

STORMWATER CALCULATIONS

555 Hopping Brook Road

Holliston, Massachusetts

Prepared For:

CRG INTEGRATED REAL ESTATE SOLUTIONS

200 BARR HARBOR DRIVE
CONSHOHOCKEN, PA 19248

Prepared By:



32 Turnpike Road
Southborough, Massachusetts 01772

November 16, 2019

Revised: February 5, 2020

Revised: February 5, 2021

Revised: April 13, 2021

TABLE OF CONTENTS

	Page No.
Cover Page	1
Table of Contents	2
Project Narrative	3
Drainage Narrative	3-4
Pre/Post-development peak discharge rates	4
Infiltration/Detention Basin summary	4
DEP Stormwater Management Standards	5-6
DEP Checklist for Stormwater Report	7-14
 Stormwater Management Calculations	
Routing Diagram	15
2-year	16-27
10-year	27-38
25-year	39-50
100-year	51-84
Swale Runoff (100-year)	85-86
Simple Dynamic – 0.85”	87-89
 Attachments:	
Manning’s Pipe Flow	90-97
Riprap for Outlets Design	98-109
Riprap Lined Plunge Pool	110-111
FIRM Map	112
Soil Survey Map & Data	113-116
Contech TSS removal calculations	117-121
Contech Structure Details	122-124
Forebay volumes table	125
Site Runoff Areas Plan	126
Pre-development Runoff Areas Plan	127
Post-development Runoff Areas Plan	128
Swale Runoff Areas (Adjacent to Medway Abutters)	129

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.

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 Cross Culverts (11R) in the wetland area have not changed from the original design, no design information on them is provided in this report as they have more than enough capacity as designed.

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 11L, “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 10S, 11S, 12S, 15S, 17S, 19S, 21S, 22S, and 27S represent developed portions of the parcel flowing to the west. Subcatchments 15S, 16S, and 18S represent roadway Subcatchments and Subcatchment 21S is an area that surround the

detention basins 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 (5) Subcatchments that, included in the proposed condition that flow to the north. Subcatchments representing developed land are 23S, 24S, 25S and 28S. 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					Events for Link 11L: Total Post Developed West				
Event	Rainfall (inches)	Inflow (cfs)	Volume (cubic-feet)	Depth (inches)	Event	Rainfall (inches)	Inflow (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year D	3.16	21.8	302,530	0.80	2-Year D	3.16	21.6	422,272	1.08
10-Year D	4.77	55.9	701,900	1.87	10-Year D	4.77	51.6	874,801	2.24
25-Year D	6.03	86.7	1,063,312	2.83	25-Year D	6.03	76.7	1,271,083	3.25
100-Year D	8.62	155.5	1,879,893	5.00	100-Year D	8.62	155.3	2,153,567	5.50

Events for Subcatchment 3S: Total PreDeveloped North					Events for Link 12L: Total Post-Developed North				
Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)	Event	Rainfall (inches)	Inflow (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year D	3.16	10.9	156,676	0.80	2-Year D	3.16	10.9	200,521	1.12
10-Year D	4.77	27.9	363,503	1.87	10-Year D	4.77	25.9	419,039	2.34
25-Year D	6.03	43.2	550,673	2.83	25-Year D	6.03	40.9	609,440	3.40
100-Year D	8.62	77.5	973,568	5.00	100-Year D	8.62	74.0	1,025,313	5.72

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 relocated 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.

WEST	Detention Basin Data (10P) Berm Elev: 284.50			
	2-Year	10-Year	25-Year	100-year
Peak Elevation (ft.)	279.35	280.55	281.46	282.65

NORTH	Detention Basin Data (30P) Berm Elev: 308.50			
	2-Year	10-Year	25-Year	100-year
Peak Elevation (ft.)	304.58	305.37	305.91	307.04

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. 1,556,246 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.

821,794 s.f of impervious flows to the west, and 734,452 s.f of impervious flows to the north.

The amount of recharge required to the west is $(821,794 \times 0.25/12) = 17,121$ c.f., based upon an underlying hydrologic soil group C. Recharge required to the north is $(734,452 \times 0.25/12) = 15,301$ c.f.

DEP's "Simple Dynamic" method of evaluating recharge was used for this project. Two Subcatchments were created using only the impervious areas flowing to the west and north, a storm that produces 0.85 inches of precipitation for hours 11 to 13, provides the required recharge volume of runoff. Both infiltration/detention basins are designed to infiltrate the required amount of runoff with no outflow out the primary outlets.

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

$$T_{(\text{drawdown})} = Rv/k(\text{bottom Area})$$

$$T(\text{West}) = 17,121/((0.27/12)(13,808)) = 55.11 \text{ hours}$$

$$T(\text{North}) = 15,301/((0.27/12)(13,400)) = 50.75 \text{ hours}$$

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 81.8% to 90.9% TSS removal.

The forebays and WQV for the infiltration/detention basins were designed using 0.5-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: 374,296 s.f. of pavement, Required volume= $374,296 \times 0.1"/12 = 3,119$ c.f.
Volume provided = 11,151 c.f. ok!

Basin 30P;

Northeast Forebay: 199,841 s.f. of pavement, Required volume= $199,841 \times 0.1"/12 = 1,665$ c.f.
Volume provided = 4,564 c.f. ok!

Northwest Forebay: 181,690 s.f. of pavement, Required volume= $181,690 \times 0.1"/12 = 1,514$ c.f.
Volume provided = 4,416 c.f. ok!

Water Quality Volume for the infiltration basins;

Basin 10P = $374,296 \times 0.5"/12 = 15,596$ c.f. required, 17,998 c.f. provided, ok!

Basin 30P = $381,531 \times 0.5' / 12 = 15,897$ c.f. required, 29,430 c.f. provided, ok!

The storage provided to the west basin is up to the elevation of the outlet control structure 276.67, and the storage provided is 17,998 cubic feet. The storage provided to the north basin is up to the elevation of the outlet control structure 307.50, and the storage provided is 29,430 cubic feet.

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 0.5-inch rule was used to calculate the water quality volume for the basins.

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.

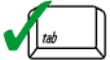


Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

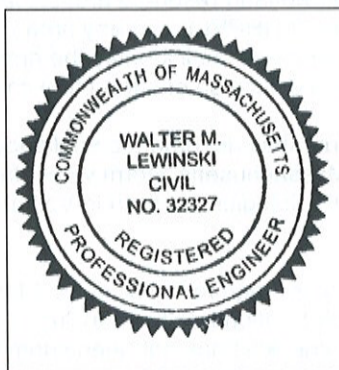
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Walter M. Lewinski 2-5-21
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



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

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.



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

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 Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



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

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.



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

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.



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

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)

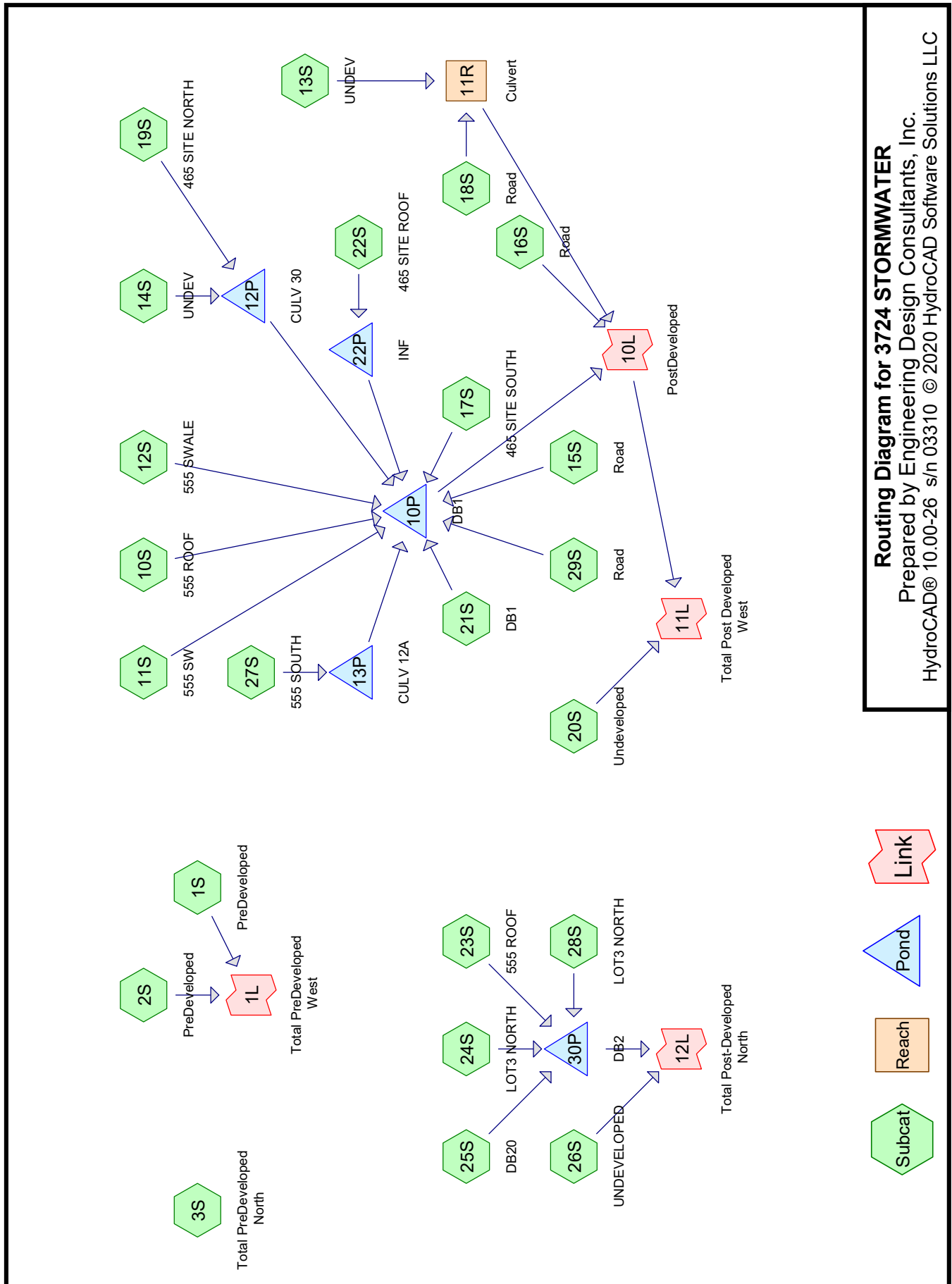
- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and 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.



3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 1

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 2

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, 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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 3

Summary for Subcatchment 10S: 555 ROOF

Runoff = 28.4 cfs @ 12.13 hrs, Volume= 109,176 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
447,498	98	Roofs, HSG C
447,498		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
1.4	1,210	0.0300	14.47	71.04	Pipe Channel, RCP_Round 30" 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
6.4	1,210	Total			

Summary for Subcatchment 11S: 555 SW

Runoff = 10.5 cfs @ 12.16 hrs, Volume= 38,580 cf, Depth= 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
274,316	74	>75% Grass cover, Good, HSG C
79,970	98	Paved parking, HSG C
354,286	79	Weighted Average
274,316		77.43% Pervious Area
79,970		22.57% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 4

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0800	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	330	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,569	0.0240	11.16	35.05	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	1,949	Total			

Summary for Subcatchment 12S: 555 SWALE

Runoff = 18.5 cfs @ 12.15 hrs, Volume= 66,016 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
221,347	74	>75% Grass cover, Good, HSG C
218,665	98	Paved parking, HSG C
440,012	86	Weighted Average
221,347		50.30% Pervious Area
218,665		49.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.2	55	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,528	0.0240	11.16	35.05	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.2	1,633	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 5

Summary for Subcatchment 13S: UNDEV

Runoff = 3.0 cfs @ 13.07 hrs, Volume= 36,394 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
479,049	70	Woods, Good, HSG C
63,530	74	>75% Grass cover, Good, HSG C
542,579	70	Weighted Average
542,579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.4	602	0.0320	0.45		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.2	164	0.1160	0.85		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.1	340	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
72.7	1,893	Total			

Summary for Subcatchment 14S: UNDEV

Runoff = 2.8 cfs @ 12.58 hrs, Volume= 22,679 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 6

Area (sf)	CN	Description
234,585	70	Woods, Good, HSG C
84,030	74	>75% Grass cover, Good, HSG C
318,615	71	Weighted Average
318,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.7	220	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.7	366	0.0570	3.58		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	65	0.2860	8.02		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.6	587	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
39.4	1,288	Total			

Summary for Subcatchment 15S: Road

Runoff = 1.8 cfs @ 12.12 hrs, Volume= 5,778 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
20,387	98	Paved parking, HSG C
16,503	74	>75% Grass cover, Good, HSG C
36,890	87	Weighted Average
16,503		44.74% Pervious Area
20,387		55.26% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 7

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 8

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 9

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 13.1 cfs @ 12.90 hrs, Volume= 140,867 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 10

Area (sf)	CN	Description
2,100,143	70	Woods, Good, HSG C
2,100,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0170	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.7	170	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
60.8	1,735	Total			

Summary for Subcatchment 21S: DB1

Runoff = 2.7 cfs @ 12.24 hrs, Volume= 12,754 cf, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
139,013	74	>75% Grass cover, Good, HSG C
20,864	70	Woods, Good, HSG C
159,877	73	Weighted Average
159,877		100.00% Pervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 11

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= 0.00-96.00 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 ROOF

Runoff = 23.0 cfs @ 12.12 hrs, Volume= 86,102 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
352,921	98	Roofs, HSG C
352,921		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
5.7	483	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 14.3 cfs @ 12.16 hrs, Volume= 53,745 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
90,573	74	>75% Grass cover, Good, HSG C
199,841	98	Paved parking, HSG C
290,414	91	Weighted Average
90,573		31.19% Pervious Area
199,841		68.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0470	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	186	0.0470	1.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	160	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	192	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.0	588	Total			

Summary for Subcatchment 25S: DB20

Runoff = 4.7 cfs @ 12.14 hrs, Volume= 15,819 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 13

Area (sf)	CN	Description
187,710	74	>75% Grass cover, Good, HSG C
187,710		100.00% Pervious Area

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

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 8.4 cfs @ 12.69 hrs, Volume= 76,052 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
902,457	70	Woods, Good, HSG C
166,007	74	>75% Grass cover, Good, HSG C
1,068,464	71	Weighted Average
1,068,464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	50	0.0120	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	285	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
16.7	405	0.0260	0.40		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.4	740	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 14

Summary for Subcatchment 27S: 555 SOUTH

Runoff = 0.4 cfs @ 12.24 hrs, Volume= 1,778 cf, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
5,500	74	>75% Grass cover, Good, HSG C
19,481	70	Woods, Good, HSG C
24,981	71	Weighted Average
24,981		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.1700	0.09		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
5.1	242	0.1000	0.79		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
14.2	292	Total			

Summary for Subcatchment 28S: LOT3 NORTH

Runoff = 12.5 cfs @ 12.16 hrs, Volume= 46,389 cf, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
68,977	74	>75% Grass cover, Good, HSG C
181,690	98	Paved parking, HSG C
250,667	91	Weighted Average
68,977		27.52% Pervious Area
181,690		72.48% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 15

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0400	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	32	0.3500	4.14		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	310	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	240	0.0110	7.55	23.73	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	632	Total			

Summary for Subcatchment 29S: Road

Runoff = 0.6 cfs @ 12.11 hrs, Volume= 2,032 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 2-Year D Rainfall=3.16"

Area (sf)	CN	Description
7,650	98	Paved parking, HSG C
3,787	74	>75% Grass cover, Good, HSG C
11,437	90	Weighted Average
3,787		33.11% Pervious Area
7,650		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	20	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.4	99	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	135	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 16

4.5 254 Total

Summary for Reach 11R: Culvert

Inflow Area = 564,505 sf, 1.94% Impervious, Inflow Depth = 0.86" for 2-Year D event
 Inflow = 3.1 cfs @ 13.04 hrs, Volume= 40,619 cf
 Outflow = 3.1 cfs @ 13.06 hrs, Volume= 40,619 cf, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Max. Velocity= 3.31 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.40 fps, Avg. Travel Time= 0.6 min

Peak Storage= 48 cf @ 13.05 hrs

Average Depth at Peak Storage= 0.45'

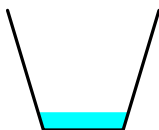
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

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'

**Summary for Pond 10P: DB1**

Inflow Area = 2,000,649 sf, 46.65% Impervious, Inflow Depth = 1.69" for 2-Year D event
 Inflow = 68.7 cfs @ 12.15 hrs, Volume= 281,786 cf
 Outflow = 6.1 cfs @ 13.65 hrs, Volume= 281,609 cf, Atten= 91%, Lag= 90.2 min
 Discarded = 0.5 cfs @ 13.65 hrs, Volume= 45,626 cf
 Primary = 5.6 cfs @ 13.65 hrs, Volume= 235,983 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 2

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 17

Peak Elev= 279.35' @ 13.65 hrs Surf.Area= 78,642 sf Storage= 143,027 cf

Plug-Flow detention time= 444.4 min calculated for 281,521 cf (100% of inflow)
Center-of-Mass det. time= 445.2 min (1,258.3 - 813.1)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	661,735 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	113 cf	4.00'D x 9.00'H Vertical Cone/Cylinder
		661,848 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	0	0.0	0	0	0
276.00	13,808	670.0	4,603	4,603	35,724
277.00	26,900	835.0	19,994	24,596	55,499
278.00	44,600	1,025.0	35,379	59,975	83,637
279.00	70,690	1,550.0	57,147	117,122	191,224
280.00	94,783	1,550.0	82,443	199,564	192,774
281.00	112,000	1,690.0	103,272	302,836	228,907
282.00	117,000	1,710.0	114,491	417,327	234,579
283.00	122,500	1,730.0	119,739	537,067	240,317
284.00	126,850	1,750.0	124,669	661,735	246,123

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' / ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.67'	6.0" Vert. Orifice/Grate X 3.00' C= 0.600
#3	Device 1	278.80'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	282.60'	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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 18

Discarded OutFlow Max=0.5 cfs @ 13.65 hrs HW=279.35' (Free Discharge)
↳ **6=Exfiltration** (Exfiltration Controls 0.5 cfs)**Primary OutFlow** Max=5.6 cfs @ 13.65 hrs HW=279.35' (Free Discharge)
↳ **1=Culvert** (Passes 5.6 cfs of 33.8 cfs potential flow)
↳ **2=Orifice/Grate** (Orifice Controls 4.4 cfs @ 7.50 fps)
↳ **3=Sharp-Crested Rectangular Weir** (Weir Controls 1.2 cfs @ 2.42 fps)
↳ **4=Orifice/Grate** (Controls 0.0 cfs)
↳ **5=Emergency Spillway** (Controls 0.0 cfs)**Summary for Pond 12P: CULV 30**

Inflow Area =	366,527 sf,	6.00% Impervious,	Inflow Depth = 0.97" for 2-Year D event
Inflow =	3.2 cfs @	12.56 hrs,	Volume= 29,560 cf
Outflow =	3.2 cfs @	12.58 hrs,	Volume= 29,560 cf, Atten= 0%, Lag= 1.3 min
Discarded =	0.5 cfs @	12.58 hrs,	Volume= 16,932 cf
Primary =	2.7 cfs @	12.58 hrs,	Volume= 12,628 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 6
Peak Elev= 280.64' @ 12.58 hrs Surf.Area= 734 sf Storage= 530 cfPlug-Flow detention time= 4.1 min calculated for 29,560 cf (100% of inflow)
Center-of-Mass det. time= 4.1 min (923.4 - 919.3)

Volume	Invert	Avail.Storage	Storage Description
#1	279.50'	8,119 cf	Custom Stage Data (Conic) 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 19

Device	Routing	Invert	Outlet Devices
#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 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'	27.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.5 cfs @ 12.58 hrs HW=280.64' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.5 cfs)**Primary OutFlow** Max=2.7 cfs @ 12.58 hrs HW=280.64' (Free Discharge)↳ **1=Culvert** (Inlet Controls 2.7 cfs @ 2.72 fps)**Summary for Pond 13P: CULV 12A**

Inflow Area = 24,981 sf, 0.00% Impervious, Inflow Depth = 0.85" for 2-Year D event
 Inflow = 0.4 cfs @ 12.24 hrs, Volume= 1,778 cf
 Outflow = 0.4 cfs @ 12.24 hrs, Volume= 1,778 cf, Atten= 0%, Lag= 0.3 min
 Discarded = 0.0 cfs @ 12.24 hrs, Volume= 0 cf
 Primary = 0.4 cfs @ 12.24 hrs, Volume= 1,778 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Peak Elev= 287.30' @ 12.24 hrs Surf.Area= 46 sf Storage= 5 cf

Plug-Flow detention time= 0.1 min calculated for 1,778 cf (100% of inflow)

Center-of-Mass det. time= 0.1 min (916.3 - 916.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	287.00'	9,713 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
287.00	0	0.0	0	0	0
288.00	508	86.0	169	169	590
290.00	1,679	162.0	2,074	2,243	2,110
292.00	2,763	200.1	4,397	6,640	3,266
293.00	3,393	220.0	3,073	9,713	3,964

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 20

Device	Routing	Invert	Outlet Devices
#1	Primary	287.00'	12.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 287.00' / 282.00' S= 0.0417 ' /' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	287.00'	0.027 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.24 hrs HW=287.30' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=0.4 cfs @ 12.24 hrs HW=287.30' (Free Discharge)↳ **1=Culvert** (Inlet Controls 0.4 cfs @ 1.86 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= 0.00-96.00 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 27,220 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	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 21

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 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'	0.270 in/hr Exfiltration over Wetted area

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 = 1,081,712 sf, 67.90% Impervious, Inflow Depth = 2.24" for 2-Year D event
 Inflow = 53.2 cfs @ 12.14 hrs, Volume= 202,055 cf
 Outflow = 3.2 cfs @ 14.27 hrs, Volume= 202,044 cf, Atten= 94%, Lag= 127.6 min
 Discarded = 0.6 cfs @ 14.27 hrs, Volume= 78,394 cf
 Primary = 2.6 cfs @ 14.27 hrs, Volume= 123,650 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 4

Peak Elev= 304.58' @ 14.27 hrs Surf.Area= 92,065 sf Storage= 111,848 cf

Plug-Flow detention time= 579.3 min calculated for 202,044 cf (100% of inflow)

Center-of-Mass det. time= 578.9 min (1,380.4 - 801.4)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	488,203 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	301.50'	72 cf	4.00'D x 5.70'H Vertical Cone/Cylinder
		488,275 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
303.00	31,785	685.0	0.0	0	0	31,785
304.00	91,010	1,200.0	100.0	58,860	58,860	109,043
306.00	94,640	1,220.0	100.0	185,638	244,498	113,591
308.00	98,340	1,245.0	100.0	192,968	437,466	119,080
308.50	104,640	1,280.0	100.0	50,737	488,203	126,141

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 22

Device	Routing	Invert	Outlet Devices
#1	Primary	301.50'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.50' / 298.00' S= 0.0700 ' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	303.50'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	304.80'	1.6' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	307.20'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	307.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	301.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 14.27 hrs HW=304.58' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=2.6 cfs @ 14.27 hrs HW=304.58' (Free Discharge)**1=Culvert** (Passes 2.6 cfs of 21.8 cfs potential flow)**2=Orifice/Grate** (Orifice Controls 2.6 cfs @ 4.38 fps)**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)**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= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,595,817 sf, 36.83% Impervious, Inflow Depth = 1.30" for 2-Year D event
 Inflow = 8.7 cfs @ 13.14 hrs, Volume= 281,405 cf
 Primary = 8.7 cfs @ 13.14 hrs, Volume= 281,405 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 23

Summary for Link 11L: Total Post Developed West

Inflow Area = 4,695,960 sf, 20.36% Impervious, Inflow Depth = 1.08" for 2-Year D event
 Inflow = 21.6 cfs @ 12.94 hrs, Volume= 422,272 cf
 Primary = 21.6 cfs @ 12.94 hrs, Volume= 422,272 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,150,176 sf, 34.16% Impervious, Inflow Depth = 1.11" for 2-Year D event
 Inflow = 10.8 cfs @ 12.69 hrs, Volume= 199,702 cf
 Primary = 10.8 cfs @ 12.69 hrs, Volume= 199,702 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 24

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 25

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, 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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 26

Summary for Subcatchment 10S: 555 ROOF

Runoff = 43.2 cfs @ 12.13 hrs, Volume= 169,063 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
447,498	98	Roofs, HSG C
447,498		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
1.4	1,210	0.0300	14.47	71.04	Pipe Channel, RCP_Round 30" 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
6.4	1,210	Total			

Summary for Subcatchment 11S: 555 SW

Runoff = 21.2 cfs @ 12.16 hrs, Volume= 76,901 cf, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
274,316	74	>75% Grass cover, Good, HSG C
79,970	98	Paved parking, HSG C
354,286	79	Weighted Average
274,316		77.43% Pervious Area
79,970		22.57% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 27

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0800	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	330	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,569	0.0240	11.16	35.05	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	1,949	Total			

Summary for Subcatchment 12S: 555 SWALE

Runoff = 32.8 cfs @ 12.15 hrs, Volume= 119,277 cf, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
221,347	74	>75% Grass cover, Good, HSG C
218,665	98	Paved parking, HSG C
440,012	86	Weighted Average
221,347		50.30% Pervious Area
218,665		49.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.2	55	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,528	0.0240	11.16	35.05	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.2	1,633	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 28

Summary for Subcatchment 13S: UNDEV

Runoff = 7.8 cfs @ 13.01 hrs, Volume= 84,437 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
479,049	70	Woods, Good, HSG C
63,530	74	>75% Grass cover, Good, HSG C
542,579	70	Weighted Average
542,579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.4	602	0.0320	0.45		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.2	164	0.1160	0.85		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.1	340	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
72.7	1,893	Total			

Summary for Subcatchment 14S: UNDEV

Runoff = 6.9 cfs @ 12.56 hrs, Volume= 51,622 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 29

Area (sf)	CN	Description
234,585	70	Woods, Good, HSG C
84,030	74	>75% Grass cover, Good, HSG C
318,615	71	Weighted Average
318,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.7	220	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.7	366	0.0570	3.58		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	65	0.2860	8.02		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.6	587	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
39.4	1,288	Total			

Summary for Subcatchment 15S: Road

Runoff = 3.2 cfs @ 12.12 hrs, Volume= 10,302 cf, Depth= 3.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
20,387	98	Paved parking, HSG C
16,503	74	>75% Grass cover, Good, HSG C
36,890	87	Weighted Average
16,503		44.74% Pervious Area
20,387		55.26% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 30

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 31

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 32

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 33.6 cfs @ 12.86 hrs, Volume= 326,827 cf, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 33

Area (sf)	CN	Description
2,100,143	70	Woods, Good, HSG C
2,100,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0170	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.7	170	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
60.8	1,735	Total			

Summary for Subcatchment 21S: DB1

Runoff = 6.2 cfs @ 12.23 hrs, Volume= 28,000 cf, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
139,013	74	>75% Grass cover, Good, HSG C
20,864	70	Woods, Good, HSG C
159,877	73	Weighted Average
159,877		100.00% Pervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 34

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= 0.00-96.00 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 ROOF

Runoff = 35.0 cfs @ 12.12 hrs, Volume= 133,332 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
352,921	98	Roofs, HSG C
352,921		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
5.7	483	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 35

Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 23.5 cfs @ 12.16 hrs, Volume= 90,974 cf, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
90,573	74	>75% Grass cover, Good, HSG C
199,841	98	Paved parking, HSG C
290,414	91	Weighted Average
90,573		31.19% Pervious Area
199,841		68.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0470	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	186	0.0470	1.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	160	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	192	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.0	588	Total			

Summary for Subcatchment 25S: DB20

Runoff = 10.4 cfs @ 12.13 hrs, Volume= 34,135 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 36

Area (sf)	CN	Description
187,710	74	>75% Grass cover, Good, HSG C
187,710		100.00% Pervious Area

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

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 21.0 cfs @ 12.64 hrs, Volume= 173,112 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
902,457	70	Woods, Good, HSG C
166,007	74	>75% Grass cover, Good, HSG C
1,068,464	71	Weighted Average
1,068,464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	50	0.0120	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	285	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
16.7	405	0.0260	0.40		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.4	740	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 37

Summary for Subcatchment 27S: 555 SOUTH

Runoff = 0.9 cfs @ 12.23 hrs, Volume= 4,047 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
5,500	74	>75% Grass cover, Good, HSG C
19,481	70	Woods, Good, HSG C
24,981	71	Weighted Average
24,981		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.1700	0.09		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
5.1	242	0.1000	0.79		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
14.2	292	Total			

Summary for Subcatchment 28S: LOT3 NORTH

Runoff = 20.5 cfs @ 12.16 hrs, Volume= 78,523 cf, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
68,977	74	>75% Grass cover, Good, HSG C
181,690	98	Paved parking, HSG C
250,667	91	Weighted Average
68,977		27.52% Pervious Area
181,690		72.48% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 38

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0400	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	32	0.3500	4.14		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	310	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	240	0.0110	7.55	23.73	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	632	Total			

Summary for Subcatchment 29S: Road

Runoff = 1.1 cfs @ 12.11 hrs, Volume= 3,483 cf, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 10-Year D Rainfall=4.77"

Area (sf)	CN	Description
7,650	98	Paved parking, HSG C
3,787	74	>75% Grass cover, Good, HSG C
11,437	90	Weighted Average
3,787		33.11% Pervious Area
7,650		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	20	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.4	99	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	135	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 39

4.5 254 Total

Summary for Reach 11R: Culvert

Inflow Area = 564,505 sf, 1.94% Impervious, Inflow Depth = 1.95" for 10-Year D event
 Inflow = 8.0 cfs @ 13.01 hrs, Volume= 91,499 cf
 Outflow = 8.0 cfs @ 13.01 hrs, Volume= 91,499 cf, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Max. Velocity= 4.38 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 1.73 fps, Avg. Travel Time= 0.5 min

Peak Storage= 91 cf @ 13.01 hrs

Average Depth at Peak Storage= 0.81'

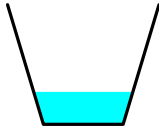
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

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'

