

Stormwater Management Report

August 13, 2021

DCH Brunswick Toyota

Block 143.05, Lots 18.02, 19.01, 20 & 21

Township of North Brunswick, Middlesex County, New Jersey

Prepared for:

DCH Investments, Inc.
955 Route 9 North
South Amboy, NJ 08879

Prepared by:



Michael F. Gallagher
NJ Professional Engineer
License No. 48719

Colliers Engineering & Design
331 Newman Springs Road
Suite 203
Red Bank New Jersey 07701
Main: 732-383-1950
Colliersengineering.com

Project No. 19003878A

Maser Consulting is now Colliers Engineering & Design

Accelerating success.

Table of Contents

Introduction.....	1
Soil Characteristics	1
Flood Hazard Areas/ Riparian Zones	1
Wetlands	2
Compliance Statement.....	2
Study Areas.....	2
Existing Hydrologic Analysis	2
Proposed Hydrologic Analysis	3
Stormwater Management Methodology.....	4
Water Quantity (N.J.A.C. 7:8-5.6)	4
Water Quality (N.J.A.C. 7:8-5.5)	4
Groundwater Recharge (N.J.A.C. 7:8-5.4).....	5
Storm Sewer Design	5
Soil Erosion and Sediment Control	5
Point of Discharge Stability	5
Downstream (Off-Site) Stability.....	6
Conclusion	6

Appendix A

Tax Map
Location Map
Soils Map
USGS Map
FEMA Map

Appendix B

Existing Conditions
Proposed Conditions

Appendix C

SCD Failure Analysis

Appendix D

Stormwater Conveyance System Calculations

Appendix E

Drainage Area Maps

Introduction

This stormwater management report is being submitted as part of the Use Variance & Preliminary and Final Major Site Plan application for DCH Brunswick Toyota, located on Lots 18.02, 19.01 & 21, Block 143.05 as shown on Sheet 44 of the Official Tax Map of the Township of North Brunswick, Middlesex County, New Jersey. This report was prepared in accordance with the Township of North Brunswick, Freehold Soil Conservation District (FSCD) and the New Jersey Department of Environmental Protection (NJDEP) standards as well as current industry standards and practices for stormwater management. The purpose of this report is to summarize the stormwater management design as it pertains to the stormwater rules and to provide calculations to support the design. The stormwater management measures proposed for the site have been designed to meet erosion control, groundwater recharge, and stormwater runoff quantity and quality standards as set forth by N.J.A.C. 7:8.

The overall property consists of 278,217 SF (6.387 Ac.). The approximate state plane coordinates of the site are N 590,771, E 498,004. The site fronts along U.S. State Highway No. 1 just north of the Livingston Avenue interchange. The location of the site is shown on the U.S. Geological Survey Topographic Map (New Brunswick, NJ Quadrangle) (See Appendix). The subject property is bounded to the north by U.S. Highway No. 1, to the east and south by residential uses and to the west by the Livingston Avenue/U.S. Route 1 interchange. The subject site is presently developed as a motor vehicle dealership to conduct the sale and service of motor vehicles.

The proposed development includes the demolition of one of the existing Toyota dealership buildings and the "Brunswick Automotive" building on Lot 21. The development proposes a 36,687 SF building addition onto the remaining Toyota dealership to expand its sales and service capabilities and the expansion of on-site parking onto Lot 21. Associated site improvements include, but are not limited to, internal drive aisles, curb and sidewalk, stormwater management facilities, utility services, lighting and landscaping. There presently exists ± 6.010 acres of impervious surfaces. The development proposes to reduce the total impervious coverage on-site.

Soil Characteristics

The existing soil classifications for the site are based on the USDA NRCS Web Soil Survey. The survey is useful at the planning level to draw general conclusions about the suitability of a site for certain land uses. Based on the web site data, the site consists of the following soil types:

Soil Name	Hydrologic Group
EkaAr – Elkton Loam– 0 to 2 % slopes, rarely flooded	C/D
UR – Urban Land	N/A

Flood Hazard Areas/ Riparian Zones

The site is mapped within Zone X - (other areas), areas determined to be outside the 0.2% annual chance floodplain, as shown on the National Flood Insurance Program Flood Insurance Rate Map for

Middlesex County, NJ (All Jurisdictions), Map No. 34023C0128F, effective date July 6, 2010, prepared by the Federal Emergency Management Agency. There are no regulated water bodies within 300 feet of the subject property; therefore, there are no riparian zones within the subject property.

Wetlands

Per NJ-GeoWeb, there are no wetlands on or within 150 feet of the subject property; therefore, there are no wetland buffers affecting the subject property.

Compliance Statement

The development proposes more than one (1) acre of disturbance; therefore, the development qualifies as a major development and must comply with the requirements for water quantity, water quality, groundwater recharge and erosion control. Compliance with each of these requirements is outlined in greater detail below. This report will demonstrate how the proposed stormwater measures meet the requirements of the Township of Wall, Freehold Soil Conservation District and NJDEP standards.

Study Areas

The drainage areas utilized to analyze and calculate the stormwater attenuation requirements for this development were established based on the proposed hydrologic limits of disturbance and the existing and proposed topography. The following is a listing of the drainage areas used in this report and a description of their location:

Existing Hydrologic Analysis

Existing Drainage Area #1 (E-1). This drainage area comprises the northeasterly portion of the subject site and includes the two buildings which are proposed to be demolished. Presently, runoff from this area sheet flows overland into inlets located near NJSH 130 and discharges directly into the NJDOT drainage system. (POA 1)

Existing Drainage Area #2 (E-2). This drainage area is located in the rear of the dealership and consists primarily of asphalt pavement. Runoff generated from this drainage area is collected by inlets scattered in the rear parking lot. Oversized storm pipes collect the runoff and detain the runoff prior to discharge to a downstream detention system. (POA 1)

Existing Drainage Area #3 (E-3). This drainage area is located in the westerly portion of the site and consists primarily of asphalt pavement. Runoff generated from this area is collected by inlets scattered around the parking. Four (4) oversized storm pipes collect and detain the runoff prior to discharge into the NJDOT drainage system. (POA 1)

Existing Drainage Area #4. This drainage area is located along the easterly property line and drains towards stormwater inlets along the neighboring residential development. (POA 2)

There presently exists two systems of oversized, underground detention pipes on-site. The smaller, upstream system is located in the rear parking lot and consists of two (2), 36" RCP. The system discharges into a larger detention system located within the westerly parking area. The larger system consists of four (4), 36" RCP. A design engineer from Colliers Engineering & Design performed a site investigation in June 2021 and confirmed there does not exist any outlet control devices (orifices, weirs, etc.) within the systems but rather an 18" RCP culvert which connects the smaller system in the rear parking lot to the larger system in the western parking lot. Another 18" RCP culvert connects the entire system to the NJDOT drainage system.

As expected, the existing underground drainage system is not sized appropriately to handle current NJDEP rainfall intensities. That is, the existing system does not have capacity to handle the site's runoff from the 100-year design storm event. To ameliorate this issue, the lowest elevated grate on each of the underground systems was used as a "spillway." That way, runoff from larger storm events could still be modeled and accounted for in the peak runoff analyses.

Proposed Hydrologic Analysis

Proposed Drainage Area #1 (P-1). This drainage area is located in the southwestern portion of the site along the rear property line. Runoff generated from this area is designed to sheet flow overland into Rain Garden 1. Stormwater from more intense rainfall events discharges through an 'E'-Inlet and into the existing underground detention basin. (POA 1)

Proposed Drainage Area #2 (P-2). This drainage area is comprised of the existing building's roof runoff and most of the building addition's roof runoff and portions of the parking lot on the west side of the property. Runoff generated from these areas sheet flows into the underground detention basin or is discharged into the underground detention basin via a proposed stormwater conveyance system. Runoff is attenuated via an existing 18" culvert before it is discharged into the DOT conveyance system. (POA 1)

Proposed Drainage Area #3 (P-3). This drainage area is located in the northwestern portion of the site along Route 1. Runoff generated from this area sheet flows into a bioswale and into Rain Garden 2. Stormwater from more intense rainfall events discharges through an 'E'-Inlet and into the NJDOT stormwater conveyance system. (POA 1)

Proposed Drainage Area #4 (P-4). This drainage area makes up the majority of the eastern portion of the site. Stormwater is collected via a private stormwater conveyance system and is discharged directly into the NJDOT stormwater conveyance system. (POA 1)

Proposed Drainage Area #5 (P-5). This drainage area is located in the southeastern portion of the site along the rear property line. Runoff generated from this area is designed to sheet flow overland into Rain Garden 3. Stormwater from more intense rainfall events discharges through an 'E'-Inlet and into the existing underground detention basin. (POA 1)

Proposed Drainage Area #6 (P-6). This drainage area is located along the easterly property lines. Runoff from this area is unable to be captured and is designed to sheet flow into a 'B' Inlet near the neighboring property's access drive aisle (POA 2).

Stormwater Management Methodology

Modeling and analysis of the existing and proposed conditions is performed utilizing HydroCAD v10.10-3a software by HydroCAD Software Solutions and the Soil Conservation Service's Unit Hydrograph. Time of concentration (Tc) calculations are based on the method prescribed in the National Engineering Handbook (NEH), Part 630, Chapter 15. Peak flow rates are generated for the NJDEP water quality storm, as well as, the 2, 10, 25, and 100-year storm events. Rainfall data, except for the NJDEP water quality storm, is based on the NEH, Part 650, Chapter 2, New Jersey Supplement. NOAA Type D storm distribution is utilized.

Water Quantity (N.J.A.C. 7:8-5.6)

To meet the Township and NJDEP requirements for water quantity, it is demonstrated through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events. A summary of the results is presented in the following tables:

Comparison Hydrograph - Point Of Analysis #1

STORM (YEAR)	EX. DRAINAGE AREA PEAK FLOW (CFS)	PR. DRAINAGE AREA PEAK FLOW (CFS)	EX. DRAINAGE AREA VOLUME (AC-FT)	PR. DRAINAGE AREA VOLUME (AC-FT)
2	13.55	12.40	1.558	1.368
10	20.13	19.48	2.455	2.273
100	46.19	39.02	4.234	4.089

Comparison Hydrograph - Point Of Analysis #2

STORM (YEAR)	EX. DRAINAGE AREA PEAK FLOW (CFS)	PR. DRAINAGE AREA PEAK FLOW (CFS)	EX. DRAINAGE AREA VOLUME (AC-FT)	PR. DRAINAGE AREA VOLUME (AC-FT)
2	0.50	0.05	0.046	0.006
10	0.87	0.11	0.079	0.013
100	1.63	0.25	0.149	0.028

As shown in the above tables, the proposed development meets the requirements per N.J.A.C. 7:8-5.6.

Water Quality (N.J.A.C. 7:8-5.5)

This project does not propose to increase motor vehicle surfaces by one-quarter acre or more; therefore, the requirements of N.J.A.C. 7:8-5.5 are not applicable to the project.

Groundwater Recharge (N.J.A.C. 7:8-5.4)

The proposed development is located within Planning Area 1 (Metropolitan Planning Area). In accordance with N.J.A.C. 7:8-5.4(a)2., groundwater recharge requirements do not apply to project within the "Urban Redevelopment area." An Urban Redevelopment Area is defined, per N.J.A.C. 7:8-1.2, as development portions of areas delineated on the State Plan Policy Map as the Metropolitan Planning Area.

Storm Sewer Design

The proposed storm sewer is designed in accordance with the Township Ordinance and current industry standards. Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® was utilized for the design. The proposed storm sewer was designed using the Rational Method with a minimum time of concentration of 10 minutes and the New Jersey Intensity-Duration-Frequency Table. A Rational "C" coefficient of 0.99 is utilized for all inlet drainage areas. The proposed storm sewer is designed to convey the 25-year storm.

Soil Erosion and Sediment Control

In accordance with the Soil Erosion and Sediment Control Act, soil erosion measures will be incorporated into the design and graphically depicted on the Soil Erosion and Sediment Control Plans. These measures consist of, but are not limited to:

- Silt Fences
- Stabilized Construction Access
- Topsoil Stockpiles (if necessary)
- Storm Sewer Inlet Protection

Per the Standards for Soil Erosion and Sediment Control in New Jersey 2014 Manual, the point of discharge stability and downstream stability must be met.

Point of Discharge Stability

Per Figure 21-1 of the Standards, discharge into a defined waterway constitutes point of discharge stability. Indeed, the runoff generated on-site is captured via a private stormwater conveyance system and is discharged into the NJDOT stormwater conveyance system. Discharge into an underground pipe is considered a defined waterway.

A failure analysis is included in the Appendix to demonstrate that no erosion will occur at the point of discharge if the designed infiltration practices fail.

Downstream (Off-Site) Stability

Reductions to the existing peak flow rates and runoff volumes are proposed as result of the development. Summary tables are provided on Sheet 4 and the supporting calculations are included in the Appendix.

Conclusion

The stormwater design for the proposed development meets Township, SCD and NJDEP regulations for water quantity, water quality, groundwater recharge, and erosion control.

Appendix A

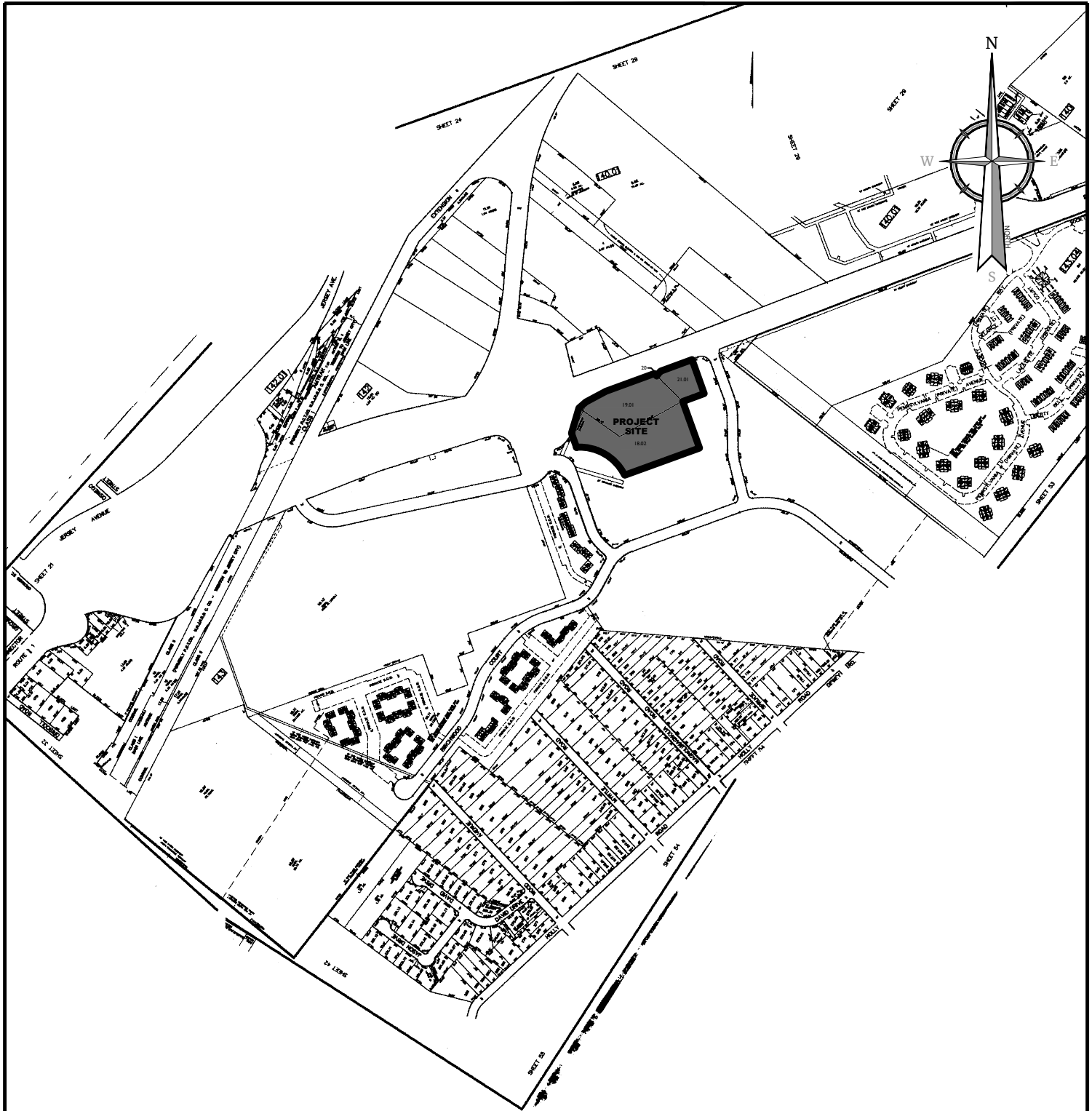
Tax Map

Location Map

Soils Map

USGS Map

FEMA Map



SOURCE: REALQUEST



**Engineering
& Design**

www.colliersengineering.com

Doing Business as



Copyright © 2021, Colliers Engineering & Design. All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

**USE VARIANCE & PRELIMINARY
AND FINAL SITE PLAN
FOR
DCH BRUNSWICK
TOYOTA**

**BLOCK 143.05
LOTS 18.02, 19.01, 20 & 21
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY
NEW JERSEY**



Know what's below.
Call before you dig.

