6.0 min CN=70 Runoff=71.7 cfs 5.198 af

Subcatchment P3b: SW Side of Bldg 3 Runoff Area=9.762 ac 41.71% Impervious Runoff Depth=3.72"
Tc=6.0 min CN=64 Runoff=41.5 cfs 3.024 af

Subcatchment P3c: E Side of Bldg 3 Runoff Area=7.969 ac 74.10% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=85 Runoff=54.1 cfs 4.075 af

Subcatchment P4a: Road + Basin Runoff Area=4.310 ac 67.33% Impervious Runoff Depth=6.61"
Tc=6.0 min CN=89 Runoff=30.7 cfs 2.373 af

Subcatchment P4b: Road + Basin Runoff Area=3.464 ac 59.90% Impervious Runoff Depth=6.02"
Tc=6.0 min CN=84 Runoff=23.2 cfs 1.737 af

Subcatchment P4c: Road + Basin Runoff Area=1.966 ac 75.13% Impervious Runoff Depth=6.49"
Tc=6.0 min CN=88 Runoff=13.9 cfs 1.063 af

Subcatchment P4d.1: Central overland (west) Runoff Area=3.152 ac 0.00% Impervious Runoff Depth=1.22"
Flow Length=1,086' Tc=7.4 min CN=40 Runoff=2.8 cfs 0.319 af

Subcatchment P4e: North overland Runoff Area=13.665 ac 0.00% Impervious Runoff Depth=1.50"
Flow Length=270' Tc=8.5 min CN=43 Runoff=16.9 cfs 1.707 af

Subcatchment P4X: Overland Runoff Area=4.942 ac 0.00% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=35 Runoff=1.8 cfs 0.320 af

Subcatchment P5: Northwest overland Runoff Area=0.125 ac 0.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=38 Runoff=0.1 cfs 0.011 af

Subcatchment P6X: Overland Runoff Area=1.210 ac 0.00% Impervious Runoff Depth=2.10"
Tc=6.0 min CN=49 Runoff=2.6 cfs 0.212 af

Reach DP1: Wetlands @ Boston Road Inflow=1.4 cfs 0.419 af
Outflow=1.4 cfs 0.419 af

Reach DP2: Onsite Eastern Boundary / Brook Inflow=20.7 cfs 3.373 af
Outflow=20.7 cfs 3.373 af

Reach DP3: Onsite Wetland Inflow=1.7 cfs 0.694 af
Outflow=1.7 cfs 0.694 af

Reach DP4: Onsite Eastern Boundary / IWPA Inflow=7.2 cfs 3.823 af
Outflow=7.2 cfs 3.823 af

Reach DP5: Western Boundary Inflow=0.1 cfs 0.011 af
Outflow=0.1 cfs 0.011 af

Reach DP6: Onsite Northeastern Boundary / LG Wetland System Inflow=20.9 cfs 3.980 af
Outflow=20.9 cfs 3.980 af

Pond B1: Surface Infiltration Basin #1 Peak Elev=356.42' Storage=26,195 cf Inflow=13.9 cfs 1.063 af
Discarded=0.6 cfs 1.064 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.6 cfs 1.064 af

Pond B2: Surface Infiltration Basin #2 Peak Elev=365.03' Storage=37,544 cf Inflow=23.2 cfs 1.737 af
Discarded=1.3 cfs 1.739 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.3 cfs 1.739 af

Pond B2a: Surface Basin - Bldg2 North Peak Elev=350.96' Storage=131,945 cf Inflow=77.7 cfs 6.045 af
Discarded=1.8 cfs 3.983 af Primary=10.9 cfs 2.062 af Secondary=0.0 cfs 0.000 af Outflow=12.7 cfs 6.045 af

Pond B2b: Surface Basin - Bldg2 Northwest Peak Elev=370.90' Storage=40,049 cf Inflow=19.7 cfs 1.503 af
Discarded=0.7 cfs 1.503 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=0.7 cfs 1.503 af

Pond B2c: Surface Basin - Bldg2 Southwest Peak Elev=378.89' Storage=95,118 cf Inflow=56.1 cfs 4.226 af
Discarded=1.4 cfs 2.813 af Primary=5.5 cfs 1.414 af Secondary=0.0 cfs 0.000 af Outflow=6.9 cfs 4.226 af

Pond B3: Surface Infiltration Basin #3 Peak Elev=374.73' Storage=33,371 cf Inflow=30.7 cfs 2.373 af
Discarded=4.2 cfs 2.377 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=4.2 cfs 2.377 af

Pond B3a: Surface Basin - Bldg3 Peak Elev=376.77' Storage=213,719 cf Inflow=71.6 cfs 6.433 af
Primary=3.5 cfs 1.771 af Secondary=0.0 cfs 0.000 af Outflow=3.5 cfs 1.771 af

Pond B3b: Surface Basin - Bldg3 West Peak Elev=387.00' Storage=40,755 cf Inflow=41.5 cfs 3.024 af
Discarded=2.9 cfs 2.312 af Primary=13.8 cfs 0.713 af Secondary=0.0 cfs 0.000 af Outflow=16.6 cfs 3.025 af

Pond B4: Surface Infiltration Basin #4 Peak Elev=395.49' Storage=10,983 cf Inflow=9.2 cfs 0.692 af
Discarded=1.2 cfs 0.692 af Primary=0.0 cfs 0.000 af Secondary=0.0 cfs 0.000 af Outflow=1.2 cfs 0.692 af

Pond UG2d: UG Basin - Bldg2 East Peak Elev=376.41' Storage=73,570 cf Inflow=53.2 cfs 4.171 af
Discarded=1.2 cfs 2.295 af Primary=16.4 cfs 1.877 af Outflow=17.6 cfs 4.172 af

Pond UG2e: UG Basin - Bldg2 South Peak Elev=378.91' Storage=25,885 cf Inflow=18.3 cfs 1.345 af
Discarded=0.5 cfs 0.827 af Primary=1.8 cfs 0.518 af Outflow=2.2 cfs 1.346 af

Pond UG3c: UG Basin - Bldg3 East Peak Elev=385.39' Storage=87,761 cf Inflow=54.1 cfs 4.075 af
Discarded=1.2 cfs 3.284 af Primary=6.5 cfs 0.793 af Outflow=7.6 cfs 4.077 af

Total Runoff Area = 145.167 ac Runoff Volume = 39.840 af Average Runoff Depth = 3.29"
66.08% Pervious = 95.921 ac 33.92% Impervious = 49.246 ac

Summary for Subcatchment P1a: Road + Basin

Runoff = 9.2 cfs @ 12.09 hrs, Volume= 0.692 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	0.967	98	Paved parking, HSG A
	0.304	39	>75% Grass cover, Good, HSG A
*	0.082	98	Bot. Basin, 0% imp, HSG A
	1.353	85	Weighted Average
	0.386		28.53% Pervious Area
	0.967		71.47% Impervious Area

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

Summary for Subcatchment P1b: South overland

Runoff = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
1.367	39	>75% Grass cover, Good, HSG A
0.256	72	Dirt roads, HSG A
7.669	30	Woods, Good, HSG A
9.292	32	Weighted Average
9.292		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0460	0.09		**Sheet Flow, 418-415.7** Woods: Light underbrush n= 0.400 P2= 3.00"
14.6	620	0.0200	0.71		**Shallow Concentrated Flow, 415.7 to 403.2** Woodland Kv= 5.0 fps
1.7	85	0.0140	0.83		**Shallow Concentrated Flow, 403.2 to 402** Short Grass Pasture Kv= 7.0 fps
0.8	592	0.0270	11.83	37.17	**Pipe Channel, 402 to 386** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
26.2	1,347	Total			

Summary for Subcatchment P2: Southeast Overland

Runoff = 1.3 cfs @ 12.86 hrs, Volume= 0.522 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
9.933	30	Woods, Good, HSG A
0.822	39	>75% Grass cover, Good, HSG A
0.103	72	Dirt roads, HSG A
2.535	30	Meadow, non-grazed, HSG A
13.393	31	Weighted Average
13.393		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	50	0.0316	0.17		**Sheet Flow, 418 to 416.42** Grass: Short n= 0.150 P2= 3.00"
8.9	600	0.0260	1.13		**Shallow Concentrated Flow, 416.42 to 401** Short Grass Pasture Kv= 7.0 fps
0.3	119	0.0168	7.70	13.62	**Pipe Channel, 401 to 399** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
0.6	249	0.0120	7.05	12.47	**Pipe Channel, 399 to 396** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
20.3	974	0.0130	0.80		**Shallow Concentrated Flow, 396 to 383** Short Grass Pasture Kv= 7.0 fps
0.1	34	0.0300	11.15	19.71	**Pipe Channel, 378-377** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.1	54	0.0074	6.71	21.08	**Pipe Channel, 374-373.6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.2	95	0.0053	7.44	52.60	**Pipe Channel, 373.5-373** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
35.3	2,175	Total			

Summary for Subcatchment P2a: N Side of Bldg2

Runoff = 77.7 cfs @ 12.09 hrs, Volume= 6.045 af, Depth= 6.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
5.620	98	Roofs, HSG A
3.027	98	Paved parking, HSG A
0.958	39	>75% Grass cover, Good, HSG A
0.440	98	Water Surface, 0% imp, HSG B
0.060	98	Paved parking, HSG B
0.678	61	>75% Grass cover, Good, HSG B
10.783	90	Weighted Average
2.076		19.25% Pervious Area
8.707		80.75% Impervious Area

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

Summary for Subcatchment P2b: NW Side of Bldg 2

Runoff = 19.7 cfs @ 12.09 hrs, Volume= 1.503 af, Depth= 6.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
1.890	98	Roofs, HSG A
0.304	98	Paved parking, HSG A
0.509	39	>75% Grass cover, Good, HSG A
0.128	98	Water Surface, 0% imp, HSG A
2.831	87	Weighted Average
0.637		22.50% Pervious Area
2.194		77.50% Impervious Area

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

Summary for Subcatchment P2c: SW Side of Bldg 2

Runoff = 56.1 cfs @ 12.09 hrs, Volume= 4.226 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
3.570	98	Roofs, HSG A
2.544	98	Paved parking, HSG A
1.805	39	>75% Grass cover, Good, HSG A
0.345	98	Water Surface, 0% imp, HSG A
8.264	85	Weighted Average
2.150		26.02% Pervious Area
6.114		73.98% Impervious Area

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

Summary for Subcatchment P2d: E Side of Bldg 2

Runoff = 53.2 cfs @ 12.09 hrs, Volume= 4.171 af, Depth= 6.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
3.890	98	Roofs, HSG A
2.574	98	Paved parking, HSG A
0.848	39	>75% Grass cover, Good, HSG A
7.312	91	Weighted Average
0.848		11.60% Pervious Area
6.464		88.40% Impervious Area

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

Summary for Subcatchment P2e: S Side of Bldg 2

Runoff = 18.3 cfs @ 12.10 hrs, Volume= 1.345 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
2.039	39	>75% Grass cover, Good, HSG A
1.810	98	Paved parking, HSG A
0.677	30	Meadow, non-grazed, HSG A
0.243	61	>75% Grass cover, Good, HSG B
4.769	61	Weighted Average
2.959		62.05% Pervious Area
1.810		37.95% Impervious Area

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

Summary for Subcatchment P2X: Overland

Runoff = 2.0 cfs @ 12.11 hrs, Volume= 0.185 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
1.183	39	>75% Grass cover, Good, HSG A
0.302	61	>75% Grass cover, Good, HSG B
1.485	43	Weighted Average
1.485		100.00% Pervious Area

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

Summary for Subcatchment P3: West overland

Runoff = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
18.741	30	Woods, Good, HSG A
2.189	30	Meadow, non-grazed, HSG A
20.930	30	Weighted Average
20.930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		**Sheet Flow, 502 - 500** Woods: Light underbrush n= 0.400 P2= 3.00"
5.1	331	0.0470	1.08		**Shallow Concentrated Flow, 500 - 484.4** Woodland Kv= 5.0 fps
8.4	283	0.0014	0.56		**Shallow Concentrated Flow, 484.4 to 484** Grassed Waterway Kv= 15.0 fps
1.4	262	0.3820	3.09		**Shallow Concentrated Flow, 484 to 384** Woodland Kv= 5.0 fps
24.6	926	Total			

Summary for Subcatchment P3a: NW Side of Bldg 3 & SW Side of Bldg 2

Runoff = 71.7 cfs @ 12.09 hrs, Volume= 5.198 af, Depth= 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
2.293	98	Roofs, HSG A
5.718	39	>75% Grass cover, Good, HSG A
2.599	98	Paved parking, HSG A
1.010	98	Water Surface, 0% imp, HSG A
0.862	98	Paved parking, HSG A
0.795	39	>75% Grass cover, Good, HSG A
0.805	98	Paved parking, HSG A
0.108	39	>75% Grass cover, Good, HSG A
14.190	70	Weighted Average
7.631		53.78% Pervious Area
6.559		46.22% Impervious Area

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

Summary for Subcatchment P3b: SW Side of Bldg 3

Runoff = 41.5 cfs @ 12.09 hrs, Volume= 3.024 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
3.317	39	>75% Grass cover, Good, HSG A
0.224	98	Water Surface, 0% imp, HSG A
1.780	98	Roofs, HSG A
2.292	98	Paved parking, HSG A
1.790	30	Meadow, non-grazed, HSG A
0.051	30	Woods, Good, HSG A
0.029	72	Dirt roads, HSG A
0.088	76	Gravel roads, HSG A
0.191	78	Meadow, non-grazed, HSG D
9.762	64	Weighted Average
5.690		58.29% Pervious Area
4.072		41.71% Impervious Area

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

Summary for Subcatchment P3c: E Side of Bldg 3

Runoff = 54.1 cfs @ 12.09 hrs, Volume= 4.075 af, Depth= 6.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	1.702	39	>75% Grass cover, Good, HSG A
	0.347	80	>75% Grass cover, Good, HSG D
	2.068	98	Paved parking, HSG A
	3.837	98	Roofs, HSG A
	0.015	61	>75% Grass cover, Good, HSG B
	7.969	85	Weighted Average
	2.064		25.90% Pervious Area
	5.905		74.10% Impervious Area

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

Summary for Subcatchment P4a: Road + Basin

Runoff = 30.7 cfs @ 12.09 hrs, Volume= 2.373 af, Depth= 6.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	2.902	98	Paved parking, HSG A
	0.657	39	>75% Grass cover, Good, HSG A
*	0.751	98	Bot. Basin, 0% imp, HSG A
	4.310	89	Weighted Average
	1.408		32.67% Pervious Area
	2.902		67.33% Impervious Area

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

Summary for Subcatchment P4b: Road + Basin

Runoff = 23.2 cfs @ 12.09 hrs, Volume= 1.737 af, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	2.075	98	Paved parking, HSG A
	0.566	39	>75% Grass cover, Good, HSG A
	0.450	61	>75% Grass cover, Good, HSG B
*	0.373	98	Bot. Basin, 0% imp, HSG B
	3.464	84	Weighted Average
	1.389		40.10% Pervious Area
	2.075		59.90% Impervious Area

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

Summary for Subcatchment P4c: Road + Basin

Runoff = 13.9 cfs @ 12.09 hrs, Volume= 1.063 af, Depth= 6.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

	Area (ac)	CN	Description
	1.477	98	Paved parking, HSG A
	0.335	39	>75% Grass cover, Good, HSG A
*	0.154	98	Bot. Basin, 0% imp, HSG A
	1.966	88	Weighted Average
	0.489		24.87% Pervious Area
	1.477		75.13% Impervious Area

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

Summary for Subcatchment P4d.1: Central overland (west)

Runoff = 2.8 cfs @ 12.15 hrs, Volume= 0.319 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.662	72	Dirt roads, HSG A
1.148	30	Meadow, non-grazed, HSG A
0.902	30	Woods, Good, HSG A
0.440	39	>75% Grass cover, Good, HSG A
3.152	40	Weighted Average
3.152		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	50	0.0300	0.41		**Sheet Flow, 394.5-393** Fallow n= 0.050 P2= 3.00"
0.7	137	0.0360	3.05		**Shallow Concentrated Flow, 393-388** Unpaved Kv= 16.1 fps
1.9	140	0.0320	1.25		**Shallow Concentrated Flow, 388-383.5** Short Grass Pasture Kv= 7.0 fps
0.3	75	0.0060	4.08	5.00	**Pipe Channel, 379-378.55** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	117	0.0090	4.99	6.13	**Pipe Channel, 378.45-377.4** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.6	168	0.0077	4.62	5.67	**Pipe Channel, 377.3-376** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.5	124	0.0072	4.47	5.48	**Pipe Channel, 375.9-375** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.9	248	0.0077	4.62	5.67	**Pipe Channel, 374.9-373** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.0	27	0.0334	9.62	11.81	**Pipe Channel, 372.9-372** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
7.4	1,086	Total			

Summary for Subcatchment P4e: North overland

Runoff = 16.9 cfs @ 12.15 hrs, Volume= 1.707 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.240	61	>75% Grass cover, Good, HSG B
2.977	72	Dirt roads, HSG A
1.738	30	Meadow, non-grazed, HSG A
3.554	30	Woods, Good, HSG A
5.156	39	>75% Grass cover, Good, HSG A
13.665	43	Weighted Average
13.665		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	50	0.0150	0.13		**Sheet Flow, 366-365.25** Grass: Short n= 0.150 P2= 3.00"
1.8	88	0.0140	0.83		**Shallow Concentrated Flow, 365.25-364** Short Grass Pasture Kv= 7.0 fps
0.2	132	0.0300	9.12	11.19	**Pipe Channel, 364-360** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.5	270	Total			

Summary for Subcatchment P4X: Overland

Runoff = 1.8 cfs @ 12.27 hrs, Volume= 0.320 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
2.378	30	Meadow, non-grazed, HSG A
2.564	39	>75% Grass cover, Good, HSG A
4.942	35	Weighted Average
4.942		100.00% Pervious Area

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

Summary for Subcatchment P5: Northwest overland

Runoff = 0.1 cfs @ 12.14 hrs, Volume= 0.011 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.109	39	>75% Grass cover, Good, HSG A
0.016	30	Meadow, non-grazed, HSG A
0.125	38	Weighted Average
0.125		100.00% Pervious Area

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

Summary for Subcatchment P6X: Overland

Runoff = 2.6 cfs @ 12.10 hrs, Volume= 0.212 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.92"

Area (ac)	CN	Description
0.639	39	>75% Grass cover, Good, HSG A
0.571	61	>75% Grass cover, Good, HSG B
1.210	49	Weighted Average
1.210		100.00% Pervious Area