**Summary for Pond 10P: DB1**

Inflow Area = 2,000,649 sf, 46.65% Impervious, Inflow Depth = 3.04" for 10-Year D event
 Inflow = 119.2 cfs @ 12.15 hrs, Volume= 506,721 cf
 Outflow = 11.0 cfs @ 13.62 hrs, Volume= 506,397 cf, Atten= 91%, Lag= 88.2 min
 Discarded = 0.7 cfs @ 13.62 hrs, Volume= 58,484 cf
 Primary = 10.3 cfs @ 13.62 hrs, Volume= 447,913 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 2

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 40

Peak Elev= 280.55' @ 13.62 hrs Surf.Area= 104,117 sf Storage= 254,506 cf

Plug-Flow detention time= 411.6 min calculated for 506,239 cf (100% of inflow)

Center-of-Mass det. time= 412.4 min (1,217.0 - 804.6)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	661,735 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	113 cf	4.00'D x 9.00'H Vertical Cone/Cylinder
		661,848 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	0	0.0	0	0	0
276.00	13,808	670.0	4,603	4,603	35,724
277.00	26,900	835.0	19,994	24,596	55,499
278.00	44,600	1,025.0	35,379	59,975	83,637
279.00	70,690	1,550.0	57,147	117,122	191,224
280.00	94,783	1,550.0	82,443	199,564	192,774
281.00	112,000	1,690.0	103,272	302,836	228,907
282.00	117,000	1,710.0	114,491	417,327	234,579
283.00	122,500	1,730.0	119,739	537,067	240,317
284.00	126,850	1,750.0	124,669	661,735	246,123

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.67'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	282.60'	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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 41

Discarded OutFlow Max=0.7 cfs @ 13.62 hrs HW=280.55' (Free Discharge)↳ **6=Exfiltration** (Exfiltration Controls 0.7 cfs)**Primary OutFlow** Max=10.3 cfs @ 13.62 hrs HW=280.55' (Free Discharge)

↳ **1=Culvert** (Passes 10.3 cfs of 37.7 cfs potential flow)
 ↳ **2=Orifice/Grate** (Orifice Controls 5.4 cfs @ 9.18 fps)
 ↳ **3=Sharp-Crested Rectangular Weir** (Weir Controls 4.9 cfs @ 4.33 fps)
 ↳ **4=Orifice/Grate** (Controls 0.0 cfs)
 ↳ **5=Emergency Spillway** (Controls 0.0 cfs)

Summary for Pond 12P: CULV 30

Inflow Area = 366,527 sf, 6.00% Impervious, Inflow Depth = 2.10" for 10-Year D event
 Inflow = 7.6 cfs @ 12.55 hrs, Volume= 64,223 cf
 Outflow = 7.6 cfs @ 12.56 hrs, Volume= 64,223 cf, Atten= 0%, Lag= 0.9 min
 Discarded = 0.5 cfs @ 12.56 hrs, Volume= 22,352 cf
 Primary = 7.1 cfs @ 12.56 hrs, Volume= 41,870 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 281.07' @ 12.56 hrs Surf.Area= 823 sf Storage= 865 cf

Plug-Flow detention time= 3.7 min calculated for 64,203 cf (100% of inflow)
 Center-of-Mass det. time= 3.7 min (896.1 - 892.4)

Volume Invert Avail.Storage Storage Description
 #1 279.50' 8,119 cf **Custom Stage Data (Conic)**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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 42

Device Routing Invert Outlet Devices
 #1 Primary 280.00' **30.0" Round Culvert** L= 129.0' RCP, square edge headwall, Ke= 0.500
 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' **27.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.5 cfs @ 12.56 hrs HW=281.07' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.5 cfs)**Primary OutFlow** Max=7.1 cfs @ 12.56 hrs HW=281.07' (Free Discharge)↳ **1=Culvert** (Inlet Controls 7.1 cfs @ 3.52 fps)**Summary for Pond 13P: CULV 12A**

Inflow Area = 24,981 sf, 0.00% Impervious, Inflow Depth = 1.94" for 10-Year D event
 Inflow = 0.9 cfs @ 12.23 hrs, Volume= 4,047 cf
 Outflow = 0.9 cfs @ 12.24 hrs, Volume= 4,047 cf, Atten= 0%, Lag= 0.6 min
 Discarded = 0.0 cfs @ 12.24 hrs, Volume= 0 cf
 Primary = 0.9 cfs @ 12.24 hrs, Volume= 4,047 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
 Peak Elev= 287.49' @ 12.24 hrs Surf.Area= 120 sf Storage= 19 cf

Plug-Flow detention time= 0.2 min calculated for 4,046 cf (100% of inflow)
 Center-of-Mass det. time= 0.2 min (884.4 - 884.3)

Volume Invert Avail.Storage Storage Description
 #1 287.00' 9,713 cf **Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
287.00	0	0.0	0	0	0
288.00	508	86.0	169	169	590
290.00	1,679	162.0	2,074	2,243	2,110
292.00	2,763	200.1	4,397	6,640	3,266
293.00	3,393	220.0	3,073	9,713	3,964

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 43

Device	Routing	Invert	Outlet Devices
#1	Primary	287.00'	12.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 287.00' / 282.00' S= 0.0417 ' /' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	287.00'	0.027 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.24 hrs HW=287.49' (Free Discharge)**2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=0.9 cfs @ 12.24 hrs HW=287.49' (Free Discharge)**1=Culvert** (Inlet Controls 0.9 cfs @ 2.37 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= 0.00-96.00 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 42,154 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	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 44

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq. cut end projecting, Ke= 0.500 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'	0.270 in/hr Exfiltration over Wetted area

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 = 1,081,712 sf, 67.90% Impervious, Inflow Depth = 3.74" for 10-Year D event
 Inflow = 87.5 cfs @ 12.14 hrs, Volume= 336,964 cf
 Outflow = 6.3 cfs @ 13.60 hrs, Volume= 336,955 cf, Atten= 93%, Lag= 87.6 min
 Discarded = 0.6 cfs @ 13.60 hrs, Volume= 91,695 cf
 Primary = 5.7 cfs @ 13.60 hrs, Volume= 245,260 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 305.37' @ 13.60 hrs Surf.Area= 93,498 sf Storage= 185,115 cf

Plug-Flow detention time= 574.2 min calculated for 336,849 cf (100% of inflow)
 Center-of-Mass det. time= 574.8 min (1,363.7 - 788.9)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	488,203 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	301.50'	72 cf	4.00'D x 5.70'H Vertical Cone/Cylinder
		488,275 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
303.00	31,785	685.0	0.0	0	0	31,785
304.00	91,010	1,200.0	100.0	58,860	58,860	109,043
306.00	94,640	1,220.0	100.0	185,638	244,498	113,591
308.00	98,340	1,245.0	100.0	192,968	437,466	119,080
308.50	104,640	1,280.0	100.0	50,737	488,203	126,141

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 45

Device	Routing	Invert	Outlet Devices
#1	Primary	301.50'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.50' / 298.00' S= 0.0700 ' S= 0.0700 ' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	303.50'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	304.80'	1.6' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	307.20'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	307.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	301.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 13.60 hrs HW=305.37' (Free Discharge)**6=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=5.7 cfs @ 13.60 hrs HW=305.37' (Free Discharge)**1=Culvert** (Passes 5.7 cfs of 25.6 cfs potential flow)**2=Orifice/Grate** (Orifice Controls 3.6 cfs @ 6.12 fps)**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.1 cfs @ 2.46 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= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,595,817 sf, 36.83% Impervious, Inflow Depth = 2.53" for 10-Year D event
 Inflow = 18.3 cfs @ 13.03 hrs, Volume= 547,975 cf
 Primary = 18.3 cfs @ 13.03 hrs, Volume= 547,975 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 46

Summary for Link 11L: Total Post Developed West

Inflow Area = 4,695,960 sf, 20.36% Impervious, Inflow Depth = 2.24" for 10-Year D event
 Inflow = 51.6 cfs @ 12.89 hrs, Volume= 874,801 cf
 Primary = 51.6 cfs @ 12.89 hrs, Volume= 874,801 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,150,176 sf, 34.16% Impervious, Inflow Depth = 2.33" for 10-Year D event
 Inflow = 25.9 cfs @ 12.65 hrs, Volume= 418,372 cf
 Primary = 25.9 cfs @ 12.65 hrs, Volume= 418,372 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 47

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 48

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.5	50	0.0050	0.04		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, 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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 49

Summary for Subcatchment 10S: 555 ROOF

Runoff = 54.8 cfs @ 12.13 hrs, Volume= 215,986 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
447,498	98	Roofs, HSG C
447,498		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
1.4	1,210	0.0300	14.47	71.04	Pipe Channel, RCP_Round 30" 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
6.4	1,210	Total			

Summary for Subcatchment 11S: 555 SW

Runoff = 29.9 cfs @ 12.16 hrs, Volume= 109,428 cf, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
274,316	74	>75% Grass cover, Good, HSG C
79,970	98	Paved parking, HSG C
354,286	79	Weighted Average
274,316		77.43% Pervious Area
79,970		22.57% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 50

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0800	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	330	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,569	0.0240	11.16	35.05	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	1,949	Total			

Summary for Subcatchment 12S: 555 SWALE

Runoff = 44.0 cfs @ 12.15 hrs, Volume= 162,729 cf, Depth= 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
221,347	74	>75% Grass cover, Good, HSG C
218,665	98	Paved parking, HSG C
440,012	86	Weighted Average
221,347		50.30% Pervious Area
218,665		49.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.2	55	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,528	0.0240	11.16	35.05	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.2	1,633	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 51

Summary for Subcatchment 13S: UNDEV

Runoff = 12.1 cfs @ 13.00 hrs, Volume= 127,914 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
479,049	70	Woods, Good, HSG C
63,530	74	>75% Grass cover, Good, HSG C
542,579	70	Weighted Average
542,579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.4	602	0.0320	0.45		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.2	164	0.1160	0.85		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.1	340	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
72.7	1,893	Total			

Summary for Subcatchment 14S: UNDEV

Runoff = 10.5 cfs @ 12.55 hrs, Volume= 77,608 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 52

Area (sf)	CN	Description
234,585	70	Woods, Good, HSG C
84,030	74	>75% Grass cover, Good, HSG C
318,615	71	Weighted Average
318,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.7	220	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.7	366	0.0570	3.58		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	65	0.2860	8.02		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.6	587	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
39.4	1,288	Total			

Summary for Subcatchment 15S: Road

Runoff = 4.2 cfs @ 12.12 hrs, Volume= 13,975 cf, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
20,387	98	Paved parking, HSG C
16,503	74	>75% Grass cover, Good, HSG C
36,890	87	Weighted Average
16,503		44.74% Pervious Area
20,387		55.26% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 53

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 54

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	38	0.0100	0.07		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, 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= 0.00-96.00 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 55

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

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= 0.00-96.00 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 (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	45	0.0050	0.67		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

Summary for Subcatchment 20S: Undeveloped

Runoff = 51.9 cfs @ 12.84 hrs, Volume= 495,112 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 56

Area (sf)	CN	Description
2,100,143	70	Woods, Good, HSG C
2,100,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0170	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.7	170	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
60.8	1,735	Total			

Summary for Subcatchment 21S: DB1

Runoff = 9.2 cfs @ 12.23 hrs, Volume= 41,481 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
139,013	74	>75% Grass cover, Good, HSG C
20,864	70	Woods, Good, HSG C
159,877	73	Weighted Average
159,877		100.00% Pervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 57

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= 0.00-96.00 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 ROOF

Runoff = 44.4 cfs @ 12.12 hrs, Volume= 170,338 cf, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
352,921	98	Roofs, HSG C
352,921		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
5.7	483	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 58

Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 30.6 cfs @ 12.16 hrs, Volume= 120,681 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
90,573	74	>75% Grass cover, Good, HSG C
199,841	98	Paved parking, HSG C
290,414	91	Weighted Average
90,573		31.19% Pervious Area
199,841		68.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0470	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	186	0.0470	1.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	160	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	192	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.0	588	Total			

Summary for Subcatchment 25S: DB20

Runoff = 15.2 cfs @ 12.13 hrs, Volume= 50,214 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 59

Area (sf)	CN	Description
187,710	74	>75% Grass cover, Good, HSG C
187,710		100.00% Pervious Area

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

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 32.1 cfs @ 12.64 hrs, Volume= 260,255 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

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

Area (sf)	CN	Description
902,457	70	Woods, Good, HSG C
166,007	74	>75% Grass cover, Good, HSG C
1,068,464	71	Weighted Average
1,068,464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	50	0.0120	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	285	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
16.7	405	0.0260	0.40		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.4	740	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 60

Summary for Subcatchment 27S: 555 SOUTH

Runoff = 1.4 cfs @ 12.22 hrs, Volume= 6,085 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

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

Area (sf)	CN	Description
5,500	74	>75% Grass cover, Good, HSG C
19,481	70	Woods, Good, HSG C
24,981	71	Weighted Average
24,981		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.1700	0.09		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
5.1	242	0.1000	0.79		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
14.2	292	Total			

Summary for Subcatchment 28S: LOT3 NORTH

Runoff = 26.7 cfs @ 12.15 hrs, Volume= 104,164 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

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

Area (sf)	CN	Description
68,977	74	>75% Grass cover, Good, HSG C
181,690	98	Paved parking, HSG C
250,667	91	Weighted Average
68,977		27.52% Pervious Area
181,690		72.48% Impervious Area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 61

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0400	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	32	0.3500	4.14		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	310	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	240	0.0110	7.55	23.73	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	632	Total			

Summary for Subcatchment 29S: Road

Runoff = 1.4 cfs @ 12.11 hrs, Volume= 4,646 cf, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 25-Year D Rainfall=6.03"

Area (sf)	CN	Description
7,650	98	Paved parking, HSG C
3,787	74	>75% Grass cover, Good, HSG C
11,437	90	Weighted Average
3,787		33.11% Pervious Area
7,650		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	20	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.4	99	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	135	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 62

4.5 254 Total

Summary for Reach 11R: Culvert

Inflow Area = 564,505 sf, 1.94% Impervious, Inflow Depth = 2.92" for 25-Year D event
 Inflow = 12.3 cfs @ 13.00 hrs, Volume= 137,230 cf
 Outflow = 12.3 cfs @ 13.00 hrs, Volume= 137,230 cf, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Max. Velocity= 4.92 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 1.94 fps, Avg. Travel Time= 0.4 min

Peak Storage= 125 cf @ 13.00 hrs

Average Depth at Peak Storage= 1.08'

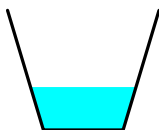
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

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'

**Summary for Pond 10P: DB1**

Inflow Area = 2,000,649 sf, 46.65% Impervious, Inflow Depth = 4.17" for 25-Year D event
 Inflow = 159.5 cfs @ 12.15 hrs, Volume= 694,677 cf
 Outflow = 14.2 cfs @ 13.67 hrs, Volume= 694,234 cf, Atten= 91%, Lag= 91.3 min
 Discarded = 0.7 cfs @ 13.67 hrs, Volume= 67,110 cf
 Primary = 13.5 cfs @ 13.67 hrs, Volume= 627,125 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 2

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 63

Peak Elev= 281.46' @ 13.67 hrs Surf.Area= 114,287 sf Storage= 354,719 cf

Plug-Flow detention time= 415.3 min calculated for 694,234 cf (100% of inflow)
Center-of-Mass det. time= 414.8 min (1,215.1 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	661,735 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	113 cf	4.00'D x 9.00'H Vertical Cone/Cylinder
		661,848 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	0	0.0	0	0	0
276.00	13,808	670.0	4,603	4,603	35,724
277.00	26,900	835.0	19,994	24,596	55,499
278.00	44,600	1,025.0	35,379	59,975	83,637
279.00	70,690	1,550.0	57,147	117,122	191,224
280.00	94,783	1,550.0	82,443	199,564	192,774
281.00	112,000	1,690.0	103,272	302,836	228,907
282.00	117,000	1,710.0	114,491	417,327	234,579
283.00	122,500	1,730.0	119,739	537,067	240,317
284.00	126,850	1,750.0	124,669	661,735	246,123

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.67'	6.0" Vert. Orifice/Grate X 3.00' C= 0.600
#3	Device 1	278.80'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	282.60'	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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 64

Discarded OutFlow Max=0.7 cfs @ 13.67 hrs HW=281.46' (Free Discharge)
↳ **6=Exfiltration** (Exfiltration Controls 0.7 cfs)**Primary OutFlow** Max=13.5 cfs @ 13.67 hrs HW=281.46' (Free Discharge)
↳ **1=Culvert** (Passes 13.5 cfs of 40.4 cfs potential flow)
↳ **2=Orifice/Grate** (Orifice Controls 6.0 cfs @ 10.26 fps)
↳ **3=Sharp-Crested Rectangular Weir** (Weir Controls 7.1 cfs @ 5.33 fps)
↳ **4=Orifice/Grate** (Weir Controls 0.4 cfs @ 0.78 fps)
↳ **5=Emergency Spillway** (Controls 0.0 cfs)**Summary for Pond 12P: CULV 30**

Inflow Area =	366,527 sf,	6.00% Impervious,	Inflow Depth = 3.11" for 25-Year D event
Inflow =	11.5 cfs @	12.54 hrs,	Volume= 94,899 cf
Outflow =	11.5 cfs @	12.56 hrs,	Volume= 94,900 cf, Atten= 0%, Lag= 1.0 min
Discarded =	0.6 cfs @	12.56 hrs,	Volume= 24,746 cf
Primary =	10.9 cfs @	12.56 hrs,	Volume= 70,153 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 6
Peak Elev= 281.36' @ 12.56 hrs Surf.Area= 888 sf Storage= 1,118 cfPlug-Flow detention time= 3.3 min calculated for 94,870 cf (100% of inflow)
Center-of-Mass det. time= 3.3 min (882.2 - 878.9)

Volume	Invert	Avail.Storage	Storage Description
#1	279.50'	8,119 cf	Custom Stage Data (Conic) 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 65

Device	Routing	Invert	Outlet Devices
#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 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'	27.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 12.56 hrs HW=281.36' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=10.9 cfs @ 12.56 hrs HW=281.36' (Free Discharge)↳ **1=Culvert** (Inlet Controls 10.9 cfs @ 3.98 fps)**Summary for Pond 13P: CULV 12A**

Inflow Area = 24,981 sf, 0.00% Impervious, Inflow Depth = 2.92" for 25-Year D event
 Inflow = 1.4 cfs @ 12.22 hrs, Volume= 6,085 cf
 Outflow = 1.4 cfs @ 12.24 hrs, Volume= 6,085 cf, Atten= 1%, Lag= 0.9 min
 Discarded = 0.0 cfs @ 12.24 hrs, Volume= 0 cf
 Primary = 1.4 cfs @ 12.24 hrs, Volume= 6,084 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Peak Elev= 287.62' @ 12.24 hrs Surf.Area= 194 sf Storage= 40 cf

Plug-Flow detention time= 0.2 min calculated for 6,083 cf (100% of inflow)

Center-of-Mass det. time= 0.2 min (869.2 - 869.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	287.00'	9,713 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
287.00	0	0.0	0	0	0
288.00	508	86.0	169	169	590
290.00	1,679	162.0	2,074	2,243	2,110
292.00	2,763	200.1	4,397	6,640	3,266
293.00	3,393	220.0	3,073	9,713	3,964

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 66

Device	Routing	Invert	Outlet Devices
#1	Primary	287.00'	12.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 287.00' / 282.00' S= 0.0417 ' /' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	287.00'	0.027 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.24 hrs HW=287.62' (Free Discharge)↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)**Primary OutFlow** Max=1.4 cfs @ 12.24 hrs HW=287.62' (Free Discharge)↳ **1=Culvert** (Inlet Controls 1.4 cfs @ 2.68 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= 0.00-96.00 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 53,851 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	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap 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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 67

Device	Routing	Invert	Outlet Devices
#1	Primary	286.00'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 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'	0.270 in/hr Exfiltration over Wetted area

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 = 1,081,712 sf, 67.90% Impervious, Inflow Depth = 4.94" for 25-Year D event
 Inflow = 114.5 cfs @ 12.14 hrs, Volume= 445,398 cf
 Outflow = 10.1 cfs @ 13.31 hrs, Volume= 445,385 cf, Atten= 91%, Lag= 70.6 min
 Discarded = 0.6 cfs @ 13.31 hrs, Volume= 96,768 cf
 Primary = 9.5 cfs @ 13.31 hrs, Volume= 348,617 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 4

Peak Elev= 305.91' @ 13.31 hrs Surf.Area= 94,497 sf Storage= 236,502 cf

Plug-Flow detention time= 523.3 min calculated for 445,385 cf (100% of inflow)

Center-of-Mass det. time= 523.1 min (1,305.3 - 782.2)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	488,203 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	301.50'	72 cf	4.00'D x 5.70'H Vertical Cone/Cylinder
		488,275 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
303.00	31,785	685.0	0.0	0	0	31,785
304.00	91,010	1,200.0	100.0	58,860	58,860	109,043
306.00	94,640	1,220.0	100.0	185,638	244,498	113,591
308.00	98,340	1,245.0	100.0	192,968	437,466	119,080
308.50	104,640	1,280.0	100.0	50,737	488,203	126,141

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 68

Device	Routing	Invert	Outlet Devices
#1	Primary	301.50'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.50' / 298.00' S= 0.0700 ' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	303.50'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	304.80'	1.6' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	307.20'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	307.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	301.50'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 13.31 hrs HW=305.91' (Free Discharge)↳ **6=Exfiltration** (Exfiltration Controls 0.6 cfs)**Primary OutFlow** Max=9.5 cfs @ 13.31 hrs HW=305.91' (Free Discharge)↳ **1=Culvert** (Passes 9.5 cfs of 28.0 cfs potential flow)↳ **2=Orifice/Grate** (Orifice Controls 4.2 cfs @ 7.08 fps)↳ **3=Sharp-Crested Rectangular Weir** (Weir Controls 5.3 cfs @ 3.45 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= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 10L: PostDeveloped

Inflow Area = 2,595,817 sf, 36.83% Impervious, Inflow Depth = 3.59" for 25-Year D event
 Inflow = 25.3 cfs @ 13.02 hrs, Volume= 775,971 cf
 Primary = 25.3 cfs @ 13.02 hrs, Volume= 775,971 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 69

Summary for Link 11L: Total Post Developed West

Inflow Area = 4,695,960 sf, 20.36% Impervious, Inflow Depth = 3.25" for 25-Year D event
Inflow = 76.7 cfs @ 12.88 hrs, Volume= 1,271,083 cf
Primary = 76.7 cfs @ 12.88 hrs, Volume= 1,271,083 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,150,176 sf, 34.16% Impervious, Inflow Depth = 3.40" for 25-Year D event
Inflow = 40.9 cfs @ 12.64 hrs, Volume= 608,872 cf
Primary = 40.9 cfs @ 12.64 hrs, Volume= 608,872 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 70

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.8	483	0.0200	0.35		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
20.8	623	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
32.8	1,254	0.0650	0.64		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
97.9	2,410	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 71

Hydrograph for Subcatchment 1S: PreDeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.02	0.4
9.00	1.58	0.10	2.0
10.50	2.15	0.30	5.1
12.00	4.13	1.42	15.4
13.50	6.47	3.18	81.4
15.00	7.04	3.65	30.8
16.50	7.43	3.98	16.1
18.00	7.73	4.23	11.6
19.50	7.98	4.45	9.2
21.00	8.22	4.65	8.2
22.50	8.43	4.83	7.5
24.00	8.62	5.00	6.9
25.50	8.62	5.00	2.8
27.00	8.62	5.00	0.3
28.50	8.62	5.00	0.0
30.00	8.62	5.00	0.0
31.50	8.62	5.00	0.0
33.00	8.62	5.00	0.0
34.50	8.62	5.00	0.0
36.00	8.62	5.00	0.0
37.50	8.62	5.00	0.0
39.00	8.62	5.00	0.0
40.50	8.62	5.00	0.0
42.00	8.62	5.00	0.0
43.50	8.62	5.00	0.0
45.00	8.62	5.00	0.0
46.50	8.62	5.00	0.0
48.00	8.62	5.00	0.0
49.50	8.62	5.00	0.0
51.00	8.62	5.00	0.0
52.50	8.62	5.00	0.0
54.00	8.62	5.00	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.00	0.0
57.00	8.62	5.00	0.0
58.50	8.62	5.00	0.0
60.00	8.62	5.00	0.0
61.50	8.62	5.00	0.0
63.00	8.62	5.00	0.0
64.50	8.62	5.00	0.0
66.00	8.62	5.00	0.0
67.50	8.62	5.00	0.0
69.00	8.62	5.00	0.0
70.50	8.62	5.00	0.0
72.00	8.62	5.00	0.0
73.50	8.62	5.00	0.0
75.00	8.62	5.00	0.0
76.50	8.62	5.00	0.0
78.00	8.62	5.00	0.0
79.50	8.62	5.00	0.0
81.00	8.62	5.00	0.0
82.50	8.62	5.00	0.0
84.00	8.62	5.00	0.0
85.50	8.62	5.00	0.0
87.00	8.62	5.00	0.0
88.50	8.62	5.00	0.0
90.00	8.62	5.00	0.0
91.50	8.62	5.00	0.0
93.00	8.62	5.00	0.0
94.50	8.62	5.00	0.0
96.00	8.62	5.00	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 72

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
25.8	387	0.0100	0.25		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
6.2	196	0.0440	0.52		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
25.8	1,142	0.0870	0.74		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
79.3	1,775	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 73

Hydrograph for Subcatchment 2S: PreDeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.02	0.4
9.00	1.58	0.10	1.9
10.50	2.15	0.30	4.6
12.00	4.13	1.42	14.9
13.50	6.47	3.18	60.1
15.00	7.04	3.65	19.5
16.50	7.43	3.98	11.1
18.00	7.73	4.23	8.6
19.50	7.98	4.45	6.9
21.00	8.22	4.65	6.2
22.50	8.43	4.83	5.7
24.00	8.62	5.00	5.2
25.50	8.62	5.00	1.3
27.00	8.62	5.00	0.1
28.50	8.62	5.00	0.0
30.00	8.62	5.00	0.0
31.50	8.62	5.00	0.0
33.00	8.62	5.00	0.0
34.50	8.62	5.00	0.0
36.00	8.62	5.00	0.0
37.50	8.62	5.00	0.0
39.00	8.62	5.00	0.0
40.50	8.62	5.00	0.0
42.00	8.62	5.00	0.0
43.50	8.62	5.00	0.0
45.00	8.62	5.00	0.0
46.50	8.62	5.00	0.0
48.00	8.62	5.00	0.0
49.50	8.62	5.00	0.0
51.00	8.62	5.00	0.0
52.50	8.62	5.00	0.0
54.00	8.62	5.00	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.00	0.0
57.00	8.62	5.00	0.0
58.50	8.62	5.00	0.0
60.00	8.62	5.00	0.0
61.50	8.62	5.00	0.0
63.00	8.62	5.00	0.0
64.50	8.62	5.00	0.0
66.00	8.62	5.00	0.0
67.50	8.62	5.00	0.0
69.00	8.62	5.00	0.0
70.50	8.62	5.00	0.0
72.00	8.62	5.00	0.0
73.50	8.62	5.00	0.0
75.00	8.62	5.00	0.0
76.50	8.62	5.00	0.0
78.00	8.62	5.00	0.0
79.50	8.62	5.00	0.0
81.00	8.62	5.00	0.0
82.50	8.62	5.00	0.0
84.00	8.62	5.00	0.0
85.50	8.62	5.00	0.0
87.00	8.62	5.00	0.0
88.50	8.62	5.00	0.0
90.00	8.62	5.00	0.0
91.50	8.62	5.00	0.0
93.00	8.62	5.00	0.0
94.50	8.62	5.00	0.0
96.00	8.62	5.00	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 74

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= 0.00-96.00 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		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
27.6	641	0.0240	0.39		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.2	1,713	0.0610	0.62		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
1.6	267	0.0600	2.71	14.43	Parabolic Channel, W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.100 Earth, dense brush, high stage
96.9	2,671	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 75

Hydrograph for Subcatchment 3S: Total PreDeveloped North

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
1.50	0.19	0.00	0.0	57.00	8.62	5.00	0.0
3.00	0.40	0.00	0.0	58.50	8.62	5.00	0.0
4.50	0.64	0.00	0.0	60.00	8.62	5.00	0.0
6.00	0.89	0.00	0.0	61.50	8.62	5.00	0.0
7.50	1.19	0.02	0.3	63.00	8.62	5.00	0.0
9.00	1.58	0.10	1.9	64.50	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				
43.50	8.62	5.00	0.0				
45.00	8.62	5.00	0.0				
46.50	8.62	5.00	0.0				
48.00	8.62	5.00	0.0				
49.50	8.62	5.00	0.0				
51.00	8.62	5.00	0.0				
52.50	8.62	5.00	0.0				
54.00	8.62	5.00	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 76

Summary for Subcatchment 10S: 555 ROOF

Runoff = 78.4 cfs @ 12.13 hrs, Volume= 312,497 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
447,498	98	Roofs, HSG C
447,498		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
1.4	1,210	0.0300	14.47	71.04	Pipe Channel, RCP_Round 30"
					30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63'
					n= 0.013
6.4	1,210	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 77

Hydrograph for Subcatchment 10S: 555 ROOF

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
1.50	0.19	0.06	0.9	57.00	8.62	8.38	0.0
3.00	0.40	0.23	1.3	58.50	8.62	8.38	0.0
4.50	0.64	0.44	1.6	60.00	8.62	8.38	0.0
6.00	0.89	0.68	1.7	61.50	8.62	8.38	0.0
7.50	1.19	0.98	2.3	63.00	8.62	8.38	0.0
9.00	1.58	1.36	2.9	64.50	8.62	8.38	0.0
10.50	2.15	1.93	4.7	66.00	8.62	8.38	0.0
12.00	4.13	3.89	41.6	67.50	8.62	8.38	0.0
13.50	6.47	6.23	5.4	69.00	8.62	8.38	0.0
15.00	7.04	6.80	3.1	70.50	8.62	8.38	0.0
16.50	7.43	7.19	2.4	72.00	8.62	8.38	0.0
18.00	7.73	7.49	1.9	73.50	8.62	8.38	0.0
19.50	7.98	7.75	1.7	75.00	8.62	8.38	0.0
21.00	8.22	7.98	1.5	76.50	8.62	8.38	0.0
22.50	8.43	8.19	1.4	78.00	8.62	8.38	0.0
24.00	8.62	8.38	1.3	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				
43.50	8.62	8.38	0.0				
45.00	8.62	8.38	0.0				
46.50	8.62	8.38	0.0				
48.00	8.62	8.38	0.0				
49.50	8.62	8.38	0.0				
51.00	8.62	8.38	0.0				
52.50	8.62	8.38	0.0				
54.00	8.62	8.38	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 78

