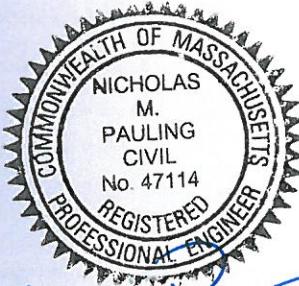


# Stormwater Management Report

**Hager Homestead  
336 King Street  
Littleton, MA**

**April 2020**



*Nicholas Pauling*  
4/7/2020

**Submitted to:**  
**Littleton Planning Board &  
Conservation Commission**  
**37 Shattuck Street  
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**Project No:**  
**191096**



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## Attachments

"Residential Development - Hager Homestead, 336-338 King Street, Littleton, MA"  
prepared for Massachusetts CoHousing, LLC, Dated April 2020.

Long-Term Pollution Prevention Plan & Stormwater System Operation and Maintenance Plan,  
Dated April 2020.



## **Section 1**

### **Introduction and Methodology**



## **Introduction and Methodology**

This Stormwater Management Report is intended to accompany plans for the proposed residential development known as Hager Homestead at 336-338 King Street, Littleton, MA. Included in this report are calculations that support a final engineering design as required by the state's Wetlands Protection Act Regulations and the Town of Littleton's ordinances and regulations. Site specific information is presented under two scenarios, "pre-development" and "post-development" conditions, so that potential impacts due to the project can be identified, quantified and, as necessary, mitigated.

The final design intent seeks to meet the following interrelated goals:

1. Limit stormwater runoff rates for the 2- and 10-year storm events to existing (pre-development) levels;
2. Evaluate potential on- and off-site flooding during the 100-year storm event due to proposed development;
3. Maintain or increase the volume of stormwater recharged per storm event to those of existing (pre-development) levels;
4. Prevent appreciable sediment and other suspended solids and contaminants transport by trapping them on site via Best Management Practices;
5. Provide adequate drainage for new surfaces;
6. Maintain existing drainage patterns while providing a cost-effective engineering solution that addresses regulatory as well as real-world constraints.

## Site Description

The proposed project is a senior residential development located off King Street in Littleton. The project area is comprised of two parcels with a total area of  $15.16 \pm$  Ac. designated as U19-38-0 and U19-38-1 by the Town of Littleton Assessor. The project site consists primarily woods and grass ground cover with wetlands covering the northwest portion of the size. There are three existing buildings on the project site shown on the Existing Conditions Plan. The three existing buildings are shown as #336, #338 and an existing storage building. The limit of disturbance will be limited within the southeast portion of the project site up to outside of the 50-ft wetland buffer limit. The project area / limit of disturbance is approximately 133,541 SF of the total project site, which will also be limit of drainage catchment for analysis purpose.

Available NCRS online soils mapping shows the soils within the project area to be Wareham loamy fine sand, 0 to 5 percent slopes in the northwest portion of the site, Hinckley loam sand, 15 to 25 percent slopes in the northern portion of the site, and Merrimac-Urban land complex, 0 to 8

percent slopes running along King street. Generally, the Hydraulic Soil Group (HSG) on site is a type A soil group.

GPR has performed soil testing on 12/16/19 (See attached soil testing logs). Deep hole soil test pits shown that the soil within the project area is generally Fine Sand, which should be considered under HSG A for the purpose of drainage analysis. A Hydraulic Soil Group A was used for the design and analysis of the project site.

Under the pre-development scenario, as shown on the plan entitled "PRE-DEVELOPMENT WATERSHED MAP", included within the attached Appendix. The Subcatchment 1.1 (SC-1.1) describes the portion of the project site outside of the wetland area with runoff flowing northwest into the existing wetland on site, which will be the analysis point AP-1.

### Project Description

The purpose of this project is to create a senior residential development known as Hager Homestead. The proposed project will construct a total of 24 residential dwelling units and provide 42 parking spaces for the residents and guests. The proposed project will construct 3 two-family dwelling units, 3 townhouse dwelling units and 15 independent living units. The existing building shown as #336 on the east portion of the project area will be partially demolished, renovated and used as a base for the construction of a common area for the proposed 15 independent living units. The existing building shown as #338 located on the north portion of the project area will also be renovated and incorporated as part of the senior residential development as a two-family dwelling unit. The existing barn building will be renovated and moved northwest outside of the 50' wetland buffer limit. 3 new residential buildings will be constructed west of the existing #336 building that will provide 7 dwelling units.

The 42 parking spaces will be constructed to serve the proposed development, which will include 2 handicap accessible parking spaces. 14 of the 42 total parking spaces are under a car port as required by the Town of Littleton Zoning bylaw. The 42 parking spaces are spread out in 3 separate parking areas. 17 parking spaces will be located on the parking lot shown on the south portion of the project area with new curb cut access on King Street. A second proposed curb cut access on king street will be located approximately 180 feet north of the south parking area. The north side curb cut access will provide access for the 21 spaces parking area located on the north east portion of the project area, and the 4 spaces parking area located adjacent to the main entrance.

To collect and treat stormwater runoff on site Impervious areas are being directed to proposed BMP's on site prior to discharging into the existing wetland. The proposed parking areas will each have a deep sump catch basin fitted with a Silt Prison set to pre-treat and discharge into the Infiltration Basin (IB) or Water Quality Swale (WQS) for stormwater attenuation and further treatment prior to discharging into the wetland outside of the project area. In order to provide recharge to the groundwater, clean roof runoff will be collected and conveyed to subsurface Infiltration Chambers (IC) set under the southern parking area. The Infiltration Basin will also provide additional groundwater recharge as well as attenuate stormwater. The proposed BMP's have been designed in accordance with the Massachusetts Stormwater Standards to attenuate

peak flows, treat runoff from impervious surfaces and maintain groundwater recharge to those of pre-development conditions.

Under the post-development scenario, the project has been divided into a total of 17 subcatchment areas, shown on the plan entitled “POST-DEVELOPMENT WATERSHED MAP”, and included in the attached Appendix, outlining runoff to the development’s analysis point.

SC-1.1, SC-1.2, SC-1.6, SC-1.7, SC-1.8 and SC-2.2 outline stormwater runoff from the proposed roof, lawn area and some unconnected paved walkway being conveyed into the Infiltration Chambers. The Infiltration Chambers will have an overflow pipe flowing to DMH-1.

SC-2.1 outlines runoff from proposed lawn area and car port roof south of the project area flowing directly into the Water Quality Swale.

SC-2.5 outlines runoff from the north side parking area to be collected by a deep sump Silt Prison catch basin to meet the 44% TSS removal and conveyed to the Sediment Forebay / Infiltration Basin prior to discharging into the wetland on site.

SC-2.7 outlines runoff from the east paved parking area and SC-2.6 outlines runoff from the south paved parking area. Both subcatchment areas are to be collected by deep sump Silt Prison catch basins to meet the 44% Total Suspended Solid (TSS) removal requirement and conveyed to the Water Quality Swale (WQS) in order to meet the 80% TSS removal prior to discharging into the wetland on site.

SC-2.8 outlines runoff from the lawn area and wooded area flowing directly into the Sediment Forebay / Infiltration Basin.

SC-1.3, SC-1.4 and SC-1.5 outline stormwater runoff from the proposed clean roof through roof drains and into the Sediment Forebay / Infiltration Basin.

SC-2.3, SC-2.4 and SC-2.9 outline stormwater runoff from the proposed clean roof, lawn area and some unconnected paved walkway flowing through grass ground cover area before flowing into the wetland on site.

Infiltration Chambers and Infiltration Basin are set 2 feet above Estimate Seasonal High Ground Water Table (ESHGWT) in order to infiltrate stormwater runoff to meet the requirement stormwater recharge volume of 1,106 CF. Infiltration Chambers, Infiltration Basin and Water Quality Swale will attenuate stormwater runoff onsite, in order to meet or reduce peak stormwater runoff for the 2 and 10-year storm as required by the MassDEP Stormwater Regulations.

### Hydrologic and Hydraulic Computation Methodology

Runoff rates were computed using the Soil Conservation Service TR-20 Method entitled “Urban Hydrology for Small Watersheds” within the HydroCAD Stormwater Modeling software platform.

The following 24-hour rainfall events from the Northeast Regional Climate Center (NRCC) Extreme Precipitation Tables database were analyzed:

Frequency (years): 2, 10 and 100

As outlined above, runoff from the site has been analyzed at one point under the pre-development and post-development conditions. As a standard for comparison AP-1 is represented in both the pre and the post development cases.

## **Summary of Results**

Peak discharge rates and volumes of the calculated runoff for both conditions analyzed are displayed in the HYDROLOGY SUMMARY that follows. As shown within the summary, the peak discharge rates for the 2 and 10-year storm events are less than or equal to the pre-development conditions.

The deep sump hooded catch basins fitted with Silt Prison provided Total Suspended Solids (TSS) removal of 63% to meet the pre-treatment requirement of 44%. Sediment Forebay, Infiltration Basin and Water Quality Swale provided additional TSS removal to meet the required 80% TSS Removal per MassDEP Stormwater management standard. The Infiltration Basin and Infiltration Chambers retain and infiltrate 3,515 cubic feet of runoff prior to discharging, well in excess of the minimum required 1,106 cubic feet occurring under existing conditions and displaced by the proposed development.

The wetland on the project site is a small part of a network of wetlands and streams that is contributing runoff into Beaver Brook and ultimately flowing into Forge Pond. The peak discharge rate for the 100-year storm event will have an increase in peak runoff rate of 1.8 cfs of stormwater into AP-1 but will also have a reduction in stormwater volume. The existing stormwater runoff volume for the 100-year storm event is approximately 26,241 cubic feet, the proposed development condition will have approximately 24,799 cubic feet of stormwater runoff volume going into the wetland on site. The increase in peak stormwater runoff rate in the 100-year storm event should not increase the potential flooding downstream due to the decrease in total stormwater runoff volume.

The proposed development meets the MassDEP Stormwater Management Standards through the use of Best Management Practices that address groundwater recharge, water quality (first flush) retention, and suspended solids removal within sustainable BMP's. See Appendix for computed solids quantities / removal process trains, and water quality runoff volumes.

## **Section 2**

### **Hydrology Summary for 24-hour Storm**



# HYDROLOGY SUMMARY FOR 24-HOUR STORM

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

## PEAK DISCHARGE RATE

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### Pre-Development (cfs)

Analysis Point	2-YR	10-YR	100-YR
AP-1	0.0	0.9	7.9

### Development (cfs)

Analysis Point	2-YR	10-YR	100-YR
AP-1	0.0	0.7	9.7

### Pre-Development vs. Developed (cfs)

Analysis Point	2-YR	10-YR	100-YR
AP-1	<b>0.0</b>	<b>-0.2</b>	<b>1.8</b>



## **Section 3**

### **Mass DEP Stormwater Management Report Checklist**





# Checklist for Stormwater Report

## A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

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



# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

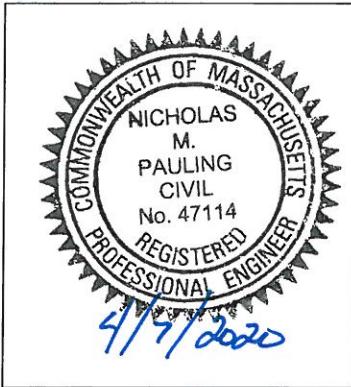
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that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

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

### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

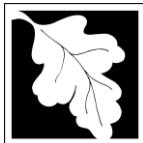


*Nicholas Pauling*  
Signature and Date

### Checklist

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

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



# Checklist for Stormwater Report

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## 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): Disconnected Roof Recharge

### Standard 1: No New Untreated Discharges

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



# Checklist for Stormwater Report

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## 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<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 3: Recharge (continued)

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

### Standard 4: Water Quality

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

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

- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
- Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
  - is within the Zone II or Interim Wellhead Protection Area
  - is near or to other critical areas
  - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
  - involves runoff from land uses with higher potential pollutant loads.
- The Required Water Quality Volume is reduced through use of the LID site Design Credits.
- Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
  - The ½" or 1" Water Quality Volume or
  - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- 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

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## Checklist (continued)

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

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

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

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

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

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

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

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

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



# Checklist for Stormwater Report

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## 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

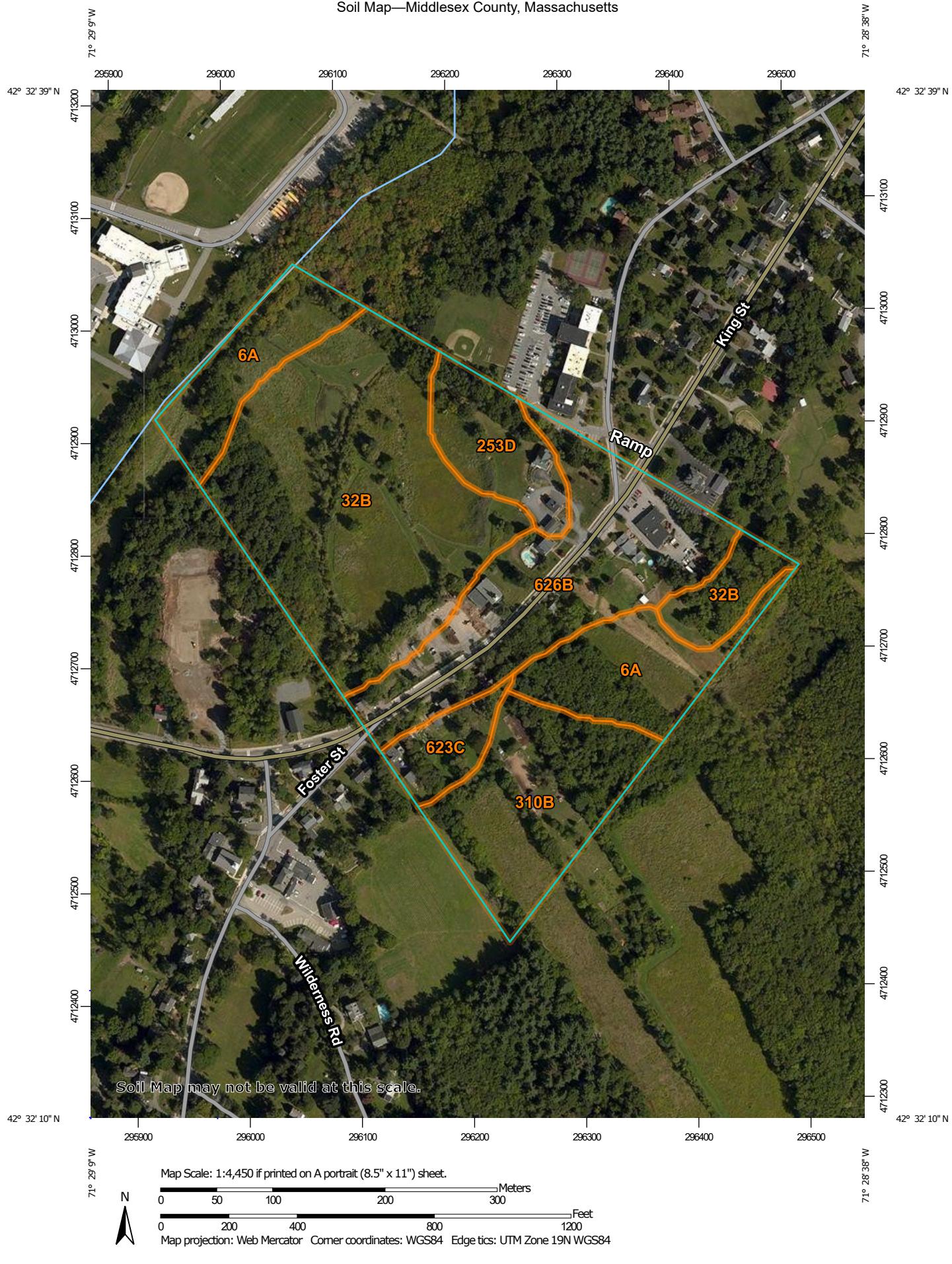
- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

## **Section 4**

### **Appendix**



## Soil Map—Middlesex County, Massachusetts



Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

11/15/2019  
Page 1 of 3

## MAP LEGEND

<b>Area of Interest (AOI)</b>		Spoil Area
<b>Soils</b>		Stony Spot
		Very Stony Spot
		Wet Spot
		Other
		Special Line Features
<b>Special Point Features</b>		
Blowout		Streams and Canals
Borrow Pit		Transportation
Clay Spot		Rails
Closed Depression		Interstate Highways
Gravel Pit		US Routes
Gravelly Spot		Major Roads
Landfill		Local Roads
Lava Flow		Background
Marsh or swamp		Aerial Photography
Mine or Quarry		
Miscellaneous Water		
Perennial Water		
Rock Outcrop		
Saline Spot		
Sandy Spot		
Severely Eroded Spot		
Sinkhole		
Slide or Slip		
Sodic Spot		