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

Summary for Reach DP1: Wetlands @ Boston Road

Inflow Area = 10.645 ac, 9.08% Impervious, Inflow Depth = 0.47" for 100-YR event
Inflow = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af
Outflow = 1.4 cfs @ 12.66 hrs, Volume= 0.419 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: Onsite Eastern Boundary / Brook

Inflow Area = 21.535 ac, 65.84% Impervious, Inflow Depth = 1.88" for 100-YR event
Inflow = 20.7 cfs @ 12.51 hrs, Volume= 3.373 af
Outflow = 20.7 cfs @ 12.51 hrs, Volume= 3.373 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: Onsite Wetland

Inflow Area = 20.930 ac, 0.00% Impervious, Inflow Depth = 0.40" for 100-YR event
Inflow = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af
Outflow = 1.7 cfs @ 12.73 hrs, Volume= 0.694 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP4: Onsite Eastern Boundary / IWPA

Inflow Area = 60.844 ac, 35.90% Impervious, Inflow Depth = 0.75" for 100-YR event
Inflow = 7.2 cfs @ 12.57 hrs, Volume= 3.823 af
Outflow = 7.2 cfs @ 12.57 hrs, Volume= 3.823 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP5: Western Boundary

Inflow Area = 0.125 ac, 0.00% Impervious, Inflow Depth = 1.03" for 100-YR event
Inflow = 0.1 cfs @ 12.14 hrs, Volume= 0.011 af
Outflow = 0.1 cfs @ 12.14 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP6: Onsite Northeastern Boundary / LG Wetland System

Inflow Area = 31.088 ac, 39.43% Impervious, Inflow Depth = 1.54" for 100-YR event
Inflow = 20.9 cfs @ 12.16 hrs, Volume= 3.980 af
Outflow = 20.9 cfs @ 12.16 hrs, Volume= 3.980 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond B1: Surface Infiltration Basin #1

Inflow Area = 1.966 ac, 75.13% Impervious, Inflow Depth = 6.49" for 100-YR event
Inflow = 13.9 cfs @ 12.09 hrs, Volume= 1.063 af
Outflow = 0.6 cfs @ 14.83 hrs, Volume= 1.064 af, Atten= 96%, Lag= 164.7 min
Discarded = 0.6 cfs @ 14.83 hrs, Volume= 1.064 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 356.42' @ 14.83 hrs Surf.Area= 11,043 sf Storage= 26,195 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 467.4 min (1,249.7 - 782.4)

Volume	Invert	Avail.Storage	Storage Description
#1	353.00'	46,324 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
353.00	4,922	0	0
354.00	6,095	5,509	5,509
356.00	10,136	16,231	21,740
358.00	14,448	24,584	46,324

Device	Routing	Invert	Outlet Devices
#1	Discarded	353.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	353.00'	**18.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 353.00' / 352.00' S= 0.0345 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	356.75'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Secondary	357.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.6 cfs @ 14.83 hrs HW=356.42' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└—**2=Culvert** (Controls 0.0 cfs)
  └—**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=353.00' TW=0.00' (Dynamic Tailwater)
└—**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2: Surface Infiltration Basin #2

Inflow Area = 3.464 ac, 59.90% Impervious, Inflow Depth = 6.02" for 100-YR event
Inflow = 23.2 cfs @ 12.09 hrs, Volume= 1.737 af
Outflow = 1.3 cfs @ 14.16 hrs, Volume= 1.739 af, Atten= 95%, Lag= 124.4 min
Discarded = 1.3 cfs @ 14.16 hrs, Volume= 1.739 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 365.03' @ 14.16 hrs Surf.Area= 22,568 sf Storage= 37,544 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 301.3 min (1,094.7 - 793.4)

Volume	Invert	Avail.Storage	Storage Description
#1	363.00'	122,385 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
363.00	14,913	0	0
364.00	18,225	16,569	16,569
366.00	26,672	44,897	61,466
368.00	34,247	60,919	122,385

Device	Routing	Invert	Outlet Devices
#1	Discarded	363.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	363.00'	**12.0" Round Culvert** L= 38.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 363.00' / 362.00' S= 0.0263 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	366.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	367.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.3 cfs @ 14.16 hrs HW=365.03' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.3 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=363.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2a: Surface Basin - Bldg2 North

Inflow Area = 10.783 ac, 80.75% Impervious, Inflow Depth = 6.73" for 100-YR event
Inflow = 77.7 cfs @ 12.09 hrs, Volume= 6.045 af
Outflow = 12.7 cfs @ 12.57 hrs, Volume= 6.045 af, Atten= 84%, Lag= 28.7 min
Discarded = 1.8 cfs @ 12.57 hrs, Volume= 3.983 af
Primary = 10.9 cfs @ 12.57 hrs, Volume= 2.062 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 350.96' @ 12.57 hrs Surf.Area= 33,009 sf Storage= 131,945 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 404.9 min (1,181.1 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1	346.00'	167,790 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
346.00	19,435	0	0
348.00	25,746	45,181	45,181
350.00	30,605	56,351	101,532
351.00	33,119	31,862	133,394
352.00	35,673	34,396	167,790

Device	Routing	Invert	Outlet Devices
#1	Discarded	346.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	346.00'	**18.0" Round Culvert** L= 71.0' Ke= 0.900 Inlet / Outlet Invert= 346.00' / 345.00' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	348.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	349.35'	**20.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	350.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	351.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.8 cfs @ 12.57 hrs HW=350.95' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.8 cfs)

Primary OutFlow Max=10.8 cfs @ 12.57 hrs HW=350.95' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 10.8 cfs of 13.8 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 7.35 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 2.4 cfs @ 5.85 fps)
  └─**5=Orifice/Grate** (Weir Controls 8.0 cfs @ 2.20 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=346.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2b: Surface Basin - Bldg2 Northwest

Inflow Area = 2.831 ac, 77.50% Impervious, Inflow Depth = 6.37" for 100-YR event
Inflow = 19.7 cfs @ 12.09 hrs, Volume= 1.503 af
Outflow = 0.7 cfs @ 15.58 hrs, Volume= 1.503 af, Atten= 96%, Lag= 209.2 min
Discarded = 0.7 cfs @ 15.58 hrs, Volume= 1.503 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 370.90' @ 15.58 hrs Surf.Area= 12,506 sf Storage= 40,049 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 610.9 min (1,396.2 - 785.3)

Volume	Invert	Avail.Storage	Storage Description
#1	366.50'	69,219 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.50	6,480	0	0
367.00	3,971	2,613	2,613
368.00	8,921	6,446	9,059
370.00	11,322	20,243	29,302
372.00	13,948	25,270	54,572
373.00	15,346	14,647	69,219

Device	Routing	Invert	Outlet Devices
#1	Discarded	366.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	366.50'	**12.0" Round Culvert** L= 49.3' Ke= 0.900 Inlet / Outlet Invert= 366.50' / 365.00' S= 0.0304 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	371.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	372.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.7 cfs @ 15.58 hrs HW=370.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.7 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=366.50' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B2c: Surface Basin - Bldg2 Southwest

Inflow Area = 8.264 ac, 73.98% Impervious, Inflow Depth = 6.14" for 100-YR event
Inflow = 56.1 cfs @ 12.09 hrs, Volume= 4.226 af
Outflow = 6.9 cfs @ 12.70 hrs, Volume= 4.226 af, Atten= 88%, Lag= 36.5 min
Discarded = 1.4 cfs @ 12.70 hrs, Volume= 2.813 af
Primary = 5.5 cfs @ 12.70 hrs, Volume= 1.414 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 378.89' @ 12.70 hrs Surf.Area= 25,322 sf Storage= 95,118 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 420.7 min (1,211.5 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	374.00'	124,553 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.00	11,840	0	0
376.00	19,088	30,928	30,928
378.00	23,422	42,510	73,438
380.00	27,693	51,115	124,553

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	374.00'	**12.0" Round Culvert** L= 40.1' Ke= 0.900 Inlet / Outlet Invert= 374.00' / 373.00' S= 0.0249 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	375.75'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	377.30'	**8.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	378.60'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	379.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.4 cfs @ 12.70 hrs HW=378.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.4 cfs)

Primary OutFlow Max=5.5 cfs @ 12.70 hrs HW=378.89' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 5.5 cfs of 6.3 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.4 cfs @ 8.36 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 1.0 cfs @ 5.83 fps)
  └─**5=Orifice/Grate** (Weir Controls 4.1 cfs @ 1.76 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=374.00' TW=0.00' (Dynamic Tailwater)
└─**6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3: Surface Infiltration Basin #3

Inflow Area = 4.310 ac, 67.33% Impervious, Inflow Depth = 6.61" for 100-YR event
Inflow = 30.7 cfs @ 12.09 hrs, Volume= 2.373 af
Outflow = 4.2 cfs @ 12.62 hrs, Volume= 2.377 af, Atten= 86%, Lag= 31.7 min
Discarded = 4.2 cfs @ 12.62 hrs, Volume= 2.377 af
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 374.73' @ 12.62 hrs Surf.Area= 22,050 sf Storage= 33,371 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 55.2 min (834.5 - 779.4)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	119,215 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	15,656	0	0
374.00	20,264	17,960	17,960
376.00	25,168	45,432	63,392
378.00	30,655	55,823	119,215

Device	Routing	Invert	Outlet Devices
#1	Discarded	373.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	373.00'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 373.00' / 372.00' S= 0.0303 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	377.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=4.2 cfs @ 12.62 hrs HW=374.73' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 4.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.0 cfs)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3a: Surface Basin - Bldg3 Northwest

Inflow Area = 37.345 ac, 28.47% Impervious, Inflow Depth = 2.07" for 100-YR event
Inflow = 71.6 cfs @ 12.09 hrs, Volume= 6.433 af
Outflow = 3.5 cfs @ 15.72 hrs, Volume= 1.771 af, Atten= 95%, Lag= 217.6 min
Primary = 3.5 cfs @ 15.72 hrs, Volume= 1.771 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 376.77' @ 15.72 hrs Surf.Area= 64,451 sf Storage= 213,719 cf

Plug-Flow detention time= 441.7 min calculated for 1.770 af (28% of inflow)
Center-of-Mass det. time= 308.1 min (1,140.9 - 832.8)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	295,503 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	49,471	0	0
374.00	52,195	50,833	50,833
376.00	62,191	114,386	165,219
378.00	68,093	130,284	295,503

Device	Routing	Invert	Outlet Devices
#1	Primary	374.65'	**15.0" Round Culvert** L= 49.2' Ke= 0.900 Inlet / Outlet Invert= 374.65' / 374.30' S= 0.0071 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	376.60'	**24.0" x 24.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	377.15'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=3.5 cfs @ 15.72 hrs HW=376.77' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.5 cfs of 5.7 cfs potential flow)
  └─**2=Orifice/Grate** (Weir Controls 3.5 cfs @ 1.33 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=373.00' TW=0.00' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B3b: Surface Basin - Bldg3 West

Inflow Area = 9.762 ac, 41.71% Impervious, Inflow Depth = 3.72" for 100-YR event
Inflow = 41.5 cfs @ 12.09 hrs, Volume= 3.024 af
Outflow = 16.6 cfs @ 12.37 hrs, Volume= 3.025 af, Atten= 60%, Lag= 16.2 min
Discarded = 2.9 cfs @ 12.37 hrs, Volume= 2.312 af
Primary = 13.8 cfs @ 12.37 hrs, Volume= 0.713 af
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 387.00' @ 12.37 hrs Surf.Area= 15,088 sf Storage= 40,755 cf

Plug-Flow detention time= 110.3 min calculated for 3.023 af (100% of inflow)
Center-of-Mass det. time= 110.4 min (948.4 - 838.0)

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	95,627 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	5,248	0	0
384.00	7,128	6,188	6,188
386.00	13,250	20,378	26,566
388.00	16,920	30,170	56,736
390.00	21,971	38,891	95,627

Device	Routing	Invert	Outlet Devices
#1	Discarded	383.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	383.00'	**24.0" Round Culvert** L= 246.0' Ke= 0.900 Inlet / Outlet Invert= 383.00' / 381.00' S= 0.0081 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	386.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	389.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=2.9 cfs @ 12.37 hrs HW=387.00' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 2.9 cfs)

Primary OutFlow Max=13.7 cfs @ 12.37 hrs HW=387.00' TW=375.23' (Dynamic Tailwater)
└─**2=Culvert** (Passes 13.7 cfs of 20.7 cfs potential flow)
  └─**3=Orifice/Grate** (Weir Controls 13.7 cfs @ 2.63 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=383.00' TW=373.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond B4: Surface Infiltration Basin #4

Inflow Area =	1.353 ac, 71.47% Impervious, Inflow Depth = 6.14" for 100-YR event		
Inflow =	9.2 cfs @ 12.09 hrs, Volume=	0.692 af	
Outflow =	1.2 cfs @ 12.65 hrs, Volume=	0.692 af,	Atten= 87%, Lag= 33.6 min
Discarded =	1.2 cfs @ 12.65 hrs, Volume=	0.692 af	
Primary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	
Secondary =	0.0 cfs @ 0.00 hrs, Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 395.49' @ 12.65 hrs Surf.Area= 6,282 sf Storage= 10,983 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 80.0 min (870.8 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1	393.00'	31,603 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
393.00	2,914	0	0
394.00	3,897	3,406	3,406
396.00	7,101	10,998	14,404
398.00	10,098	17,199	31,603

Device	Routing	Invert	Outlet Devices
#1	Discarded	393.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	392.00'	**24.0" Round Culvert** L= 286.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 392.00' / 386.00' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	396.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	397.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=1.2 cfs @ 12.65 hrs HW=395.49' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.0 cfs of 5.3 cfs potential flow)
  └─**3=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=393.00' TW=0.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond UG2d: UG Basin - Bldg2 East

Inflow Area = 7.312 ac, 88.40% Impervious, Inflow Depth = 6.85" for 100-YR event
Inflow = 53.2 cfs @ 12.09 hrs, Volume= 4.171 af
Outflow = 17.6 cfs @ 12.38 hrs, Volume= 4.172 af, Atten= 67%, Lag= 17.6 min
Discarded = 1.2 cfs @ 9.10 hrs, Volume= 2.295 af
Primary = 16.4 cfs @ 12.38 hrs, Volume= 1.877 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 376.41' @ 12.38 hrs Surf.Area= 21,589 sf Storage= 73,570 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 201.9 min (974.7 - 772.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	371.00'	29,576 cf	**65.75'W x 328.35'L x 5.50'H Field A** 118,740 cf Overall - 44,799 cf Embedded = 73,941 cf x 40.0% Voids
#2A	371.75'	44,799 cf	**ADS_StormTech MC-3500 d +Cap** x 405 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 9 Rows of 45 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		74,375 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	371.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	371.75'	**24.0" Round Culvert** L= 142.0' Ke= 0.900 Inlet / Outlet Invert= 371.75' / 369.61' S= 0.0151 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#3	Device 2	372.85'	**12.0" W x 3.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 2	374.20'	**12.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#5	Device 2	375.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 9.10 hrs HW=371.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=16.3 cfs @ 12.38 hrs HW=376.40' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 16.3 cfs of 22.8 cfs potential flow)
 ├─**3=Orifice/Grate** (Orifice Controls 2.2 cfs @ 8.91 fps)
 ├─**4=Orifice/Grate** (Orifice Controls 3.4 cfs @ 6.72 fps)
 └─**5=Sharp-Crested Rectangular Weir** (Weir Controls 10.7 cfs @ 3.10 fps)

Summary for Pond UG2e: UG Basin - Bldg2 South

Inflow Area = 4.769 ac, 37.95% Impervious, Inflow Depth = 3.38" for 100-YR event
Inflow = 18.3 cfs @ 12.10 hrs, Volume= 1.345 af
Outflow = 2.2 cfs @ 12.92 hrs, Volume= 1.346 af, Atten= 88%, Lag= 49.5 min
Discarded = 0.5 cfs @ 11.35 hrs, Volume= 0.827 af
Primary = 1.8 cfs @ 12.92 hrs, Volume= 0.518 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 378.91' @ 12.92 hrs Surf.Area= 8,389 sf Storage= 25,885 cf

Plug-Flow detention time= 290.6 min calculated for 1.345 af (100% of inflow)
Center-of-Mass det. time= 291.1 min (1,135.6 - 844.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	374.25'	11,620 cf	**65.75'W x 127.59'L x 5.50'H Field A** 46,140 cf Overall - 17,091 cf Embedded = 29,049 cf x 40.0% Voids
#2A	375.00'	17,091 cf	**ADS_StormTech MC-3500 d +Cap** x 153 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 9 Rows of 17 Chambers Cap Storage= +14.9 cf x 2 x 9 rows = 268.2 cf
		28,710 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	375.00'	**12.0" Round Culvert** L= 75.3' Ke= 0.900 Inlet / Outlet Invert= 375.00' / 374.10' S= 0.0120 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	376.60'	**5.0" Vert. Orifice/Grate** C= 0.600
#4	Device 2	378.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.5 cfs @ 11.35 hrs HW=374.31' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=1.8 cfs @ 12.92 hrs HW=378.91' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.8 cfs of 5.5 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 1.0 cfs @ 6.98 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Weir Controls 0.8 cfs @ 1.30 fps)

Summary for Pond UG3c: UG Basin - Bldg3 East

Inflow Area =	7.969 ac, 74.10% Impervious, Inflow Depth = 6.14"	for 100-YR event	
Inflow =	54.1 cfs @ 12.09 hrs, Volume=	4.075 af	
Outflow =	7.6 cfs @ 12.62 hrs, Volume=	4.077 af,	Atten= 86%, Lag= 31.7 min
Discarded =	1.2 cfs @ 9.65 hrs, Volume=	3.284 af	
Primary =	6.5 cfs @ 12.62 hrs, Volume=	0.793 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 385.39' @ 12.62 hrs Surf.Area= 20,670 sf Storage= 87,761 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 557.7 min (1,348.5 - 790.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	379.00'	32,520 cf	**92.08'W x 224.47'L x 6.75'H Field A** 139,520 cf Overall - 58,219 cf Embedded = 81,301 cf x 40.0% Voids
#2A	379.75'	58,219 cf	**ADS_StormTech MC-4500 +Cap** x 540 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 10 Rows of 54 Chambers Cap Storage= +35.7 cf x 2 x 10 rows = 714.0 cf
		90,739 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	379.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	379.15'	**18.0" Round Culvert** L= 238.6' Ke= 0.900 Inlet / Outlet Invert= 379.15' / 375.10' S= 0.0170 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	384.75'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.2 cfs @ 9.65 hrs HW=379.08' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.2 cfs)

