

# STORMWATER CALCULATIONS

## 555 Hopping Brook Road

Holliston, Massachusetts

Prepared For:

**CRG ACQUISITIONS, LLC**  
2199 INNERBELT BUSINESS CENTER DRIVE  
St. LOUIS, MO 63114

Prepared By:

**Engineering  
Design  
Consultants, Inc.**

32 Turnpike Road  
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September 1, 2022



A handwritten signature in blue ink that reads "Walter M. Lewinski". The signature is written in a cursive style and is positioned below the professional seal.

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## **PROJECT NARRATIVE**

This project, “555 Hopping Brook Road”, is a commercial development that encompasses the construction of a building, parking, and driveways including drainage, septic system and utilities.

The calculations include off-site property as well as off-site stormwater detention basins as we are using the link 11L as our design analysis point to the west and 12L as our development point to the north.

## **DRAINAGE NARRATIVE**

As required by the Town of Holliston, Massachusetts and MassDEP’s Stormwater Handbook, a storm water analysis was performed for the project at 555 Hopping Brook Road. The method of analysis is the SCS method for hydrologic conditions. The SCS method utilized TR-55 and “HydroCAD stormwater modeling system to analysis the 2-year, 10-year, 25-year and 100-year, 24 hour storm events. The “Rational Method” and “Manning’s Equation” was utilized for the 25-year storm for the analysis of the projects piped drainage system. The stormwater pipe design was calculated using “Stormwater Studio 2020v 3.0.0323” software for Manning’s equation using the 25-year storm.

The existing Cross Culverts channel (11R) in the wetland area have not changed from the original design, the existing detention basin will be increased in size to accommodate the runoff from a portion of this project.

### **Hydrologic Existing Conditions:**

The existing site runoff generally flows toward the north and west. The predominant hydrologic soils group for the project is “Woodbridge fine sandy loam” with a hydrologic value of “C” and “Paxton fine sandy loam with a hydrologic value of “C” and a smaller area of “Charlton Hollis Rock Outcrop,” with a hydrologic value of “A” is present, this was also noted in a report titled “Permeability Testing and Measured groundwater levels, Hopping Brook Park, Holliston, MA,” prepared by The Geotechnical Group, Inc. dated August 2005. In this design an overall Hydrologic Group “C” was used for the pre-developed analysis as well as the post-developed analysis.

Subcatchment Area 1S drains to the wetland to the southwest and is generally wooded. Subcatchment 2S, also flows to the wetland area to the west is generally a wooded area.

The overall pre-developed flow to the west is represented by Link 1L, “Total PreDeveloped West”. Subcatchment 3S drains to the North and is labeled, “Total PreDeveloped North.”

### Hydrologic Proposed Conditions:

Under proposed conditions the same design point locations were analyzed for peak flow discharge for the 2-year, 10-year, 25-year and 100-year, 24 hour storm events.

There are fifteen (15) Subcatchments, included in the proposed condition that flows to the west including the existing site at 465 Hopping Brook Road. Subcatchment 8S, 9S, 10S, 11S, 17S, 19S, 21S, and 22S represent developed portions of the parcel flowing to the west. Subcatchments 12S, 15S, 16S, and 18S represent Hopping Brook Road Subcatchments and Subcatchment 21S is an area that surround the detention basin directly. Other Subcatchments, 13S, 14S, and 20S are either undeveloped or partially developed areas that are wooded and also flow to the west.

There are five (6) Subcatchments that, included in the proposed condition that flow to the north. Subcatchments representing developed land are 23S, 24S and 25S. Subcatchment 26S is representing an area that is wooded and substantially undeveloped flowing to the north.

Contech Stormwater Management Structures have been added to the design for TSS removal.

The peak discharge results are in the following tables;

**Events for Link 1L: Total PreDeveloped West**

| Event      | Rainfall<br>(inches) | Inflow<br>(cfs) | Volume<br>(cubic-feet) |
|------------|----------------------|-----------------|------------------------|
| 2-Year D   | 3.16                 | 21.8            | 302,530                |
| 10-Year D  | 4.77                 | 55.9            | 701,900                |
| 25-Year D  | 6.03                 | 86.7            | 1,063,312              |
| 100-Year D | <b>8.62</b>          | <b>155.5</b>    | <b>1,879,893</b>       |

**Events for Link 11L: Total Post Developed West**

| Event      | Rainfall<br>(inches) | Inflow<br>(cfs) | Volume<br>(cubic-feet) |
|------------|----------------------|-----------------|------------------------|
| 2-Year D   | 3.16                 | 20.5            | 387,955                |
| 10-Year D  | 4.77                 | 48.6            | 806,035                |
| 25-Year D  | 6.03                 | 73.1            | 1,174,274              |
| 100-Year D | <b>8.62</b>          | <b>145.9</b>    | <b>1,996,066</b>       |

**Events for Subcatchment 3S: Total PreDeveloped N**

| Event      | Rainfall<br>(inches) | Runoff<br>(cfs) | Volume<br>(cubic-feet) |
|------------|----------------------|-----------------|------------------------|
| 2-Year D   | 3.16                 | 10.9            | 156,676                |
| 10-Year D  | 4.77                 | 27.9            | 363,503                |
| 25-Year D  | 6.03                 | 43.2            | 550,673                |
| 100-Year D | <b>8.62</b>          | <b>77.5</b>     | <b>973,568</b>         |

**Events for Link 12L: Total Post-Developed North**

| Event      | Rainfall<br>(inches) | Inflow<br>(cfs) | Volume<br>(cubic-feet) |
|------------|----------------------|-----------------|------------------------|
| 2-Year D   | 3.16                 | 10.4            | 249,723                |
| 10-Year D  | 4.77                 | 25.9            | 500,042                |
| 25-Year D  | 6.03                 | 40.0            | 715,155                |
| 100-Year D | <b>8.62</b>          | <b>75.9</b>     | <b>1,185,409</b>       |

In conclusion, the 2-year, 10-year, 25-year and 100-year peak rates of runoff are predominately maintained under proposed conditions to the design points.

## INFILTRATION/DETENTION BASIN SUMMARY

Infiltration/Detention basin “10P” was previously designed with two forebays to treat for TSS removal from the two inlet pipes from the roadway runoff, the northern most forebay will be replaced by a Contech CDS structural BMP and the detention/infiltration basin will be expanded in area and volume to accommodate this project, the outlet control structure has also been redesigned. A new proposed Infiltration/Detention basin “30P” is located at the northern end of the project.

Top of Berm for Basin 10P is 284.0

### Events for Pond 10P: DB1

| Event      | Inflow<br>(cfs) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) | Elevation<br>(feet) | Storage<br>(cubic-feet) |
|------------|-----------------|------------------|--------------------|------------------|---------------------|-------------------------|
| 2-Year D   | 42.2            | 4.7              | 0.4                | 4.3              | 278.87              | 108,049                 |
| 10-Year D  | 74.8            | 8.0              | 0.5                | 7.4              | 280.09              | 203,216                 |
| 25-Year D  | 100.4           | 10.3             | 0.6                | 9.7              | 281.01              | 287,424                 |
| 100-Year D | <b>148.9</b>    | <b>32.8</b>      | <b>0.7</b>         | <b>32.1</b>      | <b>282.27</b>       | <b>413,960</b>          |

Top of Berm for Basin 30P is 326.7

### Events for Pond 30P: DB2

| Event      | Inflow<br>(cfs) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) | Elevation<br>(feet) | Storage<br>(cubic-feet) |
|------------|-----------------|------------------|--------------------|------------------|---------------------|-------------------------|
| 2-Year D   | 43.0            | 4.9              | 0.3                | 4.6              | 322.86              | 100,894                 |
| 10-Year D  | 73.4            | 11.7             | 0.4                | 11.3             | 323.90              | 160,613                 |
| 25-Year D  | 97.7            | 18.4             | 0.5                | 17.9             | 324.55              | 207,367                 |
| 100-Year D | <b>147.9</b>    | <b>36.5</b>      | <b>0.6</b>         | <b>35.9</b>      | <b>325.65</b>       | <b>295,082</b>          |

## **DEP STORMWATER MANAGEMENT STANDARDS:**

**Standard 1.** All proposed impervious surfaces are treated and will not cause erosion in adjacent wetlands and waters of the Commonwealth, as BMP measures are proposed in accordance with the design requirements of the Stormwater Management Handbook.

**Standard 2.** The proposed development peak discharge rates predominately meet predevelopment discharge rates for the 2-year, 10-year, 25-year and 100-year storm events for the design point.

**Standard 3.** 1,195,809 s.f. of additional impervious surfaces will be created as part of the proposed project, with the prior project at 365 Hopping Brook Road having 162,608 s.f. of impervious surfaces being recharged on site.

503,704 s.f of impervious flows to the west, and 692,105 s.f of impervious flows to the north.

The amount of recharge required to the west is  $(503,704 \times 0.25/12) = 10,494$  c.f., based upon an underlying hydrologic soil group C. Recharge required to the north is  $(692,105 \times 0.25/12) = 14,419$  c.f.

DEP's "Static" method of evaluating recharge was used for this project.

Storage provided in basin 10P-DB1(West), up to the elevation 276.36 of the lowest orifice is 10,721c.f.

Storage provided in basin 30P-DB2(North), up to the elevation 320.34 of the lowest orifice is 14,623c.f.

The drawdown time for each of the two basins are calculated using the formula;

$T_{(\text{drawdown})} = Rv/k(\text{bottom Area})$  ; Rv in this case is the storage provided, k is Rawl's rate for "C" soil.

$T(\text{West}) = 10,721/((0.27/12)(28,622)) = 16.65$  hours

$T(\text{North 30P}) = 14,623/((0.27/12)(26,203)) = 24.80$  hours

This project meets Standard 3 requirements.

**Standard 4.** TSS Removal of 80% or greater.

Contech Stormwater Management Structures have been added to the design using the required 1-inch of runoff for the design. The results range from 87.6% to 89.7% TSS removal.

The forebays for the infiltration/detention basins were designed using 0.1-inches of runoff since we meet the greater than 80% TSS removal with the Contech structures.

Three forebays were designed to meet the pretreatment criteria for infiltration basins.

Basin 10P Forebay: 140,960 s.f. of pavement, Required volume= $140,960 \times 0.1"/12 = 1,175$ c.f.

Volume provided = 4,172c.f. ok!

Basin 30P:

Northeast Forebay: 241,279 s.f. of pavement, Required volume= $241,279 \times 0.1"/12 = 2,011$ c.f.

Volume provided = 3,839 c.f. ok!

Northwest Forebay: 105,720s.f. of pavement, Required volume= $105,720 \times 0.1"/12 = 881$  c.f.

Volume provided = 2,880 c.f. ok!

This project meets Standard 4 requirements.

**Standard 5.** The proposed development will not generate higher potential pollutant loads, and therefore will not require additional BMP practices.

**Standard 6.** The proposed work is not within an Outstanding Resource Water. The 1.0-inch rule was used to calculate the water quality volume for the structural BMP's..

**Standard 7.** Not applicable.

**Standard 8.** Erosion and sediment control measures are proposed during construction. They include first the installation of an erosion control barrier and catch basin protection prior to construction. Construction period pollution prevention and erosion and sedimentation control plans were previously submitted under the previous amendment and remain the same.

**Standard 9.** An operation and maintenance plan will be submitted for approval.

**Standard 10.** An Illicit Discharge Compliance Statement will be submitted and included with the pollution prevention plan.

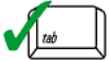


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# Checklist for Stormwater Report

## 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.



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# 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.

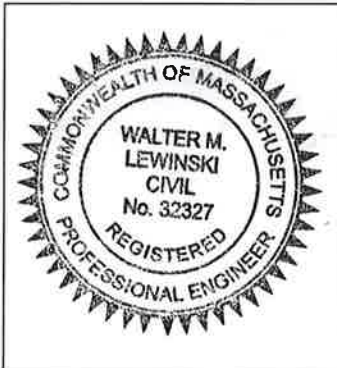
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that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



*Walter M. Lewinski* 6-1-22  
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



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# Checklist for Stormwater Report

## Checklist (continued)

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

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

## Standard 1: No New Untreated Discharges

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



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# Checklist for Stormwater Report

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☐ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☒ Static
  - ☐ Simple Dynamic
  - ☐ Dynamic Field<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.

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



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# Checklist for Stormwater Report

## Checklist (continued)

### Standard 3: Recharge (continued)

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

### Standard 4: Water Quality

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

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



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# Checklist for Stormwater Report

## Checklist (continued)

### Standard 4: Water Quality (continued)

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

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

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



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# Checklist for Stormwater Report

## Checklist (continued)

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

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
  - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



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

# Checklist for Stormwater Report

## Checklist (continued)

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

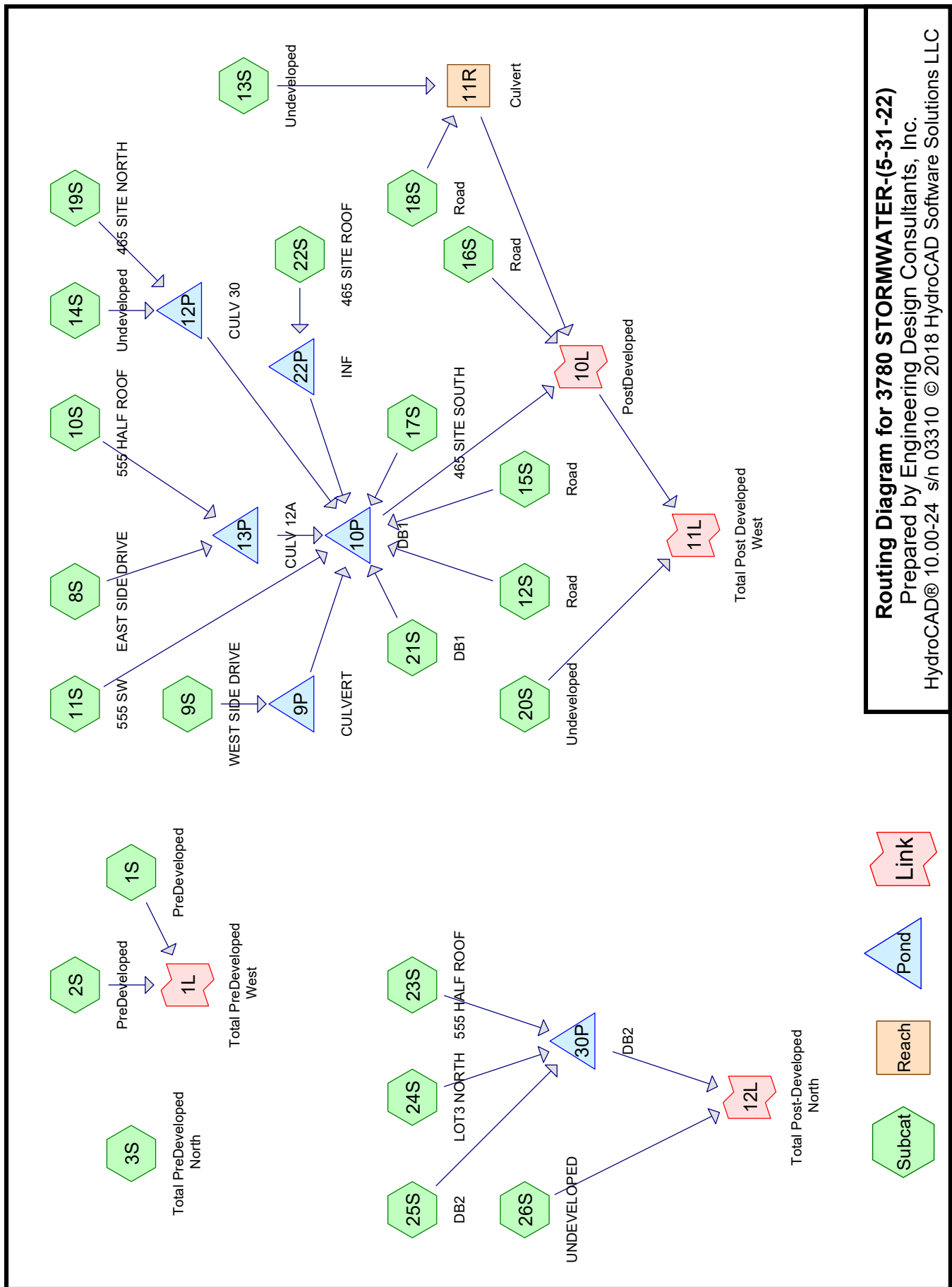
- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☒ Description and delineation of public safety features;
  - ☒ Estimated operation and maintenance budget; and
  - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

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



**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Summary for Subcatchment 1S: PreDeveloped**

Runoff = 11.8 cfs @ 13.46 hrs, Volume= 170,388 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,540,256 | 70 | Woods, Good, HSG C    |
| 2,540,256 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 22.8     | 483           | 0.0200        | 0.35              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.8     | 623           | 0.0400        | 0.50              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.8     | 1,254         | 0.0650        | 0.64              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 97.9     | 2,410         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 2S: PreDeveloped**

Runoff = 10.5 cfs @ 13.15 hrs, Volume= 132,142 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 1,970,057 | 70 | Woods, Good, HSG C    |
| 1,970,057 |    | 100.00% Pervious Area |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 25.8     | 387           | 0.0100        | 0.25              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 6.2      | 196           | 0.0440        | 0.52              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 25.8     | 1,142         | 0.0870        | 0.74              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 79.3     | 1,775         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 3S: Total PreDeveloped North**

Runoff = 10.9 cfs @ 13.46 hrs, Volume= 156,676 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,335,823 | 70 | Woods, Good, HSG C    |
| 2,335,823 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"                                               |
| 27.6     | 641           | 0.0240        | 0.39              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 46.2     | 1,713         | 0.0610        | 0.62              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 1.6      | 267           | 0.0600        | 2.71              | 14.43          | <b>Parabolic Channel,</b><br>W=8.00' D=1.00' Area=5.3 sf Perim=8.3'<br>n= 0.100 Earth, dense brush, high stage |
| 96.9     | 2,671         | Total         |                   |                |                                                                                                                |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Summary for Subcatchment 8S: EAST SIDE DRIVE**

Runoff = 2.5 cfs @ 12.26 hrs, Volume= 12,374 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 140,049   | 74 | >75% Grass cover, Good, HSG C |
| 6,776     | 70 | Woods, Good, HSG C            |
| 146,825   | 74 | Weighted Average              |
| 146,825   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.6      | 703           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.7     | 1,690         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 9S: WEST SIDE DRIVE**

Runoff = 1.8 cfs @ 12.26 hrs, Volume= 8,984 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 106,603   | 74 | >75% Grass cover, Good, HSG C |
| 106,603   |    | 100.00% Pervious Area         |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.4      | 638           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.5     | 1,625         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 10S: 555 HALF ROOF**

Runoff = 16.3 cfs @ 12.15 hrs, Volume= 67,092 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description          |
|----------|---------------|---------------|-------------------|----------------|----------------------|
| 8.4      |               |               |                   |                | <b>Direct Entry,</b> |

**Summary for Subcatchment 11S: 555 SW**

Runoff = 8.4 cfs @ 12.28 hrs, Volume= 42,700 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 90,464    | 74 | >75% Grass cover, Good, HSG C |
| 160,091   | 98 | Paved parking, HSG C          |
| 250,555   | 89 | Weighted Average              |
| 90,464    |    | 36.11% Pervious Area          |
| 160,091   |    | 63.89% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 10.4     | 50            | 0.0110        | 0.08              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 3.2      | 140           | 0.0110        | 0.73              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps              |
| 2.3      | 296           | 0.0110        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 3.2      | 1,467         | 0.0170        | 7.75              | 13.70          | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 |
| 19.1     | 1,953         | Total         |                   |                |                                                                                   |

**Summary for Subcatchment 12S: Road**

Runoff = 0.7 cfs @ 12.15 hrs, Volume= 2,434 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 9,362     | 98 | Paved parking, HSG C          |
| 3,789     | 74 | >75% Grass cover, Good, HSG C |
| 13,151    | 91 | Weighted Average              |
| 3,789     |    | 28.81% Pervious Area          |
| 9,362     |    | 71.19% Impervious Area        |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-------------------------------------------------------------------------------------------------|
| 7.4      | 44            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5      | 122           | 0.0440        | 4.26              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.2      | 100           | 0.0400        | 9.07              | 7.13           | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 8.1      | 266           | Total         |                   |                |                                                                                                 |

**Summary for Subcatchment 13S: Undeveloped**

Runoff = 3.8 cfs @ 13.07 hrs, Volume= 44,009 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 496,005   | 70 | Woods, Good, HSG C            |
| 122,277   | 74 | >75% Grass cover, Good, HSG C |
| 618,282   | 71 | Weighted Average              |
| 618,282   |    | 100.00% Pervious Area         |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 12.3        | 50               | 0.0200           | 0.07                 |                   | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 20.8        | 599              | 0.0370           | 0.48                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 12.5        | 350              | 0.0350           | 0.47                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 3.1         | 163              | 0.1200           | 0.87                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 22.7        | 737              | 0.0470           | 0.54                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 71.4        | 1,899            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 14S: Undeveloped**

Runoff = 6.4 cfs @ 12.35 hrs, Volume= 38,243 cf, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 178,452   | 70 | Woods, Good, HSG C            |
| 300,921   | 74 | >75% Grass cover, Good, HSG C |
| 479,373   | 73 | Weighted Average              |
| 479,373   |    | 100.00% Pervious Area         |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 14.3        | 50               | 0.0050           | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                  |
| 1.6         | 275              | 0.0370           | 2.89                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.4         | 225              | 0.2000           | 1.12                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 1.0         | 239              | 0.0650           | 3.82                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.1         | 357              | 0.0160           | 1.90                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 23.4        | 1,146            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 15S: Road**

Runoff = 1.7 cfs @ 12.13 hrs, Volume= 5,659 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 20,008    | 98 | Paved parking, HSG C          |
| 16,125    | 74 | >75% Grass cover, Good, HSG C |
| 36,133    | 87 | Weighted Average              |
| 16,125    |    | 44.63% Pervious Area          |
| 20,008    |    | 55.37% Impervious Area        |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft)                         | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                     |
|-------------|------------------|------------------------------------------|----------------------|-------------------|-------------------------------------------------------------------------------------------------|
| 4.3         | 16               | 0.0100                                   | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5         | 132              | 0.0460                                   | 4.35                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.3         | 110              | 0.0200                                   | 6.42                 | 5.04              | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 5.1         | 258              | Total, Increased to minimum Tc = 6.0 min |                      |                   |                                                                                                 |

**Summary for Subcatchment 16S: Road**

Runoff = 1.4 cfs @ 12.13 hrs, Volume= 4,803 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 18,005    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 2,688     | 98 | Paved parking, HSG C                       |
| 9,970     | 74 | >75% Grass cover, Good, HSG C              |
| 30,663    | 87 | Weighted Average                           |
| 18,973    |    | 61.87% Pervious Area                       |
| 11,691    |    | 38.13% Impervious Area                     |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Summary for Subcatchment 17S: 465 SITE SOUTH**

Runoff = 1.6 cfs @ 12.25 hrs, Volume= 7,445 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 21,889    | 74 | >75% Grass cover, Good, HSG C |
| 25,644    | 98 | Unconnected pavement, HSG C   |
| 47,533    | 87 | Weighted Average              |
| 21,889    |    | 46.05% Pervious Area          |
| 25,644    |    | 53.95% Impervious Area        |
| 25,644    |    | 100.00% Unconnected           |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                             |
|-------------|------------------|------------------|----------------------|-------------------|---------------------------------------------------------|
| 8.7         | 38               | 0.0100           | 0.07                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"   |
| 8.1         | 694              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps |
| 16.8        | 732              | Total            |                      |                   |                                                         |

**Summary for Subcatchment 18S: Road**

Runoff = 1.2 cfs @ 12.13 hrs, Volume= 4,226 cf, Depth= 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 21,926    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 10,963    |    | 50.00% Pervious Area                       |
| 10,963    |    | 50.00% Impervious Area                     |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

**Summary for Subcatchment 19S: 465 SITE NORTH**

Runoff = 1.9 cfs @ 12.16 hrs, Volume= 6,881 cf, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 25,932    | 74 | >75% Grass cover, Good, HSG C |
| 21,980    | 98 | Paved parking, HSG C          |
| 47,912    | 85 | Weighted Average              |
| 25,932    |    | 54.12% Pervious Area          |
| 21,980    |    | 45.88% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                              |
|-------------|------------------|------------------|----------------------|-------------------|----------------------------------------------------------|
| 1.1         | 45               | 0.0050           | 0.67                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.20" |
| 7.6         | 658              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps  |
| 8.7         | 703              | Total            |                      |                   |                                                          |

**Summary for Subcatchment 20S: Undeveloped**

Runoff = 12.3 cfs @ 12.94 hrs, Volume= 137,493 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,809,628 | 70 | Woods, Good, HSG C            |
| 240,208   | 74 | >75% Grass cover, Good, HSG C |
| 2,049,836 | 70 | Weighted Average              |
| 2,049,836 |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 12.1        | 50               | 0.0210           | 0.07                 |                   | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 13.2        | 293              | 0.0220           | 0.37                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 11.6        | 322              | 0.0340           | 0.46                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.3        | 1,193            | 0.0850           | 0.73                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 64.2        | 1,858            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 21S: DB1**

Runoff = 4.0 cfs @ 12.14 hrs, Volume= 13,686 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 162,392   | 74 | >75% Grass cover, Good, HSG C |
| 162,392   |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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**Summary for Subcatchment 22S: 465 SITE ROOF**

Runoff = 6.3 cfs @ 12.17 hrs, Volume= 27,229 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 57,453    | 98 | Roofs, HSG C            |
| 54,155    | 98 | Roofs, HSG C            |
| 111,608   | 98 | Weighted Average        |
| 111,608   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 10.0     |               |               |                   |                | Direct Entry, |

**Summary for Subcatchment 23S: 555 HALF ROOF**

Runoff = 17.4 cfs @ 12.14 hrs, Volume= 67,092 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 6.0      |               |               |                   |                | Direct Entry,                                                              |
| 0.7      | 483           | 0.0270        | 11.83             | 37.17          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 6.7      | 483           | Total         |                   |                |                                                                            |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Summary for Subcatchment 24S: LOT3 NORTH**

Runoff = 25.1 cfs @ 12.23 hrs, Volume= 113,499 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 248,887   | 74 | >75% Grass cover, Good, HSG C |
| 417,105   | 98 | Paved parking, HSG C          |
| 665,992   | 89 | Weighted Average              |
| 248,887   |    | 37.37% Pervious Area          |
| 417,105   |    | 62.63% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 5.5      | 50            | 0.0540        | 0.15              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 4.8      | 200           | 0.0100        | 0.70              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps              |
| 1.5      | 184           | 0.0100        | 2.03              |                | Shallow Concentrated Flow,<br>Paved Kv= 20.3 fps                           |
| 3.0      | 1,300         | 0.0100        | 7.20              | 22.62          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 14.8     | 1,734         | Total         |                   |                |                                                                            |

**Summary for Subcatchment 25S: DB2**

Runoff = 5.1 cfs @ 12.18 hrs, Volume= 20,794 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 246,734   | 74 | >75% Grass cover, Good, HSG C |
| 246,734   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 5.3      | 50            | 0.0600        | 0.16              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"              |
| 3.5      | 660           | 0.0450        | 3.18              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 1.5      | 119           | 0.0080        | 1.34              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 10.3     | 829           | Total         |                   |                |                                                                    |

**Summary for Subcatchment 26S: UNDEVELOPED**

Runoff = 5.8 cfs @ 13.48 hrs, Volume= 84,556 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 2-Year D Rainfall=3.16"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,184,876 | 70 | Woods, Good, HSG C            |
| 75,742    | 74 | >75% Grass cover, Good, HSG C |
| 1,260,618 | 70 | Weighted Average              |
| 1,260,618 |    | 100.00% Pervious Area         |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.3     | 50            | 0.0200        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 29.6     | 1,022         | 0.0530        | 0.58              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.6     | 586           | 0.0360        | 0.47              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 36.1     | 1,210         | 0.0500        | 0.56              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 98.6     | 2,868         | Total         |                   |                |                                                                        |

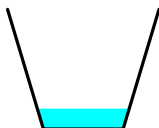
**Summary for Reach 11R: Culvert**

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 0.90" for 2-Year D event  
 Inflow = 3.9 cfs @ 13.07 hrs, Volume= 48,234 cf  
 Outflow = 3.9 cfs @ 13.07 hrs, Volume= 48,234 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
 Max. Velocity= 3.54 fps, Min. Travel Time= 0.2 min  
 Avg. Velocity = 1.47 fps, Avg. Travel Time= 0.6 min

Peak Storage= 55 cf @ 13.07 hrs  
 Average Depth at Peak Storage= 0.51'  
 Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding  
 Side Slope Z-value= 0.3 ' Top Width= 3.80'  
 Length= 50.0' Slope= 0.0200 ' / '  
 Inlet Invert= 280.00', Outlet Invert= 279.00'



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**Summary for Pond 9P: CULVERT**

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 1.01" for 2-Year D event  
 Inflow = 1.8 cfs @ 12.26 hrs, Volume= 8,984 cf  
 Outflow = 1.8 cfs @ 12.29 hrs, Volume= 8,856 cf, Atten= 2%, Lag= 1.8 min  
 Primary = 1.8 cfs @ 12.29 hrs, Volume= 8,856 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
 Peak Elev= 294.61' @ 12.29 hrs Surf.Area= 524 sf Storage= 403 cf

Plug-Flow detention time= 17.4 min calculated for 8,853 cf (99% of inflow)  
 Center-of-Mass det. time= 9.6 min ( 915.3 - 905.6 )

| Volume           | Invert            | Avail.Storage | Storage Description                                        |                        |                  |
|------------------|-------------------|---------------|------------------------------------------------------------|------------------------|------------------|
| #1               | 293.00'           | 4,006 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) |
| 293.00           | 0                 | 0.0           | 0                                                          | 0                      | 0                |
| 294.00           | 385               | 92.0          | 128                                                        | 128                    | 675              |
| 296.00           | 925               | 120.0         | 1,271                                                      | 1,400                  | 1,193            |
| 298.00           | 1,723             | 157.0         | 2,607                                                      | 4,006                  | 2,054            |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                            |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 294.00' | <b>18.0" Round Culvert</b> L= 75.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' / Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |

**Primary OutFlow** Max=1.8 cfs @ 12.29 hrs HW=294.61' (Free Discharge)  
**1=Culvert** (Inlet Controls 1.8 cfs @ 2.65 fps)

**Summary for Pond 10P: DB1****3780 STORMWATER-(5-31-22)**

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 1.65" for 2-Year D event  
 Inflow = 42.2 cfs @ 12.21 hrs, Volume= 230,604 cf  
 Outflow = 4.7 cfs @ 13.88 hrs, Volume= 230,586 cf, Atten= 89%, Lag= 100.0 min  
 Discarded = 0.4 cfs @ 13.88 hrs, Volume= 33,161 cf  
 Primary = 4.3 cfs @ 13.88 hrs, Volume= 197,425 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 278.87' @ 13.88 hrs Surf.Area= 66,258 sf Storage= 108,049 cf

Plug-Flow detention time= 362.7 min calculated for 230,529 cf (100% of inflow)  
 Center-of-Mass det. time= 363.6 min ( 1,200.4 - 836.9 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 275.00'              | 603,909 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| #2                  | 273.00'              | 138 cf           | <b>4.00'D x 11.00'H Vertical Cone/Cylinder</b>             |                           |                     |
|                     |                      | 604,047 cf       |                                                            |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 275.00              | 100                  | 40.0             | 0                                                          | 0                         | 100                 |
| 276.00              | 13,700               | 600.0            | 4,990                                                      | 4,990                     | 28,622              |
| 277.00              | 27,095               | 820.0            | 20,021                                                     | 25,011                    | 53,492              |
| 278.00              | 44,050               | 1,020.0          | 35,231                                                     | 60,242                    | 82,791              |
| 279.00              | 69,900               | 1,580.0          | 56,480                                                     | 116,721                   | 198,664             |
| 280.00              | 87,050               | 1,610.0          | 78,318                                                     | 195,040                   | 206,444             |
| 282.00              | 103,500              | 1,725.0          | 190,313                                                    | 385,353                   | 237,146             |
| 284.00              | 115,160              | 1,730.0          | 218,556                                                    | 603,909                   | 240,864             |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                    |
|--------|----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 273.34' | <b>24.0" Round Culvert</b> L= 90.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf |
| #2     | Device 1 | 276.36' | <b>6.0" Vert. Orifice/Grate X 3.00</b> C= 0.600                                                                                                                                                   |
| #3     | Device 1 | 278.80' | <b>0.7' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                              |
| #4     | Device 1 | 281.40' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                              |
| #5     | Primary  | 283.50' | <b>6.0' long x 10.0' breadth Emergency Spillway</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60                                                                                        |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64  
 #6 Discarded 273.00' **0.270 in/hr Exfiltration over Surface area**

**Discarded OutFlow** Max=0.4 cfs @ 13.88 hrs HW=278.87' (Free Discharge)  
**6=Exfiltration** (Exfiltration Controls 0.4 cfs)

**Primary OutFlow** Max=4.3 cfs @ 13.88 hrs HW=278.87' (Free Discharge)  
**1=Culvert** (Passes 4.3 cfs of 32.2 cfs potential flow)  
**2=Orifice/Grate** (Orifice Controls 4.3 cfs @ 7.24 fps)  
**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.0 cfs @ 0.87 fps)  
**4=Orifice/Grate** (Controls 0.0 cfs)  
**5=Emergency Spillway** (Controls 0.0 cfs)

**Summary for Pond 12P: CULV 30**

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 1.03" for 2-Year D event  
 Inflow = 7.1 cfs @ 12.33 hrs, Volume= 45,124 cf  
 Outflow = 7.1 cfs @ 12.35 hrs, Volume= 45,125 cf, Atten= 1%, Lag= 1.1 min  
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 365 cf  
 Primary = 7.1 cfs @ 12.35 hrs, Volume= 44,760 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 281.07' @ 12.35 hrs Surf.Area= 824 sf Storage= 868 cf

Plug-Flow detention time= 6.9 min calculated for 45,114 cf (100% of inflow)  
 Center-of-Mass det. time= 7.1 min ( 913.6 - 906.5 )

| Volume | Invert  | Avail.Storage | Storage Description                                    |
|--------|---------|---------------|--------------------------------------------------------|
| #1     | 279.50' | 8,119 cf      | <b>Custom Stage Data (Conic)</b> Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|------------------|-------------------|------------------------|------------------------|------------------|
| 279.50           | 0                 | 0                      | 0                      | 0                |
| 280.00           | 610               | 102                    | 102                    | 610              |
| 282.00           | 1,035             | 1,626                  | 1,728                  | 1,081            |
| 284.00           | 1,570             | 2,586                  | 4,315                  | 1,673            |
| 286.00           | 2,255             | 3,804                  | 8,119                  | 2,425            |

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                         |
|--------|-----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 280.00' | <b>30.0" Round Culvert</b> L= 129.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' / S= 0.0155 ' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |
| #2     | Discarded | 279.50' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                                      |

**Discarded OutFlow** Max=0.0 cfs @ 12.35 hrs HW=281.07' (Free Discharge)  
**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=7.1 cfs @ 12.35 hrs HW=281.07' (Free Discharge)  
**1=Culvert** (Inlet Controls 7.1 cfs @ 3.53 fps)

**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 2.26" for 2-Year D event  
 Inflow = 18.1 cfs @ 12.16 hrs, Volume= 79,465 cf  
 Outflow = 16.5 cfs @ 12.19 hrs, Volume= 79,466 cf, Atten= 9%, Lag= 2.3 min  
 Primary = 16.5 cfs @ 12.19 hrs, Volume= 79,466 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 292.75' @ 12.19 hrs Surf.Area= 2,558 sf Storage= 2,661 cf

Plug-Flow detention time= 2.2 min calculated for 79,446 cf (100% of inflow)  
 Center-of-Mass det. time= 2.2 min ( 787.4 - 785.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 291.00' | 28,701 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) |
|------------------|-------------------|---------------|------------------------|------------------------|------------------|
| 291.00           | 100               | 40.0          | 0                      | 0                      | 100              |
| 292.00           | 2,142             | 200.0         | 902                    | 902                    | 3,158            |
| 294.00           | 3,334             | 230.0         | 5,432                  | 6,334                  | 4,271            |
| 296.00           | 4,670             | 270.0         | 7,967                  | 14,300                 | 5,939            |
| 298.00           | 6,352             | 323.0         | 10,979                 | 25,279                 | 8,510            |
| 298.50           | 7,345             | 340.0         | 3,421                  | 28,701                 | 9,422            |

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NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Device | Routing | Invert  | Outlet Devices                                                                                                                                                            |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 291.00' | <b>30.0" Round Culvert</b> L= 120.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 '/ Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |

**Primary OutFlow** Max=16.4 cfs @ 12.19 hrs HW=292.74' (Free Discharge)**1=Culvert** (Inlet Controls 16.4 cfs @ 4.49 fps)**Summary for Pond 22P: INF**

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 2.93" for 2-Year D event  
 Inflow = 6.3 cfs @ 12.17 hrs, Volume= 27,229 cf  
 Outflow = 5.5 cfs @ 12.22 hrs, Volume= 27,229 cf, Atten= 12%, Lag= 2.9 min  
 Discarded = 0.0 cfs @ 12.22 hrs, Volume= 1,630 cf  
 Primary = 5.5 cfs @ 12.22 hrs, Volume= 25,599 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 287.18' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 2,422 cf

Plug-Flow detention time= 43.1 min calculated for 27,222 cf (100% of inflow)  
 Center-of-Mass det. time= 43.3 min ( 807.8 - 764.5 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                                                                                                                    |
|--------|---------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1A    | 285.50' | 1,589 cf      | <b>28.00'W x 73.00'L x 3.21'H Field A</b><br>6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids                                                                                                             |
| #2A    | 286.00' | 2,587 cf      | <b>Cultec R-280HD</b> x 60 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 6 rows |
|        |         |               | 4,175 cf Total Available Storage                                                                                                                                                                                       |

Storage Group A created with Chamber Wizard

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                            |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 286.00' | <b>18.0" Round Culvert</b> L= 20.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 '/ Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |
| #2     | Discarded | 285.50' | <b>0.270 in/hr Exfiltration over Wetted area</b>                                                                                                                          |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Discarded OutFlow** Max=0.0 cfs @ 12.22 hrs HW=287.17' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=5.4 cfs @ 12.22 hrs HW=287.17' (Free Discharge)**1=Culvert** (Inlet Controls 5.4 cfs @ 3.68 fps)**Summary for Pond 30P: DB2**

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 2.03" for 2-Year D event  
 Inflow = 43.0 cfs @ 12.17 hrs, Volume= 201,384 cf  
 Outflow = 4.9 cfs @ 13.44 hrs, Volume= 201,385 cf, Atten= 89%, Lag= 76.4 min  
 Discarded = 0.3 cfs @ 13.44 hrs, Volume= 36,218 cf  
 Primary = 4.6 cfs @ 13.44 hrs, Volume= 165,167 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 322.86' @ 13.44 hrs Surf.Area= 48,554 sf Storage= 100,894 cf

Plug-Flow detention time= 449.2 min calculated for 201,334 cf (100% of inflow)  
 Center-of-Mass det. time= 450.1 min ( 1,269.3 - 819.1 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------------|---------------------|
| #1                  | 319.00'              | 329,237 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Voids<br>(%)                                               | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 319.00              | 400                  | 80.0             | 0.0                                                        | 0                         | 0                         | 400                 |
| 320.00              | 19,450               | 575.0            | 100.0                                                      | 7,546                     | 7,546                     | 26,203              |
| 321.00              | 28,075               | 685.0            | 100.0                                                      | 23,631                    | 31,177                    | 37,250              |
| 322.00              | 37,630               | 790.0            | 100.0                                                      | 32,736                    | 63,913                    | 49,597              |
| 323.00              | 50,456               | 930.0            | 100.0                                                      | 43,887                    | 107,800                   | 68,779              |
| 324.00              | 69,750               | 1,090.0          | 100.0                                                      | 59,843                    | 167,643                   | 94,518              |
| 325.00              | 76,570               | 1,130.0          | 100.0                                                      | 73,133                    | 240,777                   | 101,671             |
| 326.00              | 100,910              | 1,570.0          | 100.0                                                      | 88,461                    | 329,237                   | 196,219             |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 2-Year D Rainfall=3.16"

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                            |
|--------|-----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 319.00' | <b>24.0" Round Culvert</b> L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 319.00' / 315.50' S= 0.0500 1' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf                  |
| #2     | Device 1  | 320.34' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                 |
| #3     | Device 1  | 322.50' | <b>20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)                                                                                                                |
| #4     | Device 1  | 324.90' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                      |
| #5     | Primary   | 325.50' | <b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #6     | Discarded | 319.00' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                                         |

**Discarded OutFlow** Max=0.3 cfs @ 13.44 hrs HW=322.86' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.3 cfs)**Primary OutFlow** Max=4.6 cfs @ 13.44 hrs HW=322.86' (Free Discharge)**1=Culvert** (Passes 4.6 cfs of 25.6 cfs potential flow)**2=Orifice/Grate** (Orifice Controls 3.8 cfs @ 6.98 fps)**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.8 cfs @ 1.99 fps)**4=Orifice/Grate** (Controls 0.0 cfs)**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**Summary for Link 1L: Total PreDeveloped West**

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 0.80" for 2-Year D event  
 Inflow = 21.8 cfs @ 13.33 hrs, Volume= 302,530 cf  
 Primary = 21.8 cfs @ 13.33 hrs, Volume= 302,530 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 10L: PostDeveloped**

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 1.28" for 2-Year D event  
 Inflow = 8.3 cfs @ 13.07 hrs, Volume= 250,462 cf  
 Primary = 8.3 cfs @ 13.07 hrs, Volume= 250,462 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 2-Year D Rainfall=3.16"

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**Summary for Link 11L: Total Post Developed West**

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 1.06" for 2-Year D event  
 Inflow = 20.5 cfs @ 12.97 hrs, Volume= 387,955 cf  
 Primary = 20.5 cfs @ 12.97 hrs, Volume= 387,955 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 12L: Total Post-Developed North**

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 1.22" for 2-Year D event  
 Inflow = 10.4 cfs @ 13.47 hrs, Volume= 249,723 cf  
 Primary = 10.4 cfs @ 13.47 hrs, Volume= 249,723 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 10-Year D Rainfall=4.77"

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**Summary for Subcatchment 1S: PreDeveloped**

Runoff = 30.4 cfs @ 13.38 hrs, Volume= 395,317 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,540,256 | 70 | Woods, Good, HSG C    |
| 2,540,256 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 22.8     | 483           | 0.0200        | 0.35              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.8     | 623           | 0.0400        | 0.50              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.8     | 1,254         | 0.0650        | 0.64              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 97.9     | 2,410         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 2S: PreDeveloped**

Runoff = 26.9 cfs @ 13.13 hrs, Volume= 306,582 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 1,970,057 | 70 | Woods, Good, HSG C    |
| 1,970,057 |    | 100.00% Pervious Area |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 25.8     | 387           | 0.0100        | 0.25              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 6.2      | 196           | 0.0440        | 0.52              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 25.8     | 1,142         | 0.0870        | 0.74              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 79.3     | 1,775         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 3S: Total PreDeveloped North**

Runoff = 27.9 cfs @ 13.35 hrs, Volume= 363,503 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,335,823 | 70 | Woods, Good, HSG C    |
| 2,335,823 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"                                               |
| 27.6     | 641           | 0.0240        | 0.39              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 46.2     | 1,713         | 0.0610        | 0.62              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 1.6      | 267           | 0.0600        | 2.71              | 14.43          | <b>Parabolic Channel,</b><br>W=8.00' D=1.00' Area=5.3 sf Perim=8.3'<br>n= 0.100 Earth, dense brush, high stage |
| 96.9     | 2,671         | Total         |                   |                |                                                                                                                |

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**Summary for Subcatchment 8S: EAST SIDE DRIVE**

Runoff = 5.6 cfs @ 12.25 hrs, Volume= 26,700 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 140,049   | 74 | >75% Grass cover, Good, HSG C |
| 6,776     | 70 | Woods, Good, HSG C            |
| 146,825   | 74 | Weighted Average              |
| 146,825   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.6      | 703           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.7     | 1,690         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 9S: WEST SIDE DRIVE**

Runoff = 4.1 cfs @ 12.25 hrs, Volume= 19,386 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 106,603   | 74 | >75% Grass cover, Good, HSG C |
| 106,603   |    | 100.00% Pervious Area         |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.4      | 638           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.5     | 1,625         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 10S: 555 HALF ROOF**

Runoff = 24.8 cfs @ 12.15 hrs, Volume= 103,894 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description          |
|----------|---------------|---------------|-------------------|----------------|----------------------|
| 8.4      |               |               |                   |                | <b>Direct Entry,</b> |

**Summary for Subcatchment 11S: 555 SW**

Runoff = 14.3 cfs @ 12.27 hrs, Volume= 74,167 cf, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

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NRCC 24-hr D 10-Year D Rainfall=4.77"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 90,464    | 74 | >75% Grass cover, Good, HSG C |
| 160,091   | 98 | Paved parking, HSG C          |
| 250,555   | 89 | Weighted Average              |
| 90,464    |    | 36.11% Pervious Area          |
| 160,091   |    | 63.89% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 10.4     | 50            | 0.0110        | 0.08              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 3.2      | 140           | 0.0110        | 0.73              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps              |
| 2.3      | 296           | 0.0110        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 3.2      | 1,467         | 0.0170        | 7.75              | 13.70          | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 |
| 19.1     | 1,953         | Total         |                   |                |                                                                                   |

**Summary for Subcatchment 12S: Road**

Runoff = 1.1 cfs @ 12.15 hrs, Volume= 4,120 cf, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 9,362     | 98 | Paved parking, HSG C          |
| 3,789     | 74 | >75% Grass cover, Good, HSG C |
| 13,151    | 91 | Weighted Average              |
| 3,789     |    | 28.81% Pervious Area          |
| 9,362     |    | 71.19% Impervious Area        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 10-Year D Rainfall=4.77"

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-------------------------------------------------------------------------------------------------|
| 7.4      | 44            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5      | 122           | 0.0440        | 4.26              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.2      | 100           | 0.0400        | 9.07              | 7.13           | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 8.1      | 266           | Total         |                   |                |                                                                                                 |

**Summary for Subcatchment 13S: Undeveloped**

Runoff = 9.4 cfs @ 12.99 hrs, Volume= 100,174 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 496,005   | 70 | Woods, Good, HSG C            |
| 122,277   | 74 | >75% Grass cover, Good, HSG C |
| 618,282   | 71 | Weighted Average              |
| 618,282   |    | 100.00% Pervious Area         |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 10-Year D Rainfall=4.77"

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 12.3        | 50               | 0.0200           | 0.07                 |                   | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 20.8        | 599              | 0.0370           | 0.48                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 12.5        | 350              | 0.0350           | 0.47                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 3.1         | 163              | 0.1200           | 0.87                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 22.7        | 737              | 0.0470           | 0.54                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 71.4        | 1,899            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 14S: Undeveloped**

Runoff = 14.9 cfs @ 12.34 hrs, Volume= 83,954 cf, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 178,452   | 70 | Woods, Good, HSG C            |
| 300,921   | 74 | >75% Grass cover, Good, HSG C |
| 479,373   | 73 | Weighted Average              |
| 479,373   |    | 100.00% Pervious Area         |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 14.3        | 50               | 0.0050           | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                  |
| 1.6         | 275              | 0.0370           | 2.89                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.4         | 225              | 0.2000           | 1.12                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 1.0         | 239              | 0.0650           | 3.82                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.1         | 357              | 0.0160           | 1.90                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 23.4        | 1,146            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 15S: Road**