Summary for Subcatchment 11S: 555 SW

Runoff = 48.2 cfs @ 12.16 hrs, Volume= 179,731 cf, Depth= 6.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
274,316	74	>75% Grass cover, Good, HSG C
79,970	98	Paved parking, HSG C
354,286	79	Weighted Average
274,316		77.43% Pervious Area
79,970		22.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	50	0.0800	0.18		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.6	330	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,569	0.0240	11.16	35.05	Pipe Channel, RCP_Round 24" 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	1,949	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 79

Hydrograph for Subcatchment 11S: 555 SW

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.1
6.00	0.89	0.04	0.3
7.50	1.19	0.13	0.6
9.00	1.58	0.30	1.1
10.50	2.15	0.61	2.3
12.00	4.13	2.07	21.8
13.50	6.47	4.10	4.0
15.00	7.04	4.62	2.3
16.50	7.43	4.98	1.8
18.00	7.73	5.26	1.4
19.50	7.98	5.49	1.2
21.00	8.22	5.71	1.1
22.50	8.43	5.91	1.0
24.00	8.62	6.09	0.9
25.50	8.62	6.09	0.0
27.00	8.62	6.09	0.0
28.50	8.62	6.09	0.0
30.00	8.62	6.09	0.0
31.50	8.62	6.09	0.0
33.00	8.62	6.09	0.0
34.50	8.62	6.09	0.0
36.00	8.62	6.09	0.0
37.50	8.62	6.09	0.0
39.00	8.62	6.09	0.0
40.50	8.62	6.09	0.0
42.00	8.62	6.09	0.0
43.50	8.62	6.09	0.0
45.00	8.62	6.09	0.0
46.50	8.62	6.09	0.0
48.00	8.62	6.09	0.0
49.50	8.62	6.09	0.0
51.00	8.62	6.09	0.0
52.50	8.62	6.09	0.0
54.00	8.62	6.09	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	6.09	0.0
57.00	8.62	6.09	0.0
58.50	8.62	6.09	0.0
60.00	8.62	6.09	0.0
61.50	8.62	6.09	0.0
63.00	8.62	6.09	0.0
64.50	8.62	6.09	0.0
66.00	8.62	6.09	0.0
67.50	8.62	6.09	0.0
69.00	8.62	6.09	0.0
70.50	8.62	6.09	0.0
72.00	8.62	6.09	0.0
73.50	8.62	6.09	0.0
75.00	8.62	6.09	0.0
76.50	8.62	6.09	0.0
78.00	8.62	6.09	0.0
79.50	8.62	6.09	0.0
81.00	8.62	6.09	0.0
82.50	8.62	6.09	0.0
84.00	8.62	6.09	0.0
85.50	8.62	6.09	0.0
87.00	8.62	6.09	0.0
88.50	8.62	6.09	0.0
90.00	8.62	6.09	0.0
91.50	8.62	6.09	0.0
93.00	8.62	6.09	0.0
94.50	8.62	6.09	0.0
96.00	8.62	6.09	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 80

Summary for Subcatchment 12S: 555 SWALE

Runoff = 67.0 cfs @ 12.15 hrs, Volume= 254,239 cf, Depth= 6.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
221,347	74	>75% Grass cover, Good, HSG C
218,665	98	Paved parking, HSG C
440,012	86	Weighted Average
221,347		50.30% Pervious Area
218,665		49.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0500	0.15		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.2	55	0.0460	4.35		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	1,528	0.0240	11.16	35.05	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.2	1,633	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 81

Hydrograph for Subcatchment 12S: 555 SWALE

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.1
4.50	0.64	0.05	0.5
6.00	0.89	0.14	0.8
7.50	1.19	0.30	1.3
9.00	1.58	0.55	1.9
10.50	2.15	0.97	3.6
12.00	4.13	2.66	31.7
13.50	6.47	4.85	5.2
15.00	7.04	5.40	3.0
16.50	7.43	5.78	2.3
18.00	7.73	6.07	1.8
19.50	7.98	6.32	1.6
21.00	8.22	6.54	1.5
22.50	8.43	6.75	1.3
24.00	8.62	6.93	1.2
25.50	8.62	6.93	0.0
27.00	8.62	6.93	0.0
28.50	8.62	6.93	0.0
30.00	8.62	6.93	0.0
31.50	8.62	6.93	0.0
33.00	8.62	6.93	0.0
34.50	8.62	6.93	0.0
36.00	8.62	6.93	0.0
37.50	8.62	6.93	0.0
39.00	8.62	6.93	0.0
40.50	8.62	6.93	0.0
42.00	8.62	6.93	0.0
43.50	8.62	6.93	0.0
45.00	8.62	6.93	0.0
46.50	8.62	6.93	0.0
48.00	8.62	6.93	0.0
49.50	8.62	6.93	0.0
51.00	8.62	6.93	0.0
52.50	8.62	6.93	0.0
54.00	8.62	6.93	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	6.93	0.0
57.00	8.62	6.93	0.0
58.50	8.62	6.93	0.0
60.00	8.62	6.93	0.0
61.50	8.62	6.93	0.0
63.00	8.62	6.93	0.0
64.50	8.62	6.93	0.0
66.00	8.62	6.93	0.0
67.50	8.62	6.93	0.0
69.00	8.62	6.93	0.0
70.50	8.62	6.93	0.0
72.00	8.62	6.93	0.0
73.50	8.62	6.93	0.0
75.00	8.62	6.93	0.0
76.50	8.62	6.93	0.0
78.00	8.62	6.93	0.0
79.50	8.62	6.93	0.0
81.00	8.62	6.93	0.0
82.50	8.62	6.93	0.0
84.00	8.62	6.93	0.0
85.50	8.62	6.93	0.0
87.00	8.62	6.93	0.0
88.50	8.62	6.93	0.0
90.00	8.62	6.93	0.0
91.50	8.62	6.93	0.0
93.00	8.62	6.93	0.0
94.50	8.62	6.93	0.0
96.00	8.62	6.93	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 82

Summary for Subcatchment 13S: UNDEV

Runoff = 21.5 cfs @ 12.99 hrs, Volume= 226,146 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
479,049	70	Woods, Good, HSG C
63,530	74	>75% Grass cover, Good, HSG C
542,579	70	Weighted Average
542,579		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
22.4	602	0.0320	0.45		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
3.2	164	0.1160	0.85		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
12.1	340	0.0350	0.47		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
22.7	737	0.0470	0.54		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
72.7	1,893	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 83

Hydrograph for Subcatchment 13S: UNDEV

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.02	0.1
9.00	1.58	0.10	0.5
10.50	2.15	0.30	1.3
12.00	4.13	1.42	4.5
13.50	6.47	3.18	15.3
15.00	7.04	3.65	5.0
16.50	7.43	3.98	3.0
18.00	7.73	4.23	2.3
19.50	7.98	4.45	1.9
21.00	8.22	4.65	1.7
22.50	8.43	4.83	1.6
24.00	8.62	5.00	1.4
25.50	8.62	5.00	0.3
27.00	8.62	5.00	0.0
28.50	8.62	5.00	0.0
30.00	8.62	5.00	0.0
31.50	8.62	5.00	0.0
33.00	8.62	5.00	0.0
34.50	8.62	5.00	0.0
36.00	8.62	5.00	0.0
37.50	8.62	5.00	0.0
39.00	8.62	5.00	0.0
40.50	8.62	5.00	0.0
42.00	8.62	5.00	0.0
43.50	8.62	5.00	0.0
45.00	8.62	5.00	0.0
46.50	8.62	5.00	0.0
48.00	8.62	5.00	0.0
49.50	8.62	5.00	0.0
51.00	8.62	5.00	0.0
52.50	8.62	5.00	0.0
54.00	8.62	5.00	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.00	0.0
57.00	8.62	5.00	0.0
58.50	8.62	5.00	0.0
60.00	8.62	5.00	0.0
61.50	8.62	5.00	0.0
63.00	8.62	5.00	0.0
64.50	8.62	5.00	0.0
66.00	8.62	5.00	0.0
67.50	8.62	5.00	0.0
69.00	8.62	5.00	0.0
70.50	8.62	5.00	0.0
72.00	8.62	5.00	0.0
73.50	8.62	5.00	0.0
75.00	8.62	5.00	0.0
76.50	8.62	5.00	0.0
78.00	8.62	5.00	0.0
79.50	8.62	5.00	0.0
81.00	8.62	5.00	0.0
82.50	8.62	5.00	0.0
84.00	8.62	5.00	0.0
85.50	8.62	5.00	0.0
87.00	8.62	5.00	0.0
88.50	8.62	5.00	0.0
90.00	8.62	5.00	0.0
91.50	8.62	5.00	0.0
93.00	8.62	5.00	0.0
94.50	8.62	5.00	0.0
96.00	8.62	5.00	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 84

Summary for Subcatchment 14S: UNDEV

Runoff = 18.5 cfs @ 12.54 hrs, Volume= 135,996 cf, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
234,585	70	Woods, Good, HSG C
84,030	74	>75% Grass cover, Good, HSG C
318,615	71	Weighted Average
318,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.7	220	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
1.7	366	0.0570	3.58		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.1	65	0.2860	8.02		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
19.6	587	0.0400	0.50		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
39.4	1,288	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 85

Hydrograph for Subcatchment 14S: UNDEV

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.03	0.2
9.00	1.58	0.12	0.5
10.50	2.15	0.33	1.1
12.00	4.13	1.48	4.8
13.50	6.47	3.28	5.3
15.00	7.04	3.76	2.3
16.50	7.43	4.08	1.6
18.00	7.73	4.35	1.3
19.50	7.98	4.57	1.1
21.00	8.22	4.77	1.0
22.50	8.43	4.95	0.9
24.00	8.62	5.12	0.8
25.50	8.62	5.12	0.0
27.00	8.62	5.12	0.0
28.50	8.62	5.12	0.0
30.00	8.62	5.12	0.0
31.50	8.62	5.12	0.0
33.00	8.62	5.12	0.0
34.50	8.62	5.12	0.0
36.00	8.62	5.12	0.0
37.50	8.62	5.12	0.0
39.00	8.62	5.12	0.0
40.50	8.62	5.12	0.0
42.00	8.62	5.12	0.0
43.50	8.62	5.12	0.0
45.00	8.62	5.12	0.0
46.50	8.62	5.12	0.0
48.00	8.62	5.12	0.0
49.50	8.62	5.12	0.0
51.00	8.62	5.12	0.0
52.50	8.62	5.12	0.0
54.00	8.62	5.12	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.12	0.0
57.00	8.62	5.12	0.0
58.50	8.62	5.12	0.0
60.00	8.62	5.12	0.0
61.50	8.62	5.12	0.0
63.00	8.62	5.12	0.0
64.50	8.62	5.12	0.0
66.00	8.62	5.12	0.0
67.50	8.62	5.12	0.0
69.00	8.62	5.12	0.0
70.50	8.62	5.12	0.0
72.00	8.62	5.12	0.0
73.50	8.62	5.12	0.0
75.00	8.62	5.12	0.0
76.50	8.62	5.12	0.0
78.00	8.62	5.12	0.0
79.50	8.62	5.12	0.0
81.00	8.62	5.12	0.0
82.50	8.62	5.12	0.0
84.00	8.62	5.12	0.0
85.50	8.62	5.12	0.0
87.00	8.62	5.12	0.0
88.50	8.62	5.12	0.0
90.00	8.62	5.12	0.0
91.50	8.62	5.12	0.0
93.00	8.62	5.12	0.0
94.50	8.62	5.12	0.0
96.00	8.62	5.12	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 86

Summary for Subcatchment 15S: Road

Runoff = 6.3 cfs @ 12.12 hrs, Volume= 21,686 cf, Depth= 7.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
20,387	98	Paved parking, HSG C
16,503	74	>75% Grass cover, Good, HSG C
36,890	87	Weighted Average
16,503		44.74% Pervious Area
20,387		55.26% Impervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 87

Hydrograph for Subcatchment 15S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.01	0.0
4.50	0.64	0.06	0.0
6.00	0.89	0.17	0.1
7.50	1.19	0.34	0.1
9.00	1.58	0.59	0.2
10.50	2.15	1.03	0.3
12.00	4.13	2.76	3.5
13.50	6.47	4.97	0.4
15.00	7.04	5.52	0.2
16.50	7.43	5.89	0.2
18.00	7.73	6.19	0.1
19.50	7.98	6.43	0.1
21.00	8.22	6.66	0.1
22.50	8.43	6.87	0.1
24.00	8.62	7.05	0.1
25.50	8.62	7.05	0.0
27.00	8.62	7.05	0.0
28.50	8.62	7.05	0.0
30.00	8.62	7.05	0.0
31.50	8.62	7.05	0.0
33.00	8.62	7.05	0.0
34.50	8.62	7.05	0.0
36.00	8.62	7.05	0.0
37.50	8.62	7.05	0.0
39.00	8.62	7.05	0.0
40.50	8.62	7.05	0.0
42.00	8.62	7.05	0.0
43.50	8.62	7.05	0.0
45.00	8.62	7.05	0.0
46.50	8.62	7.05	0.0
48.00	8.62	7.05	0.0
49.50	8.62	7.05	0.0
51.00	8.62	7.05	0.0
52.50	8.62	7.05	0.0
54.00	8.62	7.05	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	7.05	0.0
57.00	8.62	7.05	0.0
58.50	8.62	7.05	0.0
60.00	8.62	7.05	0.0
61.50	8.62	7.05	0.0
63.00	8.62	7.05	0.0
64.50	8.62	7.05	0.0
66.00	8.62	7.05	0.0
67.50	8.62	7.05	0.0
69.00	8.62	7.05	0.0
70.50	8.62	7.05	0.0
72.00	8.62	7.05	0.0
73.50	8.62	7.05	0.0
75.00	8.62	7.05	0.0
76.50	8.62	7.05	0.0
78.00	8.62	7.05	0.0
79.50	8.62	7.05	0.0
81.00	8.62	7.05	0.0
82.50	8.62	7.05	0.0
84.00	8.62	7.05	0.0
85.50	8.62	7.05	0.0
87.00	8.62	7.05	0.0
88.50	8.62	7.05	0.0
90.00	8.62	7.05	0.0
91.50	8.62	7.05	0.0
93.00	8.62	7.05	0.0
94.50	8.62	7.05	0.0
96.00	8.62	7.05	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 88

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= 0.00-96.00 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,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 89

Hydrograph for Subcatchment 16S: Road

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
1.50	0.19	0.00	0.0	57.00	8.62	7.05	0.0
3.00	0.40	0.01	0.0	58.50	8.62	7.05	0.0
4.50	0.64	0.06	0.0	60.00	8.62	7.05	0.0
6.00	0.89	0.17	0.1	61.50	8.62	7.05	0.0
7.50	1.19	0.34	0.1	63.00	8.62	7.05	0.0
9.00	1.58	0.59	0.1	64.50	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				
43.50	8.62	7.05	0.0				
45.00	8.62	7.05	0.0				
46.50	8.62	7.05	0.0				
48.00	8.62	7.05	0.0				
49.50	8.62	7.05	0.0				
51.00	8.62	7.05	0.0				
52.50	8.62	7.05	0.0				
54.00	8.62	7.05	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 90

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= 0.00-96.00 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		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
8.1	694	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
16.8	732	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 91

Hydrograph for Subcatchment 17S: 465 SITE SOUTH

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
1.50	0.19	0.00	0.0	57.00	8.62	7.05	0.0
3.00	0.40	0.01	0.0	58.50	8.62	7.05	0.0
4.50	0.64	0.06	0.1	60.00	8.62	7.05	0.0
6.00	0.89	0.17	0.1	61.50	8.62	7.05	0.0
7.50	1.19	0.34	0.1	63.00	8.62	7.05	0.0
9.00	1.58	0.59	0.2	64.50	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				
43.50	8.62	7.05	0.0				
45.00	8.62	7.05	0.0				
46.50	8.62	7.05	0.0				
48.00	8.62	7.05	0.0				
49.50	8.62	7.05	0.0				
51.00	8.62	7.05	0.0				
52.50	8.62	7.05	0.0				
54.00	8.62	7.05	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 92

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= 0.00-96.00 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,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 93

Hydrograph for Subcatchment 18S: Road

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
1.50	0.19	0.00	0.0	57.00	8.62	7.66	0.0
3.00	0.40	0.05	0.0	58.50	8.62	7.66	0.0
4.50	0.64	0.16	0.0	60.00	8.62	7.66	0.0
6.00	0.89	0.32	0.1	61.50	8.62	7.66	0.0
7.50	1.19	0.55	0.1	63.00	8.62	7.66	0.0
9.00	1.58	0.87	0.1	64.50	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				
43.50	8.62	7.66	0.0				
45.00	8.62	7.66	0.0				
46.50	8.62	7.66	0.0				
48.00	8.62	7.66	0.0				
49.50	8.62	7.66	0.0				
51.00	8.62	7.66	0.0				
52.50	8.62	7.66	0.0				
54.00	8.62	7.66	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 94

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= 0.00-96.00 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		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.20"
7.6	658	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.7	703	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 95

Hydrograph for Subcatchment 19S: 465 SITE NORTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.04	0.0
6.00	0.89	0.12	0.1
7.50	1.19	0.27	0.1
9.00	1.58	0.50	0.2
10.50	2.15	0.91	0.4
12.00	4.13	2.57	3.3
13.50	6.47	4.74	0.6
15.00	7.04	5.29	0.3
16.50	7.43	5.66	0.3
18.00	7.73	5.96	0.2
19.50	7.98	6.20	0.2
21.00	8.22	6.42	0.2
22.50	8.43	6.63	0.1
24.00	8.62	6.81	0.1
25.50	8.62	6.81	0.0
27.00	8.62	6.81	0.0
28.50	8.62	6.81	0.0
30.00	8.62	6.81	0.0
31.50	8.62	6.81	0.0
33.00	8.62	6.81	0.0
34.50	8.62	6.81	0.0
36.00	8.62	6.81	0.0
37.50	8.62	6.81	0.0
39.00	8.62	6.81	0.0
40.50	8.62	6.81	0.0
42.00	8.62	6.81	0.0
43.50	8.62	6.81	0.0
45.00	8.62	6.81	0.0
46.50	8.62	6.81	0.0
48.00	8.62	6.81	0.0
49.50	8.62	6.81	0.0
51.00	8.62	6.81	0.0
52.50	8.62	6.81	0.0
54.00	8.62	6.81	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	6.81	0.0
57.00	8.62	6.81	0.0
58.50	8.62	6.81	0.0
60.00	8.62	6.81	0.0
61.50	8.62	6.81	0.0
63.00	8.62	6.81	0.0
64.50	8.62	6.81	0.0
66.00	8.62	6.81	0.0
67.50	8.62	6.81	0.0
69.00	8.62	6.81	0.0
70.50	8.62	6.81	0.0
72.00	8.62	6.81	0.0
73.50	8.62	6.81	0.0
75.00	8.62	6.81	0.0
76.50	8.62	6.81	0.0
78.00	8.62	6.81	0.0
79.50	8.62	6.81	0.0
81.00	8.62	6.81	0.0
82.50	8.62	6.81	0.0
84.00	8.62	6.81	0.0
85.50	8.62	6.81	0.0
87.00	8.62	6.81	0.0
88.50	8.62	6.81	0.0
90.00	8.62	6.81	0.0
91.50	8.62	6.81	0.0
93.00	8.62	6.81	0.0
94.50	8.62	6.81	0.0
96.00	8.62	6.81	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 96

Summary for Subcatchment 20S: Undeveloped

Runoff = 92.7 cfs @ 12.82 hrs, Volume= 875,337 cf, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
2,100,143	70	Woods, Good, HSG C
2,100,143		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.2	50	0.0170	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.7	170	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
11.6	322	0.0340	0.46		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
27.3	1,193	0.0850	0.73		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
60.8	1,735	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 97

Hydrograph for Subcatchment 20S: Undeveloped

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.02	0.6
9.00	1.58	0.10	2.3
10.50	2.15	0.30	5.7
12.00	4.13	1.42	20.6
13.50	6.47	3.18	51.0
15.00	7.04	3.65	17.1
16.50	7.43	3.98	11.0
18.00	7.73	4.23	8.7
19.50	7.98	4.45	7.1
21.00	8.22	4.65	6.6
22.50	8.43	4.83	6.0
24.00	8.62	5.00	5.5
25.50	8.62	5.00	0.6
27.00	8.62	5.00	0.0
28.50	8.62	5.00	0.0
30.00	8.62	5.00	0.0
31.50	8.62	5.00	0.0
33.00	8.62	5.00	0.0
34.50	8.62	5.00	0.0
36.00	8.62	5.00	0.0
37.50	8.62	5.00	0.0
39.00	8.62	5.00	0.0
40.50	8.62	5.00	0.0
42.00	8.62	5.00	0.0
43.50	8.62	5.00	0.0
45.00	8.62	5.00	0.0
46.50	8.62	5.00	0.0
48.00	8.62	5.00	0.0
49.50	8.62	5.00	0.0
51.00	8.62	5.00	0.0
52.50	8.62	5.00	0.0
54.00	8.62	5.00	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.00	0.0
57.00	8.62	5.00	0.0
58.50	8.62	5.00	0.0
60.00	8.62	5.00	0.0
61.50	8.62	5.00	0.0
63.00	8.62	5.00	0.0
64.50	8.62	5.00	0.0
66.00	8.62	5.00	0.0
67.50	8.62	5.00	0.0
69.00	8.62	5.00	0.0
70.50	8.62	5.00	0.0
72.00	8.62	5.00	0.0
73.50	8.62	5.00	0.0
75.00	8.62	5.00	0.0
76.50	8.62	5.00	0.0
78.00	8.62	5.00	0.0
79.50	8.62	5.00	0.0
81.00	8.62	5.00	0.0
82.50	8.62	5.00	0.0
84.00	8.62	5.00	0.0
85.50	8.62	5.00	0.0
87.00	8.62	5.00	0.0
88.50	8.62	5.00	0.0
90.00	8.62	5.00	0.0
91.50	8.62	5.00	0.0
93.00	8.62	5.00	0.0
94.50	8.62	5.00	0.0
96.00	8.62	5.00	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 98

Summary for Subcatchment 21S: DB1

Runoff = 15.8 cfs @ 12.23 hrs, Volume= 71,453 cf, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
139,013	74	>75% Grass cover, Good, HSG C
20,864	70	Woods, Good, HSG C
159,877	73	Weighted Average
159,877		100.00% Pervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 99

Hydrograph for Subcatchment 21S: DB1

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
1.50	0.19	0.00	0.0	57.00	8.62	5.36	0.0
3.00	0.40	0.00	0.0	58.50	8.62	5.36	0.0
4.50	0.64	0.00	0.0	60.00	8.62	5.36	0.0
6.00	0.89	0.01	0.0	61.50	8.62	5.36	0.0
7.50	1.19	0.05	0.2	63.00	8.62	5.36	0.0
9.00	1.58	0.16	0.3	64.50	8.62	5.36	0.0
10.50	2.15	0.39	0.7	66.00	8.62	5.36	0.0
12.00	4.13	1.62	5.7	67.50	8.62	5.36	0.0
13.50	6.47	3.48	1.8	69.00	8.62	5.36	0.0
15.00	7.04	3.97	1.0	70.50	8.62	5.36	0.0
16.50	7.43	4.31	0.8	72.00	8.62	5.36	0.0
18.00	7.73	4.57	0.6	73.50	8.62	5.36	0.0
19.50	7.98	4.80	0.5	75.00	8.62	5.36	0.0
21.00	8.22	5.00	0.5	76.50	8.62	5.36	0.0
22.50	8.43	5.19	0.5	78.00	8.62	5.36	0.0
24.00	8.62	5.36	0.4	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				
43.50	8.62	5.36	0.0				
45.00	8.62	5.36	0.0				
46.50	8.62	5.36	0.0				
48.00	8.62	5.36	0.0				
49.50	8.62	5.36	0.0				
51.00	8.62	5.36	0.0				
52.50	8.62	5.36	0.0				
54.00	8.62	5.36	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 100

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= 0.00-96.00 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,

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 101

Hydrograph for Subcatchment 22S: 465 SITE ROOF

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
1.50	0.19	0.06	0.2	57.00	8.62	8.38	0.0
3.00	0.40	0.23	0.3	58.50	8.62	8.38	0.0
4.50	0.64	0.44	0.4	60.00	8.62	8.38	0.0
6.00	0.89	0.68	0.4	61.50	8.62	8.38	0.0
7.50	1.19	0.98	0.6	63.00	8.62	8.38	0.0
9.00	1.58	1.36	0.7	64.50	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				
43.50	8.62	8.38	0.0				
45.00	8.62	8.38	0.0				
46.50	8.62	8.38	0.0				
48.00	8.62	8.38	0.0				
49.50	8.62	8.38	0.0				
51.00	8.62	8.38	0.0				
52.50	8.62	8.38	0.0				
54.00	8.62	8.38	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 102

Summary for Subcatchment 23S: 555 ROOF

Runoff = 63.6 cfs @ 12.12 hrs, Volume= 246,452 cf, Depth= 8.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
352,921	98	Roofs, HSG C
352,921		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,
0.7	483	0.0270	11.83	37.17	Pipe Channel,
					24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'
					n= 0.013
5.7	483	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 103

Hydrograph for Subcatchment 23S: 555 ROOF

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.06	0.7
3.00	0.40	0.23	1.0
4.50	0.64	0.44	1.2
6.00	0.89	0.68	1.4
7.50	1.19	0.98	1.8
9.00	1.58	1.36	2.3
10.50	2.15	1.93	3.7
12.00	4.13	3.89	34.7
13.50	6.47	6.23	4.3
15.00	7.04	6.80	2.5
16.50	7.43	7.19	1.9
18.00	7.73	7.49	1.5
19.50	7.98	7.75	1.3
21.00	8.22	7.98	1.2
22.50	8.43	8.19	1.1
24.00	8.62	8.38	1.0
25.50	8.62	8.38	0.0
27.00	8.62	8.38	0.0
28.50	8.62	8.38	0.0
30.00	8.62	8.38	0.0
31.50	8.62	8.38	0.0
33.00	8.62	8.38	0.0
34.50	8.62	8.38	0.0
36.00	8.62	8.38	0.0
37.50	8.62	8.38	0.0
39.00	8.62	8.38	0.0
40.50	8.62	8.38	0.0
42.00	8.62	8.38	0.0
43.50	8.62	8.38	0.0
45.00	8.62	8.38	0.0
46.50	8.62	8.38	0.0
48.00	8.62	8.38	0.0
49.50	8.62	8.38	0.0
51.00	8.62	8.38	0.0
52.50	8.62	8.38	0.0
54.00	8.62	8.38	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	8.38	0.0
57.00	8.62	8.38	0.0
58.50	8.62	8.38	0.0
60.00	8.62	8.38	0.0
61.50	8.62	8.38	0.0
63.00	8.62	8.38	0.0
64.50	8.62	8.38	0.0
66.00	8.62	8.38	0.0
67.50	8.62	8.38	0.0
69.00	8.62	8.38	0.0
70.50	8.62	8.38	0.0
72.00	8.62	8.38	0.0
73.50	8.62	8.38	0.0
75.00	8.62	8.38	0.0
76.50	8.62	8.38	0.0
78.00	8.62	8.38	0.0
79.50	8.62	8.38	0.0
81.00	8.62	8.38	0.0
82.50	8.62	8.38	0.0
84.00	8.62	8.38	0.0
85.50	8.62	8.38	0.0
87.00	8.62	8.38	0.0
88.50	8.62	8.38	0.0
90.00	8.62	8.38	0.0
91.50	8.62	8.38	0.0
93.00	8.62	8.38	0.0
94.50	8.62	8.38	0.0
96.00	8.62	8.38	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 104

Summary for Subcatchment 24S: LOT3 NORTH

Runoff = 45.1 cfs @ 12.16 hrs, Volume= 182,407 cf, Depth= 7.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
90,573	74	>75% Grass cover, Good, HSG C
199,841	98	Paved parking, HSG C
290,414	91	Weighted Average
90,573		31.19% Pervious Area
199,841		68.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0470	0.14		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
2.0	186	0.0470	1.52		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	160	0.0270	3.34		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	192	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.0	588	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 105

Hydrograph for Subcatchment 24S: LOT3 NORTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.04	0.3
4.50	0.64	0.13	0.5
6.00	0.89	0.28	0.8
7.50	1.19	0.50	1.1
9.00	1.58	0.81	1.6
10.50	2.15	1.30	2.7
12.00	4.13	3.14	21.0
13.50	6.47	5.41	3.6
15.00	7.04	5.98	2.0
16.50	7.43	6.36	1.6
18.00	7.73	6.66	1.2
19.50	7.98	6.91	1.1
21.00	8.22	7.14	1.0
22.50	8.43	7.35	0.9
24.00	8.62	7.54	0.8
25.50	8.62	7.54	0.0
27.00	8.62	7.54	0.0
28.50	8.62	7.54	0.0
30.00	8.62	7.54	0.0
31.50	8.62	7.54	0.0
33.00	8.62	7.54	0.0
34.50	8.62	7.54	0.0
36.00	8.62	7.54	0.0
37.50	8.62	7.54	0.0
39.00	8.62	7.54	0.0
40.50	8.62	7.54	0.0
42.00	8.62	7.54	0.0
43.50	8.62	7.54	0.0
45.00	8.62	7.54	0.0
46.50	8.62	7.54	0.0
48.00	8.62	7.54	0.0
49.50	8.62	7.54	0.0
51.00	8.62	7.54	0.0
52.50	8.62	7.54	0.0
54.00	8.62	7.54	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	7.54	0.0
57.00	8.62	7.54	0.0
58.50	8.62	7.54	0.0
60.00	8.62	7.54	0.0
61.50	8.62	7.54	0.0
63.00	8.62	7.54	0.0
64.50	8.62	7.54	0.0
66.00	8.62	7.54	0.0
67.50	8.62	7.54	0.0
69.00	8.62	7.54	0.0
70.50	8.62	7.54	0.0
72.00	8.62	7.54	0.0
73.50	8.62	7.54	0.0
75.00	8.62	7.54	0.0
76.50	8.62	7.54	0.0
78.00	8.62	7.54	0.0
79.50	8.62	7.54	0.0
81.00	8.62	7.54	0.0
82.50	8.62	7.54	0.0
84.00	8.62	7.54	0.0
85.50	8.62	7.54	0.0
87.00	8.62	7.54	0.0
88.50	8.62	7.54	0.0
90.00	8.62	7.54	0.0
91.50	8.62	7.54	0.0
93.00	8.62	7.54	0.0
94.50	8.62	7.54	0.0
96.00	8.62	7.54	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 106