FOR STATE SPECIFIC DIRECT PHONE NUMBERS
VISIT: WWW.CALL811.COM

PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION
OF EXCAVATORS, DESIGNERS, OR
ANY PERSON PREPARING TO
DISTURB THE EARTH'S SURFACE
ANYWHERE IN ANY STATE



**Engineering
& Design**

RED BANK (Headquarters)
331 Newman Springs Road,
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

TAX MAP

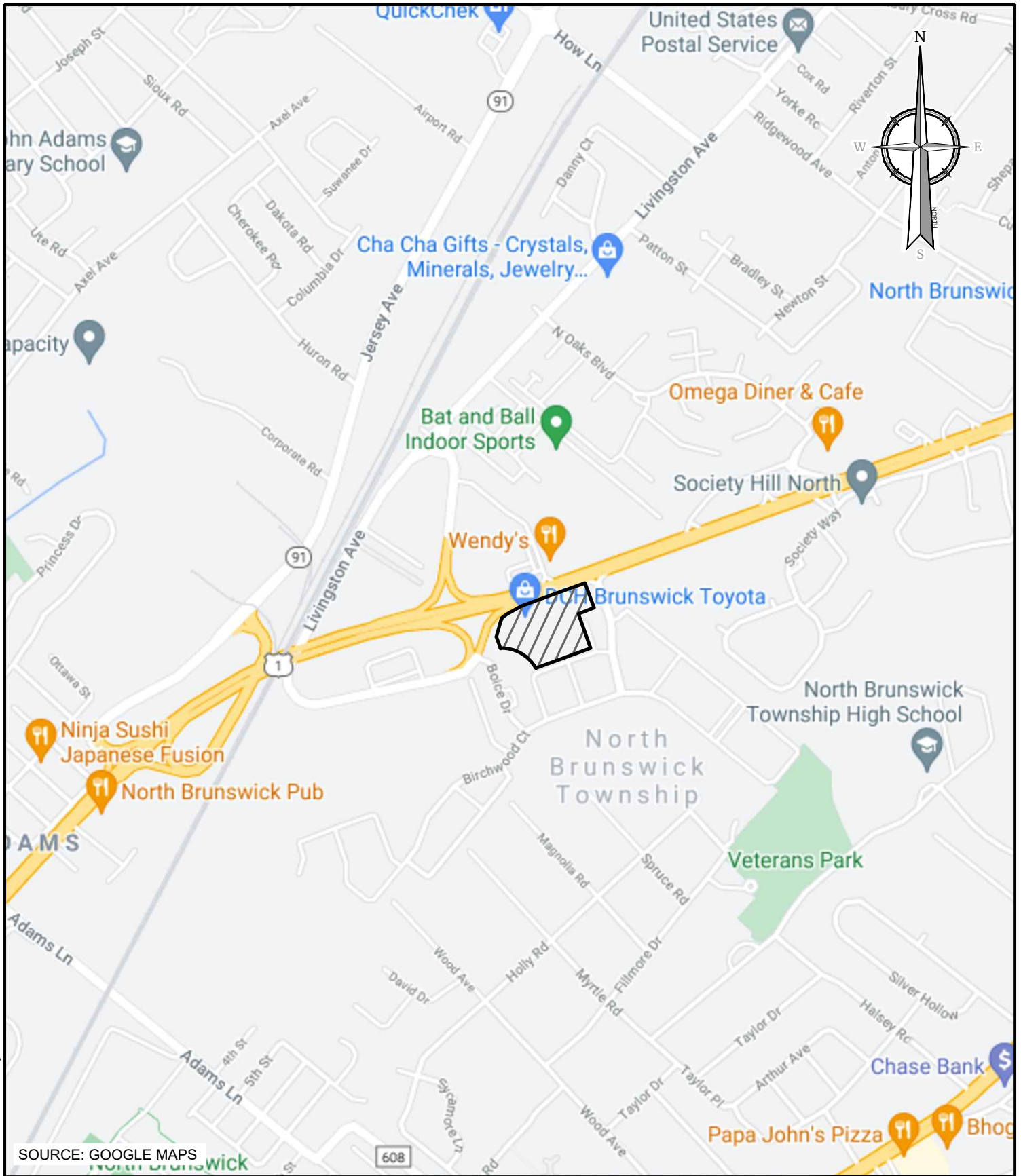
SCALE: 1" = 300'	DATE: 6/11/2021	DRAWN BY: AJU	CHECKED BY:
PROJECT NUMBER: BLISH_182	DRAWING NAME: C-PROJ-MAPS		

SHEET TITLE:

TAX MAP

SHEET NUMBER:

1 of 1



SOURCE: GOOGLE MAPS



**Engineering
& Design**

www.colliersengineering.com

Doing Business as



Copyright © 2021, Colliers Engineering & Design. All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

**USE VARIANCE & PRELIMINARY
AND FINAL SITE PLAN
FOR
DCH BRUNSWICK
TOYOTA**

**BLOCK 143.05
LOTS 18.02, 19.01, 20 & 21
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY
NEW JERSEY**



Know what's below.
Call before you dig.
FOR STATE SPECIFIC DIRECT PHONE NUMBERS
VISIT: WWW.CALL811.COM

PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION
OF EXCAVATORS, DESIGNERS, OR
ANY PERSON PREPARING TO
DISTURB THE EARTH'S SURFACE
ANYWHERE IN ANY STATE



**Engineering
& Design**

RED BANK (Headquarters)
331 Newmain Springs Road,
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

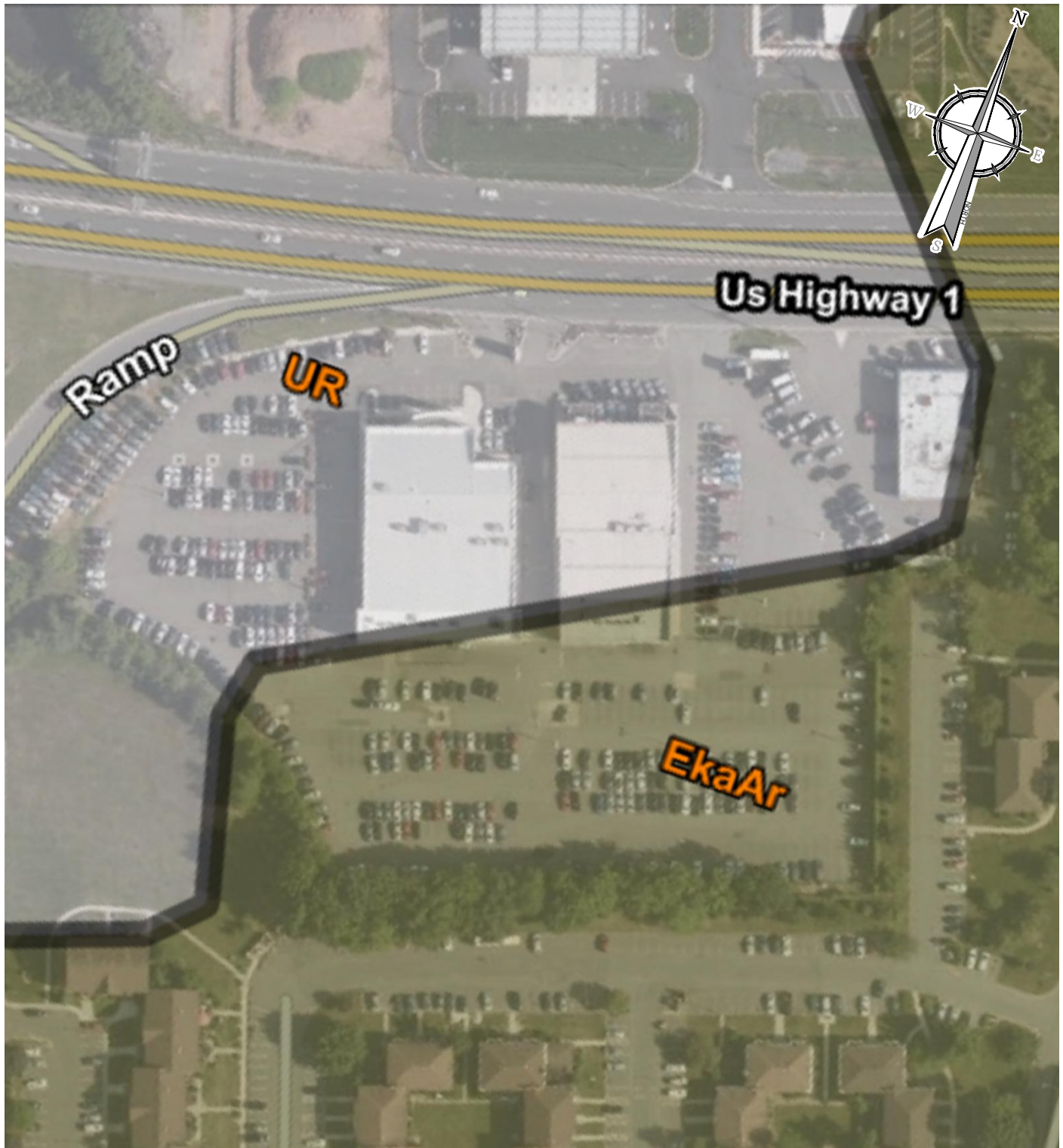
LOCATION MAP

SCALE: 1" = 1,000'	DATE: 6/11/2021	DRAWN BY: AJU	CHECKED BY:
PROJECT NUMBER: BLISH_182		DRAWING NAME: C-PROJ-MAPS	

SHEET TITLE:

LOCATION MAP

SHEET NUMBER:
1 of 1



SOURCE: USDA WEB SOIL SURVEY



Engineering
& Design

www.colliersengineering.com

Doing Business as



Copyright © 2021, Colliers Engineering & Design. All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

USE VARIANCE & PRELIMINARY
AND FINAL SITE PLAN
FOR
DCH BRUNSWICK
TOYOTA

BLOCK 143.05
LOTS 18.02, 19.01, 20 & 21
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY
NEW JERSEY



Know what's below.
Call before you dig.

FOR STATE SPECIFIC DIRECT PHONE NUMBERS
VISIT: WWW.CALL811.COM

PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION
OF EXCAVATORS, DESIGNERS, OR
ANY PERSON PREPARING TO
DISTURB THE EARTH'S SURFACE
ANYWHERE IN ANY STATE



Engineering
& Design

RED BANK (Headquarters)
331 Newmain Springs Road,
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

SOILS MAP

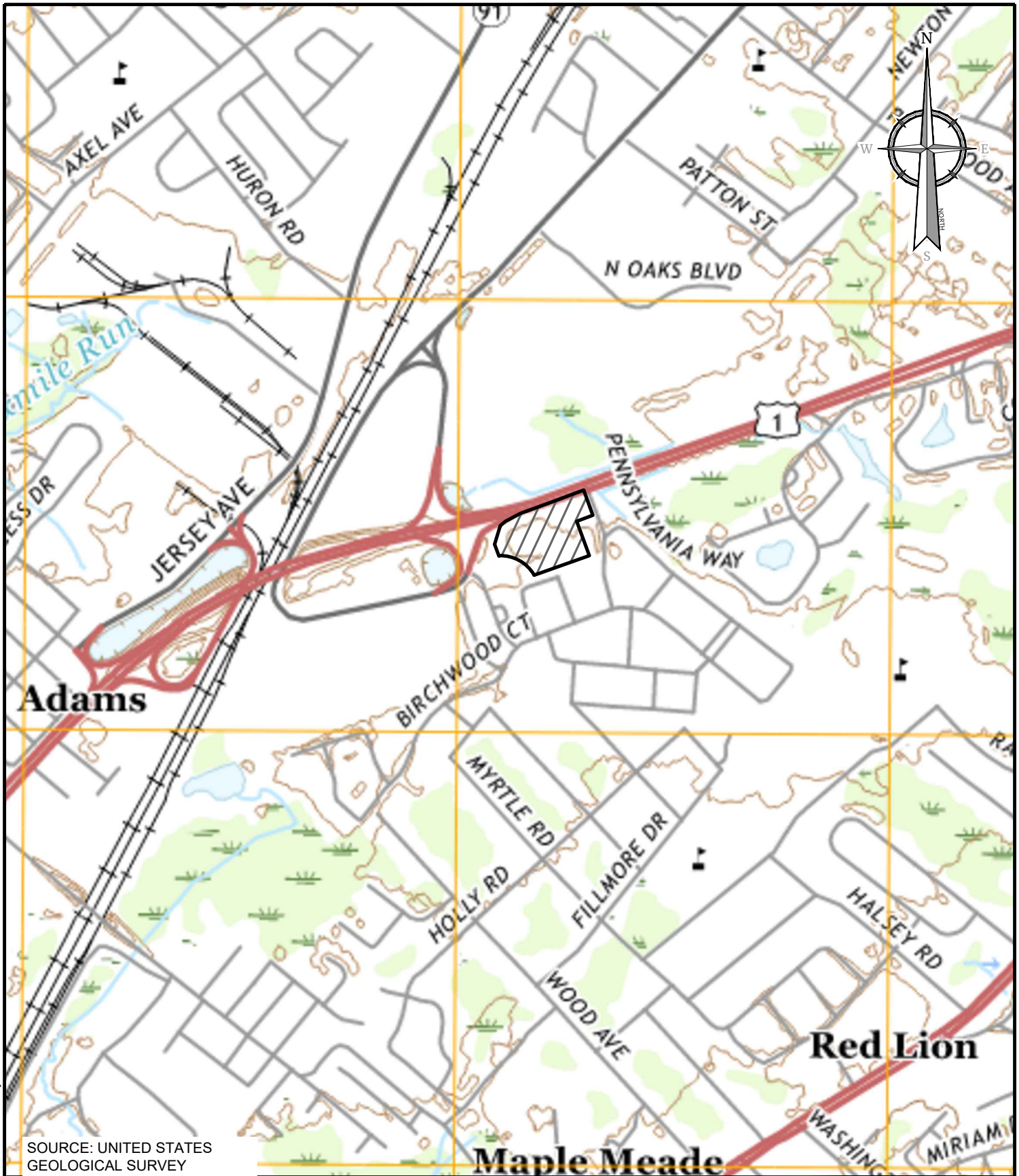
SCALE: 1" = 120'	DATE: 6/11/2021	DRAWN BY: AJU	CHECKED BY:
PROJECT NUMBER: BLISH_182	DRAWING NAME: C-PROJ-MAPS		

SHEET TITLE:

SOILS MAP

SHEET NUMBER:

1 of 1



SOURCE: UNITED STATES
GEOLOGICAL SURVEY



Engineering
& Design

www.colliersengineering.com

Doing Business as



Copyright © 2021, Colliers Engineering & Design. All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

USE VARIANCE & PRELIMINARY
AND FINAL SITE PLAN
FOR
DCH BRUNSWICK
TOYOTA

BLOCK 143.05
LOTS 18.02, 19.01, 20 & 21
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY
NEW JERSEY



Know what's below.
Call before you dig.