Primary OutFlow Max=6.4 cfs @ 12.62 hrs HW=385.39' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 6.4 cfs of 15.7 cfs potential flow)
  └─**3=Sharp-Crested Rectangular Weir** (Weir Controls 6.4 cfs @ 2.61 fps)

APPENDIX F: STORMWATER CALCULATIONS

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

NOAA Atlas 14, Volume 10, Version 3
Location name: Sutton, Massachusetts, USA*
Latitude: 42.1757°, Longitude: -71.7366°
Elevation: 386.72 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	0.340 (0.269-0.425)	0.404 (0.319-0.505)	0.508 (0.400-0.639)	0.594 (0.465-0.752)	0.712 (0.537-0.943)	0.802 (0.592-1.09)	0.895 (0.639-1.26)	0.997 (0.675-1.44)	1.14 (0.740-1.72)	1.25 (0.793-1.93)
10-min	0.482 (0.381-0.602)	0.572 (0.451-0.716)	0.719 (0.565-0.903)	0.841 (0.657-1.06)	1.01 (0.761-1.34)	1.14 (0.839-1.54)	1.27 (0.905-1.78)	1.41 (0.955-2.05)	1.61 (1.05-2.43)	1.78 (1.12-2.73)
15-min	0.567 (0.448-0.709)	0.673 (0.531-0.842)	0.846 (0.665-1.06)	0.990 (0.773-1.25)	1.19 (0.895-1.57)	1.34 (0.986-1.81)	1.49 (1.06-2.10)	1.66 (1.12-2.41)	1.90 (1.23-2.86)	2.09 (1.32-3.22)
30-min	0.773 (0.611-0.967)	0.918 (0.725-1.15)	1.16 (0.909-1.45)	1.35 (1.06-1.71)	1.62 (1.22-2.15)	1.83 (1.35-2.47)	2.04 (1.46-2.87)	2.27 (1.54-3.29)	2.60 (1.69-3.91)	2.86 (1.81-4.39)
60-min	0.980 (0.775-1.23)	1.16 (0.919-1.46)	1.47 (1.15-1.84)	1.71 (1.34-2.17)	2.06 (1.55-2.72)	2.32 (1.71-3.14)	2.59 (1.85-3.64)	2.88 (1.95-4.17)	3.29 (2.14-4.95)	3.62 (2.29-5.57)
2-hr	1.25 (0.995-1.56)	1.49 (1.18-1.85)	1.87 (1.48-2.34)	2.19 (1.73-2.76)	2.63 (2.00-3.48)	2.96 (2.20-4.00)	3.31 (2.39-4.66)	3.71 (2.52-5.35)	4.30 (2.80-6.43)	4.78 (3.04-7.31)
3-hr	1.44 (1.15-1.78)	1.71 (1.37-2.12)	2.16 (1.72-2.69)	2.54 (2.00-3.18)	3.05 (2.33-4.01)	3.43 (2.56-4.63)	3.84 (2.78-5.40)	4.32 (2.94-6.20)	5.03 (3.28-7.50)	5.63 (3.58-8.58)
6-hr	1.81 (1.46-2.23)	2.17 (1.74-2.68)	2.77 (2.21-3.42)	3.26 (2.59-4.05)	3.93 (3.02-5.15)	4.43 (3.33-5.96)	4.97 (3.63-6.98)	5.62 (3.84-8.02)	6.60 (4.32-9.78)	7.44 (4.75-11.3)
12-hr	2.25 (1.82-2.75)	2.73 (2.20-3.34)	3.50 (2.82-4.31)	4.15 (3.32-5.13)	5.04 (3.89-6.57)	5.70 (4.31-7.62)	6.41 (4.71-8.96)	7.27 (4.98-10.3)	8.58 (5.63-12.6)	9.70 (6.21-14.6)
24-hr	2.67 (2.17-3.25)	3.27 (2.66-3.98)	4.25 (3.44-5.20)	5.07 (4.07-6.23)	6.19 (4.81-8.03)	7.02 (5.34-9.34)	7.92 (5.85-11.0)	9.02 (6.20-12.7)	10.7 (7.05-15.7)	12.2 (7.81-18.2)
2-day	3.04 (2.49-3.67)	3.75 (3.07-4.54)	4.92 (4.01-5.98)	5.89 (4.76-7.20)	7.22 (5.65-9.32)	8.20 (6.29-10.9)	9.28 (6.91-12.9)	10.6 (7.33-14.9)	12.7 (8.39-18.5)	14.5 (9.35-21.5)
3-day	3.31 (2.72-3.99)	4.08 (3.35-4.92)	5.34 (4.37-6.47)	6.39 (5.19-7.78)	7.83 (6.15-10.1)	8.89 (6.83-11.7)	10.0 (7.51-13.9)	11.5 (7.95-16.0)	13.8 (9.10-19.9)	15.7 (10.1-23.2)
4-day	3.56 (2.93-4.28)	4.37 (3.59-5.25)	5.69 (4.66-6.87)	6.79 (5.53-8.24)	8.30 (6.53-10.6)	9.41 (7.24-12.4)	10.6 (7.94-14.6)	12.1 (8.40-16.9)	14.5 (9.59-20.9)	16.5 (10.7-24.3)
7-day	4.26 (3.53-5.09)	5.13 (4.25-6.14)	6.57 (5.41-7.89)	7.76 (6.35-9.38)	9.40 (7.42-12.0)	10.6 (8.19-13.8)	11.9 (8.92-16.2)	13.5 (9.40-18.7)	15.9 (10.6-22.9)	18.0 (11.7-26.4)
10-day	4.94 (4.10-5.88)	5.85 (4.86-6.98)	7.34 (6.07-8.79)	8.58 (7.05-10.3)	10.3 (8.14-13.0)	11.6 (8.93-15.0)	12.9 (9.65-17.5)	14.5 (10.1-20.0)	16.9 (11.3-24.2)	18.9 (12.3-27.6)
20-day	7.00 (5.86-8.29)	7.97 (6.66-9.44)	9.54 (7.94-11.4)	10.8 (8.97-13.0)	12.6 (10.0-15.8)	14.0 (10.8-17.9)	15.4 (11.5-20.4)	16.9 (11.9-23.1)	19.0 (12.8-27.0)	20.7 (13.5-30.0)
30-day	8.73 (7.33-10.3)	9.72 (8.15-11.5)	11.3 (9.47-13.4)	12.7 (10.5-15.1)	14.5 (11.6-18.0)	16.0 (12.3-20.2)	17.4 (12.9-22.7)	18.8 (13.2-25.5)	20.7 (13.9-29.1)	22.0 (14.4-31.8)
45-day	10.9 (9.18-12.8)	11.9 (10.0-14.0)	13.6 (11.4-16.0)	15.0 (12.5-17.8)	16.9 (13.5-20.7)	18.4 (14.2-23.0)	19.8 (14.7-25.6)	21.1 (15.0-28.5)	22.8 (15.4-31.9)	23.9 (15.6-34.3)
60-day	12.7 (10.7-14.9)	13.7 (11.6-16.1)	15.5 (13.0-18.2)	16.9 (14.1-20.0)	18.8 (15.1-23.1)	20.4 (15.8-25.5)	21.9 (16.2-28.1)	23.1 (16.4-31.1)	24.6 (16.7-34.4)	25.6 (16.7-36.6)

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

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

Please refer to NOAA Atlas 14 document for more information.

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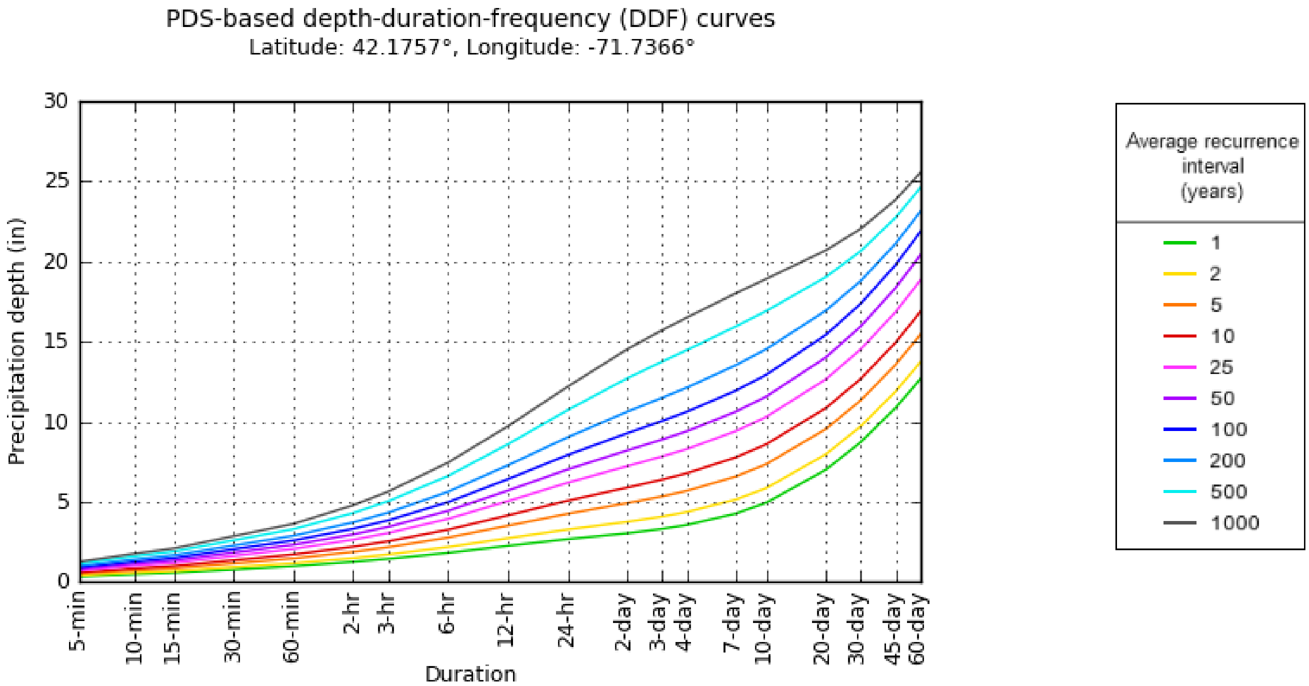
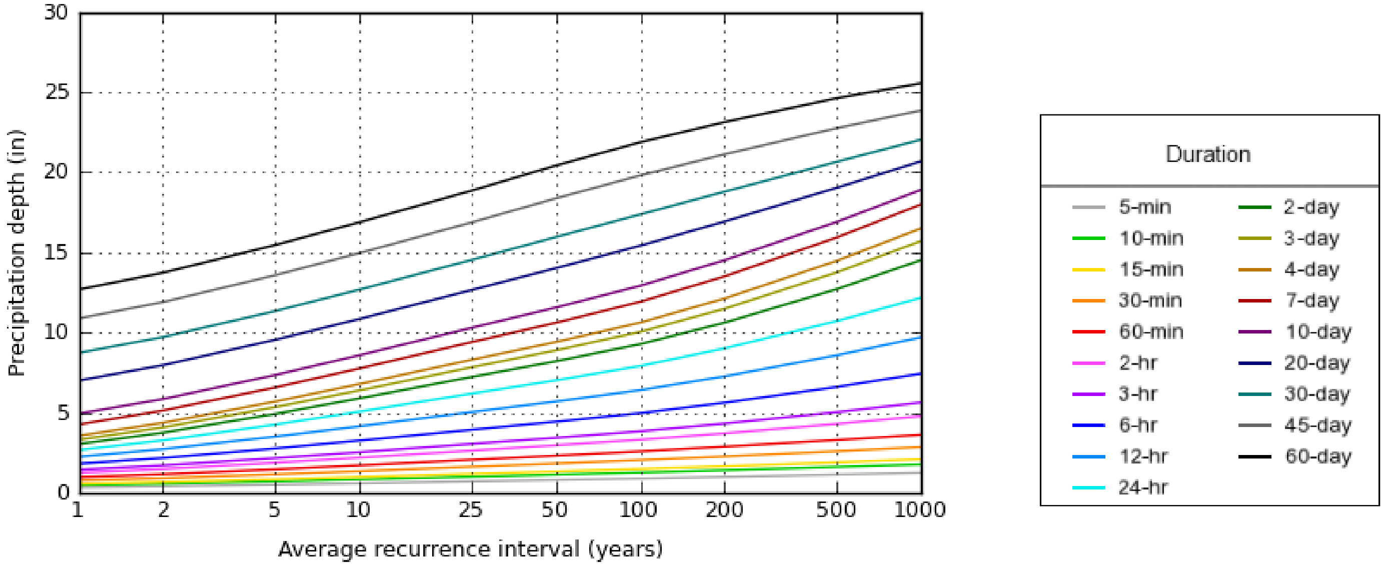
PF graphical





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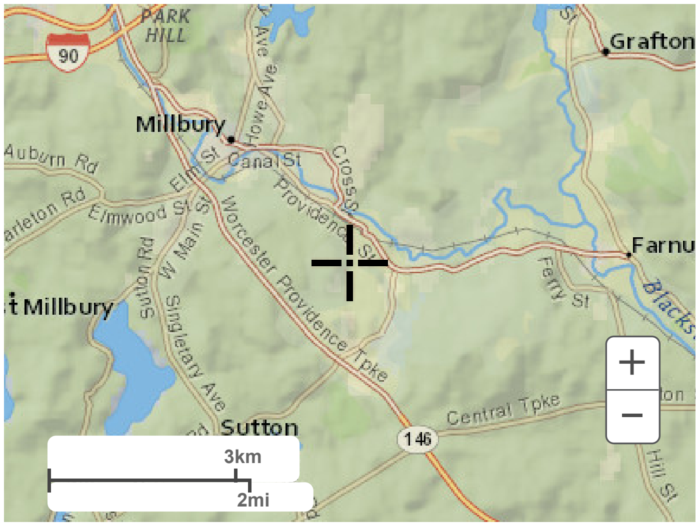
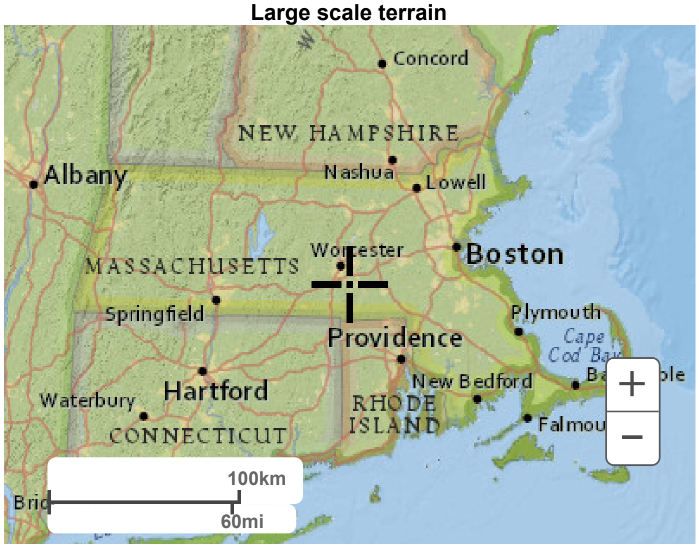
Maps & aerials

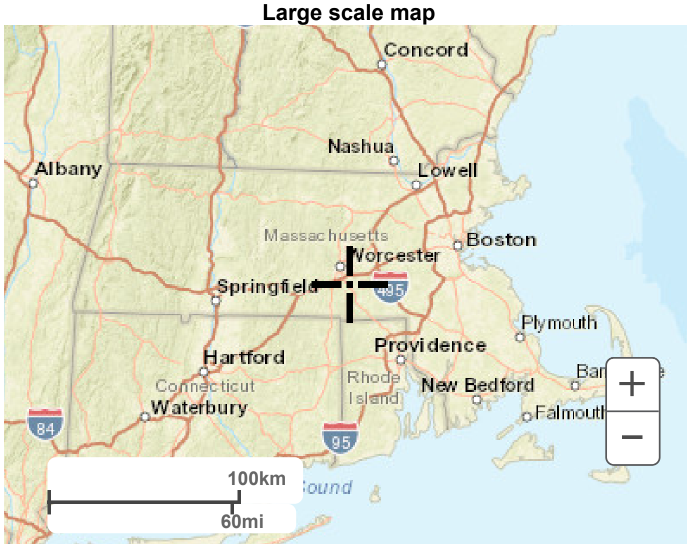
Small scale terrain



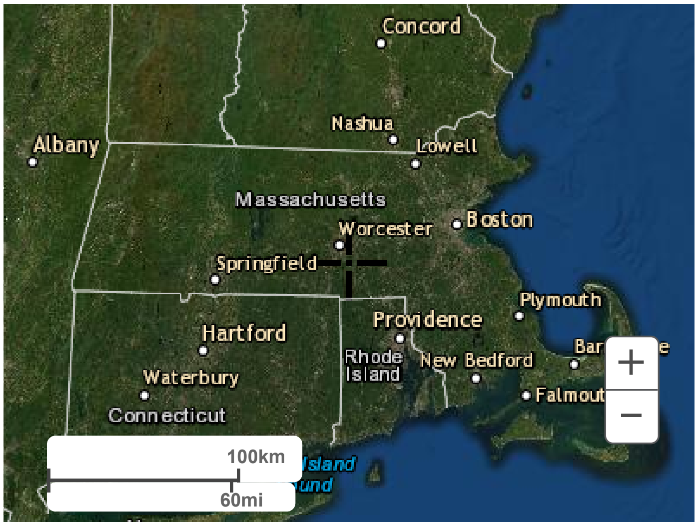
Large scale terrain



Large scale map



Large scale aerial



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Disclaimer

Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 23, 2022

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.60 in.)	
Existing Site Impervious Area (ac)*	0.000
Proposed Site Impervious Area (ac)	41.770
Proposed Increase in Site Impervious Area (ac)	41.770
Recharge Volume Required (cf)	**90,975**

*Existing HydroCAD model notes impervous area. This area is associated with the development of the subdivision road and has been accounted for in the design of the roadway. Therefore it has been excluded from this calculation. There are no other areas of impervious surface on site.