Summary for Subcatchment 25S: DB20

Runoff = 25.7 cfs @ 12.13 hrs, Volume= 85,779 cf, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
187,710	74	>75% Grass cover, Good, HSG C
187,710		100.00% Pervious Area

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

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 107

Hydrograph for Subcatchment 25S: DB20

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
1.50	0.19	0.00	0.0	57.00	8.62	5.48	0.0
3.00	0.40	0.00	0.0	58.50	8.62	5.48	0.0
4.50	0.64	0.00	0.0	60.00	8.62	5.48	0.0
6.00	0.89	0.01	0.1	61.50	8.62	5.48	0.0
7.50	1.19	0.06	0.2	63.00	8.62	5.48	0.0
9.00	1.58	0.18	0.4	64.50	8.62	5.48	0.0
10.50	2.15	0.42	1.0	66.00	8.62	5.48	0.0
12.00	4.13	1.69	12.9	67.50	8.62	5.48	0.0
13.50	6.47	3.58	1.9	69.00	8.62	5.48	0.0
15.00	7.04	4.08	1.1	70.50	8.62	5.48	0.0
16.50	7.43	4.42	0.9	72.00	8.62	5.48	0.0
18.00	7.73	4.69	0.7	73.50	8.62	5.48	0.0
19.50	7.98	4.91	0.6	75.00	8.62	5.48	0.0
21.00	8.22	5.12	0.6	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	0.5	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				
43.50	8.62	5.48	0.0				
45.00	8.62	5.48	0.0				
46.50	8.62	5.48	0.0				
48.00	8.62	5.48	0.0				
49.50	8.62	5.48	0.0				
51.00	8.62	5.48	0.0				
52.50	8.62	5.48	0.0				
54.00	8.62	5.48	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 108

Summary for Subcatchment 26S: UNDEVELOPED

Runoff = 56.6 cfs @ 12.63 hrs, Volume= 456,056 cf, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
902,457	70	Woods, Good, HSG C
166,007	74	>75% Grass cover, Good, HSG C
1,068,464	71	Weighted Average
1,068,464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1	50	0.0120	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
14.6	285	0.0170	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
16.7	405	0.0260	0.40		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
46.4	740	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 109

Hydrograph for Subcatchment 26S: UNDEVELOPED

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.03	0.5
9.00	1.58	0.12	1.5
10.50	2.15	0.33	3.5
12.00	4.13	1.48	14.0
13.50	6.47	3.28	20.4
15.00	7.04	3.76	7.9
16.50	7.43	4.08	5.4
18.00	7.73	4.35	4.3
19.50	7.98	4.57	3.6
21.00	8.22	4.77	3.3
22.50	8.43	4.95	3.0
24.00	8.62	5.12	2.8
25.50	8.62	5.12	0.1
27.00	8.62	5.12	0.0
28.50	8.62	5.12	0.0
30.00	8.62	5.12	0.0
31.50	8.62	5.12	0.0
33.00	8.62	5.12	0.0
34.50	8.62	5.12	0.0
36.00	8.62	5.12	0.0
37.50	8.62	5.12	0.0
39.00	8.62	5.12	0.0
40.50	8.62	5.12	0.0
42.00	8.62	5.12	0.0
43.50	8.62	5.12	0.0
45.00	8.62	5.12	0.0
46.50	8.62	5.12	0.0
48.00	8.62	5.12	0.0
49.50	8.62	5.12	0.0
51.00	8.62	5.12	0.0
52.50	8.62	5.12	0.0
54.00	8.62	5.12	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.12	0.0
57.00	8.62	5.12	0.0
58.50	8.62	5.12	0.0
60.00	8.62	5.12	0.0
61.50	8.62	5.12	0.0
63.00	8.62	5.12	0.0
64.50	8.62	5.12	0.0
66.00	8.62	5.12	0.0
67.50	8.62	5.12	0.0
69.00	8.62	5.12	0.0
70.50	8.62	5.12	0.0
72.00	8.62	5.12	0.0
73.50	8.62	5.12	0.0
75.00	8.62	5.12	0.0
76.50	8.62	5.12	0.0
78.00	8.62	5.12	0.0
79.50	8.62	5.12	0.0
81.00	8.62	5.12	0.0
82.50	8.62	5.12	0.0
84.00	8.62	5.12	0.0
85.50	8.62	5.12	0.0
87.00	8.62	5.12	0.0
88.50	8.62	5.12	0.0
90.00	8.62	5.12	0.0
91.50	8.62	5.12	0.0
93.00	8.62	5.12	0.0
94.50	8.62	5.12	0.0
96.00	8.62	5.12	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 110

Summary for Subcatchment 27S: 555 SOUTH

Runoff = 2.4 cfs @ 12.22 hrs, Volume= 10,663 cf, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
5,500	74	>75% Grass cover, Good, HSG C
19,481	70	Woods, Good, HSG C
24,981	71	Weighted Average
24,981		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.1700	0.09		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
5.1	242	0.1000	0.79		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
14.2	292	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 111

Hydrograph for Subcatchment 27S: 555 SOUTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.00	0.0
4.50	0.64	0.00	0.0
6.00	0.89	0.00	0.0
7.50	1.19	0.03	0.0
9.00	1.58	0.12	0.0
10.50	2.15	0.33	0.1
12.00	4.13	1.48	0.9
13.50	6.47	3.28	0.3
15.00	7.04	3.76	0.2
16.50	7.43	4.08	0.1
18.00	7.73	4.35	0.1
19.50	7.98	4.57	0.1
21.00	8.22	4.77	0.1
22.50	8.43	4.95	0.1
24.00	8.62	5.12	0.1
25.50	8.62	5.12	0.0
27.00	8.62	5.12	0.0
28.50	8.62	5.12	0.0
30.00	8.62	5.12	0.0
31.50	8.62	5.12	0.0
33.00	8.62	5.12	0.0
34.50	8.62	5.12	0.0
36.00	8.62	5.12	0.0
37.50	8.62	5.12	0.0
39.00	8.62	5.12	0.0
40.50	8.62	5.12	0.0
42.00	8.62	5.12	0.0
43.50	8.62	5.12	0.0
45.00	8.62	5.12	0.0
46.50	8.62	5.12	0.0
48.00	8.62	5.12	0.0
49.50	8.62	5.12	0.0
51.00	8.62	5.12	0.0
52.50	8.62	5.12	0.0
54.00	8.62	5.12	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	5.12	0.0
57.00	8.62	5.12	0.0
58.50	8.62	5.12	0.0
60.00	8.62	5.12	0.0
61.50	8.62	5.12	0.0
63.00	8.62	5.12	0.0
64.50	8.62	5.12	0.0
66.00	8.62	5.12	0.0
67.50	8.62	5.12	0.0
69.00	8.62	5.12	0.0
70.50	8.62	5.12	0.0
72.00	8.62	5.12	0.0
73.50	8.62	5.12	0.0
75.00	8.62	5.12	0.0
76.50	8.62	5.12	0.0
78.00	8.62	5.12	0.0
79.50	8.62	5.12	0.0
81.00	8.62	5.12	0.0
82.50	8.62	5.12	0.0
84.00	8.62	5.12	0.0
85.50	8.62	5.12	0.0
87.00	8.62	5.12	0.0
88.50	8.62	5.12	0.0
90.00	8.62	5.12	0.0
91.50	8.62	5.12	0.0
93.00	8.62	5.12	0.0
94.50	8.62	5.12	0.0
96.00	8.62	5.12	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 112

Summary for Subcatchment 28S: LOT3 NORTH

Runoff = 39.4 cfs @ 12.15 hrs, Volume= 157,442 cf, Depth= 7.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
68,977	74	>75% Grass cover, Good, HSG C
181,690	98	Paved parking, HSG C
250,667	91	Weighted Average
68,977		27.52% Pervious Area
181,690		72.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	50	0.0400	0.13		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.1	32	0.3500	4.14		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.8	310	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.5	240	0.0110	7.55	23.73	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.6	632	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 113

Hydrograph for Subcatchment 28S: LOT3 NORTH

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.04	0.2
4.50	0.64	0.13	0.5
6.00	0.89	0.28	0.7
7.50	1.19	0.50	1.0
9.00	1.58	0.81	1.3
10.50	2.15	1.30	2.3
12.00	4.13	3.14	18.7
13.50	6.47	5.41	3.1
15.00	7.04	5.98	1.7
16.50	7.43	6.36	1.4
18.00	7.73	6.66	1.0
19.50	7.98	6.91	0.9
21.00	8.22	7.14	0.9
22.50	8.43	7.35	0.8
24.00	8.62	7.54	0.7
25.50	8.62	7.54	0.0
27.00	8.62	7.54	0.0
28.50	8.62	7.54	0.0
30.00	8.62	7.54	0.0
31.50	8.62	7.54	0.0
33.00	8.62	7.54	0.0
34.50	8.62	7.54	0.0
36.00	8.62	7.54	0.0
37.50	8.62	7.54	0.0
39.00	8.62	7.54	0.0
40.50	8.62	7.54	0.0
42.00	8.62	7.54	0.0
43.50	8.62	7.54	0.0
45.00	8.62	7.54	0.0
46.50	8.62	7.54	0.0
48.00	8.62	7.54	0.0
49.50	8.62	7.54	0.0
51.00	8.62	7.54	0.0
52.50	8.62	7.54	0.0
54.00	8.62	7.54	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	7.54	0.0
57.00	8.62	7.54	0.0
58.50	8.62	7.54	0.0
60.00	8.62	7.54	0.0
61.50	8.62	7.54	0.0
63.00	8.62	7.54	0.0
64.50	8.62	7.54	0.0
66.00	8.62	7.54	0.0
67.50	8.62	7.54	0.0
69.00	8.62	7.54	0.0
70.50	8.62	7.54	0.0
72.00	8.62	7.54	0.0
73.50	8.62	7.54	0.0
75.00	8.62	7.54	0.0
76.50	8.62	7.54	0.0
78.00	8.62	7.54	0.0
79.50	8.62	7.54	0.0
81.00	8.62	7.54	0.0
82.50	8.62	7.54	0.0
84.00	8.62	7.54	0.0
85.50	8.62	7.54	0.0
87.00	8.62	7.54	0.0
88.50	8.62	7.54	0.0
90.00	8.62	7.54	0.0
91.50	8.62	7.54	0.0
93.00	8.62	7.54	0.0
94.50	8.62	7.54	0.0
96.00	8.62	7.54	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 114

Summary for Subcatchment 29S: Road

Runoff = 2.1 cfs @ 12.11 hrs, Volume= 7,069 cf, Depth= 7.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
7,650	98	Paved parking, HSG C
3,787	74	>75% Grass cover, Good, HSG C
11,437	90	Weighted Average
3,787		33.11% Pervious Area
7,650		66.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	20	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
0.4	99	0.0450	4.31		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	135	0.0400	9.07	7.13	Pipe Channel, RCP_Round 12" 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
4.5	254	Total			

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 115

Hydrograph for Subcatchment 29S: Road

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.50	0.19	0.00	0.0
3.00	0.40	0.03	0.0
4.50	0.64	0.11	0.0
6.00	0.89	0.25	0.0
7.50	1.19	0.45	0.0
9.00	1.58	0.75	0.1
10.50	2.15	1.23	0.1
12.00	4.13	3.04	1.2
13.50	6.47	5.30	0.1
15.00	7.04	5.86	0.1
16.50	7.43	6.24	0.1
18.00	7.73	6.54	0.0
19.50	7.98	6.79	0.0
21.00	8.22	7.02	0.0
22.50	8.43	7.23	0.0
24.00	8.62	7.42	0.0
25.50	8.62	7.42	0.0
27.00	8.62	7.42	0.0
28.50	8.62	7.42	0.0
30.00	8.62	7.42	0.0
31.50	8.62	7.42	0.0
33.00	8.62	7.42	0.0
34.50	8.62	7.42	0.0
36.00	8.62	7.42	0.0
37.50	8.62	7.42	0.0
39.00	8.62	7.42	0.0
40.50	8.62	7.42	0.0
42.00	8.62	7.42	0.0
43.50	8.62	7.42	0.0
45.00	8.62	7.42	0.0
46.50	8.62	7.42	0.0
48.00	8.62	7.42	0.0
49.50	8.62	7.42	0.0
51.00	8.62	7.42	0.0
52.50	8.62	7.42	0.0
54.00	8.62	7.42	0.0

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
55.50	8.62	7.42	0.0
57.00	8.62	7.42	0.0
58.50	8.62	7.42	0.0
60.00	8.62	7.42	0.0
61.50	8.62	7.42	0.0
63.00	8.62	7.42	0.0
64.50	8.62	7.42	0.0
66.00	8.62	7.42	0.0
67.50	8.62	7.42	0.0
69.00	8.62	7.42	0.0
70.50	8.62	7.42	0.0
72.00	8.62	7.42	0.0
73.50	8.62	7.42	0.0
75.00	8.62	7.42	0.0
76.50	8.62	7.42	0.0
78.00	8.62	7.42	0.0
79.50	8.62	7.42	0.0
81.00	8.62	7.42	0.0
82.50	8.62	7.42	0.0
84.00	8.62	7.42	0.0
85.50	8.62	7.42	0.0
87.00	8.62	7.42	0.0
88.50	8.62	7.42	0.0
90.00	8.62	7.42	0.0
91.50	8.62	7.42	0.0
93.00	8.62	7.42	0.0
94.50	8.62	7.42	0.0
96.00	8.62	7.42	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 116

Summary for Reach 11R: Culvert

Inflow Area = 564,505 sf, 1.94% Impervious, Inflow Depth = 5.10" for 100-Year D event
 Inflow = 21.9 cfs @ 12.98 hrs, Volume= 240,138 cf
 Outflow = 21.9 cfs @ 12.99 hrs, Volume= 240,138 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

Max. Velocity= 5.69 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.31 fps, Avg. Travel Time= 0.4 min

Peak Storage= 193 cf @ 12.98 hrs

Average Depth at Peak Storage= 1.56'

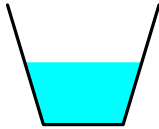
Bank-Full Depth= 3.00' Flow Area= 8.7 sf, Capacity= 63.1 cfs

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'

**3724 STORMWATER**

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 117

Hydrograph for Reach 11R: Culvert

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)
0.00	0.0	0	280.00	0.0	55.50	0.0	0	280.00	0.0
1.50	0.0	0	280.00	0.0	57.00	0.0	0	280.00	0.0
3.00	0.0	2	280.02	0.0	58.50	0.0	0	280.00	0.0
4.50	0.0	3	280.03	0.0	60.00	0.0	0	280.00	0.0
6.00	0.1	4	280.04	0.1	61.50	0.0	0	280.00	0.0
7.50	0.2	8	280.08	0.2	63.00	0.0	0	280.00	0.0
9.00	0.7	17	280.17	0.7	64.50	0.0	0	280.00	0.0
10.50	1.5	29	280.28	1.5	66.00	0.0	0	280.00	0.0
12.00	6.5	79	280.71	6.4	67.50	0.0	0	280.00	0.0
13.50	15.5	149	281.25	15.6	69.00	0.0	0	280.00	0.0
15.00	5.1	67	280.61	5.1	70.50	0.0	0	280.00	0.0
16.50	3.1	47	280.44	3.1	72.00	0.0	0	280.00	0.0
18.00	2.4	40	280.38	2.4	73.50	0.0	0	280.00	0.0
19.50	2.0	35	280.33	2.0	75.00	0.0	0	280.00	0.0
21.00	1.8	32	280.31	1.8	76.50	0.0	0	280.00	0.0
22.50	1.6	31	280.29	1.6	78.00	0.0	0	280.00	0.0
24.00	1.5	29	280.28	1.5	79.50	0.0	0	280.00	0.0
25.50	0.3	10	280.10	0.3	81.00	0.0	0	280.00	0.0
27.00	0.0	1	280.01	0.0	82.50	0.0	0	280.00	0.0
28.50	0.0	0	280.00	0.0	84.00	0.0	0	280.00	0.0
30.00	0.0	0	280.00	0.0	85.50	0.0	0	280.00	0.0
31.50	0.0	0	280.00	0.0	87.00	0.0	0	280.00	0.0
33.00	0.0	0	280.00	0.0	88.50	0.0	0	280.00	0.0
34.50	0.0	0	280.00	0.0	90.00	0.0	0	280.00	0.0
36.00	0.0	0	280.00	0.0	91.50	0.0	0	280.00	0.0
37.50	0.0	0	280.00	0.0	93.00	0.0	0	280.00	0.0
39.00	0.0	0	280.00	0.0	94.50	0.0	0	280.00	0.0
40.50	0.0	0	280.00	0.0	96.00	0.0	0	280.00	0.0
42.00	0.0	0	280.00	0.0					
43.50	0.0	0	280.00	0.0					
45.00	0.0	0	280.00	0.0					
46.50	0.0	0	280.00	0.0					
48.00	0.0	0	280.00	0.0					
49.50	0.0	0	280.00	0.0					
51.00	0.0	0	280.00	0.0					
52.50	0.0	0	280.00	0.0					
54.00	0.0	0	280.00	0.0					

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 118

Summary for Pond 10P: DB1

Inflow Area = 2,000,649 sf, 46.65% Impervious, Inflow Depth = 6.57" for 100-Year D event
 Inflow = 247.7 cfs @ 12.15 hrs, Volume= 1,095,966 cf
 Outflow = 41.6 cfs @ 12.95 hrs, Volume= 1,095,395 cf, Atten= 83%, Lag= 47.8 min
 Discarded = 0.8 cfs @ 12.95 hrs, Volume= 75,329 cf
 Primary = 40.8 cfs @ 12.95 hrs, Volume= 1,020,066 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 282.65' @ 12.95 hrs Surf.Area= 120,558 sf Storage= 494,311 cf

Plug-Flow detention time= 341.7 min calculated for 1,095,395 cf (100% of inflow)
 Center-of-Mass det. time= 341.3 min (1,133.8 - 792.5)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	661,735 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	113 cf	4.00'D x 9.00'H Vertical Cone/Cylinder
		661,848 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	0	0.0	0	0	0
276.00	13,808	670.0	4,603	4,603	35,724
277.00	26,900	835.0	19,994	24,596	55,499
278.00	44,600	1,025.0	35,379	59,975	83,637
279.00	70,690	1,550.0	57,147	117,122	191,224
280.00	94,783	1,550.0	82,443	199,564	192,774
281.00	112,000	1,690.0	103,272	302,836	228,907
282.00	117,000	1,710.0	114,491	417,327	234,579
283.00	122,500	1,730.0	119,739	537,067	240,317
284.00	126,850	1,750.0	124,669	661,735	246,123

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 119

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.67'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	282.60'	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=0.8 cfs @ 12.95 hrs HW=282.65' (Free Discharge)
 6=Exfiltration (Exfiltration Controls 0.8 cfs)

Primary OutFlow Max=40.8 cfs @ 12.95 hrs HW=282.65' (Free Discharge)
 1=Culvert (Passes 40.6 cfs of 43.6 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 6.8 cfs @ 11.52 fps)
 3=Sharp-Crested Rectangular Weir (Weir Controls 12.3 cfs @ 6.41 fps)
 4=Orifice/Grate (Orifice Controls 21.5 cfs @ 5.38 fps)
 5=Emergency Spillway (Weir Controls 0.2 cfs @ 0.54 fps)

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 120

Hydrograph for Pond 10P: DB1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	273.00	0.0	0.0	0.0
3.00	1.8	8,792	276.27	0.1	0.1	0.0
6.00	3.5	30,222	277.20	1.7	0.2	1.5
9.00	7.7	61,245	278.03	3.3	0.3	3.0
12.00	121.7	246,950	280.48	10.7	0.6	10.1
15.00	13.2	398,658	281.84	23.3	0.7	22.6
18.00	7.6	333,741	281.27	13.1	0.7	12.4
21.00	6.2	273,082	280.73	11.6	0.7	10.9
24.00	5.0	218,463	280.19	9.6	0.6	9.0
27.00	0.0	138,422	279.29	5.8	0.5	5.4
30.00	0.0	87,885	278.54	4.0	0.4	3.6
33.00	0.0	50,585	277.78	2.9	0.3	2.6
36.00	0.0	27,271	277.09	1.3	0.2	1.2
39.00	0.0	19,757	276.81	0.3	0.2	0.2
42.00	0.0	17,354	276.70	0.2	0.1	0.0
45.00	0.0	15,805	276.63	0.1	0.1	0.0
48.00	0.0	14,376	276.57	0.1	0.1	0.0
51.00	0.0	13,008	276.50	0.1	0.1	0.0
54.00	0.0	11,700	276.43	0.1	0.1	0.0
57.00	0.0	10,450	276.36	0.1	0.1	0.0
60.00	0.0	9,256	276.30	0.1	0.1	0.0
63.00	0.0	8,119	276.23	0.1	0.1	0.0
66.00	0.0	7,036	276.16	0.1	0.1	0.0
69.00	0.0	6,006	276.09	0.1	0.1	0.0
72.00	0.0	5,027	276.03	0.1	0.1	0.0
75.00	0.0	4,112	275.96	0.1	0.1	0.0
78.00	0.0	3,313	275.89	0.1	0.1	0.0
81.00	0.0	2,625	275.82	0.1	0.1	0.0
84.00	0.0	2,041	275.76	0.0	0.0	0.0
87.00	0.0	1,553	275.69	0.0	0.0	0.0
90.00	0.0	1,150	275.62	0.0	0.0	0.0
93.00	0.0	827	275.55	0.0	0.0	0.0
96.00	0.0	572	275.48	0.0	0.0	0.0

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 121

Summary for Pond 12P: CULV 30

Inflow Area = 366,527 sf, 6.00% Impervious, Inflow Depth = 5.34" for 100-Year D event
 Inflow = 20.0 cfs @ 12.53 hrs, Volume= 163,197 cf
 Outflow = 19.9 cfs @ 12.55 hrs, Volume= 163,197 cf, Atten= 0%, Lag= 1.1 min
 Discarded = 0.6 cfs @ 12.55 hrs, Volume= 28,774 cf
 Primary = 19.3 cfs @ 12.55 hrs, Volume= 134,423 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 6
 Peak Elev= 281.94' @ 12.55 hrs Surf.Area= 1,019 sf Storage= 1,661 cf

Plug-Flow detention time= 2.7 min calculated for 163,146 cf (100% of inflow)
 Center-of-Mass det. time= 2.7 min (862.7 - 860.0)

Volume	Invert	Avail.Storage	Storage Description
--------	--------	---------------	---------------------

#1	279.50'	8,119 cf	Custom Stage Data (Conic) 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

Device	Routing	Invert	Outlet Devices
--------	---------	--------	----------------

#1	Primary	280.00'	30.0" Round Culvert L= 129.0' RCP, square edge headwall, Ke= 0.500 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'	27.000 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.6 cfs @ 12.55 hrs HW=281.93' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=19.3 cfs @ 12.55 hrs HW=281.93' (Free Discharge)

↳ **1=Culvert** (Inlet Controls 19.3 cfs @ 4.74 fps)

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 122

Hydrograph for Pond 12P: CULV 30

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	279.50	0.0	0.0	0.0
3.00	0.0	0	279.55	0.0	0.0	0.0
6.00	0.1	10	279.72	0.1	0.1	0.0
9.00	0.7	218	280.18	0.6	0.4	0.2
12.00	8.1	866	281.07	7.6	0.5	7.1
15.00	2.6	478	280.57	2.6	0.4	2.1
18.00	1.5	353	280.39	1.5	0.4	1.0
21.00	1.1	309	280.32	1.1	0.4	0.7
24.00	1.0	279	280.28	1.0	0.4	0.5
27.00	0.0	0	279.50	0.0	0.0	0.0
30.00	0.0	0	279.50	0.0	0.0	0.0
33.00	0.0	0	279.50	0.0	0.0	0.0
36.00	0.0	0	279.50	0.0	0.0	0.0
39.00	0.0	0	279.50	0.0	0.0	0.0
42.00	0.0	0	279.50	0.0	0.0	0.0
45.00	0.0	0	279.50	0.0	0.0	0.0
48.00	0.0	0	279.50	0.0	0.0	0.0
51.00	0.0	0	279.50	0.0	0.0	0.0
54.00	0.0	0	279.50	0.0	0.0	0.0
57.00	0.0	0	279.50	0.0	0.0	0.0
60.00	0.0	0	279.50	0.0	0.0	0.0
63.00	0.0	0	279.50	0.0	0.0	0.0
66.00	0.0	0	279.50	0.0	0.0	0.0
69.00	0.0	0	279.50	0.0	0.0	0.0
72.00	0.0	0	279.50	0.0	0.0	0.0
75.00	0.0	0	279.50	0.0	0.0	0.0
78.00	0.0	0	279.50	0.0	0.0	0.0
81.00	0.0	0	279.50	0.0	0.0	0.0
84.00	0.0	0	279.50	0.0	0.0	0.0
87.00	0.0	0	279.50	0.0	0.0	0.0
90.00	0.0	0	279.50	0.0	0.0	0.0
93.00	0.0	0	279.50	0.0	0.0	0.0
96.00	0.0	0	279.50	0.0	0.0	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 123

Summary for Pond 13P: CULV 12A

Inflow Area = 24,981 sf, 0.00% Impervious, Inflow Depth = 5.12" for 100-Year D event
 Inflow = 2.4 cfs @ 12.22 hrs, Volume= 10,663 cf
 Outflow = 2.3 cfs @ 12.25 hrs, Volume= 10,663 cf, Atten= 2%, Lag= 1.6 min
 Discarded = 0.0 cfs @ 12.25 hrs, Volume= 1 cf
 Primary = 2.3 cfs @ 12.25 hrs, Volume= 10,662 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs
 Peak Elev= 287.88' @ 12.25 hrs Surf.Area= 397 sf Storage= 117 cf

Plug-Flow detention time= 0.3 min calculated for 10,659 cf (100% of inflow)
 Center-of-Mass det. time= 0.3 min (848.5 - 848.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	287.00'	9,713 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
287.00	0	0.0	0	0	0	
288.00	508	86.0	169	169	590	
290.00	1,679	162.0	2,074	2,243	2,110	
292.00	2,763	200.1	4,397	6,640	3,266	
293.00	3,393	220.0	3,073	9,713	3,964	

Device	Routing	Invert	Outlet Devices
#1	Primary	287.00'	12.0" Round Culvert L= 120.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 287.00' / 282.00' S= 0.0417 ' /' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	287.00'	0.027 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.0 cfs @ 12.25 hrs HW=287.88' (Free Discharge)

↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.3 cfs @ 12.25 hrs HW=287.88' (Free Discharge)

↳ **1=Culvert** (Inlet Controls 2.3 cfs @ 3.20 fps)

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 124

Hydrograph for Pond 13P: CULV 12A

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	287.00	0.0	0.0	0.0
3.00	0.0	0	287.00	0.0	0.0	0.0
6.00	0.0	0	287.01	0.0	0.0	0.0
9.00	0.0	0	287.10	0.0	0.0	0.0
12.00	0.9	18	287.47	0.8	0.0	0.8
15.00	0.2	1	287.19	0.2	0.0	0.2
18.00	0.1	1	287.14	0.1	0.0	0.1
21.00	0.1	0	287.13	0.1	0.0	0.1
24.00	0.1	0	287.12	0.1	0.0	0.1
27.00	0.0	0	287.00	0.0	0.0	0.0
30.00	0.0	0	287.00	0.0	0.0	0.0
33.00	0.0	0	287.00	0.0	0.0	0.0
36.00	0.0	0	287.00	0.0	0.0	0.0
39.00	0.0	0	287.00	0.0	0.0	0.0
42.00	0.0	0	287.00	0.0	0.0	0.0
45.00	0.0	0	287.00	0.0	0.0	0.0
48.00	0.0	0	287.00	0.0	0.0	0.0
51.00	0.0	0	287.00	0.0	0.0	0.0
54.00	0.0	0	287.00	0.0	0.0	0.0
57.00	0.0	0	287.00	0.0	0.0	0.0
60.00	0.0	0	287.00	0.0	0.0	0.0
63.00	0.0	0	287.00	0.0	0.0	0.0
66.00	0.0	0	287.00	0.0	0.0	0.0
69.00	0.0	0	287.00	0.0	0.0	0.0
72.00	0.0	0	287.00	0.0	0.0	0.0
75.00	0.0	0	287.00	0.0	0.0	0.0
78.00	0.0	0	287.00	0.0	0.0	0.0
81.00	0.0	0	287.00	0.0	0.0	0.0
84.00	0.0	0	287.00	0.0	0.0	0.0
87.00	0.0	0	287.00	0.0	0.0	0.0
90.00	0.0	0	287.00	0.0	0.0	0.0
93.00	0.0	0	287.00	0.0	0.0	0.0
96.00	0.0	0	287.00	0.0	0.0	0.0

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 125

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= 0.00-96.00 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= 20.7 min calculated for 77,919 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	28.00'W x 73.00'L x 3.21'H Field A 6,558 cf Overall - 2,587 cf Embedded = 3,971 cf x 40.0% Voids
#2A	286.00'	2,587 cf	Cultec R-280HD x 60 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap 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'	18.0" Round Culvert L= 20.0' RCP, sq.cut end projecting, Ke= 0.500 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'	0.270 in/hr Exfiltration over Wetted area

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)