## MAP INFORMATION

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

**Warning: Soil Map may not be valid at this scale.**  
Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

**Source of Map:** Natural Resources Conservation Service  
**Web Soil Survey URL:**

**Coordinate System:** Web Mercator (EPSG:3857)

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

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

**Soil Survey Area:** Middlesex County, Massachusetts  
**Survey Area Data:** Version 19, Sep 12, 2019

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

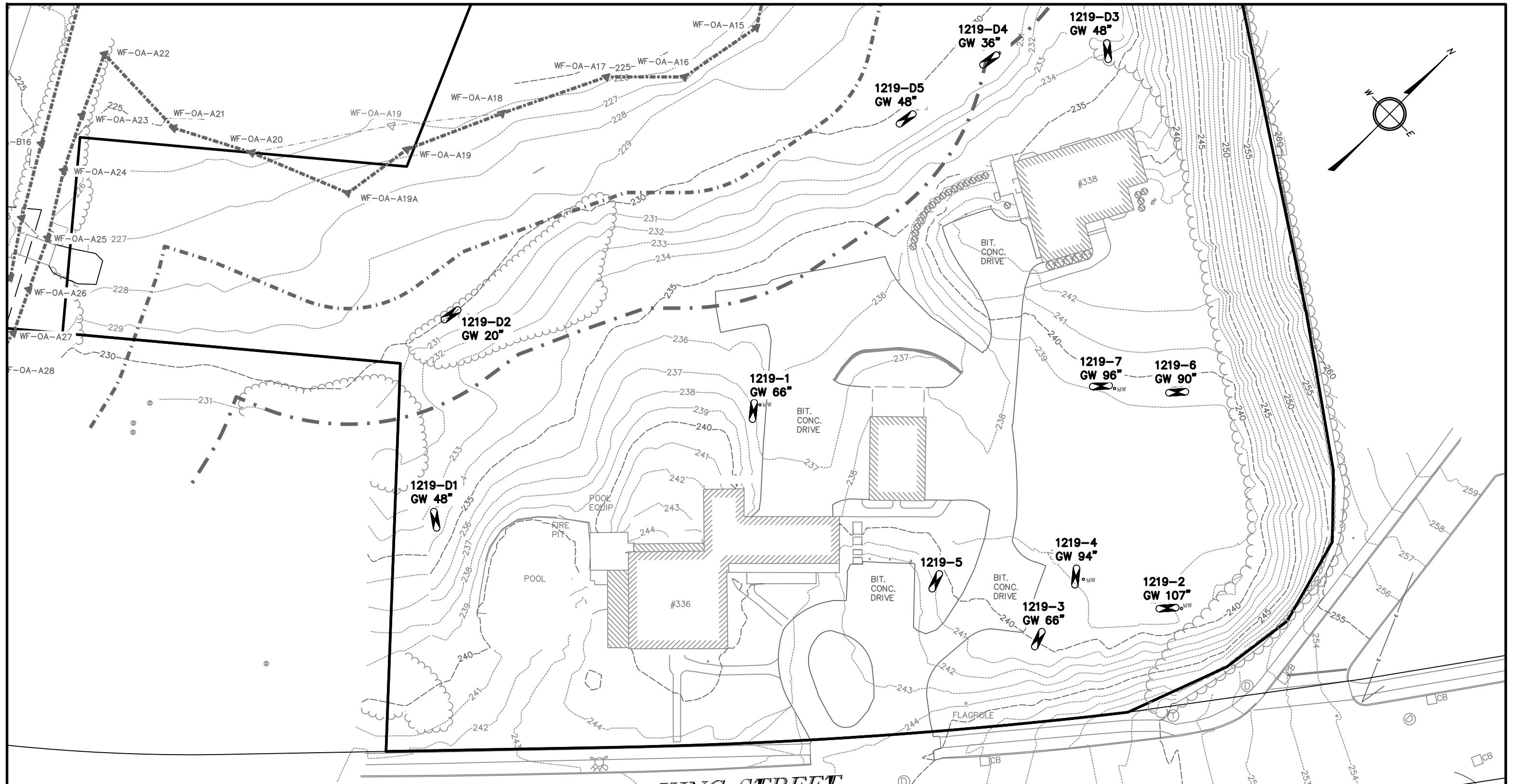
**Date(s) aerial images were photographed:** Aug 29, 2014—Sep 19, 2014

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	6.3	15.9%
32B	Wareham loamy fine sand, 0 to 5 percent slopes	15.0	37.8%
253D	Hinckley loamy sand, 15 to 25 percent slopes	2.7	6.8%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	5.7	14.4%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	1.5	3.7%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	8.5	21.4%
<b>Totals for Area of Interest</b>		<b>39.8</b>	<b>100.0%</b>





## GRAPHIC SCALE

( IN FEET )

1 INCH = 40 FEET

# GPR

Engineering Solutions  
for Land & Structures

**GOLDSMITH, PREST & RINGWALL, INC.**  
39 MAIN ST., SUITE 301, AYER, MA 01432  
CIVIL ENGINEERING • LAND SURVEYING • LAND PLANNING  
VOICE: 978.772.1590 FAX: 978.772.1591  
[www.gpr-inc.com](http://www.gpr-inc.com)

PREPARED FOR:  
MASSACHUSETTS COHOUSING, LLC  
200 SUMMIT DRIVE, SUITE 210  
BURLINGTON, MA 01803

CHK'D BY: NMF  
E: MARCH 2020

# SOIL TESTING LOCUS

PROJECT: 191096



# FORM 11 - SOIL EVALUATOR FORM

No. 191096

Date: 1/10/20

Commonwealth of Massachusetts  
Littleton, Massachusetts

## Soil Suitability Assessment for On-Site Sewage Disposal

Performed by: Bruce Ringwall, GPR Inc Date: 12/16/19  
Witnessed by: Jim Garreffa, RS NABH

Location Address: or Lot No. <u>336-338 King St. Littleton, MA 01460</u>	Owner's Name: <u>Massachusetts CoHousing, LLC</u> Address: <u>200 Summit Drive Suite 210 Burlington, MA 01803</u>
Telephone No. _____	

New Construction  Upgrade  Repair

### Office Review

Published Soil Survey Available: No  Yes   
Year Published WebSoilSurvey, 2019 Publication Scale na Soil Map Unit 626B/253D  
Soil Name Merrimac Urban Land Complex Soil Limitations \_\_\_\_\_ well drained  
Soil Name Hinkley Loamy Sand Soil Limitations \_\_\_\_\_ well drained  
Soil Name \_\_\_\_\_ Soil Limitations \_\_\_\_\_  
Surficial Geologic Report Available: No  Yes   
Year Published MASS GIS Publication Scale \_\_\_\_\_  
Geologic Material(Map Unit) Proglacial outwash  
Landform Outwash Plain

Flood Insurance Rate Map: 25017C0236F  
Above 500 Year Flood Boundary No  Yes   
Within 500 Year Flood Boundary No  Yes   
Within 100 Year Flood Boundary No  Yes   
Within Velocity Zone No  Yes

### Wetland Area:

National Wetlands Inventory Map (map unit) MA DEP Oliver  
Wetlands Conservancy Program Map (map unit) \_\_\_\_\_

### Current Water Resource Conditions (USGS): Month

Range: Above Normal  Normal  Below Normal   
Other Reference Reviewed USGS

Site Info.

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-1 Date: 12/16/19 Time: 8:00 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 140± feet  
 Drinking Water Well >100 feet Other: feet

<b>Deep Observation Hole Log</b>					
Hole # 1219-1		NB 29/71		Surface El. 237.0	
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-20	FILL				
20-30	BB	FSL	10YR5/6		
30-120	C	VFS	2.5Y6/4	@66" 10Y5/8 2.5Y6/2	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >120"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 96"  
 Estimated Seasonal High Groundwater in the Hole 66"  
 Additional Notes: GWMP Observed 3/5/20 @ 71"

## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-2 Date: 12/16/19 Time: 8:30 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 35± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-2		NB 29/71	Surface El. 239.0		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8	A	FSL	10YR3/3		
8-24	B	LFS	10YR5/6		
24-40	Bc	LFS	2.5Y6/6		
40-116	C1	FS	2.5Y6/3		
116-126	C2	VFS	2.5Y6/4	@116" 10YR6/8 2.5Y6/3	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >126"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: None  
 Estimated Seasonal High Groundwater in the Hole 107"  
 Additional Notes: GWMP Observed 3/5/20 @ 107"

## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-3 Date: 12/16/19 Time: 9:00 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 35± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-3		NB 29/71	Surface El. 240.0		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-32	FILL				
32-40	BA	FSL	10YR3/3		
40-56	BB	LFS	10YR5/8	@66"	
56-120	C	S/Gr		10YR5/8 2.5Y6/2	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >120"  
 Depth to Groundwater: Standing Water in the Hole 97" Weeping from Pit Face: 97"  
 Estimated Seasonal High Groundwater in the Hole 66"  
 Additional Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-4 Date: 12/16/19 Time: 9:30 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 60± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-4		NB 29/71	Surface El. 239.0		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-64	FILL				
54-132	C1	FS	2.5Y6/4		

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >132"  
 Depth to Groundwater: Standing Water in the Hole n/a Weeping from Pit Face: n/a  
 Estimated Seasonal High Groundwater in the Hole 94"  
 Additional Notes: GWMP Observed 3/5/20 @ 94"

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# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-5 Date: 12/16/19 Time: 10:00 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation landscape bed  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 60± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-5		NB 29/77		Surface El. 240.5	
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-120	FILL				

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >120"  
 Depth to Groundwater: Standing Water in the Hole none Weeping from Pit Face: none  
 Estimated Seasonal High Groundwater in the Hole n/a  
 Additional Notes: Avoid area without additional testing.  
 \_\_\_\_\_  
 \_\_\_\_\_

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-6 Date: 12/16/19 Time: 10:30 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 60± feet  
 Drinking Water Well >100 feet Other: feet

<b>Deep Observation Hole Log</b>					
Hole # 1219-6		NB 29/77		Suface El. 239.2	
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Stucture, Stones, Boulders, Consistency, % Gravel)
0-40	FILL				
40-96	C1	FS	2.5Y6/3		
96-144	C2	VFS	2.5Y6/4	@90" 2.5Y6/2 2.5Y6/6	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >144"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: None  
 Estimated Seasonal High Groundwater in the Hole 90"  
 Additional Notes: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-7 Date: 12/16/19 Time: 11:00 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 95± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-7		NB 29/77		Suface El. 237.2	
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Stucture, Stones, Boulders, Consistency, % Gravel)
0-36	FILL				
36-72	C1	FS	2.5Y6/3		
72-134	C2	VFS	2.5Y6/4	@96" 2.5Y6/2 2.5Y6/6	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >134"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 104"  
 Estimated Seasonal High Groundwater in the Hole 96"  
 Additional Notes: GWMP Observed 3/5/20 @ 96"

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-D1 Date: 12/16/19 Time: 11:30 AM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 20± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-D1		NB 29/73	Suface El. 233.8		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Stucture, Stones, Boulders, Consistency, % Gravel)
0-16	FILL				
16-20	BA	FSL	10YR3/3		
20-32	BB	LFS	10YR5/6		
32-80	C1	FS	2.5Y6/4	@48"	
80-96	C2	Gr		10YR5/6 2.5Y6/2	cobbles

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >96"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 60"  
 Estimated Seasonal High Groundwater in the Hole 48"  
 Additional Notes: Not Witnessed

## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-D2 Date: 12/16/19 Time: 12:00 PM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 25±  
 Possible Wet Area >100 feet Property Line feet  
 Drinking Water Well >100 feet Other: feet

<b>Deep Observation Hole Log</b>					
Hole # 1219-D2		NB 29/73	Suface El. 230.0		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Stucture, Stones, Boulders, Consistency, % Gravel)
0-8	A	FSL	10YR3/3		
8-17	BA	LFS	10YR5/6	@20"	
17-90	BB	FS	2.5YR6/4	10YR5/6	
				2.5Y6/2	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >90"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 72"  
 Estimated Seasonal High Groundwater in the Hole 20"  
 Additional Notes: Not Witnessed

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

## On-Site Review

Deep Hole #: 1219-D3 Date: 12/16/19 Time: 12:30 PM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 60± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-D3		NB 29/73	Surface El. 234.0		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8	A	FSL	10YR4/4		
8-16	B	LFS	10YR5/3	@70"	
16-126	C	VFS	2.5YR6/3	10YR5/8 2.5Y6/2	friable friable-massive

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >126"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 48"  
 Estimated Seasonal High Groundwater in the Hole 48"  
 Additional Notes: Not Witnessed

## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-D4 Date: 12/16/19 Time: 1:00 PM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 110± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-D4		NB 20/73	Surface El. 230.8		
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4	A	FSL	10YR4/4		
4-10	B	LFS	10YR5/3	@36"	
10-110	C	VFS	2.5YR6/3	10YR5/8 2.5Y6/1	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >110"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 36"  
 Estimated Seasonal High Groundwater in the Hole 36"  
 Additional Notes: Not Witnessed

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## FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot #: 336-338 King St.  
Littleton, MA 01460

### On-Site Review

Deep Hole #: 1219-D5 Date: 12/16/19 Time: 1:30 PM Weather: Sunny 30°  
 Location (identify on site plan) See attached Sketch  
 Land Use Open Field/Yard Slope (%) 2% Surfaces Stones none  
 (eg woodland, agricultural field, vacant lot etc...)  
 Vegetation lawn  
 Landform Outwash plain  
 Position on landscape See attached Sketch  
 Distances from:  
 Open Water Body >100 feet Drainage Way >100 feet  
 Possible Wet Area >100 feet Property Line 150± feet  
 Drinking Water Well >100 feet Other: feet

Deep Observation Hole Log					
Hole # 1219-D5		NB 29/75		Surface El. 230.5	
Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (MUNSELL)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-32	FILL				
32-38	BA	FSL	10YR4/4		
38-48	BB	LFS	10YR5/3		
48-112	C1	VFS	2.5YR6/2	@86" 10YR5/6 2.5Y6/1	

\*MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Proglacial outwash Depth to Bedrock: >112"  
 Depth to Groundwater: Standing Water in the Hole None Weeping from Pit Face: 48"  
 Estimated Seasonal High Groundwater in the Hole 48"  
 Additional Notes: Not Witnessed

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.....

# FORM 11 - SOIL EVALUATOR FORM

Location Address or Lot#: 336-338 King St.  
Littleton, MA 01460

## Determination for Seasonal High Water Table

### Method Used:

- Depth observed standing in observation hole ..... inches .....
- Depth weeping from side of observation hole ..... inches .....
- Depth to soil mottles \* inches See individual Reports .....
- Ground water adjustment ..... feet .....

Index Well Number ..... Reading Date ..... Index Well Level .....

Adjustment Factor ..... Adjusted Ground Water Level .....

### Depth of Naturally Occuring Pervious Material

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

If not, what is the depth of naturally occuring pervious material? \_\_\_\_\_ Feet

### Certification

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

Signature



Date

1/10/20

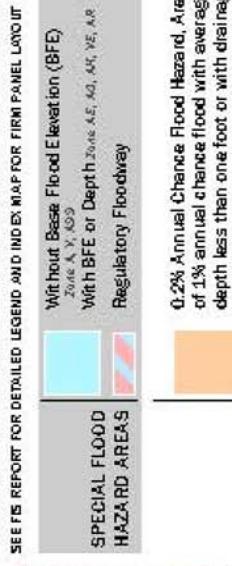
Notes: \_\_\_\_\_

Signature

# National Flood Hazard Layer FIRMette



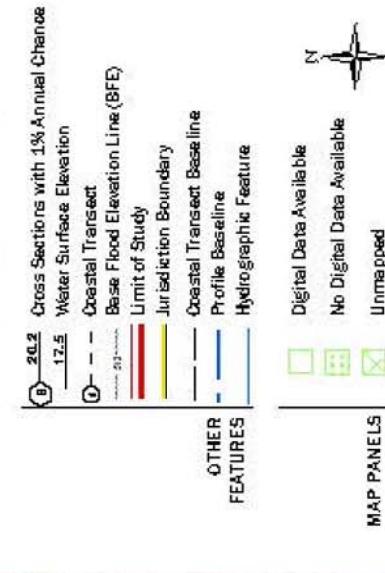
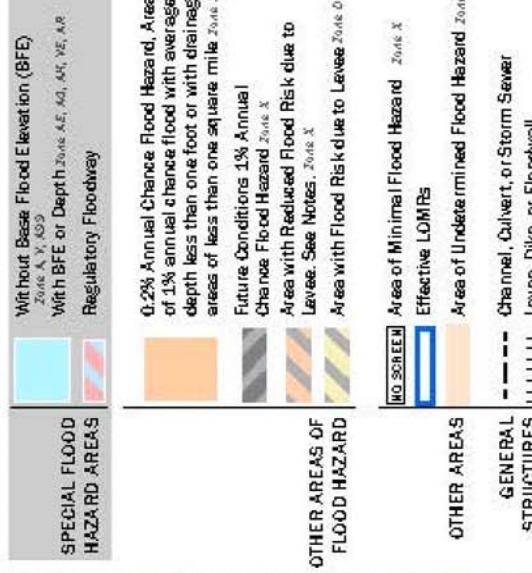
## Legend



42°32'39.41"N

71°29'23.93"W

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL L0017



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

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

The flood hazard information is derived directly from the authoritative NFHLS web services provided by FEMA. This map was exported on 11/15/2019 at 11:05:43 AM and does not reflect changes or amendments subsequent to this date and time. The NFHLS and effective information may change or become superseded by new data over time.