Runoff = 3.0 cfs @ 12.13 hrs, Volume= 10,091 cf, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 20,008    | 98 | Paved parking, HSG C          |
| 16,125    | 74 | >75% Grass cover, Good, HSG C |
| 36,133    | 87 | Weighted Average              |
| 16,125    |    | 44.63% Pervious Area          |
| 20,008    |    | 55.37% Impervious Area        |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft)                         | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                     |
|-------------|------------------|------------------------------------------|----------------------|-------------------|-------------------------------------------------------------------------------------------------|
| 4.3         | 16               | 0.0100                                   | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5         | 132              | 0.0460                                   | 4.35                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.3         | 110              | 0.0200                                   | 6.42                 | 5.04              | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 5.1         | 258              | Total, Increased to minimum Tc = 6.0 min |                      |                   |                                                                                                 |

**Summary for Subcatchment 16S: Road**

Runoff = 2.5 cfs @ 12.13 hrs, Volume= 8,563 cf, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 18,005    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 2,688     | 98 | Paved parking, HSG C                       |
| 9,970     | 74 | >75% Grass cover, Good, HSG C              |
| 30,663    | 87 | Weighted Average                           |
| 18,973    |    | 61.87% Pervious Area                       |
| 11,691    |    | 38.13% Impervious Area                     |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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**Summary for Subcatchment 17S: 465 SITE SOUTH**

Runoff = 2.8 cfs @ 12.25 hrs, Volume= 13,274 cf, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 21,889    | 74 | >75% Grass cover, Good, HSG C |
| 25,644    | 98 | Unconnected pavement, HSG C   |
| 47,533    | 87 | Weighted Average              |
| 21,889    |    | 46.05% Pervious Area          |
| 25,644    |    | 53.95% Impervious Area        |
| 25,644    |    | 100.00% Unconnected           |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                             |
|-------------|------------------|------------------|----------------------|-------------------|---------------------------------------------------------|
| 8.7         | 38               | 0.0100           | 0.07                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"   |
| 8.1         | 694              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps |
| 16.8        | 732              | Total            |                      |                   |                                                         |

**Summary for Subcatchment 18S: Road**

Runoff = 2.0 cfs @ 12.13 hrs, Volume= 7,062 cf, Depth= 3.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 21,926    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 10,963    |    | 50.00% Pervious Area                       |
| 10,963    |    | 50.00% Impervious Area                     |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

**Summary for Subcatchment 19S: 465 SITE NORTH**

Runoff = 3.4 cfs @ 12.16 hrs, Volume= 12,601 cf, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 25,932    | 74 | >75% Grass cover, Good, HSG C |
| 21,980    | 98 | Paved parking, HSG C          |
| 47,912    | 85 | Weighted Average              |
| 25,932    |    | 54.12% Pervious Area          |
| 21,980    |    | 45.88% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                        |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------|
| 1.1         | 45               | 0.0050           | 0.67                 |                   | <b>Sheet Flow,</b>                 |
|             |                  |                  |                      |                   | Smooth surfaces n= 0.011 P2= 3.20" |
| 7.6         | 658              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b>  |
|             |                  |                  |                      |                   | Paved Kv= 20.3 fps                 |
| 8.7         | 703              | Total            |                      |                   |                                    |

**Summary for Subcatchment 20S: Undeveloped**

Runoff = 31.8 cfs @ 12.90 hrs, Volume= 318,998 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,809,628 | 70 | Woods, Good, HSG C            |
| 240,208   | 74 | >75% Grass cover, Good, HSG C |
| 2,049,836 | 70 | Weighted Average              |
| 2,049,836 |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                |
|-------------|------------------|------------------|----------------------|-------------------|--------------------------------------------|
| 12.1        | 50               | 0.0210           | 0.07                 |                   | <b>Sheet Flow,</b>                         |
|             |                  |                  |                      |                   | Woods: Light underbrush n= 0.400 P2= 3.20" |
| 13.2        | 293              | 0.0220           | 0.37                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 11.6        | 322              | 0.0340           | 0.46                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 27.3        | 1,193            | 0.0850           | 0.73                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 64.2        | 1,858            | Total            |                      |                   |                                            |

**Summary for Subcatchment 21S: DB1**

Runoff = 9.0 cfs @ 12.13 hrs, Volume= 29,531 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 162,392   | 74 | >75% Grass cover, Good, HSG C |
| 162,392   |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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**Summary for Subcatchment 22S: 465 SITE ROOF**

Runoff = 9.5 cfs @ 12.17 hrs, Volume= 42,165 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 57,453    | 98 | Roofs, HSG C            |
| 54,155    | 98 | Roofs, HSG C            |
| 111,608   | 98 | Weighted Average        |
| 111,608   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 10.0     |               |               |                   |                | Direct Entry, |

**Summary for Subcatchment 23S: 555 HALF ROOF**

Runoff = 26.3 cfs @ 12.13 hrs, Volume= 103,894 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 6.0      |               |               |                   |                | Direct Entry,                                                              |
| 0.7      | 483           | 0.0270        | 11.83             | 37.17          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 6.7      | 483           | Total         |                   |                |                                                                            |

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**Summary for Subcatchment 24S: LOT3 NORTH**

Runoff = 42.8 cfs @ 12.22 hrs, Volume= 197,140 cf, Depth= 3.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 248,887   | 74 | >75% Grass cover, Good, HSG C |
| 417,105   | 98 | Paved parking, HSG C          |
| 665,992   | 89 | Weighted Average              |
| 248,887   |    | 37.37% Pervious Area          |
| 417,105   |    | 62.63% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 5.5      | 50            | 0.0540        | 0.15              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 4.8      | 200           | 0.0100        | 0.70              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps              |
| 1.5      | 184           | 0.0100        | 2.03              |                | Shallow Concentrated Flow,<br>Paved Kv= 20.3 fps                           |
| 3.0      | 1,300         | 0.0100        | 7.20              | 22.62          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 14.8     | 1,734         | Total         |                   |                |                                                                            |

**Summary for Subcatchment 25S: DB2**

Runoff = 11.5 cfs @ 12.18 hrs, Volume= 44,869 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 10-Year D Rainfall=4.77"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 246,734   | 74 | >75% Grass cover, Good, HSG C |
| 246,734   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 5.3      | 50            | 0.0600        | 0.16              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"              |
| 3.5      | 660           | 0.0450        | 3.18              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 1.5      | 119           | 0.0080        | 1.34              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 10.3     | 829           | Total         |                   |                |                                                                    |

**Summary for Subcatchment 26S: UNDEVELOPED**

Runoff = 14.9 cfs @ 13.38 hrs, Volume= 196,179 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

NRCC 24-hr D 10-Year D Rainfall=4.77"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,184,876 | 70 | Woods, Good, HSG C            |
| 75,742    | 74 | >75% Grass cover, Good, HSG C |
| 1,260,618 | 70 | Weighted Average              |
| 1,260,618 |    | 100.00% Pervious Area         |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.3     | 50            | 0.0200        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 29.6     | 1,022         | 0.0530        | 0.58              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.6     | 586           | 0.0360        | 0.47              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 36.1     | 1,210         | 0.0500        | 0.56              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 98.6     | 2,868         | Total         |                   |                |                                                                        |

**Summary for Reach 11R: Culvert**

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 2.01" for 10-Year D event  
 Inflow = 9.6 cfs @ 12.98 hrs, Volume= 107,236 cf  
 Outflow = 9.6 cfs @ 12.97 hrs, Volume= 107,236 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Max. Velocity= 4.60 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 1.81 fps, Avg. Travel Time= 0.5 min

Peak Storage= 104 cf @ 12.97 hrs

Average Depth at Peak Storage= 0.91'

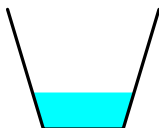
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed &amp; winding

Side Slope Z-value= 0.3 ' Top Width= 3.80'

Length= 50.0' Slope= 0.0200 ' /'

Inlet Invert= 280.00', Outlet Invert= 279.00'



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**Summary for Pond 9P: CULVERT**

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 2.18" for 10-Year D event  
 Inflow = 4.1 cfs @ 12.25 hrs, Volume= 19,386 cf  
 Outflow = 4.0 cfs @ 12.28 hrs, Volume= 19,257 cf, Atten= 2%, Lag= 1.6 min  
 Primary = 4.0 cfs @ 12.28 hrs, Volume= 19,257 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Peak Elev= 294.97' @ 12.28 hrs Surf.Area= 617 sf Storage= 609 cf

Plug-Flow detention time= 10.6 min calculated for 19,257 cf (99% of inflow)

Center-of-Mass det. time= 6.7 min ( 883.2 - 876.4 )

| Volume           | Invert            | Avail.Storage | Storage Description                                        |                        |                  |
|------------------|-------------------|---------------|------------------------------------------------------------|------------------------|------------------|
| #1               | 293.00'           | 4,006 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) |
| 293.00           | 0                 | 0.0           | 0                                                          | 0                      | 0                |
| 294.00           | 385               | 92.0          | 128                                                        | 128                    | 675              |
| 296.00           | 925               | 120.0         | 1,271                                                      | 1,400                  | 1,193            |
| 298.00           | 1,723             | 157.0         | 2,607                                                      | 4,006                  | 2,054            |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                             |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 294.00' | <b>18.0" Round Culvert</b> L= 75.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |

**Primary OutFlow** Max=4.0 cfs @ 12.28 hrs HW=294.97' (Free Discharge)**1=Culvert** (Inlet Controls 4.0 cfs @ 3.35 fps)**Summary for Pond 10P: DB1****3780 STORMWATER-(5-31-22)**

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 2.99" for 10-Year D event  
 Inflow = 74.8 cfs @ 12.22 hrs, Volume= 417,687 cf  
 Outflow = 8.0 cfs @ 13.95 hrs, Volume= 417,668 cf, Atten= 89%, Lag= 103.5 min  
 Discarded = 0.5 cfs @ 13.95 hrs, Volume= 46,429 cf  
 Primary = 7.4 cfs @ 13.95 hrs, Volume= 371,239 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2

Peak Elev= 280.09' @ 13.95 hrs Surf.Area= 87,792 sf Storage= 203,216 cf

Plug-Flow detention time= 393.3 min calculated for 417,564 cf (100% of inflow)

Center-of-Mass det. time= 394.2 min ( 1,218.8 - 824.5 )

| Volume           | Invert            | Avail.Storage | Storage Description                                        |                        |                  |
|------------------|-------------------|---------------|------------------------------------------------------------|------------------------|------------------|
| #1               | 275.00'           | 603,909 cf    | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                        |                  |
| #2               | 273.00'           | 138 cf        | <b>4.00'D x 11.00'H Vertical Cone/Cylinder</b>             |                        |                  |
|                  |                   | 604,047 cf    | Total Available Storage                                    |                        |                  |
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet)                                     | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
| 275.00           | 100               | 40.0          | 0                                                          | 0                      | 100              |
| 276.00           | 13,700            | 600.0         | 4,990                                                      | 4,990                  | 28,622           |
| 277.00           | 27,095            | 820.0         | 20,021                                                     | 25,011                 | 53,492           |
| 278.00           | 44,050            | 1,020.0       | 35,231                                                     | 60,242                 | 82,791           |
| 279.00           | 69,900            | 1,580.0       | 56,480                                                     | 116,721                | 198,664          |
| 280.00           | 87,050            | 1,610.0       | 78,318                                                     | 195,040                | 206,444          |
| 282.00           | 103,500           | 1,725.0       | 190,313                                                    | 385,353                | 237,146          |
| 284.00           | 115,160           | 1,730.0       | 218,556                                                    | 603,909                | 240,864          |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                     |
|--------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 273.34' | <b>24.0" Round Culvert</b> L= 90.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf |
| #2     | Device 1 | 276.36' | <b>6.0" Vert. Orifice/Grate X 3.00</b> C= 0.600                                                                                                                                                    |
| #3     | Device 1 | 278.80' | <b>0.7' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                               |
| #4     | Device 1 | 281.40' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                               |
| #5     | Primary  | 283.50' | <b>6.0' long x 10.0' breadth Emergency Spillway</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60                                                                                         |

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Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64  
 #6 Discarded 273.00' **0.270 in/hr Exfiltration over Surface area**

**Discarded OutFlow** Max=0.5 cfs @ 13.95 hrs HW=280.09' (Free Discharge)  
**6=Exfiltration** (Exfiltration Controls 0.5 cfs)

**Primary OutFlow** Max=7.4 cfs @ 13.95 hrs HW=280.09' (Free Discharge)  
**1=Culvert** (Passes 7.4 cfs of 36.3 cfs potential flow)  
**2=Orifice/Grate** (Orifice Controls 5.3 cfs @ 8.99 fps)  
**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.1 cfs @ 3.72 fps)  
**4=Orifice/Grate** (Controls 0.0 cfs)  
**5=Emergency Spillway** (Controls 0.0 cfs)

**Summary for Pond 12P: CULV 30**

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 2.20" for 10-Year D event  
 Inflow = 16.3 cfs @ 12.32 hrs, Volume= 96,556 cf  
 Outflow = 16.2 cfs @ 12.34 hrs, Volume= 96,556 cf, Atten= 0%, Lag= 1.1 min  
 Discarded = 0.0 cfs @ 12.34 hrs, Volume= 406 cf  
 Primary = 16.2 cfs @ 12.34 hrs, Volume= 96,150 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 281.73' @ 12.34 hrs Surf.Area= 971 sf Storage= 1,456 cf

Plug-Flow detention time= 4.3 min calculated for 96,532 cf (100% of inflow)  
 Center-of-Mass det. time= 4.5 min ( 883.4 - 878.8 )

| Volume           | Invert            | Avail.Storage          | Storage Description                                    |                  |  |
|------------------|-------------------|------------------------|--------------------------------------------------------|------------------|--|
| #1               | 279.50'           | 8,119 cf               | <b>Custom Stage Data (Conic)</b> Listed below (Recalc) |                  |  |
| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet)                                 | Wet.Area (sq-ft) |  |
| 279.50           | 0                 | 0                      | 0                                                      | 0                |  |
| 280.00           | 610               | 102                    | 102                                                    | 610              |  |
| 282.00           | 1,035             | 1,626                  | 1,728                                                  | 1,081            |  |
| 284.00           | 1,570             | 2,586                  | 4,315                                                  | 1,673            |  |
| 286.00           | 2,255             | 3,804                  | 8,119                                                  | 2,425            |  |

**3780 STORMWATER-(5-31-22)**

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                   |
|--------|-----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 280.00' | <b>30.0" Round Culvert</b> L= 129.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' S= 0.0155 ' S= 0.0155 ' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |
| #2     | Discarded | 279.50' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                                                |

**Discarded OutFlow** Max=0.0 cfs @ 12.34 hrs HW=281.73' (Free Discharge)  
**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=16.2 cfs @ 12.34 hrs HW=281.73' (Free Discharge)  
**1=Culvert** (Inlet Controls 16.2 cfs @ 4.47 fps)

**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 3.72" for 10-Year D event  
 Inflow = 29.1 cfs @ 12.16 hrs, Volume= 130,594 cf  
 Outflow = 25.9 cfs @ 12.20 hrs, Volume= 130,595 cf, Atten= 11%, Lag= 2.7 min  
 Primary = 25.9 cfs @ 12.20 hrs, Volume= 130,595 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 293.43' @ 12.20 hrs Surf.Area= 2,969 sf Storage= 4,546 cf

Plug-Flow detention time= 2.2 min calculated for 130,562 cf (100% of inflow)  
 Center-of-Mass det. time= 2.2 min ( 781.0 - 778.8 )

| Volume           | Invert            | Avail.Storage | Storage Description                                        |                        |                  |
|------------------|-------------------|---------------|------------------------------------------------------------|------------------------|------------------|
| #1               | 291.00'           | 28,701 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) |
| 291.00           | 100               | 40.0          | 0                                                          | 0                      | 100              |
| 292.00           | 2,142             | 200.0         | 902                                                        | 902                    | 3,158            |
| 294.00           | 3,334             | 230.0         | 5,432                                                      | 6,334                  | 4,271            |
| 296.00           | 4,670             | 270.0         | 7,967                                                      | 14,300                 | 5,939            |
| 298.00           | 6,352             | 323.0         | 10,979                                                     | 25,279                 | 8,510            |
| 298.50           | 7,345             | 340.0         | 3,421                                                      | 28,701                 | 9,422            |

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| Device | Routing | Invert  | Outlet Devices                                                                                                                                                            |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 291.00' | <b>30.0" Round Culvert</b> L= 120.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 '/ Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |

**Primary OutFlow** Max=25.8 cfs @ 12.20 hrs HW=293.42' (Free Discharge)**1=Culvert** (Inlet Controls 25.8 cfs @ 5.30 fps)**Summary for Pond 22P: INF**

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| Inflow Area = | 111,608 sf, 100.00% Impervious, Inflow Depth = 4.53" for 10-Year D event |
| Inflow =      | 9.5 cfs @ 12.17 hrs, Volume= 42,165 cf                                   |
| Outflow =     | 8.2 cfs @ 12.22 hrs, Volume= 42,167 cf, Atten= 14%, Lag= 3.2 min         |
| Discarded =   | 0.0 cfs @ 12.22 hrs, Volume= 1,665 cf                                    |
| Primary =     | 8.1 cfs @ 12.22 hrs, Volume= 40,502 cf                                   |

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 287.67' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 3,160 cf

Plug-Flow detention time= 32.0 min calculated for 42,157 cf (100% of inflow)  
 Center-of-Mass det. time= 32.2 min ( 787.4 - 755.1 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                                                                                                                    |
|--------|---------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1A    | 285.50' | 1,589 cf      | <b>28.00'W x 73.00'L x 3.21'H Field A</b><br>6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids                                                                                                             |
| #2A    | 286.00' | 2,587 cf      | <b>Cultec R-280HD</b> x 60 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 6 rows |
|        |         |               | 4,175 cf Total Available Storage                                                                                                                                                                                       |

Storage Group A created with Chamber Wizard

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                            |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 286.00' | <b>18.0" Round Culvert</b> L= 20.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 '/ Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |
| #2     | Discarded | 285.50' | <b>0.270 in/hr Exfiltration over Wetted area</b>                                                                                                                          |

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**Discarded OutFlow** Max=0.0 cfs @ 12.22 hrs HW=287.65' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=8.1 cfs @ 12.22 hrs HW=287.65' (Free Discharge)**1=Culvert** (Inlet Controls 8.1 cfs @ 4.58 fps)**Summary for Pond 30P: DB2**

|               |                                                                           |
|---------------|---------------------------------------------------------------------------|
| Inflow Area = | 1,187,726 sf, 58.27% Impervious, Inflow Depth = 3.49" for 10-Year D event |
| Inflow =      | 73.4 cfs @ 12.17 hrs, Volume= 345,903 cf                                  |
| Outflow =     | 11.7 cfs @ 12.96 hrs, Volume= 345,903 cf, Atten= 84%, Lag= 47.1 min       |
| Discarded =   | 0.4 cfs @ 12.96 hrs, Volume= 42,040 cf                                    |
| Primary =     | 11.3 cfs @ 12.96 hrs, Volume= 303,863 cf                                  |

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 323.90' @ 12.96 hrs Surf.Area= 67,632 sf Storage= 160,613 cf

Plug-Flow detention time= 366.9 min calculated for 345,816 cf (100% of inflow)  
 Center-of-Mass det. time= 367.8 min ( 1,173.1 - 805.2 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------------|---------------------|
| #1                  | 319.00'              | 329,237 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Voids<br>(%)                                               | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 319.00              | 400                  | 80.0             | 0.0                                                        | 0                         | 0                         | 400                 |
| 320.00              | 19,450               | 575.0            | 100.0                                                      | 7,546                     | 7,546                     | 26,203              |
| 321.00              | 28,075               | 685.0            | 100.0                                                      | 23,631                    | 31,177                    | 37,250              |
| 322.00              | 37,630               | 790.0            | 100.0                                                      | 32,736                    | 63,913                    | 49,597              |
| 323.00              | 50,456               | 930.0            | 100.0                                                      | 43,887                    | 107,800                   | 68,779              |
| 324.00              | 69,750               | 1,090.0          | 100.0                                                      | 59,843                    | 167,643                   | 94,518              |
| 325.00              | 76,570               | 1,130.0          | 100.0                                                      | 73,133                    | 240,777                   | 101,671             |
| 326.00              | 100,910              | 1,570.0          | 100.0                                                      | 88,461                    | 329,237                   | 196,219             |

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                            |
|--------|-----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 319.00' | <b>24.0" Round Culvert</b> L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 319.00' / 315.50' S= 0.0500 1' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf                  |
| #2     | Device 1  | 320.34' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                 |
| #3     | Device 1  | 322.50' | <b>20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)                                                                                                                |
| #4     | Device 1  | 324.90' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                      |
| #5     | Primary   | 325.50' | <b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #6     | Discarded | 319.00' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                                         |

**Discarded OutFlow** Max=0.4 cfs @ 12.96 hrs HW=323.90' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.4 cfs)**Primary OutFlow** Max=11.3 cfs @ 12.96 hrs HW=323.90' (Free Discharge)**1=Culvert** (Passes 11.3 cfs of 29.9 cfs potential flow)**2=Orifice/Grate** (Orifice Controls 4.7 cfs @ 8.53 fps)**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 6.7 cfs @ 3.82 fps)**4=Orifice/Grate** (Controls 0.0 cfs)**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**Summary for Link 1L: Total PreDeveloped West**

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 1.87" for 10-Year D event  
 Inflow = 55.9 cfs @ 13.24 hrs, Volume= 701,900 cf  
 Primary = 55.9 cfs @ 13.24 hrs, Volume= 701,900 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 10L: PostDeveloped**

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 2.49" for 10-Year D event  
 Inflow = 17.0 cfs @ 13.02 hrs, Volume= 487,038 cf  
 Primary = 17.0 cfs @ 13.02 hrs, Volume= 487,038 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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**Summary for Link 11L: Total Post Developed West**

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 2.20" for 10-Year D event  
 Inflow = 48.6 cfs @ 12.92 hrs, Volume= 806,035 cf  
 Primary = 48.6 cfs @ 12.92 hrs, Volume= 806,035 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 12L: Total Post-Developed North**

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 2.45" for 10-Year D event  
 Inflow = 25.9 cfs @ 13.35 hrs, Volume= 500,042 cf  
 Primary = 25.9 cfs @ 13.35 hrs, Volume= 500,042 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 25-Year D Rainfall=6.03"

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**Summary for Subcatchment 1S: PreDeveloped**

Runoff = 47.0 cfs @ 13.37 hrs, Volume= 598,869 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,540,256 | 70 | Woods, Good, HSG C    |
| 2,540,256 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 22.8     | 483           | 0.0200        | 0.35              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.8     | 623           | 0.0400        | 0.50              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.8     | 1,254         | 0.0650        | 0.64              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 97.9     | 2,410         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 2S: PreDeveloped**

Runoff = 41.6 cfs @ 13.11 hrs, Volume= 464,444 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 1,970,057 | 70 | Woods, Good, HSG C    |
| 1,970,057 |    | 100.00% Pervious Area |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 25.8     | 387           | 0.0100        | 0.25              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 6.2      | 196           | 0.0440        | 0.52              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 25.8     | 1,142         | 0.0870        | 0.74              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 79.3     | 1,775         | Total         |                   |                |                                                                        |

**Summary for Subcatchment 3S: Total PreDeveloped North**

Runoff = 43.2 cfs @ 13.33 hrs, Volume= 550,673 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,335,823 | 70 | Woods, Good, HSG C    |
| 2,335,823 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"                                               |
| 27.6     | 641           | 0.0240        | 0.39              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 46.2     | 1,713         | 0.0610        | 0.62              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 1.6      | 267           | 0.0600        | 2.71              | 14.43          | <b>Parabolic Channel,</b><br>W=8.00' D=1.00' Area=5.3 sf Perim=8.3'<br>n= 0.100 Earth, dense brush, high stage |
| 96.9     | 2,671         | Total         |                   |                |                                                                                                                |

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**Summary for Subcatchment 8S: EAST SIDE DRIVE**

Runoff = 8.3 cfs @ 12.25 hrs, Volume= 39,277 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 140,049   | 74 | >75% Grass cover, Good, HSG C |
| 6,776     | 70 | Woods, Good, HSG C            |
| 146,825   | 74 | Weighted Average              |
| 146,825   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.6      | 703           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.7     | 1,690         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 9S: WEST SIDE DRIVE**

Runoff = 6.1 cfs @ 12.25 hrs, Volume= 28,517 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 106,603   | 74 | >75% Grass cover, Good, HSG C |
| 106,603   |    | 100.00% Pervious Area         |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.4      | 638           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.5     | 1,625         | Total         |                   |                |                                                                                                                     |

**Summary for Subcatchment 10S: 555 HALF ROOF**

Runoff = 31.5 cfs @ 12.15 hrs, Volume= 132,729 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description          |
|----------|---------------|---------------|-------------------|----------------|----------------------|
| 8.4      |               |               |                   |                | <b>Direct Entry,</b> |

**Summary for Subcatchment 11S: 555 SW**

Runoff = 19.0 cfs @ 12.27 hrs, Volume= 99,481 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 90,464    | 74 | >75% Grass cover, Good, HSG C |
| 160,091   | 98 | Paved parking, HSG C          |
| 250,555   | 89 | Weighted Average              |
| 90,464    |    | 36.11% Pervious Area          |
| 160,091   |    | 63.89% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 10.4     | 50            | 0.0110        | 0.08              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 3.2      | 140           | 0.0110        | 0.73              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps              |
| 2.3      | 296           | 0.0110        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 3.2      | 1,467         | 0.0170        | 7.75              | 13.70          | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 |
| 19.1     | 1,953         | Total         |                   |                |                                                                                   |

**Summary for Subcatchment 12S: Road**

Runoff = 1.4 cfs @ 12.15 hrs, Volume= 5,465 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 9,362     | 98 | Paved parking, HSG C          |
| 3,789     | 74 | >75% Grass cover, Good, HSG C |
| 13,151    | 91 | Weighted Average              |
| 3,789     |    | 28.81% Pervious Area          |
| 9,362     |    | 71.19% Impervious Area        |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-------------------------------------------------------------------------------------------------|
| 7.4      | 44            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5      | 122           | 0.0440        | 4.26              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.2      | 100           | 0.0400        | 9.07              | 7.13           | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 8.1      | 266           | Total         |                   |                |                                                                                                 |

**Summary for Subcatchment 13S: Undeveloped**

Runoff = 14.4 cfs @ 12.96 hrs, Volume= 150,600 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 496,005   | 70 | Woods, Good, HSG C            |
| 122,277   | 74 | >75% Grass cover, Good, HSG C |
| 618,282   | 71 | Weighted Average              |
| 618,282   |    | 100.00% Pervious Area         |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 12.3        | 50               | 0.0200           | 0.07                 |                   | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 20.8        | 599              | 0.0370           | 0.48                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 12.5        | 350              | 0.0350           | 0.47                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 3.1         | 163              | 0.1200           | 0.87                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 22.7        | 737              | 0.0470           | 0.54                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 71.4        | 1,899            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 14S: Undeveloped**

Runoff = 22.3 cfs @ 12.34 hrs, Volume= 124,378 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 178,452   | 70 | Woods, Good, HSG C            |
| 300,921   | 74 | >75% Grass cover, Good, HSG C |
| 479,373   | 73 | Weighted Average              |
| 479,373   |    | 100.00% Pervious Area         |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                            |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------|
| 14.3        | 50               | 0.0050           | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                  |
| 1.6         | 275              | 0.0370           | 2.89                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.4         | 225              | 0.2000           | 1.12                 |                   | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 1.0         | 239              | 0.0650           | 3.82                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.1         | 357              | 0.0160           | 1.90                 |                   | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 23.4        | 1,146            | Total            |                      |                   |                                                                        |

**Summary for Subcatchment 15S: Road**

Runoff = 4.0 cfs @ 12.13 hrs, Volume= 13,688 cf, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 20,008    | 98 | Paved parking, HSG C          |
| 16,125    | 74 | >75% Grass cover, Good, HSG C |
| 36,133    | 87 | Weighted Average              |
| 16,125    |    | 44.63% Pervious Area          |
| 20,008    |    | 55.37% Impervious Area        |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft)                         | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                     |
|-------------|------------------|------------------------------------------|----------------------|-------------------|-------------------------------------------------------------------------------------------------|
| 4.3         | 16               | 0.0100                                   | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5         | 132              | 0.0460                                   | 4.35                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.3         | 110              | 0.0200                                   | 6.42                 | 5.04              | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 5.1         | 258              | Total, Increased to minimum Tc = 6.0 min |                      |                   |                                                                                                 |

**Summary for Subcatchment 16S: Road**

Runoff = 3.4 cfs @ 12.13 hrs, Volume= 11,616 cf, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 18,005    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 2,688     | 98 | Paved parking, HSG C                       |
| 9,970     | 74 | >75% Grass cover, Good, HSG C              |
| 30,663    | 87 | Weighted Average                           |
| 18,973    |    | 61.87% Pervious Area                       |
| 11,691    |    | 38.13% Impervious Area                     |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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**Summary for Subcatchment 17S: 465 SITE SOUTH**

Runoff = 3.7 cfs @ 12.25 hrs, Volume= 18,007 cf, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 21,889    | 74 | >75% Grass cover, Good, HSG C |
| 25,644    | 98 | Unconnected pavement, HSG C   |
| 47,533    | 87 | Weighted Average              |
| 21,889    |    | 46.05% Pervious Area          |
| 25,644    |    | 53.95% Impervious Area        |
| 25,644    |    | 100.00% Unconnected           |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                             |
|-------------|------------------|------------------|----------------------|-------------------|---------------------------------------------------------|
| 8.7         | 38               | 0.0100           | 0.07                 |                   | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"   |
| 8.1         | 694              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps |
| 16.8        | 732              | Total            |                      |                   |                                                         |

**Summary for Subcatchment 18S: Road**

Runoff = 2.6 cfs @ 12.13 hrs, Volume= 9,317 cf, Depth= 5.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 21,926    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 10,963    |    | 50.00% Pervious Area                       |
| 10,963    |    | 50.00% Impervious Area                     |

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| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

**Summary for Subcatchment 19S: 465 SITE NORTH**

Runoff = 4.6 cfs @ 12.16 hrs, Volume= 17,292 cf, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 25,932    | 74 | >75% Grass cover, Good, HSG C |
| 21,980    | 98 | Paved parking, HSG C          |
| 47,912    | 85 | Weighted Average              |
| 25,932    |    | 54.12% Pervious Area          |
| 21,980    |    | 45.88% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                        |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------|
| 1.1         | 45               | 0.0050           | 0.67                 |                   | <b>Sheet Flow,</b>                 |
|             |                  |                  |                      |                   | Smooth surfaces n= 0.011 P2= 3.20" |
| 7.6         | 658              | 0.0050           | 1.44                 |                   | <b>Shallow Concentrated Flow,</b>  |
|             |                  |                  |                      |                   | Paved Kv= 20.3 fps                 |
| 8.7         | 703              | Total            |                      |                   |                                    |

**Summary for Subcatchment 20S: Undeveloped**

Runoff = 49.2 cfs @ 12.89 hrs, Volume= 483,252 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"**3780 STORMWATER-(5-31-22)**

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,809,628 | 70 | Woods, Good, HSG C            |
| 240,208   | 74 | >75% Grass cover, Good, HSG C |
| 2,049,836 | 70 | Weighted Average              |
| 2,049,836 |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                |
|-------------|------------------|------------------|----------------------|-------------------|--------------------------------------------|
| 12.1        | 50               | 0.0210           | 0.07                 |                   | <b>Sheet Flow,</b>                         |
|             |                  |                  |                      |                   | Woods: Light underbrush n= 0.400 P2= 3.20" |
| 13.2        | 293              | 0.0220           | 0.37                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 11.6        | 322              | 0.0340           | 0.46                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 27.3        | 1,193            | 0.0850           | 0.73                 |                   | <b>Shallow Concentrated Flow,</b>          |
|             |                  |                  |                      |                   | Forest w/Heavy Litter Kv= 2.5 fps          |
| 64.2        | 1,858            | Total            |                      |                   |                                            |

**Summary for Subcatchment 21S: DB1**

Runoff = 13.2 cfs @ 12.13 hrs, Volume= 43,442 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 162,392   | 74 | >75% Grass cover, Good, HSG C |
| 162,392   |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------|
| 6.0         |                  |                  |                      |                   | <b>Direct Entry,</b> |

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**Summary for Subcatchment 22S: 465 SITE ROOF**

Runoff = 12.1 cfs @ 12.17 hrs, Volume= 53,868 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 57,453    | 98 | Roofs, HSG C            |
| 54,155    | 98 | Roofs, HSG C            |
| 111,608   | 98 | Weighted Average        |
| 111,608   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 10.0     |               |               |                   |                | Direct Entry, |

**Summary for Subcatchment 23S: 555 HALF ROOF**

Runoff = 33.3 cfs @ 12.13 hrs, Volume= 132,729 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 6.0      |               |               |                   |                | Direct Entry,                                                              |
| 0.7      | 483           | 0.0270        | 11.83             | 37.17          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 6.7      | 483           | Total         |                   |                |                                                                            |

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**Summary for Subcatchment 24S: LOT3 NORTH**

Runoff = 56.5 cfs @ 12.22 hrs, Volume= 264,426 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 248,887   | 74 | >75% Grass cover, Good, HSG C |
| 417,105   | 98 | Paved parking, HSG C          |
| 665,992   | 89 | Weighted Average              |
| 248,887   |    | 37.37% Pervious Area          |
| 417,105   |    | 62.63% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 5.5      | 50            | 0.0540        | 0.15              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 4.8      | 200           | 0.0100        | 0.70              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps              |
| 1.5      | 184           | 0.0100        | 2.03              |                | Shallow Concentrated Flow,<br>Paved Kv= 20.3 fps                           |
| 3.0      | 1,300         | 0.0100        | 7.20              | 22.62          | Pipe Channel,<br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 14.8     | 1,734         | Total         |                   |                |                                                                            |

**Summary for Subcatchment 25S: DB2**

Runoff = 17.0 cfs @ 12.18 hrs, Volume= 66,004 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

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| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 246,734   | 74 | >75% Grass cover, Good, HSG C |
| 246,734   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 5.3      | 50            | 0.0600        | 0.16              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"              |
| 3.5      | 660           | 0.0450        | 3.18              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 1.5      | 119           | 0.0080        | 1.34              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 10.3     | 829           | Total         |                   |                |                                                                    |

**Summary for Subcatchment 26S: UNDEVELOPED**

Runoff = 23.1 cfs @ 13.35 hrs, Volume= 297,192 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 25-Year D Rainfall=6.03"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,184,876 | 70 | Woods, Good, HSG C            |
| 75,742    | 74 | >75% Grass cover, Good, HSG C |
| 1,260,618 | 70 | Weighted Average              |
| 1,260,618 |    | 100.00% Pervious Area         |

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| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.3     | 50            | 0.0200        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 29.6     | 1,022         | 0.0530        | 0.58              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.6     | 586           | 0.0360        | 0.47              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 36.1     | 1,210         | 0.0500        | 0.56              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 98.6     | 2,868         | Total         |                   |                |                                                                        |

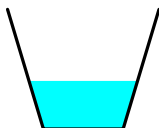
**Summary for Reach 11R: Culvert**

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 3.00" for 25-Year D event  
 Inflow = 14.6 cfs @ 12.95 hrs, Volume= 159,917 cf  
 Outflow = 14.6 cfs @ 12.95 hrs, Volume= 159,917 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
 Max. Velocity= 5.15 fps, Min. Travel Time= 0.2 min  
 Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.4 min

Peak Storage= 142 cf @ 12.95 hrs  
 Average Depth at Peak Storage= 1.20'  
 Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed & winding  
 Side Slope Z-value= 0.3 ' Top Width= 3.80'  
 Length= 50.0' Slope= 0.0200 ' / '  
 Inlet Invert= 280.00', Outlet Invert= 279.00'



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**Summary for Pond 9P: CULVERT**

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 3.21" for 25-Year D event  
 Inflow = 6.1 cfs @ 12.25 hrs, Volume= 28,517 cf  
 Outflow = 6.0 cfs @ 12.28 hrs, Volume= 28,389 cf, Atten= 2%, Lag= 1.7 min  
 Primary = 6.0 cfs @ 12.28 hrs, Volume= 28,389 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
 Peak Elev= 295.25' @ 12.28 hrs Surf.Area= 694 sf Storage= 791 cf

Plug-Flow detention time= 8.3 min calculated for 28,382 cf (100% of inflow)  
 Center-of-Mass det. time= 5.7 min ( 867.8 - 862.1 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 293.00'              | 4,006 cf         | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 293.00              | 0                    | 0.0              | 0                                                          | 0                         | 0                   |
| 294.00              | 385                  | 92.0             | 128                                                        | 128                       | 675                 |
| 296.00              | 925                  | 120.0            | 1,271                                                      | 1,400                     | 1,193               |
| 298.00              | 1,723                | 157.0            | 2,607                                                      | 4,006                     | 2,054               |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                             |  |  |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| #1     | Primary | 294.00' | <b>18.0" Round Culvert</b> L= 75.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' /' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |  |  |

**Primary OutFlow** Max=5.9 cfs @ 12.28 hrs HW=295.24' (Free Discharge)

**1=Culvert** (Inlet Controls 5.9 cfs @ 3.79 fps)

**Summary for Pond 10P: DB1****3780 STORMWATER-(5-31-22)**

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Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 4.11" for 25-Year D event  
 Inflow = 100.4 cfs @ 12.23 hrs, Volume= 573,903 cf  
 Outflow = 10.3 cfs @ 14.04 hrs, Volume= 573,884 cf, Atten= 90%, Lag= 108.4 min  
 Discarded = 0.6 cfs @ 14.04 hrs, Volume= 54,394 cf  
 Primary = 9.7 cfs @ 14.04 hrs, Volume= 519,490 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 281.01' @ 14.04 hrs Surf.Area= 95,217 sf Storage= 287,424 cf

Plug-Flow detention time= 417.6 min calculated for 573,884 cf (100% of inflow)  
 Center-of-Mass det. time= 417.4 min ( 1,234.6 - 817.2 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 275.00'              | 603,909 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| #2                  | 273.00'              | 138 cf           | <b>4.00'D x 11.00'H Vertical Cone/Cylinder</b>             |                           |                     |
|                     |                      | 604,047 cf       | Total Available Storage                                    |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 275.00              | 100                  | 40.0             | 0                                                          | 0                         | 100                 |
| 276.00              | 13,700               | 600.0            | 4,990                                                      | 4,990                     | 28,622              |
| 277.00              | 27,095               | 820.0            | 20,021                                                     | 25,011                    | 53,492              |
| 278.00              | 44,050               | 1,020.0          | 35,231                                                     | 60,242                    | 82,791              |
| 279.00              | 69,900               | 1,580.0          | 56,480                                                     | 116,721                   | 198,664             |
| 280.00              | 87,050               | 1,610.0          | 78,318                                                     | 195,040                   | 206,444             |
| 282.00              | 103,500              | 1,725.0          | 190,313                                                    | 385,353                   | 237,146             |
| 284.00              | 115,160              | 1,730.0          | 218,556                                                    | 603,909                   | 240,864             |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                     |  |  |
|--------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| #1     | Primary  | 273.34' | <b>24.0" Round Culvert</b> L= 90.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf |  |  |
| #2     | Device 1 | 276.36' | <b>6.0" Vert. Orifice/Grate X 3.00</b> C= 0.600                                                                                                                                                    |  |  |
| #3     | Device 1 | 278.80' | <b>0.7' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                               |  |  |
| #4     | Device 1 | 281.40' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                               |  |  |
| #5     | Primary  | 283.50' | <b>6.0' long x 10.0' breadth Emergency Spillway</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60                                                                                         |  |  |

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Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64  
 #6 Discarded 273.00' **0.270 in/hr Exfiltration over Surface area**

**Discarded OutFlow** Max=0.6 cfs @ 14.04 hrs HW=281.01' (Free Discharge)  
**6=Exfiltration** (Exfiltration Controls 0.6 cfs)

**Primary OutFlow** Max=9.7 cfs @ 14.04 hrs HW=281.01' (Free Discharge)  
**1=Culvert** (Passes 9.7 cfs of 39.1 cfs potential flow)  
**2=Orifice/Grate** (Orifice Controls 6.0 cfs @ 10.10 fps)  
**3=Sharp-Crested Rectangular Weir** (Weir Controls 3.8 cfs @ 4.86 fps)  
**4=Orifice/Grate** (Controls 0.0 cfs)  
**5=Emergency Spillway** (Controls 0.0 cfs)

**Summary for Pond 12P: CULV 30**

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 3.22" for 25-Year D event  
 Inflow = 24.2 cfs @ 12.32 hrs, Volume= 141,669 cf  
 Outflow = 24.0 cfs @ 12.35 hrs, Volume= 141,670 cf, Atten= 1%, Lag= 1.4 min  
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 430 cf  
 Primary = 24.0 cfs @ 12.35 hrs, Volume= 141,240 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 282.27' @ 12.35 hrs Surf.Area= 1,101 sf Storage= 2,016 cf

Plug-Flow detention time= 3.5 min calculated for 141,635 cf (100% of inflow)  
 Center-of-Mass det. time= 3.7 min ( 868.8 - 865.0 )

| Volume | Invert  | Avail.Storage | Storage Description                                    |
|--------|---------|---------------|--------------------------------------------------------|
| #1     | 279.50' | 8,119 cf      | <b>Custom Stage Data (Conic)</b> Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|------------------|-------------------|------------------------|------------------------|------------------|
| 279.50           | 0                 | 0                      | 0                      | 0                |
| 280.00           | 610               | 102                    | 102                    | 610              |
| 282.00           | 1,035             | 1,626                  | 1,728                  | 1,081            |
| 284.00           | 1,570             | 2,586                  | 4,315                  | 1,673            |
| 286.00           | 2,255             | 3,804                  | 8,119                  | 2,425            |

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                   |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 280.00' | <b>30.0" Round Culvert</b> L= 129.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' / n= 0.013, Flow Area= 4.91 sf |
| #2     | Discarded | 279.50' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                |

**Discarded OutFlow** Max=0.0 cfs @ 12.35 hrs HW=282.26' (Free Discharge)  
**2=Exfiltration** (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=24.0 cfs @ 12.35 hrs HW=282.26' (Free Discharge)  
**1=Culvert** (Inlet Controls 24.0 cfs @ 5.12 fps)

**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 4.89" for 25-Year D event  
 Inflow = 37.9 cfs @ 12.16 hrs, Volume= 172,007 cf  
 Outflow = 32.1 cfs @ 12.22 hrs, Volume= 172,006 cf, Atten= 15%, Lag= 3.5 min  
 Primary = 32.1 cfs @ 12.22 hrs, Volume= 172,006 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 294.10' @ 12.22 hrs Surf.Area= 3,396 sf Storage= 6,671 cf

Plug-Flow detention time= 2.4 min calculated for 172,006 cf (100% of inflow)  
 Center-of-Mass det. time= 2.3 min ( 777.4 - 775.1 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 291.00' | 28,701 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) |
|------------------|-------------------|---------------|------------------------|------------------------|------------------|
| 291.00           | 100               | 40.0          | 0                      | 0                      | 100              |
| 292.00           | 2,142             | 200.0         | 902                    | 902                    | 3,158            |
| 294.00           | 3,334             | 230.0         | 5,432                  | 6,334                  | 4,271            |
| 296.00           | 4,670             | 270.0         | 7,967                  | 14,300                 | 5,939            |
| 298.00           | 6,352             | 323.0         | 10,979                 | 25,279                 | 8,510            |
| 298.50           | 7,345             | 340.0         | 3,421                  | 28,701                 | 9,422            |

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| Device | Routing | Invert  | Outlet Devices                                                                                                                                                            |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 291.00' | <b>30.0" Round Culvert</b> L= 120.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 '/ Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |

**Primary OutFlow** Max=32.0 cfs @ 12.22 hrs HW=294.09' (Free Discharge)**1=Culvert** (Inlet Controls 32.0 cfs @ 6.53 fps)**Summary for Pond 22P: INF**

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| Inflow Area = | 111,608 sf, 100.00% Impervious, Inflow Depth = 5.79" for 25-Year D event |
| Inflow =      | 12.1 cfs @ 12.17 hrs, Volume= 53,868 cf                                  |
| Outflow =     | 10.4 cfs @ 12.22 hrs, Volume= 53,868 cf, Atten= 14%, Lag= 3.2 min        |
| Discarded =   | 0.0 cfs @ 12.22 hrs, Volume= 1,682 cf                                    |
| Primary =     | 10.3 cfs @ 12.22 hrs, Volume= 52,186 cf                                  |

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 288.23' @ 12.22 hrs Surf.Area= 2,044 sf Storage= 3,781 cf

Plug-Flow detention time= 27.2 min calculated for 53,854 cf (100% of inflow)  
 Center-of-Mass det. time= 27.4 min ( 778.2 - 750.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                                                                                                                    |
|--------|---------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1A    | 285.50' | 1,589 cf      | <b>28.00'W x 73.00'L x 3.21'H Field A</b><br>6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids                                                                                                             |
| #2A    | 286.00' | 2,587 cf      | <b>Cultec R-280HD</b> x 60 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 6 rows |
|        |         |               | 4,175 cf Total Available Storage                                                                                                                                                                                       |

Storage Group A created with Chamber Wizard

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                             |
|--------|-----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 286.00' | <b>18.0" Round Culvert</b> L= 20.0' RCP, sq. cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 '/ Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |
| #2     | Discarded | 285.50' | <b>0.270 in/hr Exfiltration over Wetted area</b>                                                                                                                           |

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**Discarded OutFlow** Max=0.0 cfs @ 12.22 hrs HW=288.20' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=10.3 cfs @ 12.22 hrs HW=288.20' (Free Discharge)**1=Culvert** (Inlet Controls 10.3 cfs @ 5.80 fps)**Summary for Pond 30P: DB2**

|               |                                                                           |
|---------------|---------------------------------------------------------------------------|
| Inflow Area = | 1,187,726 sf, 58.27% Impervious, Inflow Depth = 4.68" for 25-Year D event |
| Inflow =      | 97.7 cfs @ 12.17 hrs, Volume= 463,160 cf                                  |
| Outflow =     | 18.4 cfs @ 12.78 hrs, Volume= 463,160 cf, Atten= 81%, Lag= 36.6 min       |
| Discarded =   | 0.5 cfs @ 12.78 hrs, Volume= 45,197 cf                                    |
| Primary =     | 17.9 cfs @ 12.78 hrs, Volume= 417,963 cf                                  |

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 324.55' @ 12.78 hrs Surf.Area= 73,494 sf Storage= 207,367 cf

Plug-Flow detention time= 324.3 min calculated for 463,044 cf (100% of inflow)  
 Center-of-Mass det. time= 325.3 min ( 1,122.9 - 797.6 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------------|---------------------|
| #1                  | 319.00'              | 329,237 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Voids<br>(%)                                               | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 319.00              | 400                  | 80.0             | 0.0                                                        | 0                         | 0                         | 400                 |
| 320.00              | 19,450               | 575.0            | 100.0                                                      | 7,546                     | 7,546                     | 26,203              |
| 321.00              | 28,075               | 685.0            | 100.0                                                      | 23,631                    | 31,177                    | 37,250              |
| 322.00              | 37,630               | 790.0            | 100.0                                                      | 32,736                    | 63,913                    | 49,597              |
| 323.00              | 50,456               | 930.0            | 100.0                                                      | 43,887                    | 107,800                   | 68,779              |
| 324.00              | 69,750               | 1,090.0          | 100.0                                                      | 59,843                    | 167,643                   | 94,518              |
| 325.00              | 76,570               | 1,130.0          | 100.0                                                      | 73,133                    | 240,777                   | 101,671             |
| 326.00              | 100,910              | 1,570.0          | 100.0                                                      | 88,461                    | 329,237                   | 196,219             |