FOR STATE SPECIFIC DIRECT PHONE NUMBERS
VISIT: WWW.CALL811.COM

PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION
OF EXCAVATORS, DESIGNERS, OR
ANY PERSON PREPARING TO
DISTURB THE EARTH'S SURFACE
ANYWHERE IN ANY STATE



Engineering
& Design

RED BANK (Headquarters)
331 Newman Springs Road,
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

USGS MAP

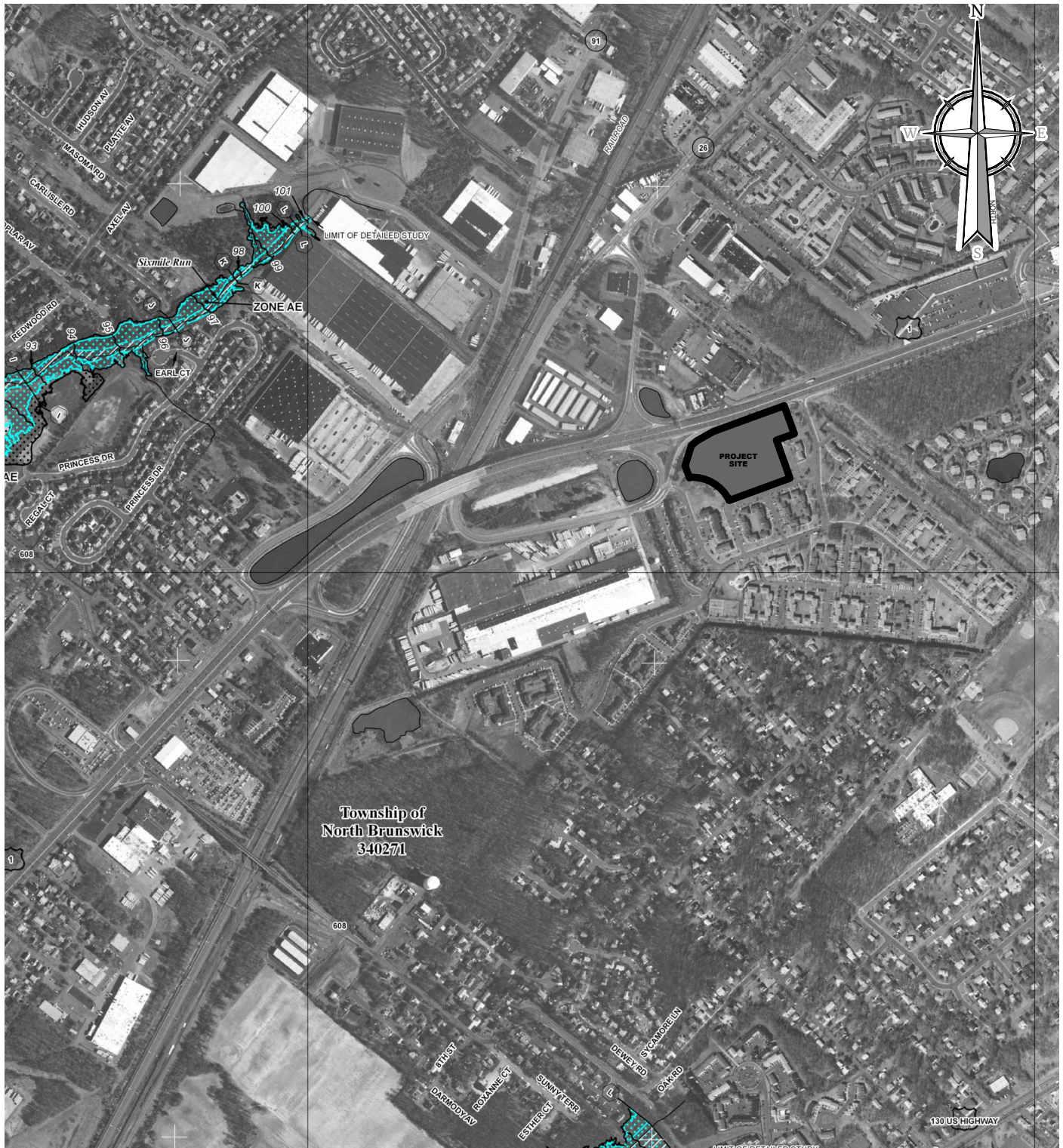
SCALE: 1" = 1,000'	DATE: 6/11/2021	DRAWN BY: AJU	CHECKED BY:
PROJECT NUMBER: BLISH_182		DRAWING NAME: C-PROJ-MAPS	

SHEET TITLE:

USGS MAP

SHEET NUMBER:

1 of 1



SOURCE: FEMA - FLOOD INSURANCE RATE MAP



Engineering
& Design

www.colliersengineering.com

Doing Business as



Copyright © 2021, Colliers Engineering & Design. All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

USE VARIANCE & PRELIMINARY
AND FINAL SITE PLAN
FOR
DCH BRUNSWICK
TOYOTA

BLOCK 143.05
LOTS 18.02, 19.01, 20 & 21
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY
NEW JERSEY



Know what's below.
Call before you dig.

FOR STATE SPECIFIC DIRECT PHONE NUMBERS
VISIT: WWW.CALL811.COM



PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION
OF EXCAVATORS, DESIGNERS, OR
ANY PERSON PREPARING TO
DISTURB THE EARTH'S SURFACE
ANYWHERE IN ANY STATE

RED BANK (Headquarters)
331 Newman Springs Road,
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

FEMA MAP

SCALE: 1" = 1,000'	DATE: 6/11/2021	DRAWN BY: AJU	CHECKED BY:
PROJECT NUMBER: BLISH_182		DRAWING NAME: C-PROJ-MAPS	

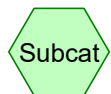
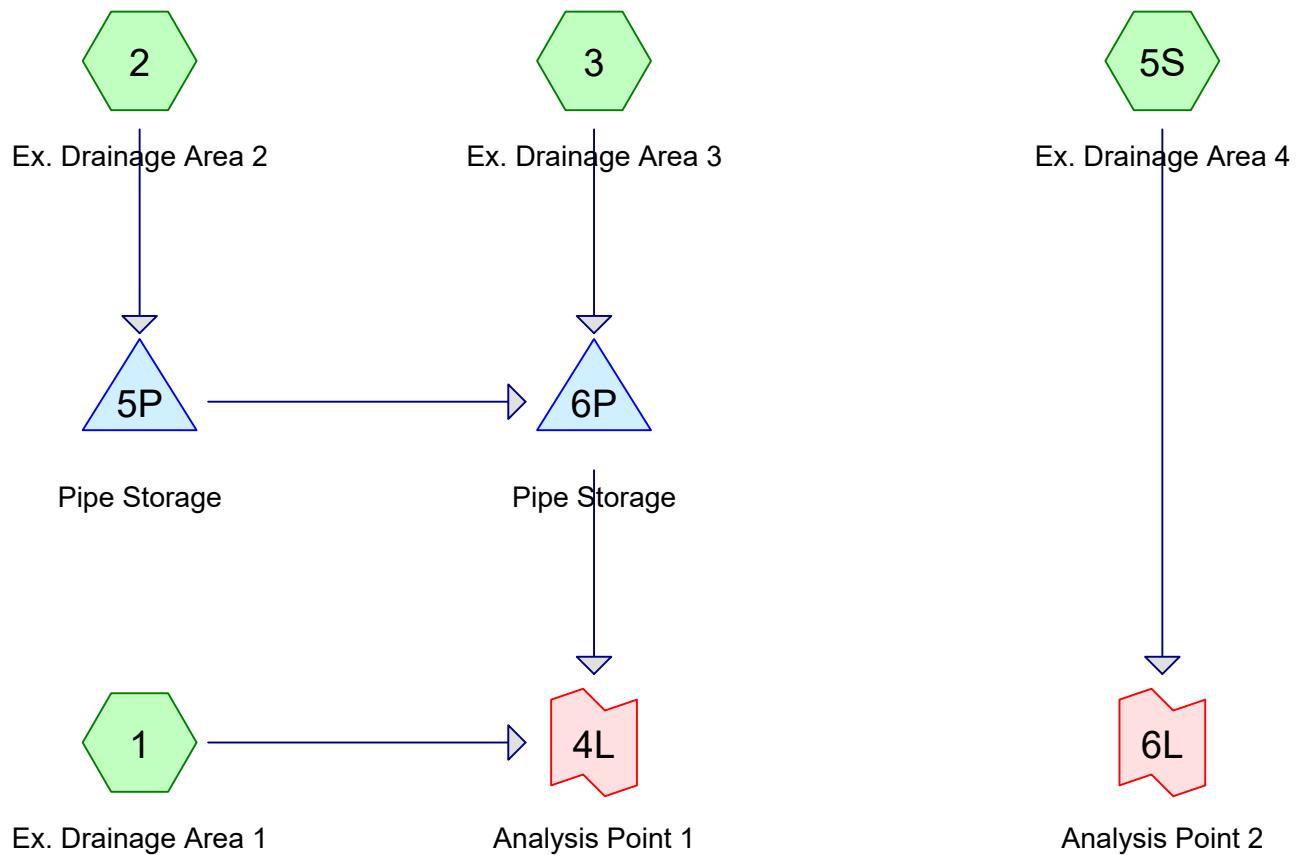
SHEET TITLE:
FEMA MAP

SHEET NUMBER:
1 of 1

Appendix B

Existing Conditions

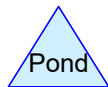
Proposed Conditions



Subcat



Reach



Pond



Link

Routing Diagram for 210600 Existing Conditions

Prepared by Maser Consulting, Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2
2	B - 2YR	NOAA 24-hr	D	Default	24.00	1	3.32	2
3	C - 10YR	NOAA 24-hr	D	Default	24.00	1	5.07	2
4	D - 25YR	NOAA 24-hr	D	Default	24.00	1	6.29	2
5	E - 100YR	NOAA 24-hr	D	Default	24.00	1	8.52	2

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 3

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.199	74	>75% Grass cover, Good, HSG C (1, 2, 5S)
0.167	80	>75% Grass cover, Good, HSG D (1)
2.125	98	Paved parking (1, 5S)
2.129	98	Paved parking, HSG C (2, 3)
0.824	98	Paved parking, HSG D (3)
0.988	98	Roofs (1, 3)
0.057	70	Woods, Good, HSG C (2)
6.489	97	TOTAL AREA

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.199	0.167	0.000	0.366	>75% Grass cover, Good	1, 2, 5S
0.000	0.000	2.129	0.824	2.125	5.078	Paved parking	1, 2, 3, 5S
0.000	0.000	0.000	0.000	0.988	0.988	Roofs	1, 3
0.000	0.000	0.057	0.000	0.000	0.057	Woods, Good	2
0.000	0.000	2.385	0.991	3.113	6.489	TOTAL AREA	

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1	0.00	0.00	25.0	0.0465	0.011	12.0	0.0	0.0
2	1	0.00	0.00	500.0	0.0010	0.011	36.0	0.0	0.0
3	2	0.00	0.00	176.0	0.0090	0.011	15.0	0.0	0.0
4	3	0.00	0.00	80.0	0.0140	0.011	15.0	0.0	0.0
5	5P	113.00	112.96	61.0	0.0007	0.013	15.0	0.0	0.0
6	6P	112.96	112.68	54.0	0.0052	0.013	18.0	0.0	0.0

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 6

Summary for Subcatchment 1: Ex. Drainage Area 1

Runoff = 7.13 cfs @ 12.13 hrs, Volume= 0.574 af, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.0
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
* 0.145	98	Roofs
* 1.993	98	Paved parking
0.037	74	>75% Grass cover, Good, HSG C
0.167	80	>75% Grass cover, Good, HSG D
2.342	96	Weighted Average
0.204	79	8.71% Pervious Area
2.138	98	91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	289	0.0120	1.42		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	25	0.0465	11.56	9.08	Pipe Channel, BC - Pipe Flow 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.4	500	0.0010	3.53	24.93	Pipe Channel, CD - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.8	814	Total			

210600 Existing Conditions

Prepared by Maser Consulting

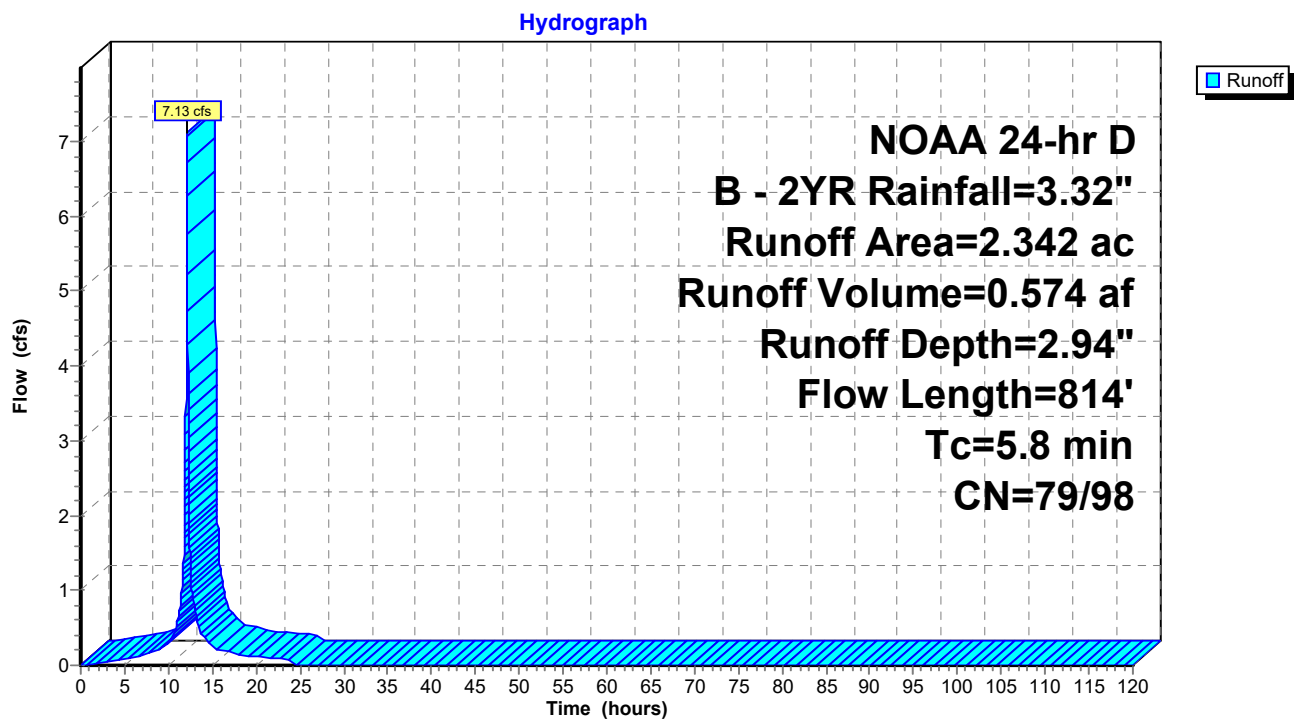
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 7

Subcatchment 1: Ex. Drainage Area 1



210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 8

Hydrograph for Subcatchment 1: Ex. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.08
10.00	0.66	0.01	0.46	0.31
15.00	2.79	1.04	2.56	0.25
20.00	3.15	1.30	2.91	0.12
25.00	3.32	1.43	3.09	0.00
30.00	3.32	1.43	3.09	0.00
35.00	3.32	1.43	3.09	0.00
40.00	3.32	1.43	3.09	0.00
45.00	3.32	1.43	3.09	0.00
50.00	3.32	1.43	3.09	0.00
55.00	3.32	1.43	3.09	0.00
60.00	3.32	1.43	3.09	0.00
65.00	3.32	1.43	3.09	0.00
70.00	3.32	1.43	3.09	0.00
75.00	3.32	1.43	3.09	0.00
80.00	3.32	1.43	3.09	0.00
85.00	3.32	1.43	3.09	0.00
90.00	3.32	1.43	3.09	0.00
95.00	3.32	1.43	3.09	0.00
100.00	3.32	1.43	3.09	0.00
105.00	3.32	1.43	3.09	0.00
110.00	3.32	1.43	3.09	0.00
115.00	3.32	1.43	3.09	0.00
120.00	3.32	1.43	3.09	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 9

Summary for Subcatchment 2: Ex. Drainage Area 2

Runoff = 5.01 cfs @ 12.19 hrs, Volume= 0.498 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
1.907	98	Paved parking, HSG C
0.034	74	>75% Grass cover, Good, HSG C
0.057	70	Woods, Good, HSG C
1.998	97	Weighted Average
0.091	71	4.55% Pervious Area
1.907	98	95.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	75	0.0120	0.13		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
1.2	53	0.0120	0.77		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
0.7	89	0.0120	2.22		Shallow Concentrated Flow, DE - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	176	0.0090	5.90	7.24	Pipe Channel, EF - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
11.7	393	Total			