Required Recharge Volume - B Soils (0.35 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.060
Proposed Increase in Site Impervious Area (ac)	0.060
Recharge Volume Required (cf)	**76**

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Required Recharge Volume - D Soils (0.10 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Total Recharge Volume Required (cf)	**91,051**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**41.926**
%Impervious Directed to Infiltration BMP	100%
Adjustment Factor	1.00
Adjusted Total Recharge Volume Required (cf)	**91,051**

Provided Recharge Volume*	
B2a	58,358
B2b	47,762
B2c	26,270
UG2d	26,815
UG2e	13,736
B3a	203,065
B3b	31,316
UG3c	82,472
Total Recharge Volume Provided (cf)	**489,794**

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

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 23, 2022

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - B2a	
Volume below outlet pipe (Rv) (cf)	58,358
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	19,435
Drawdown time (Hours)*	**15.0**
Drawdown Time - B2b	
Volume below outlet pipe (Rv) (cf)	47,762
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	6,480
Drawdown time (Hours)**	**36.7**
Drawdown Time - B2c	
Volume below outlet pipe (Rv) (cf)	26,270
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	11,840
Drawdown time (Hours)**	**11.0**
Drawdown Time - UG2d	
Volume below outlet pipe (Rv) (cf)	26,815
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	21,589
Drawdown time (Hours)**	**6.2**
Drawdown Time - UG2e	
Volume below outlet pipe (Rv) (cf)	13,736
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	8,389
Drawdown time (Hours)**	**8.2**

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March 23, 2022

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - B3a	
Volume below outlet pipe (Rv) (cf)	203,065
Soil Type	Sandy Loam - B
Infiltration rate (K)*	1.02
Bottom Area (sf)	49,471
Drawdown time (Hours)**	**48.3**
Drawdown Time - B3b	
Volume below outlet pipe (Rv) (cf)	31,316
Soil Type	Sand - A
Infiltration rate (K)*	8.27
Bottom Area (sf)	5,248
Drawdown time (Hours)**	**8.7**
Drawdown Time - UG3c	
Volume below outlet pipe (Rv) (cf)	82,472
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	20,669
Drawdown time (Hours)**	**19.9**

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March 23, 2022

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)	1,822,115
Required Water Quality Volume (cf)	**151,843**
*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*	
B2a	58,358
B2b	47,762
B2c	26,270
UG2d	26,815
UG2e	13,736
B3a	203,065
B3b	31,316
UG3c	82,472
Total Provided Water Quality Volume (cf)	**489,794**

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

Prepared By:
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Stage-Area-Storage for Pond B2a: Surface Basin - Bldg2 North (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
348.12	26,038	48,288
348.14	26,086	48,809
348.16	26,135	49,331
348.18	26,183	49,855
348.20	26,232	50,379
348.22	26,280	50,904
348.24	26,329	51,430
348.26	26,378	51,957
348.28	26,426	52,485
348.30	26,475	53,014
348.32	26,523	53,544
348.34	26,572	54,075
348.36	26,621	54,607
348.38	26,669	55,140
348.40	26,718	55,674
348.42	26,766	56,209
348.44	26,815	56,744
348.46	26,864	57,281
348.48	26,912	57,819
348.50	26,961	58,358
348.52	27,009	58,897
348.54	27,058	59,438
348.56	27,107	59,980
348.58	27,155	60,522
348.60	27,204	61,066
348.62	27,252	61,610
348.64	27,301	62,156
348.66	27,349	62,703
348.68	27,398	63,250
348.70	27,447	63,798
348.72	27,495	64,348
348.74	27,544	64,898
348.76	27,592	65,450
348.78	27,641	66,002
348.80	27,690	66,555
348.82	27,738	67,110
348.84	27,787	67,665
348.86	27,835	68,221
348.88	27,884	68,778
348.90	27,933	69,336
348.92	27,981	69,895
348.94	28,030	70,456
348.96	28,078	71,017
348.98	28,127	71,579
349.00	28,176	72,142
349.02	28,224	72,706
349.04	28,273	73,271
349.06	28,321	73,837
349.08	28,370	74,404
349.10	28,418	74,971
349.12	28,467	75,540
349.14	28,516	76,110
349.16	28,564	76,681
349.18	28,613	77,253
349.20	28,661	77,825
349.22	28,710	78,399
349.24	28,759	78,974
349.26	28,807	79,549
349.28	28,856	80,126
349.30	28,904	80,704
349.32	28,953	81,282
349.34	29,002	81,862
349.36	29,050	82,442
349.38	29,099	83,024
349.40	29,147	83,606
349.42	29,196	84,190
349.44	29,244	84,774
349.46	29,293	85,360
349.48	29,342	85,946
349.50	29,390	86,533
349.52	29,439	87,121
349.54	29,487	87,711
349.56	29,536	88,301
349.58	29,585	88,892
349.60	29,633	89,484
349.62	29,682	90,078
349.64	29,730	90,672
349.66	29,779	91,267
349.68	29,828	91,863
349.70	29,876	92,460
349.72	29,925	93,058
349.74	29,973	93,657
349.76	30,022	94,257
349.78	30,071	94,858
349.80	30,119	95,460
349.82	30,168	96,062
349.84	30,216	96,666
349.86	30,265	97,271
349.88	30,313	97,877
349.90	30,362	98,484
349.92	30,411	99,091
349.94	30,459	99,700
349.96	30,508	100,310
349.98	30,556	100,920
350.00	30,605	101,532
350.02	30,655	102,145
350.04	30,706	102,758
350.06	30,756	103,373
350.08	30,806	103,988
350.10	30,856	104,605
350.12	30,907	105,223
350.14	30,957	105,841
350.16	31,007	106,461
350.18	31,058	107,082
350.20	31,108	107,703
350.22	31,158	108,326

Stage-Area-Storage for Pond B2b: Surface Basin - Bldg2 Northwest (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
370.74	12,294	38,040	371.80	13,685	51,808
370.76	12,320	38,286	371.82	13,712	52,082
370.78	12,346	38,532	371.84	13,738	52,357
370.80	12,372	38,780	371.86	13,764	52,632
370.82	12,399	39,027	371.88	13,790	52,907
370.84	12,425	39,275	371.90	13,817	53,184
370.86	12,451	39,524	371.92	13,843	53,460
370.88	12,477	39,774	371.94	13,869	53,737
370.90	12,504	40,023	371.96	13,895	54,015
370.92	12,530	40,274	371.98	13,922	54,293
370.94	12,556	40,525	372.00	13,948	54,572
370.96	12,582	40,776	372.02	13,976	54,851
370.98	12,609	41,028	372.04	14,004	55,131
371.00	12,635	41,280	372.06	14,032	55,411
371.02	12,661	41,533	372.08	14,060	55,692
371.04	12,688	41,787	372.10	14,088	55,974
371.06	12,714	42,041	372.12	14,116	56,256
371.08	12,740	42,295	372.14	14,144	56,538
371.10	12,766	42,550	372.16	14,172	56,821
371.12	12,793	42,806	372.18	14,200	57,105
371.14	12,819	43,062	372.20	14,228	57,389
371.16	12,845	43,319	372.22	14,256	57,674
371.18	12,871	43,576	372.24	14,284	57,960
371.20	12,898	43,834	372.26	14,311	58,245
371.22	12,924	44,092	372.28	14,339	58,532
371.24	12,950	44,350	372.30	14,367	58,819
371.26	12,976	44,610	372.32	14,395	59,107
371.28	13,003	44,870	372.34	14,423	59,395
371.30	13,029	45,130	372.36	14,451	59,684
371.32	13,055	45,391	372.38	14,479	59,973
371.34	13,081	45,652	372.40	14,507	60,263
371.36	13,108	45,914	372.42	14,535	60,553
371.38	13,134	46,176	372.44	14,563	60,844
371.40	13,160	46,439	372.46	14,591	61,136
371.42	13,186	46,703	372.48	14,619	61,428
371.44	13,213	46,967	372.50	14,647	61,721
371.46	13,239	47,231	372.52	14,675	62,014
371.48	13,265	47,496	372.54	14,703	62,307
371.50	13,292	47,762	372.56	14,731	62,602
371.52	13,318	48,028	372.58	14,759	62,897
371.54	13,344	48,295	372.60	14,787	63,192
371.56	13,370	48,562	372.62	14,815	63,488
371.58	13,397	48,829	372.64	14,843	63,785
371.60	13,423	49,098	372.66	14,871	64,082
371.62	13,449	49,366	372.68	14,899	64,380
371.64	13,475	49,636	372.70	14,927	64,678
371.66	13,502	49,905	372.72	14,955	64,977
371.68	13,528	50,176	372.74	14,983	65,276
371.70	13,554	50,446	372.76	15,010	65,576
371.72	13,580	50,718	372.78	15,038	65,876
371.74	13,607	50,990	372.80	15,066	66,178
371.76	13,633	51,262	372.82	15,094	66,479
371.78	13,659	51,535	372.84	15,122	66,781

Stage-Area-Storage for Pond B2c: Surface Basin - Bldg2 Southwest

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	
374.00	11,840	0	
374.02	11,912	238	
374.04	11,985	476	
374.06	12,057	717	
374.08	12,130	959	
374.10	12,202	1,202	
374.12	12,275	1,447	
374.14	12,347	1,693	
374.16	12,420	1,941	
374.18	12,492	2,190	
374.20	12,565	2,440	
374.22	12,637	2,693	
374.24	12,710	2,946	
374.26	12,782	3,201	
374.28	12,855	3,457	
374.30	12,927	3,715	
374.32	13,000	3,974	
374.34	13,072	4,235	
374.36	13,145	4,497	
374.38	13,217	4,761	
374.40	13,290	5,026	
374.42	13,362	5,292	
374.44	13,435	5,560	
374.46	13,507	5,830	
374.48	13,580	6,101	
374.50	13,652	6,373	
374.52	13,724	6,647	
374.54	13,797	6,922	
374.56	13,869	7,199	
374.58	13,942	7,477	
374.60	14,014	7,756	
374.62	14,087	8,037	
374.64	14,159	8,320	
374.66	14,232	8,604	
374.68	14,304	8,889	
374.70	14,377	9,176	
374.72	14,449	9,464	
374.74	14,522	9,754	
374.76	14,594	10,045	
374.78	14,667	10,338	
374.80	14,739	10,632	
374.82	14,812	10,927	
374.84	14,884	11,224	
374.86	14,957	11,523	
374.88	15,029	11,822	
374.90	15,102	12,124	
374.92	15,174	12,426	
374.94	15,247	12,731	
374.96	15,319	13,036	
374.98	15,392	13,343	
375.00	15,464	13,652	
375.02	15,536	13,962	
375.04	15,609	14,273	
375.06	15,681	14,586	
375.08	15,754	14,901	
375.10	15,826	15,217	
375.12	15,899	15,534	
375.14	15,971	15,852	
375.16	16,044	16,173	
375.18	16,116	16,494	
375.20	16,189	16,817	
375.22	16,261	17,142	
375.24	16,334	17,468	
375.26	16,406	17,795	
375.28	16,479	18,124	
375.30	16,551	18,454	
375.32	16,624	18,786	
375.34	16,696	19,119	
375.36	16,769	19,454	
375.38	16,841	19,790	
375.40	16,914	20,128	
375.42	16,986	20,467	
375.44	17,059	20,807	
375.46	17,131	21,149	
375.48	17,204	21,492	
375.50	17,276	21,837	
375.52	17,348	22,183	
375.54	17,421	22,531	
375.56	17,493	22,880	
375.58	17,566	23,231	
375.60	17,638	23,583	
375.62	17,711	23,936	
375.64	17,783	24,291	
375.66	17,856	24,648	
375.68	17,928	25,005	
375.70	18,001	25,365	
375.72	18,073	25,725	
375.74	18,146	26,088	
375.76	18,218	26,451	26,270
375.78	18,291	26,816	
375.80	18,363	27,183	
375.82	18,436	27,551	
375.84	18,508	27,920	
375.86	18,581	28,291	
375.88	18,653	28,664	
375.90	18,726	29,037	
375.92	18,798	29,413	
375.94	18,871	29,789	
375.96	18,943	30,167	
375.98	19,016	30,547	
376.00	19,088	30,928	
376.02	19,131	31,310	
376.04	19,175	31,693	
376.06	19,218	32,077	
376.08	19,261	32,462	
376.10	19,305	32,848	

Stage-Area-Storage for Pond UG2d: UG Basin - Bldg2 East

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	
371.00	**21,589**	0	372.06	21,589	12,311	
371.02	21,589	173	372.08	21,589	12,685	
371.04	21,589	345	372.10	21,589	13,058	
371.06	21,589	518	372.12	21,589	13,432	
371.08	21,589	691	372.14	21,589	13,805	
371.10	21,589	864	372.16	21,589	14,177	
371.12	21,589	1,036	372.18	21,589	14,549	
371.14	21,589	1,209	372.20	21,589	14,921	
371.16	21,589	1,382	372.22	21,589	15,293	
371.18	21,589	1,554	372.24	21,589	15,664	
371.20	21,589	1,727	372.26	21,589	16,036	
371.22	21,589	1,900	372.28	21,589	16,406	
371.24	21,589	2,073	372.30	21,589	16,777	
371.26	21,589	2,245	372.32	21,589	17,147	
371.28	21,589	2,418	372.34	21,589	17,517	
371.30	21,589	2,591	372.36	21,589	17,886	
371.32	21,589	2,763	372.38	21,589	18,255	
371.34	21,589	2,936	372.40	21,589	18,624	
371.36	21,589	3,109	372.42	21,589	18,993	
371.38	21,589	3,282	372.44	21,589	19,361	
371.40	21,589	3,454	372.46	21,589	19,728	
371.42	21,589	3,627	372.48	21,589	20,096	
371.44	21,589	3,800	372.50	21,589	20,462	
371.46	21,589	3,972	372.52	21,589	20,829	
371.48	21,589	4,145	372.54	21,589	21,195	
371.50	21,589	4,318	372.56	21,589	21,561	
371.52	21,589	4,491	372.58	21,589	21,926	
371.54	21,589	4,663	372.60	21,589	22,291	
371.56	21,589	4,836	372.62	21,589	22,655	
371.58	21,589	5,009	372.64	21,589	23,019	
371.60	21,589	5,181	372.66	21,589	23,383	
371.62	21,589	5,354	372.68	21,589	23,746	
371.64	21,589	5,527	372.70	21,589	24,109	
371.66	21,589	5,699	372.72	21,589	24,471	
371.68	21,589	5,872	372.74	21,589	24,833	
371.70	21,589	6,045	372.76	21,589	25,194	
371.72	21,589	6,218	372.78	21,589	25,555	
371.74	21,589	6,390	372.80	21,589	25,915	
371.76	21,589	6,666	372.82	21,589	26,276	
371.78	21,589	7,044	372.84	21,589	26,635	
371.80	21,589	7,422	372.86	21,589	26,994	26,815
371.82	21,589	7,800	372.88	21,589	27,353	
371.84	21,589	8,178	372.90	21,589	27,711	
371.86	21,589	8,555	372.92	21,589	28,069	
371.88	21,589	8,932	372.94	21,589	28,426	
371.90	21,589	9,308	372.96	21,589	28,783	
371.92	21,589	9,685	372.98	21,589	29,139	
371.94	21,589	10,061	373.00	21,589	29,495	
371.96	21,589	10,436	373.02	21,589	29,850	
371.98	21,589	10,812	373.04	21,589	30,205	
372.00	21,589	11,187	373.06	21,589	30,559	
372.02	21,589	11,562	373.08	21,589	30,912	
372.04	21,589	11,936	373.10	21,589	31,265	

Stage-Area-Storage for Pond UG2e: UG Basin - Bldg2 South (continued)

13,736

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
376.37	8,389	12,192	377.43	8,389	18,995
376.39	8,389	12,327	377.45	8,389	19,114
376.41	8,389	12,462	377.47	8,389	19,232
376.43	8,389	12,597	377.49	8,389	19,351
376.45	8,389	12,732	377.51	8,389	19,468
376.47	8,389	12,867	377.53	8,389	19,586
376.49	8,389	13,001	377.55	8,389	19,703
376.51	8,389	13,135	377.57	8,389	19,819
376.53	8,389	13,269	377.59	8,389	19,935
376.55	8,389	13,402	377.61	8,389	20,051
376.57	8,389	13,536	377.63	8,389	20,166
376.59	8,389	13,669	377.65	8,389	20,280
376.61	8,389	13,802	377.67	8,389	20,394
376.63	8,389	13,934	377.69	8,389	20,508
376.65	8,389	14,067	377.71	8,389	20,621
376.67	8,389	14,199	377.73	8,389	20,733
376.69	8,389	14,331	377.75	8,389	20,845
376.71	8,389	14,462	377.77	8,389	20,957
376.73	8,389	14,593	377.79	8,389	21,067
376.75	8,389	14,724	377.81	8,389	21,178
376.77	8,389	14,855	377.83	8,389	21,287
376.79	8,389	14,986	377.85	8,389	21,396
376.81	8,389	15,116	377.87	8,389	21,505
376.83	8,389	15,246	377.89	8,389	21,612
376.85	8,389	15,376	377.91	8,389	21,720
376.87	8,389	15,505	377.93	8,389	21,826
376.89	8,389	15,634	377.95	8,389	21,932
376.91	8,389	15,763	377.97	8,389	22,037
376.93	8,389	15,891	377.99	8,389	22,142
376.95	8,389	16,020	378.01	8,389	22,246
376.97	8,389	16,148	378.03	8,389	22,349
376.99	8,389	16,275	378.05	8,389	22,451
377.01	8,389	16,403	378.07	8,389	22,553
377.03	8,389	16,529	378.09	8,389	22,653
377.05	8,389	16,656	378.11	8,389	22,753
377.07	8,389	16,782	378.13	8,389	22,852
377.09	8,389	16,908	378.15	8,389	22,950
377.11	8,389	17,034	378.17	8,389	23,048
377.13	8,389	17,159	378.19	8,389	23,144
377.15	8,389	17,284	378.21	8,389	23,239
377.17	8,389	17,409	378.23	8,389	23,333
377.19	8,389	17,533	378.25	8,389	23,426
377.21	8,389	17,657	378.27	8,389	23,518
377.23	8,389	17,781	378.29	8,389	23,608
377.25	8,389	17,904	378.31	8,389	23,697
377.27	8,389	18,026	378.33	8,389	23,785
377.29	8,389	18,149	378.35	8,389	23,870
377.31	8,389	18,271	378.37	8,389	23,954
377.33	8,389	18,392	378.39	8,389	24,037
377.35	8,389	18,514	378.41	8,389	24,117
377.37	8,389	18,634	378.43	8,389	24,197
377.39	8,389	18,755	378.45	8,389	24,275
377.41	8,389	18,875	378.47	8,389	24,352