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| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                            |
|--------|-----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 319.00' | <b>24.0" Round Culvert</b> L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 319.00' / 315.50' S= 0.0500 1' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf                  |
| #2     | Device 1  | 320.34' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                 |
| #3     | Device 1  | 322.50' | <b>20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)                                                                                                                |
| #4     | Device 1  | 324.90' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                      |
| #5     | Primary   | 325.50' | <b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |
| #6     | Discarded | 319.00' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                                         |

**Discarded OutFlow** Max=0.5 cfs @ 12.78 hrs HW=324.55' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.5 cfs)**Primary OutFlow** Max=17.9 cfs @ 12.78 hrs HW=324.55' (Free Discharge)**1=Culvert** (Passes 17.9 cfs of 32.3 cfs potential flow)**2=Orifice/Grate** (Orifice Controls 5.1 cfs @ 9.38 fps)**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 12.8 cfs @ 4.56 fps)**4=Orifice/Grate** (Controls 0.0 cfs)**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**Summary for Link 1L: Total PreDeveloped West**

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 2.83" for 25-Year D event  
 Inflow = 86.7 cfs @ 13.19 hrs, Volume= 1,063,312 cf  
 Primary = 86.7 cfs @ 13.19 hrs, Volume= 1,063,312 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 10L: PostDeveloped**

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 3.53" for 25-Year D event  
 Inflow = 24.1 cfs @ 12.99 hrs, Volume= 691,023 cf  
 Primary = 24.1 cfs @ 12.99 hrs, Volume= 691,023 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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**Summary for Link 11L: Total Post Developed West**

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 3.20" for 25-Year D event  
 Inflow = 73.1 cfs @ 12.91 hrs, Volume= 1,174,274 cf  
 Primary = 73.1 cfs @ 12.91 hrs, Volume= 1,174,274 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**Summary for Link 12L: Total Post-Developed North**

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 3.51" for 25-Year D event  
 Inflow = 40.0 cfs @ 13.26 hrs, Volume= 715,155 cf  
 Primary = 40.0 cfs @ 13.26 hrs, Volume= 715,155 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 1S: PreDeveloped**

Runoff = 83.8 cfs @ 13.36 hrs, Volume= 1,058,775 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,540,256 | 70 | Woods, Good, HSG C    |
| 2,540,256 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 22.8     | 483           | 0.0200        | 0.35              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.8     | 623           | 0.0400        | 0.50              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 32.8     | 1,254         | 0.0650        | 0.64              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 97.9     | 2,410         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 1S: PreDeveloped**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.00            | 0.0          | 111.00       | 8.62             | 5.00            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.00            | 0.0          | 112.50       | 8.62             | 5.00            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.00            | 0.0          | 114.00       | 8.62             | 5.00            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.00            | 0.0          | 115.50       | 8.62             | 5.00            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.00            | 0.0          | 117.00       | 8.62             | 5.00            | 0.0          |
| 7.50         | 1.19             | 0.02            | 0.4          | 63.00        | 8.62             | 5.00            | 0.0          | 118.50       | 8.62             | 5.00            | 0.0          |
| 9.00         | 1.58             | 0.10            | 2.0          | 64.50        | 8.62             | 5.00            | 0.0          | 120.00       | 8.62             | 5.00            | 0.0          |
| 10.50        | 2.15             | 0.30            | 5.1          | 66.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.42            | <b>15.4</b>  | 67.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.18            | <b>81.4</b>  | 69.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.65            | 30.8         | 70.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 3.98            | 16.1         | 72.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.23            | 11.6         | 73.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.45            | 9.2          | 75.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.65            | 8.2          | 76.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.83            | 7.5          | 78.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>5.00</b>     | 6.9          | 79.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.00            | 2.8          | 81.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.00            | 0.3          | 82.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.00            | 0.0          | 84.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.00            | 0.0          | 85.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.00            | 0.0          | 87.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.00            | 0.0          | 88.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.00            | 0.0          | 90.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.00            | 0.0          | 91.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.00            | 0.0          | 93.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.00            | 0.0          | 94.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.00            | 0.0          | 96.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.00            | 0.0          | 97.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.00            | 0.0          | 99.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.00            | 0.0          | 100.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.00            | 0.0          | 102.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.00            | 0.0          | 103.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.00            | 0.0          | 105.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.00            | 0.0          | 106.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.00            | 0.0          | 108.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.00            | 0.0          | 109.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 2S: PreDeveloped**

Runoff = 74.1 cfs @ 13.09 hrs, Volume= 821,117 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 1,970,057 | 70 | Woods, Good, HSG C    |
| 1,970,057 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 25.8     | 387           | 0.0100        | 0.25              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 6.2      | 196           | 0.0440        | 0.52              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 25.8     | 1,142         | 0.0870        | 0.74              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 79.3     | 1,775         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 2S: PreDeveloped**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.00            | 0.0          | 111.00       | 8.62             | 5.00            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.00            | 0.0          | 112.50       | 8.62             | 5.00            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.00            | 0.0          | 114.00       | 8.62             | 5.00            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.00            | 0.0          | 115.50       | 8.62             | 5.00            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.00            | 0.0          | 117.00       | 8.62             | 5.00            | 0.0          |
| 7.50         | 1.19             | 0.02            | 0.4          | 63.00        | 8.62             | 5.00            | 0.0          | 118.50       | 8.62             | 5.00            | 0.0          |
| 9.00         | 1.58             | 0.10            | 1.9          | 64.50        | 8.62             | 5.00            | 0.0          | 120.00       | 8.62             | 5.00            | 0.0          |
| 10.50        | 2.15             | 0.30            | 4.6          | 66.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.42            | <b>14.9</b>  | 67.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.18            | <b>60.1</b>  | 69.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.65            | 19.5         | 70.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 3.98            | 11.1         | 72.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.23            | 8.6          | 73.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.45            | 6.9          | 75.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.65            | 6.2          | 76.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.83            | 5.7          | 78.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>5.00</b>     | 5.2          | 79.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.00            | 1.3          | 81.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.00            | 0.1          | 82.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.00            | 0.0          | 84.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.00            | 0.0          | 85.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.00            | 0.0          | 87.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.00            | 0.0          | 88.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.00            | 0.0          | 90.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.00            | 0.0          | 91.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.00            | 0.0          | 93.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.00            | 0.0          | 94.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.00            | 0.0          | 96.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.00            | 0.0          | 97.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.00            | 0.0          | 99.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.00            | 0.0          | 100.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.00            | 0.0          | 102.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.00            | 0.0          | 103.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.00            | 0.0          | 105.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.00            | 0.0          | 106.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.00            | 0.0          | 108.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.00            | 0.0          | 109.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 3S: Total PreDeveloped North**

Runoff = 77.5 cfs @ 13.26 hrs, Volume= 973,568 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description           |
|-----------|----|-----------------------|
| 2,335,823 | 70 | Woods, Good, HSG C    |
| 2,335,823 |    | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------|
| 21.5     | 50            | 0.0050        | 0.04              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"                                               |
| 27.6     | 641           | 0.0240        | 0.39              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 46.2     | 1,713         | 0.0610        | 0.62              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps                                         |
| 1.6      | 267           | 0.0600        | 2.71              | 14.43          | <b>Parabolic Channel,</b><br>W=8.00' D=1.00' Area=5.3 sf Perim=8.3'<br>n= 0.100 Earth, dense brush, high stage |
| 96.9     | 2,671         | Total         |                   |                |                                                                                                                |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 3S: Total PreDeveloped North**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.00            | 0.0          | 111.00       | 8.62             | 5.00            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.00            | 0.0          | 112.50       | 8.62             | 5.00            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.00            | 0.0          | 114.00       | 8.62             | 5.00            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.00            | 0.0          | 115.50       | 8.62             | 5.00            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.00            | 0.0          | 117.00       | 8.62             | 5.00            | 0.0          |
| 7.50         | 1.19             | 0.02            | 0.3          | 63.00        | 8.62             | 5.00            | 0.0          | 118.50       | 8.62             | 5.00            | 0.0          |
| 9.00         | 1.58             | 0.10            | 1.9          | 64.50        | 8.62             | 5.00            | 0.0          | 120.00       | 8.62             | 5.00            | 0.0          |
| 10.50        | 2.15             | 0.30            | 4.7          | 66.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.42            | 14.3         | 67.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.18            | 74.7         | 69.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.65            | 28.0         | 70.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 3.98            | 14.7         | 72.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.23            | 10.7         | 73.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.45            | 8.5          | 75.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.65            | 7.5          | 76.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.83            | 6.9          | 78.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.00            | 6.3          | 79.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.00            | 2.5          | 81.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.00            | 0.3          | 82.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.00            | 0.0          | 84.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.00            | 0.0          | 85.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.00            | 0.0          | 87.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.00            | 0.0          | 88.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.00            | 0.0          | 90.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.00            | 0.0          | 91.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.00            | 0.0          | 93.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.00            | 0.0          | 94.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.00            | 0.0          | 96.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.00            | 0.0          | 97.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.00            | 0.0          | 99.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.00            | 0.0          | 100.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.00            | 0.0          | 102.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.00            | 0.0          | 103.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.00            | 0.0          | 105.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.00            | 0.0          | 106.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.00            | 0.0          | 108.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.00            | 0.0          | 109.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 8S: EAST SIDE DRIVE**

Runoff = 14.1 cfs @ 12.25 hrs, Volume= 67,096 cf, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 140,049   | 74 | >75% Grass cover, Good, HSG C |
| 6,776     | 70 | Woods, Good, HSG C            |
| 146,825   | 74 | Weighted Average              |
| 146,825   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                         |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                               |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                  |
| 1.6      | 703           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.7     | 1,690         | Total         |                   |                |                                                                                                                     |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 8S: EAST SIDE DRIVE**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.48            | 0.0          | 111.00       | 8.62             | 5.48            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.48            | 0.0          | 112.50       | 8.62             | 5.48            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.48            | 0.0          | 114.00       | 8.62             | 5.48            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.48            | 0.0          | 115.50       | 8.62             | 5.48            | 0.0          |
| 6.00         | 0.89             | 0.01            | 0.0          | 61.50        | 8.62             | 5.48            | 0.0          | 117.00       | 8.62             | 5.48            | 0.0          |
| 7.50         | 1.19             | 0.06            | 0.2          | 63.00        | 8.62             | 5.48            | 0.0          | 118.50       | 8.62             | 5.48            | 0.0          |
| 9.00         | 1.58             | 0.18            | 0.3          | 64.50        | 8.62             | 5.48            | 0.0          | 120.00       | 8.62             | 5.48            | 0.0          |
| 10.50        | 2.15             | 0.42            | 0.7          | 66.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.69            | 5.0          | 67.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.58            | 1.7          | 69.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 4.08            | 1.0          | 70.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.42            | 0.7          | 72.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.69            | 0.6          | 73.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.91            | 0.5          | 75.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 5.12            | 0.5          | 76.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 5.31            | 0.4          | 78.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.48            | 0.4          | 79.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.48            | 0.0          | 81.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.48            | 0.0          | 82.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.48            | 0.0          | 84.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.48            | 0.0          | 85.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.48            | 0.0          | 87.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.48            | 0.0          | 88.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.48            | 0.0          | 90.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.48            | 0.0          | 91.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.48            | 0.0          | 93.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.48            | 0.0          | 94.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.48            | 0.0          | 96.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.48            | 0.0          | 97.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.48            | 0.0          | 99.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.48            | 0.0          | 100.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.48            | 0.0          | 102.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.48            | 0.0          | 103.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.48            | 0.0          | 105.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.48            | 0.0          | 106.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.48            | 0.0          | 108.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.48            | 0.0          | 109.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 9S: WEST SIDE DRIVE**

Runoff = 10.3 cfs @ 12.25 hrs, Volume= 48,715 cf, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 106,603   | 74 | >75% Grass cover, Good, HSG C |
| 106,603   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------------|
| 8.2      | 50            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                                                  |
| 6.9      | 937           | 0.0230        | 2.27              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                                                     |
| 1.4      | 638           | 0.0450        | 7.48              | 37.40          | <b>Trap/Vee/Rect Channel Flow,</b><br>Bot.W=2.00' D=1.00' Z= 3.0 ' /' Top.W=8.00'<br>n= 0.030 Earth, grassed & winding |
| 16.5     | 1,625         | Total         |                   |                |                                                                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 9S: WEST SIDE DRIVE**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.48            | 0.0          | 111.00       | 8.62             | 5.48            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.48            | 0.0          | 112.50       | 8.62             | 5.48            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.48            | 0.0          | 114.00       | 8.62             | 5.48            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.48            | 0.0          | 115.50       | 8.62             | 5.48            | 0.0          |
| 6.00         | 0.89             | 0.01            | 0.0          | 61.50        | 8.62             | 5.48            | 0.0          | 117.00       | 8.62             | 5.48            | 0.0          |
| 7.50         | 1.19             | 0.06            | 0.1          | 63.00        | 8.62             | 5.48            | 0.0          | 118.50       | 8.62             | 5.48            | 0.0          |
| 9.00         | 1.58             | 0.18            | 0.2          | 64.50        | 8.62             | 5.48            | 0.0          | 120.00       | 8.62             | 5.48            | 0.0          |
| 10.50        | 2.15             | 0.42            | 0.5          | 66.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.69            | 3.7          | 67.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.58            | 1.2          | 69.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 4.08            | 0.7          | 70.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.42            | 0.5          | 72.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.69            | 0.4          | 73.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.91            | 0.4          | 75.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 5.12            | 0.3          | 76.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 5.31            | 0.3          | 78.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.48            | 0.3          | 79.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.48            | 0.0          | 81.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.48            | 0.0          | 82.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.48            | 0.0          | 84.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.48            | 0.0          | 85.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.48            | 0.0          | 87.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.48            | 0.0          | 88.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.48            | 0.0          | 90.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.48            | 0.0          | 91.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.48            | 0.0          | 93.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.48            | 0.0          | 94.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.48            | 0.0          | 96.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.48            | 0.0          | 97.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.48            | 0.0          | 99.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.48            | 0.0          | 100.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.48            | 0.0          | 102.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.48            | 0.0          | 103.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.48            | 0.0          | 105.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.48            | 0.0          | 106.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.48            | 0.0          | 108.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.48            | 0.0          | 109.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 10S: 555 HALF ROOF**

Runoff = 45.1 cfs @ 12.15 hrs, Volume= 192,038 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 8.4      |               |               |                   |                | Direct Entry, |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 10S: 555 HALF ROOF**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 8.38            | 0.0          | 111.00       | 8.62             | 8.38            | 0.0          |
| 1.50         | 0.19             | 0.06            | 0.5          | 57.00        | 8.62             | 8.38            | 0.0          | 112.50       | 8.62             | 8.38            | 0.0          |
| 3.00         | 0.40             | 0.23            | 0.8          | 58.50        | 8.62             | 8.38            | 0.0          | 114.00       | 8.62             | 8.38            | 0.0          |
| 4.50         | 0.64             | 0.44            | 1.0          | 60.00        | 8.62             | 8.38            | 0.0          | 115.50       | 8.62             | 8.38            | 0.0          |
| 6.00         | 0.89             | 0.68            | 1.1          | 61.50        | 8.62             | 8.38            | 0.0          | 117.00       | 8.62             | 8.38            | 0.0          |
| 7.50         | 1.19             | 0.98            | 1.4          | 63.00        | 8.62             | 8.38            | 0.0          | 118.50       | 8.62             | 8.38            | 0.0          |
| 9.00         | 1.58             | 1.36            | 1.8          | 64.50        | 8.62             | 8.38            | 0.0          | 120.00       | 8.62             | 8.38            | 0.0          |
| 10.50        | 2.15             | 1.93            | 2.9          | 66.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 3.89            | 21.8         | 67.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 6.23            | 3.4          | 69.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 6.80            | 1.9          | 70.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 7.19            | 1.5          | 72.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 7.49            | 1.2          | 73.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 7.75            | 1.0          | 75.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 7.98            | 0.9          | 76.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 8.19            | 0.9          | 78.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 8.38            | 0.8          | 79.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 8.38            | 0.0          | 81.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 8.38            | 0.0          | 82.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 8.38            | 0.0          | 84.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 8.38            | 0.0          | 85.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 8.38            | 0.0          | 87.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 8.38            | 0.0          | 88.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 8.38            | 0.0          | 90.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 8.38            | 0.0          | 91.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 8.38            | 0.0          | 93.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 8.38            | 0.0          | 94.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 8.38            | 0.0          | 96.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 8.38            | 0.0          | 97.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 8.38            | 0.0          | 99.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 8.38            | 0.0          | 100.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 8.38            | 0.0          | 102.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 8.38            | 0.0          | 103.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 8.38            | 0.0          | 105.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 8.38            | 0.0          | 106.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 8.38            | 0.0          | 108.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 8.38            | 0.0          | 109.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 11S: 555 SW**

Runoff = 28.3 cfs @ 12.27 hrs, Volume= 152,334 cf, Depth= 7.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 90,464    | 74 | >75% Grass cover, Good, HSG C |
| 160,091   | 98 | Paved parking, HSG C          |
| 250,555   | 89 | Weighted Average              |
| 90,464    |    | 36.11% Pervious Area          |
| 160,091   |    | 63.89% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 10.4     | 50            | 0.0110        | 0.08              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 3.2      | 140           | 0.0110        | 0.73              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps              |
| 2.3      | 296           | 0.0110        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 3.2      | 1,467         | 0.0170        | 7.75              | 13.70          | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 |
| 19.1     | 1,953         | Total         |                   |                |                                                                                   |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 11S: 555 SW**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.30            | 0.0          | 111.00       | 8.62             | 7.30            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.30            | 0.0          | 112.50       | 8.62             | 7.30            | 0.0          |
| 3.00         | 0.40             | 0.02            | 0.1          | 58.50        | 8.62             | 7.30            | 0.0          | 114.00       | 8.62             | 7.30            | 0.0          |
| 4.50         | 0.64             | 0.09            | 0.4          | 60.00        | 8.62             | 7.30            | 0.0          | 115.50       | 8.62             | 7.30            | 0.0          |
| 6.00         | 0.89             | 0.22            | 0.5          | 61.50        | 8.62             | 7.30            | 0.0          | 117.00       | 8.62             | 7.30            | 0.0          |
| 7.50         | 1.19             | 0.41            | 0.8          | 63.00        | 8.62             | 7.30            | 0.0          | 118.50       | 8.62             | 7.30            | 0.0          |
| 9.00         | 1.58             | 0.69            | 1.2          | 64.50        | 8.62             | 7.30            | 0.0          | 120.00       | 8.62             | 7.30            | 0.0          |
| 10.50        | 2.15             | 1.16            | 2.1          | 66.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.94            | <b>10.4</b>  | 67.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 5.19            | <b>3.5</b>   | 69.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.74            | 1.8          | 70.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 6.12            | 1.4          | 72.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.42            | 1.1          | 73.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.67            | 0.9          | 75.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.90            | 0.9          | 76.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 7.11            | 0.8          | 78.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>7.30</b>     | 0.7          | 79.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.30            | 0.0          | 81.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.30            | 0.0          | 82.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.30            | 0.0          | 84.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.30            | 0.0          | 85.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.30            | 0.0          | 87.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.30            | 0.0          | 88.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.30            | 0.0          | 90.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.30            | 0.0          | 91.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.30            | 0.0          | 93.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.30            | 0.0          | 94.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.30            | 0.0          | 96.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.30            | 0.0          | 97.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.30            | 0.0          | 99.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.30            | 0.0          | 100.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.30            | 0.0          | 102.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.30            | 0.0          | 103.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.30            | 0.0          | 105.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.30            | 0.0          | 106.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.30            | 0.0          | 108.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.30            | 0.0          | 109.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 12S: Road**

Runoff = 2.1 cfs @ 12.15 hrs, Volume= 8,260 cf, Depth= 7.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 9,362     | 98 | Paved parking, HSG C          |
| 3,789     | 74 | >75% Grass cover, Good, HSG C |
| 13,151    | 91 | Weighted Average              |
| 3,789     |    | 28.81% Pervious Area          |
| 9,362     |    | 71.19% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-------------------------------------------------------------------------------------------------|
| 7.4      | 44            | 0.0200        | 0.10              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5      | 122           | 0.0440        | 4.26              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.2      | 100           | 0.0400        | 9.07              | 7.13           | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 8.1      | 266           | Total         |                   |                |                                                                                                 |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 12S: Road**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.54            | 0.0          | 111.00       | 8.62             | 7.54            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.54            | 0.0          | 112.50       | 8.62             | 7.54            | 0.0          |
| 3.00         | 0.40             | 0.04            | 0.0          | 58.50        | 8.62             | 7.54            | 0.0          | 114.00       | 8.62             | 7.54            | 0.0          |
| 4.50         | 0.64             | 0.13            | 0.0          | 60.00        | 8.62             | 7.54            | 0.0          | 115.50       | 8.62             | 7.54            | 0.0          |
| 6.00         | 0.89             | 0.28            | 0.0          | 61.50        | 8.62             | 7.54            | 0.0          | 117.00       | 8.62             | 7.54            | 0.0          |
| 7.50         | 1.19             | 0.50            | 0.1          | 63.00        | 8.62             | 7.54            | 0.0          | 118.50       | 8.62             | 7.54            | 0.0          |
| 9.00         | 1.58             | 0.81            | 0.1          | 64.50        | 8.62             | 7.54            | 0.0          | 120.00       | 8.62             | 7.54            | 0.0          |
| 10.50        | 2.15             | 1.30            | 0.1          | 66.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 3.14            | <b>1.0</b>   | 67.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 5.41            | <b>0.2</b>   | 69.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.98            | 0.1          | 70.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 6.36            | 0.1          | 72.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.66            | 0.1          | 73.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.91            | 0.0          | 75.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 7.14            | 0.0          | 76.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 7.35            | 0.0          | 78.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>7.54</b>     | 0.0          | 79.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.54            | 0.0          | 81.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.54            | 0.0          | 82.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.54            | 0.0          | 84.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.54            | 0.0          | 85.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.54            | 0.0          | 87.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.54            | 0.0          | 88.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.54            | 0.0          | 90.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.54            | 0.0          | 91.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.54            | 0.0          | 93.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.54            | 0.0          | 94.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.54            | 0.0          | 96.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.54            | 0.0          | 97.50        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.54            | 0.0          | 99.00        | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.54            | 0.0          | 100.50       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.54            | 0.0          | 102.00       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.54            | 0.0          | 103.50       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.54            | 0.0          | 105.00       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.54            | 0.0          | 106.50       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.54            | 0.0          | 108.00       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.54            | 0.0          | 109.50       | 8.62             | 7.54            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 13S: Undeveloped**

Runoff = 25.4 cfs @ 12.94 hrs, Volume= 263,904 cf, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 496,005   | 70 | Woods, Good, HSG C            |
| 122,277   | 74 | >75% Grass cover, Good, HSG C |
| 618,282   | 71 | Weighted Average              |
| 618,282   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.3     | 50            | 0.0200        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 20.8     | 599           | 0.0370        | 0.48              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 12.5     | 350           | 0.0350        | 0.47              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 3.1      | 163           | 0.1200        | 0.87              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 22.7     | 737           | 0.0470        | 0.54              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 71.4     | 1,899         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 13S: Undeveloped**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.12            | 0.0          | 111.00       | 8.62             | 5.12            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.12            | 0.0          | 112.50       | 8.62             | 5.12            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.12            | 0.0          | 114.00       | 8.62             | 5.12            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.12            | 0.0          | 115.50       | 8.62             | 5.12            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.12            | 0.0          | 117.00       | 8.62             | 5.12            | 0.0          |
| 7.50         | 1.19             | 0.03            | 0.2          | 63.00        | 8.62             | 5.12            | 0.0          | 118.50       | 8.62             | 5.12            | 0.0          |
| 9.00         | 1.58             | 0.12            | 0.7          | 64.50        | 8.62             | 5.12            | 0.0          | 120.00       | 8.62             | 5.12            | 0.0          |
| 10.50        | 2.15             | 0.33            | 1.6          | 66.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.48            | 5.4          | 67.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.28            | 17.6         | 69.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.76            | 5.7          | 70.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.08            | 3.4          | 72.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.35            | 2.7          | 73.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.57            | 2.2          | 75.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.77            | 2.0          | 76.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.95            | 1.8          | 78.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.12            | 1.6          | 79.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.12            | 0.3          | 81.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.12            | 0.0          | 82.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.12            | 0.0          | 84.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.12            | 0.0          | 85.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.12            | 0.0          | 87.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.12            | 0.0          | 88.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.12            | 0.0          | 90.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.12            | 0.0          | 91.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.12            | 0.0          | 93.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.12            | 0.0          | 94.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.12            | 0.0          | 96.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.12            | 0.0          | 97.50        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.12            | 0.0          | 99.00        | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.12            | 0.0          | 100.50       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.12            | 0.0          | 102.00       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.12            | 0.0          | 103.50       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.12            | 0.0          | 105.00       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.12            | 0.0          | 106.50       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.12            | 0.0          | 108.00       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.12            | 0.0          | 109.50       | 8.62             | 5.12            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

Prepared by Engineering Design Consultants, Inc.

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**Summary for Subcatchment 14S: Undeveloped**

Runoff = 38.4 cfs @ 12.33 hrs, Volume= 214,243 cf, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 178,452   | 70 | Woods, Good, HSG C            |
| 300,921   | 74 | >75% Grass cover, Good, HSG C |
| 479,373   | 73 | Weighted Average              |
| 479,373   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 14.3     | 50            | 0.0050        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                  |
| 1.6      | 275           | 0.0370        | 2.89              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.4      | 225           | 0.2000        | 1.12              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 1.0      | 239           | 0.0650        | 3.82              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 3.1      | 357           | 0.0160        | 1.90              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps     |
| 23.4     | 1,146         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 14S: Undeveloped**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.36            | 0.0          | 111.00       | 8.62             | 5.36            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.36            | 0.0          | 112.50       | 8.62             | 5.36            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.36            | 0.0          | 114.00       | 8.62             | 5.36            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.36            | 0.0          | 115.50       | 8.62             | 5.36            | 0.0          |
| 6.00         | 0.89             | 0.01            | 0.1          | 61.50        | 8.62             | 5.36            | 0.0          | 117.00       | 8.62             | 5.36            | 0.0          |
| 7.50         | 1.19             | 0.05            | 0.4          | 63.00        | 8.62             | 5.36            | 0.0          | 118.50       | 8.62             | 5.36            | 0.0          |
| 9.00         | 1.58             | 0.16            | 0.9          | 64.50        | 8.62             | 5.36            | 0.0          | 120.00       | 8.62             | 5.36            | 0.0          |
| 10.50        | 2.15             | 0.39            | 2.1          | 66.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.62            | 12.0         | 67.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.48            | 6.0          | 69.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.97            | 3.2          | 70.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.31            | 2.4          | 72.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.57            | 1.9          | 73.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.80            | 1.6          | 75.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 5.00            | 1.5          | 76.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 5.19            | 1.4          | 78.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.36            | 1.2          | 79.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.36            | 0.0          | 81.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.36            | 0.0          | 82.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.36            | 0.0          | 84.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.36            | 0.0          | 85.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.36            | 0.0          | 87.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.36            | 0.0          | 88.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.36            | 0.0          | 90.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.36            | 0.0          | 91.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.36            | 0.0          | 93.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.36            | 0.0          | 94.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.36            | 0.0          | 96.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.36            | 0.0          | 97.50        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.36            | 0.0          | 99.00        | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.36            | 0.0          | 100.50       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.36            | 0.0          | 102.00       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.36            | 0.0          | 103.50       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.36            | 0.0          | 105.00       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.36            | 0.0          | 106.50       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.36            | 0.0          | 108.00       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.36            | 0.0          | 109.50       | 8.62             | 5.36            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 15S: Road**

Runoff = 6.0 cfs @ 12.13 hrs, Volume= 21,241 cf, Depth= 7.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 20,008    | 98 | Paved parking, HSG C          |
| 16,125    | 74 | >75% Grass cover, Good, HSG C |
| 36,133    | 87 | Weighted Average              |
| 16,125    |    | 44.63% Pervious Area          |
| 20,008    |    | 55.37% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft)                            | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                     |
|----------|---------------|------------------------------------------|-------------------|----------------|-------------------------------------------------------------------------------------------------|
| 4.3      | 16            | 0.0100                                   | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                                           |
| 0.5      | 132           | 0.0460                                   | 4.35              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                         |
| 0.3      | 110           | 0.0200                                   | 6.42              | 5.04           | <b>Pipe Channel, RCP_Round 12"</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 |
| 5.1      | 258           | Total, Increased to minimum Tc = 6.0 min |                   |                |                                                                                                 |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 15S: Road**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.05            | 0.0          | 111.00       | 8.62             | 7.05            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.05            | 0.0          | 112.50       | 8.62             | 7.05            | 0.0          |
| 3.00         | 0.40             | 0.01            | 0.0          | 58.50        | 8.62             | 7.05            | 0.0          | 114.00       | 8.62             | 7.05            | 0.0          |
| 4.50         | 0.64             | 0.06            | 0.0          | 60.00        | 8.62             | 7.05            | 0.0          | 115.50       | 8.62             | 7.05            | 0.0          |
| 6.00         | 0.89             | 0.17            | 0.1          | 61.50        | 8.62             | 7.05            | 0.0          | 117.00       | 8.62             | 7.05            | 0.0          |
| 7.50         | 1.19             | 0.34            | 0.1          | 63.00        | 8.62             | 7.05            | 0.0          | 118.50       | 8.62             | 7.05            | 0.0          |
| 9.00         | 1.58             | 0.59            | 0.2          | 64.50        | 8.62             | 7.05            | 0.0          | 120.00       | 8.62             | 7.05            | 0.0          |
| 10.50        | 2.15             | 1.03            | 0.3          | 66.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.76            | <b>3.2</b>   | 67.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 4.97            | <b>0.4</b>   | 69.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.52            | 0.2          | 70.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 5.89            | 0.2          | 72.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.19            | 0.1          | 73.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.43            | 0.1          | 75.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.66            | 0.1          | 76.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 6.87            | 0.1          | 78.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>7.05</b>     | 0.1          | 79.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.05            | 0.0          | 81.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.05            | 0.0          | 82.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.05            | 0.0          | 84.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.05            | 0.0          | 85.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.05            | 0.0          | 87.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.05            | 0.0          | 88.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.05            | 0.0          | 90.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.05            | 0.0          | 91.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.05            | 0.0          | 93.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.05            | 0.0          | 94.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.05            | 0.0          | 96.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.05            | 0.0          | 97.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.05            | 0.0          | 99.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.05            | 0.0          | 100.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.05            | 0.0          | 102.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.05            | 0.0          | 103.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.05            | 0.0          | 105.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.05            | 0.0          | 106.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.05            | 0.0          | 108.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.05            | 0.0          | 109.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 16S: Road**

Runoff = 5.1 cfs @ 12.13 hrs, Volume= 18,026 cf, Depth= 7.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 18,005    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 2,688     | 98 | Paved parking, HSG C                       |
| 9,970     | 74 | >75% Grass cover, Good, HSG C              |
| 30,663    | 87 | Weighted Average                           |
| 18,973    |    | 61.87% Pervious Area                       |
| 11,691    |    | 38.13% Impervious Area                     |

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

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 16S: Road**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.05            | 0.0          | 111.00       | 8.62             | 7.05            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.05            | 0.0          | 112.50       | 8.62             | 7.05            | 0.0          |
| 3.00         | 0.40             | 0.01            | 0.0          | 58.50        | 8.62             | 7.05            | 0.0          | 114.00       | 8.62             | 7.05            | 0.0          |
| 4.50         | 0.64             | 0.06            | 0.0          | 60.00        | 8.62             | 7.05            | 0.0          | 115.50       | 8.62             | 7.05            | 0.0          |
| 6.00         | 0.89             | 0.17            | 0.1          | 61.50        | 8.62             | 7.05            | 0.0          | 117.00       | 8.62             | 7.05            | 0.0          |
| 7.50         | 1.19             | 0.34            | 0.1          | 63.00        | 8.62             | 7.05            | 0.0          | 118.50       | 8.62             | 7.05            | 0.0          |
| 9.00         | 1.58             | 0.59            | 0.1          | 64.50        | 8.62             | 7.05            | 0.0          | 120.00       | 8.62             | 7.05            | 0.0          |
| 10.50        | 2.15             | 1.03            | 0.3          | 66.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.76            | 2.7          | 67.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 4.97            | 0.4          | 69.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.52            | 0.2          | 70.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 5.89            | 0.2          | 72.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.19            | 0.1          | 73.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.43            | 0.1          | 75.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.66            | 0.1          | 76.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 6.87            | 0.1          | 78.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 7.05            | 0.1          | 79.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.05            | 0.0          | 81.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.05            | 0.0          | 82.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.05            | 0.0          | 84.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.05            | 0.0          | 85.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.05            | 0.0          | 87.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.05            | 0.0          | 88.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.05            | 0.0          | 90.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.05            | 0.0          | 91.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.05            | 0.0          | 93.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.05            | 0.0          | 94.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.05            | 0.0          | 96.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.05            | 0.0          | 97.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.05            | 0.0          | 99.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.05            | 0.0          | 100.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.05            | 0.0          | 102.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.05            | 0.0          | 103.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.05            | 0.0          | 105.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.05            | 0.0          | 106.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.05            | 0.0          | 108.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.05            | 0.0          | 109.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 17S: 465 SITE SOUTH**

Runoff = 5.6 cfs @ 12.25 hrs, Volume= 27,943 cf, Depth= 7.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 21,889    | 74 | >75% Grass cover, Good, HSG C |
| 25,644    | 98 | Unconnected pavement, HSG C   |
| 47,533    | 87 | Weighted Average              |
| 21,889    |    | 46.05% Pervious Area          |
| 25,644    |    | 53.95% Impervious Area        |
| 25,644    |    | 100.00% Unconnected           |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------|
| 8.7      | 38            | 0.0100        | 0.07              |                | <b>Sheet Flow,</b>                |
|          |               |               |                   |                | Grass: Dense n= 0.240 P2= 3.20"   |
| 8.1      | 694           | 0.0050        | 1.44              |                | <b>Shallow Concentrated Flow,</b> |
|          |               |               |                   |                | Paved Kv= 20.3 fps                |
| 16.8     | 732           | Total         |                   |                |                                   |

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NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 17S: 465 SITE SOUTH**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.05            | 0.0          | 111.00       | 8.62             | 7.05            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.05            | 0.0          | 112.50       | 8.62             | 7.05            | 0.0          |
| 3.00         | 0.40             | 0.01            | 0.0          | 58.50        | 8.62             | 7.05            | 0.0          | 114.00       | 8.62             | 7.05            | 0.0          |
| 4.50         | 0.64             | 0.06            | 0.1          | 60.00        | 8.62             | 7.05            | 0.0          | 115.50       | 8.62             | 7.05            | 0.0          |
| 6.00         | 0.89             | 0.17            | 0.1          | 61.50        | 8.62             | 7.05            | 0.0          | 117.00       | 8.62             | 7.05            | 0.0          |
| 7.50         | 1.19             | 0.34            | 0.1          | 63.00        | 8.62             | 7.05            | 0.0          | 118.50       | 8.62             | 7.05            | 0.0          |
| 9.00         | 1.58             | 0.59            | 0.2          | 64.50        | 8.62             | 7.05            | 0.0          | 120.00       | 8.62             | 7.05            | 0.0          |
| 10.50        | 2.15             | 1.03            | 0.4          | 66.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.76            | 2.1          | 67.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 4.97            | 0.6          | 69.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.52            | 0.3          | 70.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 5.89            | 0.3          | 72.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.19            | 0.2          | 73.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.43            | 0.2          | 75.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.66            | 0.2          | 76.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 6.87            | 0.1          | 78.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 7.05            | 0.1          | 79.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.05            | 0.0          | 81.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.05            | 0.0          | 82.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.05            | 0.0          | 84.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.05            | 0.0          | 85.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.05            | 0.0          | 87.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.05            | 0.0          | 88.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.05            | 0.0          | 90.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.05            | 0.0          | 91.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.05            | 0.0          | 93.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.05            | 0.0          | 94.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.05            | 0.0          | 96.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.05            | 0.0          | 97.50        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.05            | 0.0          | 99.00        | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.05            | 0.0          | 100.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.05            | 0.0          | 102.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.05            | 0.0          | 103.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.05            | 0.0          | 105.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.05            | 0.0          | 106.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.05            | 0.0          | 108.00       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.05            | 0.0          | 109.50       | 8.62             | 7.05            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 18S: Road**

Runoff = 3.8 cfs @ 12.13 hrs, Volume= 13,992 cf, Depth= 7.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                                |
|-----------|----|--------------------------------------------|
| 21,926    | 92 | Paved roads w/open ditches, 50% imp, HSG C |
| 10,963    |    | 50.00% Pervious Area                       |
| 10,963    |    | 50.00% Impervious Area                     |

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

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 18S: Road**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.66            | 0.0          | 111.00       | 8.62             | 7.66            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.66            | 0.0          | 112.50       | 8.62             | 7.66            | 0.0          |
| 3.00         | 0.40             | 0.05            | 0.0          | 58.50        | 8.62             | 7.66            | 0.0          | 114.00       | 8.62             | 7.66            | 0.0          |
| 4.50         | 0.64             | 0.16            | 0.0          | 60.00        | 8.62             | 7.66            | 0.0          | 115.50       | 8.62             | 7.66            | 0.0          |
| 6.00         | 0.89             | 0.32            | 0.1          | 61.50        | 8.62             | 7.66            | 0.0          | 117.00       | 8.62             | 7.66            | 0.0          |
| 7.50         | 1.19             | 0.55            | 0.1          | 63.00        | 8.62             | 7.66            | 0.0          | 118.50       | 8.62             | 7.66            | 0.0          |
| 9.00         | 1.58             | 0.87            | 0.1          | 64.50        | 8.62             | 7.66            | 0.0          | 120.00       | 8.62             | 7.66            | 0.0          |
| 10.50        | 2.15             | 1.38            | 0.2          | 66.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 3.24            | 2.0          | 67.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 5.53            | 0.3          | 69.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 6.09            | 0.2          | 70.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 6.48            | 0.1          | 72.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.78            | 0.1          | 73.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 7.03            | 0.1          | 75.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 7.26            | 0.1          | 76.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 7.47            | 0.1          | 78.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 7.66            | 0.1          | 79.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.66            | 0.0          | 81.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.66            | 0.0          | 82.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.66            | 0.0          | 84.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.66            | 0.0          | 85.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.66            | 0.0          | 87.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.66            | 0.0          | 88.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.66            | 0.0          | 90.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.66            | 0.0          | 91.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.66            | 0.0          | 93.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.66            | 0.0          | 94.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.66            | 0.0          | 96.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.66            | 0.0          | 97.50        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.66            | 0.0          | 99.00        | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.66            | 0.0          | 100.50       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.66            | 0.0          | 102.00       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.66            | 0.0          | 103.50       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.66            | 0.0          | 105.00       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.66            | 0.0          | 106.50       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.66            | 0.0          | 108.00       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.66            | 0.0          | 109.50       | 8.62             | 7.66            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 19S: 465 SITE NORTH**

Runoff = 7.1 cfs @ 12.16 hrs, Volume= 27,201 cf, Depth= 6.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 25,932    | 74 | >75% Grass cover, Good, HSG C |
| 21,980    | 98 | Paved parking, HSG C          |
| 47,912    | 85 | Weighted Average              |
| 25,932    |    | 54.12% Pervious Area          |
| 21,980    |    | 45.88% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                              |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------|
| 1.1      | 45            | 0.0050        | 0.67              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.20" |
| 7.6      | 658           | 0.0050        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps  |
| 8.7      | 703           | Total         |                   |                |                                                          |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 19S: 465 SITE NORTH**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 6.81            | 0.0          | 111.00       | 8.62             | 6.81            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 6.81            | 0.0          | 112.50       | 8.62             | 6.81            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 6.81            | 0.0          | 114.00       | 8.62             | 6.81            | 0.0          |
| 4.50         | 0.64             | 0.04            | 0.0          | 60.00        | 8.62             | 6.81            | 0.0          | 115.50       | 8.62             | 6.81            | 0.0          |
| 6.00         | 0.89             | 0.12            | 0.1          | 61.50        | 8.62             | 6.81            | 0.0          | 117.00       | 8.62             | 6.81            | 0.0          |
| 7.50         | 1.19             | 0.27            | 0.1          | 63.00        | 8.62             | 6.81            | 0.0          | 118.50       | 8.62             | 6.81            | 0.0          |
| 9.00         | 1.58             | 0.50            | 0.2          | 64.50        | 8.62             | 6.81            | 0.0          | 120.00       | 8.62             | 6.81            | 0.0          |
| 10.50        | 2.15             | 0.91            | 0.4          | 66.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.57            | <b>3.3</b>   | 67.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 4.74            | <b>0.6</b>   | 69.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.29            | 0.3          | 70.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 5.66            | 0.3          | 72.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 5.96            | 0.2          | 73.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.20            | 0.2          | 75.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.42            | 0.2          | 76.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 6.63            | 0.1          | 78.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>6.81</b>     | 0.1          | 79.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 6.81            | 0.0          | 81.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 6.81            | 0.0          | 82.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 6.81            | 0.0          | 84.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 6.81            | 0.0          | 85.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 6.81            | 0.0          | 87.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 6.81            | 0.0          | 88.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 6.81            | 0.0          | 90.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 6.81            | 0.0          | 91.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 6.81            | 0.0          | 93.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 6.81            | 0.0          | 94.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 6.81            | 0.0          | 96.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 6.81            | 0.0          | 97.50        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 6.81            | 0.0          | 99.00        | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 6.81            | 0.0          | 100.50       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 6.81            | 0.0          | 102.00       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 6.81            | 0.0          | 103.50       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 6.81            | 0.0          | 105.00       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 6.81            | 0.0          | 106.50       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 6.81            | 0.0          | 108.00       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 6.81            | 0.0          | 109.50       | 8.62             | 6.81            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 20S: Undeveloped**

Runoff = 87.7 cfs @ 12.88 hrs, Volume= 854,369 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,809,628 | 70 | Woods, Good, HSG C            |
| 240,208   | 74 | >75% Grass cover, Good, HSG C |
| 2,049,836 | 70 | Weighted Average              |
| 2,049,836 |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.1     | 50            | 0.0210        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 13.2     | 293           | 0.0220        | 0.37              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 11.6     | 322           | 0.0340        | 0.46              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.3     | 1,193         | 0.0850        | 0.73              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 64.2     | 1,858         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 20S: Undeveloped**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.00            | 0.0          | 111.00       | 8.62             | 5.00            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.00            | 0.0          | 112.50       | 8.62             | 5.00            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.00            | 0.0          | 114.00       | 8.62             | 5.00            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.00            | 0.0          | 115.50       | 8.62             | 5.00            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.00            | 0.0          | 117.00       | 8.62             | 5.00            | 0.0          |
| 7.50         | 1.19             | 0.02            | 0.6          | 63.00        | 8.62             | 5.00            | 0.0          | 118.50       | 8.62             | 5.00            | 0.0          |
| 9.00         | 1.58             | 0.10            | 2.2          | 64.50        | 8.62             | 5.00            | 0.0          | 120.00       | 8.62             | 5.00            | 0.0          |
| 10.50        | 2.15             | 0.30            | 5.4          | 66.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.42            | 19.1         | 67.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.18            | 52.2         | 69.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.65            | 17.3         | 70.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 3.98            | 10.8         | 72.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.23            | 8.6          | 73.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.45            | 7.0          | 75.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.65            | 6.4          | 76.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.83            | 5.9          | 78.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.00            | 5.4          | 79.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.00            | 0.7          | 81.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.00            | 0.0          | 82.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.00            | 0.0          | 84.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.00            | 0.0          | 85.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.00            | 0.0          | 87.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.00            | 0.0          | 88.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.00            | 0.0          | 90.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.00            | 0.0          | 91.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.00            | 0.0          | 93.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.00            | 0.0          | 94.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.00            | 0.0          | 96.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.00            | 0.0          | 97.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.00            | 0.0          | 99.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.00            | 0.0          | 100.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.00            | 0.0          | 102.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.00            | 0.0          | 103.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.00            | 0.0          | 105.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.00            | 0.0          | 106.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.00            | 0.0          | 108.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.00            | 0.0          | 109.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 21S: DB1**

Runoff = 22.2 cfs @ 12.13 hrs, Volume= 74,210 cf, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 162,392   | 74 | >75% Grass cover, Good, HSG C |
| 162,392   |    | 100.00% Pervious Area         |

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

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 21S: DB1**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.48            | 0.0          | 111.00       | 8.62             | 5.48            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.48            | 0.0          | 112.50       | 8.62             | 5.48            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.48            | 0.0          | 114.00       | 8.62             | 5.48            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.48            | 0.0          | 115.50       | 8.62             | 5.48            | 0.0          |
| 6.00         | 0.89             | 0.01            | 0.1          | 61.50        | 8.62             | 5.48            | 0.0          | 117.00       | 8.62             | 5.48            | 0.0          |
| 7.50         | 1.19             | 0.06            | 0.2          | 63.00        | 8.62             | 5.48            | 0.0          | 118.50       | 8.62             | 5.48            | 0.0          |
| 9.00         | 1.58             | 0.18            | 0.4          | 64.50        | 8.62             | 5.48            | 0.0          | 120.00       | 8.62             | 5.48            | 0.0          |
| 10.50        | 2.15             | 0.42            | 0.8          | 66.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.69            | 11.1         | 67.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.58            | 1.7          | 69.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 4.08            | 1.0          | 70.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.42            | 0.8          | 72.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.69            | 0.6          | 73.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.91            | 0.5          | 75.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 5.12            | 0.5          | 76.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 5.31            | 0.5          | 78.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.48            | 0.4          | 79.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.48            | 0.0          | 81.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.48            | 0.0          | 82.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.48            | 0.0          | 84.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.48            | 0.0          | 85.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.48            | 0.0          | 87.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.48            | 0.0          | 88.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.48            | 0.0          | 90.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.48            | 0.0          | 91.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.48            | 0.0          | 93.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.48            | 0.0          | 94.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.48            | 0.0          | 96.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.48            | 0.0          | 97.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.48            | 0.0          | 99.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.48            | 0.0          | 100.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.48            | 0.0          | 102.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.48            | 0.0          | 103.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.48            | 0.0          | 105.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.48            | 0.0          | 106.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.48            | 0.0          | 108.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.48            | 0.0          | 109.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 22S: 465 SITE ROOF**