210600 Existing Conditions

Prepared by Maser Consulting

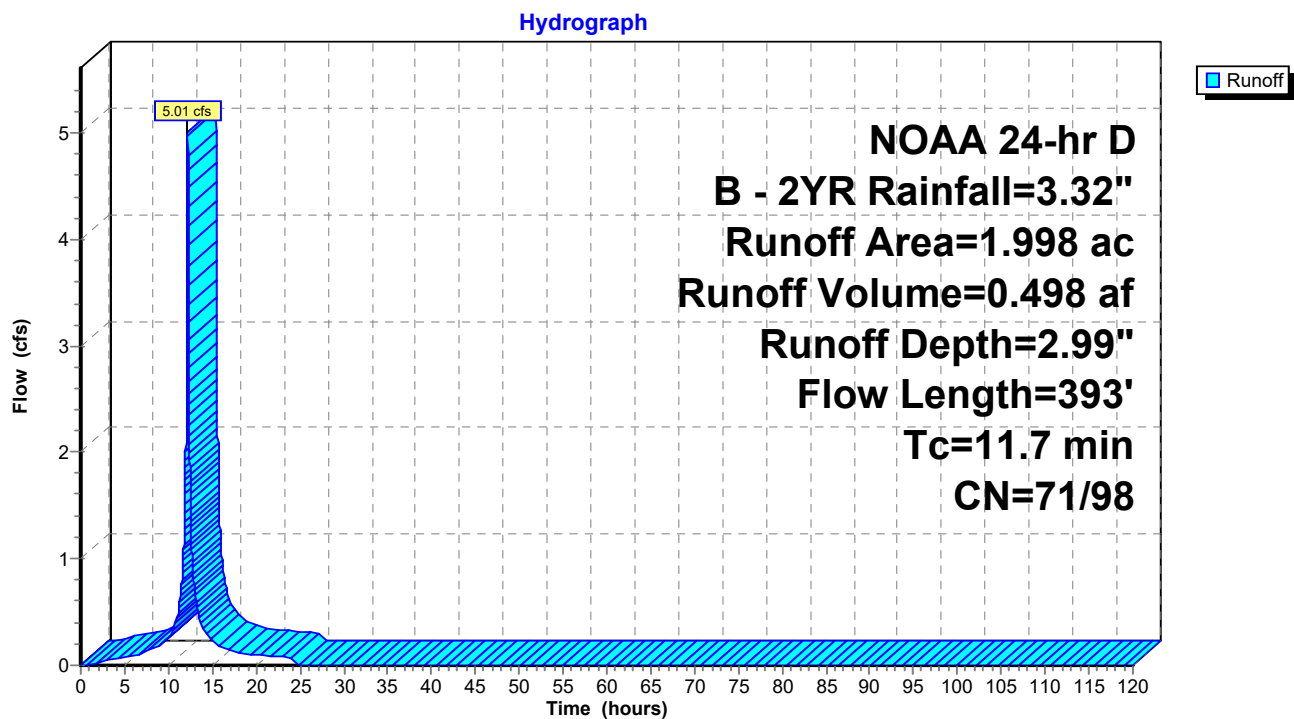
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 10

Subcatchment 2: Ex. Drainage Area 2



210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 11

Hydrograph for Subcatchment 2: Ex. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.07
10.00	0.66	0.00	0.46	0.27
15.00	2.79	0.64	2.56	0.23
20.00	3.15	0.85	2.91	0.10
25.00	3.32	0.95	3.09	0.00
30.00	3.32	0.95	3.09	0.00
35.00	3.32	0.95	3.09	0.00
40.00	3.32	0.95	3.09	0.00
45.00	3.32	0.95	3.09	0.00
50.00	3.32	0.95	3.09	0.00
55.00	3.32	0.95	3.09	0.00
60.00	3.32	0.95	3.09	0.00
65.00	3.32	0.95	3.09	0.00
70.00	3.32	0.95	3.09	0.00
75.00	3.32	0.95	3.09	0.00
80.00	3.32	0.95	3.09	0.00
85.00	3.32	0.95	3.09	0.00
90.00	3.32	0.95	3.09	0.00
95.00	3.32	0.95	3.09	0.00
100.00	3.32	0.95	3.09	0.00
105.00	3.32	0.95	3.09	0.00
110.00	3.32	0.95	3.09	0.00
115.00	3.32	0.95	3.09	0.00
120.00	3.32	0.95	3.09	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 12

Summary for Subcatchment 3: Ex. Drainage Area 3

Runoff = 6.53 cfs @ 12.10 hrs, Volume= 0.486 af, Depth= 3.09"

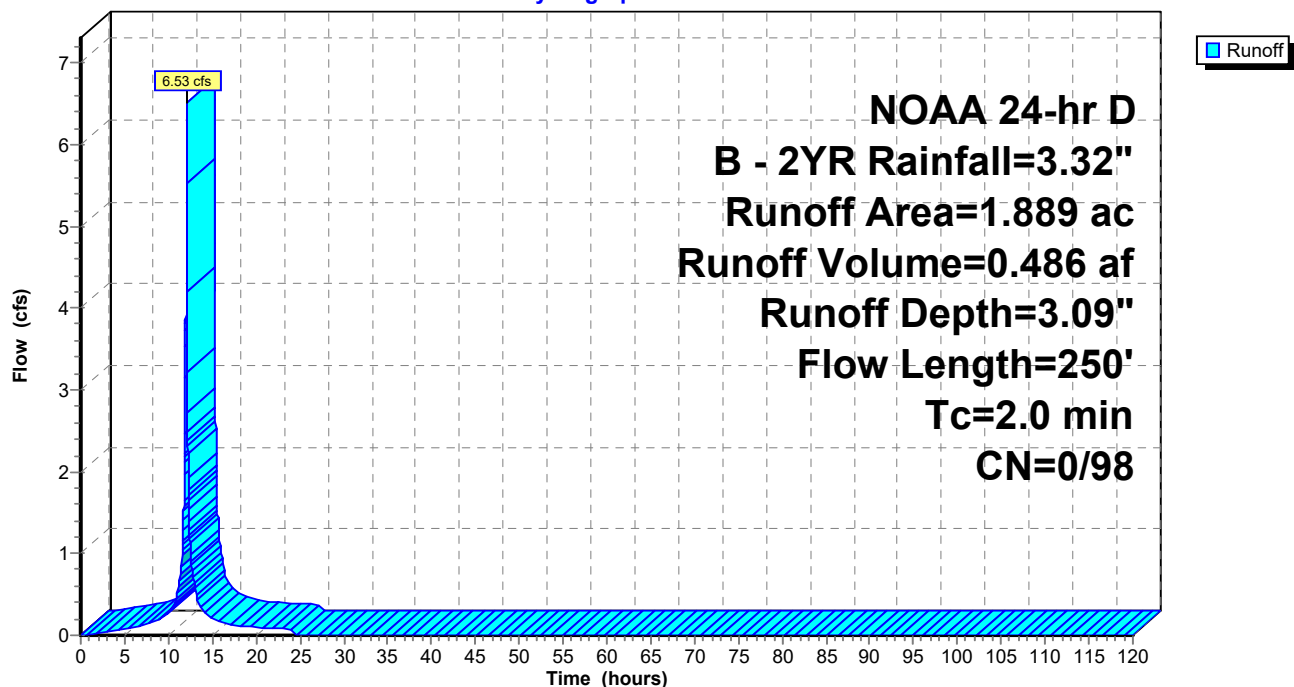
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
* 0.843	98	Roofs
0.222	98	Paved parking, HSG C
0.824	98	Paved parking, HSG D
1.889	98	Weighted Average
1.889	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	170	0.0210	1.60		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	80	0.0140	7.36	9.03	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
2.0	250	Total			

Subcatchment 3: Ex. Drainage Area 3

Hydrograph



210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 13

Hydrograph for Subcatchment 3: Ex. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.08
10.00	0.66	0.00	0.46	0.28
15.00	2.79	0.00	2.56	0.20
20.00	3.15	0.00	2.91	0.10
25.00	3.32	0.00	3.09	0.00
30.00	3.32	0.00	3.09	0.00
35.00	3.32	0.00	3.09	0.00
40.00	3.32	0.00	3.09	0.00
45.00	3.32	0.00	3.09	0.00
50.00	3.32	0.00	3.09	0.00
55.00	3.32	0.00	3.09	0.00
60.00	3.32	0.00	3.09	0.00
65.00	3.32	0.00	3.09	0.00
70.00	3.32	0.00	3.09	0.00
75.00	3.32	0.00	3.09	0.00
80.00	3.32	0.00	3.09	0.00
85.00	3.32	0.00	3.09	0.00
90.00	3.32	0.00	3.09	0.00
95.00	3.32	0.00	3.09	0.00
100.00	3.32	0.00	3.09	0.00
105.00	3.32	0.00	3.09	0.00
110.00	3.32	0.00	3.09	0.00
115.00	3.32	0.00	3.09	0.00
120.00	3.32	0.00	3.09	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 14

Summary for Subcatchment 5S: Ex. Drainage Area 4

Runoff = 0.50 cfs @ 12.17 hrs, Volume= 0.046 af, Depth= 2.12"

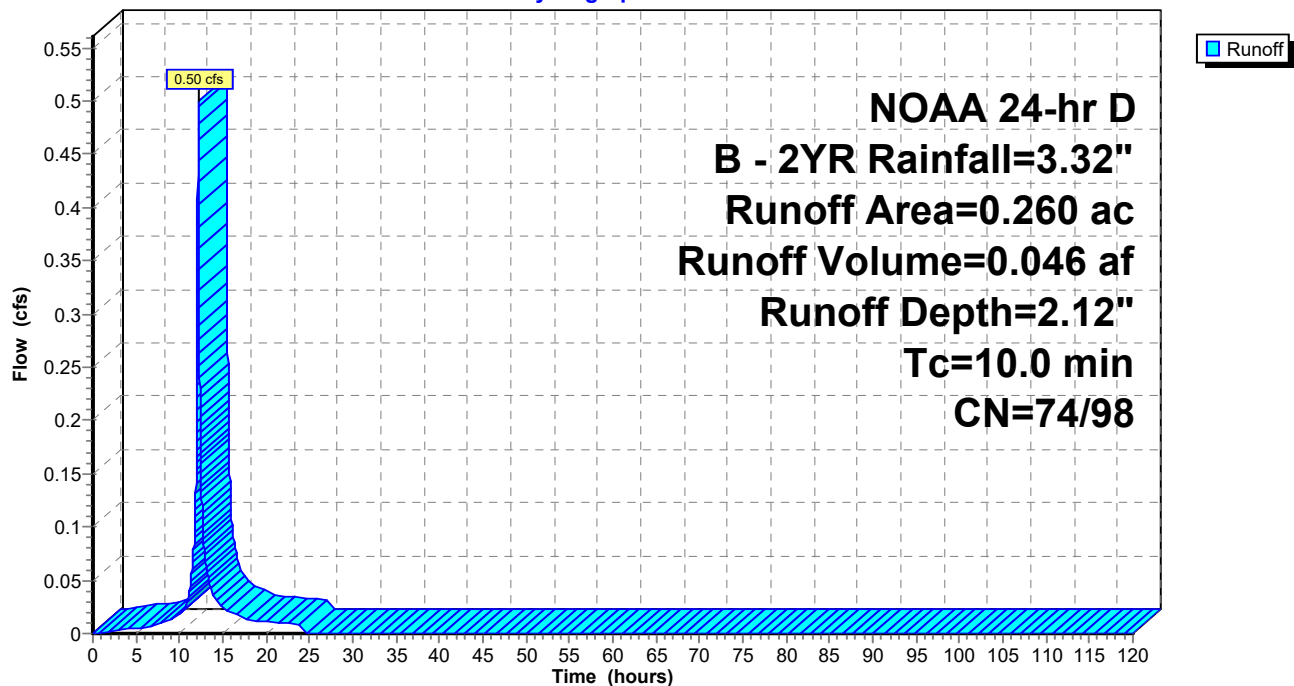
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
* 0.132	98	Paved parking
0.128	74	>75% Grass cover, Good, HSG C
0.260	86	Weighted Average
0.128	74	49.23% Pervious Area
0.132	98	50.77% Impervious Area

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

Subcatchment 5S: Ex. Drainage Area 4

Hydrograph



210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 15

Hydrograph for Subcatchment 5S: Ex. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.00	0.46	0.02
15.00	2.79	0.78	2.56	0.02
20.00	3.15	1.00	2.91	0.01
25.00	3.32	1.12	3.09	0.00
30.00	3.32	1.12	3.09	0.00
35.00	3.32	1.12	3.09	0.00
40.00	3.32	1.12	3.09	0.00
45.00	3.32	1.12	3.09	0.00
50.00	3.32	1.12	3.09	0.00
55.00	3.32	1.12	3.09	0.00
60.00	3.32	1.12	3.09	0.00
65.00	3.32	1.12	3.09	0.00
70.00	3.32	1.12	3.09	0.00
75.00	3.32	1.12	3.09	0.00
80.00	3.32	1.12	3.09	0.00
85.00	3.32	1.12	3.09	0.00
90.00	3.32	1.12	3.09	0.00
95.00	3.32	1.12	3.09	0.00
100.00	3.32	1.12	3.09	0.00
105.00	3.32	1.12	3.09	0.00
110.00	3.32	1.12	3.09	0.00
115.00	3.32	1.12	3.09	0.00
120.00	3.32	1.12	3.09	0.00

210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 16

Summary for Pond 5P: Pipe Storage

Inflow Area = 1.998 ac, 95.45% Impervious, Inflow Depth = 2.99" for B - 2YR event
 Inflow = 5.01 cfs @ 12.19 hrs, Volume= 0.498 af
 Outflow = 4.38 cfs @ 12.25 hrs, Volume= 0.498 af, Atten= 13%, Lag= 3.9 min
 Primary = 4.38 cfs @ 12.25 hrs, Volume= 0.498 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 115.07' @ 12.25 hrs Surf.Area= 0.026 ac Storage= 0.050 af

Plug-Flow detention time= 16.4 min calculated for 0.498 af (100% of inflow)
 Center-of-Mass det. time= 16.3 min (780.9 - 764.6)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	0.031 af	36.0" Round Pipe Storage x 2 L= 97.0'
#2	113.00'	0.022 af	36.0" Round Pipe Storage L= 135.0'
#3	113.00'	0.028 af	Custom Stage Data (Prismatic) Listed below (Recalc) x 5
		0.081 af	Total Available Storage

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	0.001	0.000	0.000
118.62	0.001	0.006	0.006

Device	Routing	Invert	Outlet Devices
#1	Primary	113.00'	15.0" Round Culvert L= 61.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 113.00' / 112.96' S= 0.0007 ' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	118.55'	48.0" x 42.0" Horiz. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.37 cfs @ 12.25 hrs HW=115.07' TW=114.49' (Dynamic Tailwater)

1=Culvert (Outlet Controls 4.37 cfs @ 3.56 fps)

2=Orifice/Grate (Controls 0.00 cfs)

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

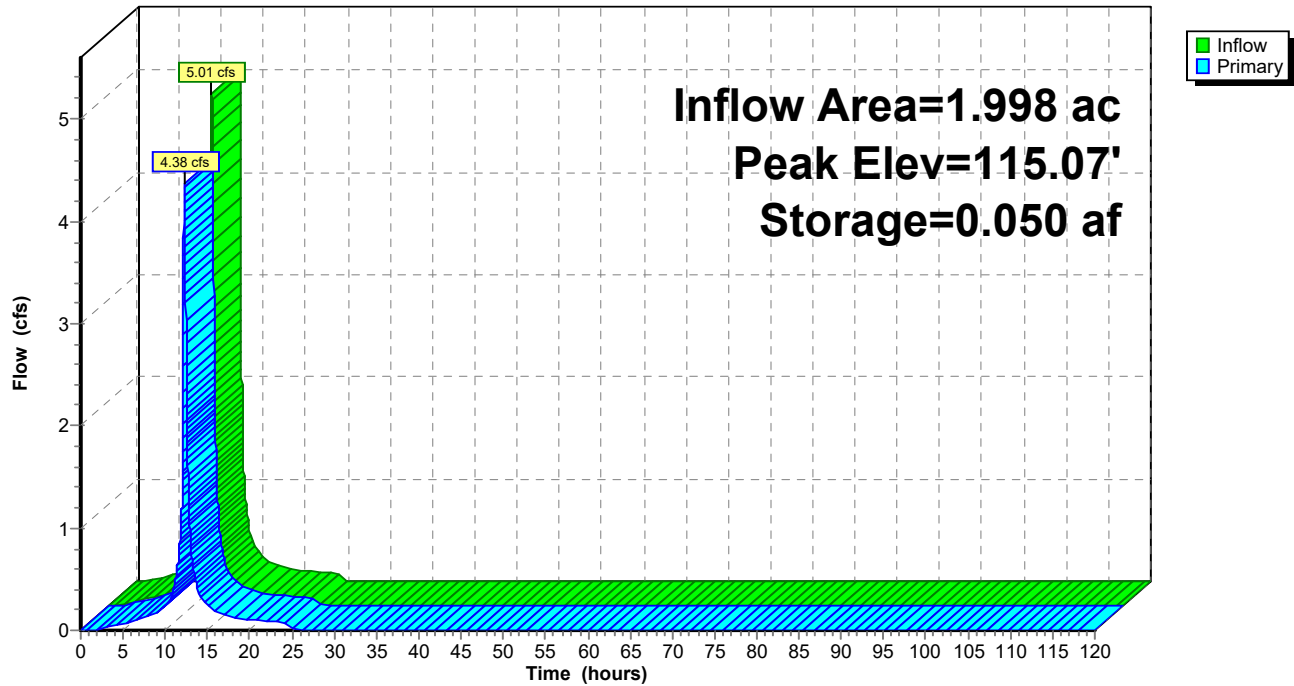
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 17