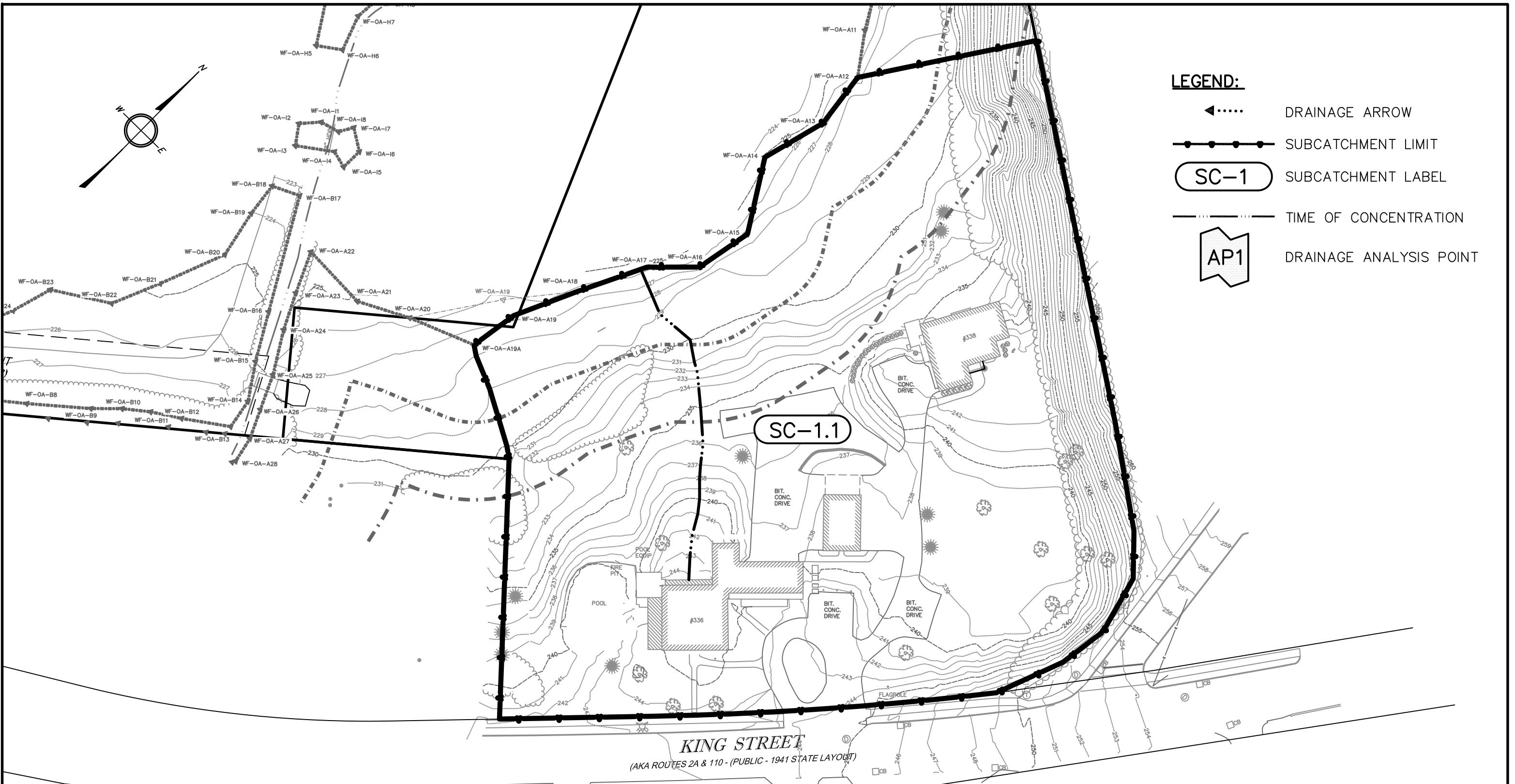
This map image is void if the one or more of the following map elements do not appear: basemap image, flood zone labels, legend, scale bar, map creation date, community identifier, FIRM panel number, and FEMA effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory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

USGS The National Map Orthoimagery. Data refreshed April, 2019.  
42°32'31.77"N  
71°28'31.00"W

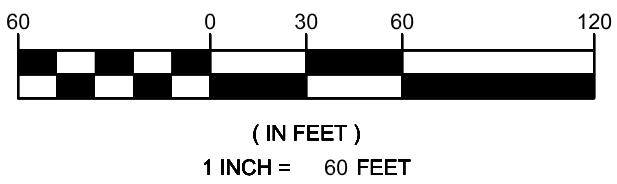
1:6,000  
1,000  
2,000  
Feet

0 250 500 1,500  
N





GRAPHIC SCALE



**GPR**  
Engineering Solutions  
for Land & Structures

**GOLDSMITH, PREST & RINGWALL, INC.**  
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DES'D BY: LT	CHK'D BY: NMP
DATE: FEBRUARY 2020	

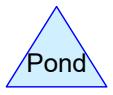
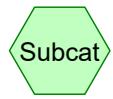
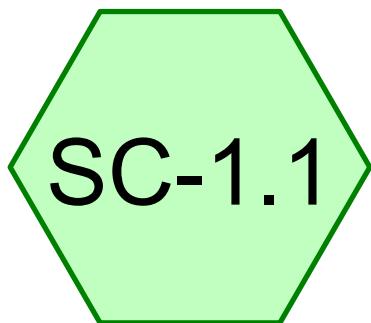
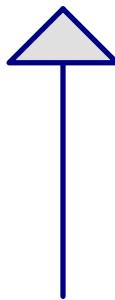
PRE-DEVELOPMENT  
WATERSHED MAP

336-338 KING STREET  
LITTLETON, MA

PROJECT: 191096

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#### Routing Diagram for PRE-DEV

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**PRE-DEV**

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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
85,388	39	>75% Grass cover, Good, HSG A (SC-1.1)
17,800	98	Paved parking, HSG A (SC-1.1)
7,682	98	Roofs, HSG A (SC-1.1)
22,671	30	Woods, Good, HSG A (SC-1.1)
<b>133,541</b>	<b>49</b>	<b>TOTAL AREA</b>

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2

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

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

**Subcatchment SC-1.1:**

Runoff Area=133,541 sf 19.08% Impervious Runoff Depth>0.09"  
Flow Length=213' Tc=5.0 min CN=49 Runoff=0.0 cfs 986 cf

**Link AP-1:**

Inflow=0.0 cfs 986 cf  
Primary=0.0 cfs 986 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 986 cf Average Runoff Depth = 0.09"  
80.92% Pervious = 108,059 sf 19.08% Impervious = 25,482 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 0.0 cfs @ 14.53 hrs, Volume= 986 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
85,388	39	>75% Grass cover, Good, HSG A
22,671	30	Woods, Good, HSG A
17,800	98	Paved parking, HSG A
7,682	98	Roofs, HSG A
133,541	49	Weighted Average
108,059		80.92% Pervious Area
25,482		19.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.3	163	0.0859	2.05		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.6	213				Total, Increased to minimum Tc = 5.0 min

**Summary for Link AP-1:**

Inflow Area = 133,541 sf, 19.08% Impervious, Inflow Depth > 0.09" for 2-Year event

Inflow = 0.0 cfs @ 14.53 hrs, Volume= 986 cf

Primary = 0.0 cfs @ 14.53 hrs, Volume= 986 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2

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

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

**Subcatchment SC-1.1:**

Runoff Area=133,541 sf 19.08% Impervious Runoff Depth>0.51"  
Flow Length=213' Tc=5.0 min CN=49 Runoff=0.9 cfs 5,642 cf

**Link AP-1:**

Inflow=0.9 cfs 5,642 cf  
Primary=0.9 cfs 5,642 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 5,642 cf Average Runoff Depth = 0.51"  
80.92% Pervious = 108,059 sf 19.08% Impervious = 25,482 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 0.9 cfs @ 12.14 hrs, Volume= 5,642 cf, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
85,388	39	>75% Grass cover, Good, HSG A
22,671	30	Woods, Good, HSG A
17,800	98	Paved parking, HSG A
7,682	98	Roofs, HSG A
133,541	49	Weighted Average
108,059		80.92% Pervious Area
25,482		19.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.3	163	0.0859	2.05		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.6	213				Total, Increased to minimum Tc = 5.0 min

**Summary for Link AP-1:**

Inflow Area = 133,541 sf, 19.08% Impervious, Inflow Depth > 0.51" for 10-Year event

Inflow = 0.9 cfs @ 12.14 hrs, Volume= 5,642 cf

Primary = 0.9 cfs @ 12.14 hrs, Volume= 5,642 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2

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

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

**Subcatchment SC-1.1:**

Runoff Area=133,541 sf 19.08% Impervious Runoff Depth>2.36"

Flow Length=213' Tc=5.0 min CN=49 Runoff=7.9 cfs 26,241 cf

**Link AP-1:**

Inflow=7.9 cfs 26,241 cf

Primary=7.9 cfs 26,241 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 26,241 cf Average Runoff Depth = 2.36"**  
**80.92% Pervious = 108,059 sf 19.08% Impervious = 25,482 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 7.9 cfs @ 12.12 hrs, Volume= 26,241 cf, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
85,388	39	>75% Grass cover, Good, HSG A
22,671	30	Woods, Good, HSG A
17,800	98	Paved parking, HSG A
7,682	98	Roofs, HSG A
133,541	49	Weighted Average
108,059		80.92% Pervious Area
25,482		19.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.3	163	0.0859	2.05		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.6	213				Total, Increased to minimum Tc = 5.0 min

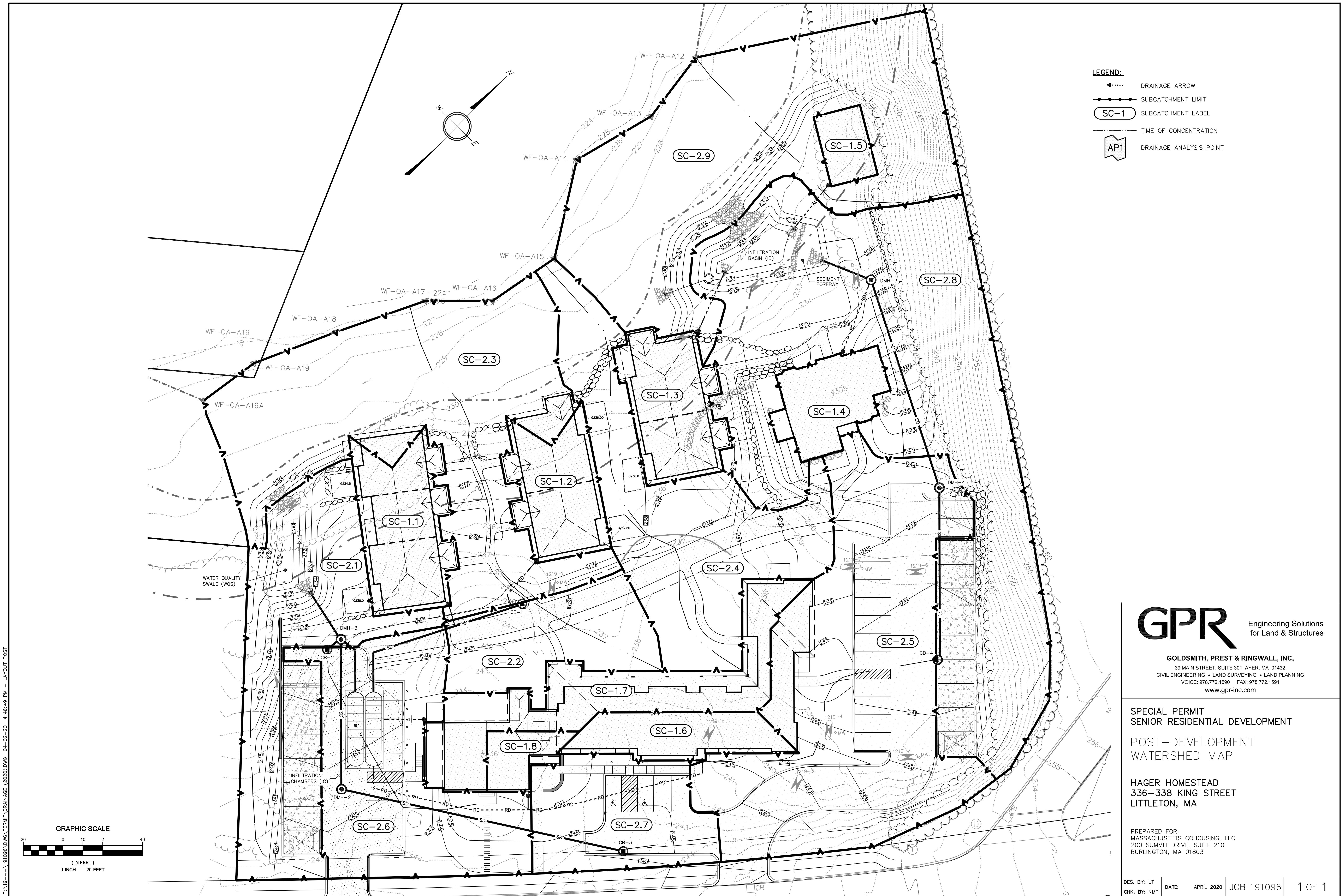
**Summary for Link AP-1:**

Inflow Area = 133,541 sf, 19.08% Impervious, Inflow Depth > 2.36" for 100-Year event

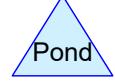
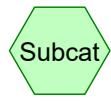
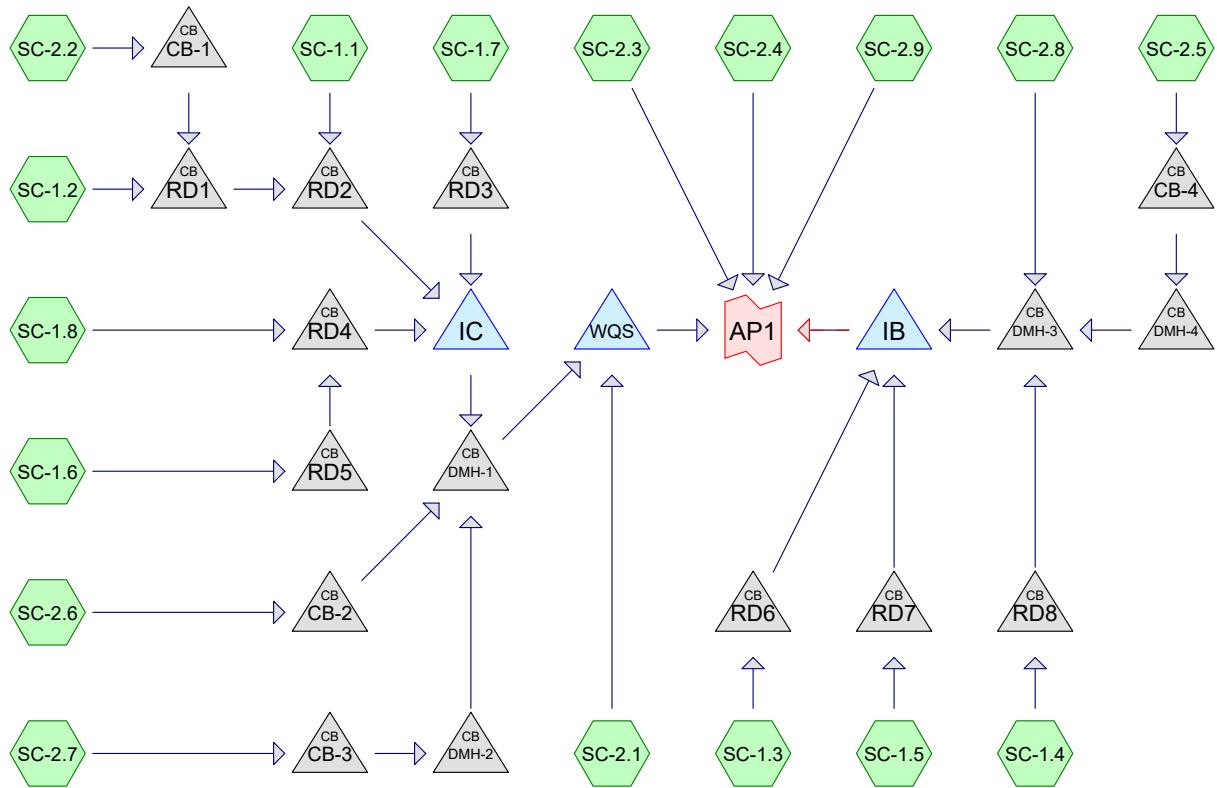
Inflow = 7.9 cfs @ 12.12 hrs, Volume= 26,241 cf

Primary = 7.9 cfs @ 12.12 hrs, Volume= 26,241 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs







#### Routing Diagram for POST-DEV

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**POST-DEV**

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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
72,785	39	>75% Grass cover, Good, HSG A (SC-2.1, SC-2.2, SC-2.3, SC-2.4, SC-2.5, SC-2.6, SC-2.7, SC-2.8, SC-2.9)
14,348	98	Paved parking, HSG A (SC-2.5, SC-2.6, SC-2.7)
27,583	98	Roofs, HSG A (SC-1.1, SC-1.2, SC-1.3, SC-1.4, SC-1.5, SC-1.6, SC-1.7, SC-1.8, SC-2.1, SC-2.3, SC-2.5, SC-2.8)
5,674	98	Unconnected pavement, HSG A (SC-2.1, SC-2.2, SC-2.3, SC-2.4, SC-2.5, SC-2.6, SC-2.7, SC-2.8)
13,151	30	Woods, Good, HSG A (SC-2.5, SC-2.8, SC-2.9)
<b>133,541</b>	<b>59</b>	<b>TOTAL AREA</b>

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment SC-1.1:</b>	Runoff Area=3,546 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.2 cfs 844 cf
<b>Subcatchment SC-1.2:</b>	Runoff Area=2,804 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.2 cfs 667 cf
<b>Subcatchment SC-1.3:</b>	Runoff Area=3,194 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.2 cfs 760 cf
<b>Subcatchment SC-1.4:</b>	Runoff Area=2,179 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.1 cfs 518 cf
<b>Subcatchment SC-1.5:</b>	Runoff Area=872 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.1 cfs 207 cf
<b>Subcatchment SC-1.6:</b>	Runoff Area=2,230 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.1 cfs 531 cf
<b>Subcatchment SC-1.7:</b>	Runoff Area=5,484 sf 100.00% Impervious Runoff Depth>2.86" Tc=5.0 min CN=98 Runoff=0.4 cfs 1,305 cf
<b>Subcatchment SC-1.8:</b>	Runoff Area=970 sf 100.00% Impervious Runoff Depth>2.86" Tc=0.0 min CN=98 Runoff=0.1 cfs 231 cf
<b>Subcatchment SC-2.1:</b>	Runoff Area=9,724 sf 20.38% Impervious Runoff Depth>0.13" Flow Length=167' Tc=5.4 min CN=51 Runoff=0.0 cfs 102 cf
<b>Subcatchment SC-2.2:</b>	Runoff Area=4,382 sf 24.31% Impervious Runoff Depth>0.04" Flow Length=160' Tc=6.2 min UI Adjusted CN=46 Runoff=0.0 cfs 16 cf
<b>Subcatchment SC-2.3:</b>	Runoff Area=16,189 sf 9.17% Impervious Runoff Depth>0.01" Flow Length=167' Tc=5.0 min UI Adjusted CN=43 Runoff=0.0 cfs 19 cf
<b>Subcatchment SC-2.4:</b>	Runoff Area=10,201 sf 14.02% Impervious Runoff Depth>0.01" Flow Length=244' Tc=15.0 min UI Adjusted CN=43 Runoff=0.0 cfs 11 cf
<b>Subcatchment SC-2.5:</b>	Runoff Area=17,260 sf 56.96% Impervious Runoff Depth>0.86" Flow Length=149' Tc=5.3 min CN=72 Runoff=0.4 cfs 1,238 cf
<b>Subcatchment SC-2.6:</b>	Runoff Area=9,114 sf 54.03% Impervious Runoff Depth>0.81" Flow Length=124' Tc=5.0 min CN=71 Runoff=0.2 cfs 616 cf
<b>Subcatchment SC-2.7:</b>	Runoff Area=4,874 sf 56.23% Impervious Runoff Depth>0.86" Flow Length=47' Slope=0.0300 '/' Tc=5.0 min CN=72 Runoff=0.1 cfs 350 cf
<b>Subcatchment SC-2.8:</b>	Runoff Area=23,717 sf 12.10% Impervious Runoff Depth>0.01" Flow Length=130' Tc=5.0 min UI Adjusted CN=42 Runoff=0.0 cfs 15 cf