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 126

Hydrograph for Pond 22P: INF

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	285.50	0.0	0.0	0.0
3.00	0.3	834	286.24	0.3	0.0	0.3
6.00	0.4	909	286.28	0.4	0.0	0.4
9.00	0.7	1,059	286.37	0.7	0.0	0.7
12.00	7.9	2,586	287.28	6.2	0.0	6.2
15.00	0.8	1,122	286.40	0.8	0.0	0.8
18.00	0.5	945	286.30	0.5	0.0	0.5
21.00	0.4	886	286.27	0.4	0.0	0.4
24.00	0.3	839	286.24	0.3	0.0	0.3
27.00	0.0	391	285.98	0.0	0.0	0.0
30.00	0.0	248	285.80	0.0	0.0	0.0
33.00	0.0	107	285.63	0.0	0.0	0.0
36.00	0.0	3	285.50	0.0	0.0	0.0
39.00	0.0	0	285.50	0.0	0.0	0.0
42.00	0.0	0	285.50	0.0	0.0	0.0
45.00	0.0	0	285.50	0.0	0.0	0.0
48.00	0.0	0	285.50	0.0	0.0	0.0
51.00	0.0	0	285.50	0.0	0.0	0.0
54.00	0.0	0	285.50	0.0	0.0	0.0
57.00	0.0	0	285.50	0.0	0.0	0.0
60.00	0.0	0	285.50	0.0	0.0	0.0
63.00	0.0	0	285.50	0.0	0.0	0.0
66.00	0.0	0	285.50	0.0	0.0	0.0
69.00	0.0	0	285.50	0.0	0.0	0.0
72.00	0.0	0	285.50	0.0	0.0	0.0
75.00	0.0	0	285.50	0.0	0.0	0.0
78.00	0.0	0	285.50	0.0	0.0	0.0
81.00	0.0	0	285.50	0.0	0.0	0.0
84.00	0.0	0	285.50	0.0	0.0	0.0
87.00	0.0	0	285.50	0.0	0.0	0.0
90.00	0.0	0	285.50	0.0	0.0	0.0
93.00	0.0	0	285.50	0.0	0.0	0.0
96.00	0.0	0	285.50	0.0	0.0	0.0

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

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

Page 127

Summary for Pond 30P: DB2

Inflow Area = 1,081,712 sf, 67.90% Impervious, Inflow Depth = 7.46" for 100-Year D event
 Inflow = 170.2 cfs @ 12.14 hrs, Volume= 672,081 cf
 Outflow = 18.4 cfs @ 13.04 hrs, Volume= 672,094 cf, Atten= 89%, Lag= 53.9 min
 Discarded = 0.6 cfs @ 13.04 hrs, Volume= 103,274 cf
 Primary = 17.7 cfs @ 13.04 hrs, Volume= 568,820 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs / 4
 Peak Elev= 307.04' @ 13.04 hrs Surf.Area= 96,561 sf Storage= 343,649 cf

Plug-Flow detention time= 447.9 min calculated for 671,884 cf (100% of inflow)
 Center-of-Mass det. time= 448.6 min (1,221.3 - 772.7)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	488,203 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	301.50'	72 cf	4.00'D x 5.70'H Vertical Cone/Cylinder
		488,275 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
303.00	31,785	685.0	0.0	0	0	31,785
304.00	91,010	1,200.0	100.0	58,860	58,860	109,043
306.00	94,640	1,220.0	100.0	185,638	244,498	113,591
308.00	98,340	1,245.0	100.0	192,968	437,466	119,080
308.50	104,640	1,280.0	100.0	50,737	488,203	126,141

Device	Routing	Invert	Outlet Devices
#1	Primary	301.50'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.50' / 298.00' S= 0.0700 ' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	303.50'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	304.80'	1.6' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	307.20'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	307.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	301.50'	0.270 in/hr Exfiltration over Surface area

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 128

Discarded OutFlow Max=0.6 cfs @ 13.04 hrs HW=307.04' (Free Discharge)

6=Exfiltration (Exfiltration Controls 0.6 cfs)

Primary OutFlow Max=17.7 cfs @ 13.04 hrs HW=307.04' (Free Discharge)

1=Culvert (Passes 17.7 cfs of 32.2 cfs potential flow)

2=Orifice/Grate (Orifice Controls 5.1 cfs @ 8.73 fps)

3=Sharp-Crested Rectangular Weir (Weir Controls 12.6 cfs @ 4.89 fps)

4=Orifice/Grate (Controls 0.0 cfs)

5=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 129

Hydrograph for Pond 30P: DB2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.0	0	301.50	0.0	0.0	0.0
3.00	1.6	5,893	303.16	0.2	0.2	0.0
6.00	2.8	26,516	303.57	0.4	0.4	0.1
9.00	5.6	59,061	304.00	2.0	0.6	1.4
12.00	87.2	191,971	305.44	6.7	0.6	6.2
15.00	7.4	300,979	306.59	15.1	0.6	14.5
18.00	4.4	231,278	305.86	9.7	0.6	9.1
21.00	3.6	188,817	305.41	6.5	0.6	5.9
24.00	3.0	163,619	305.14	4.9	0.6	4.3
27.00	0.0	122,588	304.70	3.3	0.6	2.8
30.00	0.0	89,731	304.34	2.7	0.6	2.2
33.00	0.0	63,406	304.05	2.1	0.6	1.5
36.00	0.0	44,681	303.83	1.3	0.5	0.8
39.00	0.0	33,994	303.69	0.7	0.4	0.3
42.00	0.0	27,635	303.59	0.5	0.4	0.1
45.00	0.0	23,124	303.52	0.4	0.4	0.0
48.00	0.0	19,289	303.45	0.3	0.3	0.0
51.00	0.0	15,726	303.38	0.3	0.3	0.0
54.00	0.0	12,416	303.32	0.3	0.3	0.0
57.00	0.0	9,351	303.25	0.3	0.3	0.0
60.00	0.0	6,520	303.18	0.3	0.3	0.0
63.00	0.0	3,915	303.11	0.2	0.2	0.0
66.00	0.0	1,526	303.05	0.2	0.2	0.0
69.00	0.0	17	302.84	0.0	0.0	0.0
72.00	0.0	16	302.77	0.0	0.0	0.0
75.00	0.0	15	302.70	0.0	0.0	0.0
78.00	0.0	14	302.64	0.0	0.0	0.0
81.00	0.0	13	302.57	0.0	0.0	0.0
84.00	0.0	13	302.50	0.0	0.0	0.0
87.00	0.0	12	302.43	0.0	0.0	0.0
90.00	0.0	11	302.37	0.0	0.0	0.0
93.00	0.0	10	302.30	0.0	0.0	0.0
96.00	0.0	9	302.23	0.0	0.0	0.0

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 130

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= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 131

Hydrograph for Link 1L: Total PreDeveloped West

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0
4.50	0.0	0.00	0.0	60.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	61.50	0.0	0.00	0.0
7.50	0.8	0.00	0.8	63.00	0.0	0.00	0.0
9.00	3.9	0.00	3.9	64.50	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				
43.50	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.50	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.50	0.0	0.00	0.0				
51.00	0.0	0.00	0.0				
52.50	0.0	0.00	0.0				
54.00	0.0	0.00	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 132

Summary for Link 10L: PostDeveloped

Inflow Area = 2,595,817 sf, 36.83% Impervious, Inflow Depth = 5.91" for 100-Year D event
 Inflow = 63.3 cfs @ 12.97 hrs, Volume= 1,278,230 cf
 Primary = 63.3 cfs @ 12.97 hrs, Volume= 1,278,230 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 133

Hydrograph for Link 10L: PostDeveloped

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0
4.50	0.3	0.00	0.3	60.00	0.0	0.00	0.0
6.00	1.6	0.00	1.6	61.50	0.0	0.00	0.0
7.50	2.6	0.00	2.6	63.00	0.0	0.00	0.0
9.00	3.8	0.00	3.8	64.50	0.0	0.00	0.0
10.50	5.6	0.00	5.6	66.00	0.0	0.00	0.0
12.00	19.2	0.00	19.2	67.50	0.0	0.00	0.0
13.50	54.6	0.00	54.6	69.00	0.0	0.00	0.0
15.00	28.0	0.00	28.0	70.50	0.0	0.00	0.0
16.50	17.6	0.00	17.6	72.00	0.0	0.00	0.0
18.00	14.9	0.00	14.9	73.50	0.0	0.00	0.0
19.50	13.8	0.00	13.8	75.00	0.0	0.00	0.0
21.00	12.8	0.00	12.8	76.50	0.0	0.00	0.0
22.50	11.7	0.00	11.7	78.00	0.0	0.00	0.0
24.00	10.6	0.00	10.6	79.50	0.0	0.00	0.0
25.50	7.4	0.00	7.4	81.00	0.0	0.00	0.0
27.00	5.4	0.00	5.4	82.50	0.0	0.00	0.0
28.50	4.1	0.00	4.1	84.00	0.0	0.00	0.0
30.00	3.6	0.00	3.6	85.50	0.0	0.00	0.0
31.50	3.2	0.00	3.2	87.00	0.0	0.00	0.0
33.00	2.6	0.00	2.6	88.50	0.0	0.00	0.0
34.50	2.0	0.00	2.0	90.00	0.0	0.00	0.0
36.00	1.2	0.00	1.2	91.50	0.0	0.00	0.0
37.50	0.5	0.00	0.5	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				
43.50	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.50	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.50	0.0	0.00	0.0				
51.00	0.0	0.00	0.0				
52.50	0.0	0.00	0.0				
54.00	0.0	0.00	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 134

Summary for Link 11L: Total Post Developed West

Inflow Area = 4,695,960 sf, 20.36% Impervious, Inflow Depth = 5.50" for 100-Year D event
 Inflow = 155.3 cfs @ 12.85 hrs, Volume= 2,153,567 cf
 Primary = 155.3 cfs @ 12.85 hrs, Volume= 2,153,567 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 135

Hydrograph for Link 11L: Total Post Developed West

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0
4.50	0.3	0.00	0.3	60.00	0.0	0.00	0.0
6.00	1.6	0.00	1.6	61.50	0.0	0.00	0.0
7.50	3.2	0.00	3.2	63.00	0.0	0.00	0.0
9.00	6.1	0.00	6.1	64.50	0.0	0.00	0.0
10.50	11.3	0.00	11.3	66.00	0.0	0.00	0.0
12.00	39.8	0.00	39.8	67.50	0.0	0.00	0.0
13.50	105.6	0.00	105.6	69.00	0.0	0.00	0.0
15.00	45.1	0.00	45.1	70.50	0.0	0.00	0.0
16.50	28.6	0.00	28.6	72.00	0.0	0.00	0.0
18.00	23.6	0.00	23.6	73.50	0.0	0.00	0.0
19.50	20.9	0.00	20.9	75.00	0.0	0.00	0.0
21.00	19.4	0.00	19.4	76.50	0.0	0.00	0.0
22.50	17.7	0.00	17.7	78.00	0.0	0.00	0.0
24.00	16.1	0.00	16.1	79.50	0.0	0.00	0.0
25.50	8.0	0.00	8.0	81.00	0.0	0.00	0.0
27.00	5.4	0.00	5.4	82.50	0.0	0.00	0.0
28.50	4.1	0.00	4.1	84.00	0.0	0.00	0.0
30.00	3.6	0.00	3.6	85.50	0.0	0.00	0.0
31.50	3.2	0.00	3.2	87.00	0.0	0.00	0.0
33.00	2.6	0.00	2.6	88.50	0.0	0.00	0.0
34.50	2.0	0.00	2.0	90.00	0.0	0.00	0.0
36.00	1.2	0.00	1.2	91.50	0.0	0.00	0.0
37.50	0.5	0.00	0.5	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				
43.50	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.50	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.50	0.0	0.00	0.0				
51.00	0.0	0.00	0.0				
52.50	0.0	0.00	0.0				
54.00	0.0	0.00	0.0				

3724 STORMWATER

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 136

Summary for Link 12L: Total Post-Developed North

Inflow Area = 2,150,176 sf, 34.16% Impervious, Inflow Depth = 5.72" for 100-Year D event
 Inflow = 74.0 cfs @ 12.63 hrs, Volume= 1,024,876 cf
 Primary = 74.0 cfs @ 12.63 hrs, Volume= 1,024,876 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.03 hrs

3724 STORMWATER

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

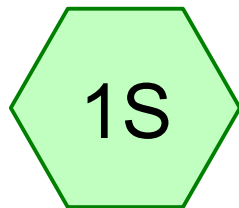
Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

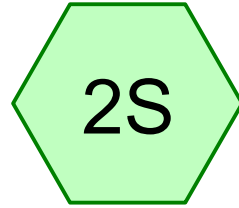
Page 137

Hydrograph for Link 12L: Total Post-Developed North

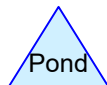
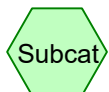
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	0.00	0.0	55.50	0.0	0.00	0.0
1.50	0.0	0.00	0.0	57.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	58.50	0.0	0.00	0.0
4.50	0.0	0.00	0.0	60.00	0.0	0.00	0.0
6.00	0.1	0.00	0.1	61.50	0.0	0.00	0.0
7.50	1.2	0.00	1.2	63.00	0.0	0.00	0.0
9.00	2.9	0.00	2.9	64.50	0.0	0.00	0.0
10.50	5.6	0.00	5.6	66.00	0.0	0.00	0.0
12.00	20.2	0.00	20.2	67.50	0.0	0.00	0.0
13.50	37.8	0.00	37.8	69.00	0.0	0.00	0.0
15.00	22.4	0.00	22.4	70.50	0.0	0.00	0.0
16.50	16.9	0.00	16.9	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	10.8	0.00	10.8	75.00	0.0	0.00	0.0
21.00	9.3	0.00	9.3	76.50	0.0	0.00	0.0
22.50	8.1	0.00	8.1	78.00	0.0	0.00	0.0
24.00	7.1	0.00	7.1	79.50	0.0	0.00	0.0
25.50	3.3	0.00	3.3	81.00	0.0	0.00	0.0
27.00	2.8	0.00	2.8	82.50	0.0	0.00	0.0
28.50	2.5	0.00	2.5	84.00	0.0	0.00	0.0
30.00	2.2	0.00	2.2	85.50	0.0	0.00	0.0
31.50	1.9	0.00	1.9	87.00	0.0	0.00	0.0
33.00	1.5	0.00	1.5	88.50	0.0	0.00	0.0
34.50	1.2	0.00	1.2	90.00	0.0	0.00	0.0
36.00	0.8	0.00	0.8	91.50	0.0	0.00	0.0
37.50	0.5	0.00	0.5	93.00	0.0	0.00	0.0
39.00	0.3	0.00	0.3	94.50	0.0	0.00	0.0
40.50	0.2	0.00	0.2	96.00	0.0	0.00	0.0
42.00	0.1	0.00	0.1				
43.50	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.50	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.50	0.0	0.00	0.0				
51.00	0.0	0.00	0.0				
52.50	0.0	0.00	0.0				
54.00	0.0	0.00	0.0				



SWALE NORTH



SWALE SOUTH



Routing Diagram for 3724 STORMWATER SWALE
Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

3724 STORMWATER SWALE

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

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 2

Summary for Subcatchment 1S: SWALE NORTH

Runoff = 19.27 cfs @ 12.12 hrs, Volume= 1.413 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
134,665	74	>75% Grass cover, Good, HSG C
134,665		100.00% Pervious Area

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

Summary for Subcatchment 2S: SWALE SOUTH

Runoff = 10.77 cfs @ 12.12 hrs, Volume= 0.790 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.03 hrs
NRCC 24-hr D 100-Year D Rainfall=8.62"

Area (sf)	CN	Description
75,263	74	>75% Grass cover, Good, HSG C
75,263		100.00% Pervious Area

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

3724 STORMWATER

NRCC 24-hr D Custom Rainfall=0.85"

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 1

Summary for Pond 10P: DB1

Inflow Area = 2,000,649 sf, 46.65% Impervious, Inflow Depth > 0.10" for Custom event
 Inflow = 8.7 cfs @ 12.14 hrs, Volume= 17,360 cf
 Outflow = 0.1 cfs @ 13.00 hrs, Volume= 717 cf, Atten= 98%, Lag= 51.6 min
 Discarded = 0.1 cfs @ 13.00 hrs, Volume= 717 cf
 Primary = 0.0 cfs @ 13.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 10.00-13.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 276.67' @ 13.00 hrs Surf.Area= 22,116 sf Storage= 16,574 cf

Plug-Flow detention time= 107.2 min calculated for 710 cf (4% of inflow)
 Center-of-Mass det. time= 2.5 min (725.4 - 722.9)

Volume	Invert	Avail.Storage	Storage Description
#1	275.00'	661,735 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	273.00'	113 cf	4.00'D x 9.00'H Vertical Cone/Cylinder
		661,848 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	0	0.0	0	0	0
276.00	13,808	670.0	4,603	4,603	35,724
277.00	26,900	835.0	19,994	24,596	55,499
278.00	44,600	1,025.0	35,379	59,975	83,637
279.00	70,690	1,550.0	57,147	117,122	191,224
280.00	94,783	1,550.0	82,443	199,564	192,774
281.00	112,000	1,690.0	103,272	302,836	228,907
282.00	117,000	1,710.0	114,491	417,327	234,579
283.00	122,500	1,730.0	119,739	537,067	240,317
284.00	126,850	1,750.0	124,669	661,735	246,123

3724 STORMWATER

NRCC 24-hr D Custom Rainfall=0.85"

Prepared by Engineering Design Consultants, Inc.

HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

Page 2

Device	Routing	Invert	Outlet Devices
#1	Primary	273.34'	24.0" Round Culvert L= 90.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 273.34' / 266.30' S= 0.0782 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.67'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	278.80'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	281.40'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	282.60'	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=0.1 cfs @ 13.00 hrs HW=276.67' (Free Discharge)

6=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 13.00 hrs HW=276.67' (Free Discharge)

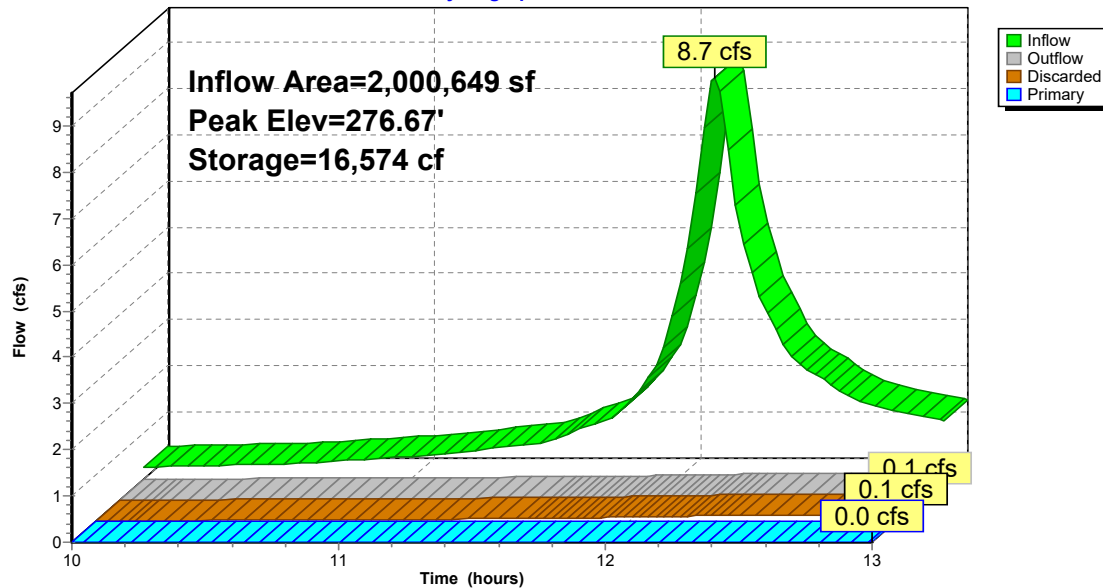
- 1=Culvert (Passes 0.0 cfs of 23.1 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.0 cfs @ 0.04 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)
- 4=Orifice/Grate (Controls 0.0 cfs)
- 5=Emergency Spillway (Controls 0.0 cfs)

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

NRCC 24-hr D Custom Rainfall=0.85"

Page 3

Pond 10P: DB1**Hydrograph****3724 STORMWATER**

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

NRCC 24-hr D Custom Rainfall=0.85"

Page 4

Summary for Pond 30P: DB2

Inflow Area = 1,081,712 sf, 67.90% Impervious, Inflow Depth > 0.17" for Custom event
Inflow = 8.3 cfs @ 12.14 hrs, Volume= 15,579 cf
Outflow = 0.3 cfs @ 13.00 hrs, Volume= 2,483 cf, Atten= 96%, Lag= 51.9 min
Discarded = 0.3 cfs @ 13.00 hrs, Volume= 2,483 cf
Primary = 0.0 cfs @ 10.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 10.00-13.00 hrs, dt= 0.03 hrs / 4
Peak Elev= 303.33' @ 13.00 hrs Surf.Area= 47,915 sf Storage= 13,037 cf

Plug-Flow detention time= 38.0 min calculated for 2,455 cf (16% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	303.00'	488,203 cf	Custom Stage Data (Irregular) Listed below (Recalc)
#2	301.50'	72 cf	4.00'D x 5.70'H Vertical Cone/Cylinder
		488,275 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
303.00	31,785	685.0	0.0	0	0	31,785
304.00	91,010	1,200.0	100.0	58,860	58,860	109,043
306.00	94,640	1,220.0	100.0	185,638	244,498	113,591
308.00	98,340	1,245.0	100.0	192,968	437,466	119,080
308.50	104,640	1,280.0	100.0	50,737	488,203	126,141

Device	Routing	Invert	Outlet Devices
#1	Primary	301.50'	24.0" Round Culvert L= 50.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 301.50' / 298.00' S= 0.0700 ' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	303.50'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600
#3	Device 1	304.80'	1.6' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	307.20'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Primary	307.50'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#6	Discarded	301.50'	0.270 in/hr Exfiltration over Surface area

3724 STORMWATER

Prepared by Engineering Design Consultants, Inc.
HydroCAD® 10.00-26 s/n 03310 © 2020 HydroCAD Software Solutions LLC

NRCC 24-hr D Custom Rainfall=0.85"

Page 5

Discarded OutFlow Max=0.3 cfs @ 13.00 hrs HW=303.33' (Free Discharge)

↳ **6=Exfiltration** (Exfiltration Controls 0.3 cfs)

Primary OutFlow Max=0.0 cfs @ 10.00 hrs HW=301.73' (Free Discharge)

↳ **1=Culvert** (Passes 0.0 cfs of 0.3 cfs potential flow)

↳ **2=Orifice/Grate** (Controls 0.0 cfs)

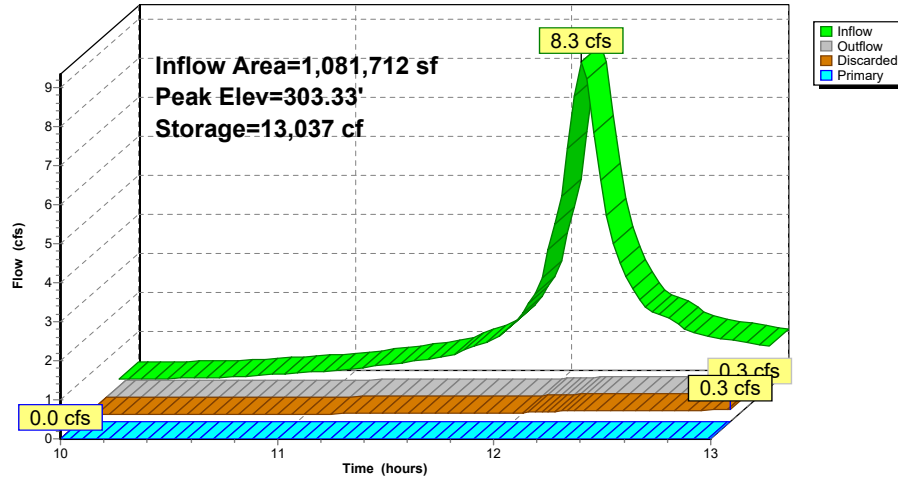
↳ **3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

↳ **4=Orifice/Grate** (Controls 0.0 cfs)

↳ **5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond 30P: DB2

Hydrograph



LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
DCB#15 TO DMH#38 (DSNE)	0.66	0.66	0.82	5.00	0.01	5.00	8.71	4.71	13.38	18	5.55	0.02	0.78	4.88	0.013	341.30	341.21	346.21
CB#23 to DMH#35 (DSNE)	0.19	0.19	0.95	5.00	0.03	5.00	8.71	1.57	4.15	12	7.47	0.01	1.00	2.00	0.013	350.21	350.11	354.50
CB#22 to DMH#35 (DSNE)	0.28	0.28	0.95	5.00	0.02	5.00	8.71	2.32	5.17	12	8.99	0.02	1.00	2.95	0.013	350.30	350.11	354.47
DMH#35 to DMH#36 (DSNE)	0.00	0.47	0.00	0.00	0.42	5.00	8.69	3.88	4.21	12	153.13	0.01	0.76	5.78	0.013	350.07	347.93	354.28
DCB#13 to DMH#36 (DSNE)	0.34	0.34	0.95	5.00	0.01	5.00	8.71	2.81	19.99	18	6.48	0.04	0.53	4.44	0.013	349.67	349.43	354.37
DMH#36 to DMH#37 (DSNE)	0.00	0.81	0.00	0.00	0.41	5.40	8.32	6.40	18.07	18	224.01	0.03	1.50	4.47	0.013	347.43	340.80	354.14
DCB#14 to DMH#37 (DSNE)	0.79	0.79	0.90	5.00	0.07	5.00	8.71	6.19	10.52	18	26.71	0.01	0.89	5.44	0.013	342.85	342.58	347.56
DMH#37 to DMH#38 (DSNE)	0.00	1.60	0.00	0.00	0.31	5.90	8.00	11.85	22.86	24	132.21	0.01	1.84	4.91	0.013	340.70	339.35	347.29
DMH#38 to DMH#34 (DSNE)	0.00	2.26	0.00	0.00	0.16	6.20	7.78	15.73	23.63	24	74.18	0.01	1.27	7.07	0.013	339.25	338.44	346.21
DCB#12 to DMH#34 (DSNE)	1.24	1.24	0.90	5.00	0.05	5.00	8.71	9.72	10.48	18	19.54	0.01	1.18	6.49	0.013	342.20	342.01	347.22
DCB#11 to DMH#33 (DSNE)	0.97	0.97	0.89	5.00	0.02	5.00	8.71	7.52	10.51	18	7.61	0.01	1.03	5.74	0.013	344.75	344.67	349.46
DCB#10 to DMH#32 (DSNE)	0.95	0.95	0.88	5.00	0.04	5.00	8.71	7.28	10.57	18	14.70	0.01	1.00	5.73	0.013	345.39	345.24	350.10
DCB#9 to DMH#31 (DSNE)	1.09	1.09	0.89	5.00	0.02	5.00	8.71	8.45	10.50	18	9.90	0.01	1.10	6.06	0.013	346.20	346.10	350.91
DMH#31 to DMH#32 (DSNE)	0.00	1.09	0.00	0.00	0.47	5.00	8.69	8.43	10.50	18	185.59	0.01	1.50	5.40	0.013	346.00	344.15	350.85
DMH#32 to DMH#33 (DSNE)	0.00	2.04	0.00	0.00	0.45	5.50	8.28	14.95	22.62	24	204.66	0.01	2.00	5.64	0.013	344.05	342.00	350.24
DMH#33 to DMH#34 (DSNE)	0.00	3.01	0.00	0.00	0.72	5.90	7.93	21.18	26.86	24	396.30	0.01	1.36	8.51	0.013	341.90	336.31	350.09
DMH#34 to DMH#34B (DSNE)	0.00	6.51	0.00	0.00	0.02	6.70	7.46	43.32	70.90	30	16.06	0.03	2.50	8.85	0.013	334.57	334.09	347.49
DMH#34B to OUTLET#4 (DSNE)	0.00	6.51	0.00	0.00	0.13	6.70	7.45	43.25	68.02	30	109.06	0.03	1.61	11.21	0.013	334.00	331.00	344.64