Runoff = 17.3 cfs @ 12.17 hrs, Volume= 77,938 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 57,453    | 98 | Roofs, HSG C            |
| 54,155    | 98 | Roofs, HSG C            |
| 111,608   | 98 | Weighted Average        |
| 111,608   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 10.0     |               |               |                   |                | Direct Entry, |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 22S: 465 SITE ROOF**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 8.38            | 0.0          | 111.00       | 8.62             | 8.38            | 0.0          |
| 1.50         | 0.19             | 0.06            | 0.2          | 57.00        | 8.62             | 8.38            | 0.0          | 112.50       | 8.62             | 8.38            | 0.0          |
| 3.00         | 0.40             | 0.23            | 0.3          | 58.50        | 8.62             | 8.38            | 0.0          | 114.00       | 8.62             | 8.38            | 0.0          |
| 4.50         | 0.64             | 0.44            | 0.4          | 60.00        | 8.62             | 8.38            | 0.0          | 115.50       | 8.62             | 8.38            | 0.0          |
| 6.00         | 0.89             | 0.68            | 0.4          | 61.50        | 8.62             | 8.38            | 0.0          | 117.00       | 8.62             | 8.38            | 0.0          |
| 7.50         | 1.19             | 0.98            | 0.6          | 63.00        | 8.62             | 8.38            | 0.0          | 118.50       | 8.62             | 8.38            | 0.0          |
| 9.00         | 1.58             | 1.36            | 0.7          | 64.50        | 8.62             | 8.38            | 0.0          | 120.00       | 8.62             | 8.38            | 0.0          |
| 10.50        | 2.15             | 1.93            | 1.2          | 66.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 3.89            | 7.9          | 67.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 6.23            | 1.4          | 69.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 6.80            | 0.8          | 70.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 7.19            | 0.6          | 72.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 7.49            | 0.5          | 73.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 7.75            | 0.4          | 75.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 7.98            | 0.4          | 76.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 8.19            | 0.4          | 78.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 8.38            | 0.3          | 79.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 8.38            | 0.0          | 81.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 8.38            | 0.0          | 82.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 8.38            | 0.0          | 84.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 8.38            | 0.0          | 85.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 8.38            | 0.0          | 87.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 8.38            | 0.0          | 88.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 8.38            | 0.0          | 90.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 8.38            | 0.0          | 91.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 8.38            | 0.0          | 93.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 8.38            | 0.0          | 94.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 8.38            | 0.0          | 96.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 8.38            | 0.0          | 97.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 8.38            | 0.0          | 99.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 8.38            | 0.0          | 100.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 8.38            | 0.0          | 102.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 8.38            | 0.0          | 103.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 8.38            | 0.0          | 105.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 8.38            | 0.0          | 106.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 8.38            | 0.0          | 108.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 8.38            | 0.0          | 109.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 23S: 555 HALF ROOF**

Runoff = 47.7 cfs @ 12.13 hrs, Volume= 192,038 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 275,000   | 98 | Roofs, HSG C            |
| 275,000   |    | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                   |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------|
| 6.0      |               |               |                   |                | <b>Direct Entry,</b>                          |
| 0.7      | 483           | 0.0270        | 11.83             | 37.17          | <b>Pipe Channel,</b>                          |
|          |               |               |                   |                | 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' |
|          |               |               |                   |                | n= 0.013                                      |
| 6.7      | 483           | Total         |                   |                |                                               |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 23S: 555 HALF ROOF**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 8.38            | 0.0          | 111.00       | 8.62             | 8.38            | 0.0          |
| 1.50         | 0.19             | 0.06            | 0.5          | 57.00        | 8.62             | 8.38            | 0.0          | 112.50       | 8.62             | 8.38            | 0.0          |
| 3.00         | 0.40             | 0.23            | 0.8          | 58.50        | 8.62             | 8.38            | 0.0          | 114.00       | 8.62             | 8.38            | 0.0          |
| 4.50         | 0.64             | 0.44            | 1.0          | 60.00        | 8.62             | 8.38            | 0.0          | 115.50       | 8.62             | 8.38            | 0.0          |
| 6.00         | 0.89             | 0.68            | 1.1          | 61.50        | 8.62             | 8.38            | 0.0          | 117.00       | 8.62             | 8.38            | 0.0          |
| 7.50         | 1.19             | 0.98            | 1.4          | 63.00        | 8.62             | 8.38            | 0.0          | 118.50       | 8.62             | 8.38            | 0.0          |
| 9.00         | 1.58             | 1.36            | 1.8          | 64.50        | 8.62             | 8.38            | 0.0          | 120.00       | 8.62             | 8.38            | 0.0          |
| 10.50        | 2.15             | 1.93            | 2.9          | 66.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 3.89            | <b>24.9</b>  | 67.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 6.23            | <b>3.4</b>   | 69.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 6.80            | 1.9          | 70.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 7.19            | 1.5          | 72.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 7.49            | 1.1          | 73.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 7.75            | 1.0          | 75.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 7.98            | 0.9          | 76.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 8.19            | 0.9          | 78.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>8.38</b>     | 0.8          | 79.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 8.38            | 0.0          | 81.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 8.38            | 0.0          | 82.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 8.38            | 0.0          | 84.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 8.38            | 0.0          | 85.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 8.38            | 0.0          | 87.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 8.38            | 0.0          | 88.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 8.38            | 0.0          | 90.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 8.38            | 0.0          | 91.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 8.38            | 0.0          | 93.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 8.38            | 0.0          | 94.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 8.38            | 0.0          | 96.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 8.38            | 0.0          | 97.50        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 8.38            | 0.0          | 99.00        | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 8.38            | 0.0          | 100.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 8.38            | 0.0          | 102.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 8.38            | 0.0          | 103.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 8.38            | 0.0          | 105.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 8.38            | 0.0          | 106.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 8.38            | 0.0          | 108.00       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 8.38            | 0.0          | 109.50       | 8.62             | 8.38            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 24S: LOT3 NORTH**

Runoff = 84.4 cfs @ 12.22 hrs, Volume= 404,914 cf, Depth= 7.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 248,887   | 74 | >75% Grass cover, Good, HSG C |
| 417,105   | 98 | Paved parking, HSG C          |
| 665,992   | 89 | Weighted Average              |
| 248,887   |    | 37.37% Pervious Area          |
| 417,105   |    | 62.63% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 5.5      | 50            | 0.0540        | 0.15              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"                             |
| 4.8      | 200           | 0.0100        | 0.70              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps              |
| 1.5      | 184           | 0.0100        | 2.03              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 3.0      | 1,300         | 0.0100        | 7.20              | 22.62          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 |
| 14.8     | 1,734         | Total         |                   |                |                                                                                   |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 24S: LOT3 NORTH**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 7.30            | 0.0          | 111.00       | 8.62             | 7.30            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 7.30            | 0.0          | 112.50       | 8.62             | 7.30            | 0.0          |
| 3.00         | 0.40             | 0.02            | 0.4          | 58.50        | 8.62             | 7.30            | 0.0          | 114.00       | 8.62             | 7.30            | 0.0          |
| 4.50         | 0.64             | 0.09            | 1.0          | 60.00        | 8.62             | 7.30            | 0.0          | 115.50       | 8.62             | 7.30            | 0.0          |
| 6.00         | 0.89             | 0.22            | 1.5          | 61.50        | 8.62             | 7.30            | 0.0          | 117.00       | 8.62             | 7.30            | 0.0          |
| 7.50         | 1.19             | 0.41            | 2.3          | 63.00        | 8.62             | 7.30            | 0.0          | 118.50       | 8.62             | 7.30            | 0.0          |
| 9.00         | 1.58             | 0.69            | 3.2          | 64.50        | 8.62             | 7.30            | 0.0          | 120.00       | 8.62             | 7.30            | 0.0          |
| 10.50        | 2.15             | 1.16            | 5.7          | 66.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 2.94            | <b>33.5</b>  | 67.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 5.19            | <b>8.7</b>   | 69.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 5.74            | 4.8          | 70.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 6.12            | 3.6          | 72.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 6.42            | 2.8          | 73.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 6.67            | 2.5          | 75.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 6.90            | 2.3          | 76.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 7.11            | 2.1          | 78.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>7.30</b>     | 1.9          | 79.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 7.30            | 0.0          | 81.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 7.30            | 0.0          | 82.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 7.30            | 0.0          | 84.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 7.30            | 0.0          | 85.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 7.30            | 0.0          | 87.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 7.30            | 0.0          | 88.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 7.30            | 0.0          | 90.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 7.30            | 0.0          | 91.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 7.30            | 0.0          | 93.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 7.30            | 0.0          | 94.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 7.30            | 0.0          | 96.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 7.30            | 0.0          | 97.50        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 7.30            | 0.0          | 99.00        | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 7.30            | 0.0          | 100.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 7.30            | 0.0          | 102.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 7.30            | 0.0          | 103.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 7.30            | 0.0          | 105.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 7.30            | 0.0          | 106.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 7.30            | 0.0          | 108.00       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 7.30            | 0.0          | 109.50       | 8.62             | 7.30            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 25S: DB2**

Runoff = 28.8 cfs @ 12.18 hrs, Volume= 112,752 cf, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 246,734   | 74 | >75% Grass cover, Good, HSG C |
| 246,734   |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------|
| 5.3      | 50            | 0.0600        | 0.16              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.20"              |
| 3.5      | 660           | 0.0450        | 3.18              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 1.5      | 119           | 0.0080        | 1.34              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps |
| 10.3     | 829           | Total         |                   |                |                                                                    |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 25S: DB2**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.48            | 0.0          | 111.00       | 8.62             | 5.48            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.48            | 0.0          | 112.50       | 8.62             | 5.48            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.48            | 0.0          | 114.00       | 8.62             | 5.48            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.48            | 0.0          | 115.50       | 8.62             | 5.48            | 0.0          |
| 6.00         | 0.89             | 0.01            | 0.1          | 61.50        | 8.62             | 5.48            | 0.0          | 117.00       | 8.62             | 5.48            | 0.0          |
| 7.50         | 1.19             | 0.06            | 0.3          | 63.00        | 8.62             | 5.48            | 0.0          | 118.50       | 8.62             | 5.48            | 0.0          |
| 9.00         | 1.58             | 0.18            | 0.6          | 64.50        | 8.62             | 5.48            | 0.0          | 120.00       | 8.62             | 5.48            | 0.0          |
| 10.50        | 2.15             | 0.42            | 1.2          | 66.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.69            | 12.0         | 67.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.58            | 2.7          | 69.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 4.08            | 1.5          | 70.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 4.42            | 1.2          | 72.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.69            | 0.9          | 73.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.91            | 0.8          | 75.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 5.12            | 0.8          | 76.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 5.31            | 0.7          | 78.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 24.00        | 8.62             | 5.48            | 0.6          | 79.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.48            | 0.0          | 81.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.48            | 0.0          | 82.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.48            | 0.0          | 84.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.48            | 0.0          | 85.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.48            | 0.0          | 87.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.48            | 0.0          | 88.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.48            | 0.0          | 90.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.48            | 0.0          | 91.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.48            | 0.0          | 93.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.48            | 0.0          | 94.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.48            | 0.0          | 96.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.48            | 0.0          | 97.50        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.48            | 0.0          | 99.00        | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.48            | 0.0          | 100.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.48            | 0.0          | 102.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.48            | 0.0          | 103.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.48            | 0.0          | 105.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.48            | 0.0          | 106.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.48            | 0.0          | 108.00       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.48            | 0.0          | 109.50       | 8.62             | 5.48            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Subcatchment 26S: UNDEVELOPED**

Runoff = 41.4 cfs @ 13.27 hrs, Volume= 525,424 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 1,184,876 | 70 | Woods, Good, HSG C            |
| 75,742    | 74 | >75% Grass cover, Good, HSG C |
| 1,260,618 | 70 | Weighted Average              |
| 1,260,618 |    | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                            |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------|
| 12.3     | 50            | 0.0200        | 0.07              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.20"       |
| 29.6     | 1,022         | 0.0530        | 0.58              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 20.6     | 586           | 0.0360        | 0.47              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 36.1     | 1,210         | 0.0500        | 0.56              |                | <b>Shallow Concentrated Flow,</b><br>Forest w/Heavy Litter Kv= 2.5 fps |
| 98.6     | 2,868         | Total         |                   |                |                                                                        |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Subcatchment 26S: UNDEVELOPED**

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) | Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|--------------|------------------|-----------------|--------------|
| 0.00         | 0.00             | 0.00            | 0.0          | 55.50        | 8.62             | 5.00            | 0.0          | 111.00       | 8.62             | 5.00            | 0.0          |
| 1.50         | 0.19             | 0.00            | 0.0          | 57.00        | 8.62             | 5.00            | 0.0          | 112.50       | 8.62             | 5.00            | 0.0          |
| 3.00         | 0.40             | 0.00            | 0.0          | 58.50        | 8.62             | 5.00            | 0.0          | 114.00       | 8.62             | 5.00            | 0.0          |
| 4.50         | 0.64             | 0.00            | 0.0          | 60.00        | 8.62             | 5.00            | 0.0          | 115.50       | 8.62             | 5.00            | 0.0          |
| 6.00         | 0.89             | 0.00            | 0.0          | 61.50        | 8.62             | 5.00            | 0.0          | 117.00       | 8.62             | 5.00            | 0.0          |
| 7.50         | 1.19             | 0.02            | 0.2          | 63.00        | 8.62             | 5.00            | 0.0          | 118.50       | 8.62             | 5.00            | 0.0          |
| 9.00         | 1.58             | 0.10            | 1.0          | 64.50        | 8.62             | 5.00            | 0.0          | 120.00       | 8.62             | 5.00            | 0.0          |
| 10.50        | 2.15             | 0.30            | 2.5          | 66.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 12.00        | 4.13             | 1.42            | <b>7.6</b>   | 67.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 13.50        | 6.47             | 3.18            | <b>40.3</b>  | 69.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 15.00        | 7.04             | 3.65            | 15.4         | 70.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 16.50        | 7.43             | 3.98            | 8.0          | 72.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 18.00        | 7.73             | 4.23            | 5.8          | 73.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 19.50        | 7.98             | 4.45            | 4.6          | 75.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 21.00        | 8.22             | 4.65            | 4.1          | 76.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 22.50        | 8.43             | 4.83            | 3.7          | 78.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 24.00        | <b>8.62</b>      | <b>5.00</b>     | 3.4          | 79.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 25.50        | 8.62             | 5.00            | 1.4          | 81.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 27.00        | 8.62             | 5.00            | 0.1          | 82.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 28.50        | 8.62             | 5.00            | 0.0          | 84.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 30.00        | 8.62             | 5.00            | 0.0          | 85.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 31.50        | 8.62             | 5.00            | 0.0          | 87.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 33.00        | 8.62             | 5.00            | 0.0          | 88.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 34.50        | 8.62             | 5.00            | 0.0          | 90.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 36.00        | 8.62             | 5.00            | 0.0          | 91.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 37.50        | 8.62             | 5.00            | 0.0          | 93.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 39.00        | 8.62             | 5.00            | 0.0          | 94.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 40.50        | 8.62             | 5.00            | 0.0          | 96.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 42.00        | 8.62             | 5.00            | 0.0          | 97.50        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 43.50        | 8.62             | 5.00            | 0.0          | 99.00        | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 45.00        | 8.62             | 5.00            | 0.0          | 100.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 46.50        | 8.62             | 5.00            | 0.0          | 102.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 48.00        | 8.62             | 5.00            | 0.0          | 103.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 49.50        | 8.62             | 5.00            | 0.0          | 105.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 51.00        | 8.62             | 5.00            | 0.0          | 106.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 52.50        | 8.62             | 5.00            | 0.0          | 108.00       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |
| 54.00        | 8.62             | 5.00            | 0.0          | 109.50       | 8.62             | 5.00            | 0.0          |              |                  |                 |              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Reach 11R: Culvert**

Inflow Area = 640,208 sf, 1.71% Impervious, Inflow Depth = 5.21" for 100-Year D event  
 Inflow = 25.8 cfs @ 12.94 hrs, Volume= 277,895 cf  
 Outflow = 25.8 cfs @ 12.94 hrs, Volume= 277,895 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

Max. Velocity= 5.92 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.42 fps, Avg. Travel Time= 0.3 min

Peak Storage= 218 cf @ 12.94 hrs

Average Depth at Peak Storage= 1.73'

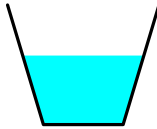
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

2.00' x 3.00' deep channel, n= 0.030 Earth, grassed &amp; winding

Side Slope Z-value= 0.3 ' Top Width= 3.80'

Length= 50.0' Slope= 0.0200 ' /'

Inlet Invert= 280.00', Outlet Invert= 279.00'

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Reach 11R: Culvert**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|-----------------|-----------------|-------------------------|---------------------|------------------|
| 0.00            | 0.0             | 0                       | 280.00              | 0.0              | 111.00          | 0.0             | 0                       | 280.00              | 0.0              |
| 3.00            | 0.0             | 2                       | 280.02              | 0.0              | 114.00          | 0.0             | 0                       | 280.00              | 0.0              |
| 6.00            | 0.1             | 4                       | 280.04              | 0.1              | 117.00          | 0.0             | 0                       | 280.00              | 0.0              |
| 9.00            | 0.8             | 20                      | 280.19              | 0.8              | 120.00          | 0.0             | 0                       | 280.00              | 0.0              |
| 12.00           | <b>7.5</b>      | <b>86</b>               | <b>280.77</b>       | <b>7.4</b>       |                 |                 |                         |                     |                  |
| 15.00           | <b>5.8</b>      | <b>73</b>               | <b>280.67</b>       | <b>5.9</b>       |                 |                 |                         |                     |                  |
| 18.00           | 2.8             | 43                      | 280.41              | 2.8              |                 |                 |                         |                     |                  |
| 21.00           | 2.0             | 36                      | 280.34              | 2.0              |                 |                 |                         |                     |                  |
| 24.00           | 1.7             | 32                      | 280.30              | 1.7              |                 |                 |                         |                     |                  |
| 27.00           | 0.0             | 1                       | 280.01              | 0.0              |                 |                 |                         |                     |                  |
| 30.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 33.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 36.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 39.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 42.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 45.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 48.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 51.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 54.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 57.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 60.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 63.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 66.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 69.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 72.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 75.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 78.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 81.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 84.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 87.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 90.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 93.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 96.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 99.00           | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 102.00          | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 105.00          | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |
| 108.00          | 0.0             | 0                       | 280.00              | 0.0              |                 |                 |                         |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 9P: CULVERT**

Inflow Area = 106,603 sf, 0.00% Impervious, Inflow Depth = 5.48" for 100-Year D event  
 Inflow = 10.3 cfs @ 12.25 hrs, Volume= 48,715 cf  
 Outflow = 9.7 cfs @ 12.30 hrs, Volume= 48,587 cf, Atten= 6%, Lag= 3.1 min  
 Primary = 9.7 cfs @ 12.30 hrs, Volume= 48,587 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs  
 Peak Elev= 296.05' @ 12.30 hrs Surf.Area= 941 sf Storage= 1,443 cf

Plug-Flow detention time= 6.2 min calculated for 48,575 cf (100% of inflow)  
 Center-of-Mass det. time= 4.6 min ( 846.8 - 842.2 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------|
| #1                  | 293.00'              | 4,006 cf         | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet)                                  | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 293.00              | 0                    | 0.0              | 0                                                          | 0                         | 0                   |
| 294.00              | 385                  | 92.0             | 128                                                        | 128                       | 675                 |
| 296.00              | 925                  | 120.0            | 1,271                                                      | 1,400                     | 1,193               |
| 298.00              | 1,723                | 157.0            | 2,607                                                      | 4,006                     | 2,054               |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                      |  |  |
|--------|---------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| #1     | Primary | 294.00' | <b>18.0" Round Culvert</b> L= 75.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 294.00' / 293.00' S= 0.0133 ' S= 0.0133 ' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |  |  |

**Primary OutFlow** Max=9.7 cfs @ 12.30 hrs HW=296.04' (Free Discharge)

**1=Culvert** (Inlet Controls 9.7 cfs @ 5.48 fps)

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Pond 9P: CULVERT**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|-----------------|-----------------|-------------------------|---------------------|------------------|
| 0.00            | 0.0             | 0                       | 293.00              | 0.0              | 111.00          | 0.0             | 128                     | 294.00              | 0.0              |
| 3.00            | 0.0             | 0                       | 293.00              | 0.0              | 114.00          | 0.0             | 128                     | 294.00              | 0.0              |
| 6.00            | 0.0             | 49                      | 293.73              | 0.0              | 117.00          | 0.0             | 128                     | 294.00              | 0.0              |
| 9.00            | 0.2             | 212                     | 294.21              | 0.2              | 120.00          | 0.0             | 128                     | 294.00              | 0.0              |
| 12.00           | <b>3.7</b>      | <b>545</b>              | <b>294.86</b>       | <b>3.3</b>       |                 |                 |                         |                     |                  |
| 15.00           | <b>0.7</b>      | <b>285</b>              | <b>294.37</b>       | <b>0.7</b>       |                 |                 |                         |                     |                  |
| 18.00           | 0.4             | 244                     | 294.28              | 0.4              |                 |                 |                         |                     |                  |
| 21.00           | 0.3             | 232                     | 294.25              | 0.3              |                 |                 |                         |                     |                  |
| 24.00           | 0.3             | 221                     | 294.23              | 0.3              |                 |                 |                         |                     |                  |
| 27.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 30.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 33.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 36.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 39.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 42.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 45.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 48.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 51.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 54.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 57.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 60.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 63.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 66.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 69.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 72.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 75.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 78.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 81.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 84.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 87.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 90.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 93.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 96.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 99.00           | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 102.00          | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 105.00          | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |
| 108.00          | 0.0             | 128                     | 294.00              | 0.0              |                 |                 |                         |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 10P: DB1**

Inflow Area = 1,677,085 sf, 37.19% Impervious, Inflow Depth = 6.50" for 100-Year D event  
 Inflow = 148.9 cfs @ 12.22 hrs, Volume= 908,954 cf  
 Outflow = 32.8 cfs @ 13.00 hrs, Volume= 908,932 cf, Atten= 78%, Lag= 46.8 min  
 Discarded = 0.7 cfs @ 13.00 hrs, Volume= 63,156 cf  
 Primary = 32.1 cfs @ 13.00 hrs, Volume= 845,776 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 282.27' @ 13.00 hrs Surf.Area= 105,069 sf Storage= 413,960 cf

Plug-Flow detention time= 366.7 min calculated for 908,705 cf (100% of inflow)  
 Center-of-Mass det. time= 367.6 min ( 1,173.6 - 806.0 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 275.00' | 603,909 cf    | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |
| #2     | 273.00' | 138 cf        | <b>4.00'D x 11.00'H Vertical Cone/Cylinder</b>             |
|        |         | 604,047 cf    | Total Available Storage                                    |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 275.00              | 100                  | 40.0             | 0                         | 0                         | 100                 |
| 276.00              | 13,700               | 600.0            | 4,990                     | 4,990                     | 28,622              |
| 277.00              | 27,095               | 820.0            | 20,021                    | 25,011                    | 53,492              |
| 278.00              | 44,050               | 1,020.0          | 35,231                    | 60,242                    | 82,791              |
| 279.00              | 69,900               | 1,580.0          | 56,480                    | 116,721                   | 198,664             |
| 280.00              | 87,050               | 1,610.0          | 78,318                    | 195,040                   | 206,444             |
| 282.00              | 103,500              | 1,725.0          | 190,313                   | 385,353                   | 237,146             |
| 284.00              | 115,160              | 1,730.0          | 218,556                   | 603,909                   | 240,864             |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                      |
|--------|----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary  | 273.34' | <b>24.0" Round Culvert</b> L= 90.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / ' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf |
| #2     | Device 1 | 276.36' | <b>6.0" Vert. Orifice/Grate X 3.00</b> C= 0.600                                                                                                                                                     |
| #3     | Device 1 | 278.80' | <b>0.7' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                |
| #4     | Device 1 | 281.40' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                |

**3780 STORMWATER-(5-31-22)**

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#5 Primary 283.50' **6.0' long x 10.0' breadth Emergency Spillway**  
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60  
 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64  
 #6 Discarded 273.00' **0.270 in/hr Exfiltration over Surface area**

**Discarded OutFlow** Max=0.7 cfs @ 13.00 hrs HW=282.27' (Free Discharge)  
 6=Exfiltration (Exfiltration Controls 0.7 cfs)

**Primary OutFlow** Max=32.2 cfs @ 13.00 hrs HW=282.27' (Free Discharge)  
 1=Culvert (Passes 32.2 cfs of 42.6 cfs potential flow)  
 2=Orifice/Grate (Orifice Controls 6.7 cfs @ 11.46 fps)  
 3=Sharp-Crested Rectangular Weir (Weir Controls 7.4 cfs @ 6.09 fps)  
 4=Orifice/Grate (Orifice Controls 18.0 cfs @ 4.50 fps)  
 5=Emergency Spillway ( Controls 0.0 cfs)

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**Hydrograph for Pond 10P: DB1**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|--------------------|------------------|
| 0.00            | 0.0             | 0                       | 273.00              | 0.0              | 0.0                | 0.0              |
| 6.00            | 2.5             | 20,014                  | 276.80              | 1.4              | 0.2                | 1.2              |
| 12.00           | <b>73.4</b>     | <b>174,301</b>          | <b>279.75</b>       | <b>7.1</b>       | <b>0.5</b>         | <b>6.6</b>       |
| 18.00           | <b>6.7</b>      | <b>310,566</b>          | <b>281.25</b>       | <b>11.1</b>      | <b>0.6</b>         | <b>10.5</b>      |
| 24.00           | 4.5             | 221,446                 | 280.30              | 8.4              | 0.6                | 7.8              |
| 30.00           | 0.0             | 91,701                  | 278.61              | 4.4              | 0.4                | 4.0              |
| 36.00           | 0.0             | 22,563                  | 276.90              | 1.7              | 0.2                | 1.5              |
| 42.00           | 0.0             | 11,340                  | 276.39              | 0.1              | 0.1                | 0.0              |
| 48.00           | 0.0             | 8,930                   | 276.26              | 0.1              | 0.1                | 0.0              |
| 54.00           | 0.0             | 6,783                   | 276.12              | 0.1              | 0.1                | 0.0              |
| 60.00           | 0.0             | 4,850                   | 275.99              | 0.1              | 0.1                | 0.0              |
| 66.00           | 0.0             | 3,262                   | 275.85              | 0.1              | 0.1                | 0.0              |
| 72.00           | 0.0             | 2,068                   | 275.71              | 0.0              | 0.0                | 0.0              |
| 78.00           | 0.0             | 1,211                   | 275.58              | 0.0              | 0.0                | 0.0              |
| 84.00           | 0.0             | 637                     | 275.44              | 0.0              | 0.0                | 0.0              |
| 90.00           | 0.0             | 286                     | 275.31              | 0.0              | 0.0                | 0.0              |
| 96.00           | 0.0             | 104                     | 275.17              | 0.0              | 0.0                | 0.0              |
| 102.00          | 0.0             | 34                      | 275.04              | 0.0              | 0.0                | 0.0              |
| 108.00          | 0.0             | 24                      | 274.91              | 0.0              | 0.0                | 0.0              |
| 114.00          | 0.0             | 22                      | 274.77              | 0.0              | 0.0                | 0.0              |
| 120.00          | 0.0             | 21                      | 274.64              | 0.0              | 0.0                | 0.0              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 12P: CULV 30**

Inflow Area = 527,285 sf, 4.17% Impervious, Inflow Depth = 5.49" for 100-Year D event  
 Inflow = 41.3 cfs @ 12.32 hrs, Volume= 241,445 cf  
 Outflow = 40.0 cfs @ 12.37 hrs, Volume= 241,442 cf, Atten= 3%, Lag= 3.1 min  
 Discarded = 0.0 cfs @ 12.37 hrs, Volume= 466 cf  
 Primary = 40.0 cfs @ 12.37 hrs, Volume= 240,976 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 284.12' @ 12.37 hrs Surf.Area= 1,606 sf Storage= 4,498 cf

Plug-Flow detention time= 3.1 min calculated for 241,442 cf (100% of inflow)  
 Center-of-Mass det. time= 3.0 min ( 848.8 - 845.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                    |
|--------|---------|---------------|--------------------------------------------------------|
| #1     | 279.50' | 8,119 cf      | <b>Custom Stage Data (Conic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|---------------------------|---------------------------|---------------------|
| 279.50              | 0                    | 0                         | 0                         | 0                   |
| 280.00              | 610                  | 102                       | 102                       | 610                 |
| 282.00              | 1,035                | 1,626                     | 1,728                     | 1,081               |
| 284.00              | 1,570                | 2,586                     | 4,315                     | 1,673               |
| 286.00              | 2,255                | 3,804                     | 8,119                     | 2,425               |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                               |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 280.00' | <b>30.0" Round Culvert</b> L= 129.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 280.00' / 278.00' S= 0.0155 ' / ' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |
| #2     | Discarded | 279.50' | <b>0.270 in/hr Exfiltration over Surface area</b>                                                                                                                            |

**Discarded OutFlow** Max=0.0 cfs @ 12.37 hrs HW=284.11' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=39.9 cfs @ 12.37 hrs HW=284.11' (Free Discharge)

↳ **1=Culvert** (Inlet Controls 39.9 cfs @ 8.14 fps)

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Pond 12P: CULV 30**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|--------------------|------------------|
| 0.00            | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 6.00            | 0.2             | 188                     | 280.14              | 0.1              | 0.0                | 0.1              |
| 12.00           | <b>15.2</b>     | <b>1,335</b>            | <b>281.60</b>       | <b>14.3</b>      | <b>0.0</b>         | <b>14.3</b>      |
| 18.00           | <b>2.0</b>      | <b>468</b>              | <b>280.55</b>       | <b>2.1</b>       | <b>0.0</b>         | <b>2.1</b>       |
| 24.00           | 1.4             | 394                     | 280.45              | 1.4              | 0.0                | 1.4              |
| 30.00           | 0.0             | 57                      | 279.91              | 0.0              | 0.0                | 0.0              |
| 36.00           | 0.0             | 18                      | 279.78              | 0.0              | 0.0                | 0.0              |
| 42.00           | 0.0             | 3                       | 279.64              | 0.0              | 0.0                | 0.0              |
| 48.00           | 0.0             | 0                       | 279.51              | 0.0              | 0.0                | 0.0              |
| 54.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 60.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 66.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 72.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 78.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 84.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 90.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 96.00           | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 102.00          | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 108.00          | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 114.00          | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |
| 120.00          | 0.0             | 0                       | 279.50              | 0.0              | 0.0                | 0.0              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 13P: CULV 12A**

Inflow Area = 421,825 sf, 65.19% Impervious, Inflow Depth = 7.37" for 100-Year D event  
 Inflow = 56.2 cfs @ 12.16 hrs, Volume= 259,134 cf  
 Outflow = 43.5 cfs @ 12.24 hrs, Volume= 259,140 cf, Atten= 23%, Lag= 4.8 min  
 Primary = 43.5 cfs @ 12.24 hrs, Volume= 259,140 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 6  
 Peak Elev= 295.64' @ 12.24 hrs Surf.Area= 4,411 sf Storage= 12,653 cf

Plug-Flow detention time= 2.6 min calculated for 259,075 cf (100% of inflow)  
 Center-of-Mass det. time= 2.6 min ( 772.0 - 769.4 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 291.00' | 28,701 cf     | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
|---------------------|----------------------|------------------|---------------------------|---------------------------|---------------------|
| 291.00              | 100                  | 40.0             | 0                         | 0                         | 100                 |
| 292.00              | 2,142                | 200.0            | 902                       | 902                       | 3,158               |
| 294.00              | 3,334                | 230.0            | 5,432                     | 6,334                     | 4,271               |
| 296.00              | 4,670                | 270.0            | 7,967                     | 14,300                    | 5,939               |
| 298.00              | 6,352                | 323.0            | 10,979                    | 25,279                    | 8,510               |
| 298.50              | 7,345                | 340.0            | 3,421                     | 28,701                    | 9,422               |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                            |
|--------|---------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 291.00' | <b>30.0" Round Culvert</b> L= 120.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 291.00' / 286.20' S= 0.0400 1' Cc= 0.900 n= 0.013, Flow Area= 4.91 sf |

**Primary OutFlow** Max=43.5 cfs @ 12.24 hrs HW=295.64' (Free Discharge)

**1=Culvert** (Inlet Controls 43.5 cfs @ 8.86 fps)

**3780 STORMWATER-(5-31-22)**

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**Hydrograph for Pond 13P: CULV 12A**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|-----------------|-----------------|-------------------------|---------------------|------------------|
| 0.00            | 0.0             | 0                       | 291.00              | 0.0              | 111.00          | 0.0             | 0                       | 291.00              | 0.0              |
| 3.00            | 0.8             | 94                      | 291.34              | 0.8              | 114.00          | 0.0             | 0                       | 291.00              | 0.0              |
| 6.00            | 1.1             | 128                     | 291.40              | 1.1              | 117.00          | 0.0             | 0                       | 291.00              | 0.0              |
| 9.00            | 2.1             | 245                     | 291.56              | 2.1              | 120.00          | 0.0             | 0                       | 291.00              | 0.0              |
| 12.00           | <b>26.8</b>     | <b>3,595</b>            | <b>293.10</b>       | <b>21.7</b>      |                 |                 |                         |                     |                  |
| 15.00           | <b>2.9</b>      | <b>361</b>              | <b>291.67</b>       | <b>2.9</b>       |                 |                 |                         |                     |                  |
| 18.00           | 1.7             | 201                     | 291.51              | 1.7              |                 |                 |                         |                     |                  |
| 21.00           | 1.4             | 163                     | 291.46              | 1.4              |                 |                 |                         |                     |                  |
| 24.00           | 1.2             | 134                     | 291.41              | 1.2              |                 |                 |                         |                     |                  |
| 27.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 30.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 33.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 36.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 39.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 42.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 45.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 48.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 51.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 54.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 57.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 60.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 63.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 66.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 69.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 72.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 75.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 78.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 81.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 84.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 87.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 90.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 93.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 96.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 99.00           | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 102.00          | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 105.00          | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |
| 108.00          | 0.0             | 0                       | 291.00              | 0.0              |                 |                 |                         |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 22P: INF**

Inflow Area = 111,608 sf, 100.00% Impervious, Inflow Depth = 8.38" for 100-Year D event  
 Inflow = 17.3 cfs @ 12.17 hrs, Volume= 77,938 cf  
 Outflow = 17.1 cfs @ 12.17 hrs, Volume= 77,968 cf, Atten= 1%, Lag= 0.0 min  
 Discarded = 0.0 cfs @ 12.15 hrs, Volume= 1,704 cf  
 Primary = 17.1 cfs @ 12.17 hrs, Volume= 76,264 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 290.78' @ 12.17 hrs Surf.Area= 2,044 sf Storage= 4,175 cf

Plug-Flow detention time= 20.8 min calculated for 77,929 cf (100% of inflow)  
 Center-of-Mass det. time= 21.3 min ( 766.7 - 745.4 )

| Volume   | Invert  | Avail.Storage | Storage Description                                                                                                                                                                                                    |
|----------|---------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1A      | 285.50' | 1,589 cf      | <b>28.00'W x 73.00'L x 3.21'H Field A</b><br>6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids                                                                                                             |
| #2A      | 286.00' | 2,587 cf      | <b>Cultec R-280HD</b> x 60 Inside #1<br>Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf<br>Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap<br>Row Length Adjustment= +1.00' x 6.07 sf x 6 rows |
| 4,175 cf |         |               | Total Available Storage                                                                                                                                                                                                |

Storage Group A created with Chamber Wizard

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                            |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 286.00' | <b>18.0" Round Culvert</b> L= 20.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 286.00' / 285.14' S= 0.0430 1' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf |
| #2     | Discarded | 285.50' | <b>0.270 in/hr Exfiltration over Wetted area</b>                                                                                                                          |

**Discarded OutFlow** Max=0.0 cfs @ 12.15 hrs HW=290.60' (Free Discharge)  
 ↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

**Primary OutFlow** Max=16.9 cfs @ 12.17 hrs HW=290.69' (Free Discharge)  
 ↳ **1=Culvert** (Inlet Controls 16.9 cfs @ 9.56 fps)

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**Hydrograph for Pond 22P: INF**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|--------------------|------------------|
| 0.00            | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 6.00            | 0.4             | 909                     | 286.28              | 0.4              | 0.0                | 0.4              |
| 12.00           | <b>7.9</b>      | <b>2,586</b>            | <b>287.28</b>       | <b>6.2</b>       | <b>0.0</b>         | <b>6.2</b>       |
| 18.00           | <b>0.5</b>      | <b>945</b>              | <b>286.30</b>       | <b>0.5</b>       | <b>0.0</b>         | <b>0.5</b>       |
| 24.00           | 0.3             | 839                     | 286.24              | 0.3              | 0.0                | 0.3              |
| 30.00           | 0.0             | 248                     | 285.80              | 0.0              | 0.0                | 0.0              |
| 36.00           | 0.0             | 3                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 42.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 48.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 54.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 60.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 66.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 72.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 78.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 84.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 90.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 96.00           | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 102.00          | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 108.00          | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 114.00          | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |
| 120.00          | 0.0             | 0                       | 285.50              | 0.0              | 0.0                | 0.0              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Pond 30P: DB2**

Inflow Area = 1,187,726 sf, 58.27% Impervious, Inflow Depth = 7.17" for 100-Year D event  
 Inflow = 147.9 cfs @ 12.17 hrs, Volume= 709,704 cf  
 Outflow = 36.5 cfs @ 12.62 hrs, Volume= 709,689 cf, Atten= 75%, Lag= 26.6 min  
 Discarded = 0.6 cfs @ 12.62 hrs, Volume= 49,703 cf  
 Primary = 35.9 cfs @ 12.62 hrs, Volume= 659,985 cf

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs / 4  
 Peak Elev= 325.65' @ 12.62 hrs Surf.Area= 91,900 sf Storage= 295,082 cf

Plug-Flow detention time= 264.7 min calculated for 709,511 cf (100% of inflow)  
 Center-of-Mass det. time= 265.7 min ( 1,052.3 - 786.6 )

| Volume              | Invert               | Avail.Storage    | Storage Description                                        |                           |                           |                     |
|---------------------|----------------------|------------------|------------------------------------------------------------|---------------------------|---------------------------|---------------------|
| #1                  | 319.00'              | 329,237 cf       | <b>Custom Stage Data (Irregular)</b> Listed below (Recalc) |                           |                           |                     |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Perim.<br>(feet) | Voids<br>(%)                                               | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) | Wet.Area<br>(sq-ft) |
| 319.00              | 400                  | 80.0             | 0.0                                                        | 0                         | 0                         | 400                 |
| 320.00              | 19,450               | 575.0            | 100.0                                                      | 7,546                     | 7,546                     | 26,203              |
| 321.00              | 28,075               | 685.0            | 100.0                                                      | 23,631                    | 31,177                    | 37,250              |
| 322.00              | 37,630               | 790.0            | 100.0                                                      | 32,736                    | 63,913                    | 49,597              |
| 323.00              | 50,456               | 930.0            | 100.0                                                      | 43,887                    | 107,800                   | 68,779              |
| 324.00              | 69,750               | 1,090.0          | 100.0                                                      | 59,843                    | 167,643                   | 94,518              |
| 325.00              | 76,570               | 1,130.0          | 100.0                                                      | 73,133                    | 240,777                   | 101,671             |
| 326.00              | 100,910              | 1,570.0          | 100.0                                                      | 88,461                    | 329,237                   | 196,219             |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                            |  |  |  |
|--------|----------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| #1     | Primary  | 319.00' | <b>24.0" Round Culvert</b> L= 70.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 319.00' / 315.50' S= 0.0500 'l' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf                 |  |  |  |
| #2     | Device 1 | 320.34' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                 |  |  |  |
| #3     | Device 1 | 322.50' | <b>20.0 deg x 1.0' long Sharp-Crested Vee/Trap Weir</b> Cv= 2.69 (C= 3.36)                                                                                                                |  |  |  |
| #4     | Device 1 | 324.90' | <b>24.0" x 24.0" Horiz. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                      |  |  |  |
| #5     | Primary  | 325.50' | <b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir X 0.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 |  |  |  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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#6 Discarded 319.00' **0.270 in/hr Exfiltration over Surface area****Discarded OutFlow** Max=0.6 cfs @ 12.62 hrs HW=325.65' (Free Discharge)↳ **6=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=35.9 cfs @ 12.62 hrs HW=325.65' (Free Discharge)↳ **1=Culvert** (Inlet Controls 35.9 cfs @ 11.44 fps)↳ **2=Orifice/Grate** (Passes < 5.8 cfs potential flow)↳ **3=Sharp-Crested Vee/Trap Weir** (Passes < 27.1 cfs potential flow)↳ **4=Orifice/Grate** (Passes < 16.6 cfs potential flow)↳ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)**3780 STORMWATER-(5-31-22)**

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**Hydrograph for Pond 30P: DB2**

| Time<br>(hours) | Inflow<br>(cfs) | Storage<br>(cubic-feet) | Elevation<br>(feet) | Outflow<br>(cfs) | Discarded<br>(cfs) | Primary<br>(cfs) |
|-----------------|-----------------|-------------------------|---------------------|------------------|--------------------|------------------|
| 0.00            | 0.0             | 0                       | 319.00              | 0.0              | 0.0                | 0.0              |
| 6.00            | 2.6             | 23,611                  | 320.72              | 0.7              | 0.2                | 0.5              |
| 12.00           | <b>70.4</b>     | <b>160,070</b>          | <b>323.89</b>       | <b>11.7</b>      | <b>0.4</b>         | <b>11.2</b>      |
| 18.00           | <b>4.9</b>      | <b>135,890</b>          | <b>323.51</b>       | <b>8.6</b>       | <b>0.4</b>         | <b>8.3</b>       |
| 24.00           | 3.3             | 94,697                  | 322.73              | 4.4              | 0.3                | 4.1              |
| 30.00           | 0.0             | 33,144                  | 321.07              | 1.6              | 0.2                | 1.5              |
| 36.00           | 0.0             | 18,389                  | 320.50              | 0.3              | 0.1                | 0.1              |
| 42.00           | 0.0             | 14,594                  | 320.34              | 0.1              | 0.1                | 0.0              |
| 48.00           | 0.0             | 11,673                  | 320.20              | 0.1              | 0.1                | 0.0              |
| 54.00           | 0.0             | 8,902                   | 320.07              | 0.1              | 0.1                | 0.0              |
| 60.00           | 0.0             | 6,330                   | 319.93              | 0.1              | 0.1                | 0.0              |
| 66.00           | 0.0             | 4,270                   | 319.80              | 0.1              | 0.1                | 0.0              |
| 72.00           | 0.0             | 2,712                   | 319.66              | 0.1              | 0.1                | 0.0              |
| 78.00           | 0.0             | 1,586                   | 319.53              | 0.0              | 0.0                | 0.0              |
| 84.00           | 0.0             | 821                     | 319.39              | 0.0              | 0.0                | 0.0              |
| 90.00           | 0.0             | 349                     | 319.26              | 0.0              | 0.0                | 0.0              |
| 96.00           | 0.0             | 98                      | 319.12              | 0.0              | 0.0                | 0.0              |
| 102.00          | 0.0             | 9                       | 319.02              | 0.0              | 0.0                | 0.0              |
| 108.00          | 0.0             | 1                       | 319.00              | 0.0              | 0.0                | 0.0              |
| 114.00          | 0.0             | 0                       | 319.00              | 0.0              | 0.0                | 0.0              |
| 120.00          | 0.0             | 0                       | 319.00              | 0.0              | 0.0                | 0.0              |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Link 1L: Total PreDeveloped West**

Inflow Area = 4,510,313 sf, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year D event  
 Inflow = 155.5 cfs @ 13.17 hrs, Volume= 1,879,893 cf  
 Primary = 155.5 cfs @ 13.17 hrs, Volume= 1,879,893 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Hydrograph for Link 1L: Total PreDeveloped West**

| Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|
| 0.00            | 0.0             | 0.00                | 0.0              | 55.50           | 0.0             | 0.00                | 0.0              | 111.00          | 0.0             | 0.00                | 0.0              |
| 1.50            | 0.0             | 0.00                | 0.0              | 57.00           | 0.0             | 0.00                | 0.0              | 112.50          | 0.0             | 0.00                | 0.0              |
| 3.00            | 0.0             | 0.00                | 0.0              | 58.50           | 0.0             | 0.00                | 0.0              | 114.00          | 0.0             | 0.00                | 0.0              |
| 4.50            | 0.0             | 0.00                | 0.0              | 60.00           | 0.0             | 0.00                | 0.0              | 115.50          | 0.0             | 0.00                | 0.0              |
| 6.00            | 0.0             | 0.00                | 0.0              | 61.50           | 0.0             | 0.00                | 0.0              | 117.00          | 0.0             | 0.00                | 0.0              |
| 7.50            | 0.8             | 0.00                | 0.8              | 63.00           | 0.0             | 0.00                | 0.0              | 118.50          | 0.0             | 0.00                | 0.0              |
| 9.00            | 3.9             | 0.00                | 3.9              | 64.50           | 0.0             | 0.00                | 0.0              | 120.00          | 0.0             | 0.00                | 0.0              |
| 10.50           | 9.7             | 0.00                | 9.7              | 66.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 12.00           | 30.3            | 0.00                | 30.3             | 67.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 13.50           | 141.5           | 0.00                | 141.5            | 69.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 15.00           | 50.2            | 0.00                | 50.2             | 70.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 16.50           | 27.2            | 0.00                | 27.2             | 72.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 18.00           | 20.2            | 0.00                | 20.2             | 73.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 19.50           | 16.1            | 0.00                | 16.1             | 75.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 21.00           | 14.5            | 0.00                | 14.5             | 76.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 22.50           | 13.3            | 0.00                | 13.3             | 78.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 24.00           | 12.1            | 0.00                | 12.1             | 79.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 25.50           | 4.0             | 0.00                | 4.0              | 81.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 27.00           | 0.4             | 0.00                | 0.4              | 82.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 28.50           | 0.0             | 0.00                | 0.0              | 84.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 30.00           | 0.0             | 0.00                | 0.0              | 85.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 31.50           | 0.0             | 0.00                | 0.0              | 87.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 33.00           | 0.0             | 0.00                | 0.0              | 88.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 34.50           | 0.0             | 0.00                | 0.0              | 90.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 36.00           | 0.0             | 0.00                | 0.0              | 91.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 37.50           | 0.0             | 0.00                | 0.0              | 93.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 39.00           | 0.0             | 0.00                | 0.0              | 94.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 40.50           | 0.0             | 0.00                | 0.0              | 96.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 42.00           | 0.0             | 0.00                | 0.0              | 97.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 43.50           | 0.0             | 0.00                | 0.0              | 99.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 45.00           | 0.0             | 0.00                | 0.0              | 100.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 46.50           | 0.0             | 0.00                | 0.0              | 102.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 48.00           | 0.0             | 0.00                | 0.0              | 103.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 49.50           | 0.0             | 0.00                | 0.0              | 105.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 51.00           | 0.0             | 0.00                | 0.0              | 106.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 52.50           | 0.0             | 0.00                | 0.0              | 108.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 54.00           | 0.0             | 0.00                | 0.0              | 109.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Link 10L: PostDeveloped**

Inflow Area = 2,347,956 sf, 27.53% Impervious, Inflow Depth = 5.84" for 100-Year D event  
 Inflow = 58.5 cfs @ 12.94 hrs, Volume= 1,141,697 cf  
 Primary = 58.5 cfs @ 12.94 hrs, Volume= 1,141,697 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

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**Hydrograph for Link 10L: PostDeveloped**

| Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|
| 0.00            | 0.0             | 0.00                | 0.0              | 55.50           | 0.0             | 0.00                | 0.0              | 111.00          | 0.0             | 0.00                | 0.0              |
| 1.50            | 0.0             | 0.00                | 0.0              | 57.00           | 0.0             | 0.00                | 0.0              | 112.50          | 0.0             | 0.00                | 0.0              |
| 3.00            | 0.0             | 0.00                | 0.0              | 58.50           | 0.0             | 0.00                | 0.0              | 114.00          | 0.0             | 0.00                | 0.0              |
| 4.50            | 0.3             | 0.00                | 0.3              | 60.00           | 0.0             | 0.00                | 0.0              | 115.50          | 0.0             | 0.00                | 0.0              |
| 6.00            | 1.3             | 0.00                | 1.3              | 61.50           | 0.0             | 0.00                | 0.0              | 117.00          | 0.0             | 0.00                | 0.0              |
| 7.50            | 2.4             | 0.00                | 2.4              | 63.00           | 0.0             | 0.00                | 0.0              | 118.50          | 0.0             | 0.00                | 0.0              |
| 9.00            | 3.7             | 0.00                | 3.7              | 64.50           | 0.0             | 0.00                | 0.0              | 120.00          | 0.0             | 0.00                | 0.0              |
| 10.50           | 5.7             | 0.00                | 5.7              | 66.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 12.00           | 16.7            | 0.00                | 16.7             | 67.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 13.50           | 48.8            | 0.00                | 48.8             | 69.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 15.00           | 23.0            | 0.00                | 23.0             | 70.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 16.50           | 15.4            | 0.00                | 15.4             | 72.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 18.00           | 13.4            | 0.00                | 13.4             | 73.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 19.50           | 12.0            | 0.00                | 12.0             | 75.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 21.00           | 11.1            | 0.00                | 11.1             | 76.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 22.50           | 10.2            | 0.00                | 10.2             | 78.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 24.00           | 9.6             | 0.00                | 9.6              | 79.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 25.50           | 7.1             | 0.00                | 7.1              | 81.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 27.00           | 5.7             | 0.00                | 5.7              | 82.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 28.50           | 4.6             | 0.00                | 4.6              | 84.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 30.00           | 4.0             | 0.00                | 4.0              | 85.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 31.50           | 3.6             | 0.00                | 3.6              | 87.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 33.00           | 3.0             | 0.00                | 3.0              | 88.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 34.50           | 2.4             | 0.00                | 2.4              | 90.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 36.00           | 1.5             | 0.00                | 1.5              | 91.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 37.50           | 0.6             | 0.00                | 0.6              | 93.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 39.00           | 0.2             | 0.00                | 0.2              | 94.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 40.50           | 0.1             | 0.00                | 0.1              | 96.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 42.00           | 0.0             | 0.00                | 0.0              | 97.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 43.50           | 0.0             | 0.00                | 0.0              | 99.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 45.00           | 0.0             | 0.00                | 0.0              | 100.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 46.50           | 0.0             | 0.00                | 0.0              | 102.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 48.00           | 0.0             | 0.00                | 0.0              | 103.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 49.50           | 0.0             | 0.00                | 0.0              | 105.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 51.00           | 0.0             | 0.00                | 0.0              | 106.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 52.50           | 0.0             | 0.00                | 0.0              | 108.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 54.00           | 0.0             | 0.00                | 0.0              | 109.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

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**Summary for Link 11L: Total Post Developed West**

Inflow Area = 4,397,792 sf, 14.70% Impervious, Inflow Depth = 5.45" for 100-Year D event  
 Inflow = 145.9 cfs @ 12.90 hrs, Volume= 1,996,066 cf  
 Primary = 145.9 cfs @ 12.90 hrs, Volume= 1,996,066 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

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**Hydrograph for Link 11L: Total Post Developed West**

| Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|
| 0.00            | 0.0             | 0.00                | 0.0              | 55.50           | 0.0             | 0.00                | 0.0              | 111.00          | 0.0             | 0.00                | 0.0              |
| 1.50            | 0.0             | 0.00                | 0.0              | 57.00           | 0.0             | 0.00                | 0.0              | 112.50          | 0.0             | 0.00                | 0.0              |
| 3.00            | 0.0             | 0.00                | 0.0              | 58.50           | 0.0             | 0.00                | 0.0              | 114.00          | 0.0             | 0.00                | 0.0              |
| 4.50            | 0.3             | 0.00                | 0.3              | 60.00           | 0.0             | 0.00                | 0.0              | 115.50          | 0.0             | 0.00                | 0.0              |
| 6.00            | 1.3             | 0.00                | 1.3              | 61.50           | 0.0             | 0.00                | 0.0              | 117.00          | 0.0             | 0.00                | 0.0              |
| 7.50            | 2.9             | 0.00                | 2.9              | 63.00           | 0.0             | 0.00                | 0.0              | 118.50          | 0.0             | 0.00                | 0.0              |
| 9.00            | 5.9             | 0.00                | 5.9              | 64.50           | 0.0             | 0.00                | 0.0              | 120.00          | 0.0             | 0.00                | 0.0              |
| 10.50           | 11.1            | 0.00                | 11.1             | 66.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 12.00           | 35.7            | 0.00                | 35.7             | 67.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 13.50           | 101.0           | 0.00                | 101.0            | 69.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 15.00           | 40.3            | 0.00                | 40.3             | 70.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 16.50           | 26.2            | 0.00                | 26.2             | 72.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 18.00           | 21.9            | 0.00                | 21.9             | 73.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 19.50           | 19.0            | 0.00                | 19.0             | 75.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 21.00           | 17.5            | 0.00                | 17.5             | 76.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 22.50           | 16.1            | 0.00                | 16.1             | 78.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 24.00           | 15.0            | 0.00                | 15.0             | 79.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 25.50           | 7.8             | 0.00                | 7.8              | 81.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 27.00           | 5.7             | 0.00                | 5.7              | 82.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 28.50           | 4.6             | 0.00                | 4.6              | 84.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 30.00           | 4.0             | 0.00                | 4.0              | 85.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 31.50           | 3.6             | 0.00                | 3.6              | 87.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 33.00           | 3.0             | 0.00                | 3.0              | 88.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 34.50           | 2.4             | 0.00                | 2.4              | 90.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 36.00           | 1.5             | 0.00                | 1.5              | 91.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 37.50           | 0.6             | 0.00                | 0.6              | 93.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 39.00           | 0.2             | 0.00                | 0.2              | 94.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 40.50           | 0.1             | 0.00                | 0.1              | 96.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 42.00           | 0.0             | 0.00                | 0.0              | 97.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 43.50           | 0.0             | 0.00                | 0.0              | 99.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 45.00           | 0.0             | 0.00                | 0.0              | 100.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 46.50           | 0.0             | 0.00                | 0.0              | 102.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 48.00           | 0.0             | 0.00                | 0.0              | 103.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 49.50           | 0.0             | 0.00                | 0.0              | 105.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 51.00           | 0.0             | 0.00                | 0.0              | 106.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 52.50           | 0.0             | 0.00                | 0.0              | 108.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 54.00           | 0.0             | 0.00                | 0.0              | 109.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

Prepared by Engineering Design Consultants, Inc.