Stage-Area-Storage for Pond B3a: Surface Basin - Bldg3 Northwest (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
376.18	62,722	176,461	376.71	64,286	210,118
376.19	62,752	177,089	376.72	64,316	210,761
376.20	62,781	177,716	376.73	64,345	211,405
376.21	62,811	178,344	376.74	64,375	212,048
376.22	62,840	178,972	376.75	64,404	212,692
376.23	62,870	179,601	376.76	64,434	213,336
376.24	62,899	180,230	376.77	64,463	213,981
376.25	62,929	180,859	376.78	64,493	214,626
376.26	62,958	181,488	376.79	64,522	215,271
376.27	62,988	182,118	376.80	64,552	215,916
376.28	63,017	182,748	376.81	64,581	216,562
376.29	63,047	183,378	376.82	64,611	217,208
376.30	63,076	184,009	376.83	64,640	217,854
376.31	63,106	184,640	376.84	64,670	218,501
376.32	63,135	185,271	376.85	64,699	219,147
376.33	63,165	185,903	376.86	64,729	219,795
376.34	63,194	186,535	376.87	64,758	220,442
376.35	63,224	187,167	376.88	64,788	221,090
376.36	63,253	187,799	376.89	64,817	221,738
376.37	63,283	188,432	376.90	64,847	222,386
376.38	63,312	189,065	376.91	64,876	223,035
376.39	63,342	189,698	376.92	64,906	223,684
376.40	63,371	190,331	376.93	64,935	224,333
376.41	63,401	190,965	376.94	64,965	224,982
376.42	63,430	191,599	376.95	64,994	225,632
376.43	63,460	192,234	376.96	65,024	226,282
376.44	63,489	192,869	376.97	65,053	226,933
376.45	63,519	193,504	376.98	65,083	227,583
376.46	63,548	194,139	376.99	65,112	228,234
376.47	63,578	194,775	377.00	65,142	228,886
376.48	63,607	195,411	377.01	65,172	229,537
376.49	63,637	196,047	377.02	65,201	230,189
376.50	63,667	196,683	377.03	65,231	230,841
376.51	63,696	197,320	377.04	65,260	231,494
376.52	63,726	197,957	377.05	65,290	232,146
376.53	63,755	198,595	377.06	65,319	232,799
376.54	63,785	199,232	377.07	65,349	233,453
376.55	63,814	199,870	377.08	65,378	234,106
376.56	63,844	200,509	377.09	65,408	234,760
376.57	63,873	201,147	377.10	65,437	235,414
376.58	63,903	201,786	377.11	65,467	236,069
376.59	63,932	202,425	377.12	65,496	236,724
376.60	63,962	203,065	377.13	65,526	237,379
376.61	63,991	203,705	377.14	65,555	238,034
376.62	64,021	204,345	377.15	65,585	238,690
376.63	64,050	204,985	377.16	65,614	239,346
376.64	64,080	205,626	377.17	65,644	240,002
376.65	64,109	206,267	377.18	65,673	240,659
376.66	64,139	206,908	377.19	65,703	241,316
376.67	64,168	207,549	377.20	65,732	241,973
376.68	64,198	208,191	377.21	65,762	242,630
376.69	64,227	208,833	377.22	65,791	243,288
376.70	64,257	209,476	377.23	65,821	243,946

Stage-Area-Storage for Pond B3b: Surface Basin - Bldg3 West (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	
385.12	10,556	16,091	
385.14	10,618	16,303	
385.16	10,679	16,516	
385.18	10,740	16,730	
385.20	10,801	16,946	
385.22	10,862	17,162	
385.24	10,924	17,380	
385.26	10,985	17,599	
385.28	11,046	17,819	
385.30	11,107	18,041	
385.32	11,169	18,264	
385.34	11,230	18,488	
385.36	11,291	18,713	
385.38	11,352	18,939	
385.40	11,413	19,167	
385.42	11,475	19,396	
385.44	11,536	19,626	
385.46	11,597	19,857	
385.48	11,658	20,090	
385.50	11,720	20,324	
385.52	11,781	20,559	
385.54	11,842	20,795	
385.56	11,903	21,032	
385.58	11,964	21,271	
385.60	12,026	21,511	
385.62	12,087	21,752	
385.64	12,148	21,994	
385.66	12,209	22,238	
385.68	12,270	22,483	
385.70	12,332	22,729	
385.72	12,393	22,976	
385.74	12,454	23,224	
385.76	12,515	23,474	
385.78	12,577	23,725	
385.80	12,638	23,977	
385.82	12,699	24,231	
385.84	12,760	24,485	
385.86	12,821	24,741	
385.88	12,883	24,998	
385.90	12,944	25,256	
385.92	13,005	25,516	
385.94	13,066	25,777	
385.96	13,128	26,038	
385.98	13,189	26,302	
386.00	13,250	26,566	
386.02	13,287	26,831	
386.04	13,323	27,097	
386.06	13,360	27,364	
386.08	13,397	27,632	
386.10	13,434	27,900	
386.12	13,470	28,169	
386.14	13,507	28,439	
386.16	13,544	28,709	
386.18	13,580	28,981	
386.20	13,617	29,253	
386.22	13,654	29,525	
386.24	13,690	29,799	
386.26	13,727	30,073	
386.28	13,764	30,348	
386.30	13,801	30,624	
386.32	13,837	30,900	
386.34	13,874	31,177	31,316
386.36	13,911	31,455	
386.38	13,947	31,733	
386.40	13,984	32,013	
386.42	14,021	32,293	
386.44	14,057	32,574	
386.46	14,094	32,855	
386.48	14,131	33,137	
386.50	14,168	33,420	
386.52	14,204	33,704	
386.54	14,241	33,989	
386.56	14,278	34,274	
386.58	14,314	34,560	
386.60	14,351	34,846	
386.62	14,388	35,134	
386.64	14,424	35,422	
386.66	14,461	35,711	
386.68	14,498	36,000	
386.70	14,534	36,291	
386.72	14,571	36,582	
386.74	14,608	36,873	
386.76	14,645	37,166	
386.78	14,681	37,459	
386.80	14,718	37,753	
386.82	14,755	38,048	
386.84	14,791	38,343	
386.86	14,828	38,640	
386.88	14,865	38,937	
386.90	14,901	39,234	
386.92	14,938	39,533	
386.94	14,975	39,832	
386.96	15,012	40,132	
386.98	15,048	40,432	
387.00	15,085	40,734	
387.02	15,122	41,036	
387.04	15,158	41,338	
387.06	15,195	41,642	
387.08	15,232	41,946	
387.10	15,269	42,251	
387.12	15,305	42,557	
387.14	15,342	42,863	
387.16	15,379	43,171	
387.18	15,415	43,479	
387.20	15,452	43,787	
387.22	15,489	44,097	

Stage-Area-Storage for Pond UG3c: UG Basin - Bldg3 East (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	
383.24	20,670	64,945	384.30	20,670	78,427	
383.26	20,670	65,233	384.32	20,670	78,625	
383.28	20,670	65,519	384.34	20,670	78,820	
383.30	20,670	65,805	384.36	20,670	79,011	
383.32	20,670	66,089	384.38	20,670	79,201	
383.34	20,670	66,373	384.40	20,670	79,388	
383.36	20,670	66,655	384.42	20,670	79,573	
383.38	20,670	66,937	384.44	20,670	79,757	
383.40	20,670	67,217	384.46	20,670	79,939	
383.42	20,670	67,497	384.48	20,670	80,121	
383.44	20,670	67,775	384.50	20,670	80,302	
383.46	20,670	68,052	384.52	20,670	80,481	
383.48	20,670	68,329	384.54	20,670	80,660	
383.50	20,670	68,604	384.56	20,670	80,838	
383.52	20,670	68,878	384.58	20,670	81,015	
383.54	20,670	69,151	384.60	20,670	81,191	
383.56	20,670	69,423	384.62	20,670	81,366	
383.58	20,670	69,694	384.64	20,670	81,540	
383.60	20,670	69,963	384.66	20,670	81,712	
383.62	20,670	70,232	384.68	20,670	81,883	
383.64	20,670	70,499	384.70	20,670	82,053	
383.66	20,670	70,765	384.72	20,670	82,222	
383.68	20,670	71,030	384.74	20,670	82,389	
383.70	20,670	71,294	384.76	20,670	82,554	82,472
383.72	20,670	71,556	384.78	20,670	82,720	
383.74	20,670	71,818	384.80	20,670	82,885	
383.76	20,670	72,077	384.82	20,670	83,050	
383.78	20,670	72,336	384.84	20,670	83,216	
383.80	20,670	72,593	384.86	20,670	83,381	
383.82	20,670	72,848	384.88	20,670	83,546	
383.84	20,670	73,102	384.90	20,670	83,712	
383.86	20,670	73,355	384.92	20,670	83,877	
383.88	20,670	73,606	384.94	20,670	84,042	
383.90	20,670	73,856	384.96	20,670	84,208	
383.92	20,670	74,104	384.98	20,670	84,373	
383.94	20,670	74,350	385.00	20,670	84,538	
383.96	20,670	74,595	385.02	20,670	84,704	
383.98	20,670	74,838	385.04	20,670	84,869	
384.00	20,670	75,080	385.06	20,670	85,035	
384.02	20,670	75,319	385.08	20,670	85,200	
384.04	20,670	75,557	385.10	20,670	85,365	
384.06	20,670	75,793	385.12	20,670	85,531	
384.08	20,670	76,027	385.14	20,670	85,696	
384.10	20,670	76,259	385.16	20,670	85,861	
384.12	20,670	76,488	385.18	20,670	86,027	
384.14	20,670	76,716	385.20	20,670	86,192	
384.16	20,670	76,941	385.22	20,670	86,357	
384.18	20,670	77,163	385.24	20,670	86,523	
384.20	20,670	77,382	385.26	20,670	86,688	
384.22	20,670	77,598	385.28	20,670	86,853	
384.24	20,670	77,811	385.30	20,670	87,019	
384.26	20,670	78,020	385.32	20,670	87,184	
384.28	20,670	78,225	385.34	20,670	87,350	

Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 23, 2022

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: 44% Pre-Treatment: Basin 2a, Basin 2b, Basin 2c, Basin 3a, and Basin 3b

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Forebay	**0.25**	**0.75**	**0.19**	**0.56**
		Total TSS Removal =	**44%**	

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

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 23, 2022

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: Treatment: Basin 2a, Basin 2b, Basin 2c, Basin 3a, Basin 3b

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin With Forebay	**0.80**	**0.75**	**0.60**	**0.15**
		Total TSS Removal =	**85%**	

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

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Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 23, 2022

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: 44% Pre Treatment: UG2d, UG2e, UG3c

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Isolator Row	**0.25**	**0.75**	**0.19**	**0.56**
		Total TSS Removal =	**44%**	

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

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Sutton, MA
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March 23, 2022

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: Treatment: UG2d, UG2e, UG3c

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Underground Infiltration Basin with Isolator Row	**0.80**	**0.75**	**0.60**	**0.15**
		Total TSS Removal =	**85%**	

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

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Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
February 22, 2022

Forebay Sizing Calculations

Forebay F2a (Basin 2a)	
Total Post Develpoment Impervious Area (acres)	3.09
Forebay Volume Required (cf)	1,122
Forebay Volume Provided (cf)*	**1,383**

Forebay F2b (Basin 2b)	
Total Post Develpoment Impervious Area (acres)	0.3
Forebay Volume Required (cf)	109
Forebay Volume Provided (cf)*	**415**

Forebay F2c (Basin 2c)	
Total Post Develpoment Impervious Area (acres)	2.54
Forebay Volume Required (cf)	922
Forebay Volume Provided (cf)*	**1,264**

Forebay F3a (Basin 3a)	
Total Post Develpoment Impervious Area (acres)	4.37
Forebay Volume Required (cf)	1,586
Forebay Volume Provided (cf)*	**2,624**

Forebay F3b (Basin 3b)	
Total Post Develpoment Impervious Area (acres)	2.29
Forebay Volume Required (cf)	831
Forebay Volume Provided (cf)*	**1,670**

*Volume provided below lowest outlet of forebay, refer to attached storage tables

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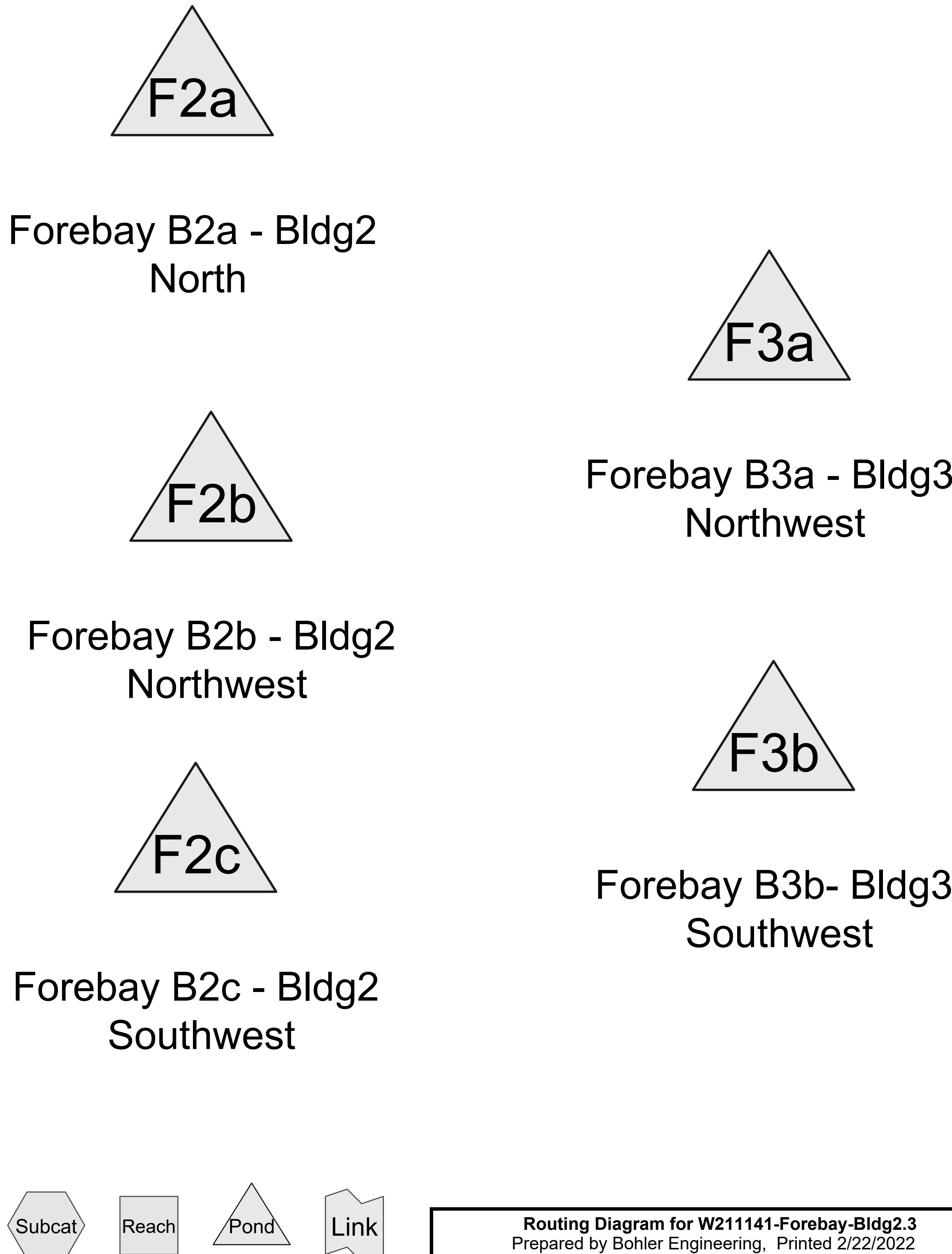

Routing Diagram for W211141-Forebay-Bldg2.3
Prepared by Bohler Engineering, Printed 2/22/2022

Summary for Pond F2a: Forebay B2a - Bldg2 North

Volume	Invert	Avail.Storage	Storage Description
#1	346.00'	1,383 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) x 1.1

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
346.00	1,048	0	0
347.00	1,467	1,258	1,258

Summary for Pond F2b: Forebay B2b - Bldg2 Northwest

Volume	Invert	Avail.Storage	Storage Description
#1	366.50'	415 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) x 1.1

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
366.50	268	0	0
367.50	486	377	377

Summary for Pond F2c: Forebay B2c - Bldg2 Southwest

Volume	Invert	Avail.Storage	Storage Description
#1	374.00'	1,264 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) x 1.1

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
374.00	930	0	0
375.00	1,369	1,150	1,150

Summary for Pond F3a: Forebay B3a - Bldg3 Northwest

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	2,624 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) x 1.1

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
373.00	2,082	0	0
374.00	2,689	2,386	2,386

Summary for Pond F3b: Forebay B3b- Bldg3 Southwest

Volume	Invert	Avail.Storage	Storage Description
#1	383.00'	1,670 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) x 1.1

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
383.00	1,189	0	0
384.00	1,848	1,519	1,519

Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		25	Year	Design Period Intensity*			6.6	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										
DCB-100	DMH-100	0.62	0.95	0.59	0.00	0.30	0.00	0.59	6	6.6	3.90	15	0.010	HDPE	0.012	7.00	5.70
DCB-101	DMH-100	0.62	0.95	0.59	0.00	0.30	0.00	0.59	6	6.6	3.90	12	0.018	HDPE	0.012	5.11	6.50
DMH-100	DMH-101	1.25	0.95	1.18	0.00	0.30	0.00	1.18	6	6.6	7.81	18	0.010	HDPE	0.012	11.21	6.34
DCB-102	DMH-101	0.64	0.95	0.60	0.03	0.30	0.01	0.61	6	6.6	4.05	15	0.010	HDPE	0.012	6.96	5.67
RD-100	DMH-102	1.94	0.95	1.84	0.00	0.30	0.00	1.84	6	6.6	12.16	18	0.013	HDPE	0.012	13.07	7.40
DMH-102	DMH-103	1.94	0.95	1.84	0.00	0.30	0.00	1.84	6	6.6	12.16	18	0.012	HDPE	0.012	12.47	7.05
DMH-103	DMH-104	1.94	0.95	1.84	0.00	0.30	0.00	1.84	6	6.6	12.16	18	0.012	HDPE	0.012	12.47	7.05
RD-101	DMH-104	1.78	0.95	1.69	0.00	0.30	0.00	1.69	6	6.6	11.18	18	0.013	HDPE	0.012	13.02	7.37
DMH-104	DMH-101	3.72	0.95	3.54	0.00	0.30	0.00	3.54	6	6.6	23.34	24	0.015	HDPE	0.012	30.02	9.55
DMH-101	DMH-105	5.60	0.95	5.32	0.03	0.30	0.01	5.33	6	6.6	35.20	30	0.011	HDPE	0.012	45.53	9.28
DMH-105	DMH-106	5.60	0.95	5.32	0.03	0.30	0.01	5.33	6	6.6	35.20	30	0.010	HDPE	0.012	44.21	9.01
CB-103	DMH-106	0.23	0.95	0.22	0.21	0.30	0.06	0.28	6	6.6	1.87	12	0.028	HDPE	0.012	6.44	8.19
DMH-106	DMH-107	5.84	0.95	5.54	0.24	0.30	0.07	5.62	6	6.6	37.06	30	0.010	HDPE	0.012	44.44	9.05
DCB-201	DMH-111	0.15	0.95	0.15	0.03	0.30	0.01	0.16	6	6.6	1.03	12	0.006	HDPE	0.012	2.86	3.64
DCB-203	DMH-111	0.60	0.95	0.57	0.10	0.30	0.03	0.60	6	6.6	3.97	15	0.009	HDPE	0.012	6.60	5.38
DMH-111	DMH-110	0.75	0.95	0.72	0.14	0.30	0.04	0.76	6	6.6	5.00	15	0.005	HDPE	0.012	5.14	4.19
DMH-110	DMH-109	0.75	0.95	0.72	0.14	0.30	0.04	0.76	6	6.6	5.00	15	0.005	HDPE	0.012	5.05	4.11
CB-104	DMH-109	0.16	0.95	0.15	0.13	0.30	0.04	0.19	6	6.6	1.26	12	0.020	HDPE	0.012	5.51	7.02
DMH-109	DMH-108	0.91	0.95	0.87	0.27	0.30	0.08	0.95	6	6.6	6.26	18	0.006	HDPE	0.012	8.44	4.78
RD-202	DMH-108	1.90	0.95	1.81	0.00	0.30	0.00	1.81	6	6.6	11.93	18	0.022	HDPE	0.012	16.72	9.46
DMH-108	DMH-107	2.82	0.95	2.68	0.27	0.30	0.08	2.76	6	6.6	18.19	24	0.015	HDPE	0.012	30.02	9.55

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Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.6**	**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										
DMH-107	DMH-112	8.65	0.95	8.22	0.50	0.30	0.15	8.37	6	6.6	55.26	36	0.008	HDPE	0.012	64.63	9.14
DMH-112	FES-100	8.65	0.95	8.22	0.50	0.30	0.15	8.37	6	6.6	55.26	36	0.008	HDPE	0.012	64.63	9.14
OCS--100	HW-101	Value from HydroCAD (100-yr)									10.90	18	0.014	HDPE	0.012	13.46	7.62
CB-200A	DMH-200	0.20	0.95	0.19	0.04	0.30	0.01	0.20	6	6.6	1.34	12	0.023	HDPE	0.012	5.85	7.45
RD-200	DMH-200	1.89	0.95	1.80	0.00	0.30	0.00	1.80	6	6.6	11.88	18	0.022	HDPE	0.012	16.88	9.55
DMH-200	DMH-201	2.09	0.95	1.99	0.04	0.30	0.01	2.00	6	6.6	13.21	18	0.015	HDPE	0.012	13.94	7.89
CB-200	DMH-201	0.20	0.95	0.19	0.09	0.30	0.03	0.22	6	6.6	1.43	12	0.018	HDPE	0.012	5.11	6.50
DMH-201	DMH-202	2.29	0.95	2.18	0.09	0.30	0.03	2.21	6	6.6	14.57	18	0.020	HDPE	0.012	16.09	9.11
TD-2A	DMH-202A	0.04	0.95	0.04	0.00	0.30	0.00	0.04	6	6.6	0.24	12	0.005	HDPE	0.012	2.84	3.61
DMH-202A	DMH-202	0.04	0.95	0.04	0.00	0.30	0.00	0.04	6	6.6	0.24	12	0.006	HDPE	0.012	2.96	3.77
DMH-202	DMH-203	2.33	0.95	2.21	0.09	0.30	0.03	2.24	6	6.6	14.80	18	0.018	HDPE	0.012	15.31	8.66
DMH-203	FES-200	2.33	0.95	2.21	0.09	0.30	0.03	2.24	6	6.6	14.80	18	0.018	HDPE	0.012	15.27	8.64
OCS-200	HW-201	Value from HydroCAD (100-yr)									0.00	12	0.030	HDPE	0.012	6.73	8.57
RD-301	DMH-303	2.00	0.95	1.90	0.00	0.30	0.00	1.90	6	6.6	12.55	18	0.020	HDPE	0.012	16.09	9.11
CB-304	DMH-303	0.33	0.95	0.31	0.11	0.30	0.03	0.34	6	6.6	2.26	12	0.012	HDPE	0.012	4.23	5.38
DMH-303	DMH-304	2.33	0.95	2.21	0.11	0.30	0.03	2.24	6	6.6	14.81	24	0.006	HDPE	0.012	18.98	6.04
DCB-305	DMH-304	0.84	0.95	0.80	0.12	0.30	0.03	0.83	6	6.6	5.51	15	0.012	HDPE	0.012	7.67	6.25
DMH-304	DMH-305	3.17	0.95	3.01	0.22	0.30	0.07	3.08	6	6.6	20.32	24	0.007	HDPE	0.012	20.50	6.53
RD-300	DMH-300	1.56	0.95	1.48	0.00	0.30	0.00	1.48	6	6.6	9.80	18	0.008	HDPE	0.012	10.11	5.72
TD-2B	DMH-300	0.05	0.95	0.05	0.00	0.30	0.00	0.05	6	6.6	0.32	12	0.006	HDPE	0.012	3.04	3.87
DMH-300	DMH-301	1.61	0.95	1.53	0.00	0.30	0.00	1.53	6	6.6	10.12	18	0.011	HDPE	0.012	11.94	6.75

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Proposed Buildings 2 & 3
UNIFIED Parkway
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Bohler Job Number: W211141
March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***		**6.6**	**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										
DMH-301	DMH-302	1.61	0.95	1.53	0.00	0.30	0.00	1.53	6	6.6	10.12	18	0.012	HDPE	0.012	12.47	7.05
DCB-303	DMH-302	1.18	0.95	1.12	0.32	0.30	0.10	1.21	6	6.6	8.01	15	0.015	HDPE	0.012	8.57	6.98
DMH-302	DMH-305	2.79	0.95	2.65	0.32	0.30	0.10	2.75	6	6.6	18.13	24	0.011	HDPE	0.012	25.70	8.18
DMH-305	FES-300	5.96	0.95	5.66	0.54	0.30	0.16	5.83	6	6.6	38.45	36	0.006	HDPE	0.012	55.97	7.92
OCS-300	HW-301	Value from HydroCAD (100-yr)									5.50	12	0.025	HDPE	0.012	6.09	7.75
DCB-400	DMH-400	0.79	0.95	0.75	0.62	0.30	0.18	0.94	6	6.6	6.18	15	0.008	HDPE	0.012	6.18	5.04
DCB-401	DMH-400	0.63	0.95	0.59	0.00	0.30	0.00	0.59	6	6.6	3.93	15	0.016	HDPE	0.012	8.80	7.17
DMH-400	DMH-401	1.42	0.95	1.35	0.62	0.30	0.18	1.53	6	6.6	10.10	18	0.008	HDPE	0.012	10.18	5.76
RD-400	DMH-407	1.92	0.95	1.82	0.00	0.30	0.00	1.82	6	6.6	12.02	18	0.014	HDPE	0.012	13.46	7.62
DMH-407	DMH-408	1.92	0.95	1.82	0.00	0.30	0.00	1.82	6	6.6	12.02	18	0.012	HDPE	0.012	12.47	7.05
DMH-408	DMH-409	1.92	0.95	1.82	0.00	0.30	0.00	1.82	6	6.6	12.02	18	0.012	HDPE	0.012	12.47	7.05
RD-403	DMH-409	1.98	0.95	1.88	0.00	0.30	0.00	1.88	6	6.6	12.39	18	0.013	HDPE	0.012	12.72	7.20
DMH-409	DMH-401	3.89	0.95	3.70	0.00	0.30	0.00	3.70	6	6.6	24.42	24	0.010	HDPE	0.012	24.87	7.92
DMH-401	DMH-402	5.31	0.95	5.05	0.62	0.30	0.18	5.23	6	6.6	34.52	30	0.010	HDPE	0.012	44.44	9.05
DCB-403	DMH-403	0.63	0.95	0.60	0.00	0.30	0.00	0.60	6	6.6	3.93	15	0.029	HDPE	0.012	11.83	9.64
DCB-402	DMH-404	0.63	0.95	0.59	0.00	0.30	0.00	0.59	6	6.6	3.92	15	0.030	HDPE	0.012	12.16	9.91
OCS-400	DMH-400A	Value from HydroCAD (100-yr)									16.40	24	0.015	HDPE	0.012	30.02	9.55
DMH-400A	HW-400	Value from HydroCAD (100-yr)									16.40	24	0.015	HDPE	0.012	30.02	9.55
CB-500	DMH-500	0.26	0.95	0.25	1.43	0.30	0.43	0.68	6	6.6	4.46	15	0.007	HDPE	0.012	5.73	4.67
DMH-500	DMH-501	0.26	0.95	0.25	1.43	0.30	0.43	0.68	6	6.6	4.46	15	0.005	HDPE	0.012	4.95	4.03
DCB-501	DMH-501	0.28	0.95	0.26	0.42	0.30	0.13	0.39	6	6.6	2.55	12	0.012	HDPE	0.012	4.19	5.34

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March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.6**	**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										
DCB-502	DMH-501	0.25	0.95	0.24	0.15	0.30	0.04	0.28	6	6.6	1.86	12	0.005	HDPE	0.012	2.84	3.61
DMH-501	DMH-502	0.79	0.95	0.75	1.99	0.30	0.60	1.35	6	6.6	8.88	24	0.005	HDPE	0.012	17.33	5.52
CB-503	DMH-504	0.31	0.95	0.29	0.41	0.30	0.12	0.42	6	6.6	2.74	12	0.012	HDPE	0.012	4.17	5.32
CB-503A	DMH-504	0.09	0.95	0.08	0.02	0.30	0.01	0.09	6	6.6	0.60	12	0.017	HDPE	0.012	4.99	6.35
DMH-504	DMH-502	0.40	0.95	0.38	0.44	0.30	0.13	0.51	6	6.6	3.34	12	0.020	HDPE	0.012	5.46	6.95
DMH-502	DMH-505A	1.18	0.95	1.12	2.43	0.30	0.73	1.85	6	6.6	12.22	24	0.006	HDPE	0.012	18.34	5.84
CB-507	DMH-505A	0.35	0.95	0.33	0.04	0.30	0.01	0.34	6	6.6	2.25	12	0.020	HDPE	0.012	5.46	6.95
CB-505	DMH-507	0.31	0.95	0.29	0.01	0.30	0.00	0.30	6	6.6	1.97	12	0.021	HDPE	0.012	5.58	7.10
CB-504	DMH-507	0.17	0.95	0.16	0.01	0.30	0.00	0.17	6	6.6	1.11	12	0.030	HDPE	0.012	6.65	8.47
DMH-507	DMH-503	0.48	0.95	0.46	0.02	0.30	0.01	0.47	6	6.6	3.07	12	0.026	HDPE	0.012	6.24	7.94
OCS-500	DMH-506	Value from HydroCAD (100-yr)									1.80	12	0.012	HDPE	0.012	4.23	5.38
CB-800	DMH-800	0.26	0.95	0.24	0.58	0.30	0.17	0.42	6	6.6	2.76	12	0.019	HDPE	0.012	5.28	6.72
CB-801	DMH-800	0.15	0.95	0.14	0.19	0.30	0.06	0.20	6	6.6	1.32	12	0.005	HDPE	0.012	2.73	3.47
DMH-800	DMH-800A	0.41	0.95	0.39	0.77	0.30	0.23	0.62	6	6.6	4.08	15	0.005	HDPE	0.012	4.95	4.03
CB-803	DMH-800A	0.29	0.95	0.27	0.48	0.30	0.15	0.42	6	6.6	2.77	12	0.005	HDPE	0.012	2.78	3.54
DMH-800A	DMH-802	0.70	0.95	0.66	1.25	0.30	0.38	1.04	6	6.6	6.85	18	0.005	HDPE	0.012	7.97	4.51
DCB-802	DMH-802A	0.75	0.95	0.72	0.05	0.30	0.01	0.73	6	6.6	4.82	18	0.005	HDPE	0.012	8.13	4.60
DCB-802A	DMH-802A	0.71	0.95	0.67	0.00	0.30	0.00	0.67	6	6.6	4.45	15	0.007	HDPE	0.012	5.90	4.81
DMH-802A	DMH-802	1.46	0.95	1.39	0.05	0.30	0.01	1.40	6	6.6	9.27	15	0.024	HDPE	0.012	10.89	8.87
RD-800	DMH-801A	1.29	0.95	1.23	0.00	0.30	0.00	1.23	6	6.6	8.11	15	0.020	HDPE	0.012	9.87	8.04
DMH-801A	DMH-801	1.29	0.95	1.23	0.00	0.30	0.00	1.23	6	6.6	8.11	15	0.029	HDPE	0.012	12.00	9.78

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Proposed Buildings 2 & 3
UNIFIED Parkway
Sutton, MA
Bohler Job Number: W211141
March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.6**	**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										
RD-802	DMH-806	1.14	0.95	1.08	0.00	0.30	0.00	1.08	6	6.6	7.12	15	0.027	HDPE	0.012	11.50	9.37
DMH-806	DMH-804	1.14	0.95	1.08	0.00	0.30	0.00	1.08	6	6.6	7.12	15	0.020	HDPE	0.012	9.90	8.06
RD-801	DMH-803	1.42	0.95	1.35	0.00	0.30	0.00	1.35	6	6.6	8.90	15	0.021	HDPE	0.012	10.14	8.26
DMH-803	DMH-804	1.42	0.95	1.35	0.00	0.30	0.00	1.35	6	6.6	8.90	15	0.021	HDPE	0.012	10.14	8.26
DMH-804	DMH-805	2.55	0.95	2.43	0.00	0.30	0.00	2.43	6	6.6	16.02	24	0.005	HDPE	0.012	18.01	5.73
OCS-800	DMH-807	Value from HydroCAD (100-yr)									6.50	18	0.017	HDPE	0.017	10.47	5.93
DMH-807	DMH-506	Value from HydroCAD (100-yr) (OCS-800)									6.50	18	0.007	HDPE	0.012	9.31	5.27
DMH-506	HW-500	Value from HydroCAD (100-yr) (OCS-500 AND OCS-800)									8.30	18	0.009	HDPE	0.012	10.80	6.11
RD-700	DMH-702	1.80	0.95	1.71	0.00	0.30	0.00	1.71	6	6.6	11.30	15	0.030	HDPE	0.012	12.12	9.88
DMH-702	DMH-701	1.80	0.95	1.71	0.00	0.30	0.00	1.71	6	6.6	11.30	24	0.006	HDPE	0.012	18.50	5.89
CB-703	DMH-701	0.31	0.95	0.30	1.36	0.30	0.41	0.71	6	6.6	4.65	12	0.041	HDPE	0.012	7.83	9.97
CB-702	DMH-701	0.42	0.95	0.40	1.86	0.30	0.56	0.96	6	6.6	6.32	12	0.027	HDPE	0.012	6.34	8.08
DMH-701	DMH-703	2.53	0.95	2.41	3.22	0.30	0.97	3.37	6	6.6	22.27	24	0.009	HDPE	0.012	22.86	7.28
TD-3A	DMH-703A	0.06	0.95	0.06	0.00	0.30	0.00	0.06	6	6.6	0.39	12	0.014	HDPE	0.012	4.53	5.77
DMH-703A	DMH-703	0.06	0.95	0.06	0.00	0.30	0.00	0.06	6	6.6	0.39	12	0.011	HDPE	0.012	3.97	5.06
DMH-703	DMH-704	2.60	0.95	2.47	3.22	0.30	0.97	3.43	6	6.6	22.66	30	0.006	HDPE	0.012	34.42	7.01
DMH-704	FES-701	2.60	0.95	2.47	3.22	0.30	0.97	3.43	6	6.6	22.66	30	0.006	HDPE	0.012	32.95	6.71
DCB-700	DMH-700	1.30	0.95	1.24	0.26	0.30	0.08	1.32	6	6.6	8.69	18	0.006	HDPE	0.012	8.81	4.99
DCB-701	DMH-700	0.32	0.95	0.31	0.32	0.30	0.10	0.40	6	6.6	2.67	15	0.007	HDPE	0.012	5.64	4.60
DMH-700	FES-700	1.63	0.95	1.55	0.58	0.30	0.17	1.72	6	6.6	11.35	24	0.008	HDPE	0.012	22.06	7.02
OCS-702	DMH-600	Value from HydroCAD (100-yr)									13.80	24	0.008	HDPE	0.012	22.06	7.02