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
DCB#20 to DMH#47 (DSNW)	0.66	0.66	0.90	5.00	0.03	5.00	8.71	5.17	10.79	18	11.28	0.01	0.83	5.03	0.013	343.29	343.17	348.00
DCB#19 to DMH#46 (DSNW)	0.78	0.78	0.90	5.00	0.03	5.00	8.71	6.11	10.65	18	11.87	0.01	1.44	3.59	0.013	343.29	343.17	348.00
DMH#46 to DMH#47 (DSNW)	0.00	0.78	0.00	0.00	0.30	5.00	8.68	6.09	10.50	18	112.45	0.01	1.50	4.23	0.013	343.07	341.94	347.99
DMH#47 to DMH#43 (DSNW)	0.00	1.44	0.00	0.00	0.14	5.30	8.41	10.90	11.50	18	60.32	0.01	1.20	7.04	0.013	341.84	341.12	348.00
DCB#18 to DMH#43 (DSNW)	0.54	0.54	0.90	5.00	0.16	5.00	8.71	4.23	10.43	18	54.62	0.01	0.70	4.86	0.013	341.41	340.87	346.12
CB#25 to DMH#42 (DSNW)	0.29	0.29	0.83	5.00	0.07	5.00	8.71	2.10	4.00	12	21.56	0.01	0.55	4.42	0.013	343.83	343.56	348.00
DCB#21 to DMH#42 (DSNW)	0.99	0.99	0.80	5.00	0.05	5.00	8.71	6.90	10.50	18	20.43	0.01	0.96	5.64	0.013	342.76	342.56	348.00
CB#28 to DMH#45 (DSNW)	0.30	0.30	0.93	5.00	0.06	5.00	8.71	2.43	3.56	12	17.00	0.01	0.64	4.50	0.013	349.92	349.75	354.24
CB#27 to DMH#44 (DSNW)	0.20	0.20	0.93	5.00	0.02	5.00	8.71	1.62	5.04	12	7.24	0.02	1.00	2.12	0.013	350.20	350.06	354.50
CB#26 to DMH#44(1) (DSNW)	0.21	0.21	0.93	5.00	0.05	5.00	8.71	1.70	4.76	12	15.36	0.02	1.00	2.42	0.013	350.33	350.06	354.50
DMH#44 to DMH#45 (DSNW)	0.00	0.41	0.00	0.00	0.43	5.00	8.67	3.30	3.56	12	133.82	0.01	0.76	5.11	0.013	349.96	348.62	354.22
DMH#45 to DMH#41 (DSNW)	0.00	0.71	0.00	0.00	0.24	5.50	8.29	5.47	21.27	18	141.42	0.04	0.55	7.21	0.013	348.43	342.62	354.01
CB#24 to DMH#40 (DSNW)	0.12	0.12	0.80	5.00	0.12	5.00	8.71	0.84	10.07	12	58.10	0.08	0.21	5.04	0.013	349.17	344.53	353.89
DCB#17 to DMH#39 (DSNW)	0.69	0.69	0.95	5.00	0.02	5.00	8.71	5.71	10.51	18	6.24	0.01	0.89	5.12	0.013	345.75	345.68	350.46
DCB#16 to DMH#38 (DSNW)	0.97	0.97	0.95	5.00	0.02	5.00	8.71	8.03	10.14	18	9.47	0.01	1.07	5.90	0.013	345.79	345.70	350.50
DMH#38 to DMH#39 (DSNW)	0.00	0.97	0.00	0.00	0.61	5.00	8.69	8.00	10.53	18	238.89	0.01	1.50	5.20	0.013	345.60	343.20	350.69
DMH#39 to DMH#40 (DSNW)	0.00	1.66	0.00	0.00	0.79	5.60	8.17	12.88	22.59	24	344.07	0.01	2.00	5.11	0.013	343.10	339.67	350.79
DMH#40 to DMH#41 (DSNW)	0.00	1.78	0.00	0.00	0.48	6.40	7.61	12.73	22.62	24	202.40	0.01	2.00	4.05	0.013	339.57	337.54	351.92
DMH#41 to DMH#42 (DSNW)	0.00	2.49	0.00	0.00	0.19	6.90	7.32	17.08	23.67	24	88.68	0.01	2.00	5.44	0.013	337.44	336.47	348.00
DMH#42 to DMH#43 (DSNW)	0.00	3.77	0.00	0.00	0.17	7.10	7.21	24.29	28.61	24	97.21	0.02	2.00	7.73	0.013	336.37	334.82	348.00
DMH#43 to DMH#43B (DSNW)	0.00	5.75	0.00	0.00	0.01	7.30	7.13	36.68	70.66	30	10.78	0.03	2.50	7.65	0.013	334.46	334.14	347.59
DMH#43B to OUTLET #6 (DSNW)	0.00	5.75	0.00	0.00	0.13	7.30	7.12	36.64	70.32	30	104.77	0.03	2.50	8.04	0.013	334.08	331.00	340.94

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
CB#8 to DMH#11 (DSS)	0.15	0.15	0.95	5.00	0.06	5.00	8.71	1.24	7.12	12	22.82	0.04	1.00	2.49	0.013	302.92	302.01	308.00
CB#7 to DMH#9 (DSS)	0.98	0.98	0.46	5.00	0.05	5.00	8.71	3.93	6.57	12	27.21	0.03	0.63	6.58	0.013	318.49	317.57	322.65
CB#6 to DMH#9 (DSS)	0.14	0.14	0.95	5.00	0.04	5.00	8.71	1.16	6.57	12	16.45	0.03	0.34	4.17	0.013	318.49	317.93	322.65
DCB#5 to DMF#15 (DSS)	0.92	0.92	0.95	5.00	0.22	5.00	8.71	7.61	19.92	18	136.00	0.04	0.68	7.78	0.013	346.14	341.24	350.34
DCB#4 to DMF#15 (DSS)	0.68	0.68	0.95	5.00	0.22	5.00	8.71	5.63	6.17	12	115.35	0.03	0.77	7.99	0.013	346.40	342.94	350.56
DMF#15 to DMH#8 (DSS)	0.00	1.60	0.00	0.00	0.22	5.20	8.51	12.94	28.95	18	205.21	0.08	1.50	7.52	0.013	338.89	323.29	351.84
CB#5 to DMH#7 (DSS)	0.83	0.83	0.69	5.00	0.06	5.00	8.71	4.99	5.28	12	27.14	0.02	0.83	6.90	0.013	331.67	331.07	336.50
CB#2 to DMH#6 (DSS)	0.21	0.21	0.80	5.00	0.18	5.00	8.71	1.46	3.56	12	45.65	0.01	0.46	3.86	0.013	343.93	343.47	350.13
CB#1 to DMH#5 (DSS)	0.29	0.29	0.70	5.00	0.10	5.00	8.71	1.77	3.56	12	26.00	0.01	0.52	4.06	0.013	345.42	345.16	351.23
DCB#2 to DMH#2 (DSS)	1.27	1.27	0.87	5.00	0.02	5.00	8.71	9.62	10.51	18	8.32	0.01	1.50	5.45	0.013	347.29	347.21	352.00
DCB#1 to DMH#1 (DSS)	1.16	1.16	0.87	5.00	0.02	5.00	8.71	8.79	10.51	18	8.20	0.01	1.50	4.97	0.013	347.08	347.00	351.79
DMH#1 to DMH#2 (DSS)	0.00	1.16	0.00	0.00	0.62	5.00	8.69	8.77	16.03	24	195.04	0.01	2.00	2.79	0.013	346.55	345.57	351.80
DMH#2 to DMH#3 (DSS)	0.00	2.43	0.00	0.00	0.51	5.60	8.16	17.25	17.51	24	195.25	0.01	2.00	5.49	0.013	345.57	344.40	352.00
DCB#3 to DMH#3 (DSS)	1.02	1.02	0.87	5.00	0.02	5.00	8.71	7.73	10.50	18	8.30	0.01	1.44	4.49	0.013	347.29	347.21	352.00
DMH#3 to DMH#4 (DSS)	0.00	3.45	0.00	0.00	0.24	6.20	7.78	23.36	23.72	24	122.24	0.01	2.00	7.44	0.013	344.40	343.06	352.00
DMH#4 to DMH#5 (DSS)	0.00	3.45	0.00	0.00	0.29	6.40	7.62	22.88	23.72	24	148.64	0.01	2.00	7.28	0.013	342.96	341.32	353.85
DMH#5 to DMH#6 (DSS)	0.00	3.74	0.00	0.00	0.16	6.70	7.44	23.85	24.78	24	83.33	0.01	2.00	7.59	0.013	341.22	340.22	350.77
CB#3 to DMH#6 (DSS)	0.13	0.13	0.95	5.00	0.14	5.00	8.71	1.08	3.56	12	32.27	0.01	0.40	3.48	0.013	343.67	343.35	349.97
DMH#6 to DMH#7 (DSS)	0.00	4.08	0.00	0.00	0.53	6.90	7.35	25.69	35.36	24	376.03	0.02	1.30	10.29	0.013	340.12	330.93	349.00
CB#4 to DMH#7 (DSS)	0.16	0.16	0.95	5.00	0.05	5.00	8.71	1.32	4.99	12	17.28	0.02	0.40	3.99	0.013	332.35	332.01	336.52
DMH#7 to DMH#8 (DSS)	0.00	5.07	0.00	0.00	0.22	7.40	7.06	29.78	36.47	24	162.00	0.03	1.45	11.00	0.013	328.66	324.45	336.18
DMH#8 to DMH#9 (DSS)	0.00	6.67	0.00	0.00	0.22	7.60	6.94	39.87	77.32	30	191.05	0.04	1.37	11.72	0.013	323.19	316.40	329.70
DMH#9 to DMH#10 (DSS)	0.00	7.79	0.00	0.00	0.25	7.80	6.84	43.26	71.03	30	207.49	0.03	1.50	11.74	0.013	314.15	307.93	322.19
DMH#10 to DMH#11 (DSS)	0.00	7.79	0.00	0.00	0.21	8.10	6.72	42.53	72.21	30	171.95	0.03	1.49	11.64	0.013	305.86	300.53	313.85
DCB#22 to DMH#11 (DSS)	1.77	1.77	0.62	5.00	0.04	5.00	8.71	9.56	19.35	18	29.46	0.03	1.50	5.91	0.013	302.24	301.24	307.98
DMH#11 to DMH#12 (DSS)	0.00	9.71	0.00	0.00	0.04	8.30	6.63	50.18	111.10	36	33.02	0.03	1.83	9.94	0.013	299.88	298.96	306.63
DMH#12 to DMH#13 (DSS)	0.00	9.71	0.00	0.00	0.12	8.30	6.62	50.05	115.69	36	97.87	0.03	1.60	10.94	0.013	297.84	294.89	305.30
DMH#13 to DMH#13B (DSS)	0.00	9.71	0.00	0.00	0.02	8.40	6.57	49.68	128.12	36	16.01	0.04	1.89	9.66	0.013	294.89	294.30	301.23
DMH#13B to DMH#14 (DSS)	0.00	9.71	0.00	0.00	0.10	8.50	6.56	49.62	126.77	36	91.62	0.04	1.53	11.23	0.013	294.20	290.89	300.65
DMH#14 to OUTLET 1 (DSS)	0.00	9.71	0.00	0.00	0.17	8.60	6.52	49.31	127.39	36	152.66	0.04	1.45	11.67	0.013	287.57	282.00	297.35

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	Lineslope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
CB#21 to DMH#29 (DSW)	0.28	0.28	0.79	5.00	0.02	5.00	8.71	1.93	6.59	12	10.19	0.03	1.00	2.45	0.013	294.39	294.04	302.39
CB#20 to DMH#29 (DSW)	0.45	0.45	0.76	5.00	0.08	5.00	8.71	2.98	3.56	12	24.10	0.01	1.00	3.79	0.013	293.56	293.32	301.56
CB#19 to DMH#26 (DSW)	0.39	0.39	0.76	5.00	0.02	5.00	8.71	2.58	8.38	12	13.08	0.06	1.00	3.91	0.013	304.07	303.34	308.23
CB#18 to DMH#26 (DSW)	1.04	1.04	0.72	5.00	0.05	5.00	8.71	6.52	10.50	18	17.24	0.01	0.93	5.50	0.013	303.98	303.80	308.14
CB#17 to DMH#25 (DSW)	0.38	0.38	0.77	5.00	0.05	5.00	8.71	2.55	5.74	12	19.36	0.03	0.54	5.22	0.013	315.58	315.07	323.58
CB#16 to DMH#25 (DSW)	0.28	0.28	0.79	5.00	0.06	5.00	8.71	1.93	5.78	12	24.71	0.03	0.45	4.84	0.013	315.75	315.09	320.10
DCB#6 to DMH#19 (DSW)	0.91	0.91	0.95	5.00	0.02	5.00	8.71	7.53	12.13	18	9.59	0.01	1.00	5.87	0.013	345.89	345.76	350.61
DMH#19 to DMH#18 (DSW)	0.00	0.91	0.00	0.00	0.27	5.00	8.69	7.51	10.50	18	103.10	0.01	0.96	5.98	0.013	345.66	344.63	350.47
DCB#7 to DMH#17 (DSW)	0.95	0.95	0.95	5.00	0.02	5.00	8.71	7.86	11.99	18	10.02	0.01	1.02	5.97	0.013	345.80	345.67	350.52
DCB#8 to DMH#16 (DSW)	0.47	0.47	0.95	5.00	0.02	5.00	8.71	3.89	13.97	18	8.91	0.02	0.85	4.08	0.013	345.50	345.34	350.22
DMH#16 to DMH#17 (DSW)	0.00	0.47	0.00	0.00	0.98	5.00	8.69	3.88	7.43	18	248.48	0.01	1.06	3.64	0.013	345.24	344.00	350.05
DMH#17 to DMH#18 (DSW)	0.00	1.42	0.00	0.00	0.18	6.00	7.89	10.65	36.38	24	107.17	0.03	0.81	7.29	0.013	343.50	340.73	350.38
DMH#18 to DMH#20 (DSW)	0.00	2.33	0.00	0.00	0.03	6.20	7.77	17.20	51.33	24	24.18	0.05	1.04	8.66	0.013	336.19	334.94	350.50
DMH#20 to DMH#23 (DSW)	0.00	2.33	0.00	0.00	0.07	6.20	7.75	17.16	44.13	24	52.72	0.04	2.00	5.93	0.013	329.97	327.96	342.08
CB#13 to DMH#22 (DSW)	0.89	0.89	0.92	5.00	0.03	5.00	8.71	7.13	6.23	12	15.52	0.03	1.00	9.08	0.013	333.86	333.39	338.02
CB#12 to DMH#22 (DSW)	0.37	0.37	0.86	5.00	0.09	5.00	8.71	2.77	3.53	12	27.74	0.01	1.00	3.58	0.013	333.83	333.56	338.00
CB#11 to DMH#21 (DSW)	0.36	0.36	0.83	5.00	0.04	5.00	8.71	2.60	6.17	12	19.56	0.03	0.99	3.93	0.013	341.93	341.34	345.90
CB#10 to DMH#21 (DSW)	0.89	0.89	0.92	5.00	0.10	5.00	8.71	7.13	12.86	18	43.27	0.02	1.50	4.81	0.013	341.36	340.71	345.82
DMH#21 to DMH#22 (DSW)	0.00	1.25	0.00	0.00	0.60	5.10	8.62	9.63	15.72	18	336.14	0.02	0.87	7.78	0.013	340.61	333.07	345.67
DMH#22 to DMH#23 (DSW)	0.00	2.51	0.00	0.00	0.27	5.70	8.12	18.30	34.98	24	173.54	0.02	2.00	6.50	0.013	332.42	328.27	337.78
DMH#23 to DMH#24 (DSW)	0.00	4.84	0.00	0.00	0.22	6.30	7.70	34.42	37.46	24	173.53	0.03	1.58	12.04	0.013	327.86	323.10	333.65
CB#15 to DMH#24 (DSW)	0.47	0.47	0.78	5.00	0.02	5.00	8.71	3.19	7.96	12	12.27	0.05	1.00	4.53	0.013	324.35	323.74	336.32
CB#14 to DMH#24 (DSW)	0.43	0.43	0.80	5.00	0.04	5.00	8.71	3.00	7.96	12	24.91	0.05	0.49	6.34	0.013	325.39	324.15	332.56
DMH#24 to DMH#25 (DSW)	0.00	5.74	0.00	0.00	0.22	6.50	7.56	39.16	82.02	30	206.09	0.04	1.31	12.02	0.013	321.80	313.56	328.35
DMH#25 to DMH#26 (DSW)	0.00	6.40	0.00	0.00	0.28	6.70	7.43	42.28	75.62	30	248.58	0.03	1.42	12.02	0.013	310.69	302.24	319.35
DMH#26 to DMH#27 (DSW)	0.00	7.83	0.00	0.00	0.11	7.00	7.26	48.95	71.03	30	91.48	0.03	1.72	12.00	0.013	300.65	297.91	308.35
DMH#27 to DMH#28 (DSW)	0.00	7.83	0.00	0.00	0.07	7.10	7.21	48.55	75.62	30	64.90	0.03	1.70	11.99	0.013	297.11	294.90	303.98
DMH#28 to DMH#29 (DSW)	0.00	7.83	0.00	0.00	0.10	7.20	7.17	48.29	71.10	30	86.32	0.03	1.71	11.90	0.013	294.72	292.13	301.41
DMH#29 to DMH#29B (DSW)	0.00	8.56	0.00	0.00	0.02	7.30	7.11	51.94	63.58	30	16.23	0.02	2.50	10.58	0.013	290.83	290.44	298.59
DMH#29B to DMH#30 (DSW)	0.00	8.56	0.00	0.00	0.11	7.30	7.10	51.86	63.48	30	84.73	0.02	1.91	11.90	0.013	290.44	288.41	298.16
DMH#30 to OUTLET#3 (DSW)	0.00	8.56	0.00	0.00	0.08	7.40	7.05	51.45	61.60	30	62.50	0.02	1.97	11.63	0.013	283.41	282.00	297.73

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n~valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
RF#17 to RF#18 (RNE)	4.05	4.05	0.95	5.00	0.43	5.00	8.71	33.51	37.16	24	346.01	0.027	1.52	11.95	0.013	349.42	340.08	359.36
RF#18 to OUTLET#5 (RNE)	0.00	4.05	0.00	0.00	0.18	5.40	8.33	32.05	36.24	24	135.19	0.026	2.00	10.31	0.013	336.11	332.64	347.42

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
RF#19 to RF#20 (RNW)	4.00	4.00	0.95	5.00	0.24	5.00	8.71	33.10	47.74	24	235.93	0.045	2.00	10.63	0.013	351.98	341.47	358.48
RF#20 to RF#21 (RNW)	0.00	4.00	0.00	0.00	0.31	5.20	8.49	32.27	35.76	24	232.05	0.025	1.54	11.46	0.013	341.37	335.57	352.37
RF#21 to OUTLET#7 (RNW)	0.00	4.00	0.00	0.00	0.15	5.50	8.24	31.30	39.18	24	116.01	0.030	1.45	11.50	0.013	334.48	331.00	348.00

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	LineSlope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
RF#10 to RF#11 (RS)	5.14	5.14	0.95	5.00	0.15	5.00	8.71	42.53	78.90	30	149.34	0.037	1.44	11.96	0.013	349.41	343.88	355.65
RF#11 to RF#12 (RS)	0.00	5.14	0.00	0.00	0.03	5.20	8.57	41.85	82.02	30	27.35	0.040	1.66	10.67	0.013	339.64	338.54	351.15
RF#12 to RF#13 (RS)	0.00	5.14	0.00	0.00	0.02	5.20	8.55	41.73	82.02	30	22.82	0.040	1.69	10.53	0.013	334.15	333.24	350.08
RF#13 to RF#14 (RS)	0.00	5.14	0.00	0.00	0.03	5.20	8.52	41.63	82.02	30	26.84	0.040	1.66	10.62	0.013	327.92	326.85	339.33
RF#14 to RF#15 (RS)	0.00	5.14	0.00	0.00	0.33	5.20	8.50	41.51	75.63	30	306.88	0.034	1.39	12.03	0.013	325.08	314.64	333.15
RF#15 to RF#16 (RS)	0.00	5.14	0.00	0.00	0.24	5.60	8.22	40.14	79.95	30	221.72	0.038	1.34	12.00	0.013	312.90	304.47	320.44
RF#16 to RF#7 (RS)	0.00	5.14	0.00	0.00	0.09	5.80	8.04	39.24	83.66	30	81.10	0.042	1.40	11.41	0.013	302.71	299.33	310.46
RF#1 to RF#2 (RS)	5.14	5.14	0.95	5.00	0.36	5.00	8.71	42.53	64.85	30	305.83	0.025	1.55	11.35	0.013	348.57	340.92	354.36
RF#2 to RF#3 (RS)	0.00	5.14	0.00	0.00	0.17	5.40	8.39	40.96	82.02	30	160.87	0.040	1.36	12.05	0.013	335.97	329.53	355.36
RF#3 to RF#4 (RS)	0.00	5.14	0.00	0.00	0.11	5.50	8.25	40.29	87.00	30	103.77	0.045	1.36	11.95	0.013	324.09	319.43	343.41
RF#4 to RF#5 (RS)	0.00	5.14	0.00	0.00	0.11	5.60	8.17	39.88	87.00	30	111.41	0.045	2.50	8.57	0.013	319.03	314.01	326.09
RF#5 to RF#6 (RS)	0.00	5.14	0.00	0.00	0.25	5.70	8.08	39.45	71.42	30	205.35	0.030	1.42	11.35	0.013	313.91	307.69	321.72
RF#6 to RF#7 (RS)	0.00	5.14	0.00	0.00	0.20	6.00	7.90	38.57	83.02	30	182.53	0.041	2.50	8.36	0.013	306.20	298.72	313.48
RF#7 to RF#8 (RS)	0.00	10.28	0.00	0.00	0.13	6.20	7.76	75.78	258.06	48	124.25	0.032	1.76	11.55	0.013	298.15	294.14	307.04
RF#8 to RF#9 (RS)	0.00	10.28	0.00	0.00	0.14	6.30	7.67	74.94	227.22	48	119.90	0.025	1.86	10.96	0.013	291.31	288.31	301.56
RF#9 to OUTLET#2 (RS)	0.00	10.28	0.00	0.00	0.13	6.50	7.59	74.08	280.02	48	129.05	0.038	1.66	11.90	0.013	286.90	282.00	297.80

LineID	DrainArea (ac)	TotalArea (ac)	RunoffCoeff (C)	InletTime (min)	PipeTravel (min)	TcSystem (min)	iSyst (in/hr)	TotalRunoff (cfs)	Capac.Full (cfs)	LineSize (in)	LineLength (ft)	Lineslope (ft/ft)	DepthDn (ft)	VelAve (ft/s)	n-valuePipe	InvertUp (ft)	InvertDn (ft)	RimElev Up (ft)
CB#9 to DMH#48 (HBR)	0.13	0.13	0.95	5.00	0.13	5.00	8.71	1.08	3.56	12	30.07	0.01	0.40	3.48	0.013	291.52	291.22	295.69
DCB#23 to DMH#48 (HBR)	0.16	0.16	0.95	5.00	0.12	5.00	8.71	1.32	10.50	18	28.97	0.01	0.39	3.35	0.013	291.00	290.71	295.71
DMH#48 to OUTLET#8 (HBR)	0.00	0.29	0.00	0.00	0.21	5.10	8.59	2.37	23.48	18	106.02	0.05	1.50	2.52	0.013	287.30	282.00	297.07

	A	B	C	D	E	F	G	H	I
1	Outlet 4 & 5	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	2/1/2021			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=	75	cfs			WW horiz. Length=	275.0	ft	
7	Slope, S=	0.09	ft/ft	=	11.11	:1	U/S WW F.L. elev=	332.0	ft
8	Bottom Width, W=	7	ft			D/S WW F.L. elev=	307.3	ft	
9	Side slope, Z=	3	:1			Waterway drop=	24.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	276.1	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	10.59	in			Spreadsheet formatting key:			
13	D50 used=	12.00	in			XXX	=Input cells		
14	n=	0.048				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=	0.98	ft	Calculated					
18	Critical depth, d _c =	1.27	ft						
19	Critical slope, S _c =	0.035	ft/ft	0.7S _c =	0.0243	ft/ft			
20				1.3S _c =	0.0452	ft/ft			
21	Design slope, S=	0.0900	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	7.68	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=	1.98	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=	537.9	CY						
38	Approx. weight=	753.0	Tons						
39	Geotextile area=	1419.1	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

Outlet 4 & 5

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: 2/1/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 12.0 in.
 Rock_{ww} thickness = 2.0 Feet.

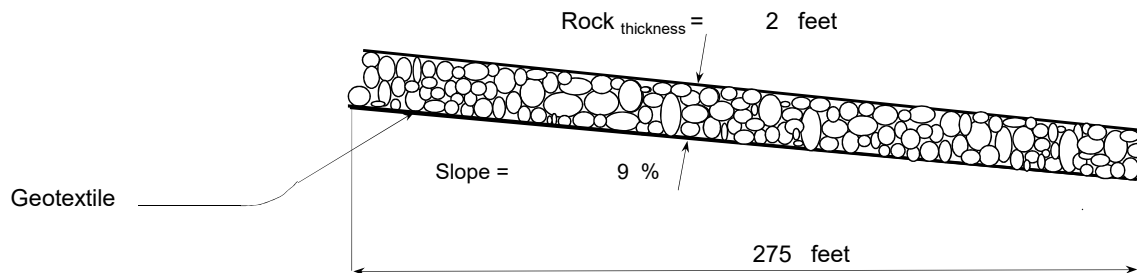
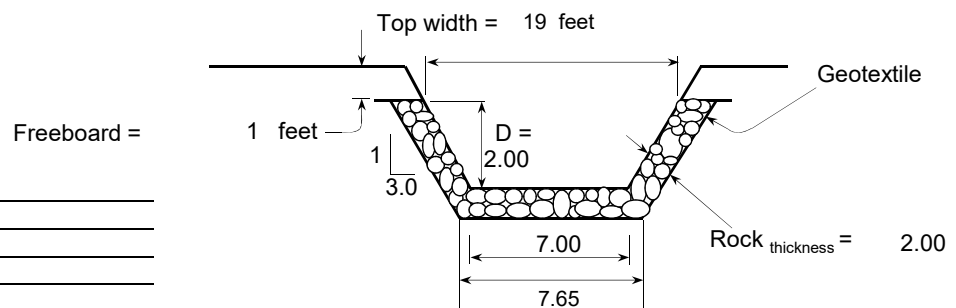
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	18 - 24 (413 - 978)
D ₈₅ -----	16 - 22 (269 - 713)
D ₅₀ -----	12 - 18 (122 - 413)
D ₁₀ -----	10 - 16 (63 - 269)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

Quantities

Rock = 538 yd³
 Geotextile (WCS-13)^a = 1419 yd²

Notes: ^a 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**

WML	Date	2/1/21	File Name
Drawn			
Checkd	0	1/0/00	
Approved			Sheet ___ of ___

	A	B	C	D	E	F	G	H	I
1	Outlet OCS1	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	2/1/2021			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=	40.1	cfs			WW horiz. Length=	65.0	ft	
7	Slope, S=	0.066	ft/ft =	15.15	:1	U/S WW F.L. elev=	266.3	ft	
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	262.0	ft	
9	Side slope, Z=	2	:1			Waterway drop=	4.3	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	65.1	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	4.92	in			Spreadsheet formatting key:			
13	D50 used=	10.00	in			XXX	=Input cells		
14	n=	0.044				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=	0.62	ft	Calculated					
18	Critical depth, d _c =	0.75	ft						
19	Critical slope, S _c =	0.034	ft/ft	0.7S _c =	0.0236	ft/ft			
20				1.3S _c =	0.0438	ft/ft			
21	Design slope, S=	0.0660	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	5.77	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=	1.67	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	15.0	20.0	246	583	
28	Sideslope height:			85	13.0	18.0	160	425	
29	Minimum=	1.62	ft	50	10.0	15.0	73	246	
30	Provided=	2.00	ft	10	8.0	13.0	37	160	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	115.3	CY						
38	Approx. weight=	161.4	Tons						
39	Geotextile area=	290.2	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: 2/1/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 10.0 in.
 Rock_{ww} thickness = 2.0 Feet.

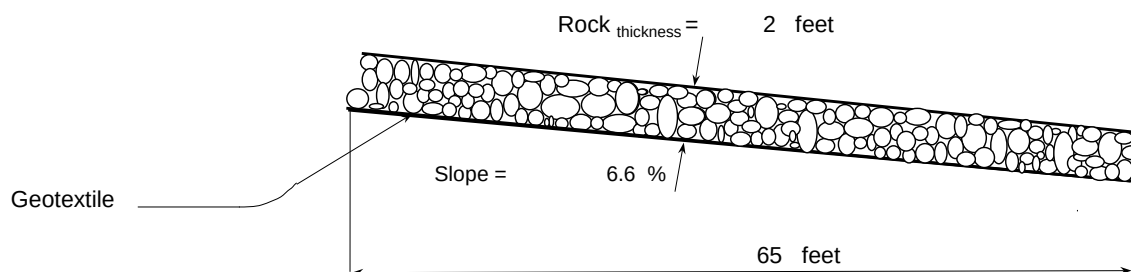
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	15 - 20 (239 - 566)
D ₈₅ -----	13 - 18 (155 - 413)
D ₅₀ -----	10 - 15 (71 - 239)
D ₁₀ -----	8 - 13 (36 - 155)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

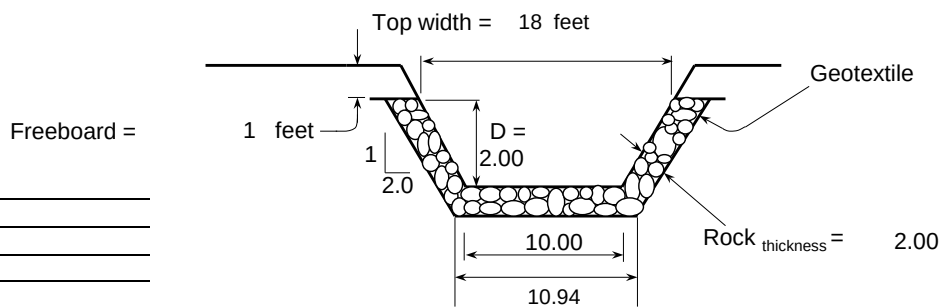
Quantities

Rock = 115 yd³
 Geotextile (WCS-13)^a = 290 yd²

Notes: ^a 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	2/1/21	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		

Sheet ___ of ___

	A	B	C	D	E	F	G	H	I
1	Outlet OCS2	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	2/1/2021			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=	17.8	cfs			WW horiz. Length=	93.0	ft	
7	Slope, S=	0.13	ft/ft	=	7.69	:1	U/S WW F.L. elev=	298.0	ft
8	Bottom Width, W=	10	ft			D/S WW F.L. elev=	285.9	ft	
9	Side slope, Z=	2	:1			Waterway drop=	12.1	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	93.8	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	4.84	in			Spreadsheet formatting key:			
13	D50 used=	10.00	in			XXX	=Input cells		
14	n=	0.049				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=	0.33	ft	Calculated					
18	Critical depth, d _c =	0.45	ft						
19	Critical slope, S _c =	0.048	ft/ft	0.7S _c =	0.0333	ft/ft			
20				1.3S _c =	0.0619	ft/ft			
21	Design slope, S=	0.1300	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	5.02	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=	1.67	ft	%	Rock dia., inches		Rock weight, lb		
26	Provided=	2.00	ft	Smaller	min.	max.	min.	max.	
27				100	15.0	20.0	246	583	
28	Sideslope height:			85	13.0	18.0	160	425	
29	Minimum=	1.33	ft	50	10.0	15.0	73	246	
30	Provided=	2.00	ft	10	8.0	13.0	37	160	
31									
32									
33									
34									
35									
36	Quantities:								
37	Riprap volume=	166.0	CY						
38	Approx. weight=	232.3	Tons						
39	Geotextile area=	410.4	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: 2/1/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 10.0 in.
 Rock_{ww} thickness = 2.0 Feet.