<b>Subcatchment SC-2.9:</b>	Runoff Area=16,801 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=168' Tc=5.0 min CN=37 Runoff=0.0 cfs 0 cf
<b>Pond CB-1:</b>	Peak Elev=235.62' Inflow=0.0 cfs 16 cf 12.0" Round Culvert n=0.013 L=4.0' S=0.0200 '/' Outflow=0.0 cfs 16 cf
<b>Pond CB-2:</b>	Peak Elev=236.43' Inflow=0.2 cfs 616 cf 12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=0.2 cfs 616 cf
<b>Pond CB-3:</b>	Peak Elev=240.32' Inflow=0.1 cfs 350 cf 12.0" Round Culvert n=0.013 L=142.0' S=0.0200 '/' Outflow=0.1 cfs 350 cf
<b>Pond CB-4:</b>	Peak Elev=236.34' Inflow=0.4 cfs 1,238 cf 12.0" Round Culvert n=0.013 L=83.0' S=0.0181 '/' Outflow=0.4 cfs 1,238 cf
<b>Pond DMH-1:</b>	Peak Elev=236.20' Inflow=0.3 cfs 966 cf 12.0" Round Culvert n=0.013 L=30.0' S=0.0633 '/' Outflow=0.3 cfs 966 cf
<b>Pond DMH-2:</b>	Peak Elev=237.38' Inflow=0.1 cfs 350 cf 12.0" Round Culvert n=0.013 L=60.0' S=0.0200 '/' Outflow=0.1 cfs 350 cf
<b>Pond DMH-3:</b>	Peak Elev=232.80' Inflow=0.5 cfs 1,771 cf 12.0" Round Culvert n=0.013 L=24.0' S=0.0167 '/' Outflow=0.5 cfs 1,771 cf
<b>Pond DMH-4:</b>	Peak Elev=234.74' Inflow=0.4 cfs 1,238 cf 12.0" Round Culvert n=0.013 L=106.0' S=0.0179 '/' Outflow=0.4 cfs 1,238 cf
<b>Pond IB:</b>	Peak Elev=231.39' Storage=979 cf Inflow=0.8 cfs 2,738 cf Discarded=0.1 cfs 2,476 cf Primary=0.0 cfs 0 cf Secondary=0.0 cfs 0 cf Outflow=0.1 cfs 2,476 cf
<b>Pond IC:</b>	Peak Elev=234.85' Storage=1,494 cf Inflow=0.9 cfs 3,593 cf Discarded=0.0 cfs 2,756 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 2,756 cf
<b>Pond RD1:</b>	Peak Elev=235.66' Inflow=0.2 cfs 683 cf 12.0" Round Culvert n=0.013 L=29.0' S=0.0207 '/' Outflow=0.2 cfs 683 cf
<b>Pond RD2:</b>	Peak Elev=235.18' Inflow=0.4 cfs 1,527 cf 12.0" Round Culvert n=0.013 L=63.0' S=0.0210 '/' Outflow=0.4 cfs 1,527 cf
<b>Pond RD3:</b>	Peak Elev=237.89' Inflow=0.4 cfs 1,305 cf 8.0" Round Culvert n=0.013 L=20.0' S=0.0375 '/' Outflow=0.4 cfs 1,305 cf
<b>Pond RD4:</b>	Peak Elev=243.37' Inflow=0.2 cfs 762 cf 6.0" Round Culvert n=0.013 L=90.0' S=0.0700 '/' Outflow=0.2 cfs 762 cf
<b>Pond RD5:</b>	Peak Elev=244.26' Inflow=0.1 cfs 531 cf 6.0" Round Culvert n=0.013 L=95.0' S=0.0100 '/' Outflow=0.1 cfs 531 cf
<b>Pond RD6:</b>	Peak Elev=231.39' Inflow=0.2 cfs 760 cf 6.0" Round Culvert n=0.013 L=31.0' S=0.0323 '/' Outflow=0.2 cfs 760 cf
<b>Pond RD7:</b>	Peak Elev=232.16' Inflow=0.1 cfs 207 cf 6.0" Round Culvert n=0.013 L=27.0' S=0.0370 '/' Outflow=0.1 cfs 207 cf

**Pond RD8:**

Peak Elev=234.26' Inflow=0.1 cfs 518 cf  
6.0" Round Culvert n=0.013 L=38.0' S=0.0395 '/' Outflow=0.1 cfs 518 cf

**Pond WQS:**

Peak Elev=230.84' Storage=362 cf Inflow=0.3 cfs 1,068 cf  
Discarded=0.0 cfs 923 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 923 cf

**Link AP1:**

Inflow=0.0 cfs 30 cf  
Primary=0.0 cfs 30 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 7,430 cf Average Runoff Depth = 0.67"**  
**64.35% Pervious = 85,935 sf 35.65% Impervious = 47,605 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 844 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description							
3,546	98	Roofs, HSG A							
3,546		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.2:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 667 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description							
2,804	98	Roofs, HSG A							
2,804		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.3:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 760 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description							
3,194	98	Roofs, HSG A							
3,194		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.4:**

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 518 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
2,179	98	Roofs, HSG A
2,179		100.00% Impervious Area

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

**Summary for Subcatchment SC-1.5:**

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 207 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
872	98	Roofs, HSG A
872		100.00% Impervious Area

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

**Summary for Subcatchment SC-1.6:**

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 531 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
2,230	98	Roofs, HSG A
2,230		100.00% Impervious Area

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

**Summary for Subcatchment SC-1.7:**

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,305 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description			
5,484	98	Roofs, HSG A			
5,484		100.00% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	Direct Entry,				

**Summary for Subcatchment SC-1.8:**

Runoff = 0.1 cfs @ 12.06 hrs, Volume= 231 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
970	98	Roofs, HSG A
970		100.00% Impervious Area

**Summary for Subcatchment SC-2.1:**

Runoff = 0.0 cfs @ 13.04 hrs, Volume= 102 cf, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description			
1,981	98	Roofs, HSG A			
0	98	Unconnected pavement, HSG A			
7,742	39	>75% Grass cover, Good, HSG A			
9,724	51	Weighted Average			
7,742		79.62% Pervious Area			
1,981		20.38% Impervious Area			
0		0.00% Unconnected			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.1	117	0.0684	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
5.4	167	Total			

### Summary for Subcatchment SC-2.2:

Runoff = 0.0 cfs @ 24.00 hrs, Volume= 16 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description		
3,317	39		>75% Grass cover, Good, HSG A		
1,065	98		Unconnected pavement, HSG A		
4,382	53	46	Weighted Average, UI Adjusted		
3,317			75.69% Pervious Area		
1,065			24.31% Impervious Area		
1,065			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.5	110	0.0318	3.62		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
6.2	160	Total			

### Summary for Subcatchment SC-2.3:

Runoff = 0.0 cfs @ 24.00 hrs, Volume= 19 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description		
14,704	39		>75% Grass cover, Good, HSG A		
876	98		Roofs, HSG A		
608	98		Unconnected pavement, HSG A		
16,189	44	43	Weighted Average, UI Adjusted		
14,704			90.83% Pervious Area		
1,484			9.17% Impervious Area		
608			40.95% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.70		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.1	33	0.0400	4.06		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.6	84	0.1250	2.47		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	167	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment SC-2.4:**

Runoff = 0.0 cfs @ 24.00 hrs, Volume= 11 cf, Depth&gt; 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description		
8,771	39		>75% Grass cover, Good, HSG A		
1,430	98		Unconnected pavement, HSG A		
10,201	47	43	Weighted Average, UI Adjusted		
8,771			85.98% Pervious Area		
1,430			14.02% Impervious Area		
1,430			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0190	0.14		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	13	0.0190	0.96		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
8.9	170	0.0765	0.32		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
15.0	244	Total			

**Summary for Subcatchment SC-2.5:**

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf, Depth&gt; 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description	
6,974	39	>75% Grass cover, Good, HSG A	
635	98	Unconnected pavement, HSG A	
7,950	98	Paved parking, HSG A	
1,247	98	Roofs, HSG A	
455	30	Woods, Good, HSG A	
17,260	72	Weighted Average	
7,429		43.04% Pervious Area	
9,832		56.96% Impervious Area	
635		6.46% Unconnected	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	49	0.0367	1.34		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.4	50	0.0130	2.31		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.3	149	Total			

### Summary for Subcatchment SC-2.6:

Runoff = 0.2 cfs @ 12.12 hrs, Volume= 616 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
596	98	Unconnected pavement, HSG A
4,328	98	Paved parking, HSG A
4,190	39	>75% Grass cover, Good, HSG A
9,114	71	Weighted Average
4,190		45.97% Pervious Area
4,924		54.03% Impervious Area
596		12.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	36	0.1000	0.26		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	14	0.0320	1.10		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.3	74	0.0320	3.63		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
2.8	124	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.7:

Runoff = 0.1 cfs @ 12.12 hrs, Volume= 350 cf, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
2,133	39	>75% Grass cover, Good, HSG A
671	98	Unconnected pavement, HSG A
2,070	98	Paved parking, HSG A
4,874	72	Weighted Average
2,133		43.77% Pervious Area
2,741		56.23% Impervious Area
671		24.47% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	47	0.0300	1.37		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.6	47	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.8:

Runoff = 0.0 cfs @ 24.00 hrs, Volume= 15 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description
11,869	39		>75% Grass cover, Good, HSG A
8,979	30		Woods, Good, HSG A
670	98		Unconnected pavement, HSG A
2,200	98		Roofs, HSG A
23,717	43	42	Weighted Average, UI Adjusted
20,847			87.90% Pervious Area
2,870			12.10% Impervious Area
670			23.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	80	0.0875	2.07		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.6	130	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.9:

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
3,717	30	Woods, Good, HSG A
13,084	39	>75% Grass cover, Good, HSG A
16,801	37	Weighted Average
16,801		100.00% Pervious Area

**POST-DEV**

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.4000	0.22		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.09"
1.1	118	0.0680	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.9	168	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond CB-1:**

Inflow Area = 4,382 sf, 24.31% Impervious, Inflow Depth > 0.04" for 2-Year event  
 Inflow = 0.0 cfs @ 24.00 hrs, Volume= 16 cf  
 Outflow = 0.0 cfs @ 24.00 hrs, Volume= 16 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.0 cfs @ 24.00 hrs, Volume= 16 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 235.62' @ 12.08 hrs

Flood Elev= 239.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	235.50'	<b>12.0" Round Culvert</b> L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 235.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.0 cfs @ 24.00 hrs HW=235.51' TW=235.45' (Dynamic Tailwater)  
 ↑1=Culvert (Outlet Controls 0.0 cfs @ 0.45 fps)

**Summary for Pond CB-2:**

Inflow Area = 9,114 sf, 54.03% Impervious, Inflow Depth > 0.81" for 2-Year event  
 Inflow = 0.2 cfs @ 12.12 hrs, Volume= 616 cf  
 Outflow = 0.2 cfs @ 12.12 hrs, Volume= 616 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.12 hrs, Volume= 616 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.43' @ 12.12 hrs

Flood Elev= 239.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.20'	<b>12.0" Round Culvert</b> L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.20' / 236.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.2 cfs @ 12.12 hrs HW=236.43' TW=236.20' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.2 cfs @ 1.30 fps)

**Summary for Pond CB-3:**

Inflow Area = 4,874 sf, 56.23% Impervious, Inflow Depth > 0.86" for 2-Year event  
 Inflow = 0.1 cfs @ 12.12 hrs, Volume= 350 cf  
 Outflow = 0.1 cfs @ 12.12 hrs, Volume= 350 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.12 hrs, Volume= 350 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 240.32' @ 12.12 hrs

Flood Elev= 244.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	240.14'	<b>12.0" Round Culvert</b> L= 142.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 240.14' / 237.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.1 cfs @ 12.12 hrs HW=240.31' TW=237.37' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.1 cfs @ 1.12 fps)

**Summary for Pond CB-4:**

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 0.86" for 2-Year event  
 Inflow = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf  
 Outflow = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.34' @ 12.13 hrs

Flood Elev= 240.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	<b>12.0" Round Culvert</b> L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.00' / 234.50' S= 0.0181 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.4 cfs @ 12.13 hrs HW=236.33' TW=234.73' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.4 cfs @ 1.55 fps)

**Summary for Pond DMH-1:**

Inflow Area = 33,404 sf, 71.14% Impervious, Inflow Depth > 0.35" for 2-Year event  
 Inflow = 0.3 cfs @ 12.12 hrs, Volume= 966 cf  
 Outflow = 0.3 cfs @ 12.12 hrs, Volume= 966 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.3 cfs @ 12.12 hrs, Volume= 966 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.20' @ 12.12 hrs

Flood Elev= 239.50'

**POST-DEV**

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Device	Routing	Invert	Outlet Devices
#1	Primary	235.90'	<b>12.0" Round Culvert</b> L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.90' / 234.00' S= 0.0633 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.3 cfs @ 12.12 hrs HW=236.20' TW=230.24' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.3 cfs @ 1.46 fps)

**Summary for Pond DMH-2:**

Inflow Area = 4,874 sf, 56.23% Impervious, Inflow Depth > 0.86" for 2-Year event  
 Inflow = 0.1 cfs @ 12.12 hrs, Volume= 350 cf  
 Outflow = 0.1 cfs @ 12.12 hrs, Volume= 350 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.12 hrs, Volume= 350 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 237.38' @ 12.12 hrs  
 Flood Elev= 241.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.20'	<b>12.0" Round Culvert</b> L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.20' / 236.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.1 cfs @ 12.12 hrs HW=237.37' TW=236.20' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.1 cfs @ 1.12 fps)

**Summary for Pond DMH-3:**

Inflow Area = 43,157 sf, 34.48% Impervious, Inflow Depth > 0.49" for 2-Year event  
 Inflow = 0.5 cfs @ 12.12 hrs, Volume= 1,771 cf  
 Outflow = 0.5 cfs @ 12.12 hrs, Volume= 1,771 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.5 cfs @ 12.12 hrs, Volume= 1,771 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 232.80' @ 12.12 hrs  
 Flood Elev= 235.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	232.40'	<b>12.0" Round Culvert</b> L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.40' / 232.00' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.5 cfs @ 12.12 hrs HW=232.80' TW=230.84' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.5 cfs @ 1.70 fps)

### Summary for Pond DMH-4:

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 0.86" for 2-Year event  
 Inflow = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf  
 Outflow = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.13 hrs, Volume= 1,238 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 234.74' @ 12.13 hrs

Flood Elev= 243.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.40'	<b>12.0" Round Culvert</b> L= 106.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.40' / 232.50' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.4 cfs @ 12.13 hrs HW=234.73' TW=232.80' (Dynamic Tailwater)  
 ↗1=Culvert (Inlet Controls 0.4 cfs @ 1.55 fps)

### Summary for Pond IB:

Inflow Area = 47,222 sf, 40.12% Impervious, Inflow Depth > 0.70" for 2-Year event  
 Inflow = 0.8 cfs @ 12.12 hrs, Volume= 2,738 cf  
 Outflow = 0.1 cfs @ 13.61 hrs, Volume= 2,476 cf, Atten= 93%, Lag= 89.3 min  
 Discarded = 0.1 cfs @ 13.61 hrs, Volume= 2,476 cf  
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf  
 Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 231.39' @ 13.61 hrs Surf.Area= 1,034 sf Storage= 979 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 129.3 min ( 957.4 - 828.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	230.00'	3,417 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)
230.00	445	97.5	0
231.00	815	126.4	621
232.00	1,431	162.0	1,109
233.00	1,958	184.3	1,688
			Cum.Store (cubic-feet)
			0
			621
			1,729
			3,417
			445
			972
			1,802
			2,440

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	230.50'	<b>12.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.50' / 230.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

#3	Device 2	232.00'	<b>24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#4	Device 2	231.50'	<b>12.0" W x 4.0" H Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#5	Secondary	232.00'	<b>6.0' long x 26.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Discarded OutFlow** Max=0.1 cfs @ 13.61 hrs HW=231.39' (Free Discharge)  
 ↪ 1=Exfiltration (Exfiltration Controls 0.1 cfs)

**Primary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=230.00' 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)

**Secondary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=230.00' TW=0.00' (Dynamic Tailwater)  
 ↪ 5=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

### Summary for Pond IC:

Inflow Area = 19,416 sf, 82.92% Impervious, Inflow Depth > 2.22" for 2-Year event  
 Inflow = 0.9 cfs @ 12.11 hrs, Volume= 3,593 cf  
 Outflow = 0.0 cfs @ 10.56 hrs, Volume= 2,756 cf, Atten= 96%, Lag= 0.0 min  
 Discarded = 0.0 cfs @ 10.56 hrs, Volume= 2,756 cf  
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 234.85' @ 14.65 hrs Surf.Area= 763 sf Storage= 1,494 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 126.4 min ( 887.7 - 761.3 )

Volume	Invert	Avail.Storage	Storage Description
#1A	232.00'	1,323 cf	<b>19.42'W x 39.32'L x 6.75'H Field A</b> 5,153 cf Overall - 1,847 cf Embedded = 3,306 cf x 40.0% Voids
#2A	232.75'	1,847 cf	<b>ADS_StormTech MC-4500 +Cap x 16 Inside #1</b> 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 16 Chambers in 2 Rows Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
3,169 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	236.75'	<b>12.0" Round Culvert</b> L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.75' / 236.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	232.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 10.56 hrs HW=232.07' (Free Discharge)  
 ↗ 2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=232.00' TW=235.90' (Dynamic Tailwater)  
 ↗ 1=Culvert (Controls 0.0 cfs)

### Summary for Pond RD1:

Inflow Area = 7,186 sf, 53.84% Impervious, Inflow Depth > 1.14" for 2-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 683 cf  
 Outflow = 0.2 cfs @ 12.11 hrs, Volume= 683 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 683 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 235.66' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	235.42'	<b>12.0" Round Culvert</b> L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.42' / 234.82' S= 0.0207 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.2 cfs @ 12.11 hrs HW=235.65' TW=235.18' (Dynamic Tailwater)  
 ↗ 1=Culvert (Inlet Controls 0.2 cfs @ 1.30 fps)

### Summary for Pond RD2:

Inflow Area = 10,732 sf, 69.09% Impervious, Inflow Depth > 1.71" for 2-Year event  
 Inflow = 0.4 cfs @ 12.11 hrs, Volume= 1,527 cf  
 Outflow = 0.4 cfs @ 12.11 hrs, Volume= 1,527 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.11 hrs, Volume= 1,527 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 235.18' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.82'	<b>12.0" Round Culvert</b> L= 63.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.82' / 233.50' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.4 cfs @ 12.11 hrs HW=235.18' TW=233.70' (Dynamic Tailwater)  
 ↗ 1=Culvert (Inlet Controls 0.4 cfs @ 1.61 fps)

**Summary for Pond RD3:**

Inflow Area = 5,484 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.4 cfs @ 12.11 hrs, Volume= 1,305 cf  
 Outflow = 0.4 cfs @ 12.11 hrs, Volume= 1,305 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.11 hrs, Volume= 1,305 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 237.89' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	237.50'	<b>8.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.50' / 236.75' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

**Primary OutFlow** Max=0.4 cfs @ 12.11 hrs HW=237.89' TW=233.70' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.4 cfs @ 1.67 fps)

**Summary for Pond RD4:**

Inflow Area = 3,200 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.2 cfs @ 12.08 hrs, Volume= 762 cf  
 Outflow = 0.2 cfs @ 12.08 hrs, Volume= 762 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.08 hrs, Volume= 762 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 243.37' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	243.05'	<b>6.0" Round Culvert</b> L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 243.05' / 236.75' S= 0.0700 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.2 cfs @ 12.08 hrs HW=243.37' TW=233.53' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.2 cfs @ 1.51 fps)

**Summary for Pond RD5:**

Inflow Area = 2,230 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.1 cfs @ 12.11 hrs, Volume= 531 cf  
 Outflow = 0.1 cfs @ 12.11 hrs, Volume= 531 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.11 hrs, Volume= 531 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 244.26' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	244.00'	<b>6.0" Round Culvert</b> L= 95.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 244.00' / 243.05' S= 0.0100 '/' Cc= 0.900  
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.1 cfs @ 12.11 hrs HW=244.26' TW=243.34' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.1 cfs @ 1.38 fps)

### **Summary for Pond RD6:**

Inflow Area = 3,194 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 760 cf  
 Outflow = 0.2 cfs @ 12.11 hrs, Volume= 760 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 760 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 231.39' @ 13.60 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	231.00'	<b>6.0" Round Culvert</b> L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 231.00' / 230.00' S= 0.0323 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.2 cfs @ 12.11 hrs HW=231.32' TW=230.81' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.2 cfs @ 1.53 fps)

### **Summary for Pond RD7:**

Inflow Area = 872 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.1 cfs @ 12.11 hrs, Volume= 207 cf  
 Outflow = 0.1 cfs @ 12.11 hrs, Volume= 207 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.11 hrs, Volume= 207 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 232.16' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	<b>6.0" Round Culvert</b> L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.00' / 231.00' S= 0.0370 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.1 cfs @ 12.11 hrs HW=232.16' TW=230.81' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.1 cfs @ 1.06 fps)

### **Summary for Pond RD8:**

Inflow Area = 2,179 sf, 100.00% Impervious, Inflow Depth > 2.86" for 2-Year event  
 Inflow = 0.1 cfs @ 12.11 hrs, Volume= 518 cf  
 Outflow = 0.1 cfs @ 12.11 hrs, Volume= 518 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.11 hrs, Volume= 518 cf

**POST-DEV**

Prepared by Goldsmith, Prest &amp; Ringwall, Inc.