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**Summary for Link 12L: Total Post-Developed North**

Inflow Area = 2,448,344 sf, 28.27% Impervious, Inflow Depth = 5.81" for 100-Year D event  
 Inflow = 75.9 cfs @ 13.24 hrs, Volume= 1,185,409 cf  
 Primary = 75.9 cfs @ 13.24 hrs, Volume= 1,185,409 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs

**3780 STORMWATER-(5-31-22)**

NRCC 24-hr D 100-Year D Rainfall=8.62"

Prepared by Engineering Design Consultants, Inc.

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**Hydrograph for Link 12L: Total Post-Developed North**

| Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) | Time<br>(hours) | Inflow<br>(cfs) | Elevation<br>(feet) | Primary<br>(cfs) |
|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|-----------------|-----------------|---------------------|------------------|
| 0.00            | 0.0             | 0.00                | 0.0              | 55.50           | 0.0             | 0.00                | 0.0              | 111.00          | 0.0             | 0.00                | 0.0              |
| 1.50            | 0.0             | 0.00                | 0.0              | 57.00           | 0.0             | 0.00                | 0.0              | 112.50          | 0.0             | 0.00                | 0.0              |
| 3.00            | 0.0             | 0.00                | 0.0              | 58.50           | 0.0             | 0.00                | 0.0              | 114.00          | 0.0             | 0.00                | 0.0              |
| 4.50            | 0.0             | 0.00                | 0.0              | 60.00           | 0.0             | 0.00                | 0.0              | 115.50          | 0.0             | 0.00                | 0.0              |
| 6.00            | 0.5             | 0.00                | 0.5              | 61.50           | 0.0             | 0.00                | 0.0              | 117.00          | 0.0             | 0.00                | 0.0              |
| 7.50            | 1.8             | 0.00                | 1.8              | 63.00           | 0.0             | 0.00                | 0.0              | 118.50          | 0.0             | 0.00                | 0.0              |
| 9.00            | 3.3             | 0.00                | 3.3              | 64.50           | 0.0             | 0.00                | 0.0              | 120.00          | 0.0             | 0.00                | 0.0              |
| 10.50           | 5.7             | 0.00                | 5.7              | 66.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 12.00           | 18.8            | 0.00                | 18.8             | 67.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 13.50           | 69.3            | 0.00                | 69.3             | 69.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 15.00           | 31.7            | 0.00                | 31.7             | 70.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 16.50           | 19.2            | 0.00                | 19.2             | 72.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 18.00           | 14.0            | 0.00                | 14.0             | 73.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 19.50           | 11.0            | 0.00                | 11.0             | 75.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 21.00           | 9.4             | 0.00                | 9.4              | 76.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 22.50           | 8.3             | 0.00                | 8.3              | 78.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 24.00           | 7.5             | 0.00                | 7.5              | 79.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 25.50           | 4.7             | 0.00                | 4.7              | 81.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 27.00           | 2.9             | 0.00                | 2.9              | 82.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 28.50           | 2.2             | 0.00                | 2.2              | 84.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 30.00           | 1.5             | 0.00                | 1.5              | 85.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 31.50           | 0.8             | 0.00                | 0.8              | 87.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 33.00           | 0.4             | 0.00                | 0.4              | 88.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 34.50           | 0.2             | 0.00                | 0.2              | 90.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 36.00           | 0.1             | 0.00                | 0.1              | 91.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 37.50           | 0.1             | 0.00                | 0.1              | 93.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 39.00           | 0.0             | 0.00                | 0.0              | 94.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 40.50           | 0.0             | 0.00                | 0.0              | 96.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 42.00           | 0.0             | 0.00                | 0.0              | 97.50           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 43.50           | 0.0             | 0.00                | 0.0              | 99.00           | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 45.00           | 0.0             | 0.00                | 0.0              | 100.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 46.50           | 0.0             | 0.00                | 0.0              | 102.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 48.00           | 0.0             | 0.00                | 0.0              | 103.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 49.50           | 0.0             | 0.00                | 0.0              | 105.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 51.00           | 0.0             | 0.00                | 0.0              | 106.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 52.50           | 0.0             | 0.00                | 0.0              | 108.00          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |
| 54.00           | 0.0             | 0.00                | 0.0              | 109.50          | 0.0             | 0.00                | 0.0              |                 |                 |                     |                  |

**3780 STORMWATER SWALE**

NRCC 24-hr D 100-Year D Rainfall=8.62"

Prepared by Engineering Design Consultants, Inc.

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**Summary for Subcatchment 1S: SWALE NORTH**

Runoff = 14.16 cfs @ 12.13 hrs, Volume= 0.606 af, Depth&gt; 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 10.00-13.00 hrs, dt= 0.05 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 105,938   | 74 | >75% Grass cover, Good, HSG C |
| 105,938   |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---------------|
| 6.0         |                  |                  |                      |                   | Direct Entry, |

**Summary for Subcatchment 2S: SWALE SOUTH**

Runoff = 4.76 cfs @ 12.13 hrs, Volume= 0.204 af, Depth&gt; 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 10.00-13.00 hrs, dt= 0.05 hrs  
NRCC 24-hr D 100-Year D Rainfall=8.62"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 35,608    | 74 | >75% Grass cover, Good, HSG C |
| 35,608    |    | 100.00% Pervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---------------|
| 6.0         |                  |                  |                      |                   | Direct Entry, |

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: 3780 - 555 HOPPING BROOK RD HOLLISTON  
06-01-2022

| Line ID             | Line Length (ft) | Drain Area (ac) | Total Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Pipe Travel (min) | Tc System (min) | i Syst (in/hr) | Total Runoff (cfs) | Q Capt (cfs) | Q Bypass (cfs) | Q Carry (cfs) | Q Total (cfs) | Capac. Full (cfs) | Line Size (in) | Line Slope (ft/ft) | n-value Pipe | Vel Ave (ft/s) | Normal Depth (ft) | Invert Up (ft) | Invert Dn (ft) | Grnd/Rim Elev Up (ft) | Grnd/Rim Elev Dn (ft) |  |
|---------------------|------------------|-----------------|-----------------|------------------|------------------|-------------------|-----------------|----------------|--------------------|--------------|----------------|---------------|---------------|-------------------|----------------|--------------------|--------------|----------------|-------------------|----------------|----------------|-----------------------|-----------------------|--|
| CB A12 to DMH A13   | 12.95            | 2.034           | 2.034           | 0.79             | 6.0              | 0.01              | 6.0             | 7.89           | 12.68              | 16.09        | 0.00           | 1.90          | 16.09         | 36.45             | 18             | 0.1205             | 0.013        | 10.54          | 0.65              | 340.73         | 339.17         | 347.73                | 348.02                |  |
| CB A10 to DMH A11   | 15.39            | 0.718           | 0.718           | 0.81             | 6.0              | 0.03              | 6.0             | 7.89           | 4.59               | 2.69         | 1.90           | 0.00          | 4.59          | 14.67             | 18             | 0.0195             | 0.013        | 2.60           | 0.58              | 341.10         | 340.80         | 348.91                | 349.08                |  |
| CB A8 to DMH A9     | 12.23            | 1.511           | 1.511           | 0.80             | 6.0              | 0.03              | 6.0             | 7.89           | 9.54               | 9.54         | 0.00           | 0.00          | 9.54          | 9.97              | 18             | 0.009              | 0.013        | 5.40           | 1.18              | 342.53         | 342.42         | 349.05                | 349.35                |  |
| CB A6 to DMH A7     | 18.69            | 2.613           | 2.613           | 0.79             | 6.0              | 0.03              | 6.0             | 7.89           | 16.29              | 23.87        | 0.00           | 7.57          | 23.87         | 15.02             | 18             | 0.0205             | 0.013        | 9.22           | 1.50              | 343.94         | 343.56         | 349.05                | 349.39                |  |
| CB A4 to DMH A5     | 13.92            | 1.650           | 1.650           | 0.77             | 6.0              | 0.04              | 6.0             | 7.89           | 10.03              | 6.13         | 7.57           | 3.68          | 13.71         | 9.37              | 18             | 0.008              | 0.013        | 5.68           | 1.36              | 345.71         | 345.60         | 350.42                | 350.45                |  |
| CB A2 to DMH A3     | 27.23            | 0.533           | 0.533           | 0.74             | 6.0              | 0.06              | 6.0             | 7.89           | 3.11               | 1.52         | 1.59           | 0.00          | 3.11          | 5.59              | 12             | 0.0246             | 0.013        | 3.96           | 0.53              | 347.87         | 347.20         | 352.04                | 351.75                |  |
| CB A1 to DMH A3     | 26.88            | 0.748           | 0.748           | 0.73             | 6.0              | 0.07              | 6.0             | 7.89           | 4.31               | 2.22         | 2.09           | 0.00          | 4.31          | 4.18              | 12             | 0.0138             | 0.013        | 5.49           | 0.85              | 347.57         | 347.20         | 351.74                | 351.75                |  |
| DMH A3 to DMH A5    | 184.11           | 0.000           | 1.281           | 0.00             | 0.0              | 0.59              | 6.1             | 7.84           | 7.37               | ....         | ....           | ....          | ....          | 8.12              | 18             | 0.006              | 0.013        | 4.17           | 1.12              | 346.70         | 345.60         | 351.75                | 350.45                |  |
| DMH A5 to DMH A7    | 274.18           | 0.000           | 2.931           | 0.00             | 0.0              | 0.73              | 6.7             | 7.46           | 16.49              | ....         | ....           | ....          | ....          | 17.55             | 24             | 0.006              | 0.013        | 5.25           | 1.54              | 345.10         | 343.45         | 350.45                | 349.39                |  |
| DMH A7 to DMH A9    | 256.00           | 0.000           | 5.544           | 0.00             | 0.0              | 0.59              | 7.4             | 7.05           | 30.15              | ....         | ....           | ....          | ....          | 31.69             | 30             | 0.006              | 0.013        | 6.14           | 1.95              | 342.95         | 341.42         | 349.39                | 349.35                |  |
| DMH A9 to DMH A11   | 267.82           | 0.000           | 7.055           | 0.00             | 0.0              | 0.59              | 8.0             | 6.76           | 37.10              | ....         | ....           | ....          | ....          | 33.06             | 30             | 0.0065             | 0.013        | 7.56           | 2.50              | 341.42         | 339.68         | 349.35                | 349.08                |  |
| DMH A11 to DMH A13  | 249.06           | 0.000           | 7.773           | 0.00             | 0.0              | 0.49              | 8.6             | 6.51           | 39.49              | ....         | ....           | ....          | ....          | 59.32             | 36             | 0.0079             | 0.013        | 8.26           | 1.79              | 339.70         | 337.73         | 349.08                | 348.02                |  |
| DMH A13 to HDWL A14 | 144.58           | 0.000           | 9.807           | 0.00             | 0.0              | 0.17              | 9.1             | 6.32           | 48.46              | ....         | ....           | ....          | ....          | 111.00            | 36             | 0.0277             | 0.013        | 11.04          | 1.41              | 335.00         | 331.00         | 348.02                | 335.43                |  |

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID             | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| CB B9 to DMH B10    | 45.09               | 0.133              | 0.133              | 0.89                | 6.0                 | 0.10                 | 6.0                | 7.89              | 0.93                  | 0.93            | 0.00              | 0.00             | 0.93             | 9.78                 | 12                | 0.0754                | 0.013        | 5.06              | 0.21                 | 346.60            | 343.20            | 351.43                   | 348.16                   |  |
| CB B6 to DMH B8     | 35.81               | 0.406              | 0.406              | 0.88                | 6.0                 | 0.06                 | 6.0                | 7.89              | 2.82                  | 2.82            | 0.00              | 0.00             | 2.82             | 9.40                 | 12                | 0.0697                | 0.013        | 6.86              | 0.38                 | 347.53            | 345.03            | 351.67                   | 349.72                   |  |
| CB B7 to DMH B8     | 30.93               | 0.351              | 0.351              | 0.88                | 6.0                 | 0.06                 | 6.0                | 7.89              | 2.44                  | 2.44            | 0.00              | 0.00             | 2.44             | 7.70                 | 12                | 0.0467                | 0.013        | 5.93              | 0.39                 | 346.48            | 345.03            | 351.64                   | 349.72                   |  |
| CB B4 to DMH B5     | 25.02               | 0.243              | 0.243              | 0.80                | 6.0                 | 0.09                 | 6.0                | 7.89              | 1.53                  | 0.92            | 0.62              | 0.00             | 1.53             | 3.96                 | 12                | 0.0124                | 0.013        | 2.63              | 0.43                 | 346.19            | 345.88            | 350.36                   | 350.48                   |  |
| CB B3 to DMH B5     | 24.83               | 0.303              | 0.303              | 0.82                | 6.0                 | 0.08                 | 6.0                | 7.89              | 1.96                  | 1.09            | 0.87              | 0.00             | 1.96             | 4.02                 | 12                | 0.0127                | 0.013        | 3.36              | 0.49                 | 346.20            | 345.88            | 350.36                   | 350.48                   |  |
| CB B1 to DMH B2     | 35.07               | 0.491              | 0.491              | 0.88                | 6.0                 | 0.06                 | 6.0                | 7.89              | 3.41                  | 3.41            | 0.00              | 0.00             | 3.41             | 7.54                 | 12                | 0.0448                | 0.013        | 4.76              | 0.47                 | 348.00            | 346.43            | 352.83                   | 350.88                   |  |
| DMH B2 to DMH B5    | 45.21               | 0.000              | 0.491              | 0.00                | 0.0                 | 0.15                 | 6.1                | 7.85              | 3.39                  | ....            | ....              | ....             | ....             | 3.55                 | 12                | 0.01                  | 0.013        | 5.14              | 0.78                 | 346.33            | 345.88            | 350.88                   | 350.48                   |  |
| DMH B5 to DMH B8    | 85.07               | 0.000              | 1.037              | 0.00                | 0.0                 | 0.23                 | 6.2                | 7.75              | 6.78                  | ....            | ....              | ....             | ....             | 10.50                | 18                | 0.01                  | 0.013        | 5.75              | 0.88                 | 345.38            | 344.53            | 350.48                   | 349.72                   |  |
| DMH B8 to DMH B10   | 164.61              | 0.000              | 1.794              | 0.00                | 0.0                 | 0.38                 | 6.4                | 7.60              | 11.71                 | ....            | ....              | ....             | ....             | 22.64                | 24                | 0.01                  | 0.013        | 6.41              | 1.02                 | 344.03            | 342.38            | 349.72                   | 348.16                   |  |
| DMH B10 to HDWL B11 | 207.56              | 0.000              | 1.927              | 0.00                | 0.0                 | 0.28                 | 6.8                | 7.37              | 12.22                 | ....            | ....              | ....             | ....             | 48.16                | 24                | 0.0453                | 0.013        | 8.96              | 0.69                 | 339.41            | 330.00            | 348.16                   | 337.67                   |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System B.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID             | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| CB C9 to DMH C10    | 87.86               | 0.482              | 0.482              | 0.88                | 6.0                 | 0.13                 | 6.0                | 7.89              | 3.35                  | 3.35            | 0.00              | 0.00             | 3.35             | 10.08                | 12                | 0.0801                | 0.013        | 7.91              | 0.40                 | 349.38            | 342.35            | 353.55                   | 353.81                   |  |
| CB C7 to DMH C8     | 93.70               | 0.895              | 0.895              | 0.83                | 6.0                 | 0.12                 | 6.0                | 7.89              | 5.86                  | 5.86            | 0.00              | 0.00             | 5.86             | 9.33                 | 12                | 0.0686                | 0.013        | 9.71              | 0.57                 | 344.32            | 337.89            | 348.49                   | 350.57                   |  |
| CB C5 to DMH C6     | 79.76               | 0.546              | 0.546              | 0.83                | 6.0                 | 0.14                 | 6.0                | 7.89              | 3.58                  | 3.58            | 0.00              | 0.00             | 3.58             | 7.40                 | 12                | 0.0432                | 0.013        | 7.01              | 0.49                 | 343.11            | 339.66            | 347.27                   | 349.60                   |  |
| CB C4 to DMH C6     | 81.89               | 0.546              | 0.546              | 0.83                | 6.0                 | 0.15                 | 6.0                | 7.89              | 3.58                  | 3.58            | 0.00              | 0.00             | 3.58             | 7.31                 | 12                | 0.0422                | 0.013        | 6.99              | 0.49                 | 343.11            | 339.66            | 347.28                   | 349.60                   |  |
| CB C2 to DMH C3     | 79.65               | 0.546              | 0.546              | 0.83                | 6.0                 | 0.26                 | 6.0                | 7.89              | 3.58                  | 3.58            | 0.00              | 0.00             | 3.58             | 3.56                 | 12                | 0.01                  | 0.013        | 5.17              | 0.82                 | 343.11            | 342.31            | 347.28                   | 349.60                   |  |
| CB C1 to DMH C3     | 82.52               | 0.546              | 0.546              | 0.83                | 6.0                 | 0.27                 | 6.0                | 7.89              | 3.58                  | 3.58            | 0.00              | 0.00             | 3.58             | 3.57                 | 12                | 0.0101                | 0.013        | 5.18              | 0.82                 | 343.12            | 342.29            | 347.28                   | 349.60                   |  |
| DMH C3 to DMH C6    | 262.83              | 0.000              | 1.092              | 0.00                | 0.0                 | 0.69                 | 6.3                | 7.71              | 6.99                  | ....            | ....              | ....             | ....             | 10.50                | 18                | 0.01                  | 0.013        | 5.90              | 0.89                 | 341.79            | 339.16            | 349.60                   | 349.60                   |  |
| DMH C6 to DMH C8    | 177.72              | 0.000              | 2.184              | 0.00                | 0.0                 | 0.41                 | 7.0                | 7.29              | 13.21                 | ....            | ....              | ....             | ....             | 22.57                | 24                | 0.01                  | 0.013        | 5.19              | 1.10                 | 338.66            | 336.89            | 349.60                   | 350.57                   |  |
| DMH C8 to DMH C10   | 269.06              | 0.000              | 3.079              | 0.00                | 0.0                 | 0.58                 | 7.4                | 7.06              | 18.05                 | ....            | ....              | ....             | ....             | 22.62                | 24                | 0.01                  | 0.013        | 6.43              | 1.35                 | 336.89            | 334.20            | 350.57                   | 353.81                   |  |
| DMH C10 to HDWL C11 | 331.86              | 0.000              | 3.561              | 0.00                | 0.0                 | 0.71                 | 8.0                | 6.78              | 20.20                 | ....            | ....              | ....             | ....             | 22.62                | 24                | 0.01                  | 0.013        | 6.98              | 1.47                 | 334.20            | 330.88            | 353.81                   | 333.25                   |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System C.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...  
06-01-2022

| Line ID             | Line Length (ft) | Drain Area (ac) | Total Area (ac) | Runoff Coeff (C) | Inlet Time (min) | Pipe Travel (min) | Tc System (min) | i Syst (in/hr) | Total Runoff (cfs) | Q Capt (cfs) | Q Bypass (cfs) | Q Carry (cfs) | Q Total (cfs) | Capac. Full (cfs) | Line Size (in) | Line Slope (ft/ft) | n-value Pipe | Vel Ave (ft/s) | Normal Depth (ft) | Invert Up (ft) | Invert Dn (ft) | Grnd/Rim Elev Up (ft) | Grnd/Rim Elev Dn (ft) |  |
|---------------------|------------------|-----------------|-----------------|------------------|------------------|-------------------|-----------------|----------------|--------------------|--------------|----------------|---------------|---------------|-------------------|----------------|--------------------|--------------|----------------|-------------------|----------------|----------------|-----------------------|-----------------------|--|
| CB E18 to DMH E20   | 12.22            | 0.133           | 0.133           | 0.90             | 6.0              | 0.03              | 6.0             | 7.89           | 0.94               | 0.91         | 0.36           | 0.33          | 1.28          | 9.39              | 12             | 0.0696             | 0.013        | 4.39           | 0.21              | 294.40         | 293.55         | 298.03                |                       |  |
| CB E15 to DMH E16   | 22.78            | 0.163           | 0.163           | 0.85             | 6.0              | 0.05              | 6.0             | 7.89           | 1.09               | 1.28         | 0.70           | 0.89          | 1.98          | 9.43              | 12             | 0.0701             | 0.013        | 2.23           | 0.23              | 307.86         | 306.26         | 312.02                | 311.69                |  |
| CB E10 to DMH E12   | 13.96            | 0.122           | 0.122           | 0.90             | 6.0              | 0.03              | 6.0             | 7.89           | 0.87               | 1.11         | 0.53           | 0.78          | 1.64          | 9.48              | 12             | 0.0709             | 0.013        | 1.25           | 0.20              | 319.30         | 318.31         | 323.47                | 323.22                |  |
| CB D6 to DMH D8     | 10.32            | 0.547           | 0.547           | 0.84             | 6.0              | 0.03              | 6.0             | 7.89           | 3.63               | 3.63         | 0.00           | 0.00          | 3.63          | 3.47              | 12             | 0.0095             | 0.013        | 5.02           | 0.87              | 343.12         | 343.02         | 347.28                | 347.55                |  |
| CB D7 to DMH D8     | 22.20            | 0.546           | 0.546           | 0.83             | 6.0              | 0.07              | 6.0             | 7.89           | 3.58               | 3.58         | 0.00           | 0.00          | 3.58          | 3.56              | 12             | 0.01               | 0.013        | 5.17           | 0.82              | 343.11         | 342.89         | 347.27                | 347.55                |  |
| CB D4 to DMH D5     | 11.83            | 0.803           | 0.803           | 0.81             | 6.0              | 0.03              | 6.0             | 7.89           | 5.13               | 11.47        | 0.00           | 6.34          | 11.47         | 10.57             | 18             | 0.0101             | 0.013        | 3.23           | 0.74              | 343.07         | 342.95         | 347.93                | 348.00                |  |
| CB D2 to DMH D3     | 32.77            | 1.468           | 1.468           | 0.72             | 6.0              | 0.05              | 6.0             | 7.89           | 8.34               | 3.00         | 5.34           | 0.00          | 8.34          | 4.38              | 12             | 0.0151             | 0.013        | 10.62          | 1.00              | 347.13         | 346.63         | 351.29                | 351.23                |  |
| CB D1 to DMH D3     | 39.64            | 0.353           | 0.353           | 0.78             | 6.0              | 0.10              | 6.0             | 7.89           | 2.17               | 1.18         | 0.99           | 0.00          | 2.17          | 5.66              | 12             | 0.0252             | 0.013        | 3.57           | 0.43              | 347.63         | 346.63         | 351.79                | 351.23                |  |
| DMH D3 to DMH D5    | 150.89           | 0.000           | 1.821           | 0.00             | 0.0              | 0.26              | 6.1             | 7.82           | 10.42              | ....         | ....           | ....          | ....          | 35.18             | 24             | 0.0242             | 0.013        | 4.48           | 0.75              | 345.98         | 342.33         | 351.23                | 348.00                |  |
| DMH D5 to DMH D8    | 251.01           | 0.000           | 2.624           | 0.00             | 0.0              | 0.45              | 6.4             | 7.65           | 15.17              | ....         | ....           | ....          | ....          | 29.84             | 24             | 0.0174             | 0.013        | 5.70           | 1.01              | 342.33         | 337.96         | 348.00                | 347.55                |  |
| DMH D8 to DMH D9    | 38.15            | 0.000           | 3.717           | 0.00             | 0.0              | 0.04              | 6.8             | 7.37           | 21.35              | ....         | ....           | ....          | ....          | 64.06             | 24             | 0.0802             | 0.013        | 10.77          | 0.80              | 337.96         | 334.90         | 347.55                | 340.19                |  |
| DMH D9 to DMH D10   | 29.81            | 0.000           | 3.717           | 0.00             | 0.0              | 0.03              | 6.8             | 7.35           | 21.29              | ....         | ....           | ....          | ....          | 64.17             | 24             | 0.0805             | 0.013        | 10.49          | 0.79              | 330.75         | 328.35         | 340.19                | 334.86                |  |
| DMH D10 to DMH D11  | 43.02            | 0.000           | 3.717           | 0.00             | 0.0              | 0.05              | 6.9             | 7.34           | 21.24              | ....         | ....           | ....          | ....          | 43.62             | 24             | 0.0372             | 0.013        | 7.25           | 0.98              | 325.13         | 323.53         | 334.86                | 329.53                |  |
| CB E7 to DMH E9     | 34.59            | 0.165           | 0.165           | 0.90             | 6.0              | 0.10              | 6.0             | 7.89           | 1.17               | 1.18         | 0.78           | 0.78          | 1.95          | 5.90              | 12             | 0.0275             | 0.013        | 2.42           | 0.30              | 330.88         | 329.93         | 335.05                | 334.60                |  |
| CB E8 to DMH E9     | 34.06            | 0.227           | 0.227           | 0.85             | 6.0              | 0.09              | 6.0             | 7.89           | 1.52               | 1.25         | 0.87           | 0.61          | 2.13          | 5.92              | 12             | 0.0276             | 0.013        | 2.82           | 0.35              | 330.87         | 329.93         | 335.04                | 334.60                |  |
| CB E4 to DMH E6     | 33.41            | 0.225           | 0.225           | 0.90             | 6.0              | 0.10              | 6.0             | 7.89           | 1.60               | 1.17         | 0.78           | 0.35          | 1.95          | 5.03              | 12             | 0.0199             | 0.013        | 2.21           | 0.39              | 339.32         | 338.65         | 343.48                | 343.33                |  |
| CB E5 to DMH E6     | 31.01            | 0.195           | 0.195           | 0.85             | 6.0              | 0.08              | 6.0             | 7.89           | 1.31               | 1.05         | 0.61           | 0.35          | 1.66          | 6.02              | 12             | 0.0286             | 0.013        | 2.39           | 0.32              | 339.54         | 338.65         | 343.70                | 343.33                |  |
| CB E2 to DMH E3     | 33.18            | 0.168           | 0.168           | 0.90             | 6.0              | 0.08              | 6.0             | 7.89           | 1.19               | 0.84         | 0.35           | 0.00          | 1.19          | 7.13              | 12             | 0.0401             | 0.013        | 2.57           | 0.28              | 346.78         | 345.45         | 350.95                | 350.68                |  |
| CB E1 to DMH E3     | 30.55            | 0.174           | 0.174           | 0.81             | 6.0              | 0.07              | 6.0             | 7.89           | 1.11               | 0.76         | 0.35           | 0.00          | 1.11          | 7.43              | 12             | 0.0435             | 0.013        | 2.46           | 0.26              | 346.78         | 345.45         | 351.00                | 350.68                |  |
| DMH E3 to DMH E6    | 309.44           | 0.000           | 0.342           | 0.00             | 0.0              | 0.80              | 6.1             | 7.84           | 2.29               | ....         | ....           | ....          | ....          | 5.24              | 12             | 0.0217             | 0.013        | 3.61           | 0.46              | 345.35         | 338.65         | 350.68                | 343.33                |  |
| DMH E6 to DMH E9    | 369.15           | 0.000           | 0.762           | 0.00             | 0.0              | 0.80              | 6.9             | 7.33           | 4.84               | ....         | ....           | ....          | ....          | 5.44              | 12             | 0.0234             | 0.013        | 7.11           | 0.73              | 338.55         | 329.93         | 343.33                | 334.60                |  |
| DMH E9 to DMH D10   | 180.27           | 0.000           | 1.154           | 0.00             | 0.0              | 0.33              | 7.7             | 6.90           | 6.92               | ....         | ....           | ....          | ....          | 18.19             | 18             | 0.03               | 0.013        | 4.71           | 0.64              | 329.44         | 324.03         | 334.60                | 329.53                |  |
| DMH D10 to DMH E12  | 147.51           | 0.000           | 4.871           | 0.00             | 0.0              | 0.17              | 8.0             | 6.75           | 26.29              | ....         | ....           | ....          | ....          | 48.02             | 24             | 0.0451             | 0.013        | 8.61           | 1.06              | 323.53         | 316.88         | 329.53                | 323.22                |  |
| CB E11 to DMH E12   | 21.84            | 0.213           | 0.213           | 0.85             | 6.0              | 0.04              | 6.0             | 7.89           | 1.43               | 1.42         | 0.89           | 0.87          | 2.30          | 9.43              | 12             | 0.0701             | 0.013        | 2.18           | 0.26              | 319.34         | 317.81         | 323.51                | 323.22                |  |
| DMH E12 to DMH E13  | 103.10           | 0.000           | 5.206           | 0.00             | 0.0              | 0.11              | 8.2             | 6.67           | 27.94              | ....         | ....           | ....          | ....          | 49.41             | 24             | 0.0477             | 0.013        | 9.08           | 1.08              | 316.88         | 311.96         | 323.22                | 318.60                |  |
| DMH E13 TO DMH E16  | 151.85           | 0.000           | 5.206           | 0.00             | 0.0              | 0.17              | 8.3             | 6.62           | 27.73              | ....         | ....           | ....          | ....          | 47.97             | 24             | 0.045              | 0.013        | 9.02           | 1.09              | 311.96         | 305.13         | 318.60                | 311.69                |  |
| CB E14 to DMH E16   | 15.74            | 0.094           | 0.094           | 0.90             | 6.0              | 0.04              | 6.0             | 7.89           | 0.67               | 0.87         | 0.33           | 0.53          | 1.20          | 9.41              | 12             | 0.0699             | 0.013        | 1.27           | 0.18              | 307.86         | 306.76         | 312.03                | 311.69                |  |
| DMH E16 to DMH E17  | 157.43           | 0.000           | 5.463           | 0.00             | 0.0              | 0.18              | 8.5             | 6.55           | 28.88              | ....         | ....           | ....          | ....          | 48.00             | 24             | 0.045              | 0.013        | 9.36           | 1.12              | 305.13         | 298.04         | 311.69                | 304.58                |  |
| DMH E17 to DMH E20  | 177.92           | 0.000           | 5.463           | 0.00             | 0.0              | 0.21              | 8.7             | 6.47           | 28.56              | ....         | ....           | ....          | ....          | 47.96             | 24             | 0.045              | 0.013        | 9.27           | 1.11              | 298.04         | 290.04         | 304.58                | 298.03                |  |
| CB E19 to DMH E20   | 25.61            | 0.200           | 0.200           | 0.85             | 6.0              | 0.05              | 6.0             | 7.89           | 1.34               | 1.29         | 0.75           | 0.70          | 2.04          | 8.93              | 12             | 0.0629             | 0.013        | 2.60           | 0.26              | 293.96         | 292.35         | 298.13                | 298.03                |  |
| DMH E20 to HDWL E21 | 180.80           | 0.000           | 5.796           | 0.00             | 0.0              | 0.21              | 8.9             | 6.39           | 30.05              | ....         | ....           | ....          | ....          | 47.70             | 24             | 0.0445             | 0.013        | 12.39          | 1.15              | 290.04         | 282.00         | 298.03                | 288.35                |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System D-E.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID           | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|-------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| DMH F1 to DMH F2  | 227.50              | 3.156              | 3.156              | 0.90                | 6.0                 | 0.58                 | 6.0                | 7.89              | 22.42                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 5.48              | 1.65                 | 346.11            | 344.97            | 351.90                   | 355.57                   |  |
| DMH F2 to DMH F3  | 227.50              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.60                 | 6.6                | 7.51              | 21.33                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 4.61              | 1.59                 | 344.97            | 343.83            | 355.57                   | 354.02                   |  |
| DMH F3 to DMH F4  | 246.35              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.67                 | 7.2                | 7.16              | 20.35                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 4.17              | 1.54                 | 343.83            | 342.60            | 354.02                   | 357.38                   |  |
| DMH F4 to DMH F8  | 246.36              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.68                 | 7.8                | 6.83              | 19.39                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 3.95              | 1.50                 | 342.60            | 341.37            | 357.38                   | 347.15                   |  |
| DMH F5 to DMH F6  | 227.50              | 3.156              | 3.156              | 0.90                | 6.0                 | 0.58                 | 6.0                | 7.89              | 22.42                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 5.01              | 1.65                 | 345.23            | 344.09            | 351.90                   | 355.57                   |  |
| DMH F6 to DMH F7  | 227.50              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.60                 | 6.6                | 7.51              | 21.33                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 4.41              | 1.59                 | 344.09            | 342.96            | 355.57                   | 355.32                   |  |
| DMH F7 to DMH F8  | 275.06              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.74                 | 7.2                | 7.16              | 20.35                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 4.15              | 1.54                 | 342.96            | 341.58            | 355.32                   | 347.15                   |  |
| DMH F8 to HDWL F9 | 129.27              | 0.000              | 6.312              | 0.00                | 0.0                 | 0.25                 | 8.5                | 6.53              | 37.08                 | ....            | ....              | ....             | ....             | 61.04                | 36                | 0.0084                | 0.013        | 6.26              | 1.69                 | 341.40            | 340.32            | 347.15                   | 344.16                   |  |
|                   |                     |                    |                    |                     |                     |                      |                    |                   |                       |                 |                   |                  |                  |                      |                   |                       |              |                   |                      |                   |                   |                          |                          |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System F.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID           | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|-------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| DMH G1 to DMH G2  | 227.50              | 3.156              | 3.156              | 0.90                | 6.0                 | 0.58                 | 6.0                | 7.89              | 22.42                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 6.83              | 1.65                 | 345.13            | 344.00            | 351.90                   | 352.22                   |  |
| DMH G2 to DMH G3  | 242.50              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.64                 | 6.6                | 7.51              | 21.33                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 6.13              | 1.59                 | 344.00            | 342.78            | 352.22                   | 355.00                   |  |
| DMH G3 to DMH G4  | 152.13              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.18                 | 7.2                | 7.14              | 20.29                 | ....            | ....              | ....             | ....             | 87.45                | 30                | 0.0455                | 0.013        | 9.68              | 0.82                 | 342.78            | 335.87            | 355.00                   | 348.61                   |  |
| DMH G4 to HDWL G5 | 146.65              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.19                 | 7.4                | 7.05              | 20.01                 | ....            | ....              | ....             | ....             | 82.02                | 30                | 0.04                  | 0.013        | 5.31              | 0.84                 | 335.87            | 330.00            | 348.61                   | 331.67                   |  |
|                   |                     |                    |                    |                     |                     |                      |                    |                   |                       |                 |                   |                  |                  |                      |                   |                       |              |                   |                      |                   |                   |                          |                          |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System G.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID           | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|-------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| DMH H1 to DMH H2  | 227.50              | 3.156              | 3.156              | 0.90                | 6.0                 | 0.58                 | 6.0                | 7.89              | 22.42                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 6.83              | 1.65                 | 345.13            | 344.00            | 351.90                   | 352.22                   |  |
| DMH H2 to DMH H3  | 227.50              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.60                 | 6.6                | 7.51              | 21.33                 | ....            | ....              | ....             | ....             | 29.00                | 30                | 0.005                 | 0.013        | 6.12              | 1.59                 | 344.00            | 342.86            | 352.22                   | 355.90                   |  |
| DMH H3 to DMH H4  | 278.79              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.45                 | 7.2                | 7.16              | 20.35                 | ....            | ....              | ....             | ....             | 58.00                | 30                | 0.02                  | 0.013        | 8.33              | 1.02                 | 342.86            | 337.28            | 355.90                   | 352.12                   |  |
| DMH H4 to HDWL H5 | 295.44              | 0.000              | 3.156              | 0.00                | 0.0                 | 0.46                 | 7.6                | 6.93              | 19.69                 | ....            | ....              | ....             | ....             | 64.39                | 30                | 0.0246                | 0.013        | 5.25              | 0.95                 | 337.28            | 330.00            | 352.12                   | 333.29                   |  |
|                   |                     |                    |                    |                     |                     |                      |                    |                   |                       |                 |                   |                  |                  |                      |                   |                       |              |                   |                      |                   |                   |                          |                          |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System H.sws

# Drainage Report

Stormwater Studio 2022 v 3.0.0.29

Project Name: Enter Project Name...

06-01-2022

| Line ID           | Line Length<br>(ft) | Drain Area<br>(ac) | Total Area<br>(ac) | Runoff Coeff<br>(C) | Inlet Time<br>(min) | Pipe Travel<br>(min) | Tc System<br>(min) | i Syst<br>(in/hr) | Total Runoff<br>(cfs) | Q Capt<br>(cfs) | Q Bypass<br>(cfs) | Q Carry<br>(cfs) | Q Total<br>(cfs) | Capac. Full<br>(cfs) | Line Size<br>(in) | Line Slope<br>(ft/ft) | n-value Pipe | Vel Ave<br>(ft/s) | Normal Depth<br>(ft) | Invert Up<br>(ft) | Invert Dn<br>(ft) | Grnd/Rim Elev Up<br>(ft) | Grnd/Rim Elev Dn<br>(ft) |  |
|-------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|--------------------|-------------------|-----------------------|-----------------|-------------------|------------------|------------------|----------------------|-------------------|-----------------------|--------------|-------------------|----------------------|-------------------|-------------------|--------------------------|--------------------------|--|
| CB J2 to DMH J3   | 21.21               | 0.168              | 0.168              | 0.90                | 6.0                 | 0.05                 | 6.0                | 7.89              | 1.19                  | 1.54            | 0.41              | 0.00             | 1.94             | 6.48                 | 12                | 0.0331                | 0.013        | 4.98              | 0.38                 | 290.74            | 290.04            | 294.81                   | 294.57                   |  |
| CB J1 to DMH J3   | 18.82               | 0.063              | 0.063              | 0.90                | 6.0                 | 0.05                 | 6.0                | 7.89              | 0.45                  | 0.77            | 0.04              | 0.00             | 0.81             | 7.87                 | 12                | 0.0488                | 0.013        | 4.08              | 0.22                 | 290.96            | 290.04            | 294.81                   | 294.57                   |  |
| DMH J3 to HDWL J4 | 87.94               | 0.000              | 0.231              | 0.00                | 0.0                 | 0.13                 | 6.0                | 7.86              | 1.63                  | ....            | ....              | ....             | ....             | 10.08                | 12                | 0.0801                | 0.013        | 7.41              | 0.36                 | 289.04            | 282.00            | 294.57                   | 285.84                   |  |

Notes: IDF File = FraminghamMA.idf, Return Period = 25-yrs.

Project File: Drainage System J.sws

|    | A                                                                                                | B                  | C      | D                                                                                     | E                 | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|---------------------------------------------------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                                                                       |                   |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                                                             |                   |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                                                             |                   |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                                                                       |                   |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                                                                       |                   |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 9.7                | cfs    |                                                                                       |                   | WW horiz. Length=           | 48.0                          | ft      |    |
| 7  | Slope, S=                                                                                        | 0.03               | ft/ft  | =                                                                                     | 33.33             | :1                          | U/S WW F.L. elev=             | 293.0   | ft |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft     |                                                                                       |                   | D/S WW F.L. elev=           | 291.6                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1     |                                                                                       |                   | Waterway drop=              | 1.4                           | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                                                                         |                   | WW length along slope=      | 48.0                          | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                                                                       |                   |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 1.24               | in     |                                                                                       |                   | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 6.00               | in     |                                                                                       |                   | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.037              |        |                                                                                       |                   | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                                                                       |                   | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                                                                       |                   | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.30               | ft     | Calculated                                                                            |                   |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.30               | ft     |                                                                                       |                   |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.030              | ft/ft  | 0.7S <sub>c</sub> =                                                                   | 0.0210            | ft/ft                       |                               |         |    |
| 20 |                                                                                                  |                    |        | 1.3S <sub>c</sub> =                                                                   | 0.0390            | ft/ft                       |                               |         |    |
| 21 | Design slope, S=                                                                                 | 0.0300             | ft/ft  | 0.7S <sub>c</sub> < S < 1.3S <sub>c</sub> . Select a different slope or bottom width. |                   |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 3.00               | fps    |                                                                                       |                   | Est. riprap unit wt=        | 0.02                          | Tons/CY |    |
| 23 |                                                                                                  |                    |        | Rock shape =                                                                          | Angular           | Rock Gs =                   | 2.65                          |         |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected                                            |                   |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 1.00               | ft     | %                                                                                     | Rock dia., inches |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                                                               | min.              | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                                                                   | 9.0               | 12.0                        | 53                            | 126     |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                                                                    | 7.8               | 10.8                        | 35                            | 92      |    |
| 29 | Minimum=                                                                                         | 1.30               | ft     | 50                                                                                    | 6.0               | 9.0                         | 16                            | 53      |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                                                                    | 4.8               | 7.8                         | 8                             | 35      |    |
| 31 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                                                                       |                   |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 94.4               | CY     |                                                                                       |                   |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 1.9                | Tons   |                                                                                       |                   |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 249.0              | SY*    |                                                                                       |                   |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                                                                       |                   |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                                                                       |                   |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                                                                       |                   |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                                                                       |                   |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                                                                       |                   |                             |                               |         |    |

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>ww</sub> thickness = 2.0 Feet.