Pond 5P: Pipe Storage

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 18

Hydrograph for Pond 5P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	113.00	0.00
5.00	0.07	0.003	113.22	0.07
10.00	0.27	0.006	113.40	0.25
15.00	0.23	0.006	113.40	0.25
20.00	0.10	0.004	113.26	0.10
25.00	0.00	0.001	113.10	0.01
30.00	0.00	0.000	113.02	0.00
35.00	0.00	0.000	113.01	0.00
40.00	0.00	0.000	113.01	0.00
45.00	0.00	0.000	113.01	0.00
50.00	0.00	0.000	113.00	0.00
55.00	0.00	0.000	113.00	0.00
60.00	0.00	0.000	113.00	0.00
65.00	0.00	0.000	113.00	0.00
70.00	0.00	0.000	113.00	0.00
75.00	0.00	0.000	113.00	0.00
80.00	0.00	0.000	113.00	0.00
85.00	0.00	0.000	113.00	0.00
90.00	0.00	0.000	113.00	0.00
95.00	0.00	0.000	113.00	0.00
100.00	0.00	0.000	113.00	0.00
105.00	0.00	0.000	113.00	0.00
110.00	0.00	0.000	113.00	0.00
115.00	0.00	0.000	113.00	0.00
120.00	0.00	0.000	113.00	0.00

210600 Existing Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 19

Summary for Pond 6P: Pipe Storage

Inflow Area = 3.887 ac, 97.66% Impervious, Inflow Depth = 3.04" for B - 2YR event
 Inflow = 8.64 cfs @ 12.11 hrs, Volume= 0.984 af
 Outflow = 6.43 cfs @ 12.14 hrs, Volume= 0.984 af, Atten= 26%, Lag= 1.8 min
 Primary = 6.43 cfs @ 12.14 hrs, Volume= 0.984 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 114.52' @ 12.14 hrs Surf.Area= 0.056 ac Storage= 0.073 af

Plug-Flow detention time= 15.2 min calculated for 0.984 af (100% of inflow)
 Center-of-Mass det. time= 15.3 min (782.8 - 767.5)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.43 cfs @ 12.14 hrs HW=114.51' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 6.43 cfs @ 4.36 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

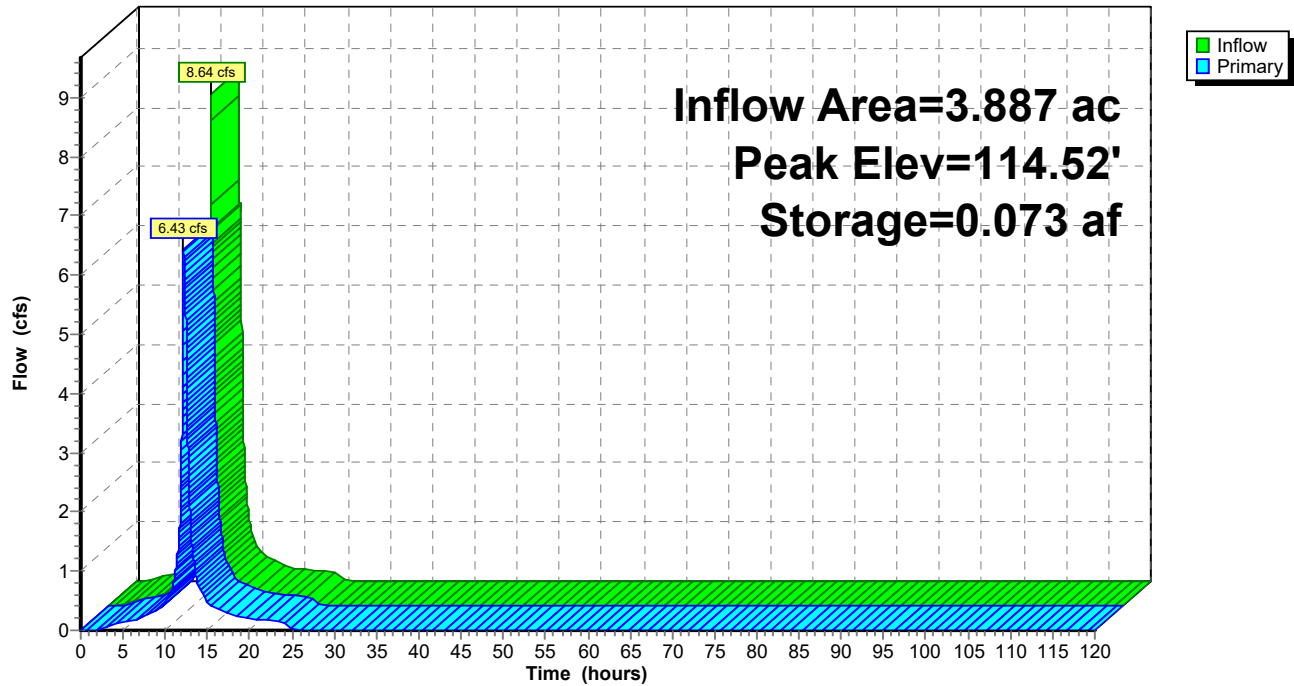
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 20

Pond 6P: Pipe Storage

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 21

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.14	0.005	113.15	0.14
10.00	0.52	0.012	113.32	0.49
15.00	0.45	0.012	113.31	0.48
20.00	0.20	0.007	113.19	0.20
25.00	0.01	0.002	113.05	0.03
30.00	0.00	0.000	112.98	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.97	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 22

Summary for Link 4L: Analysis Point 1

Inflow Area = 6.229 ac, 95.26% Impervious, Inflow Depth = 3.00" for B - 2YR event

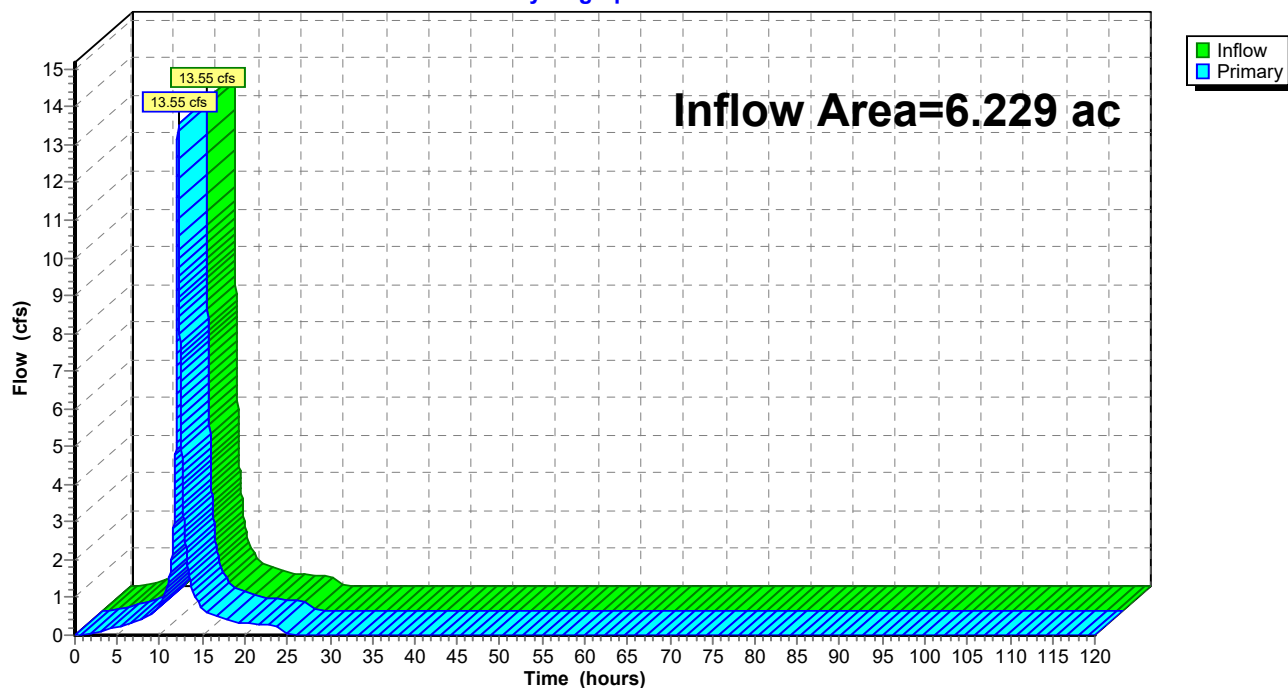
Inflow = 13.55 cfs @ 12.13 hrs, Volume= 1.558 af

Primary = 13.55 cfs @ 12.13 hrs, Volume= 1.558 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 1

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 23

Hydrograph for Link 4L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.03	0.00	0.03	106.00	0.00	0.00	0.00
4.00	0.17	0.00	0.17	108.00	0.00	0.00	0.00
6.00	0.26	0.00	0.26	110.00	0.00	0.00	0.00
8.00	0.44	0.00	0.44	112.00	0.00	0.00	0.00
10.00	0.80	0.00	0.80	114.00	0.00	0.00	0.00
12.00	7.80	0.00	7.80	116.00	0.00	0.00	0.00
14.00	1.09	0.00	1.09	118.00	0.00	0.00	0.00
16.00	0.57	0.00	0.57	120.00	0.00	0.00	0.00
18.00	0.39	0.00	0.39				
20.00	0.32	0.00	0.32				
22.00	0.28	0.00	0.28				
24.00	0.23	0.00	0.23				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 24

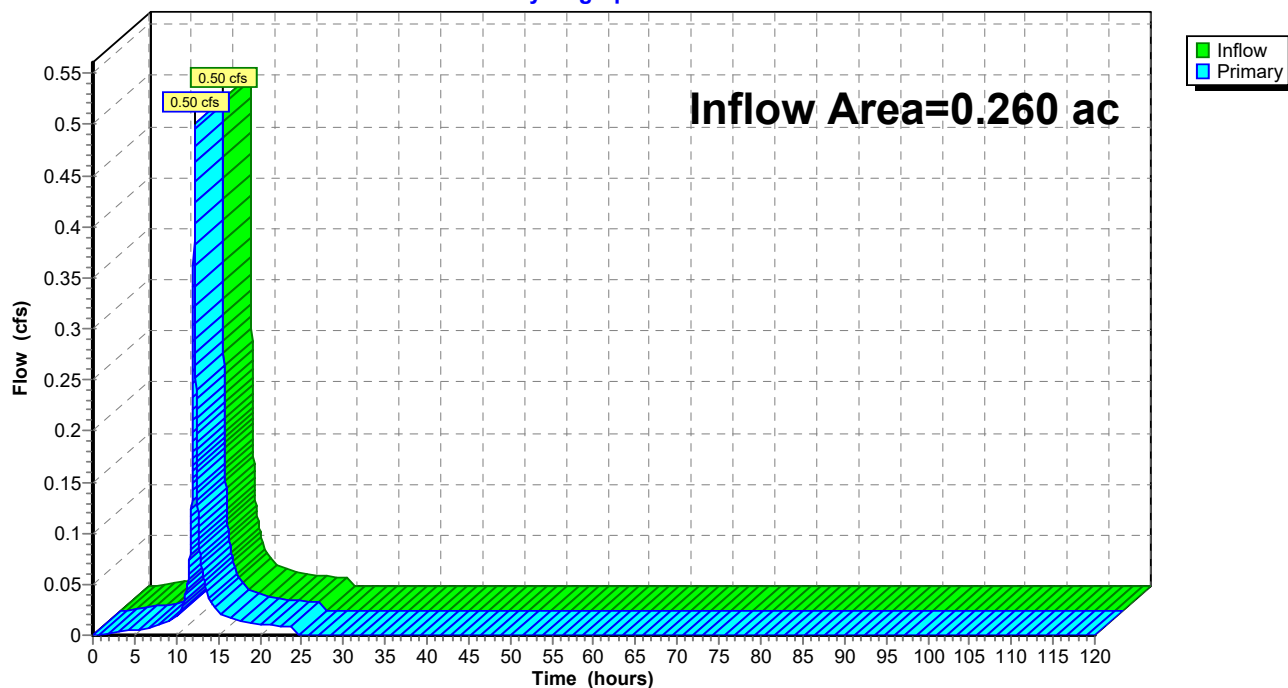
Summary for Link 6L: Analysis Point 2

Inflow Area = 0.260 ac, 50.77% Impervious, Inflow Depth = 2.12" for B - 2YR event
Inflow = 0.50 cfs @ 12.17 hrs, Volume= 0.046 af
Primary = 0.50 cfs @ 12.17 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 6L: Analysis Point 2

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 25

Hydrograph for Link 6L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.01	0.00	0.01	110.00	0.00	0.00	0.00
8.00	0.01	0.00	0.01	112.00	0.00	0.00	0.00
10.00	0.02	0.00	0.02	114.00	0.00	0.00	0.00
12.00	0.22	0.00	0.22	116.00	0.00	0.00	0.00
14.00	0.03	0.00	0.03	118.00	0.00	0.00	0.00
16.00	0.02	0.00	0.02	120.00	0.00	0.00	0.00
18.00	0.01	0.00	0.01				
20.00	0.01	0.00	0.01				
22.00	0.01	0.00	0.01				
24.00	0.01	0.00	0.01				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 26

Summary for Subcatchment 1: Ex. Drainage Area 1

[47] Hint: Peak is 122% of capacity of segment #2

Runoff = 11.11 cfs @ 12.13 hrs, Volume= 0.910 af, Depth= 4.66"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.0
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
* 0.145	98	Roofs
* 1.993	98	Paved parking
0.037	74	>75% Grass cover, Good, HSG C
0.167	80	>75% Grass cover, Good, HSG D
2.342	96	Weighted Average
0.204	79	8.71% Pervious Area
2.138	98	91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	289	0.0120	1.42		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	25	0.0465	11.56	9.08	Pipe Channel, BC - Pipe Flow 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.4	500	0.0010	3.53	24.93	Pipe Channel, CD - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.8	814	Total			