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NRCC 24-hr D 2-Year Rainfall=3.09"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 234.26' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.00'	<b>6.0" Round Culvert</b> L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.00' / 232.50' S= 0.0395 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.1 cfs @ 12.11 hrs HW=234.26' TW=232.80' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 0.1 cfs @ 1.37 fps)

**Summary for Pond WQS:**

Inflow Area =	43,128 sf, 59.70% Impervious, Inflow Depth > 0.30" for 2-Year event
Inflow =	0.3 cfs @ 12.12 hrs, Volume= 1,068 cf
Outflow =	0.0 cfs @ 14.23 hrs, Volume= 923 cf, Atten= 91%, Lag= 126.7 min
Discarded =	0.0 cfs @ 14.23 hrs, Volume= 923 cf
Primary =	0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 230.84' @ 14.23 hrs Surf.Area= 456 sf Storage= 362 cf

Plug-Flow detention time= 191.0 min calculated for 921 cf (86% of inflow)

Center-of-Mass det. time= 126.6 min ( 1,049.0 - 922.4 )

Volume	Invert	Avail.Storage	Storage Description		
#1	229.00'	1,129 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
229.00	8	23.0	0	0	8
230.00	214	86.3	88	88	561
231.00	513	112.2	353	441	982
232.00	880	132.2	688	1,129	1,390

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	<b>6.0' long x 22.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	229.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 14.23 hrs HW=230.84' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=229.00' TW=0.00' (Dynamic Tailwater)

↑1=Broad-Crested Rectangular Weir ( Controls 0.0 cfs)

**Summary for Link AP1:**

Inflow Area = 133,541 sf, 35.65% Impervious, Inflow Depth > 0.00" for 2-Year event  
Inflow = 0.0 cfs @ 24.00 hrs, Volume= 30 cf  
Primary = 0.0 cfs @ 24.00 hrs, Volume= 30 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment SC-1.1:</b>	Runoff Area=3,546 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.4 cfs 1,303 cf
<b>Subcatchment SC-1.2:</b>	Runoff Area=2,804 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.3 cfs 1,030 cf
<b>Subcatchment SC-1.3:</b>	Runoff Area=3,194 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.3 cfs 1,174 cf
<b>Subcatchment SC-1.4:</b>	Runoff Area=2,179 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.2 cfs 801 cf
<b>Subcatchment SC-1.5:</b>	Runoff Area=872 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.1 cfs 320 cf
<b>Subcatchment SC-1.6:</b>	Runoff Area=2,230 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.2 cfs 820 cf
<b>Subcatchment SC-1.7:</b>	Runoff Area=5,484 sf 100.00% Impervious Runoff Depth>4.41" Tc=5.0 min CN=98 Runoff=0.5 cfs 2,015 cf
<b>Subcatchment SC-1.8:</b>	Runoff Area=970 sf 100.00% Impervious Runoff Depth>4.41" Tc=0.0 min CN=98 Runoff=0.1 cfs 357 cf
<b>Subcatchment SC-2.1:</b>	Runoff Area=9,724 sf 20.38% Impervious Runoff Depth>0.60" Flow Length=167' Tc=5.4 min CN=51 Runoff=0.1 cfs 488 cf
<b>Subcatchment SC-2.2:</b>	Runoff Area=4,382 sf 24.31% Impervious Runoff Depth>0.38" Flow Length=160' Tc=6.2 min UI Adjusted CN=46 Runoff=0.0 cfs 137 cf
<b>Subcatchment SC-2.3:</b>	Runoff Area=16,189 sf 9.17% Impervious Runoff Depth>0.26" Flow Length=167' Tc=5.0 min UI Adjusted CN=43 Runoff=0.0 cfs 352 cf
<b>Subcatchment SC-2.4:</b>	Runoff Area=10,201 sf 14.02% Impervious Runoff Depth>0.26" Flow Length=244' Tc=15.0 min UI Adjusted CN=43 Runoff=0.0 cfs 220 cf
<b>Subcatchment SC-2.5:</b>	Runoff Area=17,260 sf 56.96% Impervious Runoff Depth>1.93" Flow Length=149' Tc=5.3 min CN=72 Runoff=0.9 cfs 2,774 cf
<b>Subcatchment SC-2.6:</b>	Runoff Area=9,114 sf 54.03% Impervious Runoff Depth>1.85" Flow Length=124' Tc=5.0 min CN=71 Runoff=0.4 cfs 1,407 cf
<b>Subcatchment SC-2.7:</b>	Runoff Area=4,874 sf 56.23% Impervious Runoff Depth>1.93" Flow Length=47' Slope=0.0300 '/' Tc=5.0 min CN=72 Runoff=0.2 cfs 784 cf
<b>Subcatchment SC-2.8:</b>	Runoff Area=23,717 sf 12.10% Impervious Runoff Depth>0.23" Flow Length=130' Tc=5.0 min UI Adjusted CN=42 Runoff=0.0 cfs 447 cf

<b>Subcatchment SC-2.9:</b>	Runoff Area=16,801 sf 0.00% Impervious Runoff Depth>0.08" Flow Length=168' Tc=5.0 min CN=37 Runoff=0.0 cfs 118 cf
<b>Pond CB-1:</b>	Peak Elev=236.88' Inflow=0.0 cfs 137 cf 12.0" Round Culvert n=0.013 L=4.0' S=0.0200 '/' Outflow=0.0 cfs 136 cf
<b>Pond CB-2:</b>	Peak Elev=236.58' Inflow=0.4 cfs 1,407 cf 12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=0.4 cfs 1,407 cf
<b>Pond CB-3:</b>	Peak Elev=240.41' Inflow=0.2 cfs 784 cf 12.0" Round Culvert n=0.013 L=142.0' S=0.0200 '/' Outflow=0.2 cfs 784 cf
<b>Pond CB-4:</b>	Peak Elev=236.54' Inflow=0.9 cfs 2,774 cf 12.0" Round Culvert n=0.013 L=83.0' S=0.0181 '/' Outflow=0.9 cfs 2,774 cf
<b>Pond DMH-1:</b>	Peak Elev=236.38' Inflow=0.7 cfs 2,552 cf 12.0" Round Culvert n=0.013 L=30.0' S=0.0633 '/' Outflow=0.7 cfs 2,552 cf
<b>Pond DMH-2:</b>	Peak Elev=237.47' Inflow=0.2 cfs 784 cf 12.0" Round Culvert n=0.013 L=60.0' S=0.0200 '/' Outflow=0.2 cfs 784 cf
<b>Pond DMH-3:</b>	Peak Elev=233.02' Inflow=1.1 cfs 4,022 cf 12.0" Round Culvert n=0.013 L=24.0' S=0.0167 '/' Outflow=1.1 cfs 4,022 cf
<b>Pond DMH-4:</b>	Peak Elev=234.94' Inflow=0.9 cfs 2,774 cf 12.0" Round Culvert n=0.013 L=106.0' S=0.0179 '/' Outflow=0.9 cfs 2,774 cf
<b>Pond IB:</b>	Peak Elev=231.79' Storage=1,444 cf Inflow=1.5 cfs 5,516 cf Discarded=0.1 cfs 3,250 cf Primary=0.5 cfs 1,461 cf Secondary=0.0 cfs 0 cf Outflow=0.6 cfs 4,711 cf
<b>Pond IC:</b>	Peak Elev=236.89' Storage=2,548 cf Inflow=1.4 cfs 5,660 cf Discarded=0.0 cfs 3,085 cf Primary=0.1 cfs 361 cf Outflow=0.1 cfs 3,447 cf
<b>Pond RD1:</b>	Peak Elev=236.89' Inflow=0.3 cfs 1,166 cf 12.0" Round Culvert n=0.013 L=29.0' S=0.0207 '/' Outflow=0.3 cfs 1,166 cf
<b>Pond RD2:</b>	Peak Elev=236.89' Inflow=0.6 cfs 2,469 cf 12.0" Round Culvert n=0.013 L=63.0' S=0.0210 '/' Outflow=0.6 cfs 2,468 cf
<b>Pond RD3:</b>	Peak Elev=238.01' Inflow=0.5 cfs 2,015 cf 8.0" Round Culvert n=0.013 L=20.0' S=0.0375 '/' Outflow=0.5 cfs 2,015 cf
<b>Pond RD4:</b>	Peak Elev=243.46' Inflow=0.3 cfs 1,176 cf 6.0" Round Culvert n=0.013 L=90.0' S=0.0700 '/' Outflow=0.3 cfs 1,176 cf
<b>Pond RD5:</b>	Peak Elev=244.34' Inflow=0.2 cfs 820 cf 6.0" Round Culvert n=0.013 L=95.0' S=0.0100 '/' Outflow=0.2 cfs 820 cf
<b>Pond RD6:</b>	Peak Elev=231.81' Inflow=0.3 cfs 1,174 cf 6.0" Round Culvert n=0.013 L=31.0' S=0.0323 '/' Outflow=0.3 cfs 1,174 cf
<b>Pond RD7:</b>	Peak Elev=232.20' Inflow=0.1 cfs 320 cf 6.0" Round Culvert n=0.013 L=27.0' S=0.0370 '/' Outflow=0.1 cfs 320 cf

**Pond RD8:**

Peak Elev=234.33' Inflow=0.2 cfs 801 cf  
6.0" Round Culvert n=0.013 L=38.0' S=0.0395 '/' Outflow=0.2 cfs 801 cf

**Pond WQS:**

Peak Elev=231.55' Storage=774 cf Inflow=0.8 cfs 3,040 cf  
Discarded=0.0 cfs 1,641 cf Primary=0.2 cfs 876 cf Outflow=0.2 cfs 2,517 cf

**Link AP1:**

Inflow=0.7 cfs 3,027 cf  
Primary=0.7 cfs 3,027 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 14,547 cf Average Runoff Depth = 1.31"**  
**64.35% Pervious = 85,935 sf 35.65% Impervious = 47,605 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,303 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
3,546	98	Roofs, HSG A							
3,546		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.2:**

Runoff = 0.3 cfs @ 12.11 hrs, Volume= 1,030 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
2,804	98	Roofs, HSG A							
2,804		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.3:**

Runoff = 0.3 cfs @ 12.11 hrs, Volume= 1,174 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
3,194	98	Roofs, HSG A							
3,194		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.4:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 801 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
2,179	98	Roofs, HSG A							
2,179		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.5:**

Runoff = 0.1 cfs @ 12.11 hrs, Volume= 320 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
872	98	Roofs, HSG A							
872		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.6:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 820 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description							
2,230	98	Roofs, HSG A							
2,230		100.00% Impervious Area							
Tc	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>				
5.0					<b>Direct Entry,</b>				

**Summary for Subcatchment SC-1.7:**

Runoff = 0.5 cfs @ 12.11 hrs, Volume= 2,015 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description			
5,484	98	Roofs, HSG A			
5,484		100.00% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	Direct Entry,				

**Summary for Subcatchment SC-1.8:**

Runoff = 0.1 cfs @ 12.06 hrs, Volume= 357 cf, Depth> 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
970	98	Roofs, HSG A
970		100.00% Impervious Area

**Summary for Subcatchment SC-2.1:**

Runoff = 0.1 cfs @ 12.14 hrs, Volume= 488 cf, Depth> 0.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description			
1,981	98	Roofs, HSG A			
0	98	Unconnected pavement, HSG A			
7,742	39	>75% Grass cover, Good, HSG A			
9,724	51	Weighted Average			
7,742		79.62% Pervious Area			
1,981		20.38% Impervious Area			
0		0.00% Unconnected			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.1	117	0.0684	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
5.4	167	Total			

**Summary for Subcatchment SC-2.2:**

Runoff = 0.0 cfs @ 12.19 hrs, Volume= 137 cf, Depth&gt; 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description		
3,317	39		>75% Grass cover, Good, HSG A		
1,065	98		Unconnected pavement, HSG A		
4,382	53	46	Weighted Average, UI Adjusted		
3,317			75.69% Pervious Area		
1,065			24.31% Impervious Area		
1,065			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.5	110	0.0318	3.62		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
6.2	160	Total			

**Summary for Subcatchment SC-2.3:**

Runoff = 0.0 cfs @ 12.52 hrs, Volume= 352 cf, Depth&gt; 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description		
14,704	39		>75% Grass cover, Good, HSG A		
876	98		Roofs, HSG A		
608	98		Unconnected pavement, HSG A		
16,189	44	43	Weighted Average, UI Adjusted		
14,704			90.83% Pervious Area		
1,484			9.17% Impervious Area		
608			40.95% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.70		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.1	33	0.0400	4.06		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.6	84	0.1250	2.47		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	167	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment SC-2.4:**

Runoff = 0.0 cfs @ 12.94 hrs, Volume= 220 cf, Depth&gt; 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description		
8,771	39		>75% Grass cover, Good, HSG A		
1,430	98		Unconnected pavement, HSG A		
10,201	47	43	Weighted Average, UI Adjusted		
8,771			85.98% Pervious Area		
1,430			14.02% Impervious Area		
1,430			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0190	0.14		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	13	0.0190	0.96		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
8.9	170	0.0765	0.32		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
15.0	244	Total			

**Summary for Subcatchment SC-2.5:**

Runoff = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf, Depth&gt; 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description	
6,974	39	>75% Grass cover, Good, HSG A	
635	98	Unconnected pavement, HSG A	
7,950	98	Paved parking, HSG A	
1,247	98	Roofs, HSG A	
455	30	Woods, Good, HSG A	
17,260	72	Weighted Average	
7,429		43.04% Pervious Area	
9,832		56.96% Impervious Area	
635		6.46% Unconnected	

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	49	0.0367	1.34		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.4	50	0.0130	2.31		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.3	149	Total			

### Summary for Subcatchment SC-2.6:

Runoff = 0.4 cfs @ 12.12 hrs, Volume= 1,407 cf, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
596	98	Unconnected pavement, HSG A
4,328	98	Paved parking, HSG A
4,190	39	>75% Grass cover, Good, HSG A
9,114	71	Weighted Average
4,190		45.97% Pervious Area
4,924		54.03% Impervious Area
596		12.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	36	0.1000	0.26		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	14	0.0320	1.10		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.3	74	0.0320	3.63		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
2.8	124	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.7:

Runoff = 0.2 cfs @ 12.12 hrs, Volume= 784 cf, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
2,133	39	>75% Grass cover, Good, HSG A
671	98	Unconnected pavement, HSG A
2,070	98	Paved parking, HSG A
4,874	72	Weighted Average
2,133		43.77% Pervious Area
2,741		56.23% Impervious Area
671		24.47% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	47	0.0300	1.37		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.6	47	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.8:

Runoff = 0.0 cfs @ 12.93 hrs, Volume= 447 cf, Depth> 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description
11,869	39		>75% Grass cover, Good, HSG A
8,979	30		Woods, Good, HSG A
670	98		Unconnected pavement, HSG A
2,200	98		Roofs, HSG A
23,717	43	42	Weighted Average, UI Adjusted
20,847			87.90% Pervious Area
2,870			12.10% Impervious Area
670			23.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	80	0.0875	2.07		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.6	130	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.9:

Runoff = 0.0 cfs @ 22.03 hrs, Volume= 118 cf, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
3,717	30	Woods, Good, HSG A
13,084	39	>75% Grass cover, Good, HSG A
16,801	37	Weighted Average
16,801		100.00% Pervious Area

**POST-DEV**

Prepared by Goldsmith, Prest &amp; Ringwall, Inc.