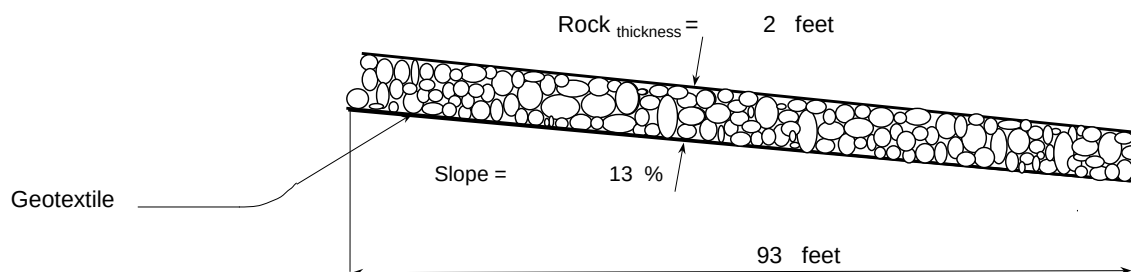
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	15 - 20 (239 - 566)
D ₈₅ -----	13 - 18 (155 - 413)
D ₅₀ -----	10 - 15 (71 - 239)
D ₁₀ -----	8 - 13 (36 - 155)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

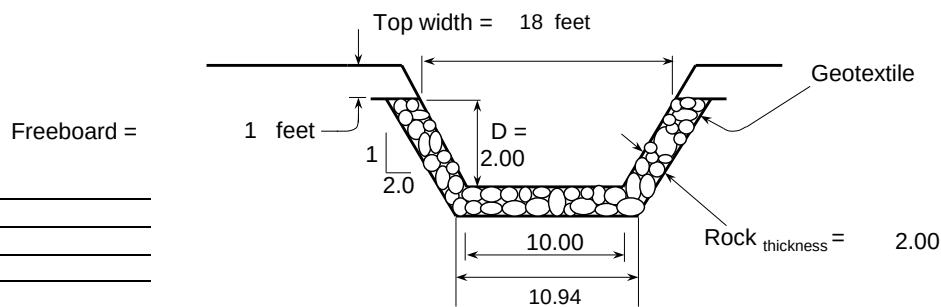
Quantities

Rock = 166 yd³
 Geotextile (WCS-13)^a = 410 yd²

Notes: ^a 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	2/1/21	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		

	A	B	C	D	E	F	G	H	I
1	Outlet 6 & 7	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	2/1/2021			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=	68	cfs			WW horiz. Length=	195.0	ft	
7	Slope, S=	0.11	ft/ft	=	9.09	:1	U/S WW F.L. elev=	331.0	ft
8	Bottom Width, W=	7	ft			D/S WW F.L. elev=	309.6	ft	
9	Side slope, Z=	3	:1			Waterway drop=	21.5	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	196.2	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	11.29	in			Spreadsheet formatting key:			
13	D50 used=	12.00	in			XXX	=Input cells		
14	n=	0.049				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=	0.90	ft	Calculated					
18	Critical depth, d _c =	1.20	ft						
19	Critical slope, S _c =	0.037	ft/ft	0.7S _c =	0.0262	ft/ft			
20				1.3S _c =	0.0487	ft/ft			
21	Design slope, S=	0.1100	ft/ft	Design slope OK. Flow is Supercritical.					
22	Velocity=	7.84	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=	1.90	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=	382.2	CY						
38	Approx. weight=	535.0	Tons						
39	Geotextile area=	1014.1	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: 2/1/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 12.0 in.
 Rock_{ww} thickness = 2.0 Feet.

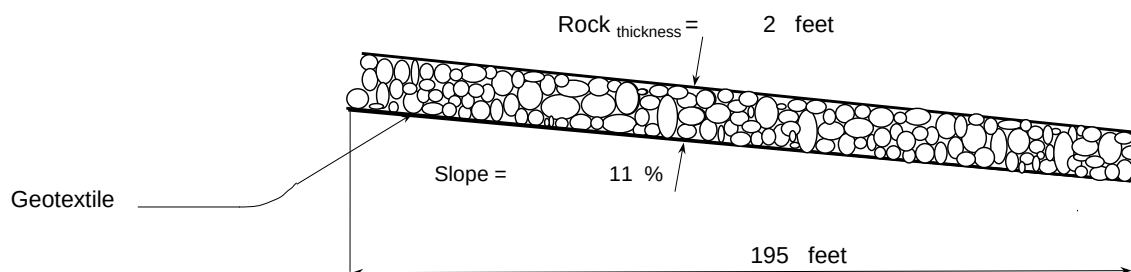
Rock Gradation Envelope

% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	18 - 24 (413 - 978)
D ₈₅ -----	16 - 22 (269 - 713)
D ₅₀ -----	12 - 18 (122 - 413)
D ₁₀ -----	10 - 16 (63 - 269)
Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$	

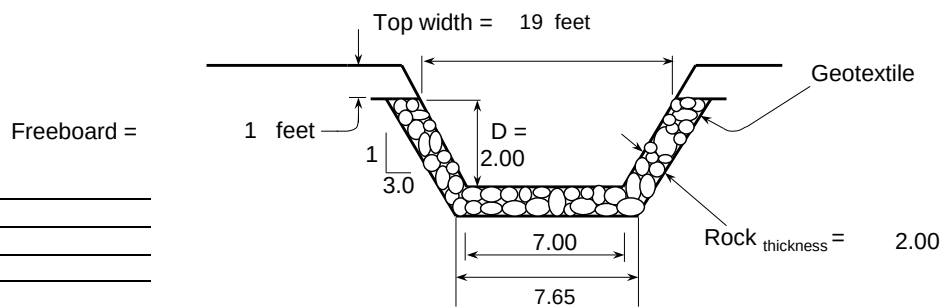
Quantities

Rock = 382 yd³
 Geotextile (WCS-13)^a = 1014 yd²

Notes: ^a 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	2/1/21	File Name
WML		
Drawn		
Checkd	0	1/0/00
Approved		
		Sheet ___ of ___

	A	B	C	D	E	F	G	H	I
1	Swale North	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	4/12/2021			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=	19.3	cfs			WW horiz. Length=	1800.0	ft	
7	Slope, S=	0.041	ft/ft	=	24.39	:1	U/S WW F.L. elev=	366.0	ft
8	Bottom Width, W=	2	ft			D/S WW F.L. elev=	292.2	ft	
9	Side slope, Z=	2	:1			Waterway drop=	73.8	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	1801.5	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	5.36	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=	0.92	ft		Calculated				
18	Critical depth, d _c =	1.02	ft						
19	Critical slope, S _c =	0.027	ft/ft		0.7S _c =	0.0187	ft/ft		
20					1.3S _c =	0.0348	ft/ft		
21	Design slope, S=	0.0410	ft/ft		Design slope OK. Flow is Supercritical.				
22	Velocity=	5.47	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=	1.00	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=	1.92	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=	895.2	CY						
38	Approx. weight=	1253.3	Tons						
39	Geotextile area=	4080.1	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

Swale North

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: 4/12/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 1.0 Feet.

Rock Gradation Envelope

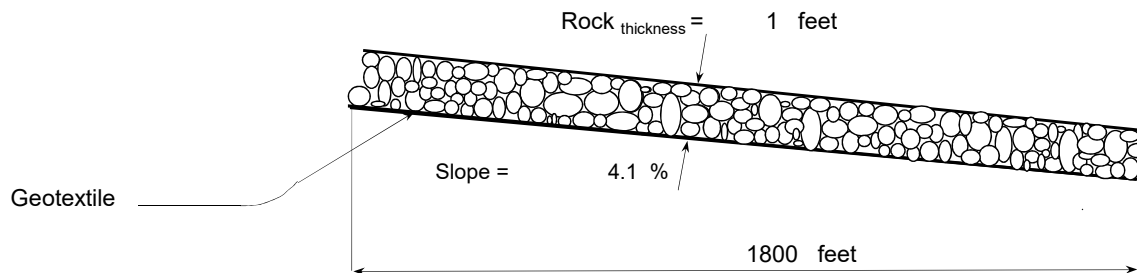
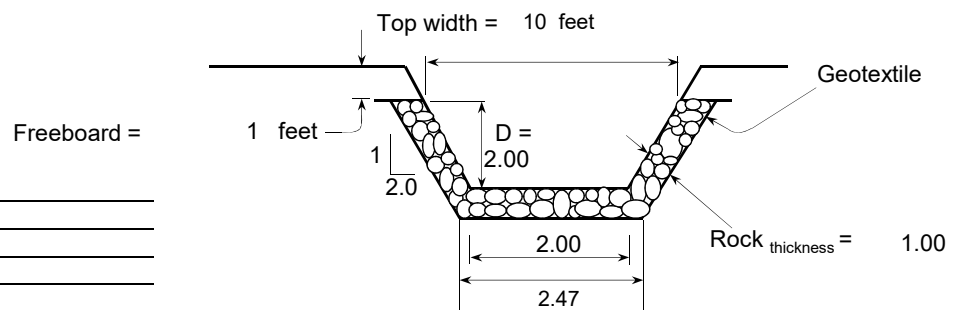
% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)

Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities

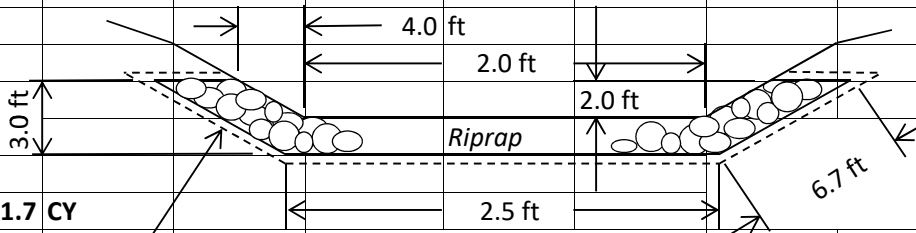
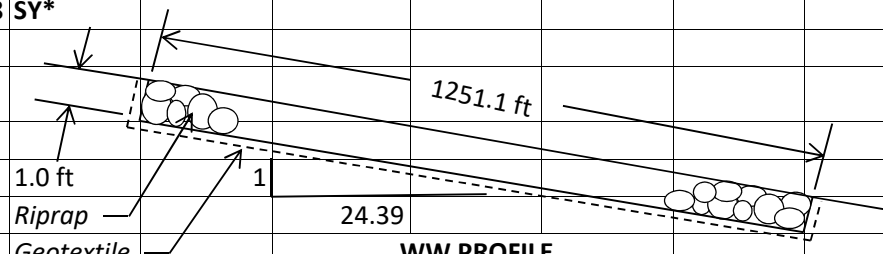
Rock = 895 yd³
 Geotextile (WCS-13)^a = 4080 yd²

Notes: ^a 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**

WML _____ Date 4/12/21
 Drawn _____
 Checkd 0 1/0/00
 Approved _____
 Sheet of

	A	B	C	D	E	F	G	H	I
1	Swale South	Trapezoidal Riprap-Lined Waterway Design.xlsm							
2	Landowner	555 Hopping Brk Rd	County	Middlesex			V 11.2019		
3	Computed By	WML	Date	4/12/2021			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=	10.8	cfs			WW horiz. Length=	1250.0	ft	
7	Slope, S=	0.041	ft/ft	=	24.39	:1	U/S WW F.L. elev=	366.0	ft
8	Bottom Width, W=	2	ft			D/S WW F.L. elev=	314.8	ft	
9	Side slope, Z=	2	:1			Waterway drop=	51.3	ft	
10	Safety factor=	1.2		Typically 1.2		WW length along slope=	1251.1	ft	
11	Rock shape =	Angular							
12	Min. req'd D50=	3.94	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=	0.69	ft		Calculated				
18	Critical depth, d _c =	0.75	ft						
19	Critical slope, S _c =	0.029	ft/ft		0.7S _c =	0.0202	ft/ft		
20					1.3S _c =	0.0375	ft/ft		
21	Design slope, S=	0.0410	ft/ft		Design slope OK. Flow is Supercritical.				
22	Velocity=	4.67	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=	1.00	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=	1.69	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=	621.7	CY						
38	Approx. weight=	870.3	Tons						
39	Geotextile area=	2834.8	SY*						
40									
41									
42	*Geotextile area								
43	includes actual covered								
44	surfaces only (no extra								
45	for laps or anchorage)								
46									

Swale South

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: 4/12/2021

County: Middlesex
 Checked by: _____
 Date: _____

Design Values

D_{50} dia. = 6.0 in.
 Rock_{ww} thickness = 1.0 Feet.

Rock Gradation Envelope

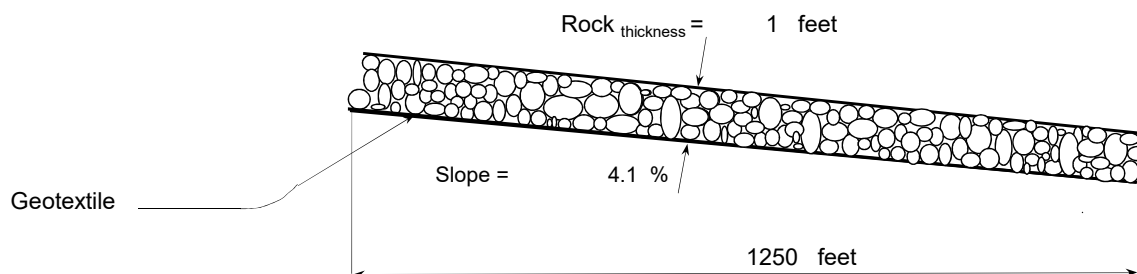
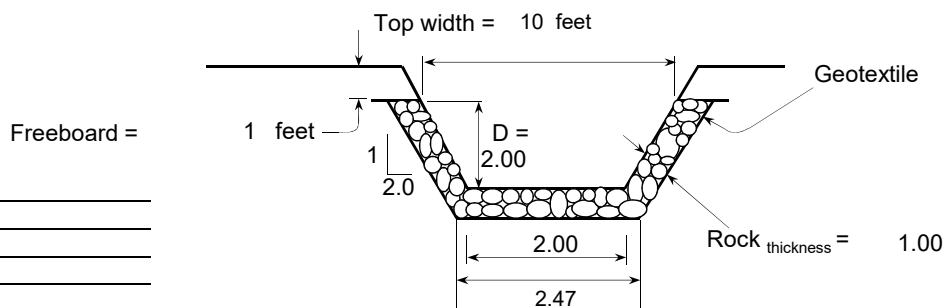
% Passing	Diameter, in. (weight, lbs.)
D ₁₀₀ -----	9 - 12 (52 - 122)
D ₈₅ -----	8 - 11 (34 - 89)
D ₅₀ -----	6 - 9 (15 - 52)
D ₁₀ -----	5 - 8 (8 - 34)

Coefficient of Uniformity, $(D_{60})/(D_{10}) < 1.7$

Quantities

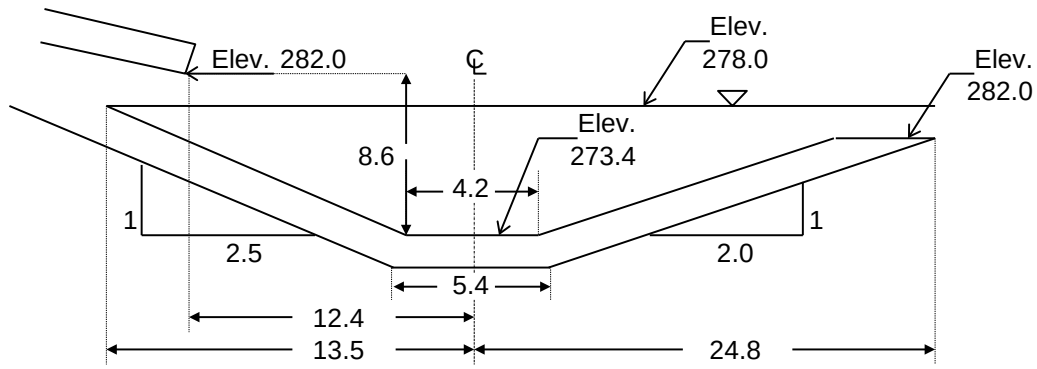
Rock = 622 yd³
 Geotextile (WCS-13)^a = 2835 yd²

Notes: ^a 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.

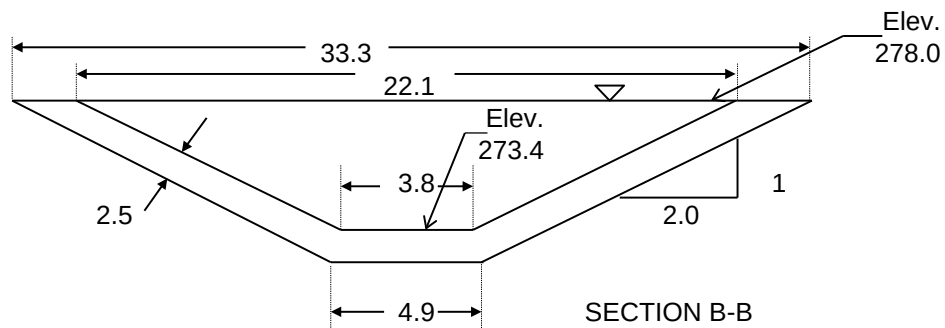
**Profile Along Centerline of Rock Lined Waterway****Rock Lined WW Cross Section****Profile, Cross Sections, and Quantities**

Date: 4/12/21
 Drawn: _____
 Checkd: 0 1/0/00
 Approved: _____
 Sheet of

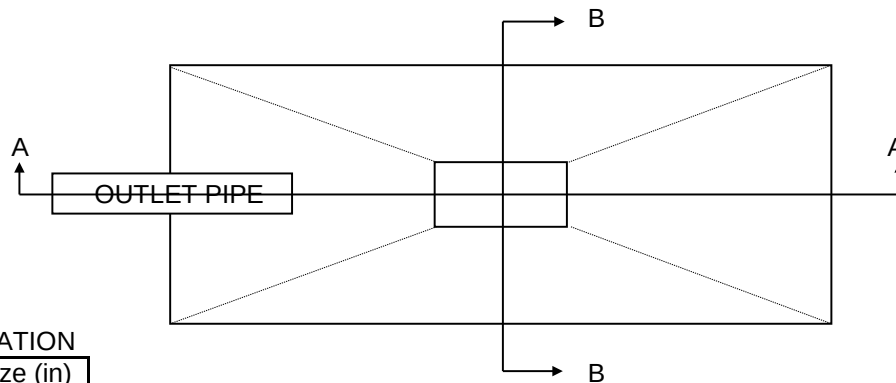
RIPRAP LINED PLUNGE POOL FOR CANTILEVER OUTLET
 Reference Design Note No. 6 (Second Edition), Jan. 23, 1986



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

LANDOWNER

DESIGNER:
 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: 2/5/2021
Date:

INPUT DATA:

Conduit Diameter	D =	4.00	ft
Conduit Discharge:	Q =	177.00	cfs
Conduit Slope at Outlet:	S =	0.04	ft/ft
Conduit Outlet Invert Elevation:	El, CO =	282.00	ft
Tailwater Elevation:	El, TW =	278.00	ft
Outlet Channel Invert Elevation:	El, CH =	282.00	ft

Water Density:	RHO =	1.00	
Bed/Riprap Particle Density: (Default 2.64)	RHOS =	2.64	
D ₅₀ Riprap Size (inches):	12*RS =	24.00	inches
D ₅₀ 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 =	2.50	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 =	12.37	ft
Pool depth at C/L Below Conduit Invert:	Zp+0.8Zm =	8.58	ft
Pool Bottom Elev:	El, PB =	273.42	ft
Pool Bottom Length:	2Lr2 =	4.18	ft
Pool Bottom Width:	2Wr2 =	3.77	ft
Upstream Pool Length at Tailwater Elev.:	Lru =	13.54	ft
Downstream Pool Length at Tailwater Elev.:	Lrd =	11.25	ft
Pool Width at Tailwater Elev.:	2Wr =	22.09	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:	El, BR =	270.92	ft
Pool Bottom Elev. at Bottom of Bedding:	El, BB =	269.92	ft

OUTPUT---VOLUMES BELOW WATER SURFACE ELEVATION:

Volume of Excavation (measured from bottom surface of bedding):	V,pbs =	166.1	cu yd
Volume of Rock Riprap:	V,rs =	81.3	cu yd
Volume of Bedding:	V,bs =	50.8	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

National Flood Hazard Layer FIRMette



42°10'26.07"N



71°27'5.39"W

USGS The National Map: Orthoimagery. Data refreshed April 2019. eff. 7/1/2012



Legend

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

Without Base Flood Elevation (BFE)
Zone A, V, A99

With BFE or Depth
Zone AE, AO, AH, VE, AP

Regulatory Floodway

11

12

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

NO SCREEN

Effective LOMRs

Area of Minimal Flood Hazard
Zone X

Area of Undetermined Flood Hazard
Zone D

OTHER AREAS

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

GENERAL STRUCTURES

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

Digital Data Available

No Digital Data Available

Unmapped

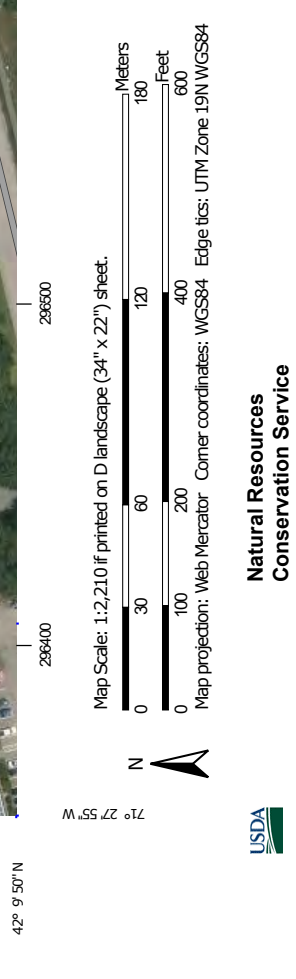
MAP PANELS

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

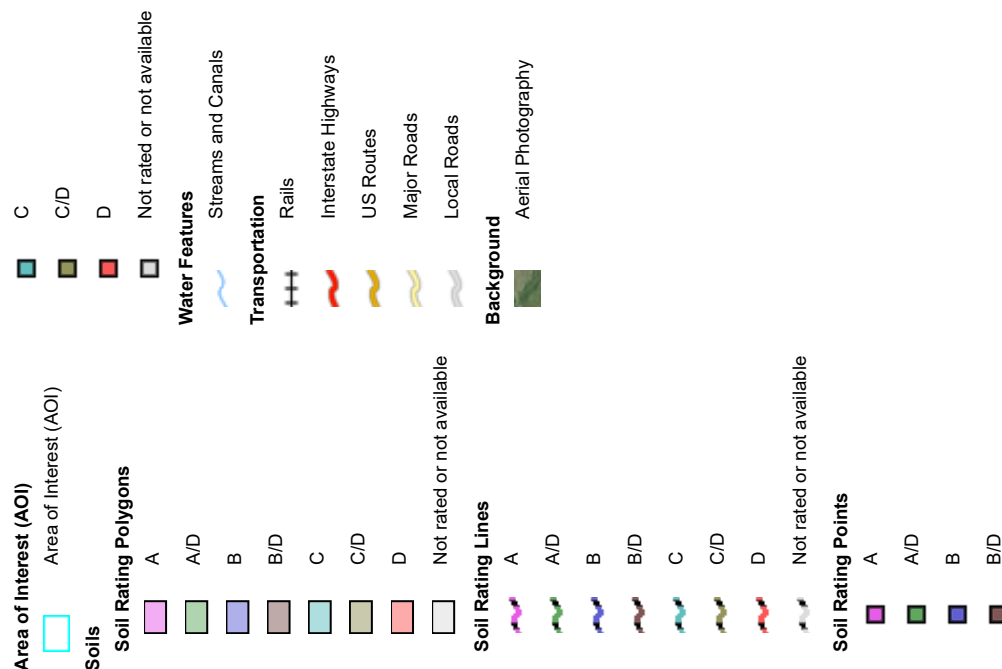
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

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 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%
Totals for Area of Interest			179.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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/mi²/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 ²)	t_c (min)	t_c (hr)	WQV (in)	q_u (csm/in.)	Q (cfs)
CDS3035-13	DMH 13	5.02	0.0078438	8.0	0.133	1.00	736.00	5.77
CS-5-29	DMH 29	1.84	0.0028750	8.0	0.133	1.00	736.00	2.12
CS-6-34	DMH 34	4.59	0.0071719	8.0	0.133	1.00	736.00	5.28
CS-6-43	DMH 43	4.17	0.0065156	8.0	0.133	1.00	736.00	4.80

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.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**555 HOPPING BROOK ROAD
HOLLISTON, MA**

Area **5.02 ac**
Weighted C **0.9**
 t_c **8 min**
CDS Model **3035-6**

Unit Site Designation **DMH 13**
Rainfall Station # **68**

CDS3035-13

CDS Treatment Capacity **6.5 cfs**

<u>Rainfall Intensity¹ (in/hr)</u>	<u>Percent Rainfall Volume¹</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%	0.09	0.09	9.0
0.04	9.5%	18.8%	0.18	0.18	9.1
0.06	8.7%	27.5%	0.27	0.27	8.3
0.08	10.1%	37.6%	0.36	0.36	9.5
0.10	7.2%	44.8%	0.45	0.45	6.7
0.12	6.0%	50.8%	0.54	0.54	5.6
0.14	6.3%	57.1%	0.63	0.63	5.8
0.16	5.6%	62.7%	0.72	0.72	5.1
0.18	4.7%	67.4%	0.81	0.81	4.2
0.20	3.6%	71.0%	0.90	0.90	3.2
0.25	8.2%	79.1%	1.13	1.13	7.1
0.50	14.9%	94.0%	2.26	2.26	11.5
0.75	3.2%	97.3%	3.39	3.39	2.2
1.00	1.2%	98.5%	4.52	4.52	0.7
1.50	0.7%	99.2%	6.78	6.50	0.3
2.00	0.8%	100.0%	9.04	6.50	0.2
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
					88.2
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.3%
Predicted Net Annual Load Removal Efficiency =					81.8%

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.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 Hopping Brook Road
Holliston, MA
DMH 29



AREA 1.84 acres CASCADE MODEL CS-5-29
WEIGHTED C 0.95 CS-5
TC 8.00 minutes RAINFALL STATION 68

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	0.80	100.0	9.3
0.04	9.5%	1.60	100.0	9.5
0.06	8.7%	2.40	100.0	8.7
0.08	10.1%	3.20	100.0	10.1
0.10	7.2%	4.00	100.0	7.2
0.12	6.0%	4.79	100.0	6.0
0.14	6.3%	5.59	100.0	6.3
0.16	5.6%	6.39	100.0	5.6
0.18	4.7%	7.19	100.0	4.7
0.20	3.6%	7.99	100.0	3.6
0.25	8.2%	9.99	100.0	8.2
0.50	14.9%	19.98	93.1	13.9
0.75	3.2%	29.97	83.7	2.7
1.00	1.2%	39.96	74.3	0.9
1.50	0.7%	59.94	55.6	0.4
2.00	0.8%	79.91	36.8	0.3
				97.3
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.5%
Predicted Net Annual Load Removal Efficiency =				90.9%

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.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 Hopping Brook Road
Holliston, MA
DMH 34



AREA	4.59	acres	CASCADE MODEL	CS-6-34
WEIGHTED C	0.95			CS-6
TC	8.00	minutes	RAINFALL STATION	68

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	1.38	100.0	9.3
0.04	9.5%	2.77	100.0	9.5
0.06	8.7%	4.15	100.0	8.7
0.08	10.1%	5.54	100.0	10.1
0.10	7.2%	6.92	100.0	7.2
0.12	6.0%	8.31	100.0	6.0
0.14	6.3%	9.69	100.0	6.3
0.16	5.6%	11.08	100.0	5.6
0.18	4.7%	12.46	100.0	4.7
0.20	3.6%	13.84	98.9	3.6
0.25	8.2%	17.30	95.6	7.8
0.50	14.9%	34.61	79.4	11.8
0.75	3.2%	51.91	63.1	2.0
1.00	1.2%	69.22	46.8	0.6
1.50	0.7%	103.83	14.3	0.1
2.00	0.8%	115.09	3.1	0.0
				93.3
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.4%
Predicted Net Annual Load Removal Efficiency =				86.9%

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.

Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method



555 Hopping Brook Road
Holliston, MA
DMH 43



AREA	4.17	acres	CASCADE MODEL	CS-6-43 CS-6
WEIGHTED C	0.95			
TC	8.00	minutes	RAINFALL STATION	68

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft ²)	Removal Efficiency (%)	Incremental Removal (%)
0.02	9.3%	1.26	100.0	9.3
0.04	9.5%	2.52	100.0	9.5
0.06	8.7%	3.77	100.0	8.7
0.08	10.1%	5.03	100.0	10.1
0.10	7.2%	6.29	100.0	7.2
0.12	6.0%	7.55	100.0	6.0
0.14	6.3%	8.80	100.0	6.3
0.16	5.6%	10.06	100.0	5.6
0.18	4.7%	11.32	100.0	4.7
0.20	3.6%	12.58	100.0	3.6
0.25	8.2%	15.72	97.1	7.9
0.50	14.9%	31.44	82.3	12.3
0.75	3.2%	47.16	67.6	2.2
1.00	1.2%	62.89	52.8	0.7
1.50	0.7%	94.33	23.2	0.2
2.00	0.8%	115.09	3.4	0.0
				94.2
Removal Efficiency Adjustment ² =				6.5%
Predicted % Annual Rainfall Treated =				93.5%
Predicted Net Annual Load Removal Efficiency =				87.7%

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.

[illegible]

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



N.T.S.