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

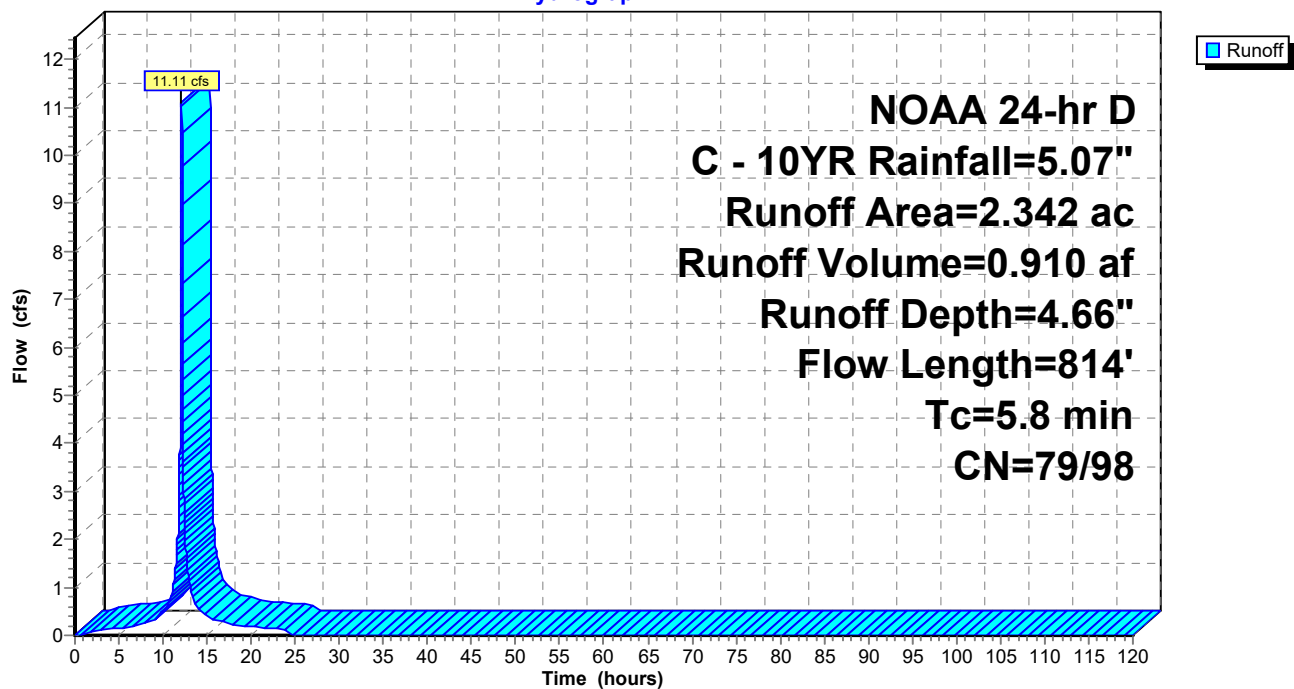
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 27

Subcatchment 1: Ex. Drainage Area 1

Hydrograph



210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 28

Hydrograph for Subcatchment 1: Ex. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.15
10.00	1.01	0.07	0.80	0.50
15.00	4.27	2.18	4.03	0.39
20.00	4.80	2.63	4.57	0.18
25.00	5.07	2.86	4.83	0.00
30.00	5.07	2.86	4.83	0.00
35.00	5.07	2.86	4.83	0.00
40.00	5.07	2.86	4.83	0.00
45.00	5.07	2.86	4.83	0.00
50.00	5.07	2.86	4.83	0.00
55.00	5.07	2.86	4.83	0.00
60.00	5.07	2.86	4.83	0.00
65.00	5.07	2.86	4.83	0.00
70.00	5.07	2.86	4.83	0.00
75.00	5.07	2.86	4.83	0.00
80.00	5.07	2.86	4.83	0.00
85.00	5.07	2.86	4.83	0.00
90.00	5.07	2.86	4.83	0.00
95.00	5.07	2.86	4.83	0.00
100.00	5.07	2.86	4.83	0.00
105.00	5.07	2.86	4.83	0.00
110.00	5.07	2.86	4.83	0.00
115.00	5.07	2.86	4.83	0.00
120.00	5.07	2.86	4.83	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 29

Summary for Subcatchment 2: Ex. Drainage Area 2

[47] Hint: Peak is 107% of capacity of segment #4

Runoff = 7.76 cfs @ 12.19 hrs, Volume= 0.785 af, Depth= 4.71"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.0
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
1.907	98	Paved parking, HSG C
0.034	74	>75% Grass cover, Good, HSG C
0.057	70	Woods, Good, HSG C
1.998	97	Weighted Average
0.091	71	4.55% Pervious Area
1.907	98	95.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	75	0.0120	0.13		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
1.2	53	0.0120	0.77		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
0.7	89	0.0120	2.22		Shallow Concentrated Flow, DE - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	176	0.0090	5.90	7.24	Pipe Channel, EF - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
11.7	393	Total			

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

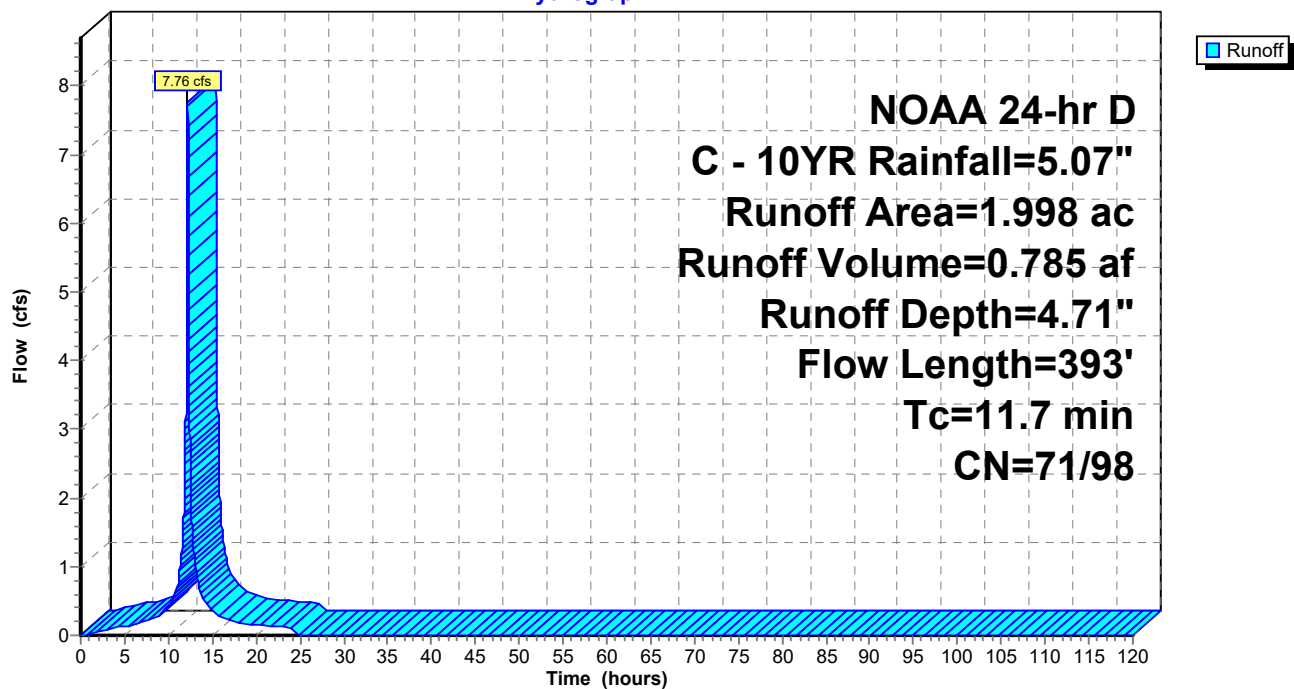
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 30

Subcatchment 2: Ex. Drainage Area 2

Hydrograph



210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 31

Hydrograph for Subcatchment 2: Ex. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.13
10.00	1.01	0.01	0.80	0.42
15.00	4.27	1.58	4.03	0.35
20.00	4.80	1.97	4.57	0.16
25.00	5.07	2.17	4.83	0.00
30.00	5.07	2.17	4.83	0.00
35.00	5.07	2.17	4.83	0.00
40.00	5.07	2.17	4.83	0.00
45.00	5.07	2.17	4.83	0.00
50.00	5.07	2.17	4.83	0.00
55.00	5.07	2.17	4.83	0.00
60.00	5.07	2.17	4.83	0.00
65.00	5.07	2.17	4.83	0.00
70.00	5.07	2.17	4.83	0.00
75.00	5.07	2.17	4.83	0.00
80.00	5.07	2.17	4.83	0.00
85.00	5.07	2.17	4.83	0.00
90.00	5.07	2.17	4.83	0.00
95.00	5.07	2.17	4.83	0.00
100.00	5.07	2.17	4.83	0.00
105.00	5.07	2.17	4.83	0.00
110.00	5.07	2.17	4.83	0.00
115.00	5.07	2.17	4.83	0.00
120.00	5.07	2.17	4.83	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 32

Summary for Subcatchment 3: Ex. Drainage Area 3

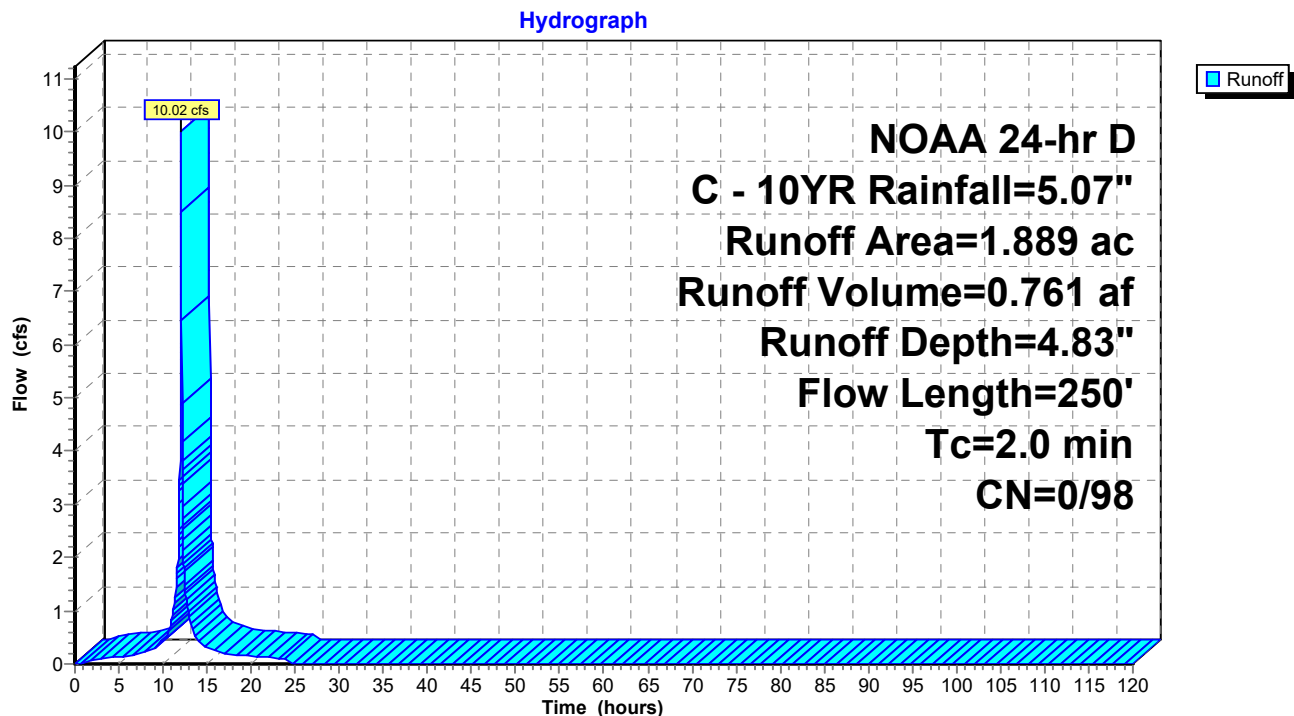
[47] Hint: Peak is 111% of capacity of segment #2

Runoff = 10.02 cfs @ 12.10 hrs, Volume= 0.761 af, Depth= 4.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
* 0.843	98	Roofs
0.222	98	Paved parking, HSG C
0.824	98	Paved parking, HSG D
1.889	98	Weighted Average
1.889	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	170	0.0210	1.60		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	80	0.0140	7.36	9.03	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
2.0	250	Total			

Subcatchment 3: Ex. Drainage Area 3

210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 33

Hydrograph for Subcatchment 3: Ex. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.13
10.00	1.01	0.00	0.80	0.44
15.00	4.27	0.00	4.03	0.31
20.00	4.80	0.00	4.57	0.15
25.00	5.07	0.00	4.83	0.00
30.00	5.07	0.00	4.83	0.00
35.00	5.07	0.00	4.83	0.00
40.00	5.07	0.00	4.83	0.00
45.00	5.07	0.00	4.83	0.00
50.00	5.07	0.00	4.83	0.00
55.00	5.07	0.00	4.83	0.00
60.00	5.07	0.00	4.83	0.00
65.00	5.07	0.00	4.83	0.00
70.00	5.07	0.00	4.83	0.00
75.00	5.07	0.00	4.83	0.00
80.00	5.07	0.00	4.83	0.00
85.00	5.07	0.00	4.83	0.00
90.00	5.07	0.00	4.83	0.00
95.00	5.07	0.00	4.83	0.00
100.00	5.07	0.00	4.83	0.00
105.00	5.07	0.00	4.83	0.00
110.00	5.07	0.00	4.83	0.00
115.00	5.07	0.00	4.83	0.00
120.00	5.07	0.00	4.83	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 34

Summary for Subcatchment 5S: Ex. Drainage Area 4

Runoff = 0.87 cfs @ 12.17 hrs, Volume= 0.079 af, Depth= 3.65"

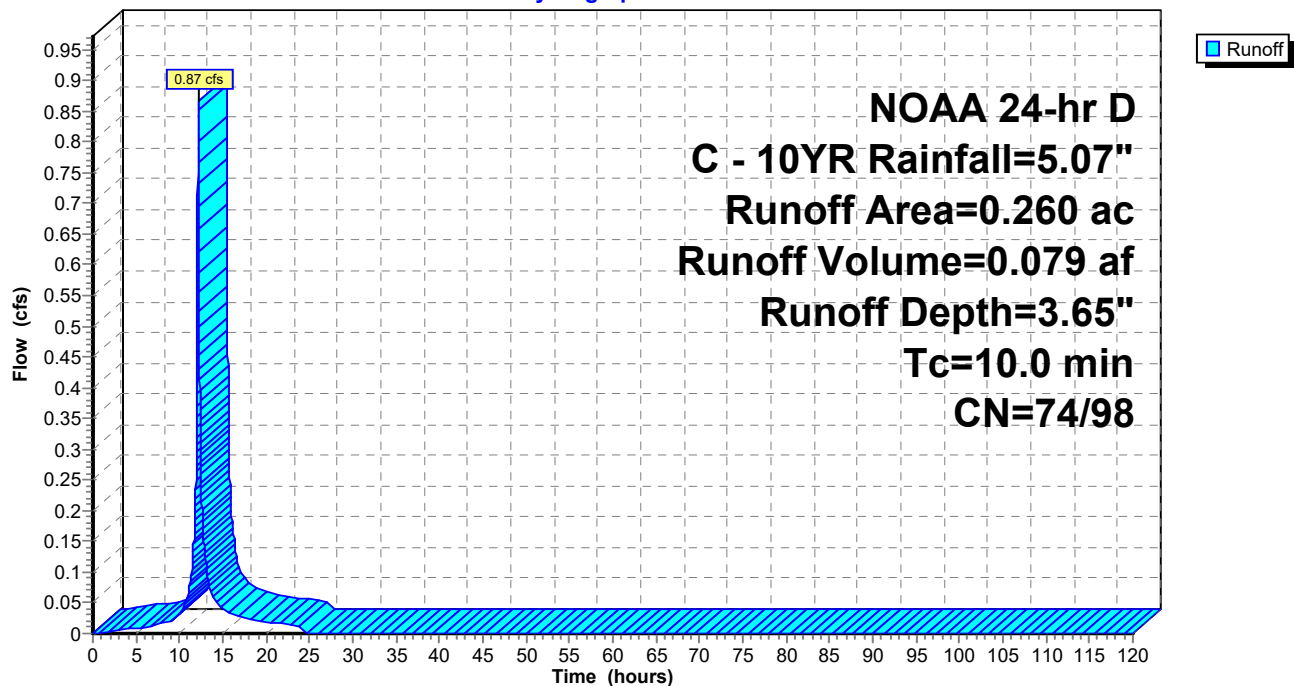
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
* 0.132	98	Paved parking
0.128	74	>75% Grass cover, Good, HSG C
0.260	86	Weighted Average
0.128	74	49.23% Pervious Area
0.132	98	50.77% Impervious Area