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NRCC 24-hr D 10-Year Rainfall=4.65"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.4000	0.22		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.09"
1.1	118	0.0680	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.9	168	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond CB-1:**

Inflow Area = 4,382 sf, 24.31% Impervious, Inflow Depth > 0.38" for 10-Year event  
 Inflow = 0.0 cfs @ 12.19 hrs, Volume= 137 cf  
 Outflow = 0.0 cfs @ 12.19 hrs, Volume= 136 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.0 cfs @ 12.19 hrs, Volume= 136 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.88' @ 13.44 hrs

Flood Elev= 239.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	235.50'	<b>12.0" Round Culvert</b> L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 235.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.0 cfs @ 12.19 hrs HW=235.65' TW=235.64' (Dynamic Tailwater)  
 ↑1=Culvert (Outlet Controls 0.0 cfs @ 0.43 fps)

**Summary for Pond CB-2:**

Inflow Area = 9,114 sf, 54.03% Impervious, Inflow Depth > 1.85" for 10-Year event  
 Inflow = 0.4 cfs @ 12.12 hrs, Volume= 1,407 cf  
 Outflow = 0.4 cfs @ 12.12 hrs, Volume= 1,407 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.12 hrs, Volume= 1,407 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.58' @ 12.12 hrs

Flood Elev= 239.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.20'	<b>12.0" Round Culvert</b> L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.20' / 236.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.4 cfs @ 12.12 hrs HW=236.58' TW=236.38' (Dynamic Tailwater)  
 ↑1=Culvert (Outlet Controls 0.4 cfs @ 2.42 fps)

**Summary for Pond CB-3:**

Inflow Area = 4,874 sf, 56.23% Impervious, Inflow Depth > 1.93" for 10-Year event  
 Inflow = 0.2 cfs @ 12.12 hrs, Volume= 784 cf  
 Outflow = 0.2 cfs @ 12.12 hrs, Volume= 784 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.12 hrs, Volume= 784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 240.41' @ 12.12 hrs

Flood Elev= 244.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	240.14'	<b>12.0" Round Culvert</b> L= 142.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 240.14' / 237.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.2 cfs @ 12.12 hrs HW=240.41' TW=237.47' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.2 cfs @ 1.41 fps)

**Summary for Pond CB-4:**

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 1.93" for 10-Year event  
 Inflow = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf  
 Outflow = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.54' @ 12.12 hrs

Flood Elev= 240.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	<b>12.0" Round Culvert</b> L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.00' / 234.50' S= 0.0181 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.9 cfs @ 12.12 hrs HW=236.54' TW=234.94' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.9 cfs @ 1.97 fps)

**Summary for Pond DMH-1:**

Inflow Area = 33,404 sf, 71.14% Impervious, Inflow Depth > 0.92" for 10-Year event  
 Inflow = 0.7 cfs @ 12.12 hrs, Volume= 2,552 cf  
 Outflow = 0.7 cfs @ 12.12 hrs, Volume= 2,552 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.7 cfs @ 12.12 hrs, Volume= 2,552 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 236.38' @ 12.12 hrs

Flood Elev= 239.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	235.90'	<b>12.0" Round Culvert</b> L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.90' / 234.00' S= 0.0633 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.7 cfs @ 12.12 hrs HW=236.38' TW=231.10' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 0.7 cfs @ 1.86 fps)

### Summary for Pond DMH-2:

Inflow Area = 4,874 sf, 56.23% Impervious, Inflow Depth > 1.93" for 10-Year event  
 Inflow = 0.2 cfs @ 12.12 hrs, Volume= 784 cf  
 Outflow = 0.2 cfs @ 12.12 hrs, Volume= 784 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.12 hrs, Volume= 784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 237.47' @ 12.12 hrs  
 Flood Elev= 241.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.20'	<b>12.0" Round Culvert</b> L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.20' / 236.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.2 cfs @ 12.12 hrs HW=237.47' TW=236.38' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 0.2 cfs @ 1.41 fps)

### Summary for Pond DMH-3:

Inflow Area = 43,157 sf, 34.48% Impervious, Inflow Depth > 1.12" for 10-Year event  
 Inflow = 1.1 cfs @ 12.12 hrs, Volume= 4,022 cf  
 Outflow = 1.1 cfs @ 12.12 hrs, Volume= 4,022 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.1 cfs @ 12.12 hrs, Volume= 4,022 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 233.02' @ 12.12 hrs  
 Flood Elev= 235.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	232.40'	<b>12.0" Round Culvert</b> L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.40' / 232.00' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.1 cfs @ 12.12 hrs HW=233.02' TW=231.57' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 1.1 cfs @ 2.11 fps)

### Summary for Pond DMH-4:

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 1.93" for 10-Year event  
 Inflow = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf  
 Outflow = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.9 cfs @ 12.12 hrs, Volume= 2,774 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 234.94' @ 12.12 hrs

Flood Elev= 243.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.40'	<b>12.0" Round Culvert</b> L= 106.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.40' / 232.50' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.9 cfs @ 12.12 hrs HW=234.94' TW=233.01' (Dynamic Tailwater)  
 ↗1=Culvert (Inlet Controls 0.9 cfs @ 1.97 fps)

### Summary for Pond IB:

Inflow Area = 47,222 sf, 40.12% Impervious, Inflow Depth > 1.40" for 10-Year event  
 Inflow = 1.5 cfs @ 12.12 hrs, Volume= 5,516 cf  
 Outflow = 0.6 cfs @ 12.26 hrs, Volume= 4,711 cf, Atten= 61%, Lag= 8.4 min  
 Discarded = 0.1 cfs @ 12.26 hrs, Volume= 3,250 cf  
 Primary = 0.5 cfs @ 12.26 hrs, Volume= 1,461 cf  
 Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 231.79' @ 12.26 hrs Surf.Area= 1,287 sf Storage= 1,444 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 63.3 min ( 899.9 - 836.5 )

Volume	Invert	Avail.Storage	Storage Description		
#1	230.00'	3,417 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
230.00	445	97.5	0	0	445
231.00	815	126.4	621	621	972
232.00	1,431	162.0	1,109	1,729	1,802
233.00	1,958	184.3	1,688	3,417	2,440

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	230.50'	<b>12.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.50' / 230.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

#3	Device 2	232.00'	<b>24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#4	Device 2	231.50'	<b>12.0" W x 4.0" H Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#5	Secondary	232.00'	<b>6.0' long x 26.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Discarded OutFlow** Max=0.1 cfs @ 12.26 hrs HW=231.79' (Free Discharge)  
 ↪ 1=Exfiltration (Exfiltration Controls 0.1 cfs)

**Primary OutFlow** Max=0.5 cfs @ 12.26 hrs HW=231.79' TW=0.00' (Dynamic Tailwater)  
 ↪ 2=Culvert (Passes 0.5 cfs of 2.6 cfs potential flow)  
   └ 3=Orifice/Grate ( Controls 0.0 cfs)  
   └ 4=Orifice/Grate (Orifice Controls 0.5 cfs @ 1.72 fps)

**Secondary OutFlow** Max=0.0 cfs @ 0.00 hrs HW=230.00' TW=0.00' (Dynamic Tailwater)  
 ↪ 5=Broad-Crested Rectangular Weir ( Controls 0.0 cfs)

### Summary for Pond IC:

Inflow Area = 19,416 sf, 82.92% Impervious, Inflow Depth > 3.50" for 10-Year event  
 Inflow = 1.4 cfs @ 12.11 hrs, Volume= 5,660 cf  
 Outflow = 0.1 cfs @ 13.45 hrs, Volume= 3,447 cf, Atten= 93%, Lag= 80.1 min  
 Discarded = 0.0 cfs @ 9.08 hrs, Volume= 3,085 cf  
 Primary = 0.1 cfs @ 13.45 hrs, Volume= 361 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 236.89' @ 13.45 hrs Surf.Area= 763 sf Storage= 2,548 cf

Plug-Flow detention time= 217.1 min calculated for 3,447 cf (61% of inflow)  
 Center-of-Mass det. time= 76.3 min ( 832.4 - 756.1 )

Volume	Invert	Avail.Storage	Storage Description
#1A	232.00'	1,323 cf	<b>19.42'W x 39.32'L x 6.75'H Field A</b> 5,153 cf Overall - 1,847 cf Embedded = 3,306 cf x 40.0% Voids
#2A	232.75'	1,847 cf	<b>ADS_StormTech MC-4500 +Cap x 16 Inside #1</b> 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 16 Chambers in 2 Rows Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
3,169 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	236.75'	<b>12.0" Round Culvert</b> L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.75' / 236.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	232.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 9.08 hrs HW=232.07' (Free Discharge)  
 ↗ 2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=0.1 cfs @ 13.45 hrs HW=236.89' TW=236.09' (Dynamic Tailwater)  
 ↗ 1=Culvert (Inlet Controls 0.1 cfs @ 0.99 fps)

### Summary for Pond RD1:

Inflow Area = 7,186 sf, 53.84% Impervious, Inflow Depth > 1.95" for 10-Year event  
 Inflow = 0.3 cfs @ 12.12 hrs, Volume= 1,166 cf  
 Outflow = 0.3 cfs @ 12.12 hrs, Volume= 1,166 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.3 cfs @ 12.12 hrs, Volume= 1,166 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 236.89' @ 13.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	235.42'	<b>12.0" Round Culvert</b> L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.42' / 234.82' S= 0.0207 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.3 cfs @ 12.12 hrs HW=235.71' TW=235.31' (Dynamic Tailwater)  
 ↗ 1=Culvert (Inlet Controls 0.3 cfs @ 1.46 fps)

### Summary for Pond RD2:

Inflow Area = 10,732 sf, 69.09% Impervious, Inflow Depth > 2.76" for 10-Year event  
 Inflow = 0.6 cfs @ 12.12 hrs, Volume= 2,469 cf  
 Outflow = 0.6 cfs @ 12.12 hrs, Volume= 2,468 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.6 cfs @ 12.12 hrs, Volume= 2,468 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 236.89' @ 13.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.82'	<b>12.0" Round Culvert</b> L= 63.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.82' / 233.50' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.6 cfs @ 12.12 hrs HW=235.30' TW=234.87' (Dynamic Tailwater)  
 ↗ 1=Culvert (Outlet Controls 0.6 cfs @ 2.49 fps)

### Summary for Pond RD3:

Inflow Area = 5,484 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.5 cfs @ 12.11 hrs, Volume= 2,015 cf  
 Outflow = 0.5 cfs @ 12.11 hrs, Volume= 2,015 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.5 cfs @ 12.11 hrs, Volume= 2,015 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 238.01' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	237.50'	<b>8.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.50' / 236.75' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

**Primary OutFlow** Max=0.5 cfs @ 12.11 hrs HW=238.00' TW=234.86' (Dynamic Tailwater)  
 ↗1=Culvert (Inlet Controls 0.5 cfs @ 1.90 fps)

### Summary for Pond RD4:

Inflow Area = 3,200 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.3 cfs @ 12.08 hrs, Volume= 1,176 cf  
 Outflow = 0.3 cfs @ 12.08 hrs, Volume= 1,176 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.3 cfs @ 12.08 hrs, Volume= 1,176 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 243.46' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	243.05'	<b>6.0" Round Culvert</b> L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 243.05' / 236.75' S= 0.0700 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.3 cfs @ 12.08 hrs HW=243.46' TW=234.58' (Dynamic Tailwater)  
 ↗1=Culvert (Inlet Controls 0.3 cfs @ 1.73 fps)

### Summary for Pond RD5:

Inflow Area = 2,230 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 820 cf  
 Outflow = 0.2 cfs @ 12.11 hrs, Volume= 820 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 820 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 244.34' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	244.00'	<b>6.0" Round Culvert</b> L= 95.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 244.00' / 243.05' S= 0.0100 '/' Cc= 0.900  
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.2 cfs @ 12.11 hrs HW=244.33' TW=243.43' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.2 cfs @ 1.55 fps)

### **Summary for Pond RD6:**

Inflow Area = 3,194 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.3 cfs @ 12.11 hrs, Volume= 1,174 cf  
 Outflow = 0.3 cfs @ 12.11 hrs, Volume= 1,174 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.3 cfs @ 12.11 hrs, Volume= 1,174 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 231.81' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	231.00'	<b>6.0" Round Culvert</b> L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 231.00' / 230.00' S= 0.0323 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.3 cfs @ 12.11 hrs HW=231.71' TW=231.54' (Dynamic Tailwater)  
↑1=Culvert (Inlet Controls 0.3 cfs @ 1.59 fps)

### **Summary for Pond RD7:**

Inflow Area = 872 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.1 cfs @ 12.11 hrs, Volume= 320 cf  
 Outflow = 0.1 cfs @ 12.11 hrs, Volume= 320 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.1 cfs @ 12.11 hrs, Volume= 320 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 232.20' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	<b>6.0" Round Culvert</b> L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.00' / 231.00' S= 0.0370 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.1 cfs @ 12.11 hrs HW=232.20' TW=231.54' (Dynamic Tailwater)  
↑1=Culvert (Inlet Controls 0.1 cfs @ 1.19 fps)

### **Summary for Pond RD8:**

Inflow Area = 2,179 sf, 100.00% Impervious, Inflow Depth > 4.41" for 10-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 801 cf  
 Outflow = 0.2 cfs @ 12.11 hrs, Volume= 801 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 801 cf

**POST-DEV**

Prepared by Goldsmith, Prest &amp; Ringwall, Inc.

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NRCC 24-hr D 10-Year Rainfall=4.65"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 234.33' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.00'	<b>6.0" Round Culvert</b> L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.00' / 232.50' S= 0.0395 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.2 cfs @ 12.11 hrs HW=234.33' TW=233.01' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 0.2 cfs @ 1.54 fps)

**Summary for Pond WQS:**

Inflow Area =	43,128 sf, 59.70% Impervious, Inflow Depth > 0.85"	for 10-Year event
Inflow =	0.8 cfs @ 12.12 hrs, Volume=	3,040 cf
Outflow =	0.2 cfs @ 12.36 hrs, Volume=	2,517 cf, Atten= 71%, Lag= 14.3 min
Discarded =	0.0 cfs @ 12.36 hrs, Volume=	1,641 cf
Primary =	0.2 cfs @ 12.36 hrs, Volume=	876 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 231.55' @ 12.36 hrs Surf.Area= 703 sf Storage= 774 cf

Plug-Flow detention time= 160.6 min calculated for 2,513 cf (83% of inflow)

Center-of-Mass det. time= 83.7 min ( 971.5 - 887.8 )

Volume	Invert	Avail.Storage	Storage Description		
#1	229.00'	1,129 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
229.00	8	23.0	0	0	8
230.00	214	86.3	88	88	561
231.00	513	112.2	353	441	982
232.00	880	132.2	688	1,129	1,390

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	<b>6.0' long x 22.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	229.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 12.36 hrs HW=231.55' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=0.2 cfs @ 12.36 hrs HW=231.55' TW=0.00' (Dynamic Tailwater)

↑1=Broad-Crested Rectangular Weir (Weir Controls 0.2 cfs @ 0.61 fps)

**Summary for Link AP1:**

Inflow Area = 133,541 sf, 35.65% Impervious, Inflow Depth > 0.27" for 10-Year event

Inflow = 0.7 cfs @ 12.33 hrs, Volume= 3,027 cf

Primary = 0.7 cfs @ 12.33 hrs, Volume= 3,027 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points x 2  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment SC-1.1:</b>	Runoff Area=3,546 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.6 cfs 2,397 cf
<b>Subcatchment SC-1.2:</b>	Runoff Area=2,804 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.5 cfs 1,896 cf
<b>Subcatchment SC-1.3:</b>	Runoff Area=3,194 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.6 cfs 2,159 cf
<b>Subcatchment SC-1.4:</b>	Runoff Area=2,179 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.4 cfs 1,473 cf
<b>Subcatchment SC-1.5:</b>	Runoff Area=872 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.2 cfs 590 cf
<b>Subcatchment SC-1.6:</b>	Runoff Area=2,230 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=0.4 cfs 1,508 cf
<b>Subcatchment SC-1.7:</b>	Runoff Area=5,484 sf 100.00% Impervious Runoff Depth>8.11" Tc=5.0 min CN=98 Runoff=1.0 cfs 3,708 cf
<b>Subcatchment SC-1.8:</b>	Runoff Area=970 sf 100.00% Impervious Runoff Depth>8.12" Tc=0.0 min CN=98 Runoff=0.2 cfs 656 cf
<b>Subcatchment SC-2.1:</b>	Runoff Area=9,724 sf 20.38% Impervious Runoff Depth>2.58" Flow Length=167' Tc=5.4 min CN=51 Runoff=0.6 cfs 2,089 cf
<b>Subcatchment SC-2.2:</b>	Runoff Area=4,382 sf 24.31% Impervious Runoff Depth>2.03" Flow Length=160' Tc=6.2 min UI Adjusted CN=46 Runoff=0.2 cfs 742 cf
<b>Subcatchment SC-2.3:</b>	Runoff Area=16,189 sf 9.17% Impervious Runoff Depth>1.71" Flow Length=167' Tc=5.0 min UI Adjusted CN=43 Runoff=0.6 cfs 2,314 cf
<b>Subcatchment SC-2.4:</b>	Runoff Area=10,201 sf 14.02% Impervious Runoff Depth>1.71" Flow Length=244' Tc=15.0 min UI Adjusted CN=43 Runoff=0.3 cfs 1,450 cf
<b>Subcatchment SC-2.5:</b>	Runoff Area=17,260 sf 56.96% Impervious Runoff Depth>5.01" Flow Length=149' Tc=5.3 min CN=72 Runoff=2.2 cfs 7,199 cf
<b>Subcatchment SC-2.6:</b>	Runoff Area=9,114 sf 54.03% Impervious Runoff Depth>4.89" Flow Length=124' Tc=5.0 min CN=71 Runoff=1.2 cfs 3,712 cf
<b>Subcatchment SC-2.7:</b>	Runoff Area=4,874 sf 56.23% Impervious Runoff Depth>5.01" Flow Length=47' Slope=0.0300 '/' Tc=5.0 min CN=72 Runoff=0.6 cfs 2,033 cf
<b>Subcatchment SC-2.8:</b>	Runoff Area=23,717 sf 12.10% Impervious Runoff Depth>1.61" Flow Length=130' Tc=5.0 min UI Adjusted CN=42 Runoff=0.9 cfs 3,185 cf