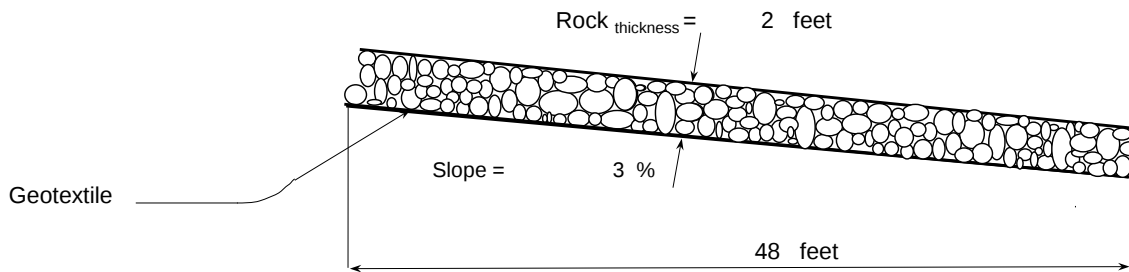
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 9 - 12 (52 - 122)            |
| D <sub>85</sub> -----                                | 8 - 11 (34 - 89)             |
| D <sub>50</sub> -----                                | 6 - 9 (15 - 52)              |
| D <sub>10</sub> -----                                | 5 - 8 (8 - 34)               |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

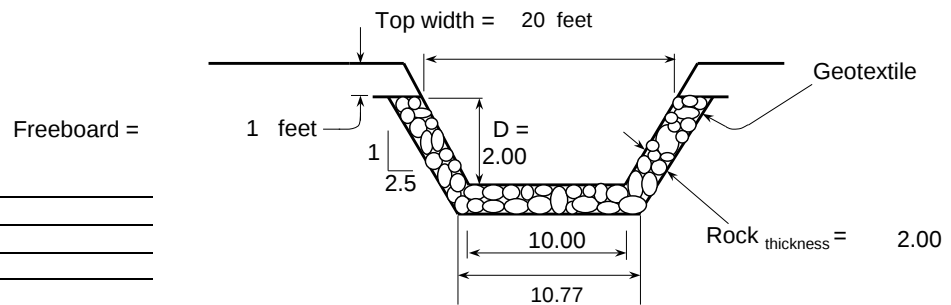
### Quantities

Rock = 94 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 249 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C       | D                                          | E                 | F                           | G                             | H       | I |
|----|--------------------------------------------------------------------------------------------------|--------------------|---------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|---|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |         |                                            |                   |                             |                               |         |   |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County  | Middlesex                                  |                   |                             | V 11.2019                     |         |   |
| 3  | Computed By                                                                                      | WML                | Date    | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |   |
| 4  | Checked by                                                                                       |                    | Date    |                                            |                   |                             |                               |         |   |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |         |                                            |                   |                             |                               |         |   |
| 6  | Design flow, Q=                                                                                  | 36.1               | cfs     |                                            |                   | WW horiz. Length=           | 60.0                          | ft      |   |
| 7  | Slope, S=                                                                                        | 0.13               | ft/ft = | 7.69                                       | :1                | U/S WW F.L. elev=           | 315.5                         | ft      |   |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft      |                                            |                   | D/S WW F.L. elev=           | 307.7                         | ft      |   |
| 9  | Side slope, Z=                                                                                   | 6                  | :1      |                                            |                   | Waterway drop=              | 7.8                           | ft      |   |
| 10 | Safety factor=                                                                                   | 1.2                |         | Typically 1.2                              |                   | WW length along slope=      | 60.5                          | ft      |   |
| 11 | Rock shape =                                                                                     | Angular            |         |                                            |                   |                             |                               |         |   |
| 12 | Min. req'd D50=                                                                                  | 7.03               | in      |                                            |                   | Spreadsheet formatting key: |                               |         |   |
| 13 | D50 used=                                                                                        | 12.00              | in      |                                            |                   | XXX                         | =Input cells                  |         |   |
| 14 | n=                                                                                               | 0.050              |         |                                            |                   | X.XX                        | =Output from "Solve" button   |         |   |
| 15 | Freeboard=                                                                                       | 1.00               | ft      |                                            |                   | X.XX                        | =Other computed output        |         |   |
| 16 |                                                                                                  |                    |         |                                            |                   | Red text                    | =Instructions, warnings, info |         |   |
| 17 | Flow depth, d=                                                                                   | 0.49               | ft      | Calculated                                 |                   |                             |                               |         |   |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.65               | ft      |                                            |                   |                             |                               |         |   |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.046              | ft/ft   | 0.7S <sub>c</sub> =                        | 0.0324            | ft/ft                       |                               |         |   |
| 20 |                                                                                                  |                    |         | 1.3S <sub>c</sub> =                        | 0.0601            | ft/ft                       |                               |         |   |
| 21 | Design slope, S=                                                                                 | 0.1300             | ft/ft   | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |   |
| 22 | Velocity=                                                                                        | 5.76               | fps     |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |   |
| 23 |                                                                                                  |                    |         | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |   |
| 24 | Riprap thickness:                                                                                |                    |         | Required riprap gradation for D50 selected |                   |                             |                               |         |   |
| 25 | Minimum=                                                                                         | 2.00               | ft      | %                                          | Rock dia., inches |                             | Rock weight, lb               |         |   |
| 26 | Provided=                                                                                        | 2.00               | ft      | Smaller                                    | min.              | max.                        | min.                          | max.    |   |
| 27 |                                                                                                  |                    |         | 100                                        | 18.0              | 24.0                        | 425                           | 1007    |   |
| 28 | Sideslope height:                                                                                |                    |         | 85                                         | 15.6              | 21.6                        | 277                           | 734     |   |
| 29 | Minimum=                                                                                         | 1.49               | ft      | 50                                         | 12.0              | 18.0                        | 126                           | 425     |   |
| 30 | Provided=                                                                                        | 2.00               | ft      | 10                                         | 9.6               | 15.6                        | 64                            | 277     |   |
| 31 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 32 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 33 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 34 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 35 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 36 | Quantities:                                                                                      |                    |         |                                            |                   |                             |                               |         |   |
| 37 | Riprap volume=                                                                                   | 209.1              | CY      |                                            |                   |                             |                               |         |   |
| 38 | Approx. weight=                                                                                  | 292.8              | Tons    |                                            |                   |                             |                               |         |   |
| 39 | Geotextile area=                                                                                 | 597.2              | SY*     |                                            |                   |                             |                               |         |   |
| 40 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 41 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 42 | *Geotextile area                                                                                 |                    |         |                                            |                   |                             |                               |         |   |
| 43 | includes actual covered                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 44 | surfaces only (no extra                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 45 | for laps or anchorage)                                                                           |                    |         |                                            |                   |                             |                               |         |   |
| 46 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 12.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

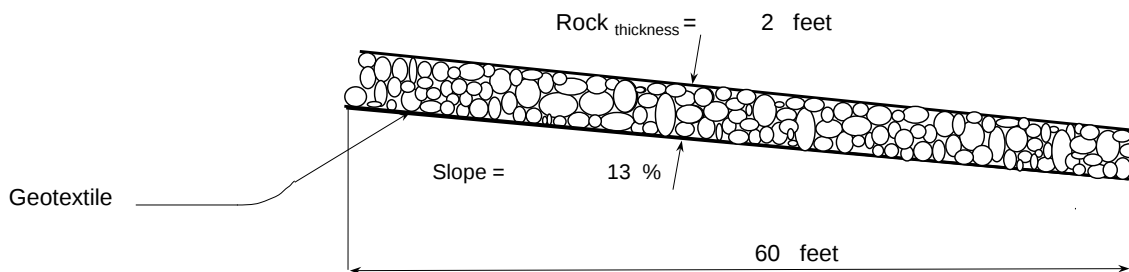
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 18 - 24 (413 - 978)          |
| D <sub>85</sub> -----                                | 16 - 22 (269 - 713)          |
| D <sub>50</sub> -----                                | 12 - 18 (122 - 413)          |
| D <sub>10</sub> -----                                | 10 - 16 (63 - 269)           |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

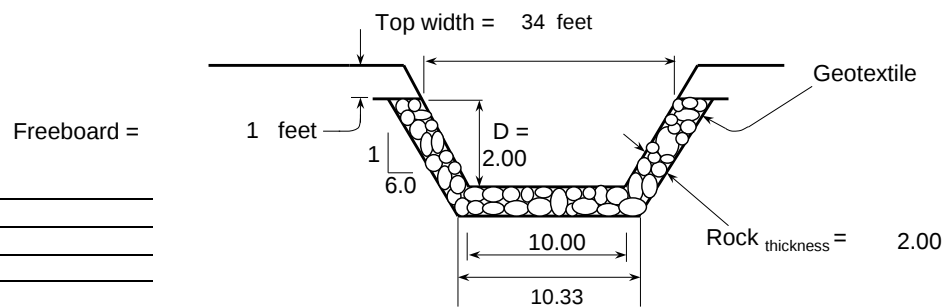
### Quantities

Rock = 209 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 597 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C      | D                                          | E                                       | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|--------------------------------------------|-----------------------------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                            |                                         |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                  |                                         |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                  |                                         |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                            |                                         |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                            |                                         |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 61                 | cfs    |                                            |                                         | WW horiz. Length=           | 244.0                         | ft      |    |
| 7  | Slope, S=                                                                                        | 0.028              | ft/ft  | =                                          | 35.71                                   | :1                          | U/S WW F.L. elev=             | 330.0   | ft |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft     |                                            |                                         | D/S WW F.L. elev=           | 323.2                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1     |                                            |                                         | Waterway drop=              | 6.8                           | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                              |                                         | WW length along slope=      | 244.1                         | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                            |                                         |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 3.11               | in     |                                            |                                         | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 6.00               | in     |                                            |                                         | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.036              |        |                                            |                                         | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                            |                                         | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                            |                                         | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.89               | ft     |                                            | Calculated                              |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.96               | ft     |                                            |                                         |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.021              | ft/ft  |                                            | 0.7S <sub>c</sub> =                     | 0.0147                      | ft/ft                         |         |    |
| 20 |                                                                                                  |                    |        |                                            | 1.3S <sub>c</sub> =                     | 0.0274                      | ft/ft                         |         |    |
| 21 | Design slope, S=                                                                                 | 0.0280             | ft/ft  |                                            | Design slope OK. Flow is Supercritical. |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 5.61               | fps    |                                            |                                         | Est. riprap unit wt=        | 1.4                           | Tons/CY |    |
| 23 |                                                                                                  |                    |        |                                            | Rock shape =                            | Angular                     | Rock Gs =                     | 2.65    |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected |                                         |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 1.00               | ft     | %                                          | Rock dia., inches                       |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                    | min.                                    | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                        | 9.0                                     | 12.0                        | 53                            | 126     |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                         | 7.8                                     | 10.8                        | 35                            | 92      |    |
| 29 | Minimum=                                                                                         | 1.89               | ft     | 50                                         | 6.0                                     | 9.0                         | 16                            | 53      |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                         | 4.8                                     | 7.8                         | 8                             | 35      |    |
| 31 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                            |                                         |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 479.9              | CY     |                                            |                                         |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 671.8              | Tons   |                                            |                                         |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 1187.6             | SY*    |                                            |                                         |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                            |                                         |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                            |                                         |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                            |                                         |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                            |                                         |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

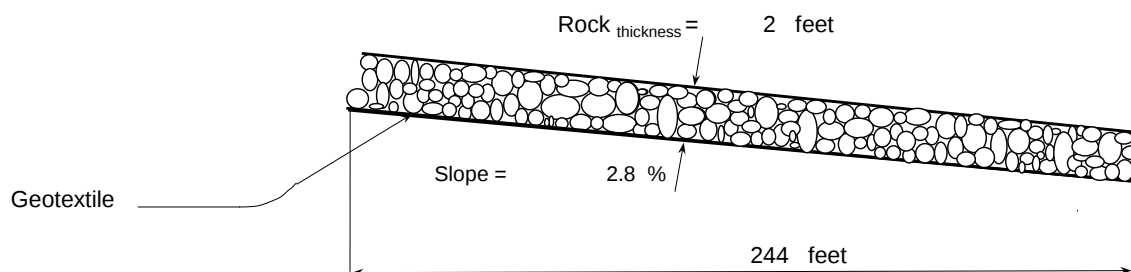
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 9 - 12 (52 - 122)            |
| D <sub>85</sub> -----                                | 8 - 11 (34 - 89)             |
| D <sub>50</sub> -----                                | 6 - 9 (15 - 52)              |
| D <sub>10</sub> -----                                | 5 - 8 (8 - 34)               |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

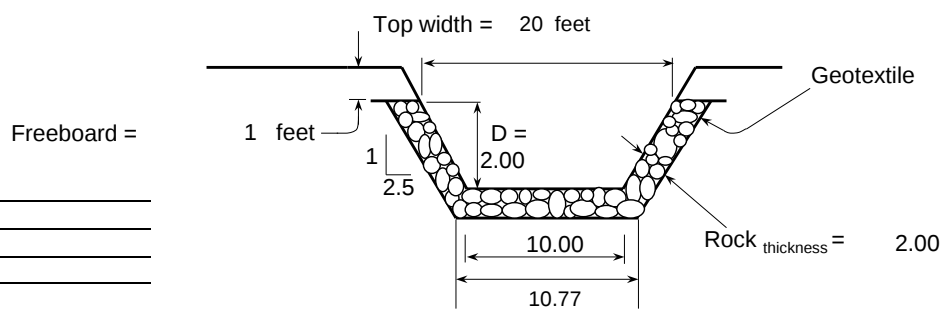
### Quantities

Rock = 480 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 1188 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



### Profile Along Centerline of Rock Lined Waterway



### Rock Lined WW Cross Section

### Profile, Cross Sections, and Quantities



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C      | D                                          | E                 | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                            |                   |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                  |                   |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                            |                   |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                            |                   |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 20.3               | cfs    |                                            |                   | WW horiz. Length=           | 75.0                          | ft      |    |
| 7  | Slope, S=                                                                                        | 0.09               | ft/ft  | =                                          | 11.11             | :1                          | U/S WW F.L. elev=             | 330.9   | ft |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft     |                                            |                   | D/S WW F.L. elev=           | 324.1                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 3                  | :1     |                                            |                   | Waterway drop=              | 6.8                           | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                              |                   | WW length along slope=      | 75.3                          | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                            |                   |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 4.39               | in     |                                            |                   | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 6.00               | in     |                                            |                   | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.043              |        |                                            |                   | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                            |                   | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                            |                   | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.37               | ft     | Calculated                                 |                   |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.48               | ft     |                                            |                   |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.036              | ft/ft  | 0.7S <sub>c</sub> =                        | 0.0253            | ft/ft                       |                               |         |    |
| 20 |                                                                                                  |                    |        | 1.3S <sub>c</sub> =                        | 0.0470            | ft/ft                       |                               |         |    |
| 21 | Design slope, S=                                                                                 | 0.0900             | ft/ft  | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 4.98               | fps    |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |    |
| 23 |                                                                                                  |                    |        | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected |                   |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 1.00               | ft     | %                                          | Rock dia., inches |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                    | min.              | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                        | 9.0               | 12.0                        | 53                            | 126     |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                         | 7.8               | 10.8                        | 35                            | 92      |    |
| 29 | Minimum=                                                                                         | 1.37               | ft     | 50                                         | 6.0               | 9.0                         | 16                            | 53      |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                         | 4.8               | 7.8                         | 8                             | 35      |    |
| 31 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                            |                   |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 163.4              | CY     |                                            |                   |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 228.8              | Tons   |                                            |                   |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 428.2              | SY*    |                                            |                   |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                            |                   |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                            |                   |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>ww</sub> thickness = 2.0 Feet.

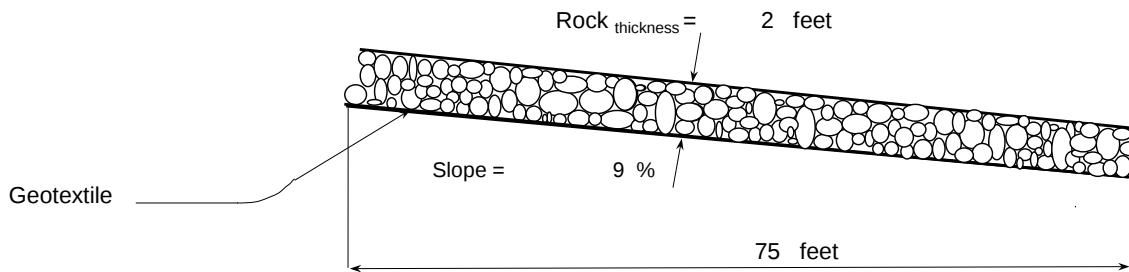
### Rock Gradation Envelope

| <u>% Passing</u>                                     | <u>Diameter, in. (weight, lbs.)</u> |
|------------------------------------------------------|-------------------------------------|
| $D_{100}$ -----                                      | 9 - 12 (52 - 122)                   |
| $D_{85}$ -----                                       | 8 - 11 (34 - 89)                    |
| $D_{50}$ -----                                       | 6 - 9 (15 - 52)                     |
| $D_{10}$ -----                                       | 5 - 8 (8 - 34)                      |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                                     |

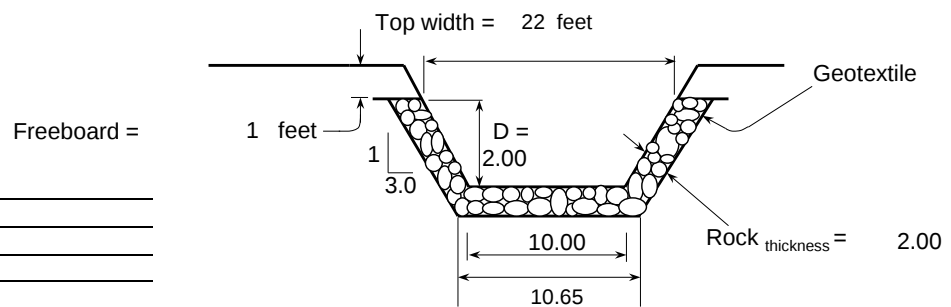
### Quantities

Rock = 163 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 428 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C       | D                                          | E                 | F                           | G                             | H       | I |
|----|--------------------------------------------------------------------------------------------------|--------------------|---------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|---|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |         |                                            |                   |                             |                               |         |   |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County  | Middlesex                                  |                   |                             | V 11.2019                     |         |   |
| 3  | Computed By                                                                                      | WML                | Date    | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |   |
| 4  | Checked by                                                                                       |                    | Date    |                                            |                   |                             |                               |         |   |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |         |                                            |                   |                             |                               |         |   |
| 6  | Design flow, Q=                                                                                  | 41                 | cfs     |                                            |                   | WW horiz. Length=           | 290.0                         | ft      |   |
| 7  | Slope, S=                                                                                        | 0.16               | ft/ft = | 6.25                                       | :1                | U/S WW F.L. elev=           | 340.3                         | ft      |   |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft      |                                            |                   | D/S WW F.L. elev=           | 293.9                         | ft      |   |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1      |                                            |                   | Waterway drop=              | 46.4                          | ft      |   |
| 10 | Safety factor=                                                                                   | 1.2                |         | Typically 1.2                              |                   | WW length along slope=      | 293.7                         | ft      |   |
| 11 | Rock shape =                                                                                     | Angular            |         |                                            |                   |                             |                               |         |   |
| 12 | Min. req'd D50=                                                                                  | 8.02               | in      |                                            |                   | Spreadsheet formatting key: |                               |         |   |
| 13 | D50 used=                                                                                        | 12.00              | in      |                                            |                   | XXX                         | =Input cells                  |         |   |
| 14 | n=                                                                                               | 0.052              |         |                                            |                   | X.XX                        | =Output from "Solve" button   |         |   |
| 15 | Freeboard=                                                                                       | 1.00               | ft      |                                            |                   | X.XX                        | =Other computed output        |         |   |
| 16 |                                                                                                  |                    |         |                                            |                   | Red text                    | =Instructions, warnings, info |         |   |
| 17 | Flow depth, d=                                                                                   | 0.53               | ft      | Calculated                                 |                   |                             |                               |         |   |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.75               | ft      |                                            |                   |                             |                               |         |   |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.046              | ft/ft   | 0.7S <sub>c</sub> =                        | 0.0322            | ft/ft                       |                               |         |   |
| 20 |                                                                                                  |                    |         | 1.3S <sub>c</sub> =                        | 0.0599            | ft/ft                       |                               |         |   |
| 21 | Design slope, S=                                                                                 | 0.1600             | ft/ft   | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |   |
| 22 | Velocity=                                                                                        | 6.90               | fps     |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |   |
| 23 |                                                                                                  |                    |         | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |   |
| 24 | Riprap thickness:                                                                                |                    |         | Required riprap gradation for D50 selected |                   |                             |                               |         |   |
| 25 | Minimum=                                                                                         | 2.00               | ft      | %                                          | Rock dia., inches | Rock weight, lb             |                               |         |   |
| 26 | Provided=                                                                                        | 2.00               | ft      | Smaller                                    | min.              | max.                        | min.                          | max.    |   |
| 27 |                                                                                                  |                    |         | 100                                        | 18.0              | 24.0                        | 425                           | 1007    |   |
| 28 | Sideslope height:                                                                                |                    |         | 85                                         | 15.6              | 21.6                        | 277                           | 734     |   |
| 29 | Minimum=                                                                                         | 1.53               | ft      | 50                                         | 12.0              | 18.0                        | 126                           | 425     |   |
| 30 | Provided=                                                                                        | 2.00               | ft      | 10                                         | 9.6               | 15.6                        | 64                            | 277     |   |
| 31 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 32 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 33 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 34 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 35 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 36 | Quantities:                                                                                      |                    |         |                                            |                   |                             |                               |         |   |
| 37 | Riprap volume=                                                                                   | 577.4              | CY      |                                            |                   |                             |                               |         |   |
| 38 | Approx. weight=                                                                                  | 808.3              | Tons    |                                            |                   |                             |                               |         |   |
| 39 | Geotextile area=                                                                                 | 1425.0             | SY*     |                                            |                   |                             |                               |         |   |
| 40 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 41 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 42 | *Geotextile area                                                                                 |                    |         |                                            |                   |                             |                               |         |   |
| 43 | includes actual covered                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 44 | surfaces only (no extra                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 45 | for laps or anchorage)                                                                           |                    |         |                                            |                   |                             |                               |         |   |
| 46 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |

**WW CROSS SECTION**

**WW PROFILE**

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 12.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

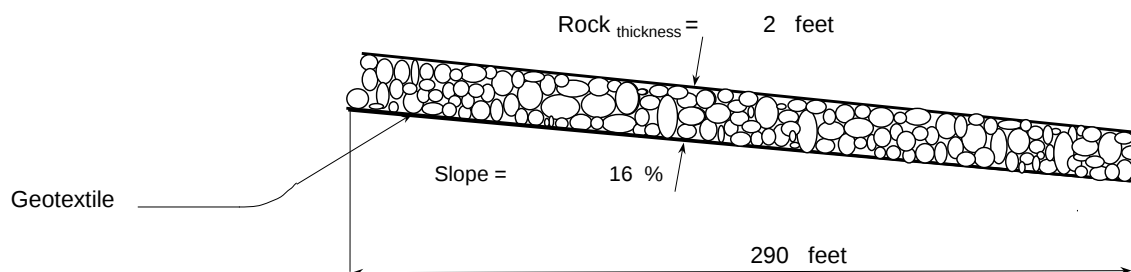
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 18 - 24 (413 - 978)          |
| D <sub>85</sub> -----                                | 16 - 22 (269 - 713)          |
| D <sub>50</sub> -----                                | 12 - 18 (122 - 413)          |
| D <sub>10</sub> -----                                | 10 - 16 (63 - 269)           |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

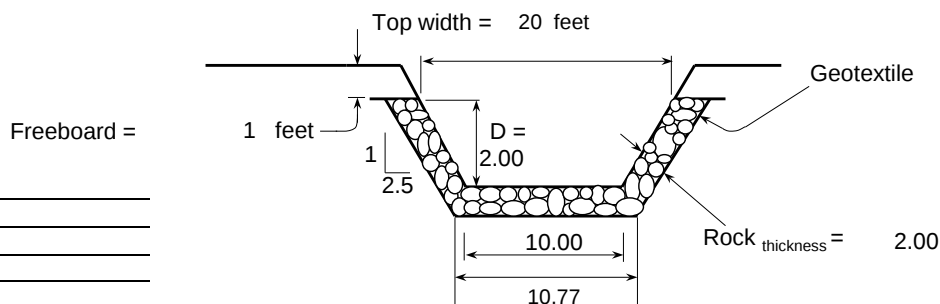
### Quantities

Rock = 577 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 1425 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |           |
|----------|---------|-----------|
| Date     | 5/24/22 | File Name |
| WML      |         |           |
| Drawn    |         |           |
| Checkd   | 0       | 1/0/00    |
| Approved |         |           |

|    | A                                                                                                | B                  | C      | D                                          | E                 | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                            |                   |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                  |                   |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                            |                   |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                            |                   |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 61                 | cfs    |                                            |                   | WW horiz. Length=           | 244.0                         | ft      |    |
| 7  | Slope, S=                                                                                        | 0.028              | ft/ft  | =                                          | 35.71             | :1                          | U/S WW F.L. elev=             | 330.0   | ft |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft     |                                            |                   | D/S WW F.L. elev=           | 323.2                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1     |                                            |                   | Waterway drop=              | 6.8                           | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                              |                   | WW length along slope=      | 244.1                         | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                            |                   |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 3.11               | in     |                                            |                   | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 6.00               | in     |                                            |                   | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.036              |        |                                            |                   | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                            |                   | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                            |                   | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.89               | ft     | Calculated                                 |                   |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.96               | ft     |                                            |                   |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.021              | ft/ft  | 0.7S <sub>c</sub> =                        | 0.0147            | ft/ft                       |                               |         |    |
| 20 |                                                                                                  |                    |        | 1.3S <sub>c</sub> =                        | 0.0274            | ft/ft                       |                               |         |    |
| 21 | Design slope, S=                                                                                 | 0.0280             | ft/ft  | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 5.61               | fps    |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |    |
| 23 |                                                                                                  |                    |        | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected |                   |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 1.00               | ft     | %                                          | Rock dia., inches |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                    | min.              | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                        | 9.0               | 12.0                        | 53                            | 126     |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                         | 7.8               | 10.8                        | 35                            | 92      |    |
| 29 | Minimum=                                                                                         | 1.89               | ft     | 50                                         | 6.0               | 9.0                         | 16                            | 53      |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                         | 4.8               | 7.8                         | 8                             | 35      |    |
| 31 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                            |                   |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 479.9              | CY     |                                            |                   |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 671.8              | Tons   |                                            |                   |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 1187.6             | SY*    |                                            |                   |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                            |                   |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                            |                   |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

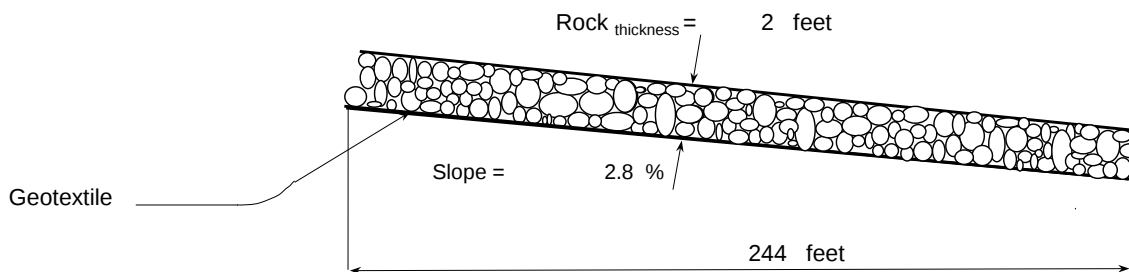
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| $D_{100}$ -----                                      | 9 - 12 (52 - 122)            |
| $D_{85}$ -----                                       | 8 - 11 (34 - 89)             |
| $D_{50}$ -----                                       | 6 - 9 (15 - 52)              |
| $D_{10}$ -----                                       | 5 - 8 (8 - 34)               |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

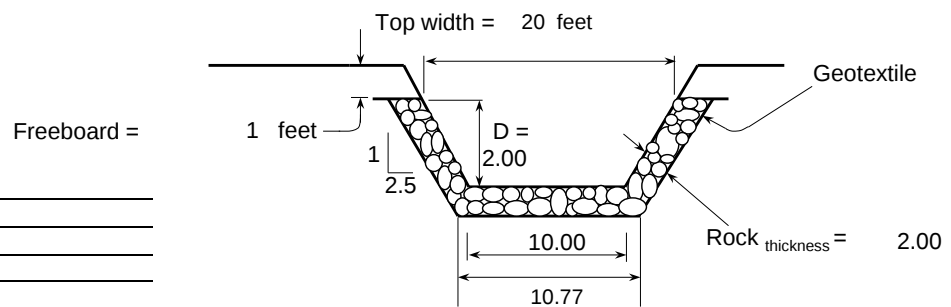
### Quantities

Rock = 480 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 1188 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C      | D                                          | E                 | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                            |                   |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                  |                   |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                            |                   |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                            |                   |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 19.71              | cfs    |                                            |                   | WW horiz. Length=           | 36.0                          | ft      |    |
| 7  | Slope, S=                                                                                        | 0.16               | ft/ft  | =                                          | 6.25              | :1                          | U/S WW F.L. elev=             | 330.0   | ft |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft     |                                            |                   | D/S WW F.L. elev=           | 324.2                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 3                  | :1     |                                            |                   | Waterway drop=              | 5.8                           | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                              |                   | WW length along slope=      | 36.5                          | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                            |                   |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 5.44               | in     |                                            |                   | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 12.00              | in     |                                            |                   | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.052              |        |                                            |                   | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                            |                   | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                            |                   | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.34               | ft     | Calculated                                 |                   |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.47               | ft     |                                            |                   |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.053              | ft/ft  | 0.7S <sub>c</sub> =                        | 0.0369            | ft/ft                       |                               |         |    |
| 20 |                                                                                                  |                    |        | 1.3S <sub>c</sub> =                        | 0.0686            | ft/ft                       |                               |         |    |
| 21 | Design slope, S=                                                                                 | 0.1600             | ft/ft  | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 5.26               | fps    |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |    |
| 23 |                                                                                                  |                    |        | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected |                   |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 2.00               | ft     | %                                          | Rock dia., inches |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                    | min.              | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                        | 18.0              | 24.0                        | 425                           | 1007    |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                         | 15.6              | 21.6                        | 277                           | 734     |    |
| 29 | Minimum=                                                                                         | 1.34               | ft     | 50                                         | 12.0              | 18.0                        | 126                           | 425     |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                         | 9.6               | 15.6                        | 64                            | 277     |    |
| 31 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                            |                   |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 79.1               | CY     |                                            |                   |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 110.8              | Tons   |                                            |                   |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 218.5              | SY*    |                                            |                   |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                            |                   |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                            |                   |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                            |                   |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                            |                   |                             |                               |         |    |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 12.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

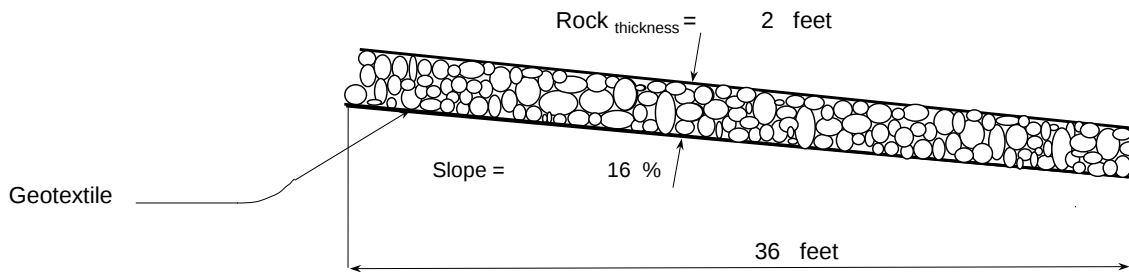
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 18 - 24 (413 - 978)          |
| D <sub>85</sub> -----                                | 16 - 22 (269 - 713)          |
| D <sub>50</sub> -----                                | 12 - 18 (122 - 413)          |
| D <sub>10</sub> -----                                | 10 - 16 (63 - 269)           |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

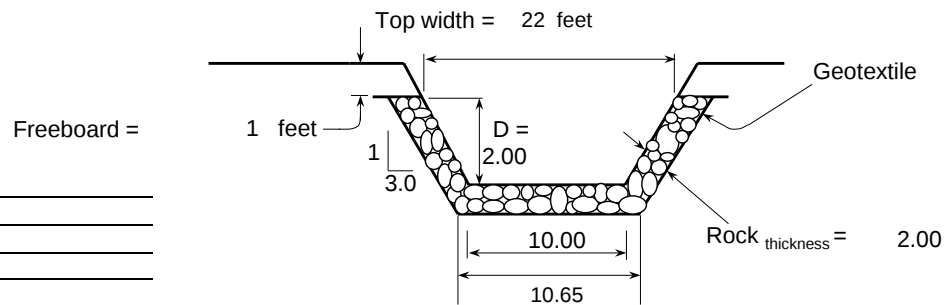
### Quantities

Rock = 79 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 218 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### **Profile, Cross Sections, and Quantities**



|          |         |                  |
|----------|---------|------------------|
| Date     | 5/24/22 | File Name        |
| WML      |         |                  |
| Drawn    |         |                  |
| Checkd   | 0       | 1/0/00           |
| Approved |         |                  |
|          |         | Sheet ___ of ___ |

|    | A                                                                                                | B                  | C       | D                                          | E                 | F                           | G                             | H       | I |
|----|--------------------------------------------------------------------------------------------------|--------------------|---------|--------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|---|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |         |                                            |                   |                             |                               |         |   |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County  | Middlesex                                  |                   |                             | V 11.2019                     |         |   |
| 3  | Computed By                                                                                      | WML                | Date    | 5/24/2022                                  |                   |                             | 11/15/2019                    |         |   |
| 4  | Checked by                                                                                       |                    | Date    |                                            |                   |                             |                               |         |   |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |         |                                            |                   |                             |                               |         |   |
| 6  | Design flow, Q=                                                                                  | 36.1               | cfs     |                                            |                   | WW horiz. Length=           | 36.0                          | ft      |   |
| 7  | Slope, S=                                                                                        | 0.33               | ft/ft = | 3.03                                       | :1                | U/S WW F.L. elev=           | 330.0                         | ft      |   |
| 8  | Bottom Width, W=                                                                                 | 10                 | ft      |                                            |                   | D/S WW F.L. elev=           | 318.1                         | ft      |   |
| 9  | Side slope, Z=                                                                                   | 3                  | :1      |                                            |                   | Waterway drop=              | 11.9                          | ft      |   |
| 10 | Safety factor=                                                                                   | 1.2                |         | Typically 1.2                              |                   | WW length along slope=      | 37.9                          | ft      |   |
| 11 | Rock shape =                                                                                     | Angular            |         |                                            |                   |                             |                               |         |   |
| 12 | Min. req'd D50=                                                                                  | 9.37               | in      |                                            |                   | Spreadsheet formatting key: |                               |         |   |
| 13 | D50 used=                                                                                        | 12.00              | in      |                                            |                   | XXX                         | =Input cells                  |         |   |
| 14 | n=                                                                                               | 0.058              |         |                                            |                   | X.XX                        | =Output from "Solve" button   |         |   |
| 15 | Freeboard=                                                                                       | 1.00               | ft      |                                            |                   | X.XX                        | =Other computed output        |         |   |
| 16 |                                                                                                  |                    |         |                                            |                   | Red text                    | =Instructions, warnings, info |         |   |
| 17 | Flow depth, d=                                                                                   | 0.42               | ft      | Calculated                                 |                   |                             |                               |         |   |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.69               | ft      |                                            |                   |                             |                               |         |   |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.059              | ft/ft   | 0.7S <sub>c</sub> =                        | 0.0410            | ft/ft                       |                               |         |   |
| 20 |                                                                                                  |                    |         | 1.3S <sub>c</sub> =                        | 0.0761            | ft/ft                       |                               |         |   |
| 21 | Design slope, S=                                                                                 | 0.3300             | ft/ft   | Design slope OK. Flow is Supercritical.    |                   |                             |                               |         |   |
| 22 | Velocity=                                                                                        | 7.69               | fps     |                                            |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |   |
| 23 |                                                                                                  |                    |         | Rock shape = Angular                       |                   | Rock Gs =                   | 2.65                          |         |   |
| 24 | Riprap thickness:                                                                                |                    |         | Required riprap gradation for D50 selected |                   |                             |                               |         |   |
| 25 | Minimum=                                                                                         | 2.00               | ft      | %                                          | Rock dia., inches | Rock weight, lb             |                               |         |   |
| 26 | Provided=                                                                                        | 2.00               | ft      | Smaller                                    | min.              | max.                        | min.                          | max.    |   |
| 27 |                                                                                                  |                    |         | 100                                        | 18.0              | 24.0                        | 425                           | 1007    |   |
| 28 | Sideslope height:                                                                                |                    |         | 85                                         | 15.6              | 21.6                        | 277                           | 734     |   |
| 29 | Minimum=                                                                                         | 1.42               | ft      | 50                                         | 12.0              | 18.0                        | 126                           | 425     |   |
| 30 | Provided=                                                                                        | 2.00               | ft      | 10                                         | 9.6               | 15.6                        | 64                            | 277     |   |
| 31 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 32 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 33 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 34 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 35 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 36 | Quantities:                                                                                      |                    |         |                                            |                   |                             |                               |         |   |
| 37 | Riprap volume=                                                                                   | 82.3               | CY      |                                            |                   |                             |                               |         |   |
| 38 | Approx. weight=                                                                                  | 115.2              | Tons    |                                            |                   |                             |                               |         |   |
| 39 | Geotextile area=                                                                                 | 226.3              | SY*     |                                            |                   |                             |                               |         |   |
| 40 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 41 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |
| 42 | *Geotextile area                                                                                 |                    |         |                                            |                   |                             |                               |         |   |
| 43 | includes actual covered                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 44 | surfaces only (no extra                                                                          |                    |         |                                            |                   |                             |                               |         |   |
| 45 | for laps or anchorage)                                                                           |                    |         |                                            |                   |                             |                               |         |   |
| 46 |                                                                                                  |                    |         |                                            |                   |                             |                               |         |   |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 12.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

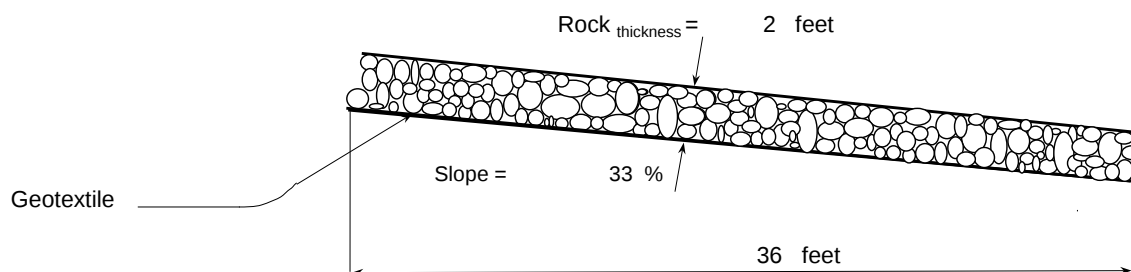
### Rock Gradation Envelope

| <u>% Passing</u>                                     | <u>Diameter, in. (weight, lbs.)</u> |
|------------------------------------------------------|-------------------------------------|
| D <sub>100</sub> -----                               | 18 - 24 (413 - 978)                 |
| D <sub>85</sub> -----                                | 16 - 22 (269 - 713)                 |
| D <sub>50</sub> -----                                | 12 - 18 (122 - 413)                 |
| D <sub>10</sub> -----                                | 10 - 16 (63 - 269)                  |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                                     |

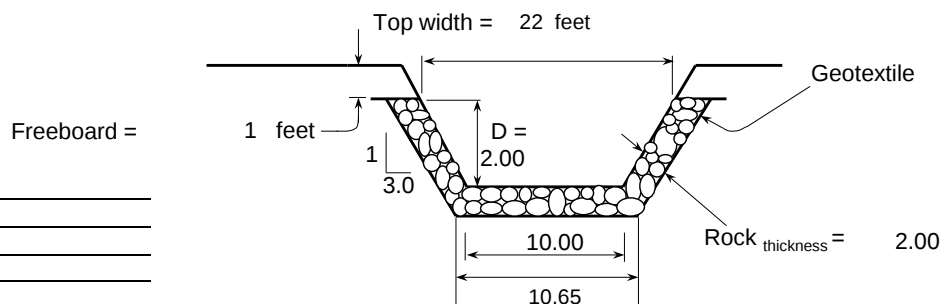
### Quantities

Rock = 82 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 226 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### **Profile, Cross Sections, and Quantities**



|          |         |           |
|----------|---------|-----------|
| Date     | 5/24/22 | File Name |
| WML      |         |           |
| Drawn    |         |           |
| Checkd   | 0       | 1/0/00    |
| Approved |         |           |

Sheet \_\_\_ of \_\_\_

|    | A                                                                                                | B                  | C      | D                                          | E                                       | F                           | G                             | H       | I  |
|----|--------------------------------------------------------------------------------------------------|--------------------|--------|--------------------------------------------|-----------------------------------------|-----------------------------|-------------------------------|---------|----|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |        |                                            |                                         |                             |                               |         |    |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County | Middlesex                                  |                                         |                             | V 11.2019                     |         |    |
| 3  | Computed By                                                                                      | WML                | Date   | 5/24/2022                                  |                                         |                             | 11/15/2019                    |         |    |
| 4  | Checked by                                                                                       |                    | Date   |                                            |                                         |                             |                               |         |    |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |        |                                            |                                         |                             |                               |         |    |
| 6  | Design flow, Q=                                                                                  | 14.16              | cfs    |                                            |                                         | WW horiz. Length=           | 1425.0                        | ft      |    |
| 7  | Slope, S=                                                                                        | 0.041              | ft/ft  | =                                          | 24.39                                   | :1                          | U/S WW F.L. elev=             | 368.5   | ft |
| 8  | Bottom Width, W=                                                                                 | 3                  | ft     |                                            |                                         | D/S WW F.L. elev=           | 310.1                         | ft      |    |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1     |                                            |                                         | Waterway drop=              | 58.4                          | ft      |    |
| 10 | Safety factor=                                                                                   | 1.2                |        | Typically 1.2                              |                                         | WW length along slope=      | 1426.2                        | ft      |    |
| 11 | Rock shape =                                                                                     | Angular            |        |                                            |                                         |                             |                               |         |    |
| 12 | Min. req'd D50=                                                                                  | 3.67               | in     |                                            |                                         | Spreadsheet formatting key: |                               |         |    |
| 13 | D50 used=                                                                                        | 6.00               | in     |                                            |                                         | XXX                         | =Input cells                  |         |    |
| 14 | n=                                                                                               | 0.038              |        |                                            |                                         | X.XX                        | =Output from "Solve" button   |         |    |
| 15 | Freeboard=                                                                                       | 1.00               | ft     |                                            |                                         | X.XX                        | =Other computed output        |         |    |
| 16 |                                                                                                  |                    |        |                                            |                                         | Red text                    | =Instructions, warnings, info |         |    |
| 17 | Flow depth, d=                                                                                   | 0.65               | ft     |                                            | Calculated                              |                             |                               |         |    |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.72               | ft     |                                            |                                         |                             |                               |         |    |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.028              | ft/ft  |                                            | 0.7S <sub>c</sub> =                     | 0.0195                      | ft/ft                         |         |    |
| 20 |                                                                                                  |                    |        |                                            | 1.3S <sub>c</sub> =                     | 0.0362                      | ft/ft                         |         |    |
| 21 | Design slope, S=                                                                                 | 0.0410             | ft/ft  |                                            | Design slope OK. Flow is Supercritical. |                             |                               |         |    |
| 22 | Velocity=                                                                                        | 4.71               | fps    |                                            |                                         | Est. riprap unit wt=        | 1.4                           | Tons/CY |    |
| 23 |                                                                                                  |                    |        |                                            | Rock shape = Angular                    |                             | Rock Gs =                     | 2.65    |    |
| 24 | Riprap thickness:                                                                                |                    |        | Required riprap gradation for D50 selected |                                         |                             |                               |         |    |
| 25 | Minimum=                                                                                         | 1.00               | ft     | %                                          | Rock dia., inches                       |                             | Rock weight, lb               |         |    |
| 26 | Provided=                                                                                        | 2.00               | ft     | Smaller                                    | min.                                    | max.                        | min.                          | max.    |    |
| 27 |                                                                                                  |                    |        | 100                                        | 9.0                                     | 12.0                        | 53                            | 126     |    |
| 28 | Sideslope height:                                                                                |                    |        | 85                                         | 7.8                                     | 10.8                        | 35                            | 92      |    |
| 29 | Minimum=                                                                                         | 1.65               | ft     | 50                                         | 6.0                                     | 9.0                         | 16                            | 53      |    |
| 30 | Provided=                                                                                        | 2.00               | ft     | 10                                         | 4.8                                     | 7.8                         | 8                             | 35      |    |
| 31 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 32 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 33 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 34 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 35 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 36 | Quantities:                                                                                      |                    |        |                                            |                                         |                             |                               |         |    |
| 37 | Riprap volume=                                                                                   | 2064.4             | CY     |                                            |                                         |                             |                               |         |    |
| 38 | Approx. weight=                                                                                  | 2890.1             | Tons   |                                            |                                         |                             |                               |         |    |
| 39 | Geotextile area=                                                                                 | 5733.7             | SY*    |                                            |                                         |                             |                               |         |    |
| 40 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 41 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |
| 42 | *Geotextile area                                                                                 |                    |        |                                            |                                         |                             |                               |         |    |
| 43 | includes actual covered                                                                          |                    |        |                                            |                                         |                             |                               |         |    |
| 44 | surfaces only (no extra                                                                          |                    |        |                                            |                                         |                             |                               |         |    |
| 45 | for laps or anchorage)                                                                           |                    |        |                                            |                                         |                             |                               |         |    |
| 46 |                                                                                                  |                    |        |                                            |                                         |                             |                               |         |    |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>WW</sub> thickness = 2.0 Feet.