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

Subcatchment 5S: Ex. Drainage Area 4

Hydrograph



210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 35

Hydrograph for Subcatchment 5S: Ex. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.01
10.00	1.01	0.02	0.80	0.03
15.00	4.27	1.79	4.03	0.04
20.00	4.80	2.21	4.57	0.02
25.00	5.07	2.42	4.83	0.00
30.00	5.07	2.42	4.83	0.00
35.00	5.07	2.42	4.83	0.00
40.00	5.07	2.42	4.83	0.00
45.00	5.07	2.42	4.83	0.00
50.00	5.07	2.42	4.83	0.00
55.00	5.07	2.42	4.83	0.00
60.00	5.07	2.42	4.83	0.00
65.00	5.07	2.42	4.83	0.00
70.00	5.07	2.42	4.83	0.00
75.00	5.07	2.42	4.83	0.00
80.00	5.07	2.42	4.83	0.00
85.00	5.07	2.42	4.83	0.00
90.00	5.07	2.42	4.83	0.00
95.00	5.07	2.42	4.83	0.00
100.00	5.07	2.42	4.83	0.00
105.00	5.07	2.42	4.83	0.00
110.00	5.07	2.42	4.83	0.00
115.00	5.07	2.42	4.83	0.00
120.00	5.07	2.42	4.83	0.00

210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 36

Summary for Pond 5P: Pipe Storage

Inflow Area = 1.998 ac, 95.45% Impervious, Inflow Depth = 4.71" for C - 10YR event
 Inflow = 7.76 cfs @ 12.19 hrs, Volume= 0.785 af
 Outflow = 7.34 cfs @ 12.22 hrs, Volume= 0.784 af, Atten= 5%, Lag= 2.0 min
 Primary = 7.34 cfs @ 12.22 hrs, Volume= 0.784 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 116.93' @ 12.23 hrs Surf.Area= 0.005 ac Storage= 0.073 af

Plug-Flow detention time= 14.6 min calculated for 0.784 af (100% of inflow)
 Center-of-Mass det. time= 14.4 min (771.0 - 756.6)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	0.031 af	36.0" Round Pipe Storage x 2 L= 97.0'
#2	113.00'	0.022 af	36.0" Round Pipe Storage L= 135.0'
#3	113.00'	0.028 af	Custom Stage Data (Prismatic) Listed below (Recalc) x 5
		0.081 af	Total Available Storage

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	0.001	0.000	0.000
118.62	0.001	0.006	0.006

Device	Routing	Invert	Outlet Devices
#1	Primary	113.00'	15.0" Round Culvert L= 61.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 113.00' / 112.96' S= 0.0007 ' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	118.55'	48.0" x 42.0" Horiz. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.34 cfs @ 12.22 hrs HW=116.93' TW=115.30' (Dynamic Tailwater)

1=Culvert (Outlet Controls 7.34 cfs @ 5.98 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

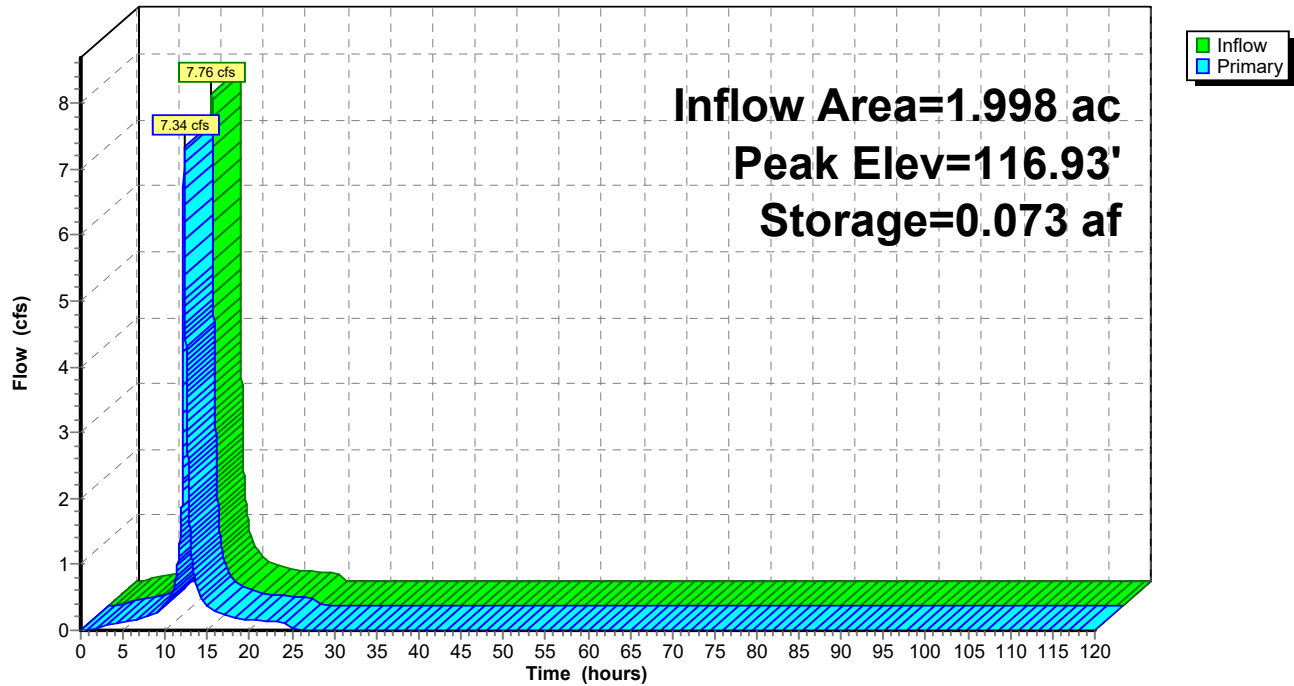
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 37

Pond 5P: Pipe Storage

Hydrograph



210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 38

Hydrograph for Pond 5P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	113.00	0.00
5.00	0.13	0.004	113.29	0.13
10.00	0.42	0.009	113.51	0.39
15.00	0.35	0.008	113.49	0.37
20.00	0.16	0.005	113.32	0.16
25.00	0.00	0.001	113.11	0.01
30.00	0.00	0.000	113.02	0.00
35.00	0.00	0.000	113.01	0.00
40.00	0.00	0.000	113.01	0.00
45.00	0.00	0.000	113.01	0.00
50.00	0.00	0.000	113.00	0.00
55.00	0.00	0.000	113.00	0.00
60.00	0.00	0.000	113.00	0.00
65.00	0.00	0.000	113.00	0.00
70.00	0.00	0.000	113.00	0.00
75.00	0.00	0.000	113.00	0.00
80.00	0.00	0.000	113.00	0.00
85.00	0.00	0.000	113.00	0.00
90.00	0.00	0.000	113.00	0.00
95.00	0.00	0.000	113.00	0.00
100.00	0.00	0.000	113.00	0.00
105.00	0.00	0.000	113.00	0.00
110.00	0.00	0.000	113.00	0.00
115.00	0.00	0.000	113.00	0.00
120.00	0.00	0.000	113.00	0.00

210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 39

Summary for Pond 6P: Pipe Storage

Inflow Area = 3.887 ac, 97.66% Impervious, Inflow Depth = 4.77" for C - 10YR event
 Inflow = 12.83 cfs @ 12.10 hrs, Volume= 1.545 af
 Outflow = 9.65 cfs @ 12.25 hrs, Volume= 1.545 af, Atten= 25%, Lag= 8.9 min
 Primary = 9.65 cfs @ 12.25 hrs, Volume= 1.545 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 115.33' @ 12.25 hrs Surf.Area= 0.048 ac Storage= 0.117 af

Plug-Flow detention time= 13.6 min calculated for 1.545 af (100% of inflow)
 Center-of-Mass det. time= 13.5 min (771.8 - 758.4)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.65 cfs @ 12.25 hrs HW=115.33' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 9.65 cfs @ 5.46 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

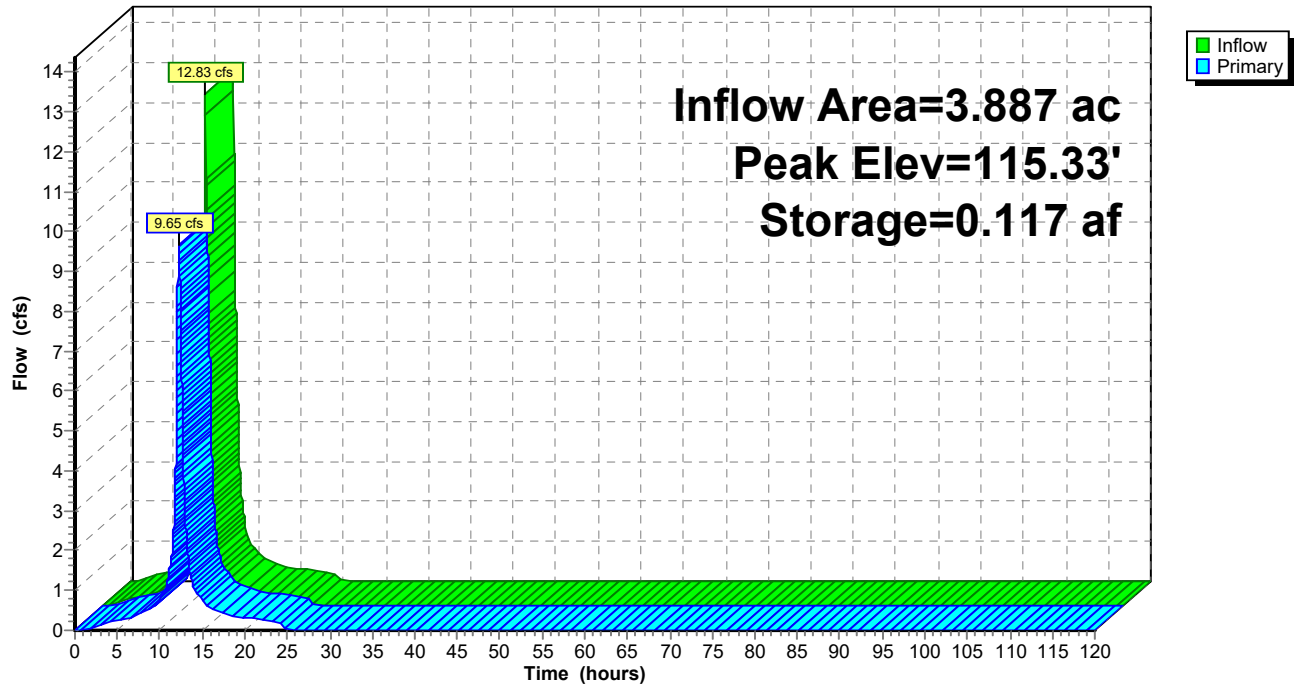
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 40

Pond 6P: Pipe Storage

Hydrograph



210600 Existing Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 41

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.26	0.008	113.21	0.25
10.00	0.83	0.016	113.41	0.78
15.00	0.69	0.015	113.40	0.74
20.00	0.31	0.009	113.24	0.31
25.00	0.01	0.003	113.07	0.04
30.00	0.00	0.000	112.98	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.97	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 42

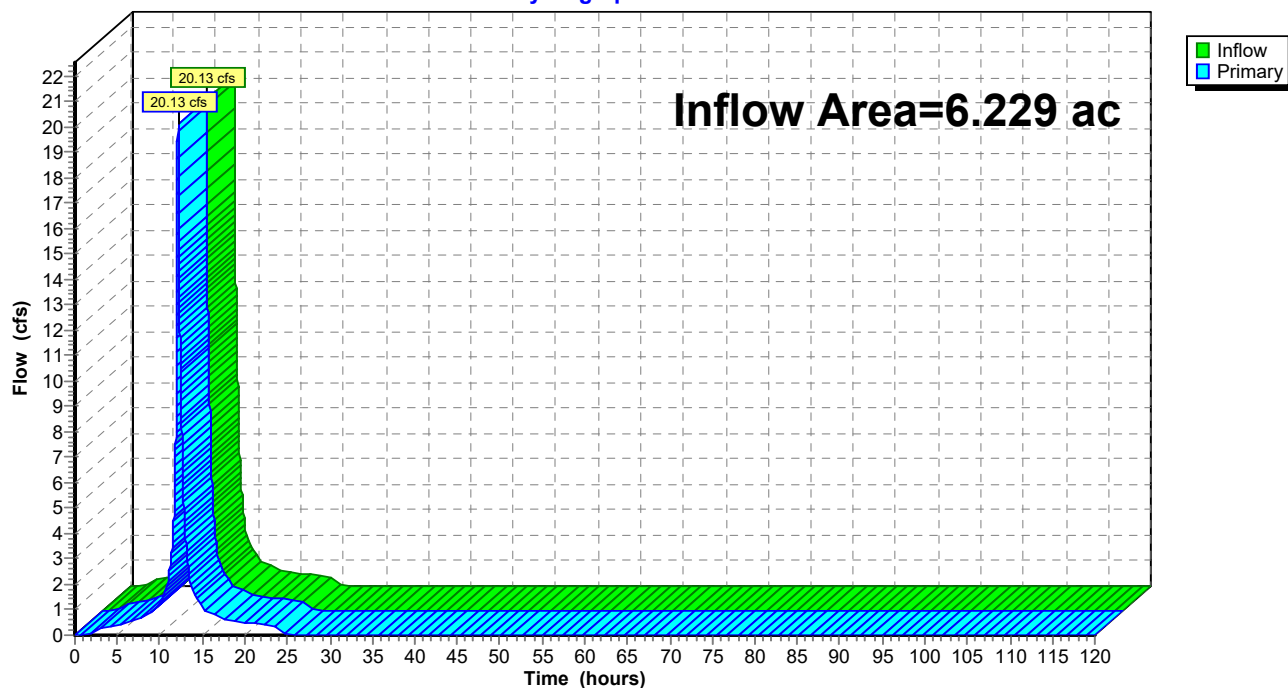
Summary for Link 4L: Analysis Point 1

Inflow Area = 6.229 ac, 95.26% Impervious, Inflow Depth = 4.73" for C - 10YR event
Inflow = 20.13 cfs @ 12.13 hrs, Volume= 2.455 af
Primary = 20.13 cfs @ 12.13 hrs, Volume= 2.455 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 1

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 43

Hydrograph for Link 4L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.12	0.00	0.12	106.00	0.00	0.00	0.00
4.00	0.34	0.00	0.34	108.00	0.00	0.00	0.00
6.00	0.45	0.00	0.45	110.00	0.00	0.00	0.00
8.00	0.72	0.00	0.72	112.00	0.00	0.00	0.00
10.00	1.29	0.00	1.29	114.00	0.00	0.00	0.00
12.00	12.19	0.00	12.19	116.00	0.00	0.00	0.00
14.00	1.66	0.00	1.66	118.00	0.00	0.00	0.00
16.00	0.88	0.00	0.88	120.00	0.00	0.00	0.00
18.00	0.60	0.00	0.60				
20.00	0.49	0.00	0.49				
22.00	0.42	0.00	0.42				
24.00	0.36	0.00	0.36				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 44

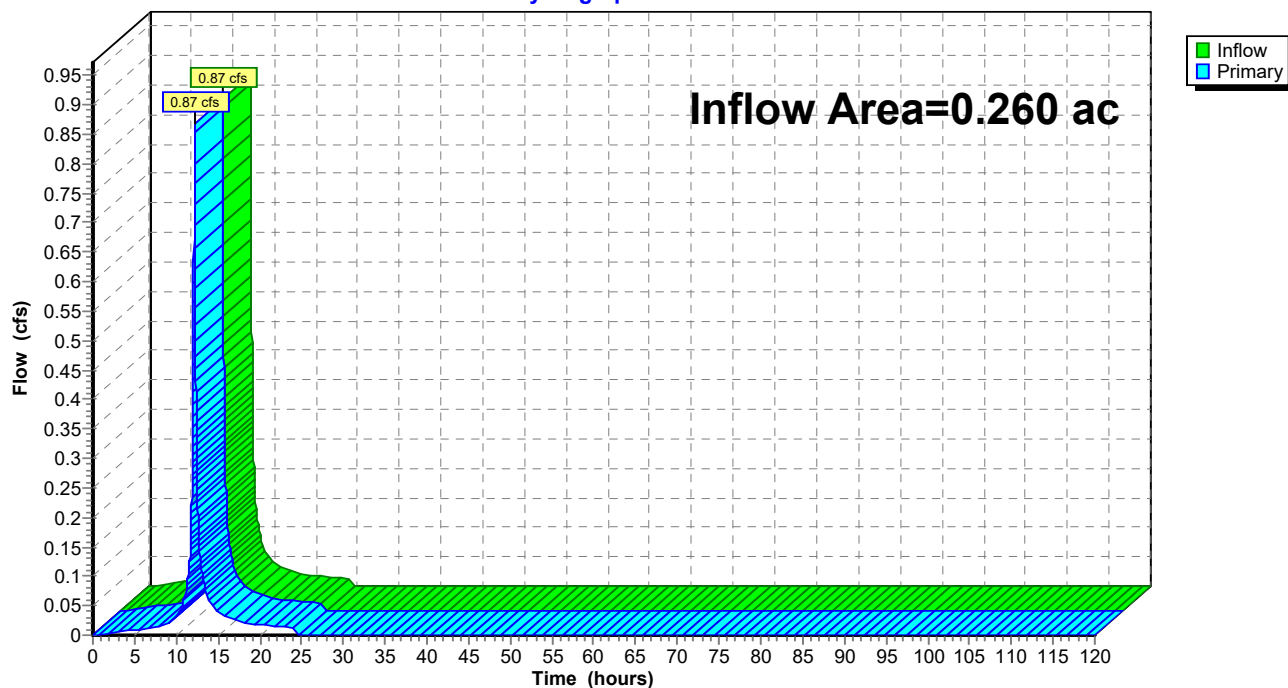
Summary for Link 6L: Analysis Point 2

Inflow Area = 0.260 ac, 50.77% Impervious, Inflow Depth = 3.65" for C - 10YR event
Inflow = 0.87 cfs @ 12.17 hrs, Volume= 0.079 af
Primary = 0.87 cfs @ 12.17 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 6L: Analysis Point 2