<b>Subcatchment SC-2.9:</b>	Runoff Area=16,801 sf 0.00% Impervious Runoff Depth>1.11" Flow Length=168' Tc=5.0 min CN=37 Runoff=0.3 cfs 1,560 cf
<b>Pond CB-1:</b>	Peak Elev=239.18' Inflow=0.2 cfs 742 cf 12.0" Round Culvert n=0.013 L=4.0' S=0.0200 '/' Outflow=0.2 cfs 740 cf
<b>Pond CB-2:</b>	Peak Elev=239.95' Inflow=1.2 cfs 3,712 cf 12.0" Round Culvert n=0.013 L=5.0' S=0.0400 '/' Outflow=1.2 cfs 3,712 cf
<b>Pond CB-3:</b>	Peak Elev=240.60' Inflow=0.6 cfs 2,033 cf 12.0" Round Culvert n=0.013 L=142.0' S=0.0200 '/' Outflow=0.6 cfs 2,033 cf
<b>Pond CB-4:</b>	Peak Elev=237.05' Inflow=2.2 cfs 7,199 cf 12.0" Round Culvert n=0.013 L=83.0' S=0.0181 '/' Outflow=2.2 cfs 7,199 cf
<b>Pond DMH-1:</b>	Peak Elev=239.65' Inflow=5.4 cfs 10,654 cf 12.0" Round Culvert n=0.013 L=30.0' S=0.0633 '/' Outflow=5.4 cfs 10,654 cf
<b>Pond DMH-2:</b>	Peak Elev=239.77' Inflow=0.6 cfs 2,033 cf 12.0" Round Culvert n=0.013 L=60.0' S=0.0200 '/' Outflow=0.6 cfs 2,033 cf
<b>Pond DMH-3:</b>	Peak Elev=234.24' Inflow=3.5 cfs 11,857 cf 12.0" Round Culvert n=0.013 L=24.0' S=0.0167 '/' Outflow=3.5 cfs 11,857 cf
<b>Pond DMH-4:</b>	Peak Elev=235.45' Inflow=2.2 cfs 7,199 cf 12.0" Round Culvert n=0.013 L=106.0' S=0.0179 '/' Outflow=2.2 cfs 7,199 cf
<b>Pond IB:</b> Discarded=0.1 cfs 4,000 cf Primary=2.7 cfs 8,709 cf Secondary=1.2 cfs 749 cf Outflow=4.0 cfs 13,458 cf	Peak Elev=232.18' Storage=1,993 cf Inflow=4.2 cfs 14,605 cf
<b>Pond IC:</b> Discarded=0.0 cfs 3,488 cf Primary=4.0 cfs 4,908 cf Outflow=4.0 cfs 8,397 cf	Peak Elev=241.37' Storage=3,169 cf Inflow=2.8 cfs 10,905 cf
<b>Pond RD1:</b>	Peak Elev=241.46' Inflow=0.7 cfs 2,635 cf 12.0" Round Culvert n=0.013 L=29.0' S=0.0207 '/' Outflow=0.7 cfs 2,635 cf
<b>Pond RD2:</b>	Peak Elev=239.16' Inflow=1.3 cfs 5,033 cf 12.0" Round Culvert n=0.013 L=63.0' S=0.0210 '/' Outflow=1.3 cfs 5,033 cf
<b>Pond RD3:</b>	Peak Elev=239.36' Inflow=1.0 cfs 3,708 cf 8.0" Round Culvert n=0.013 L=20.0' S=0.0375 '/' Outflow=1.0 cfs 3,708 cf
<b>Pond RD4:</b>	Peak Elev=243.83' Inflow=0.5 cfs 2,164 cf 6.0" Round Culvert n=0.013 L=90.0' S=0.0700 '/' Outflow=0.5 cfs 2,164 cf
<b>Pond RD5:</b>	Peak Elev=244.54' Inflow=0.4 cfs 1,508 cf 6.0" Round Culvert n=0.013 L=95.0' S=0.0100 '/' Outflow=0.4 cfs 1,508 cf
<b>Pond RD6:</b>	Peak Elev=232.76' Inflow=0.6 cfs 2,159 cf 6.0" Round Culvert n=0.013 L=31.0' S=0.0323 '/' Outflow=0.6 cfs 2,159 cf
<b>Pond RD7:</b>	Peak Elev=232.33' Inflow=0.2 cfs 590 cf 6.0" Round Culvert n=0.013 L=27.0' S=0.0370 '/' Outflow=0.2 cfs 590 cf

**Pond RD8:**

Peak Elev=234.56' Inflow=0.4 cfs 1,473 cf  
6.0" Round Culvert n=0.013 L=38.0' S=0.0395 '/' Outflow=0.4 cfs 1,473 cf

**Pond WQS:**

Peak Elev=231.97' Storage=1,098 cf Inflow=5.9 cfs 12,743 cf  
Discarded=0.0 cfs 1,978 cf Primary=5.1 cfs 10,018 cf Outflow=5.2 cfs 11,996 cf

**Link AP1:**

Inflow=9.7 cfs 24,799 cf  
Primary=9.7 cfs 24,799 cf

**Total Runoff Area = 133,541 sf Runoff Volume = 38,669 cf Average Runoff Depth = 3.47"**  
**64.35% Pervious = 85,935 sf 35.65% Impervious = 47,605 sf**

**Summary for Subcatchment SC-1.1:**

Runoff = 0.6 cfs @ 12.11 hrs, Volume= 2,397 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
3,546	98	Roofs, HSG A				
3,546		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.2:**

Runoff = 0.5 cfs @ 12.11 hrs, Volume= 1,896 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
2,804	98	Roofs, HSG A				
2,804		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.3:**

Runoff = 0.6 cfs @ 12.11 hrs, Volume= 2,159 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
3,194	98	Roofs, HSG A				
3,194		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.4:**

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,473 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
2,179	98	Roofs, HSG A				
2,179		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.5:**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 590 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
872	98	Roofs, HSG A				
872		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.6:**

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,508 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description				
2,230	98	Roofs, HSG A				
2,230		100.00% Impervious Area				
Tc	Length	Slope	Velocity	Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	<b>Direct Entry,</b>	
5.0						

**Summary for Subcatchment SC-1.7:**

Runoff = 1.0 cfs @ 12.11 hrs, Volume= 3,708 cf, Depth> 8.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description			
5,484	98	Roofs, HSG A			
5,484		100.00% Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	Direct Entry,				

**Summary for Subcatchment SC-1.8:**

Runoff = 0.2 cfs @ 12.06 hrs, Volume= 656 cf, Depth> 8.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
970	98	Roofs, HSG A
970		100.00% Impervious Area

**Summary for Subcatchment SC-2.1:**

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,089 cf, Depth> 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description			
1,981	98	Roofs, HSG A			
0	98	Unconnected pavement, HSG A			
7,742	39	>75% Grass cover, Good, HSG A			
9,724	51	Weighted Average			
7,742		79.62% Pervious Area			
1,981		20.38% Impervious Area			
0		0.00% Unconnected			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
1.1	117	0.0684	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
5.4	167	Total			

### Summary for Subcatchment SC-2.2:

Runoff = 0.2 cfs @ 12.14 hrs, Volume= 742 cf, Depth> 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description		
3,317	39		>75% Grass cover, Good, HSG A		
1,065	98		Unconnected pavement, HSG A		
4,382	53	46	Weighted Average, UI Adjusted		
3,317			75.69% Pervious Area		
1,065			24.31% Impervious Area		
1,065			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.5	110	0.0318	3.62		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
6.2	160	Total			

### Summary for Subcatchment SC-2.3:

Runoff = 0.6 cfs @ 12.13 hrs, Volume= 2,314 cf, Depth> 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description		
14,704	39		>75% Grass cover, Good, HSG A		
876	98		Roofs, HSG A		
608	98		Unconnected pavement, HSG A		
16,189	44	43	Weighted Average, UI Adjusted		
14,704			90.83% Pervious Area		
1,484			9.17% Impervious Area		
608			40.95% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.70		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.1	33	0.0400	4.06		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.6	84	0.1250	2.47		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
1.2	167	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment SC-2.4:**

Runoff = 0.3 cfs @ 12.25 hrs, Volume= 1,450 cf, Depth&gt; 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description		
8,771	39		>75% Grass cover, Good, HSG A		
1,430	98		Unconnected pavement, HSG A		
10,201	47	43	Weighted Average, UI Adjusted		
8,771			85.98% Pervious Area		
1,430			14.02% Impervious Area		
1,430			100.00% Unconnected		
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0190	0.14		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	13	0.0190	0.96		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.1	11	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
8.9	170	0.0765	0.32		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
15.0	244	Total			

**Summary for Subcatchment SC-2.5:**

Runoff = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf, Depth&gt; 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
6,974	39	>75% Grass cover, Good, HSG A
635	98	Unconnected pavement, HSG A
7,950	98	Paved parking, HSG A
1,247	98	Roofs, HSG A
455	30	Woods, Good, HSG A
17,260	72	Weighted Average
7,429		43.04% Pervious Area
9,832		56.96% Impervious Area
635		6.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	49	0.0367	1.34		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.4	50	0.0130	2.31		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
5.3	149	Total			

### Summary for Subcatchment SC-2.6:

Runoff = 1.2 cfs @ 12.12 hrs, Volume= 3,712 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
596	98	Unconnected pavement, HSG A
4,328	98	Paved parking, HSG A
4,190	39	>75% Grass cover, Good, HSG A
9,114	71	Weighted Average
4,190		45.97% Pervious Area
4,924		54.03% Impervious Area
596		12.10% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	36	0.1000	0.26		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.2	14	0.0320	1.10		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.3	74	0.0320	3.63		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
2.8	124	Total, Increased to minimum Tc = 5.0 min			

### Summary for Subcatchment SC-2.7:

Runoff = 0.6 cfs @ 12.12 hrs, Volume= 2,033 cf, Depth> 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
2,133	39	>75% Grass cover, Good, HSG A
671	98	Unconnected pavement, HSG A
2,070	98	Paved parking, HSG A
4,874	72	Weighted Average
2,133		43.77% Pervious Area
2,741		56.23% Impervious Area
671		24.47% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	47	0.0300	1.37		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.09"
0.6	47	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment SC-2.8:**

Runoff = 0.9 cfs @ 12.13 hrs, Volume= 3,185 cf, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description
11,869	39		>75% Grass cover, Good, HSG A
8,979	30		Woods, Good, HSG A
670	98		Unconnected pavement, HSG A
2,200	98		Roofs, HSG A
23,717	43	42	Weighted Average, UI Adjusted
20,847			87.90% Pervious Area
2,870			12.10% Impervious Area
670			23.34% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.1000	0.28		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.09"
0.6	80	0.0875	2.07		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
3.6	130	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment SC-2.9:**

Runoff = 0.3 cfs @ 12.13 hrs, Volume= 1,560 cf, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
3,717	30	Woods, Good, HSG A
13,084	39	>75% Grass cover, Good, HSG A
16,801	37	Weighted Average
16,801		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.4000	0.22		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.09"
1.1	118	0.0680	1.83		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
4.9	168	Total, Increased to minimum Tc = 5.0 min			

### Summary for Pond CB-1:

Inflow Area = 4,382 sf, 24.31% Impervious, Inflow Depth > 2.03" for 100-Year event  
 Inflow = 0.2 cfs @ 12.14 hrs, Volume= 742 cf  
 Outflow = 0.2 cfs @ 12.14 hrs, Volume= 740 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.14 hrs, Volume= 740 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 239.18' @ 12.20 hrs

Flood Elev= 239.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	235.50'	<b>12.0" Round Culvert</b> L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.50' / 235.42' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.0 cfs @ 12.14 hrs HW=238.22' TW=238.76' (Dynamic Tailwater)  
 ↑1=Culvert (Controls 0.0 cfs)

### Summary for Pond CB-2:

Inflow Area = 9,114 sf, 54.03% Impervious, Inflow Depth > 4.89" for 100-Year event  
 Inflow = 1.2 cfs @ 12.12 hrs, Volume= 3,712 cf  
 Outflow = 1.2 cfs @ 12.12 hrs, Volume= 3,712 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.2 cfs @ 12.12 hrs, Volume= 3,712 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 239.95' @ 12.15 hrs

Flood Elev= 239.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.20'	<b>12.0" Round Culvert</b> L= 5.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.20' / 236.00' S= 0.0400 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=4.0 cfs @ 12.12 hrs HW=239.08' TW=237.29' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 4.0 cfs @ 5.09 fps)

**Summary for Pond CB-3:**

Inflow Area = 4,874 sf, 56.23% Impervious, Inflow Depth > 5.01" for 100-Year event  
 Inflow = 0.6 cfs @ 12.12 hrs, Volume= 2,033 cf  
 Outflow = 0.6 cfs @ 12.12 hrs, Volume= 2,033 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.6 cfs @ 12.12 hrs, Volume= 2,033 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 240.60' @ 12.12 hrs

Flood Elev= 244.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	240.14'	<b>12.0" Round Culvert</b> L= 142.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 240.14' / 237.30' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.6 cfs @ 12.12 hrs HW=240.59' TW=238.97' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.6 cfs @ 1.81 fps)

**Summary for Pond CB-4:**

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 5.01" for 100-Year event  
 Inflow = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf  
 Outflow = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 237.05' @ 12.12 hrs

Flood Elev= 240.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	236.00'	<b>12.0" Round Culvert</b> L= 83.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.00' / 234.50' S= 0.0181 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.2 cfs @ 12.12 hrs HW=237.05' TW=235.45' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 2.2 cfs @ 2.83 fps)

**Summary for Pond DMH-1:**

Inflow Area = 33,404 sf, 71.14% Impervious, Inflow Depth > 3.83" for 100-Year event  
 Inflow = 5.4 cfs @ 12.16 hrs, Volume= 10,654 cf  
 Outflow = 5.4 cfs @ 12.16 hrs, Volume= 10,654 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 5.4 cfs @ 12.16 hrs, Volume= 10,654 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 239.65' @ 12.16 hrs

Flood Elev= 239.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	235.90'	<b>12.0" Round Culvert</b> L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.90' / 234.00' S= 0.0633 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=5.2 cfs @ 12.16 hrs HW=239.47' TW=231.95' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 5.2 cfs @ 6.66 fps)

### Summary for Pond DMH-2:

Inflow Area =	4,874 sf, 56.23% Impervious, Inflow Depth > 5.01"	for 100-Year event
Inflow =	0.6 cfs @ 12.12 hrs, Volume=	2,033 cf
Outflow =	0.6 cfs @ 12.12 hrs, Volume=	2,033 cf, Atten= 0%, Lag= 0.0 min
Primary =	0.6 cfs @ 12.12 hrs, Volume=	2,033 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 239.77' @ 12.15 hrs  
 Flood Elev= 241.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	237.20'	<b>12.0" Round Culvert</b> L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.20' / 236.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.4 cfs @ 12.12 hrs HW=238.97' TW=237.29' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 3.4 cfs @ 4.29 fps)

### Summary for Pond DMH-3:

Inflow Area =	43,157 sf, 34.48% Impervious, Inflow Depth > 3.30"	for 100-Year event
Inflow =	3.5 cfs @ 12.12 hrs, Volume=	11,857 cf
Outflow =	3.5 cfs @ 12.12 hrs, Volume=	11,857 cf, Atten= 0%, Lag= 0.0 min
Primary =	3.5 cfs @ 12.12 hrs, Volume=	11,857 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 234.24' @ 12.12 hrs  
 Flood Elev= 235.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	232.40'	<b>12.0" Round Culvert</b> L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.40' / 232.00' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.4 cfs @ 12.12 hrs HW=234.23' TW=232.17' (Dynamic Tailwater)  
 ↑—1=Culvert (Inlet Controls 3.4 cfs @ 4.39 fps)

### Summary for Pond DMH-4:

Inflow Area = 17,260 sf, 56.96% Impervious, Inflow Depth > 5.01" for 100-Year event  
 Inflow = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf  
 Outflow = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.2 cfs @ 12.12 hrs, Volume= 7,199 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 235.45' @ 12.12 hrs

Flood Elev= 243.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	234.40'	<b>12.0" Round Culvert</b> L= 106.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.40' / 232.50' S= 0.0179 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.2 cfs @ 12.12 hrs HW=235.45' TW=234.24' (Dynamic Tailwater)  
 ↗1=Culvert (Inlet Controls 2.2 cfs @ 2.83 fps)

### Summary for Pond IB:

Inflow Area = 47,222 sf, 40.12% Impervious, Inflow Depth > 3.71" for 100-Year event  
 Inflow = 4.2 cfs @ 12.12 hrs, Volume= 14,605 cf  
 Outflow = 4.0 cfs @ 12.14 hrs, Volume= 13,458 cf, Atten= 5%, Lag= 1.1 min  
 Discarded = 0.1 cfs @ 12.14 hrs, Volume= 4,000 cf  
 Primary = 2.7 cfs @ 12.14 hrs, Volume= 8,709 cf  
 Secondary = 1.2 cfs @ 12.14 hrs, Volume= 749 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 232.18' @ 12.14 hrs Surf.Area= 1,519 sf Storage= 1,993 cf

Plug-Flow detention time= 68.2 min calculated for 13,436 cf (92% of inflow)  
 Center-of-Mass det. time= 24.8 min ( 855.1 - 830.3 )

Volume	Invert	Avail.Storage	Storage Description		
#1	230.00'	3,417 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
230.00	445	97.5	0	0	445
231.00	815	126.4	621	621	972
232.00	1,431	162.0	1,109	1,729	1,802
233.00	1,958	184.3	1,688	3,417	2,440

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	<b>2.410 in/hr Exfiltration over Surface area</b>
#2	Primary	230.50'	<b>12.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 230.50' / 230.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

#3	Device 2	232.00'	<b>24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#4	Device 2	231.50'	<b>12.0" W x 4.0" H Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads
#5	Secondary	232.00'	<b>6.0' long x 26.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

**Discarded OutFlow** Max=0.1 cfs @ 12.14 hrs HW=232.17' (Free Discharge)  
 ↪ 1=Exfiltration (Exfiltration Controls 0.1 cfs)

**Primary OutFlow** Max=2.6 cfs @ 12.14 hrs HW=232.17' TW=0.00' (Dynamic Tailwater)  
 ↪ 2=Culvert (Passes 2.6 cfs of 3.2 cfs potential flow)  
   └ 3=Orifice/Grate (Weir Controls 1.5 cfs @ 1.36 fps)  
   └ 4=Orifice/Grate (Orifice Controls 1.1 cfs @ 3.41 fps)

**Secondary OutFlow** Max=1.2 cfs @ 12.14 hrs HW=232.17' TW=0.00' (Dynamic Tailwater)  
 ↪ 5=Broad-Crested Rectangular Weir (Weir Controls 1.2 cfs @ 1.12 fps)