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.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

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 CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
- C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
- 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

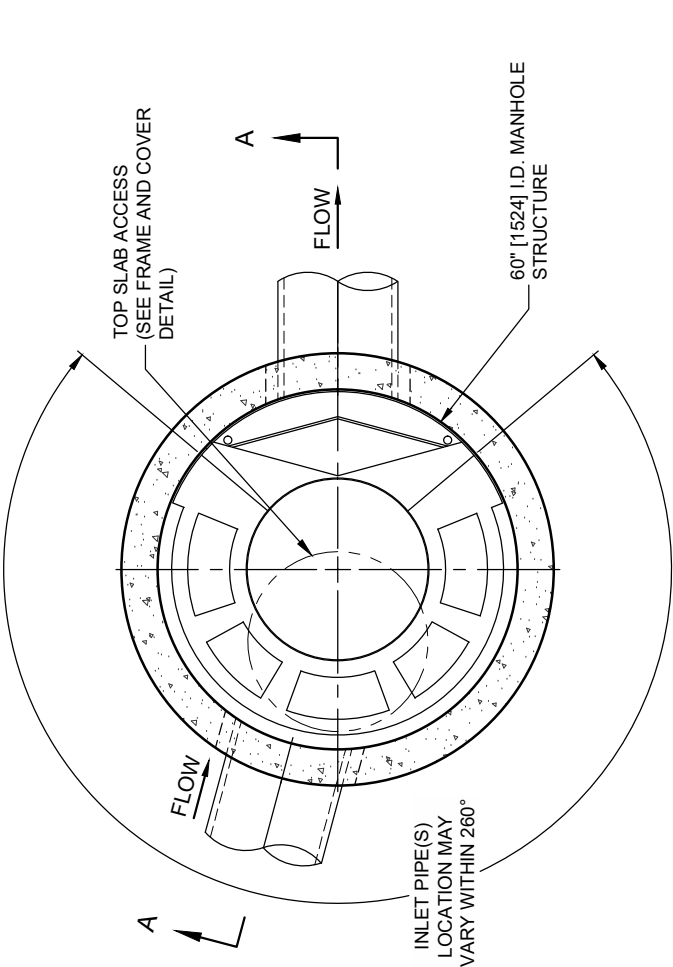
STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:			
I.E.	MATERIAL	DIAMETER	
INLET PIPE 1	*	*	
INLET PIPE 2	*	*	
OUTLET PIPE	*	*	
RIM ELEVATION			
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			
* PER ENGINEER OF RECORD			

CDS3035-6-C
ONLINE CDS
STANDARD DET

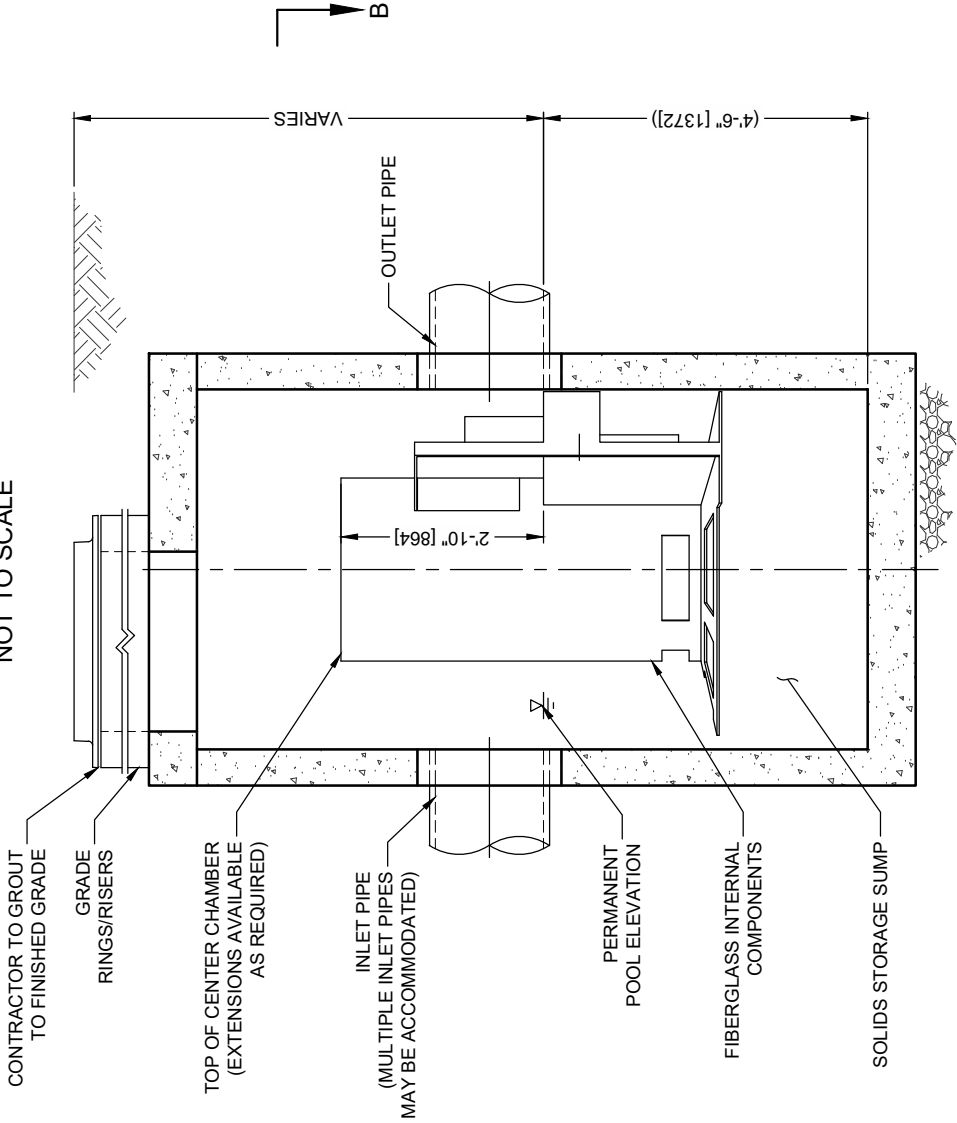
www.contechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

800-338-1122 513-645-7000 513-645-7993 FAX



PLAN VIEW B-B
NOT TO SCALE



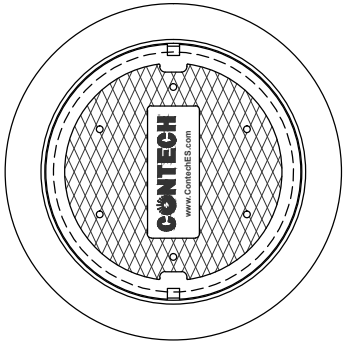
ELEVATION A-A
NOT TO SCALE

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
- 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].

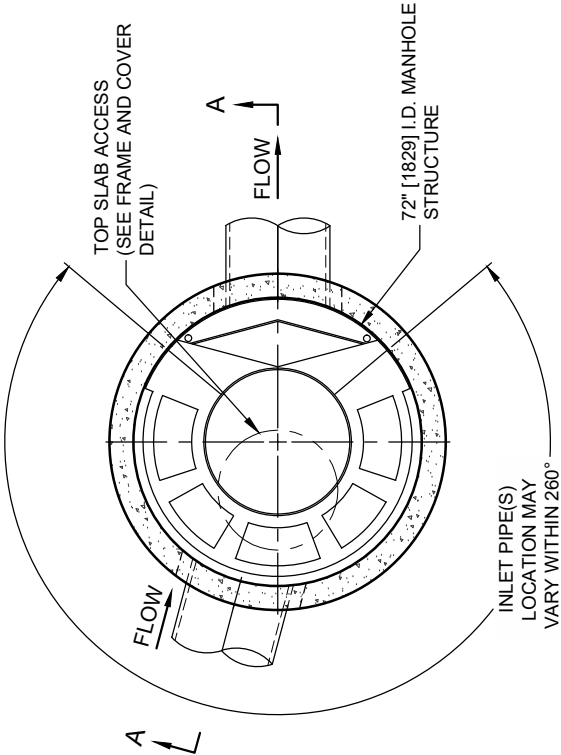
INSTALLATION NOTES

- 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.

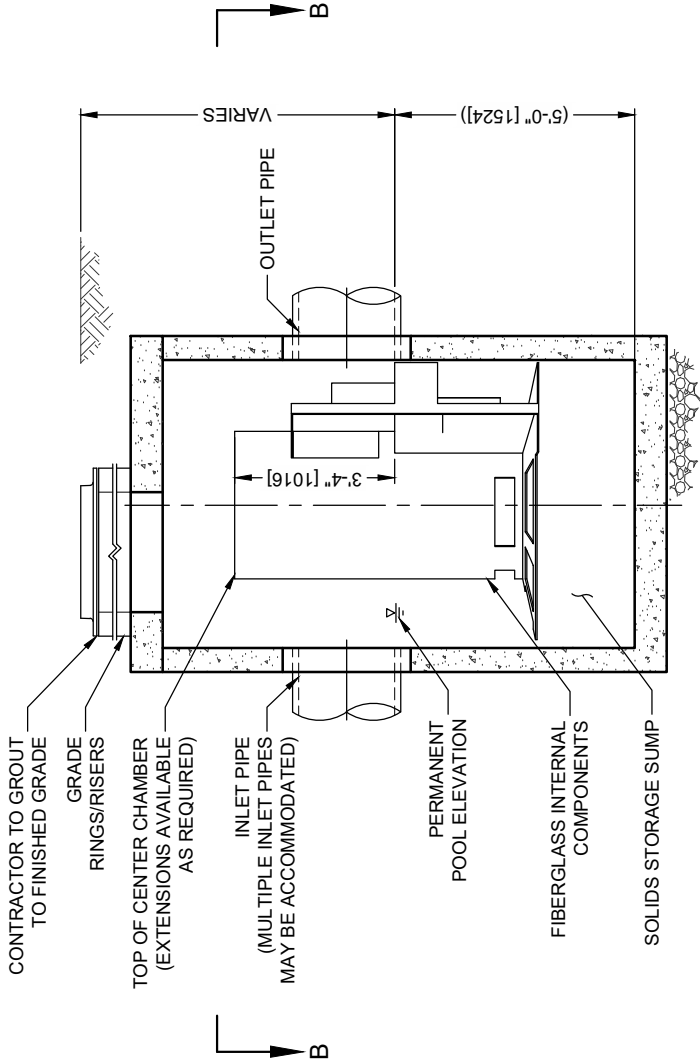
CONTECH
ENGINEERED SOLUTIONS LLC

www.contechES.com
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



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.

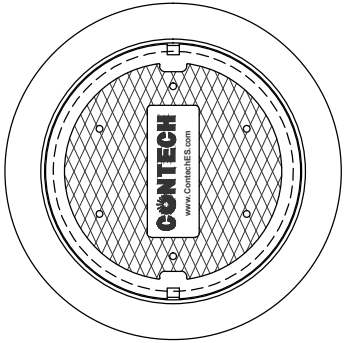
CONFIGURATION DESCRIPTION

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:	INVERT	MATERIAL	DIAMETER	
INLET PIPE 1				
INLET PIPE 2				
OUTLET PIPE				
NOTES / SPECIAL REQUIREMENTS:				

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
- 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.



ENGINEERED SOLUTIONS LLC

www.contechES.com

9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069

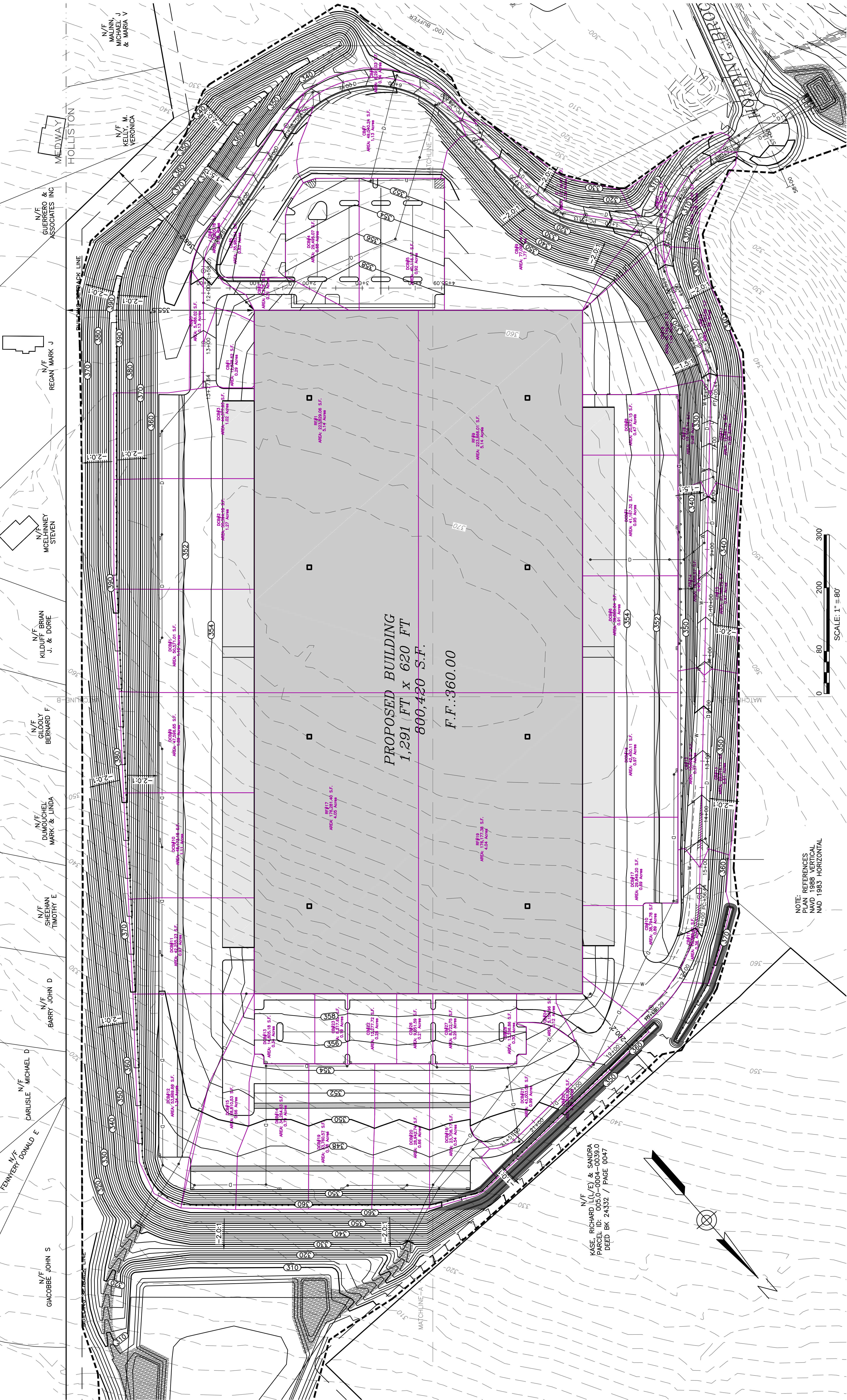
800-338-1122 513-645-7000 513-645-7993 FAX

CS-6
CASCADE SEPARATOR
STANDARD DETAIL

FOREBAY VOLUMES

4/13/2021

30P-NE	ELEVATION	AREA	Δ ELEV x AVG AREA	VOLUME AT ELEVATION
	305.00	3755.00		
	306.00	5375.00	4565.00	4565.00
	307.00	6820.00	6097.50	10662.50
30P-NW	305.00	3860.00		
	306.00	4975.00	4417.50	4417.50
	307.00	5975.00	5475.00	9892.50
10P	274.00	160.00		
	276.00	555.00	715.00	715.00
	278.00	1100.00	1655.00	2370.00
	280.00	1780.00	2880.00	5250.00
	282.00	2665.00	4445.00	9695.00
	282.50	3160.00	1456.25	11151.25



NOTE:
PLAN REFERENCES
NAD 1983 VERTICAL
NAD 1983 HORIZONTAL



ENGINEERING DESIGN CONSULTANTS, INC. SHALL NOT BE
RESPONSIBLE FOR THE ACCURACY OF THE DATA, RECORDS,
TECHNIQUES, OR PROCEDURES UTILIZED BY THE
CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR
PROPERTY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR
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	DESCRIPTION
3	2/5/21	ISSUED FOR REVIEW
2	2/5/20	FOR REVIEW COMMENTS
1	11/16/19	FOR REVIEW COMMENTS
0		

DRAWN BY: MML
CHECKED BY: PSB
APPROVED BY:



Engineering Design Consultants, Inc.
32 Turnpike Road
Southborough, Massachusetts
PH: (508) 480-0225 FAX: (508) 852-5781

PROJECT:

555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

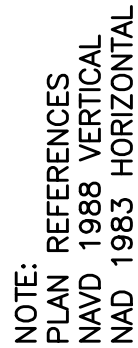
TITLE:

SITE RUIOFF AREAS PLAN
555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
ORG INTEGRATED REAL ESTATE SOLUTIONS
200 Barr Harbor Drive
Conshohocken, PA 19248

DRAWN BY:

FILE NO. 3724 GRADING DRAINAGE
RUNOFF 25
DATE: NOVEMBER 16, 2019
REVISED PLAN NO. 1 of 1

ALL RIGHTS RESERVED
NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC
OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING OR OTHERWISE, WITHOUT THE PRIOR WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. ANY
VIOLATION OF THIS DOCUMENT WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW. THE WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. SHALL BE REQUIRED FOR ANY REUSE OR REPRODUCTION.



LEGEND	
SYMBOL	DESCRIPTION
2S	SUBCATCHMENT LABEL
1L	LINK SUMMARY LOCATION
---	SUBCATCHMENT AREA OUTLINE
---	TIME OF CONCENTRATION LINE

ENGINEERING DESIGN CONSULTANTS, INC. SHALL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, OR PROCEDURES UTILIZED BY THE CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR CONTRACTOR EMPLOYEES, OR FOR THE FAILURE OF THE CONTRACTOR TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

REV #	DATE	DESCRIPTION
0	11/16/19	ISSUED FOR REVIEW
1	2/3/20	PEER REVIEW COMMENTS
2	3/2/20	PEER REVIEW COMMENTS
3	2/5/21	ISSUED FOR REVIEW
4	4/13/21	PEER REVIEW COMMENTS



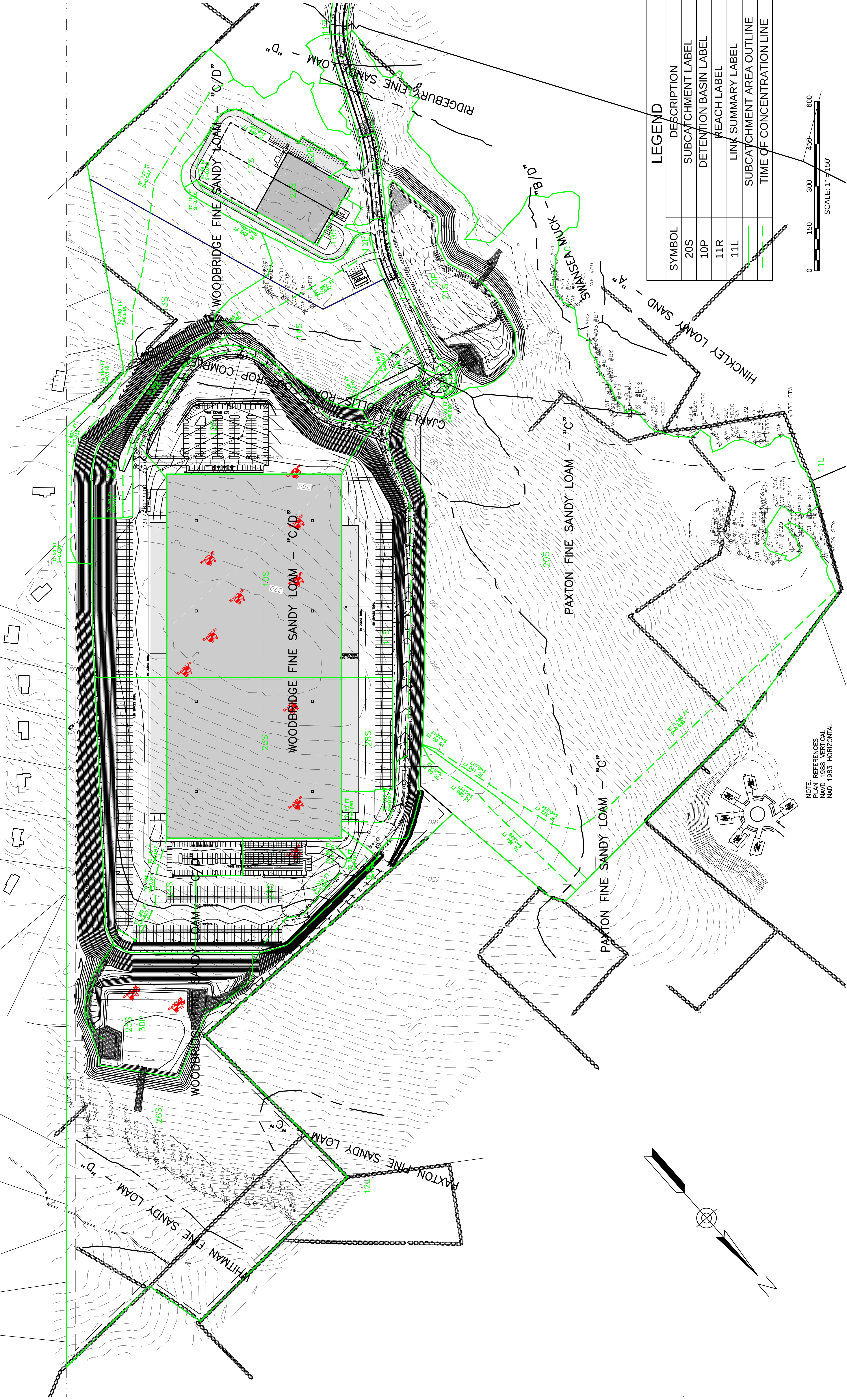
Engineering Design Consultants, Inc.
32 Turnpike Road
Southborough, Massachusetts
ph:(508) 480-0225 fax:(800)832-5781

555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

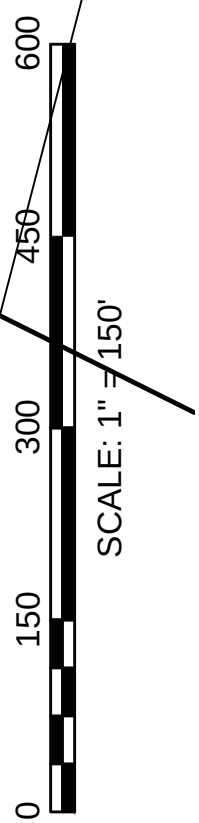
PRE-DEVELOPED RUNOFF AREAS
555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS

CRG INTEGRATED REAL ESTATE SOLUTION
200 Barr Harbor Drive
Conshohocken, PA 19248

FILE NO: 3724 GRADING DRAINAGE
PRE-DEV
DATE: NOVEMBER 16, 201
DEFINITIVE PLAN NO.:



LEGEND	
SYMBOL	DESCRIPTION
20S	SUBCATCHMENT LABEL
10P	DETENTION BASIN LABEL
11R	REACH LABEL
11L	LINK SUMMARY LABEL
	SUBCATCHMENT AREA OUTLINE
	TIME OF CONCENTRATION LINE

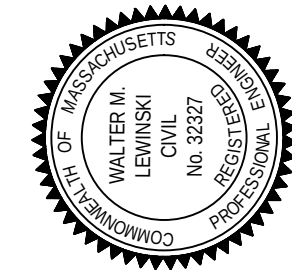


NOTE:
PLAN REFERENCES
NAVD 1988 VERTICAL
NAD 1983 HORIZONTAL

ALL RIGHTS RESERVED
NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR OTHERWISE, WITHOUT THE PRIOR WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. ANY VIOLATION OF THIS DOCUMENT WITHOUT THE WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. SHALL RENDER THEM VOID AND UNUSABLE.

ENGINEERING DESIGN CONSULTANTS, INC. SHALL NOT BE
RESPONSIBLE FOR THE ACCURACY OF THE DATA, SURVEY,
TECHNOLOGIES, OR PROCEDURES UTILIZED BY THE
CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR
CONTRACTOR EMPLOYEES, OR FOR THE FAILURE OF THE
DESIGN OR CONSTRUCTION OF THE PROJECT, OR FOR
ANY DAMAGE TO PERSONS OR PROPERTY, OR FOR
ANY LOSS OF PROFITS, OR FOR ANY OTHER
DAMAGES, INCLUDING ATTORNEY'S FEES, ARISING
FROM THE USE OF THIS DOCUMENT, TO THE EXTENT OF ITS
THIRD PARTY COSTS.

REVISIONS	DATE	DESCRIPTION
4	4/13/21	PEER REVIEW COMMENTS
3	2/5/21	ISSUED FOR REVIEW
2	2/2/20	PEER REVIEW COMMENTS
1	11/16/19	ISSUED FOR REVIEW
0		

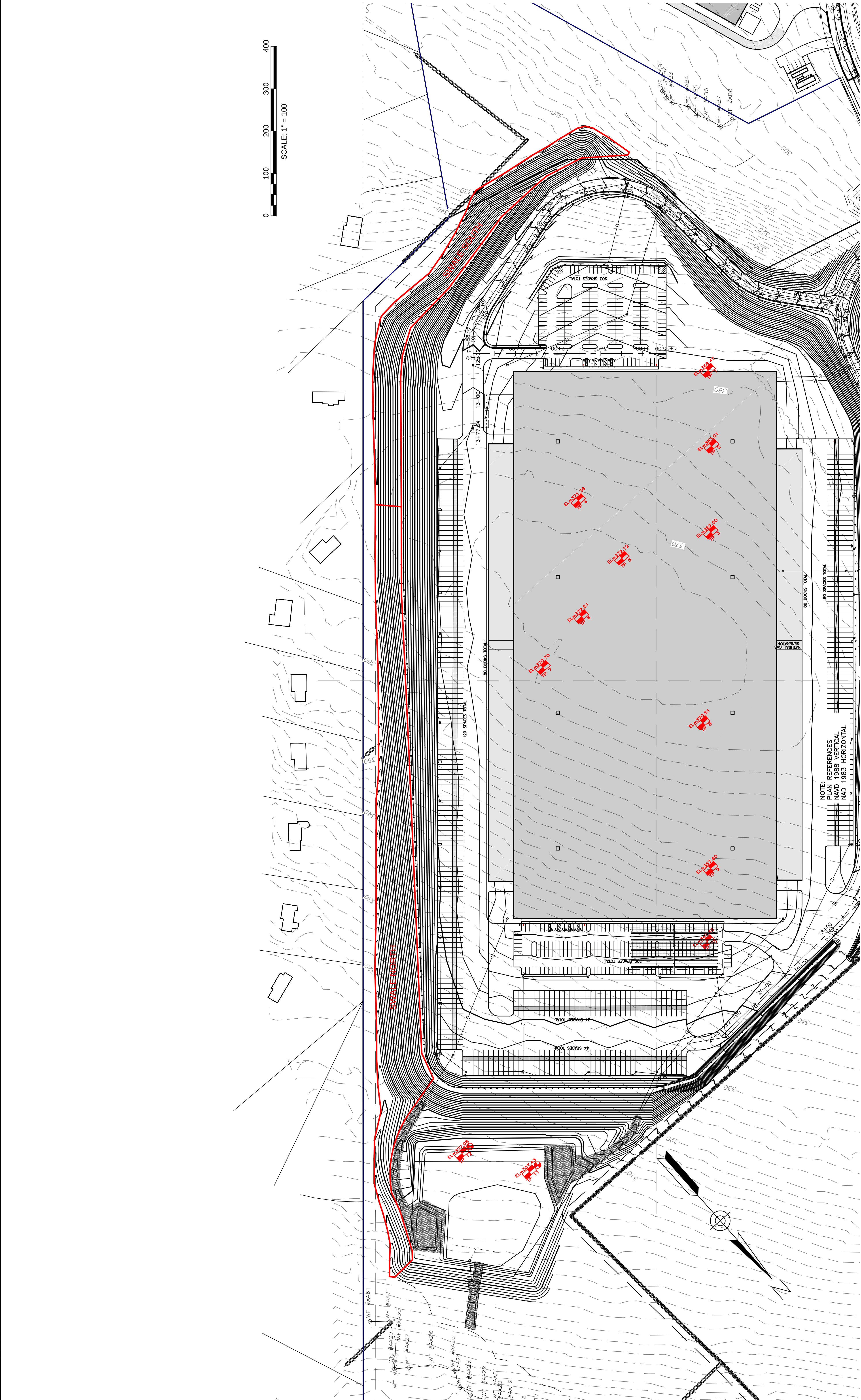


Engineering Design Consultants, Inc.
32 Turnpike Road
Southborough, Massachusetts
ph:(508) 480-0225 fax:(508) 852-5751

555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

POST-DEVELOPED RUNOFF AREAS
555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
CRG INTEGRATED REAL ESTATE SOLUTIONS
200 Barr Harbor Drive
Conshohocken, PA 19248

FILE NO. 3724 GRADING DRAINAGE
PROJECT NO. 555 HOPPING BROOK ROAD
DATE NOVEMBER 16, 2019
DESIGNED BY 1
CHECKED BY 1
DATE 1
REVISED BY 1
REVISED DATE 1



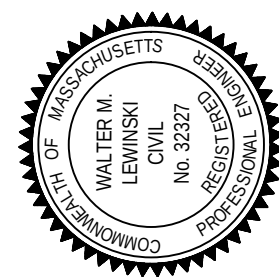
0 100 200 300 400
SCALE: 1" = 100'

FILE NO. 3724 GRADING DRAINAGE	
SWALES	
DATE	NOVEMBER 16, 2019
DESIGNER PLAN NO.	1 of 1

TITLE	
PROJECT	
ENGINEER/APPLICANT	

555 HOPPING BROOK ROAD
HOLLISTON, MASSACHUSETTS
(MIDDLESEX COUNTY)

Engineering Design Consultants, Inc.
32 Turnpike Road
Southborough, Massachusetts
PH: (508) 480-0225 FAX: (508) 480-0225



REVISIONS	DATE	DESCRIPTION
4	4/13/21	ISSUED FOR REVIEW
3	2/5/21	ISSUED FOR REVIEW
2	2/5/20	ISSUED FOR REVIEW
1	11/16/19	ISSUED FOR REVIEW
0		

ENGINEERING DESIGN CONSULTANTS, INC. SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OF THE INFORMATION, TECHNICAL, PHOTOGRAPHIC, RECORDING OR TRANSMISSION OF THE INFORMATION, OR PROCEDURES UTILIZED BY THE CONTRACTOR, NOR FOR THE SAFETY OF PUBLIC OR CONTRACTOR EMPLOYEES, OR FOR THE FAILURE OF THE CONTRACTOR TO FOLLOW THE CONTRACT DOCUMENTS. THIS PLAN IS LIMITED TO THE EXTENT OF ITS FEE LESS THIRD PARTY COSTS.

ALL RIGHTS RESERVED
NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, WITHOUT THE WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. ANY REPRODUCTION OR TRANSMISSION WITHOUT THE WRITTEN PERMISSION OF ENGINEERING DESIGN CONSULTANTS, INC. SHALL RENDER THEM VOID AND UNUSABLE.