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March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.6**	**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										
DCB-600	DMH-600	1.13	0.95	1.08	1.46	0.30	0.44	1.51	6	6.6	10.00	15	0.026	HDPE	0.012	11.28	9.20
DMH-600	DMH-601	1.13	0.95	1.08	1.46	0.30	0.44	1.51	6	6.6	23.80	36	0.008	HDPE	0.012	65.43	9.26
RD-600	DMH-602	1.11	0.95	1.05	0.00	0.30	0.00	1.05	6	6.6	6.96	15	0.016	HDPE	0.012	8.96	7.30
DMH-602	DMH-601	1.11	0.95	1.05	0.00	0.30	0.00	1.05	6	6.6	6.96	15	0.021	HDPE	0.012	10.14	8.26
DCB-601	DMH-601	0.84	0.95	0.80	0.53	0.30	0.16	0.96	6	6.6	6.34	15	0.015	HDPE	0.012	8.57	6.98
DMH-601	DMH-603	3.09	0.95	2.93	1.98	0.30	0.60	3.53	6	6.6	37.09	30	0.012	HDPE	0.012	48.68	9.92
TD-3B	DMH-603	0.07	0.95	0.06	0.00	0.30	0.00	0.06	6	6.6	0.42	12	0.021	HDPE	0.012	5.59	7.12
DMH-603	DMH-604	3.16	0.95	3.00	1.98	0.30	0.60	3.59	6	6.6	37.51	36	0.007	HDPE	0.012	60.88	8.61
DMH-604	DMH-605	3.16	0.95	3.00	1.98	0.30	0.60	3.59	6	6.6	37.51	36	0.008	HDPE	0.012	62.99	8.91
RD-601	DMH-605	1.11	0.95	1.05	0.00	0.30	0.00	1.05	6	6.6	6.96	15	0.010	HDPE	0.012	7.00	5.70
DMH-605	DMH-606	4.27	0.95	4.05	1.98	0.30	0.60	4.65	6	6.6	44.47	36	0.008	HDPE	0.012	64.63	9.14
CB-602	DMH-606	0.20	0.95	0.19	0.02	0.30	0.00	0.19	6	6.6	1.27	12	0.031	HDPE	0.012	6.78	8.64
DCB-603	DMH-606	0.55	0.95	0.52	0.03	0.30	0.01	0.53	6	6.6	3.48	12	0.038	HDPE	0.012	7.56	9.63
DMH-606	DMH-607	5.01	0.95	4.76	2.03	0.30	0.61	5.37	6	6.6	49.22	36	0.006	HDPE	0.012	57.35	8.11
HW-600	DMH-607	0.04	0.95	0.03	1.69	0.30	0.51	0.54	6	6.6	28.58	24	0.015	HDPE	0.012	30.02	9.55
							(FLOW VALUE FOR HW-600 to DMH-607 INCLUDES FLOW FOR UPSTREAM CULVERT)										
DMH-607	DMH-608	5.04	0.95	4.79	3.72	0.30	1.12	5.91	6	6.6	77.80	42	0.007	HDPE	0.012	91.19	9.48
CB-510	DMH-512	0.12	0.95	0.12	0.19	0.30	0.06	0.17	6	6.6	1.15	12	0.005	HDPE	0.012	2.81	3.58
CB-511	DMH-512	0.31	0.95	0.30	0.14	0.30	0.04	0.34	6	6.6	2.25	12	0.008	HDPE	0.012	3.47	4.42
CB-512	DMH-512	0.34	0.95	0.32	0.15	0.30	0.05	0.37	6	6.6	2.44	12	0.006	HDPE	0.012	3.09	3.93
DMH-512	DMH-513	0.78	0.95	0.74	0.48	0.30	0.14	0.88	6	6.6	5.84	18	0.008	HDPE	0.012	10.18	5.76
CB-509	DMH-511	0.06	0.95	0.06	0.03	0.30	0.01	0.07	6	6.6	0.46	12	0.021	HDPE	0.012	5.59	7.12

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March 25, 2022

Rational Pipe Sizing Calculations

Design Period Storm:		**25**	**Year**	**Design Period Intensity***			**6.6**	**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-508	DMH-511	0.08	0.95	0.07	0.26	0.30	0.08	0.15	6	6.6	1.01	12	0.013	HDPE	0.012	4.45	5.67
DMH-511	DMH-513	0.14	0.95	0.13	0.29	0.30	0.09	0.22	6	6.6	1.47	18	0.007	HDPE	0.012	9.52	5.39
DMH-513	DMH-610	0.92	0.95	0.87	0.77	0.30	0.23	1.11	6	6.6	7.30	24	0.007	HDPE	0.012	20.80	6.62
CB-606	DMH-610	0.06	0.95	0.05	0.12	0.30	0.04	0.09	6	6.6	0.60	12	0.018	HDPE	0.012	5.15	6.56
CB-607	DMH-610	0.05	0.95	0.05	0.14	0.30	0.04	0.09	6	6.6	0.59	12	0.028	HDPE	0.012	6.40	8.15
DMH-610	DMH-608	1.03	0.95	0.98	1.03	0.30	0.31	1.29	6	6.6	8.49	24	0.011	HDPE	0.012	25.11	7.99
CB-604	DMH-609	0.26	0.95	0.25	0.25	0.30	0.07	0.33	6	6.6	2.15	12	0.010	HDPE	0.012	3.76	4.79
CB-605	DMH-609	0.24	0.95	0.23	0.13	0.30	0.04	0.27	6	6.6	1.76	12	0.010	HDPE	0.012	3.82	4.86
DMH-609	DMH-608	0.50	0.95	0.48	0.38	0.30	0.11	0.59	6	6.6	3.91	12	0.014	HDPE	0.012	4.63	5.90
DCB-302	DMH-608A	0.30	0.95	0.28	0.65	0.30	0.20	0.48	6	6.6	3.15	15	0.005	HDPE	0.012	4.95	4.03
CB-301	DMH-608A	0.08	0.95	0.08	0.18	0.30	0.05	0.13	6	6.6	0.88	12	0.011	HDPE	0.012	4.05	5.15
DMH-608A	DMH-608	0.38	0.95	0.36	0.83	0.30	0.25	0.61	6	6.6	4.02	15	0.005	HDPE	0.012	4.95	4.03
DMH-608	FES-600	6.96	0.95	6.61	5.13	0.30	1.54	8.15	6	6.6	92.57	48	0.006	HDPE	0.012	121.54	9.67
OCS-600	DMH-8B	Value from HydroCAD									3.50	15	0.007	HDPE	0.012	5.86	4.77

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Proposed Buildings 2 & 3
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Rational Pipe Sizing Calculations (Culverts)

Design Period Storm:		100	Year		Design Period Intensity*		8	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										
DMH-8	DMH-8A	0.00	0.95	0.00	1.85	0.30	0.56	0.56	6	8	4.44	15	0.009	HDPE	0.012	6.78	5.53
DMH-8A	DMH-8B	0.00	0.95	0.00	1.85	0.30	0.56	0.56	6	8	4.44	15	0.009	HDPE	0.012	6.75	5.50
DMH-8B	DMH-8C	0.00	0.95	0.00	1.85	0.30	0.56	0.56	6	8	7.94	18	0.005	HDPE	0.012	8.13	4.60
DMH-8C	HW-7B	0.00	0.95	0.00	1.85	0.30	0.56	0.56	6	8	7.94	18	0.020	HDPE	0.012	16.09	9.11
DMH-10B	HW-10B	0.00	0.95	0.00	4.41	0.30	1.32	1.32	6	8	10.58	18	0.012	HDPE	0.012	12.52	7.08
FES-9A	HW-9B	0.00	0.95	0.00	5.92	0.30	1.78	1.78	6	8	14.21	18	0.018	HDPE	0.012	15.27	8.64
FES-8A	DMH-9	0.00	0.95	0.00	2.94	0.30	0.88	0.88	6	8	7.06	18	0.007	HDPE	0.012	9.52	5.39
Inlet	DMH-9	0.00	0.95	0.00	1.90	0.30	0.57	0.57	6	8	29.35	36	0.006	HDPE	0.012	55.50	7.85
DMH-9	HW-8B	0.00	0.95	0.00	15.17	0.30	4.55	4.55	6	8	36.41	36	0.006	HDPE	0.012	55.50	7.85

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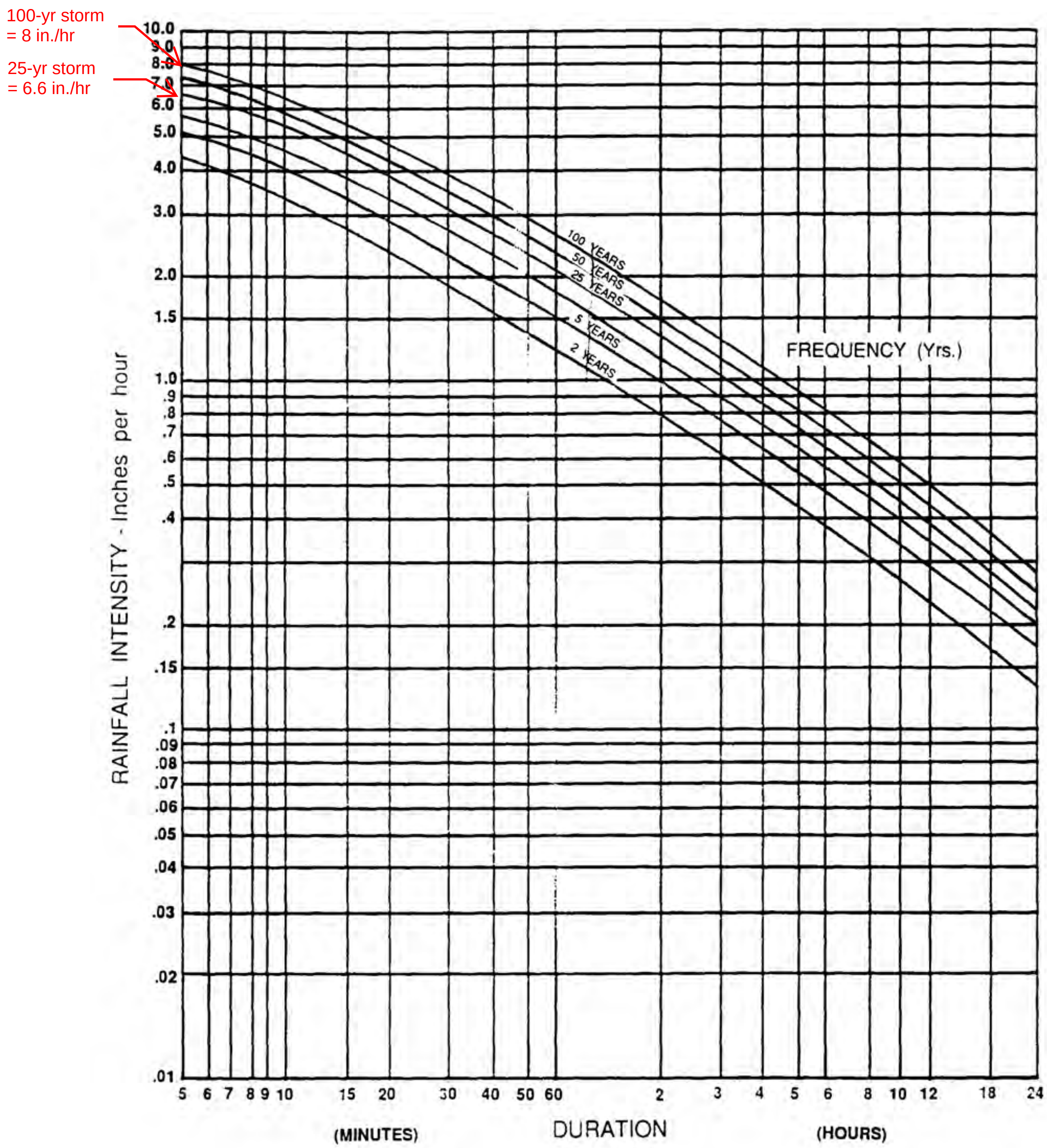
Exhibit 8-14

Intensity – Duration – Frequency Curve for Worcester, MA



Source: TR55 - Urban Hydrology for Small Wetlands, NRCS

Proposed Buildings 2 & 3
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Rip Rap Sizing Calculations

Design Period Storm: **25 Year for Basin Inlet Pipes / 100 Year for Basin Outlet Pipes and Culverts**

Rip Rap Sizing Calculations						
Location	Pipe Size (in.)	Pipe Size (ft.)	Q (cfs)	TW* (ft.)	D_{50}** (ft.)	D_{50}** (in.)
HW-101	18	1.5	10.90	0.3	0.58	**7**
HW-201	12	1.0	0.00	0.3	0.00	**6**
HW-301	12	1.0	5.50	0.3	0.40	**6**
HW-400	24	2.0	16.40	0.3	0.69	**8**
HW-500	18	1.5	8.30	0.3	0.41	**6**
HW-7B	18	1.5	7.94	0.3	0.38	**6**
FES-100	36	3.0	55.26	0.3	2.02	**24**
FES-200	18	1.5	14.80	0.3	0.88	**11**
FES-300	36	3.0	38.45	0.3	1.25	**15**
FES-600	42	3.5	60.27	0.3	1.85	**22**
FES-700	24	2.0	11.35	0.3	0.42	**6**
FES-701	30	2.5	22.66	0.3	0.79	**9**
HW-10B / HW-9B	36	3.0	24.79	0.3	0.70	**8**
HW-8B	36	3.0	36.41	0.3	1.16	**14**

Based on Eq. 11.35 of ConnDOT Drainage Manual

* Assume tailwater = 0.3

** Q<10 cfs - min. 6" stone size, Q>10 cfs - min. 12" stone size

Outlet Protection Sizing Calculations						
Location	Pipe Size (in.)	Pipe Size (ft.)	Q (cfs)	W1 (ft.)	La (ft.)	W2 (ft.)
HW-101	18	1.5	10.90	4.50	Use Scour Hole	
HW-201	12	1.0	0.00	3.00	10.0	10.0
HW-301	12	1.0	5.50	3.00	12.0	11.0
HW-400	24	2.0	16.40	6.00	Use Scour Hole	
HW-500	18	1.5	8.30	4.50	10.0	12.0
FES-100	36	3.0	55.26	9.00	Use Scour Hole	
FES-200	18	1.5	14.80	4.50	Use Scour Hole	
FES-300	36	3.0	38.45	9.00	Use Scour Hole	
FES-600	42	3.5	60.27	10.50	Use Scour Hole	
FES-700	24	2.0	11.35	6.00	14.0	16.0
FES-701	30	2.5	22.66	7.50	Use Scour Hole	
HW-7B	18	1.5	7.94	4.50	13.0	14.0
HW-10B / HW-9B	36	3.0	24.79	9.00	Use Scour Hole	
HW-8B	36	3.0	36.41	9.00	Use Scour Hole	

Based ConnDOT Drainage Manual - Type A Riprap Apron

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Rip Rap Sizing Calculations

Scour Hole Sizing Calculations						
	Pipe Size	Pipe Size	Q	F	C	B
Location	(in)	(ft)	(cfs)	(ft)	(ft)	(ft)
HW-101	18	1.5	10.90	0.75	9	7.5
FES-100	36	3.0	55.26	1.50	18.0	15
FES-200	18	1.5	14.80	0.75	9.0	7.5
FES-300	36	3.0	38.45	1.50	18.0	15
FES-600	42	3.5	60.27	1.75	21.0	17.5
FES-701	30	2.5	22.66	1.25	15.0	12.5
HW-10B / HW-9B*	36	3.0	24.79	1.50	18.0	15
HW-8B	36	3.0	36.41	1.50	18.0	15

Based on ConnDOT Drainage Manual - Type 1 Scour Hole
* Pipe size and flow equal to the subm of HW-10B and HW-9B

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OUTLET PROTECTION - OUTLET VELOCITY ≤ 14 feet/sec

DISCHARGE (cfs)	**OUTLET PIPE DIAMETER OR SPAN (in)**									
	12	15	18	24	30	36	42	48	54	60
0-5	***10***	***10***		***USE***						
6	12	11								
7		13	***12***							
8		14	13	***12***		***MINIMUM***				
9			14	13						
10			15	13						
11			16	14				***LENGTH***		
12				14						
14				16	***14***					
16				17	15	***14***			***OUTLINED***	
18				18	16	15				
20					17	15	***14***			
22		***USE***			18	16	15			
24						17	15	***14***		
26						17	16	15		
28						18	16	15		
30						19	17	16		
35						20	18	17	***16***	
40			***PREFORMED***				20	18	17	***16***
45							21	19	18	16
50							22	20	18	17
55								21	19	18
60								22	20	19
65								24	21	20
70					***SCOUR***			25	22	20
75								26	23	21
80									24	22
90									26	24
100									28	25
110										27
125							***HOLE***			29
130										30

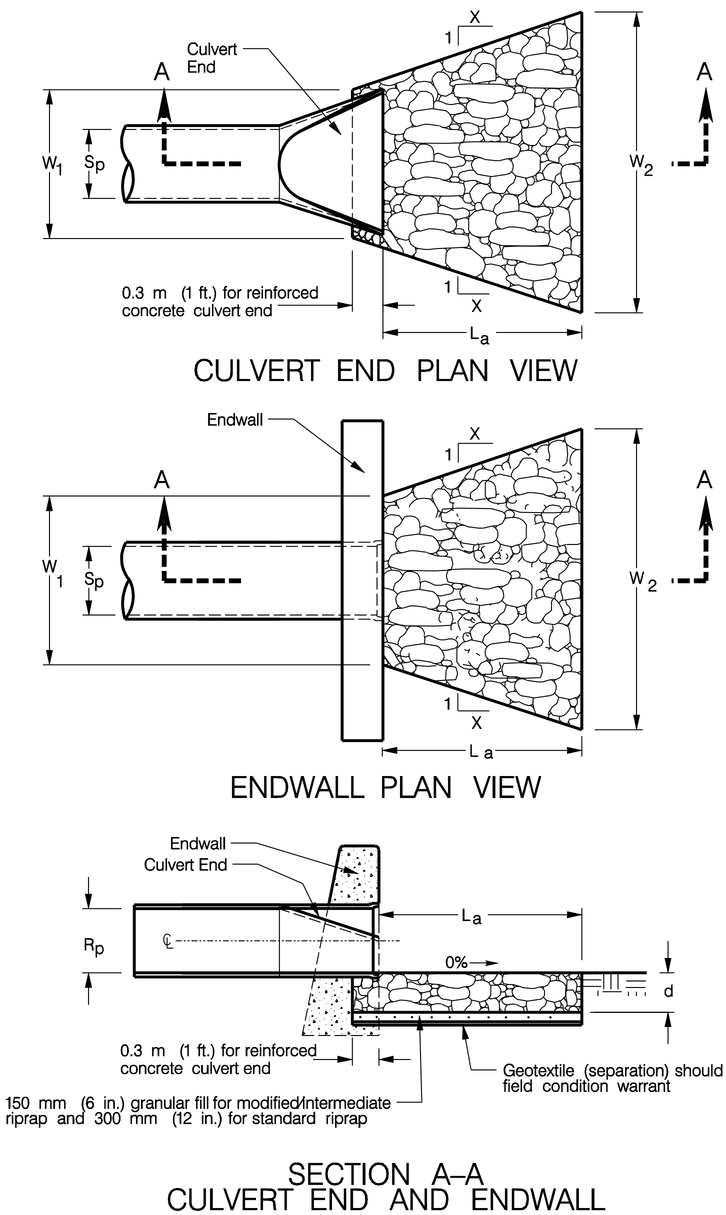
Table 11-12.1 - Length - L_a (feet)
Type A Riprap Apron

Notes: 1. Bold face outlined boxes indicate minimum L_a to be used for a given pipe diameter or span.
2. Rounding and interpolating are acceptable.