### Summary for Pond IC:

Inflow Area = 19,416 sf, 82.92% Impervious, Inflow Depth > 6.74" for 100-Year event  
 Inflow = 2.8 cfs @ 12.11 hrs, Volume= 10,905 cf  
 Outflow = 4.0 cfs @ 12.17 hrs, Volume= 8,397 cf, Atten= 0%, Lag= 3.4 min  
 Discarded = 0.0 cfs @ 4.44 hrs, Volume= 3,488 cf  
 Primary = 4.0 cfs @ 12.17 hrs, Volume= 4,908 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 241.37' @ 12.16 hrs Surf.Area= 763 sf Storage= 3,169 cf

Plug-Flow detention time= 146.4 min calculated for 8,397 cf (77% of inflow)  
 Center-of-Mass det. time= 40.9 min ( 793.0 - 752.1 )

Volume	Invert	Avail.Storage	Storage Description
#1A	232.00'	1,323 cf	<b>19.42"W x 39.32'L x 6.75'H Field A</b> 5,153 cf Overall - 1,847 cf Embedded = 3,306 cf x 40.0% Voids
#2A	232.75'	1,847 cf	<b>ADS_StormTech MC-4500 +Cap x 16 Inside #1</b> 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 16 Chambers in 2 Rows Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
3,169 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	236.75'	<b>12.0" Round Culvert</b> L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 236.75' / 236.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	232.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 4.44 hrs HW=232.07' (Free Discharge)  
 ↗ 2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=3.5 cfs @ 12.17 hrs HW=240.68' TW=239.28' (Dynamic Tailwater)  
 ↗ 1=Culvert (Inlet Controls 3.5 cfs @ 4.50 fps)

### Summary for Pond RD1:

Inflow Area = 7,186 sf, 53.84% Impervious, Inflow Depth > 4.40" for 100-Year event  
 Inflow = 0.7 cfs @ 12.12 hrs, Volume= 2,635 cf  
 Outflow = 0.7 cfs @ 12.12 hrs, Volume= 2,635 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.7 cfs @ 12.12 hrs, Volume= 2,635 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 241.46' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	235.42'	<b>12.0" Round Culvert</b> L= 29.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.42' / 234.82' S= 0.0207 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.0 cfs @ 12.12 hrs HW=238.24' TW=238.48' (Dynamic Tailwater)  
 ↗ 1=Culvert (Controls 0.0 cfs)

### Summary for Pond RD2:

Inflow Area = 10,732 sf, 69.09% Impervious, Inflow Depth > 5.63" for 100-Year event  
 Inflow = 1.3 cfs @ 12.12 hrs, Volume= 5,033 cf  
 Outflow = 1.3 cfs @ 12.12 hrs, Volume= 5,033 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.3 cfs @ 12.12 hrs, Volume= 5,033 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 239.16' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.82'	<b>12.0" Round Culvert</b> L= 63.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.82' / 233.50' S= 0.0210 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.0 cfs @ 12.12 hrs HW=238.44' TW=239.06' (Dynamic Tailwater)  
 ↗ 1=Culvert (Controls 0.0 cfs)

**Summary for Pond RD3:**

Inflow Area = 5,484 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-Year event  
 Inflow = 1.0 cfs @ 12.11 hrs, Volume= 3,708 cf  
 Outflow = 1.0 cfs @ 12.11 hrs, Volume= 3,708 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 1.0 cfs @ 12.11 hrs, Volume= 3,708 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 239.36' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	237.50'	<b>8.0" Round Culvert</b> L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 237.50' / 236.75' S= 0.0375 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

**Primary OutFlow** Max=0.0 cfs @ 12.11 hrs HW=238.74' TW=238.97' (Dynamic Tailwater)  
 ↑ 1=Culvert (Controls 0.0 cfs)

**Summary for Pond RD4:**

Inflow Area = 3,200 sf, 100.00% Impervious, Inflow Depth > 8.12" for 100-Year event  
 Inflow = 0.5 cfs @ 12.08 hrs, Volume= 2,164 cf  
 Outflow = 0.5 cfs @ 12.08 hrs, Volume= 2,164 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.5 cfs @ 12.08 hrs, Volume= 2,164 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 243.83' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	243.05'	<b>6.0" Round Culvert</b> L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 243.05' / 236.75' S= 0.0700 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.5 cfs @ 12.08 hrs HW=243.82' TW=238.01' (Dynamic Tailwater)  
 ↑ 1=Culvert (Inlet Controls 0.5 cfs @ 2.75 fps)

**Summary for Pond RD5:**

Inflow Area = 2,230 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-Year event  
 Inflow = 0.4 cfs @ 12.11 hrs, Volume= 1,508 cf  
 Outflow = 0.4 cfs @ 12.11 hrs, Volume= 1,508 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.11 hrs, Volume= 1,508 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 244.54' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	244.00'	<b>6.0" Round Culvert</b> L= 95.0' CPP, projecting, no headwall, Ke= 0.900

Inlet / Outlet Invert= 244.00' / 243.05' S= 0.0100 '/' Cc= 0.900  
 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.4 cfs @ 12.11 hrs HW=244.53' TW=243.70' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.4 cfs @ 2.00 fps)

### **Summary for Pond RD6:**

Inflow Area = 3,194 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-Year event  
 Inflow = 0.6 cfs @ 12.11 hrs, Volume= 2,159 cf  
 Outflow = 0.6 cfs @ 12.11 hrs, Volume= 2,159 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.6 cfs @ 12.11 hrs, Volume= 2,159 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 232.76' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	231.00'	<b>6.0" Round Culvert</b> L= 31.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 231.00' / 230.00' S= 0.0323 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.6 cfs @ 12.11 hrs HW=232.73' TW=232.17' (Dynamic Tailwater)  
 ↑1=Culvert (Inlet Controls 0.6 cfs @ 2.86 fps)

### **Summary for Pond RD7:**

Inflow Area = 872 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 590 cf  
 Outflow = 0.2 cfs @ 12.11 hrs, Volume= 590 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 590 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 232.33' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	232.00'	<b>6.0" Round Culvert</b> L= 27.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 232.00' / 231.00' S= 0.0370 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.2 cfs @ 12.11 hrs HW=232.33' TW=232.17' (Dynamic Tailwater)  
 ↑1=Culvert (Outlet Controls 0.2 cfs @ 1.59 fps)

### **Summary for Pond RD8:**

Inflow Area = 2,179 sf, 100.00% Impervious, Inflow Depth > 8.11" for 100-Year event  
 Inflow = 0.4 cfs @ 12.11 hrs, Volume= 1,473 cf  
 Outflow = 0.4 cfs @ 12.11 hrs, Volume= 1,473 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.4 cfs @ 12.11 hrs, Volume= 1,473 cf

**POST-DEV**

NRCC 24-hr D 100-Year Rainfall=8.36"

Prepared by Goldsmith, Prest &amp; Ringwall, Inc.

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 234.56' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	234.00'	<b>6.0" Round Culvert</b> L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.00' / 232.50' S= 0.0395 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf

**Primary OutFlow** Max=0.4 cfs @ 12.11 hrs HW=234.55' TW=234.18' (Dynamic Tailwater)

↑1=Culvert (Inlet Controls 0.4 cfs @ 2.07 fps)

**Summary for Pond WQS:**

Inflow Area =	43,128 sf, 59.70% Impervious, Inflow Depth > 3.55"	for 100-Year event
Inflow =	5.9 cfs @ 12.16 hrs, Volume=	12,743 cf
Outflow =	5.2 cfs @ 12.18 hrs, Volume=	11,996 cf, Atten= 13%, Lag= 1.2 min
Discarded =	0.0 cfs @ 12.18 hrs, Volume=	1,978 cf
Primary =	5.1 cfs @ 12.18 hrs, Volume=	10,018 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 231.97' @ 12.18 hrs Surf.Area= 866 sf Storage= 1,098 cf

Plug-Flow detention time= 44.9 min calculated for 11,976 cf (94% of inflow)

Center-of-Mass det. time= 13.9 min ( 854.6 - 840.7 )

Volume	Invert	Avail.Storage	Storage Description		
#1	229.00'	1,129 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
229.00	8	23.0	0	0	8
230.00	214	86.3	88	88	561
231.00	513	112.2	353	441	982
232.00	880	132.2	688	1,129	1,390

Device	Routing	Invert	Outlet Devices
#1	Primary	231.50'	<b>6.0' long x 22.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	229.00'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.0 cfs @ 12.18 hrs HW=231.95' (Free Discharge)

↑2=Exfiltration (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=4.9 cfs @ 12.18 hrs HW=231.95' TW=0.00' (Dynamic Tailwater)

↑1=Broad-Crested Rectangular Weir (Weir Controls 4.9 cfs @ 1.81 fps)

**Summary for Link AP1:**

Inflow Area = 133,541 sf, 35.65% Impervious, Inflow Depth > 2.23" for 100-Year event

Inflow = 9.7 cfs @ 12.16 hrs, Volume= 24,799 cf

Primary = 9.7 cfs @ 12.16 hrs, Volume= 24,799 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

## Stormwater Management Standard 3 GROUNDWATER RECHARGE

## Pre-Development Conditions

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

		<u>Area (sf)</u>	<u>Area (Ac)</u>
<b>Total Subcatchment Areas</b>		133,541	3.1
<b>Total Subcatchment Areas On-Site</b>		133,541	3.1
<b>Total Area of Hydrolic Soil Groups On-Site</b>		133,541	3.1
<b>Surface Type Areas</b>			
Grass Cover, Good	A	85,388	2.0
Pave Parking	A	17,800	0.4
Roofs	A	7,682	0.2
Woods, Good	A	22,671	0.5
<b>Total Impervious Area</b>		25,482	0.6

## Infiltration Volume

Inches of Recharge per Storm Event A 0.60

Infiltration Volume =  $\sum \{[(\text{Total Subcatchment Area within HSG}) - (\text{Total Impervious Area within HSG})] \times (\text{inches of Recharge Per Storm})\}$

## Infiltration Volume

5,403 CF

# Stormwater Management Standard 3

## GROUNDWATER RECHARGE

### Post Development Conditions

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

		<u>Area (sf)</u>	<u>Area (Ac)</u>
<b>Total Subcatchment Areas</b>		133,541	3.1
<b>Total Subcatchment Areas On-Site</b>		133,541	3.1
<b>Total Area of Hydrolic Soil Groups On-Site</b>		133,541	3.1
<b>Surface Type Areas</b>			
Grass Cover, Good	A	72,785	1.7
Paved Parking	A	14,348	0.3
Unconnected Pavement / Walkway	A	5,674	0.1
Roofs	A	27,582	0.6
Woods	A	13,152	0.3
<b>Total Impervious Area</b>		47,604	1.1

### Infiltration Volume

Inches of Recharge per Storm Event A 0.60

$$\text{Infiltration Volume} = \sum \{[(\text{Total Subcatchment Area within HSG}) - (\text{Total Impervious Area within HSG})] \times (\text{inches of Recharge Per Storm})\}$$

Natural Infiltration Volume	4,297	CF
Pre-Development Infiltration Volume	5,403	CF
Required Infiltration Volume (Unadjusted)	1,106	CF
Total Site Impervious Capture Area	35,044	SF (74% Site Impervious Area Captured)
Impervious Area Capture Adjustment Rate	1.00	

**Required Infiltration Volume** 1,106 CF [Req Infiltration Vol. Unadjusted x Imp. Area Capture Adjustment Rate]

### Provided Infiltration Volume

Infiltration Basin (IB) 1,098 CF Volume below 231.50' Orifice  
Infiltration Chambers (IC) 2,417 CF Volume below 236.75' Orifice

**Total Provided Infiltration Volume** 3,515 CF

 Pond IB: - POST-DEV[Summary](#) [Hydrograph](#) [Discharge](#) [Storage](#) [Events](#) [Sizing](#)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
230.00	445	0
230.10	477	46
230.20	510	95
230.30	544	148
230.40	580	204
230.50	616	264
230.60	654	328
230.70	692	395
230.80	732	466
230.90	773	541
231.00	815	621
231.10	869	705
231.20	924	795
231.30	982	890
231.40	1,041	991
231.50	1,101	1,098
231.60	1,164	1,211
231.70	1,228	1,331
231.80	1,294	1,457
231.90	1,362	1,590
232.00	1,431	1,729
232.10	1,480	1,875
232.20	1,530	2,025
232.30	1,580	2,181
232.40	1,632	2,342
232.50	1,684	2,507
232.60	1,737	2,678
232.70	1,791	2,855
232.80	1,846	3,037
232.90	1,902	3,224
233.00	1,958	3,417



Pond IC: - POST-DEV

[Summary](#) [Wizards](#) [Hydrograph](#) [Discharge](#) [Storage](#) [Events](#) [Sizing](#)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
232.00	763	0
232.20	763	61
232.40	763	122
232.60	763	183
232.80	763	260
233.00	763	384
233.20	763	507
233.40	763	630
233.60	763	752
233.80	763	873
234.00	763	993
234.20	763	1,112
234.40	763	1,231
234.60	763	1,348
234.80	763	1,463
235.00	763	1,577
235.20	763	1,690
235.40	763	1,801
235.60	763	1,910
235.80	763	2,016
236.00	763	2,121
236.20	763	2,223
236.40	763	2,322
236.60	763	2,417
236.80	763	2,510
237.00	763	2,597
237.20	763	2,679
237.40	763	2,751
237.60	763	2,817
237.80	763	2,879
238.00	763	2,940
238.20	763	3,001
238.40	763	3,062
238.60	763	3,123

# Stormwater Management Standard 3

## GROUNDWATER RECHARGE

### Infiltration Area Requirements

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

### Drawdown Time

(Per Massachusetts Stormwater regulations, infiltration areas must completely drain within 72 hours)

		<u>Infiltration Basin (IB)</u>	<u>Infiltration Chambers (IC)</u>
Infiltration Area Storage Volume	cf	1,098	2,417
Design infiltration Rate	in/hr	2.41	2.41
Infiltration Bottom Area	sf	445	764
Drawdown Time = Infiltration Area Storage Volume / [Design Infiltration Rate x Infiltration Area Bottom Area]			
Drawdown Time (Hrs)		12.3	15.8

### Mounding Analysis

Per the Massachusetts Stormwater Handbook, mounding analysis is required when "... The vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm." The mounding analysis "... must show that the REQUIRED RECHARGE VOLUME is fully dewatered within 72 hours..."

		<u>Infiltration Basin (IB)</u>	<u>Infiltration Chambers (IC)</u>
Hydraulic Conductivity	(K)	ft/day	16
			Lower Range Standard Value for "Medium Sand" material
Specific Yield	(Sy)		0.28
			Standard Value for "Medium Sand" material
Initial Saturated Thickness	(h)	ft	10
			Depth to bedrock
Infiltration Rate	(q)	ft/day	4.82
Design Recharge Rate	(Q)	cf/day	2145
Time		days	3
			Minimum 72 hr evaluation period
Bottom Infiltrating Area		sf	445
Length of Infiltration Area		ft	38.5
Width of Infiltration Area		ft	11.6
Time when Infiltration Stops	(t)	days	0.51
			Calculated Drawdown Time (see Above)
Maximum Water table rise at 72 hours <sup>1</sup>	(s)	ft	0.19
		in	2 3/8
			0.44
			5 2/8

- Resulting mound will not interfere with the full draining of the infiltration area in accordance with  
Mass Stormwater Standards -

<sup>1</sup> - mounding analysis calculated using the MOUNDSOLV Wizaard, Groundwater Mounding Analysis For A Sloping Water-Table Aquifer, Zlotnik Et Al. (2017) Solution.

**Stormwater Management Standard 4**  
**WATER QUALITY RETENTION VOLUME**

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

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Parameter	Unit	Quantity	Remarks
Watershed area	sf	133,541	
Predevelopment impervious area	sf	25,482	
Total impervious area added	sf	22,122	
Total impervious area	sf	<u>47,604</u>	
Total impervious area required for retention	sf	<u>22,122</u>	
Runoff depth over impervious area	IN	0.5	
<b>Required Water Quality Volume</b>	<b>CF</b>	<b>922</b>	

---

**Provided Water Quality Volume**

Infiltration Basin (IB)	1,098	CF	Volume below 231.50' Orifice
Infiltration Chambers (IC)	2,417	CF	Volume below 236.75' Orifice

**DESIGN VOLUME PROVIDED**      **CF**      **3,515**



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Evaluation Project

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## MASTEP Technology Review

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**Technology Name:** Stormwater Buffer Zone

**Studies Reviewed:** Verification Testing of a 4-ft Stormwater Buffer Zone Stormwater Catch Basin Treatment Unit, Alden Laboratory 2012

**Date:** 1/7/2013

**Reviewer:** Jerry Schoen

**Rating:** 2

**Brief rationale for rating:** This laboratory study in general followed New Jersey protocols for laboratory testing, but only 7 runs were performed (15 or more recommended). The report lacks details on quality control procedures.

**Other Comments:**

- ASTM 3977, the Suspended Sediment Concentration method was used.
- Influent sediment concentration generally 200 mg/l range, within NJCAT guidelines.
- Sediment mix used had a mean particle size of 70 microns, within NJCAT guidelines.
- 5 flow rates tested, ranging from < 10% to 125% of system design flow.
- Scour test was performed according to NJCAT guidelines. No scour found.
- Sediment removal efficiency ranged from 41% - 77%, depending on flow rates tested. Overall removal efficiency of 62.6% reported.

## Stormwater Management Standard 4

### TSS REMOVAL

Mass co. Housing  
336-338 King Street, Littleton, MA  
Project No. 191096

Process Train No.	Impervious Area (SF)	BMP Type	TSS Removal Rate	TSS Remaining at Discharge	TSS Removed at Discharge
SC-2.5	9,832	SP	63%	37%	<b>63%</b>
		FB / INF	80%	7%	<b>93%</b>
SC-2.6	4,925	SP	63%	37%	<b>63%</b>
		WQS	70%	11%	<b>89%</b>
SC-2.8	2,455	SP	63%	37%	<b>63%</b>
		WQS	70%	11%	<b>89%</b>

\* - Impervious areas within the remaining Subcatchments on site are limited to proposed dwelling roofs and walkways which will not accumulate or produce sediment. Any runoff produced by these areas must flow through long stretches of existing grass or captured and discharging directly into the proposed Infiltration Basin/Infiltration Chambers/Water Quality Swale prior to reaching a design analysis point and have been considered as clean runoff for the above calculations.

#### **ABBREVIATIONS:**

TSS=total suspended solids; SF=square feet; SC=subcatchment; GC=grassed channel; BMP=best management practices; CB=deep sump hooded catch basin; FB = Sediment Forebay; INF=infiltration basin; WB=wet basin; SP=Silt Prison Catch Basin WQS= Water Quality Swale; IC= Infiltration Chambers