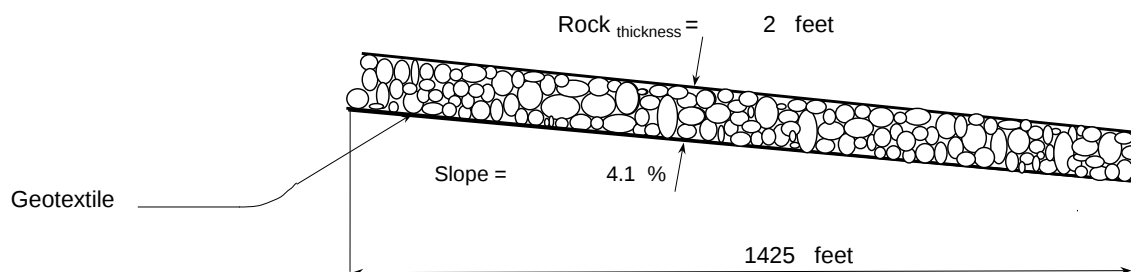
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 9 - 12 (52 - 122)            |
| D <sub>85</sub> -----                                | 8 - 11 (34 - 89)             |
| D <sub>50</sub> -----                                | 6 - 9 (15 - 52)              |
| D <sub>10</sub> -----                                | 5 - 8 (8 - 34)               |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

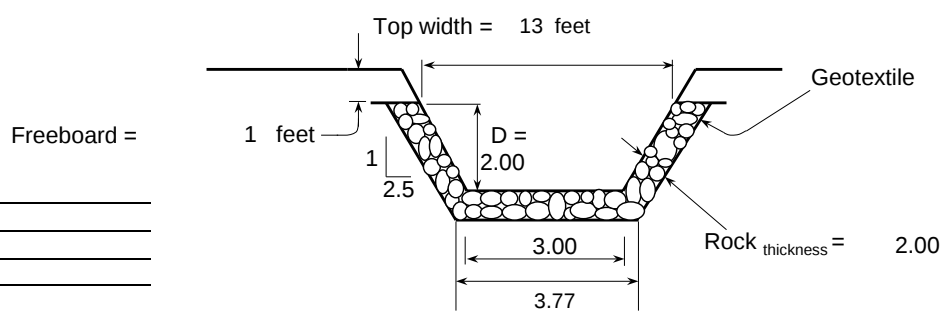
### Quantities

Rock = 2064 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 5734 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |           |
|----------|---------|-----------|
| Date     | 5/24/22 | File Name |
| WML      |         |           |
| Drawn    |         |           |
| Checkd   | 0       | 1/0/00    |
| Approved |         |           |

|    | A                                                                                                | B                  | C       | D                                                                                     | E                 | F                           | G                             | H       | I |
|----|--------------------------------------------------------------------------------------------------|--------------------|---------|---------------------------------------------------------------------------------------|-------------------|-----------------------------|-------------------------------|---------|---|
| 1  | <b>Trapezoidal Riprap-Lined Waterway Design.xlsm</b>                                             |                    |         |                                                                                       |                   |                             |                               |         |   |
| 2  | Landowner                                                                                        | 555 Hopping Brk Rd | County  | Middlesex                                                                             |                   |                             | V 11.2019                     |         |   |
| 3  | Computed By                                                                                      | WML                | Date    | 5/24/2022                                                                             |                   |                             | 11/15/2019                    |         |   |
| 4  | Checked by                                                                                       |                    | Date    |                                                                                       |                   |                             |                               |         |   |
| 5  | <i>Note: Macros must be enabled in this spreadsheet in order for the "Solve" button to work.</i> |                    |         |                                                                                       |                   |                             |                               |         |   |
| 6  | Design flow, Q=                                                                                  | 4.76               | cfs     |                                                                                       |                   | WW horiz. Length=           | 596.0                         | ft      |   |
| 7  | Slope, S=                                                                                        | 0.025              | ft/ft = | 40.00                                                                                 | :1                | U/S WW F.L. elev=           | 368.5                         | ft      |   |
| 8  | Bottom Width, W=                                                                                 | 3                  | ft      |                                                                                       |                   | D/S WW F.L. elev=           | 353.6                         | ft      |   |
| 9  | Side slope, Z=                                                                                   | 2.5                | :1      |                                                                                       |                   | Waterway drop=              | 14.9                          | ft      |   |
| 10 | Safety factor=                                                                                   | 1.2                |         | Typically 1.2                                                                         |                   | WW length along slope=      | 596.2                         | ft      |   |
| 11 | Rock shape =                                                                                     | Angular            |         |                                                                                       |                   |                             |                               |         |   |
| 12 | Min. req'd D50=                                                                                  | 1.39               | in      |                                                                                       |                   | Spreadsheet formatting key: |                               |         |   |
| 13 | D50 used=                                                                                        | 6.00               | in      |                                                                                       |                   | XXX                         | =Input cells                  |         |   |
| 14 | n=                                                                                               | 0.036              |         |                                                                                       |                   | X.XX                        | =Output from "Solve" button   |         |   |
| 15 | Freeboard=                                                                                       | 1.00               | ft      |                                                                                       |                   | X.XX                        | =Other computed output        |         |   |
| 16 |                                                                                                  |                    |         |                                                                                       |                   | Red text                    | =Instructions, warnings, info |         |   |
| 17 | Flow depth, d=                                                                                   | 0.40               | ft      | Calculated                                                                            |                   |                             |                               |         |   |
| 18 | Critical depth, d <sub>c</sub> =                                                                 | 0.38               | ft      |                                                                                       |                   |                             |                               |         |   |
| 19 | Critical slope, S <sub>c</sub> =                                                                 | 0.028              | ft/ft   | 0.7S <sub>c</sub> =                                                                   | 0.0198            | ft/ft                       |                               |         |   |
| 20 |                                                                                                  |                    |         | 1.3S <sub>c</sub> =                                                                   | 0.0368            | ft/ft                       |                               |         |   |
| 21 | Design slope, S=                                                                                 | 0.0250             | ft/ft   | 0.7S <sub>c</sub> < S < 1.3S <sub>c</sub> . Select a different slope or bottom width. |                   |                             |                               |         |   |
| 22 | Velocity=                                                                                        | 3.02               | fps     |                                                                                       |                   | Est. riprap unit wt=        | 1.4                           | Tons/CY |   |
| 23 |                                                                                                  |                    |         | Rock shape =                                                                          | Angular           | Rock Gs =                   | 2.65                          |         |   |
| 24 | Riprap thickness:                                                                                |                    |         | Required riprap gradation for D50 selected                                            |                   |                             |                               |         |   |
| 25 | Minimum=                                                                                         | 1.00               | ft      | %                                                                                     | Rock dia., inches | Rock weight, lb             |                               |         |   |
| 26 | Provided=                                                                                        | 2.00               | ft      | Smaller                                                                               | min.              | max.                        | min.                          | max.    |   |
| 27 |                                                                                                  |                    |         | 100                                                                                   | 9.0               | 12.0                        | 53                            | 126     |   |
| 28 | Sideslope height:                                                                                |                    |         | 85                                                                                    | 7.8               | 10.8                        | 35                            | 92      |   |
| 29 | Minimum=                                                                                         | 1.40               | ft      | 50                                                                                    | 6.0               | 9.0                         | 16                            | 53      |   |
| 30 | Provided=                                                                                        | 2.00               | ft      | 10                                                                                    | 4.8               | 7.8                         | 8                             | 35      |   |
| 31 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 32 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 33 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 34 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 35 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 36 | Quantities:                                                                                      |                    |         |                                                                                       |                   |                             |                               |         |   |
| 37 | Riprap volume=                                                                                   | 863.0              | CY      |                                                                                       |                   |                             |                               |         |   |
| 38 | Approx. weight=                                                                                  | 1208.1             | Tons    |                                                                                       |                   |                             |                               |         |   |
| 39 | Geotextile area=                                                                                 | 2406.2             | SY*     |                                                                                       |                   |                             |                               |         |   |
| 40 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 41 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |
| 42 | *Geotextile area                                                                                 |                    |         |                                                                                       |                   |                             |                               |         |   |
| 43 | includes actual covered                                                                          |                    |         |                                                                                       |                   |                             |                               |         |   |
| 44 | surfaces only (no extra                                                                          |                    |         |                                                                                       |                   |                             |                               |         |   |
| 45 | for laps or anchorage)                                                                           |                    |         |                                                                                       |                   |                             |                               |         |   |
| 46 |                                                                                                  |                    |         |                                                                                       |                   |                             |                               |         |   |

WW CROSS SECTION

WW PROFILE

## Rock Riprap Lined Waterway Design - Cut/Paste Plan

(Version WI-July-2010, Based on Design of Rock Chutes by Robinson, Rice, Kadavy, ASAE, 1998)

Client 555 Hopping Brk Rd  
 Designer: WML  
 Date: 5/24/2022

County: Middlesex  
 Checked by: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Design Values

$D_{50}$  dia. = 6.0 in.  
 Rock<sub>ww</sub> thickness = 2.0 Feet.

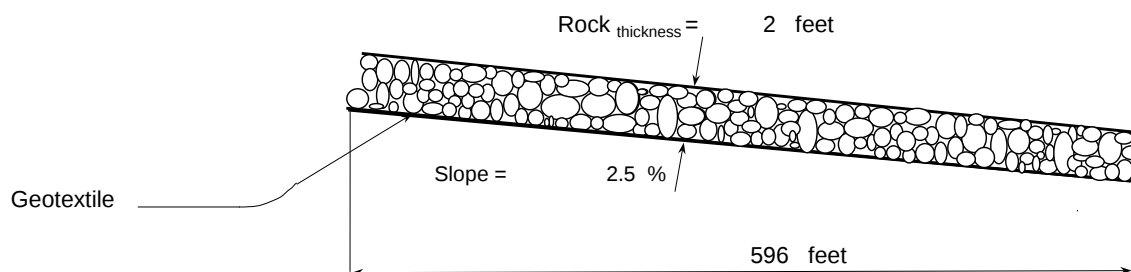
### Rock Gradation Envelope

| % Passing                                            | Diameter, in. (weight, lbs.) |
|------------------------------------------------------|------------------------------|
| D <sub>100</sub> -----                               | 9 - 12 (52 - 122)            |
| D <sub>85</sub> -----                                | 8 - 11 (34 - 89)             |
| D <sub>50</sub> -----                                | 6 - 9 (15 - 52)              |
| D <sub>10</sub> -----                                | 5 - 8 (8 - 34)               |
| Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$ |                              |

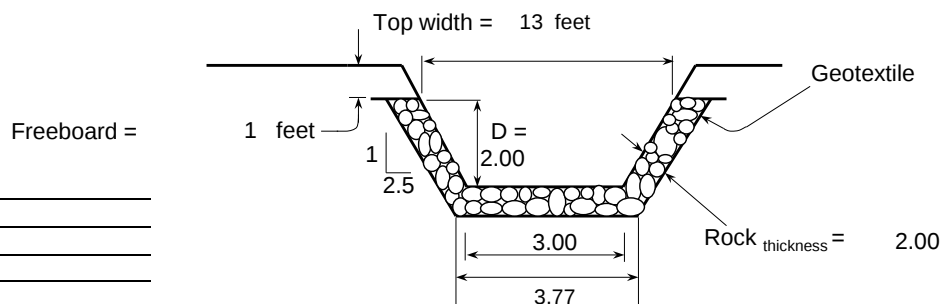
### Quantities

Rock = 863 yd<sup>3</sup>  
 Geotextile (WCS-13)<sup>a</sup> = 2406 yd<sup>2</sup>

**Notes:** <sup>a</sup> Geotextile Class I (Non-woven) shall be overlapped and anchored (18-in. minimum along sides and 24-in. minimum on the ends) --- quantity not included.



**Profile Along Centerline of Rock Lined Waterway**



**Rock Lined WW Cross Section**

### Profile, Cross Sections, and Quantities



|          |         |           |
|----------|---------|-----------|
| Date     | 5/24/22 | File Name |
| WML      |         |           |
| Drawn    |         |           |
| Checkd   | 0       | 1/0/00    |
| Approved |         |           |

Sheet \_\_\_ of \_\_\_

**RIPRAP LINED PLUNGE POOL FOR CANTILEVER OUTLET (Version 8/2015)**  
(Reference Design Note No. 6 (Second Edition), Jan. 23, 1986)

JOB: 555 Hopping Brook road  
DESIGNER: WML  
CHECKER:

Date: 5/23/2022  
Date:

**INPUT DATA:**

|                                                                |          |        |        |
|----------------------------------------------------------------|----------|--------|--------|
| Conduit Diameter                                               | D =      | 4.00   | ft     |
| Conduit Discharge:                                             | Q =      | 134.50 | cfs    |
| Conduit Slope at Outlet:                                       | S =      | 0.04   | ft/ft  |
| Conduit Outlet Invert Elevation:                               | EI, CO = | 282.00 | ft     |
| Tailwater Elevation:                                           | EI, TW = | 278.00 | ft     |
| Outlet Channel Invert Elevation:                               | EI, CH = | 282.00 | ft     |
|                                                                |          |        |        |
| Water Density:                                                 | RHO =    | 1.00   |        |
| Bed/Riprap Particle Density: (Default 2.64)                    | RHOS =   | 2.64   |        |
| D <sub>50</sub> Riprap Size (inches):                          | 12*RS =  | 24.00  | inches |
| D <sub>50</sub> Riprap Size (feet):                            | RS =     | 2.00   | ft     |
| Riprap Thickness: (2.5*D, 50 recommended)                      | RT =     | 2.50   | ft     |
| Bedding Thickness: (6 inch min. rec.) (Enter 0 for geotextile) | BT =     | 1.00   | ft     |
| Side Slope Ratio:                                              | Zw =     | 2.00   | ft/ft  |
| Upstream End Slope Ratio:                                      | Zlu =    | 3.00   | ft/ft  |
| Downstream End Slope Ratio:                                    | Zld =    | 2.00   | ft/ft  |
| Combined End Slope Ratio:                                      | Z1 =     | 2.00   | ft/ft  |

**OUTPUT---POOL LOCATION AND DIMENSIONS:**

|                                                         |            |        |    |
|---------------------------------------------------------|------------|--------|----|
| Vert. Dist. from Tailwater to Conduit Invert:           | Zp =       | 4.00   | ft |
| Submergence Check: (If Zp < 0, Use Zp = 0)              | Use Zp =   | 4.00   | ft |
| Beaching Check: $[Q/(gD^5)^{0.5} \leq (1.0+25*D,50/D)]$ |            | O.K.   |    |
| **Beaching Controlled**                                 |            |        |    |
| Distance from Conduit Exit to C/L Pool:                 | Xm =       | 8.27   | ft |
| Pool depth at C/L Below Conduit Invert:                 | Zp+0.8Zm = | 6.43   | ft |
| Pool Bottom Elev:                                       | EI, PB =   | 275.57 | ft |
| Pool Bottom Length:                                     | 2Lr2 =     | 2.12   | ft |
| Pool Bottom Width:                                      | 2Wr2 =     | 1.95   | ft |
| Upstream Pool Length at Tailwater Elev.:                | Lru =      | 8.34   | ft |
| Downstream Pool Length at Tailwater Elev.:              | Lrd =      | 5.91   | ft |
| Pool Width at Tailwater Elev.:                          | 2Wr =      | 11.66  | ft |
| Check Side Slope Ratio: (Wr>=We)                        |            | O.K.   |    |
| **Side Slope Ratio Zw O.K.**                            |            |        |    |
| Check Min. End Slope Ratio: (Lru & Lrd >= Le)           |            | O.K.   |    |
| **End Slope Ratios O.K.**                               |            |        |    |
| Check Upstream Length: (Lru >= Xm)                      |            | O.K.   |    |
| **End Slope Ratio Zlu O.K.**                            |            |        |    |
| Pool Bottom Elev. at Bottom of Riprap:                  | EI, BR =   | 273.07 | ft |
| Pool Bottom Elev. at Bottom of Bedding:                 | EI, BB =   | 272.07 | ft |

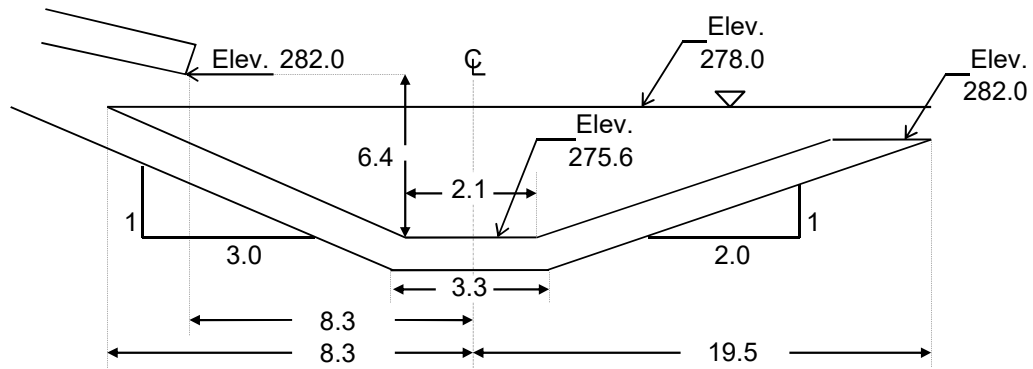
**OUTPUT---VOLUMES BELOW WATER SURFACE ELEVATION:**

|                                                                 |         |      |       |
|-----------------------------------------------------------------|---------|------|-------|
| Volume of Excavation (measured from bottom surface of bedding): | V,pbs = | 62.3 | cu yd |
| Volume of Rock Riprap:                                          | V,rs =  | 32.1 | cu yd |
| Volume of Bedding:                                              | V,bs =  | 25.2 | cu yd |

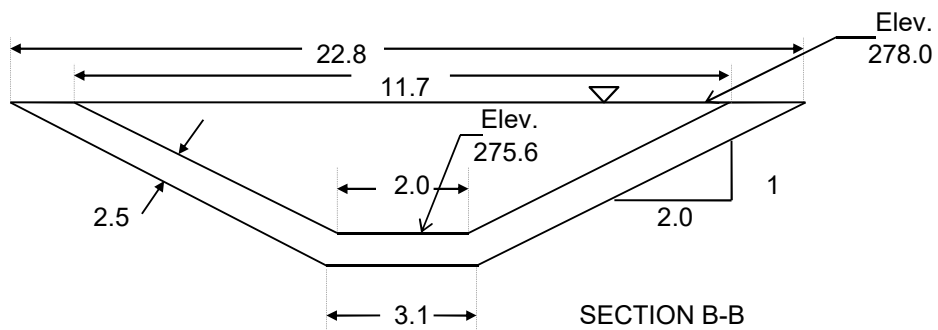
Spreadsheet developed by D. Hurtz, Midwest NTC, 1/90

Spreadsheet modified by M. Dreischmeier, Eau Claire TC, Wis., 3/98 and 5/2005

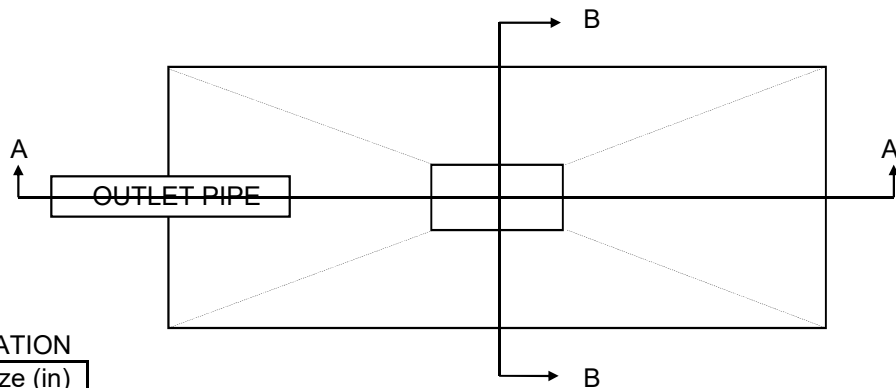
**RIPRAP LINED PLUNGE POOL FOR CANTILEVER OUTLET**  
 Reference Design Note No. 6 (Second Edition), Jan. 23, 1986



SECTION A-A



SECTION B-B



**ROCK GRADATION**

| % Passing | Size (in) |
|-----------|-----------|
| 100       | 48        |
| 60-85     | 36        |
| 25-50     | 24        |
| 5-20      | 12        |
| 0-5       | 4.8       |

555 Hopping Brook road  
 LANDOWNER

DESIGNER: WML  
 SHEET \_\_\_\_ OF \_\_\_\_

# National Flood Hazard Layer FIRMette



42°10'26.07"N



71°27'5.39"W

USGS The National Map: Orthoimagery. Data refreshed April 2019.



## Legend

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

Without Base Flood Elevation (BFE)  
*Zone A, V, AE*

With BFE or Depth  
*Zone AE, AO, AH, VE, AP*

Regulatory Floodway

SPECIAL FLOOD HAZARD AREAS

11

08

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile  
*Zone X*

Future Conditions 1% Annual Chance Flood Hazard  
*Zone X*

Area with Reduced Flood Risk due to Levee. See Notes.  
*Zone X*

Area with Flood Risk due to Levee  
*Zone D*

OTHER AREAS OF FLOOD HAZARD

11

08

Area of Minimal Flood Hazard  
*Zone X*

Effective LOMRs

Area of Undetermined Flood Hazard  
*Zone D*

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

GENERAL STRUCTURES

11

08

Cross Sections with 1% Annual Chance

Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

OTHER FEATURES

11

08

Digital Data Available

No Digital Data Available

Unmapped

MAP PANELS

11

08

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

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

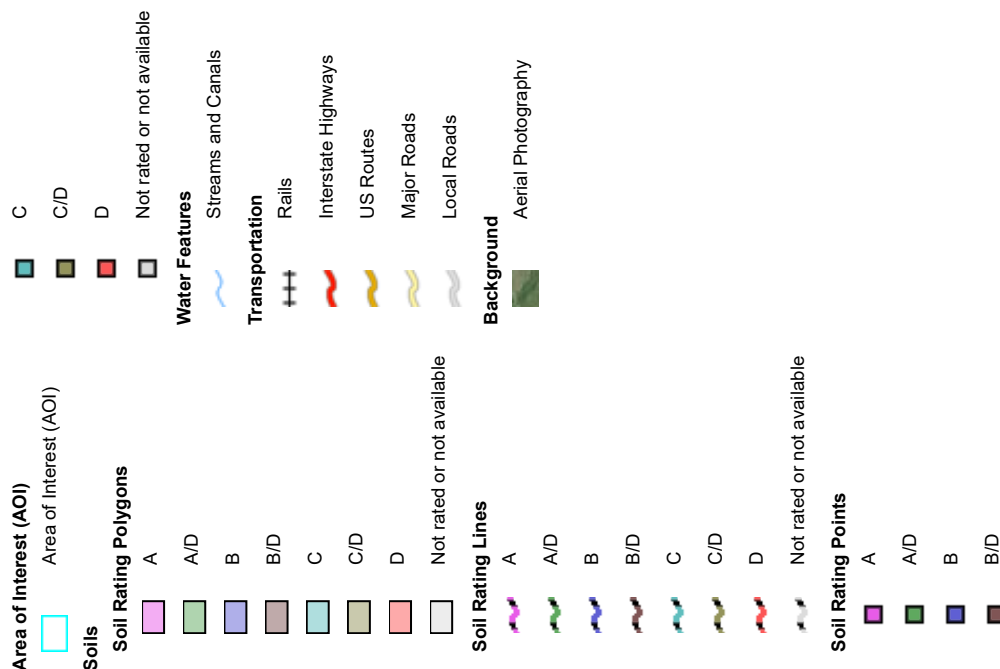
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/31/2020 at 8:45:21 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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



Map Scale: 1:22,110 (printed on D landscape 36" x 24" sheet)  
0 50 100 150 200 Feet  
0 10 20 30 Meters  
Registration: Web Mercator Corner coordinates: WGS84 Edge: UTM Zone 18N UTMCS84

## MAP LEGEND



## 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: Jul 28, 2019—Aug 15, 2019

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

## Hydrologic Soil Group

| Map unit symbol                    | Map unit name                                                     | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|-------------------------------------------------------------------|--------|--------------|----------------|
| 51A                                | Swansea muck, 0 to 1 percent slopes                               | B/D    | 1.7          | 0.9%           |
| 52A                                | Freetown muck, 0 to 1 percent slopes                              | B/D    | 1.6          | 0.9%           |
| 71B                                | Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony | D      | 1.3          | 0.7%           |
| 73B                                | Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony   | D      | 4.1          | 2.3%           |
| 103C                               | Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes      | B      | 8.4          | 4.7%           |
| 253C                               | Hinckley loamy sand, 8 to 15 percent slopes                       | A      | 1.0          | 0.6%           |
| 307B                               | Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony    | C      | 4.9          | 2.7%           |
| 307C                               | Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony   | C      | 28.6         | 16.0%          |
| 307D                               | Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony  | C      | 2.4          | 1.3%           |
| 310B                               | Woodbridge fine sandy loam, 3 to 8 percent slopes                 | C/D    | 1.9          | 1.1%           |
| 311B                               | Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony     | C/D    | 122.6        | 68.5%          |
| 311C                               | Woodbridge fine sandy loam, 8 to 15 percent slopes, very stony    | C/D    | 0.5          | 0.3%           |
| <b>Totals for Area of Interest</b> |                                                                   |        | <b>179.0</b> | <b>100.0%</b>  |

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher

**Project:** 555 Hopping Brook Road  
**Location:** Holliston, MA  
**Prepared For:** Engineering Design Consultants



**Purpose:** To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

**Reference:** Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

**Procedure:** Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the  $t_c$ , read the unit peak discharge ( $q_u$ ) from Figure 1 or Table in Figure 2.  $q_u$  is expressed in the following units: cfs/mi<sup>2</sup>/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (q_u) (A) (WQV)$$

where:

Q = flow rate associated with first 1" of runoff

$q_u$  = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1" in this case)

| Structure Name | Impv. (acres) | A (miles <sup>2</sup> ) | $t_c$ (min) | $t_c$ (hr) | WQV (in) | $q_u$ (csm/in.) | Q (cfs) |
|----------------|---------------|-------------------------|-------------|------------|----------|-----------------|---------|
| DMH A13        | 3.97          | 0.0062047               | 8.6         | 0.143      | 1.00     | 736.00          | 4.57    |
| DMH B10        | 1.57          | 0.0024500               | 6.8         | 0.113      | 1.00     | 774.00          | 1.90    |
| DMH C10        | 2.43          | 0.0037922               | 7.9         | 0.132      | 1.00     | 755.00          | 2.86    |
| DMH E19        | 3.24          | 0.0050563               | 8.9         | 0.148      | 1.00     | 736.00          | 3.72    |
| DMH J3         | 0.23          | 0.0003609               | 6.0         | 0.100      | 1.00     | 774.00          | 0.28    |
|                |               |                         |             |            |          |                 |         |
|                |               |                         |             |            |          |                 |         |
|                |               |                         |             |            |          |                 |         |
|                |               |                         |             |            |          |                 |         |
|                |               |                         |             |            |          |                 |         |

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.

Estimated Net Annual Solids Load Reduction  
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD  
HOLLISTON, MA  
A13

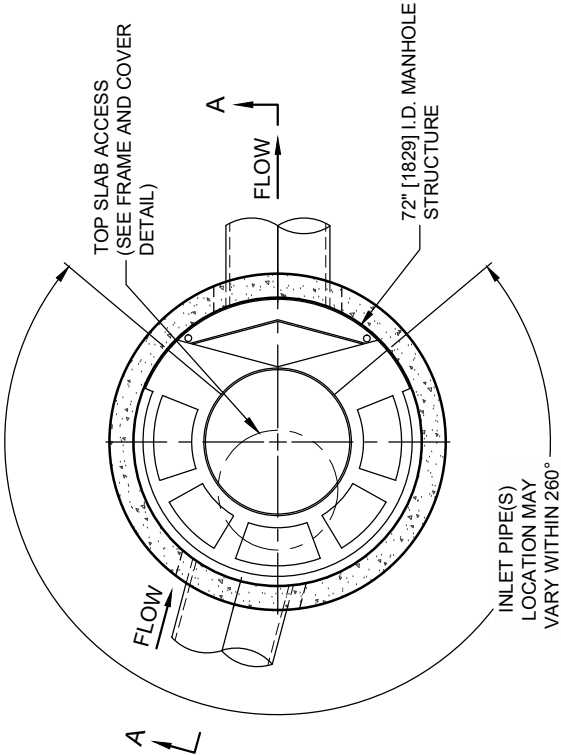


|            |      |         |                  |      |
|------------|------|---------|------------------|------|
| AREA       | 3.97 | acres   | CASCADE MODEL    | CS-6 |
| WEIGHTED C | 0.95 |         |                  |      |
| TC         | 6.00 | minutes | RAINFALL STATION | 68   |

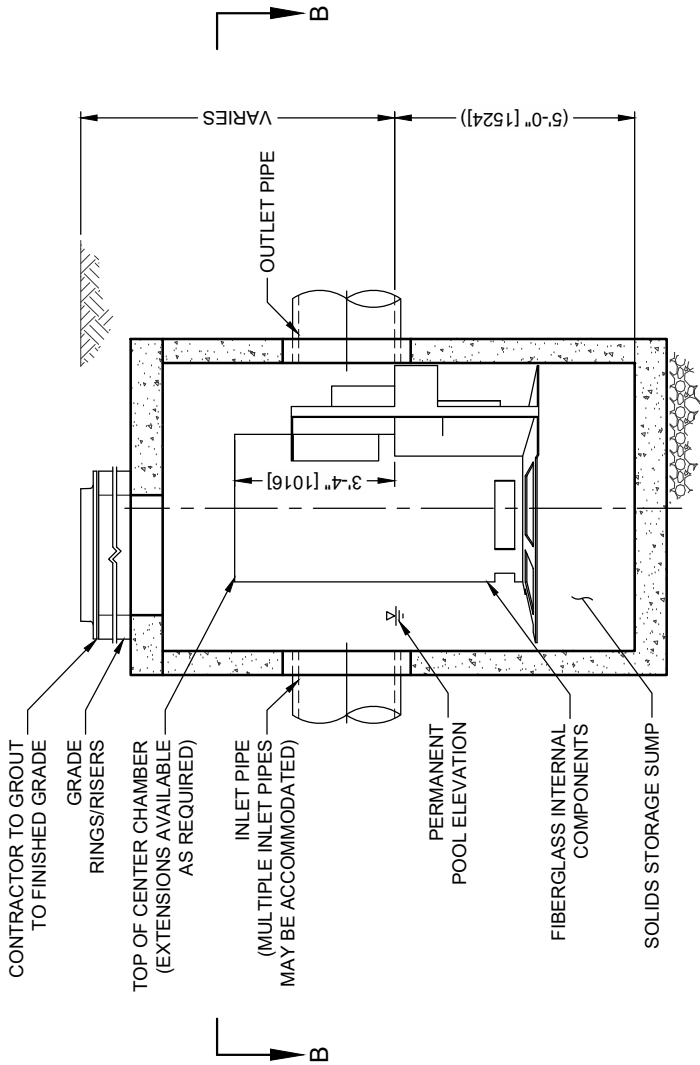
| Rainfall Intensity <sup>1</sup><br>(in/hr)     | Percent Rainfall<br>Volume <sup>1</sup> | Hydraulic Loading Rate<br>(gpm/ft <sup>2</sup> ) | Removal Efficiency<br>(%) | Incremental Removal<br>(%) |
|------------------------------------------------|-----------------------------------------|--------------------------------------------------|---------------------------|----------------------------|
| 0.02                                           | 9.3%                                    | 1.20                                             | 100.0                     | 9.3                        |
| 0.04                                           | 9.5%                                    | 2.39                                             | 100.0                     | 9.5                        |
| 0.06                                           | 8.7%                                    | 3.59                                             | 100.0                     | 8.7                        |
| 0.08                                           | 10.1%                                   | 4.79                                             | 100.0                     | 10.1                       |
| 0.10                                           | 7.2%                                    | 5.99                                             | 100.0                     | 7.2                        |
| 0.12                                           | 6.0%                                    | 7.18                                             | 100.0                     | 6.0                        |
| 0.14                                           | 6.3%                                    | 8.38                                             | 100.0                     | 6.3                        |
| 0.16                                           | 5.6%                                    | 9.58                                             | 100.0                     | 5.6                        |
| 0.18                                           | 4.7%                                    | 10.78                                            | 100.0                     | 4.7                        |
| 0.20                                           | 3.6%                                    | 11.97                                            | 100.0                     | 3.6                        |
| 0.25                                           | 8.2%                                    | 14.97                                            | 97.8                      | 8.0                        |
| 0.50                                           | 14.9%                                   | 29.93                                            | 83.8                      | 12.5                       |
| 0.75                                           | 3.2%                                    | 44.90                                            | 69.7                      | 2.2                        |
| 1.00                                           | 1.2%                                    | 59.87                                            | 55.6                      | 0.7                        |
| 1.50                                           | 0.7%                                    | 89.80                                            | 27.5                      | 0.2                        |
| 2.00                                           | 0.8%                                    | 115.09                                           | 3.6                       | 0.0                        |
|                                                |                                         |                                                  |                           | 94.6                       |
| Removal Efficiency Adjustment <sup>2</sup> =   |                                         |                                                  |                           | 6.5%                       |
| Predicted % Annual Rainfall Treated =          |                                         |                                                  |                           | 93.5%                      |
| Predicted Net Annual Load Removal Efficiency = |                                         |                                                  |                           | 88.2%                      |

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B  
NOT TO SCALE



ELEVATION A-A  
NOT TO SCALE

CASCADE  
separator™

CASCADE SEPARATOR DESIGN NOTES

CS-6 RATED TREATMENT CAPACITY IS 5.6 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-6 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

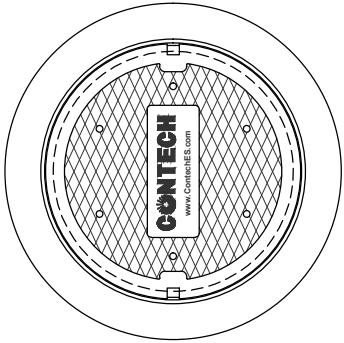
CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER  
(DIAMETER VARIES)  
NOT TO SCALE

SITE SPECIFIC  
DATA REQUIREMENTS

|                                     |        |          |          |
|-------------------------------------|--------|----------|----------|
| STRUCTURE ID                        |        |          |          |
| WATER QUALITY FLOW RATE (cfs [L/s]) |        |          |          |
| PEAK FLOW RATE (cfs [L/s])          |        |          |          |
| RETURN PERIOD OF PEAK FLOW (yrs)    |        |          |          |
| RIM ELEVATION                       |        |          |          |
|                                     |        |          |          |
| PIPE DATA:                          |        |          |          |
| INLET PIPE 1                        | INVERT | MATERIAL | DIAMETER |
| INLET PIPE 2                        |        |          |          |
| OUTLET PIPE                         |        |          |          |
|                                     |        |          |          |

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.contechES.com](http://www.contechES.com)
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

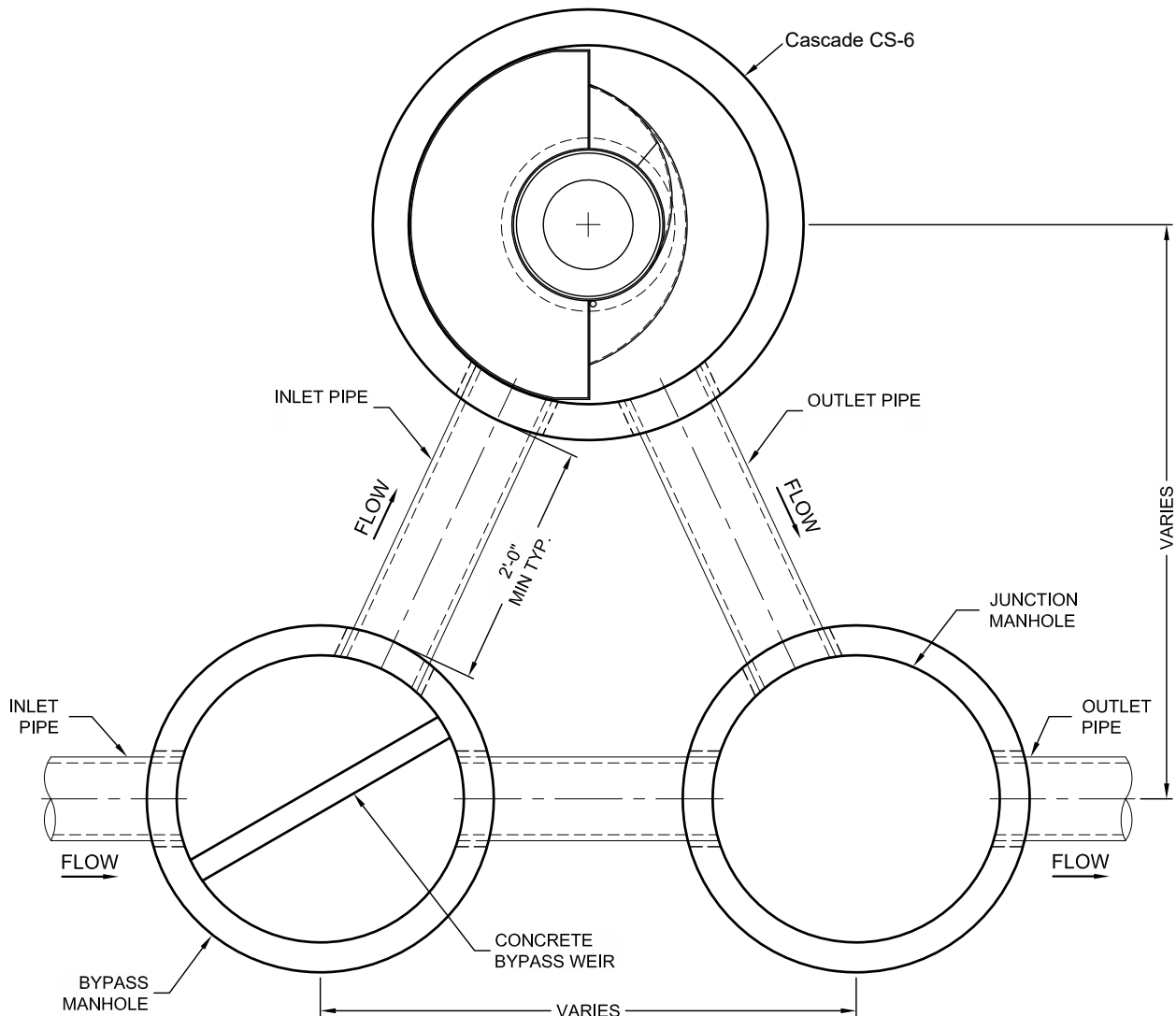
INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH  
ENGINEERED SOLUTIONS LLC

[www.contechES.com](http://www.contechES.com)  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

CS-6  
CASCADE SEPARATOR  
STANDARD DETAIL



THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

**CONTECH<sup>®</sup>**  
ENGINEERED SOLUTIONS LLC

[www.ContechES.com](http://www.ContechES.com)

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800-338-1122 513-645-7000 513-645-7993 FAX

## STORMWATER TREATMENT SYSTEM TYPICAL OFFLINE LAYOUT WITH BYPASS & JUNCTION MANHOLE STRUCTURES

|                |             |                  |               |            |              |
|----------------|-------------|------------------|---------------|------------|--------------|
| DATE: 03/12/13 | SCALE: NONE | PROJECT No.: N/A | SEQ. No.: N/A | DRAWN: N/A | CHECKED: N/A |
|----------------|-------------|------------------|---------------|------------|--------------|

Engineering Design Consultants, Inc. 32 Tumpike Road Southborough, MA 01772 (508) 486-0225

Estimated Net Annual Solids Load Reduction  
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD  
HOLLISTON, MA  
B10



|            |      |         |                  |      |
|------------|------|---------|------------------|------|
| AREA       | 1.57 | acres   | CASCADE MODEL    | CS-4 |
| WEIGHTED C | 0.95 |         |                  |      |
| TC         | 6.80 | minutes | RAINFALL STATION | 68   |

| Rainfall Intensity <sup>1</sup><br>(in/hr)     | Percent Rainfall<br>Volume <sup>1</sup> | Hydraulic Loading Rate<br>(gpm/ft <sup>2</sup> ) | Removal Efficiency<br>(%) | Incremental Removal<br>(%) |
|------------------------------------------------|-----------------------------------------|--------------------------------------------------|---------------------------|----------------------------|
| 0.02                                           | 9.3%                                    | 1.07                                             | 100.0                     | 9.3                        |
| 0.04                                           | 9.5%                                    | 2.13                                             | 100.0                     | 9.5                        |
| 0.06                                           | 8.7%                                    | 3.20                                             | 100.0                     | 8.7                        |
| 0.08                                           | 10.1%                                   | 4.26                                             | 100.0                     | 10.1                       |
| 0.10                                           | 7.2%                                    | 5.33                                             | 100.0                     | 7.2                        |
| 0.12                                           | 6.0%                                    | 6.39                                             | 100.0                     | 6.0                        |
| 0.14                                           | 6.3%                                    | 7.46                                             | 100.0                     | 6.3                        |
| 0.16                                           | 5.6%                                    | 8.52                                             | 100.0                     | 5.6                        |
| 0.18                                           | 4.7%                                    | 9.59                                             | 100.0                     | 4.7                        |
| 0.20                                           | 3.6%                                    | 10.65                                            | 100.0                     | 3.6                        |
| 0.25                                           | 8.2%                                    | 13.32                                            | 99.4                      | 8.1                        |
| 0.50                                           | 14.9%                                   | 26.64                                            | 86.9                      | 13.0                       |
| 0.75                                           | 3.2%                                    | 39.95                                            | 74.3                      | 2.4                        |
| 1.00                                           | 1.2%                                    | 53.27                                            | 61.8                      | 0.8                        |
| 1.50                                           | 0.7%                                    | 76.08                                            | 38.5                      | 0.3                        |
| 2.00                                           | 0.8%                                    | 76.08                                            | 28.8                      | 0.2                        |
|                                                |                                         |                                                  |                           | 95.7                       |
| Removal Efficiency Adjustment <sup>2</sup> =   |                                         |                                                  |                           | 6.5%                       |
| Predicted % Annual Rainfall Treated =          |                                         |                                                  |                           | 93.3%                      |
| Predicted Net Annual Load Removal Efficiency = |                                         |                                                  |                           | 89.2%                      |

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

## CASCADE SEPARATOR DESIGN NOTES

CS-4 RATED TREATMENT CAPACITY IS 2.0 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS4 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

## CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

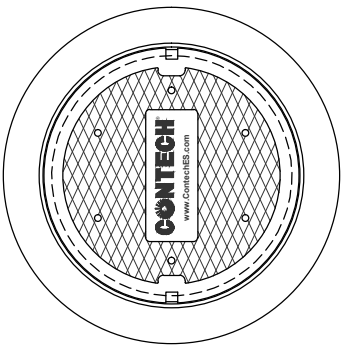
## GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES

## SITE SPECIFIC DATA REQUIREMENTS

|                                     |        |          |          |
|-------------------------------------|--------|----------|----------|
| STRUCTURE ID                        |        |          |          |
| WATER QUALITY FLOW RATE (cfs [L/s]) |        |          |          |
| PEAK FLOW RATE (cfs [L/s])          |        |          |          |
| RETURN PERIOD OF PEAK FLOW (yrs)    |        |          |          |
| RIM ELEVATION                       |        |          |          |
| PIPE DATA:                          | INVERT | MATERIAL | DIAMETER |
| INLET PIPE 1                        |        |          |          |
| INLET PIPE 2                        |        |          |          |
| OUTLET PIPE                         |        |          |          |
| NOTES / SPECIAL REQUIREMENTS:       |        |          |          |



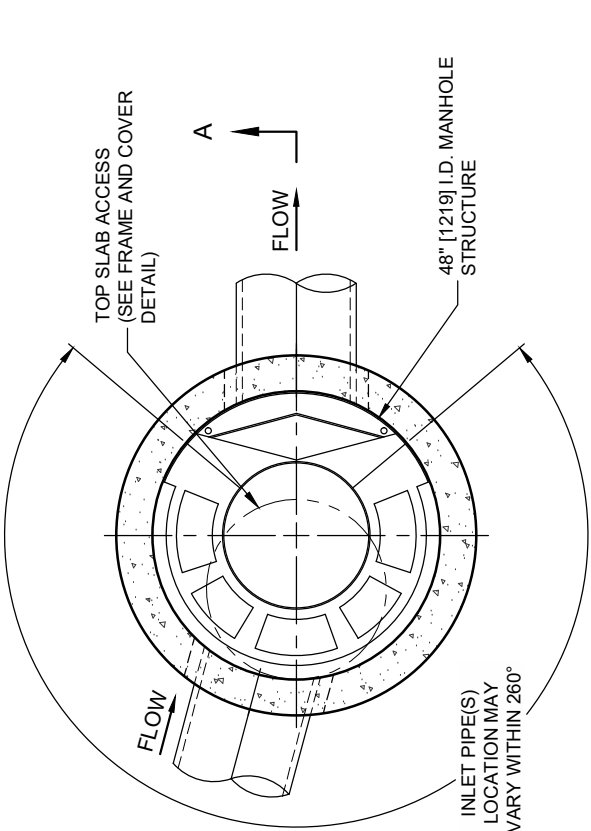
**FRAME AND COVER**  
(DIAMETER VARIES)  
NOT TO SCALE

## GENERAL NOTES

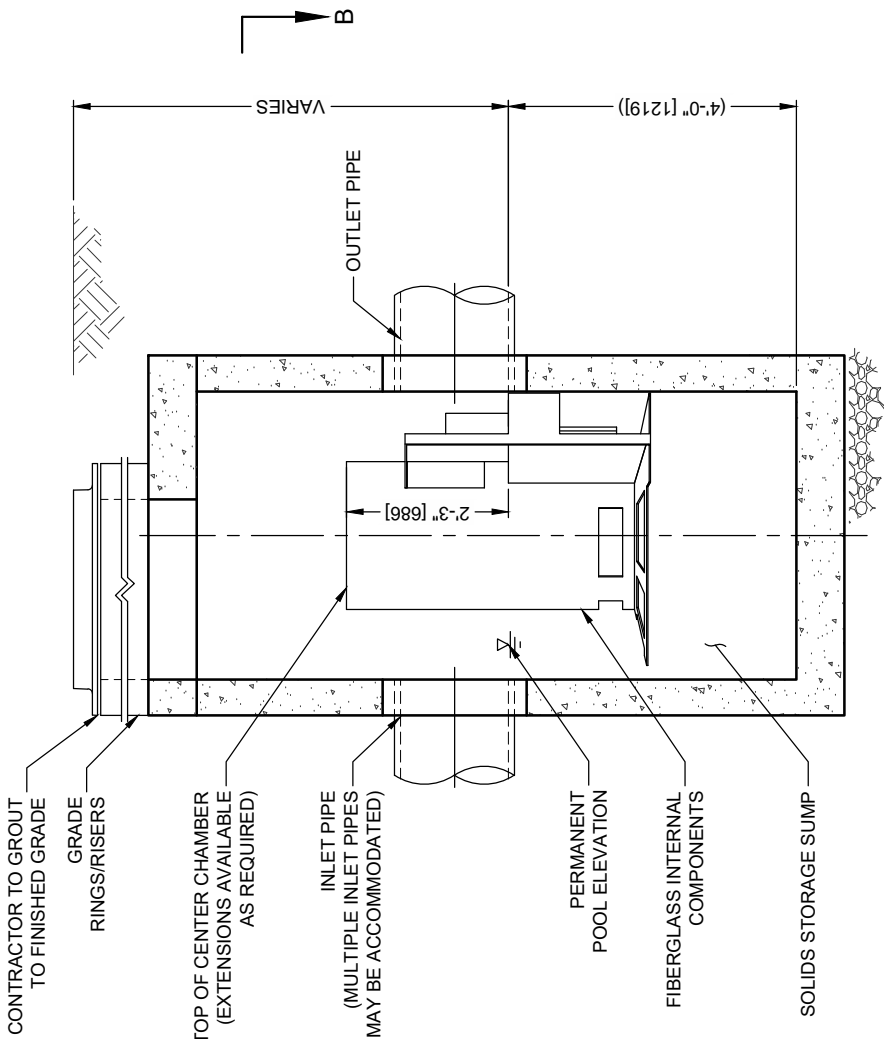
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.ContechES.com](http://www.ContechES.com)
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm ].

## INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



**PLAN VIEW B-B**  
**NOT TO SCALE**



**ELEVATION A-A**  
**NOT TO SCALE**

# CASCADE separator™

**CONTECH.**  
ENGINEERED SOLUTIONS LLC

**www.contechES.com**  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

CS-4  
CASCADE SEPARATOR  
STANDARD DETAIL

Estimated Net Annual Solids Load Reduction  
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD  
HOLLISTON, MA  
C10

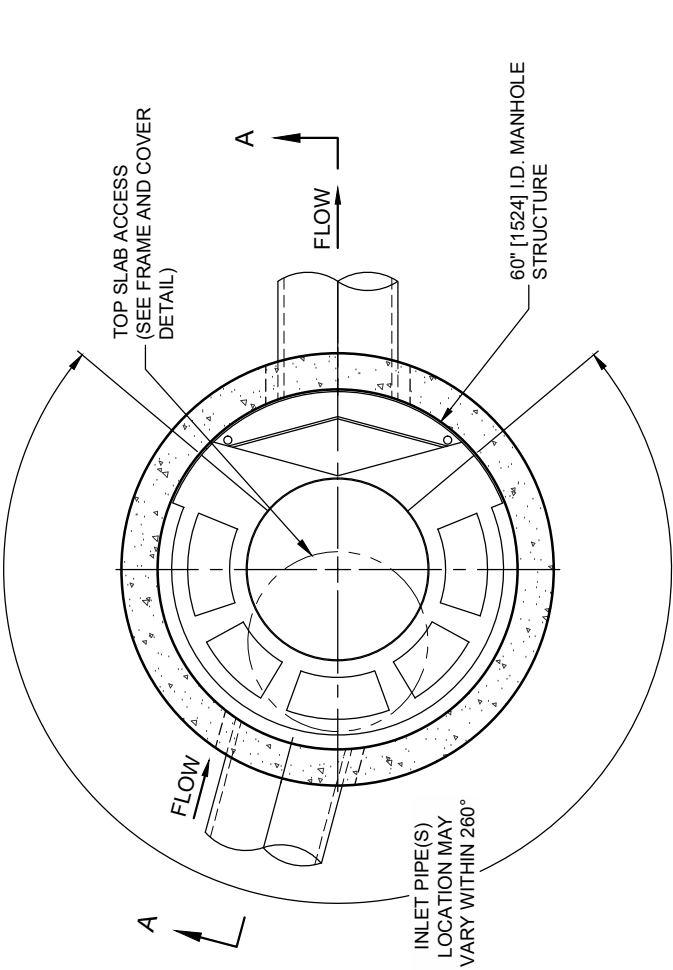


|            |      |         |                  |      |
|------------|------|---------|------------------|------|
| AREA       | 2.43 | acres   | CASCADE MODEL    | CS-5 |
| WEIGHTED C | 0.95 |         |                  |      |
| TC         | 7.90 | minutes | RAINFALL STATION | 68   |

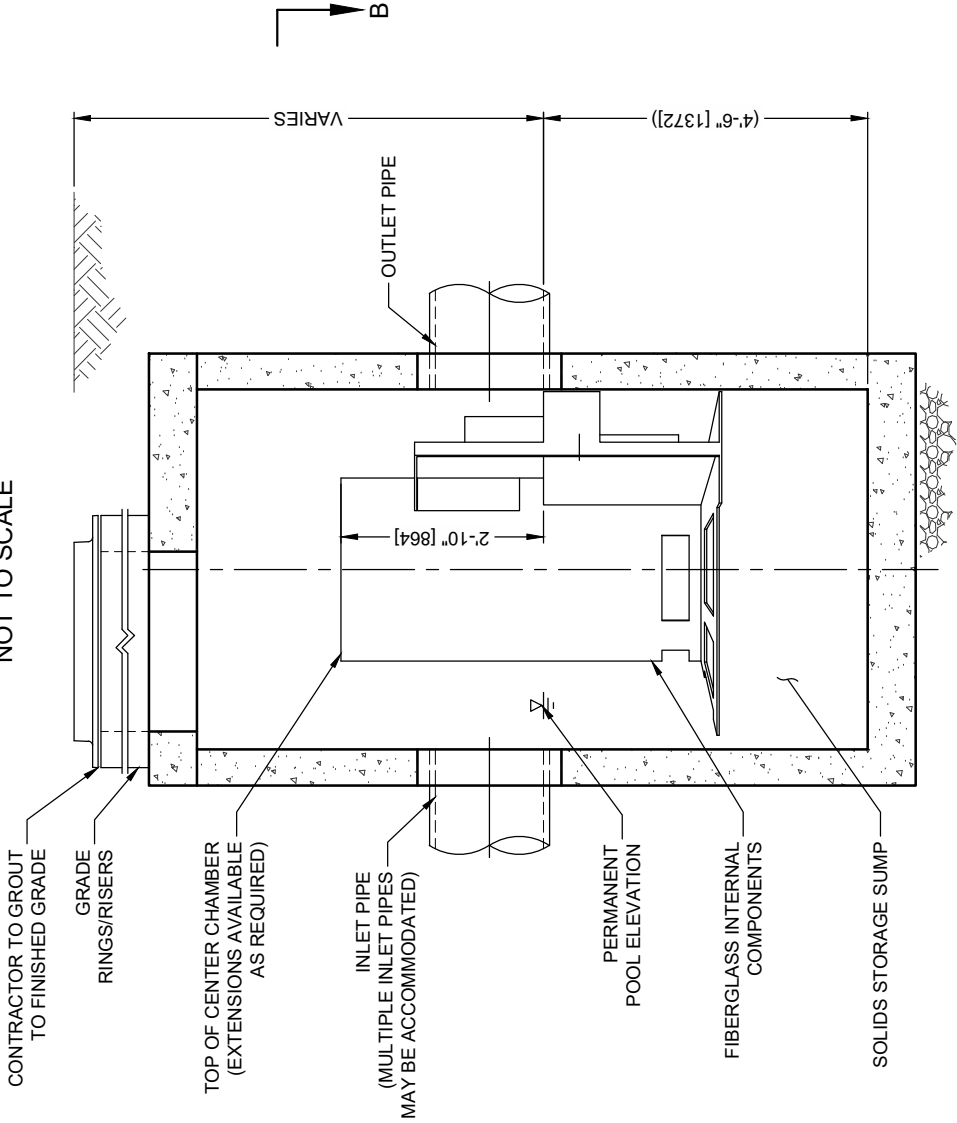
| Rainfall Intensity <sup>1</sup><br>(in/hr)     | Percent Rainfall<br>Volume <sup>1</sup> | Hydraulic Loading Rate<br>(gpm/ft <sup>2</sup> ) | Removal Efficiency<br>(%) | Incremental Removal<br>(%) |
|------------------------------------------------|-----------------------------------------|--------------------------------------------------|---------------------------|----------------------------|
| 0.02                                           | 9.3%                                    | 1.06                                             | 100.0                     | 9.3                        |
| 0.04                                           | 9.5%                                    | 2.11                                             | 100.0                     | 9.5                        |
| 0.06                                           | 8.7%                                    | 3.17                                             | 100.0                     | 8.7                        |
| 0.08                                           | 10.1%                                   | 4.22                                             | 100.0                     | 10.1                       |
| 0.10                                           | 7.2%                                    | 5.28                                             | 100.0                     | 7.2                        |
| 0.12                                           | 6.0%                                    | 6.33                                             | 100.0                     | 6.0                        |
| 0.14                                           | 6.3%                                    | 7.39                                             | 100.0                     | 6.3                        |
| 0.16                                           | 5.6%                                    | 8.44                                             | 100.0                     | 5.6                        |
| 0.18                                           | 4.7%                                    | 9.50                                             | 100.0                     | 4.7                        |
| 0.20                                           | 3.6%                                    | 10.55                                            | 100.0                     | 3.6                        |
| 0.25                                           | 8.2%                                    | 13.19                                            | 99.5                      | 8.1                        |
| 0.50                                           | 14.9%                                   | 26.38                                            | 87.1                      | 13.0                       |
| 0.75                                           | 3.2%                                    | 39.58                                            | 74.7                      | 2.4                        |
| 1.00                                           | 1.2%                                    | 52.77                                            | 62.3                      | 0.8                        |
| 1.50                                           | 0.7%                                    | 79.15                                            | 37.5                      | 0.3                        |
| 2.00                                           | 0.8%                                    | 80.01                                            | 27.8                      | 0.2                        |
|                                                |                                         |                                                  |                           | 95.7                       |
| Removal Efficiency Adjustment <sup>2</sup> =   |                                         |                                                  |                           | 6.5%                       |
| Predicted % Annual Rainfall Treated =          |                                         |                                                  |                           | 93.4%                      |
| Predicted Net Annual Load Removal Efficiency = |                                         |                                                  |                           | 89.3%                      |

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B  
NOT TO SCALE



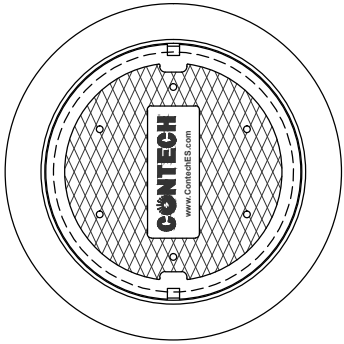
ELEVATION A-A  
NOT TO SCALE

## CASCADE separator™

## CASCADE SEPARATOR DESIGN NOTES

|                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CS-5 RATED TREATMENT CAPACITY IS 3.50 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-5 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS. |
| CONFIGURATION DESCRIPTION                                                                                                                                                                                                                  |
| GRATED INLET ONLY (NO INLET PIPE)                                                                                                                                                                                                          |
| GRATED INLET WITH INLET PIPE OR PIPES                                                                                                                                                                                                      |
| CURB INLET ONLY (NO INLET PIPE)                                                                                                                                                                                                            |
| CURB INLET WITH INLET PIPE OR PIPES                                                                                                                                                                                                        |

| SITE SPECIFIC DATA REQUIREMENTS     |        |          |          |  |
|-------------------------------------|--------|----------|----------|--|
| STRUCTURE ID                        |        |          |          |  |
| WATER QUALITY FLOW RATE (cfs [L/s]) |        |          |          |  |
| PEAK FLOW RATE (cfs [L/s])          |        |          |          |  |
| RETURN PERIOD OF PEAK FLOW (yrs)    |        |          |          |  |
| RIM ELEVATION                       |        |          |          |  |
| PIPE DATA:                          | INVERT | MATERIAL | DIAMETER |  |
| INLET PIPE 1                        |        |          |          |  |
| INLET PIPE 2                        |        |          |          |  |
| OUTLET PIPE                         |        |          |          |  |
| NOTES / SPECIAL REQUIREMENTS:       |        |          |          |  |
|                                     |        |          |          |  |



FRAME AND COVER  
(DIAMETER VARIES)  
NOT TO SCALE

### GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.ContechES.com](http://www.ContechES.com)
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

### INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.



[www.contechES.com](http://www.contechES.com)  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

## CS-5 CASCADE SEPARATOR STANDARD DETAIL

Estimated Net Annual Solids Load Reduction  
Based on the Rational Rainfall Method



555 HOPPING BROOK ROAD  
HOLLISTON, MA  
E19

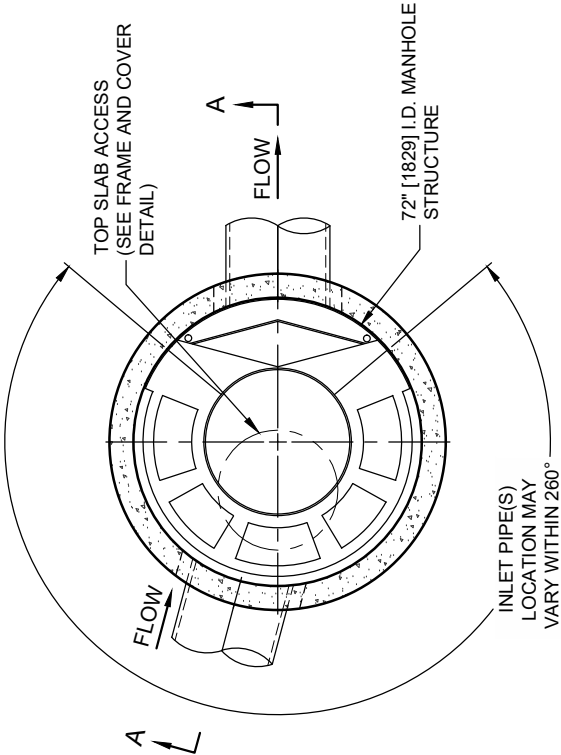


|            |      |         |                  |      |
|------------|------|---------|------------------|------|
| AREA       | 3.24 | acres   | CASCADE MODEL    | CS-6 |
| WEIGHTED C | 0.95 |         |                  |      |
| TC         | 8.90 | minutes | RAINFALL STATION | 68   |

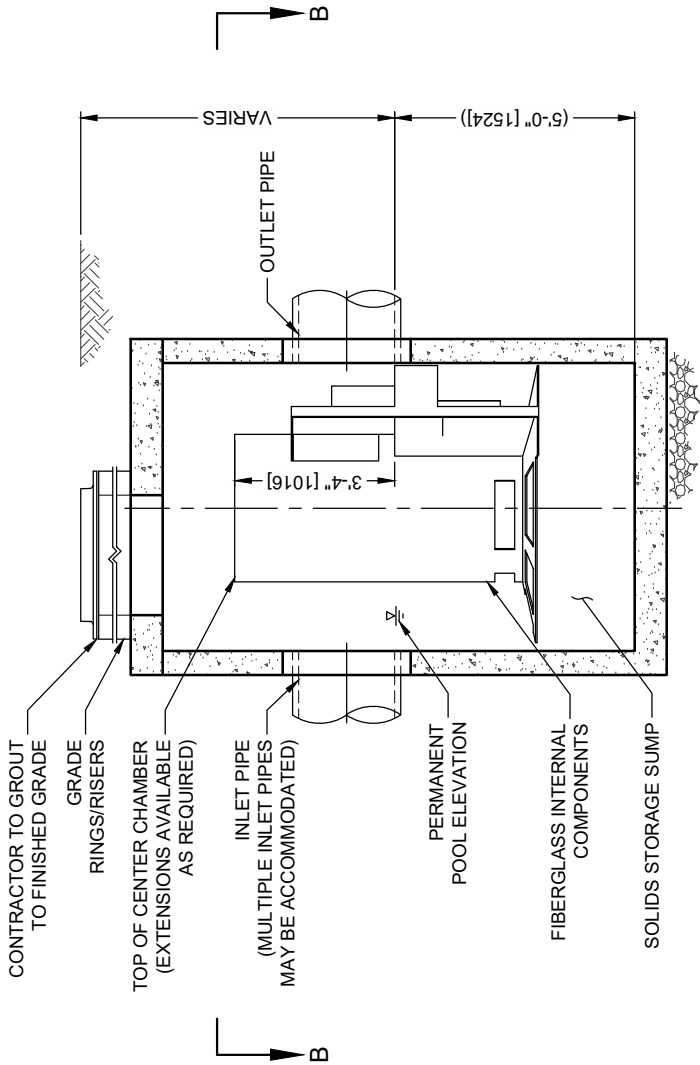
| Rainfall Intensity <sup>1</sup><br>(in/hr)     | Percent Rainfall<br>Volume <sup>1</sup> | Hydraulic Loading Rate<br>(gpm/ft <sup>2</sup> ) | Removal Efficiency<br>(%) | Incremental Removal<br>(%) |
|------------------------------------------------|-----------------------------------------|--------------------------------------------------|---------------------------|----------------------------|
| 0.02                                           | 9.3%                                    | 0.98                                             | 100.0                     | 9.3                        |
| 0.04                                           | 9.5%                                    | 1.95                                             | 100.0                     | 9.5                        |
| 0.06                                           | 8.7%                                    | 2.93                                             | 100.0                     | 8.7                        |
| 0.08                                           | 10.1%                                   | 3.91                                             | 100.0                     | 10.1                       |
| 0.10                                           | 7.2%                                    | 4.89                                             | 100.0                     | 7.2                        |
| 0.12                                           | 6.0%                                    | 5.86                                             | 100.0                     | 6.0                        |
| 0.14                                           | 6.3%                                    | 6.84                                             | 100.0                     | 6.3                        |
| 0.16                                           | 5.6%                                    | 7.82                                             | 100.0                     | 5.6                        |
| 0.18                                           | 4.7%                                    | 8.79                                             | 100.0                     | 4.7                        |
| 0.20                                           | 3.6%                                    | 9.77                                             | 100.0                     | 3.6                        |
| 0.25                                           | 8.2%                                    | 12.22                                            | 100.0                     | 8.2                        |
| 0.50                                           | 14.9%                                   | 24.43                                            | 88.9                      | 13.3                       |
| 0.75                                           | 3.2%                                    | 36.65                                            | 77.5                      | 2.5                        |
| 1.00                                           | 1.2%                                    | 48.86                                            | 66.0                      | 0.8                        |
| 1.50                                           | 0.7%                                    | 73.29                                            | 43.0                      | 0.3                        |
| 2.00                                           | 0.8%                                    | 97.72                                            | 20.0                      | 0.2                        |
|                                                |                                         |                                                  |                           | 96.2                       |
| Removal Efficiency Adjustment <sup>2</sup> =   |                                         |                                                  |                           | 6.5%                       |
| Predicted % Annual Rainfall Treated =          |                                         |                                                  |                           | 93.5%                      |
| Predicted Net Annual Load Removal Efficiency = |                                         |                                                  |                           | 89.7%                      |

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B  
NOT TO SCALE



ELEVATION A-A  
NOT TO SCALE

CASCADE  
separator™

CASCADE SEPARATOR DESIGN NOTES

CS-6 RATED TREATMENT CAPACITY IS 5.6 CFS, OR PER LOCAL REGULATIONS. THE STANDARD CS-6 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

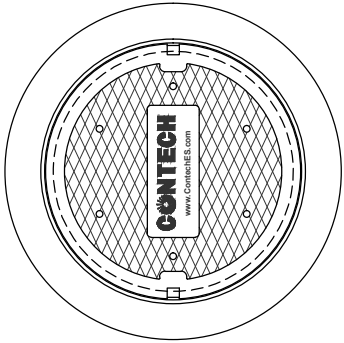
CONFIGURATION DESCRIPTION

GRATED INLET ONLY (NO INLET PIPE)

GRATED INLET WITH INLET PIPE OR PIPES

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER  
(DIAMETER VARIES)  
NOT TO SCALE

SITE SPECIFIC  
DATA REQUIREMENTS

|                                     |  |
|-------------------------------------|--|
| STRUCTURE ID                        |  |
| WATER QUALITY FLOW RATE (cfs [L/s]) |  |
| PEAK FLOW RATE (cfs [L/s])          |  |
| RETURN PERIOD OF PEAK FLOW (yrs)    |  |
| RIM ELEVATION                       |  |
|                                     |  |
| PIPE DATA:                          |  |
| INLET PIPE 1                        |  |
| INLET PIPE 2                        |  |
| OUTLET PIPE                         |  |
|                                     |  |

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.contechES.com](http://www.contechES.com)
- CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
- CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
- ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH  
ENGINEERED SOLUTIONS LLC

[www.contechES.com](http://www.contechES.com)  
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

CS-6  
CASCADE SEPARATOR  
STANDARD DETAIL

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION  
BASED ON THE RATIONAL RAINFALL METHOD**

**555 HOPPING BROOK ROAD  
HOLLISTON, MA**

Area **0.23 ac**  
Weighted C **0.9**  
 $t_c$  **6 min**  
CDS Model **1515-3**

Unit Site Designation **DMH J3**  
Rainfall Station # **68**

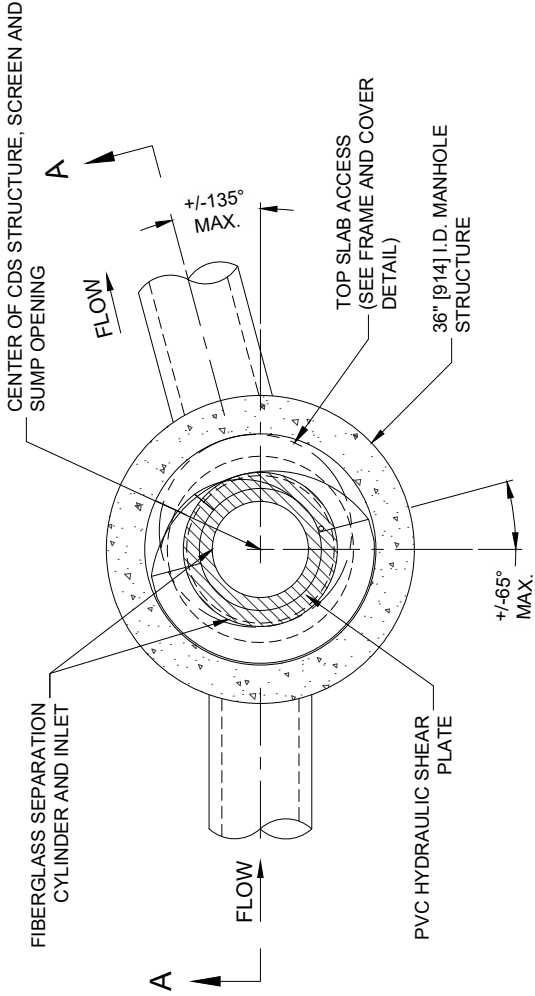
CDS Treatment Capacity **1.0 cfs**

| <u>Rainfall Intensity<sup>1</sup></u><br><u>(in/hr)</u> | <u>Percent Rainfall Volume<sup>1</sup></u> | <u>Cumulative Rainfall Volume</u> | <u>Total Flowrate (cfs)</u> | <u>Treated Flowrate (cfs)</u> | <u>Incremental Removal (%)</u> |
|---------------------------------------------------------|--------------------------------------------|-----------------------------------|-----------------------------|-------------------------------|--------------------------------|
| 0.02                                                    | 9.3%                                       | 9.3%                              | 0.00                        | 0.00                          | 9.0                            |
| 0.04                                                    | 9.5%                                       | 18.8%                             | 0.01                        | 0.01                          | 9.2                            |
| 0.06                                                    | 8.7%                                       | 27.5%                             | 0.01                        | 0.01                          | 8.4                            |
| 0.08                                                    | 10.1%                                      | 37.6%                             | 0.02                        | 0.02                          | 9.7                            |
| 0.10                                                    | 7.2%                                       | 44.8%                             | 0.02                        | 0.02                          | 6.9                            |
| 0.12                                                    | 6.0%                                       | 50.8%                             | 0.02                        | 0.02                          | 5.7                            |
| 0.14                                                    | 6.3%                                       | 57.1%                             | 0.03                        | 0.03                          | 6.0                            |
| 0.16                                                    | 5.6%                                       | 62.7%                             | 0.03                        | 0.03                          | 5.3                            |
| 0.18                                                    | 4.7%                                       | 67.4%                             | 0.04                        | 0.04                          | 4.4                            |
| 0.20                                                    | 3.6%                                       | 71.0%                             | 0.04                        | 0.04                          | 3.4                            |
| 0.25                                                    | 8.2%                                       | 79.1%                             | 0.05                        | 0.05                          | 7.6                            |
| 0.50                                                    | 14.9%                                      | 94.0%                             | 0.10                        | 0.10                          | 13.4                           |
| 0.75                                                    | 3.2%                                       | 97.3%                             | 0.16                        | 0.16                          | 2.8                            |
| 1.00                                                    | 1.2%                                       | 98.5%                             | 0.21                        | 0.21                          | 1.0                            |
| 1.50                                                    | 0.7%                                       | 99.2%                             | 0.31                        | 0.31                          | 0.5                            |
| 2.00                                                    | 0.8%                                       | 100.0%                            | 0.42                        | 0.42                          | 0.5                            |
| 0.00                                                    | 0.0%                                       | 100.0%                            | 0.00                        | 0.00                          | 0.0                            |
| 0.00                                                    | 0.0%                                       | 100.0%                            | 0.00                        | 0.00                          | 0.0                            |
| 0.00                                                    | 0.0%                                       | 100.0%                            | 0.00                        | 0.00                          | 0.0                            |
| 0.00                                                    | 0.0%                                       | 100.0%                            | 0.00                        | 0.00                          | 0.0                            |
| 0.00                                                    | 0.0%                                       | 100.0%                            | 0.00                        | 0.00                          | 0.0                            |
|                                                         |                                            |                                   |                             |                               | 94.0                           |
| Removal Efficiency Adjustment <sup>2</sup> =            |                                            |                                   |                             |                               | 6.5%                           |
| Predicted % Annual Rainfall Treated =                   |                                            |                                   |                             |                               | 93.5%                          |
| <b>Predicted Net Annual Load Removal Efficiency =</b>   |                                            |                                   |                             |                               | <b>87.6%</b>                   |

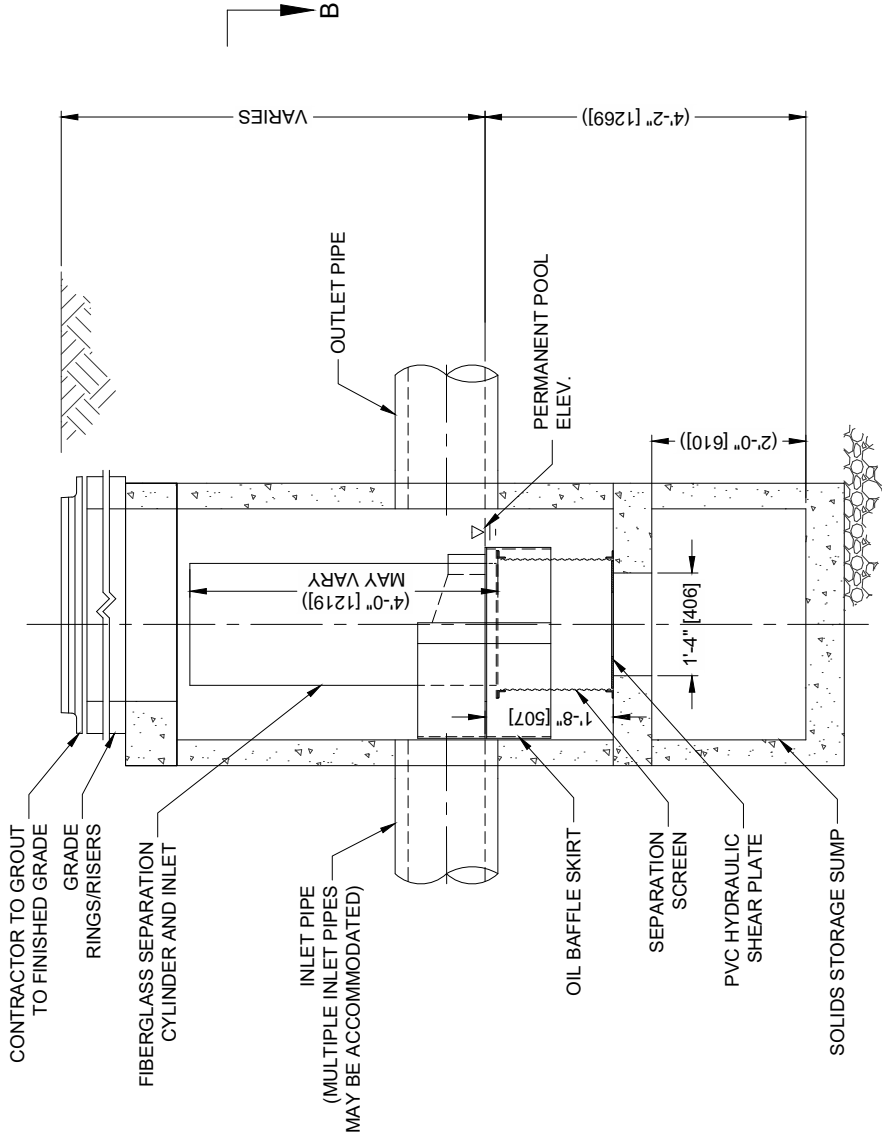
1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

I:\AD CONTECH-CPI\COM\ROOT\STORMWATER\URJIS\DICTIONS\US\A\MA\SPE DESIGN TOOL\STD\DESIGN DETAILS\CDS1515-3-C-DTL.DWG 8/6/2018 4:16 PM



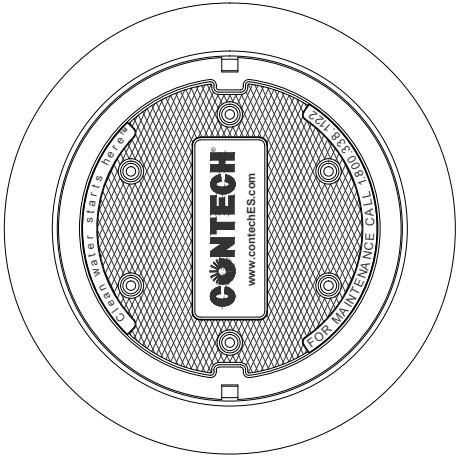
PLAN VIEW B-B  
N.T.S.



ELEVATION A-A  
N.T.S.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.  
THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



FRAME AND COVER  
(DIAMETER VARIES)  
N.T.S.

SITE SPECIFIC  
DATA REQUIREMENTS

|                                      |  |          |       |          |
|--------------------------------------|--|----------|-------|----------|
| STRUCTURE ID                         |  |          |       |          |
| WATER QUALITY FLOW RATE (CFS OR L/s) |  |          | *     |          |
| PEAK FLOW RATE (CFS OR L/s)          |  |          | *     |          |
| RETURN PERIOD OF PEAK FLOW (YRS)     |  |          | *     |          |
| SCREEN APERTURE (2400 OR 4700)       |  |          | *     |          |
| PIPE DATA:                           |  |          |       |          |
| I.E.                                 |  | MATERIAL |       | DIAMETER |
| INLET PIPE 1                         |  | *        |       | *        |
| INLET PIPE 2                         |  | *        |       | *        |
| OUTLET PIPE                          |  | *        |       | *        |
| RIM ELEVATION                        |  |          |       |          |
|                                      |  |          |       |          |
| ANTI-FLOTATION BALLAST               |  |          | WIDTH | HEIGHT   |
|                                      |  |          | *     | *        |
| NOTES/SPECIAL REQUIREMENTS:          |  |          |       |          |
|                                      |  |          |       |          |
| * PER ENGINEER OF RECORD             |  |          |       |          |

GENERAL NOTES

- CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. [www.contechES.com](http://www.contechES.com)
- CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
- STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
- IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
- CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

- ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

**CONTECH**  
ENGINEERED SOLUTIONS LLC  
[www.contechES.com](http://www.contechES.com)

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069  
800-338-1122 513-645-7000 513-645-7993 FAX

CDS1515-3-C  
ONLINE CDS  
STANDARD DETAIL



THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE  
FOLLOWING PATENTS: 6,811,111; 6,811,112; 6,811,113; 6,811,114;  
RELATED FOREIGN PATENTS, OR OTHER PATENT PENDING.

| FOREBAY VOLUMES |           |         |                          | 6/1/2022               |
|-----------------|-----------|---------|--------------------------|------------------------|
| 30P-NE          | ELEVATION | AREA    | $\Delta$ ELEV x AVG AREA | VOLUME<br>AT ELEVATION |
|                 | 323.00    | 2874.00 |                          |                        |
|                 | 324.00    | 4803.00 | 3838.50                  | 3838.50                |
|                 |           |         |                          |                        |
| 30P-NW          | 323.00    | 2045.00 |                          |                        |
|                 | 324.00    | 3715.00 | 2880.00                  | 2880.00                |
|                 |           |         |                          |                        |
| 10P             | 278.00    | 81.00   |                          |                        |
|                 | 280.00    | 509.00  | 590.00                   | 590.00                 |
|                 | 282.00    | 1095.00 | 1604.00                  | 2194.00                |

## INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 555 Hopping Brk Rd. - A + B outlets

| A                     | B                             | C                  | D                    | E                    |
|-----------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP <sup>1</sup>      | TSS Removal Rate <sup>1</sup> | Starting TSS Load* | Amount Removed (B*C) | Remaining Load (C-D) |
| Deep Sump Hooded CB's | 0.25                          | 1.00               | 0.25                 | 0.75                 |
| Concrete CS Unit      | 0.65                          | 0.75               | 0.49                 | 0.26                 |
| Sediment Forebay      | 0.25                          | 0.26               | 0.07                 | 0.19                 |
|                       |                               |                    |                      |                      |
|                       |                               |                    |                      |                      |

## TSS Removal Calculation Worksheet

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

Total TSS Removal =

81%

Project: 3780  
 Prepared By: WH  
 Date: 6/1/22

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

## INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 555 Hopping Brk Rd. - C outlet

Calculation Worksheet

| A                        | B                                | C                     | D                       | E                       |
|--------------------------|----------------------------------|-----------------------|-------------------------|-------------------------|
| BMP <sup>1</sup>         | TSS Removal<br>Rate <sup>1</sup> | Starting TSS<br>Load* | Amount<br>Removed (B*C) | Remaining<br>Load (C-D) |
| Deep Sump<br>Hooded CB's | 0.25                             | 1.00                  | 0.25                    | 0.75                    |
| Concrete<br>CS Unit      | 0.65                             | 0.75                  | 0.49                    | 0.26                    |
| Sediment<br>Forebay      | 0.25                             | 0.26                  | 0.07                    | 0.19                    |
|                          |                                  |                       |                         |                         |
|                          |                                  |                       |                         |                         |

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

Total TSS Removal =

81%

Project: 3780

Prepared By: WJ

Date: 6/1/22

\*Equals remaining load from previous BMP (E)

which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

## INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 555 Hopping Brk Rd. - E Outlet

| A                       | B                             | C                  | D                    | E                    |
|-------------------------|-------------------------------|--------------------|----------------------|----------------------|
| BMP <sup>1</sup>        | TSS Removal Rate <sup>1</sup> | Starting TSS Load* | Amount Removed (B*C) | Remaining Load (C-D) |
| Deep Sump Hooded C.B.'s | 0.25                          | 1.00               | 0.25                 | 0.75                 |
| Concrete C.S. Unit      | 0.65                          | 0.75               | 0.49                 | 0.26                 |
| Sediment Forebay        | 0.25                          | 0.26               | 0.07                 | 0.19                 |
|                         |                               |                    |                      |                      |
|                         |                               |                    |                      |                      |

## TSS Removal Calculation Worksheet

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

**Total TSS Removal =**

**81%**

Project: 3780

Prepared By: WJ

Date: 6/1/22

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

## INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 555 Hopping Brk Rd. - J outlet

| A<br>BMP <sup>1</sup>    | B<br>TSS Removal<br>Rate <sup>1</sup> | C<br>Starting TSS<br>Load* | D<br>Amount<br>Removed (B*C) | E<br>Remaining<br>Load (C-D) |
|--------------------------|---------------------------------------|----------------------------|------------------------------|------------------------------|
|                          |                                       |                            |                              |                              |
| Deep Sump<br>Hooded CB's | 0.25                                  | 1.00                       | 0.25                         | 0.75                         |
| Concrete<br>as Unit      | 0.65                                  | 0.75                       | 0.49                         | 0.26                         |
| Sediment<br>Forebay      | 0.25                                  | 0.26                       | 0.07                         | 0.19                         |
|                          |                                       |                            |                              |                              |
|                          |                                       |                            |                              |                              |

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

Total TSS Removal =

81%

Project: 3780Prepared By: WHLDate: 6/1/22

\*Equals remaining load from previous BMP (E)

which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

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ENGINEERING DESIGN CONSULTANTS, INC. SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION, DATA, OR PROCEDURES UTILIZED BY THE CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR PRIVATE PROPERTY OR PERSONS OR THE SAFETY OF THE CONTRACTOR TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

ENGINEERING DESIGN CONSULTANTS, INC.'S LIABILITY FOR THIS PLAN IS LIMITED TO THE EXTENT OF ITS FEE LESS THIRD PARTY COSTS.

| REVISION | DATE    | ISSUED FOR REVIEW | DESCRIPTION |
|----------|---------|-------------------|-------------|
| 5        |         |                   |             |
| 4        |         |                   |             |
| 3        |         |                   |             |
| 2        |         |                   |             |
| 1        |         |                   |             |
| 0        | 6/01/22 |                   |             |
| DATE     | REV     | DATE              | DESCRIPTION |

|          |          |         |          |
|----------|----------|---------|----------|
| ENGINEER | DESIGNER | CHECKER | APPROVER |
|          |          |         |          |



Engineering Design Consultants, Inc.  
32 Turnpike Road  
Southborough, Massachusetts  
PH: (508) 480-0225 FAX: (508) 480-0251

PREPARED BY:

PROJECT:

TITLE:

STORM DRAINAGE RUNOFF AREAS  
555 HOPPING BROOK ROAD  
HOLLISTON, MA 01746  
CRG INTEGRATED REAL ESTATE SOLUTIONS  
200 BARR HARBOR DRIVE  
CONSHOHOCKEN, PA 19248

555 HOPPING BROOK ROAD  
HOLLISTON, MASSACHUSETTS  
(MIDDLESEX COUNTY)

FILE NO. 3780 SITE PLANS

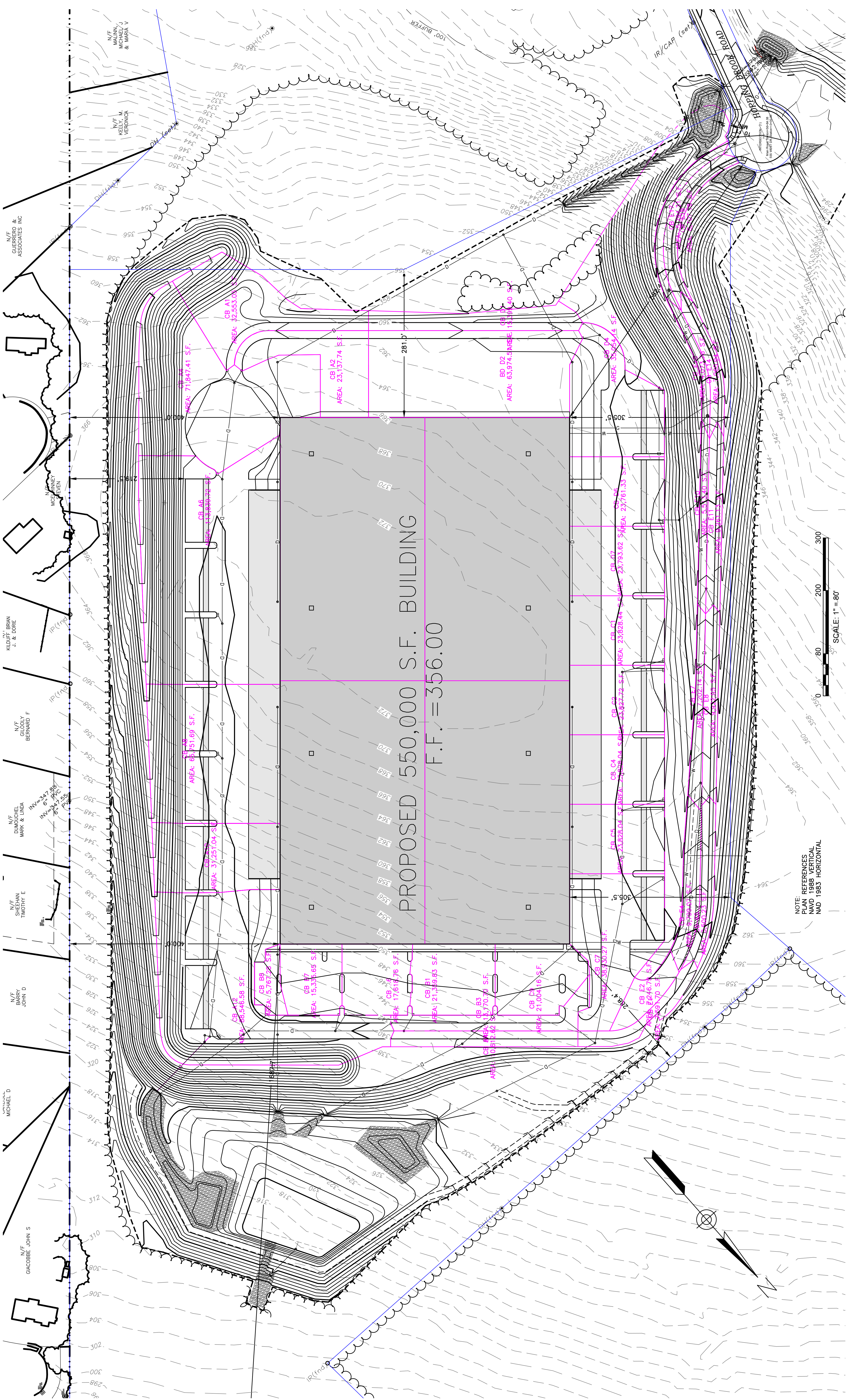
RUNOFF 25

DATE JUNE 1, 2022

REVIEW PLAN NO.

31 of 31

31



NOTE: REFERENCES  
NAD 1983 VERTICAL  
NAD 1983 HORIZONTAL

SCALE: 1" = 80'

PROPOSED 550,000 S.F. BUILDING  
F.F. = 356.00

AREA: 71,847.41 S.F.

CB A1

AREA: 12,553.03 S.F.

CB A2

AREA: 11,330.72 S.F.

CB A3

AREA: 65,751.69 S.F.

CB A4

AREA: 37,257.04 S.F.

CB A5

AREA: 17,619.76 S.F.

CB A6

AREA: 15,335.65 S.F.

CB A7

AREA: 21,389.83 S.F.

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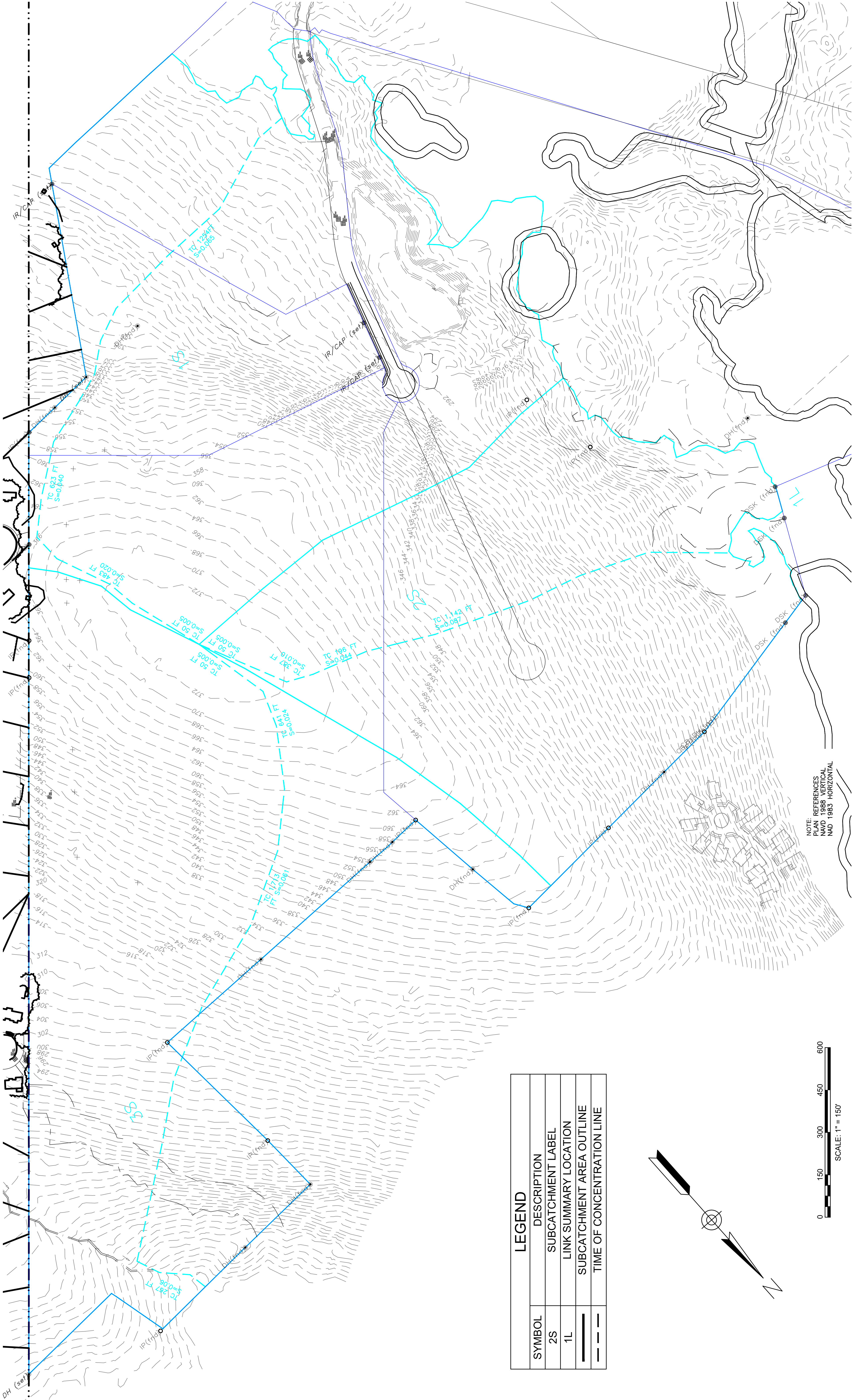
CB A123

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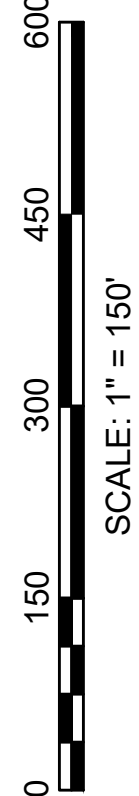
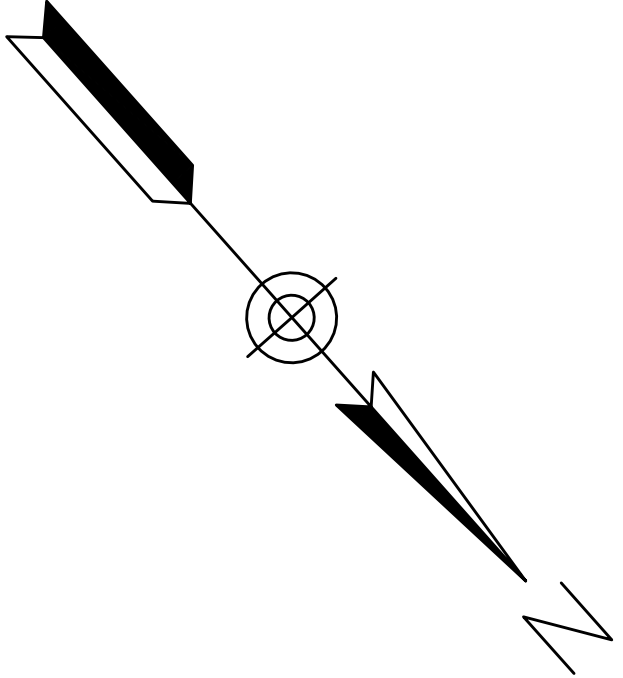


SCALE: 1" = 100'

32



| LEGEND |                            |
|--------|----------------------------|
| SYMBOL | DESCRIPTION                |
| 2S     | SUBCATCHMENT LABEL         |
| 1L     | LINK SUMMARY LOCATION      |
| —      | SUBCATCHMENT AREA OUTLINE  |
| ---    | TIME OF CONCENTRATION LINE |



NOTE:  
PLAN REFERENCES  
NAD 1988 VERTICAL  
NAD 1983 HORIZONTAL

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| REVISION | DATE    | DESCRIPTION       |
|----------|---------|-------------------|
| 5        | 6/01/22 | ISSUED FOR REVIEW |
| 4        |         |                   |
| 3        |         |                   |
| 2        |         |                   |
| 1        |         |                   |
| 0        |         |                   |



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Southborough, Massachusetts  
PH: (508) 480-0225 FAX: (508) 480-0225

555 HOPPING BROOK ROAD  
HOLLISTON, MASSACHUSETTS  
(MIDDLESEX COUNTY)

PRE-DEVELOPMENT RUNOFF AREAS  
555 HOPPING BROOK ROAD  
HOLLISTON, MA 01746  
CRG INTEGRATED REAL ESTATE SOLUTIONS  
200 BARR HARBOR DRIVE  
CONSHOHOCKEN, PA 19248

FILE NO. 3780 SITE PLANS  
PRE-DEV  
DATE JUNE 1, 2022  
REVISED PLAN NO.  
29 of 31  
29