OUTLET PROTECTION
OUTLET VELOCITY > 14 feet/sec or Length of Apron exceeds limits shown on Tables 11-12.1 and 11-13.1

Preformed Scour Hole										
(See Figure 11-15)	PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
Type 1										
B	5	6	8	10	13	15	18	20	23	25
C	6	8	9	12	15	18	21	24	27	30
d	Depends on riprap type(see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = 0.5\ S_p$	0.5	0.625	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Type 2										
B	8	10	12	16	20	24	28	32	36	40
C	9	11	14	18	23	27	32	36	41	45
d	Depends on riprap size (see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = S_p$	1.0	1.3	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Table 11-14.1 - Dimensions of Preformed Scour Hole (Feet)



LEGEND

S_p = Max. inside pipe span (non–circular sections); Inside pipe diameter (circular sections)

R_p = Max. inside pipe rise (non–circular sections); Inside pipe diameter (circular sections)

L_a = Length of riprap apron measured from the end of culvert end section or face of endwall

d = 300 mm (12 in.) Modified Riprap; 450 mm (18 in.) Intermediate Riprap; 900 mm (36 in.) Standard Riprap

	X	W_1	W_2
Type A Riprap Apron	3	$3S_p$	$3S_p + 0.7$ La
Type B Riprap Apron	5	$3S_p$	$3S_p + 0.4$ La

Figure 11-13 Type A and B Riprap Apron
(to be used where there is no defined channel downstream of the outlet)

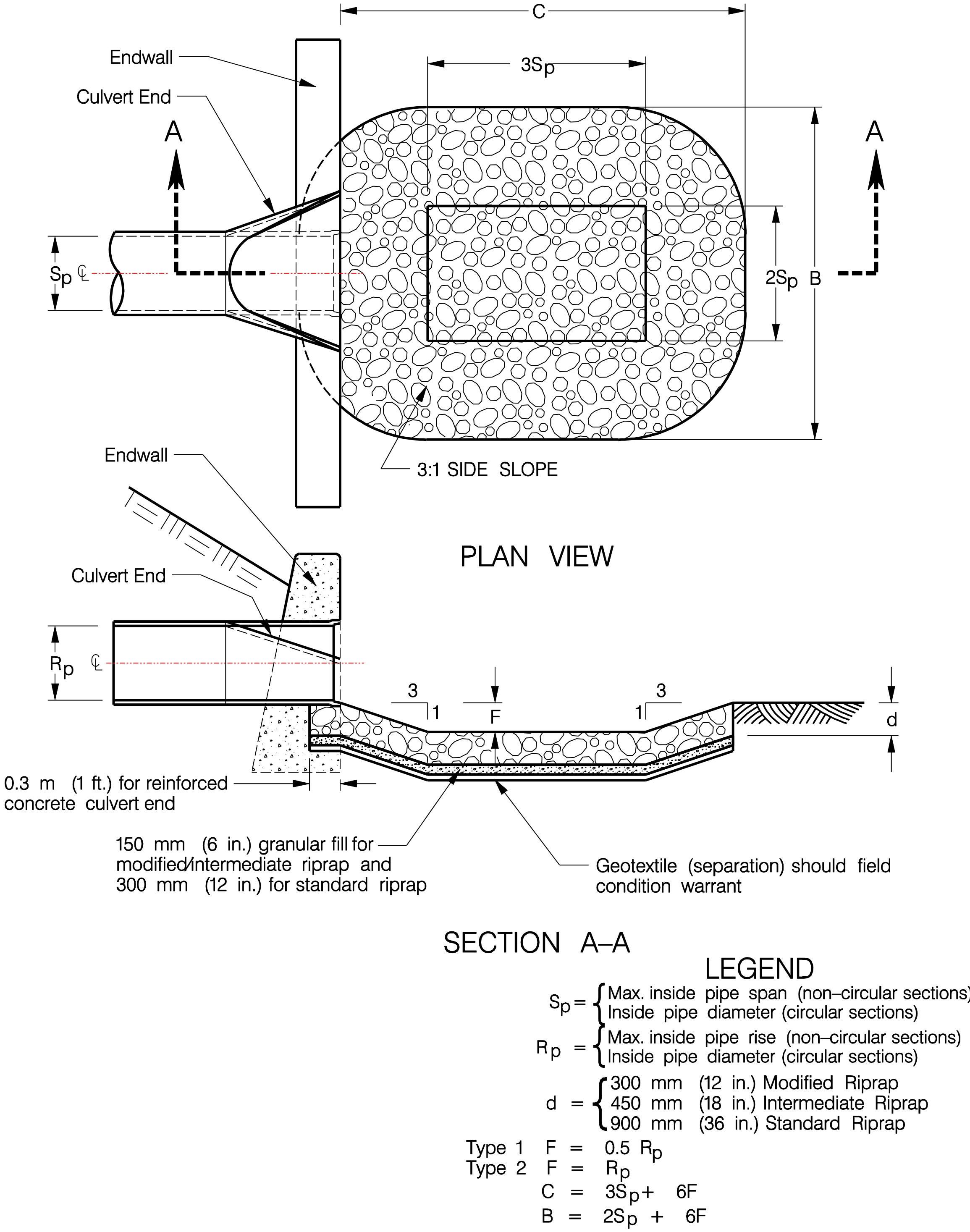


Figure 11-15 Preformed Scour Hole Type 1 and Type 2

GROUNDWATER MOUNDING CALCULATIONS

"Proposed Buildings 2 and 3 – UNIFIED Parkway"
Sutton, MA
BE Project No.: W211141

Methodology

Basins 2c and 3b for this project are designed with less than four (4) feet of separation to seasonal high groundwater. Infiltration in basins 2c and 3b area 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 72-hour 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. 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. Please refer to the table below:

Stormwater Basin	Unsaturated Zone (FT)	Depth Below Lowest Outlet (FT)	Mounding Storage Provided (FT)	Groundwater Mounding - Δh (FT)	Groundwater Mounding at 72 hrs. (FT)
2c	2.00	1.75	3.75	2.15	0.5
3b	2.20	3.35	5.55	4.83	1.00

Additionally, we must check the mound after 72 hours to verify that it is less than the unsaturated zone thickness to ensure that the basin can exfiltrate within that period of time.

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. Additionally, the mounding effect at the end of Day 3 is less than the unsaturated zone thickness for all basins. Given these results, we feel as though the basins recharge the stormwater volume within 72 hours as required.

BASIN 2C

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

4.8200	*R*	**Recharge (infiltration) rate (feet/day)**
0.150	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
283.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
35.000	x	**1/2 length of basin (x direction, in feet)**
89.000	y	**1/2 width of basin (y direction, in feet)**
0.460	t	**duration of infiltration period (days)**
25.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

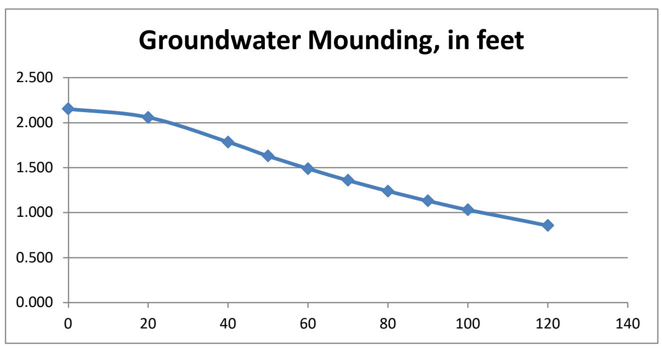
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

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).

27.153	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
2.153	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**
2.153	0
2.059	20
1.785	40
1.630	50
1.488	60
1.358	70
1.240	80
1.131	90
1.031	100
0.857	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.

BASIN 3B

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

16.5400	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
283.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
35.000	x	**1/2 length of basin (x direction, in feet)**
60.000	y	**1/2 width of basin (y direction, in feet)**
0.360	t	**duration of infiltration period (days)**
25.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

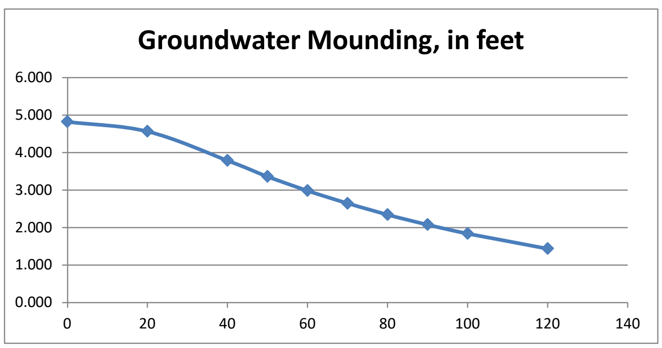
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

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).

29.827	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
4.827	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**
4.827	**0**
4.567	**20**
3.792	**40**
3.365	**50**
2.986	**60**
2.648	**70**
2.348	**80**
2.080	**90**
1.842	**100**
1.440	**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.

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*

STORMWATER OPERATION AND MAINTENANCE PLAN

Buildings 2 and 3
UNIFIED Parkway
Providence Road @ Boston Road
Sutton, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

UGPG RE Sutton LLC
223 Worcester-Providence Turnpike
Sutton, MA 01590

RESPONSIBLE PARTY POST CONSTRUCTION:

UGPG RE Sutton LLC
223 Worcester-Providence Turnpike
Sutton, MA 01590

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) if applicable. 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 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 and access drives: Sweep at least two (2) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

2. Catch basins, 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 offsite in accordance with MADEP and other applicable requirements.

3. Surface Infiltration Basin: 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 (3) months. Mow the buffer area, side slopes and basin bottom if grassed floor, rake if stone or sand bottom, remove trash and debris, remove grass clippings and accumulated organic matter. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

4. Forebays: The sediment forebay areas shall be inspected once per month to ensure they are operating as intended and that all components are stable and in working order. Inspections shall be by qualified personnel. During the growing season, the forebay shall be mowed at least twice, with additional cuttings performed as needed. All vegetation (i.e. tree saplings) will be removed from embankments and the forebay bottom. The inlet to the forebay shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired as needed. Sediment forebays shall be cleaned quarterly and when sediment depth reaches half the height of the stone weir, or three to six feet, whichever is less. After sediment is removed, replace any vegetation damaged during the clean out by either reseeding or re-sodding. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

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 rip-rap 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.

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

Buildings 2 and 3
UNIFIED Parkway
Providence Road @ Boston Road
Sutton, MA

RESPONSIBLE PARTY:

UGPG RE Sutton LLC
223 Worcester-Providence Turnpike
Sutton, MA 01590

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins / Drain inlets:	
Discharge Points/ Flared End Sections / Rip Rap:	
Underground Infiltration Basin:	
Surface Infiltration Basin:	
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:
Underground Infiltration Basin:
Surface Infiltration Basin:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

Buildings 2 and 3
UNIFIED Parkway
Providence Road @ Boston Road – Sutton, MA

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

Buildings 2 and 3
UNIFIED Parkway
Providence Road @ Boston Road
Sutton, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

UGPG RE Sutton LLC
223 Worcester-Providence Turnpike
Sutton, MA 01590

RESPONSIBLE PARTY POST CONSTRUCTION:

UGPG RE Sutton LLC
223 Worcester-Providence Turnpike
Sutton, MA 01590

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.

- Sweeping of parking lots 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.

- 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.

- Grass shall be maintained at a minimum blade height of two to three inches and only 1/3 of the plant height shall be removed at a time. Clippings shall not be disposed of within stormwater management areas or adjacent resource areas.

- Plants shall be pruned as necessary.

- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter in to 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 infiltration basins.

- 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.

- Sand and deicing chemicals should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials. Stockpile areas shall be located outside resource areas.

- Limit the use of deicing materials to calcium chloride within Zone II areas and next to jurisdictional wetlands.

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.

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

Buildings 2 and 3
UNIFIED Parkway
Providence Road @ Boston Road
Sutton, 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 Sutton 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 Sutton Board of Health at (508) 865-8724 and the Sutton Conservation Commission at (508) 865-8728.
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 of Sutton Board of Health 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 AGENCYPHONE: (888) 372-7341

Save Valuable Land and
Protect Water Resources

Detention • Retention • Water Quality

A division of ADS

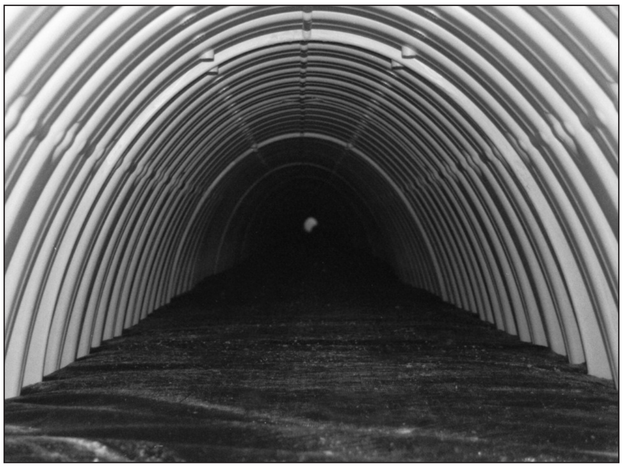
Isolator® Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator® Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patented technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.



Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC-310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

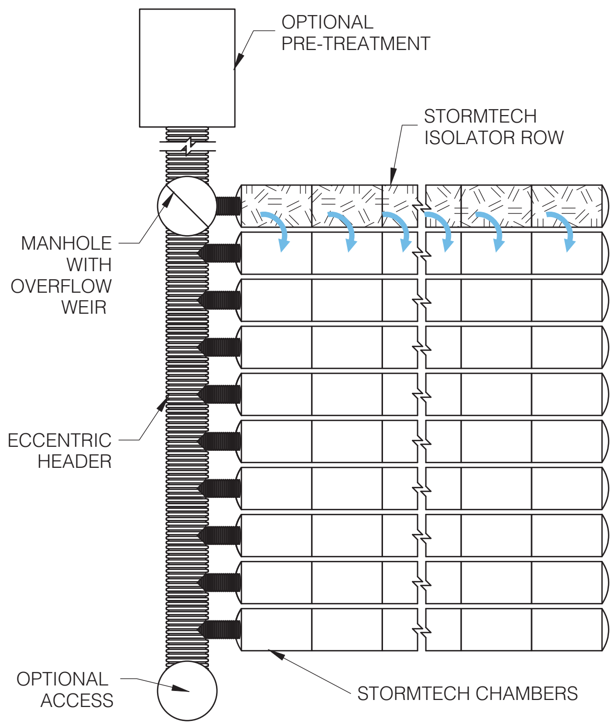
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.0 Isolator Row Inspection/Maintenance

2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

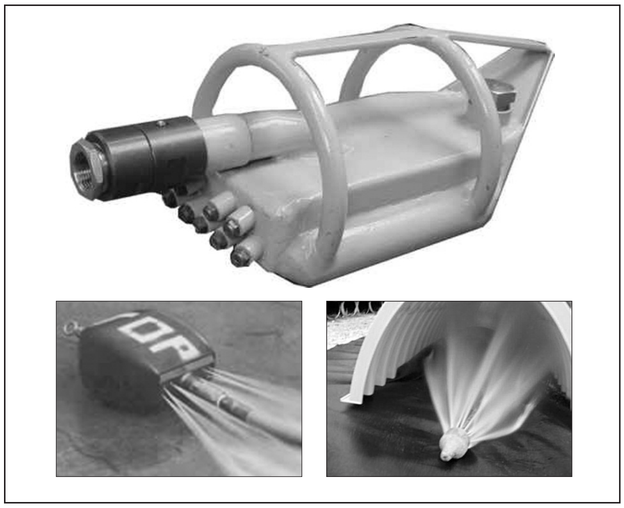
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

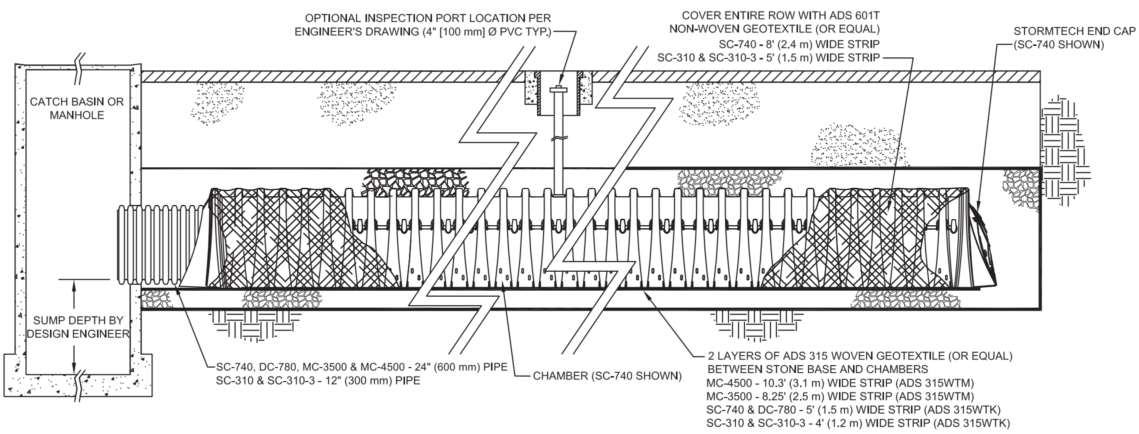
The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

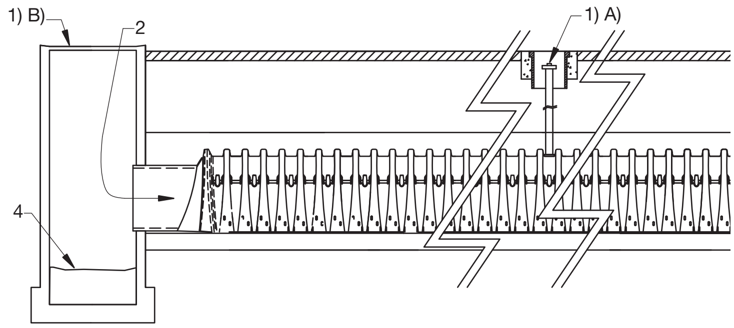


NOTE: NON-WOVEN FABRIC IS ONLY REQUIRED OVER THE INLET PIPE CONNECTION INTO THE END CAP FOR DC-780, MC-3500 AND MC-4500 CHAMBER MODELS AND IS NOT REQUIRED OVER THE ENTIRE ISOLATOR ROW.

3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment
A) Inspection ports (if present)
i. Remove lid from floor box frame
ii. Remove cap from inspection riser
iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.
B) All Isolator Rows
i. Remove cover from manhole at upstream end of Isolator Row
ii. Using a flashlight, inspect down Isolator Row through outlet pipe
1. Mirrors on poles or cameras may be used to avoid a confined space entry
2. Follow OSHA regulations for confined space entry if entering manhole
iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process
A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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