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 45

Hydrograph for Link 6L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.01	0.00	0.01	108.00	0.00	0.00	0.00
6.00	0.01	0.00	0.01	110.00	0.00	0.00	0.00
8.00	0.02	0.00	0.02	112.00	0.00	0.00	0.00
10.00	0.03	0.00	0.03	114.00	0.00	0.00	0.00
12.00	0.39	0.00	0.39	116.00	0.00	0.00	0.00
14.00	0.06	0.00	0.06	118.00	0.00	0.00	0.00
16.00	0.03	0.00	0.03	120.00	0.00	0.00	0.00
18.00	0.02	0.00	0.02				
20.00	0.02	0.00	0.02				
22.00	0.02	0.00	0.02				
24.00	0.01	0.00	0.01				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 46

Summary for Subcatchment 1: Ex. Drainage Area 1

[47] Hint: Peak is 209% of capacity of segment #2

Runoff = 18.98 cfs @ 12.13 hrs, Volume= 1.577 af, Depth= 8.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.0
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
* 0.145	98	Roofs
* 1.993	98	Paved parking
0.037	74	>75% Grass cover, Good, HSG C
0.167	80	>75% Grass cover, Good, HSG D
2.342	96	Weighted Average
0.204	79	8.71% Pervious Area
2.138	98	91.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	289	0.0120	1.42		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	25	0.0465	11.56	9.08	Pipe Channel, BC - Pipe Flow 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.4	500	0.0010	3.53	24.93	Pipe Channel, CD - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.8	814	Total			

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

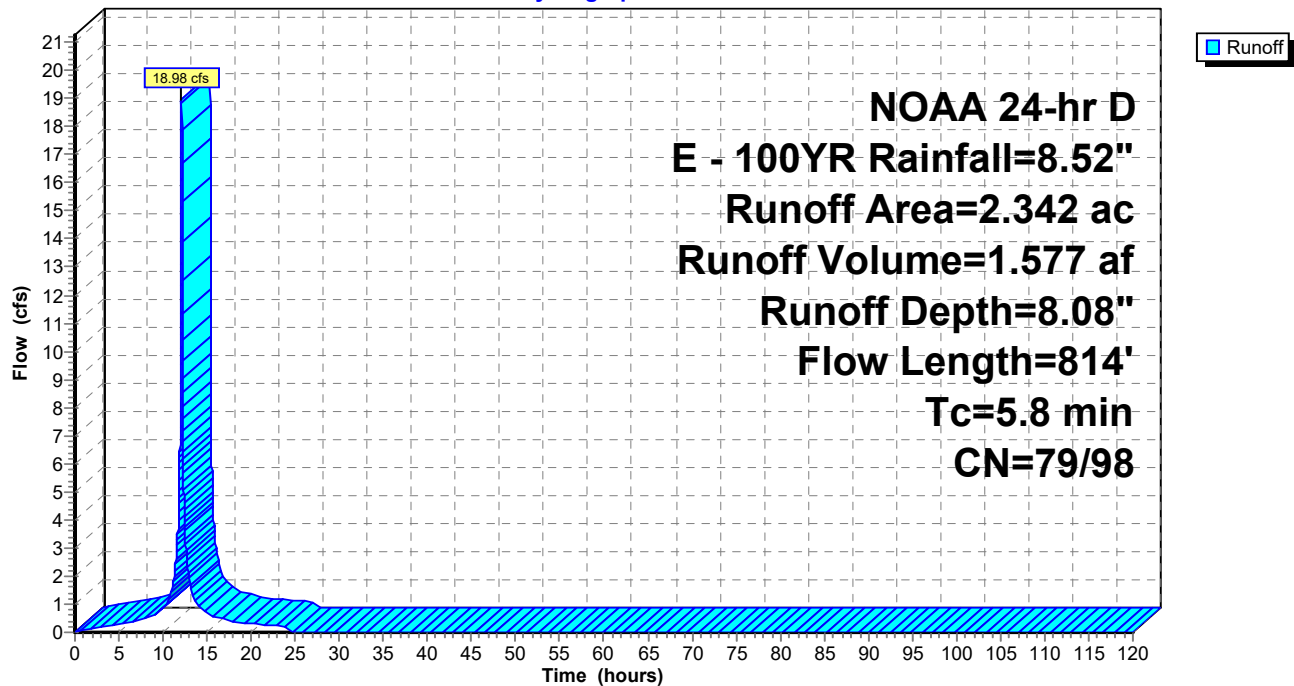
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 47

Subcatchment 1: Ex. Drainage Area 1

Hydrograph



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 48

Hydrograph for Subcatchment 1: Ex. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.28
10.00	1.69	0.35	1.47	0.88
15.00	7.17	4.74	6.93	0.66
20.00	8.07	5.58	7.83	0.31
25.00	8.52	5.99	8.28	0.00
30.00	8.52	5.99	8.28	0.00
35.00	8.52	5.99	8.28	0.00
40.00	8.52	5.99	8.28	0.00
45.00	8.52	5.99	8.28	0.00
50.00	8.52	5.99	8.28	0.00
55.00	8.52	5.99	8.28	0.00
60.00	8.52	5.99	8.28	0.00
65.00	8.52	5.99	8.28	0.00
70.00	8.52	5.99	8.28	0.00
75.00	8.52	5.99	8.28	0.00
80.00	8.52	5.99	8.28	0.00
85.00	8.52	5.99	8.28	0.00
90.00	8.52	5.99	8.28	0.00
95.00	8.52	5.99	8.28	0.00
100.00	8.52	5.99	8.28	0.00
105.00	8.52	5.99	8.28	0.00
110.00	8.52	5.99	8.28	0.00
115.00	8.52	5.99	8.28	0.00
120.00	8.52	5.99	8.28	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 49

Summary for Subcatchment 2: Ex. Drainage Area 2

[47] Hint: Peak is 182% of capacity of segment #4

Runoff = 13.22 cfs @ 12.19 hrs, Volume= 1.354 af, Depth= 8.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.0
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
1.907	98	Paved parking, HSG C
0.034	74	>75% Grass cover, Good, HSG C
0.057	70	Woods, Good, HSG C
1.998	97	Weighted Average
0.091	71	4.55% Pervious Area
1.907	98	95.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	75	0.0120	0.13		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
1.2	53	0.0120	0.77		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
0.7	89	0.0120	2.22		Shallow Concentrated Flow, DE - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	176	0.0090	5.90	7.24	Pipe Channel, EF - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
11.7	393	Total			

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

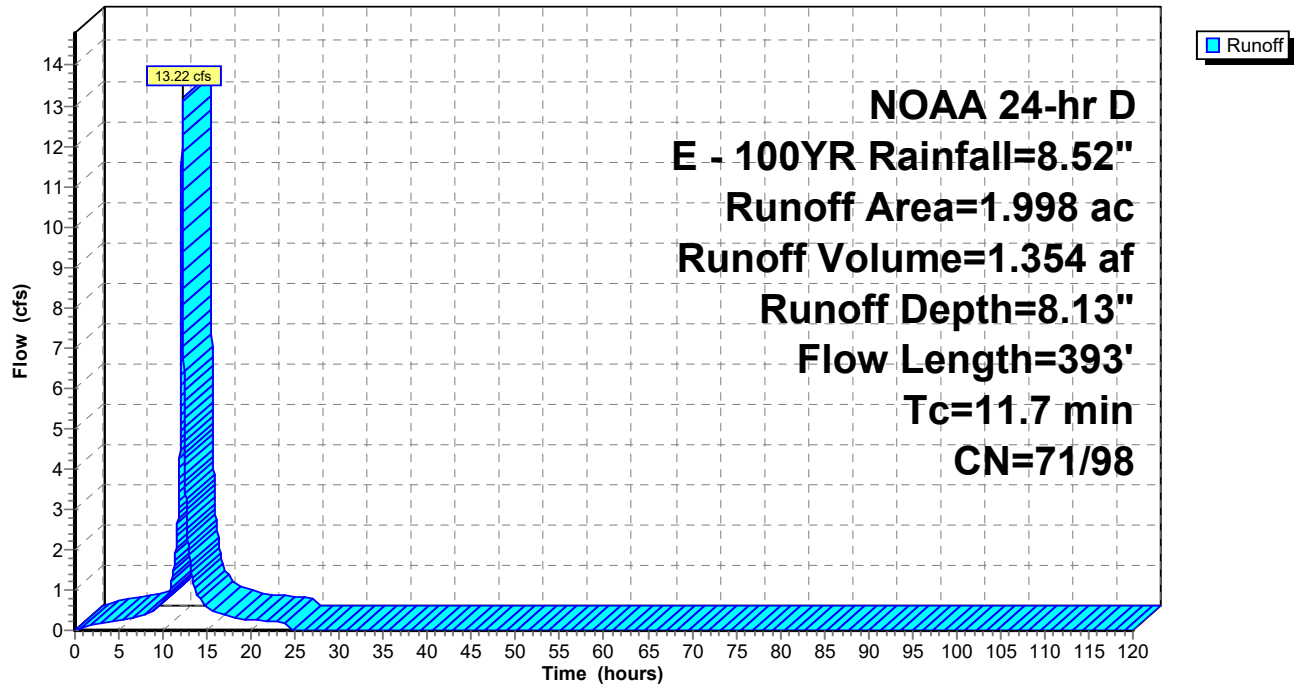
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 50

Subcatchment 2: Ex. Drainage Area 2

Hydrograph



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 51

Hydrograph for Subcatchment 2: Ex. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.25
10.00	1.69	0.15	1.47	0.73
15.00	7.17	3.87	6.93	0.59
20.00	8.07	4.64	7.83	0.26
25.00	8.52	5.03	8.28	0.00
30.00	8.52	5.03	8.28	0.00
35.00	8.52	5.03	8.28	0.00
40.00	8.52	5.03	8.28	0.00
45.00	8.52	5.03	8.28	0.00
50.00	8.52	5.03	8.28	0.00
55.00	8.52	5.03	8.28	0.00
60.00	8.52	5.03	8.28	0.00
65.00	8.52	5.03	8.28	0.00
70.00	8.52	5.03	8.28	0.00
75.00	8.52	5.03	8.28	0.00
80.00	8.52	5.03	8.28	0.00
85.00	8.52	5.03	8.28	0.00
90.00	8.52	5.03	8.28	0.00
95.00	8.52	5.03	8.28	0.00
100.00	8.52	5.03	8.28	0.00
105.00	8.52	5.03	8.28	0.00
110.00	8.52	5.03	8.28	0.00
115.00	8.52	5.03	8.28	0.00
120.00	8.52	5.03	8.28	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 52

Summary for Subcatchment 3: Ex. Drainage Area 3

[47] Hint: Peak is 187% of capacity of segment #2

Runoff = 16.89 cfs @ 12.10 hrs, Volume= 1.303 af, Depth= 8.28"

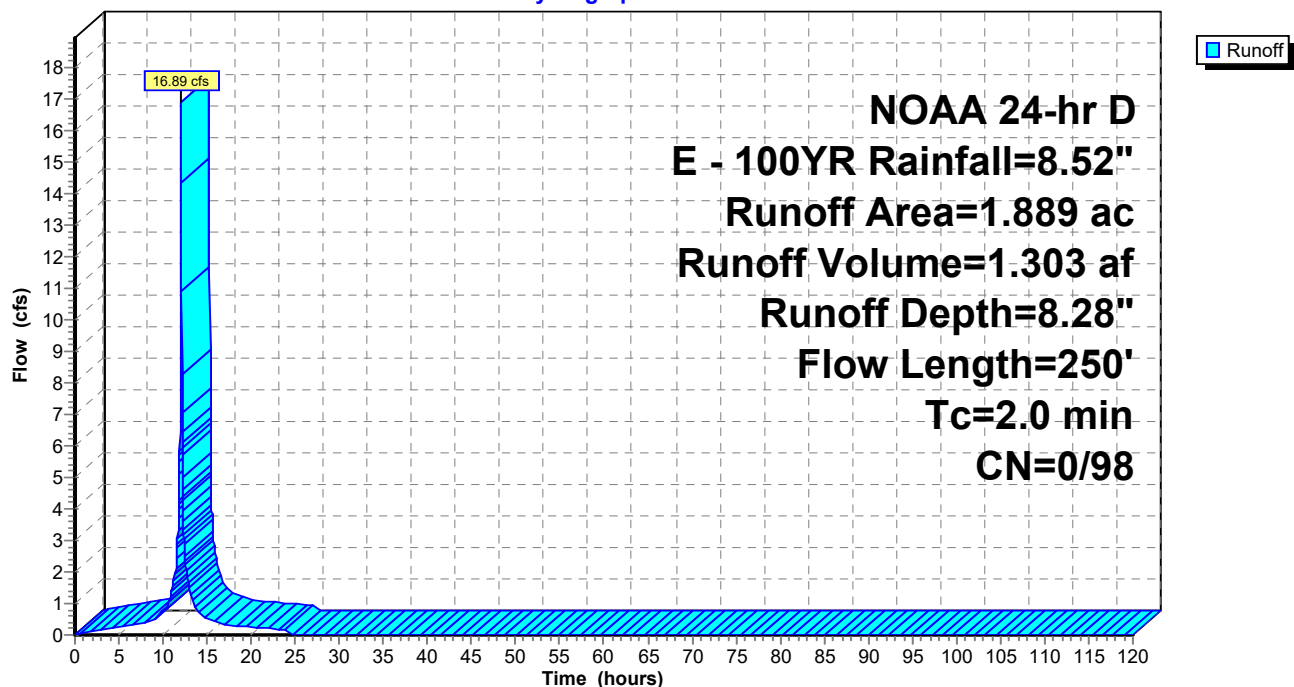
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
* 0.843	98	Roofs
0.222	98	Paved parking, HSG C
0.824	98	Paved parking, HSG D
1.889	98	Weighted Average
1.889	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	170	0.0210	1.60		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	80	0.0140	7.36	9.03	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.011 Concrete pipe, straight & clean
2.0	250	Total			

Subcatchment 3: Ex. Drainage Area 3

Hydrograph



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 53

Hydrograph for Subcatchment 3: Ex. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.25
10.00	1.69	0.00	1.47	0.75
15.00	7.17	0.00	6.93	0.53
20.00	8.07	0.00	7.83	0.25
25.00	8.52	0.00	8.28	0.00
30.00	8.52	0.00	8.28	0.00
35.00	8.52	0.00	8.28	0.00
40.00	8.52	0.00	8.28	0.00
45.00	8.52	0.00	8.28	0.00
50.00	8.52	0.00	8.28	0.00
55.00	8.52	0.00	8.28	0.00
60.00	8.52	0.00	8.28	0.00
65.00	8.52	0.00	8.28	0.00
70.00	8.52	0.00	8.28	0.00
75.00	8.52	0.00	8.28	0.00
80.00	8.52	0.00	8.28	0.00
85.00	8.52	0.00	8.28	0.00
90.00	8.52	0.00	8.28	0.00
95.00	8.52	0.00	8.28	0.00
100.00	8.52	0.00	8.28	0.00
105.00	8.52	0.00	8.28	0.00
110.00	8.52	0.00	8.28	0.00
115.00	8.52	0.00	8.28	0.00
120.00	8.52	0.00	8.28	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 54

Summary for Subcatchment 5S: Ex. Drainage Area 4

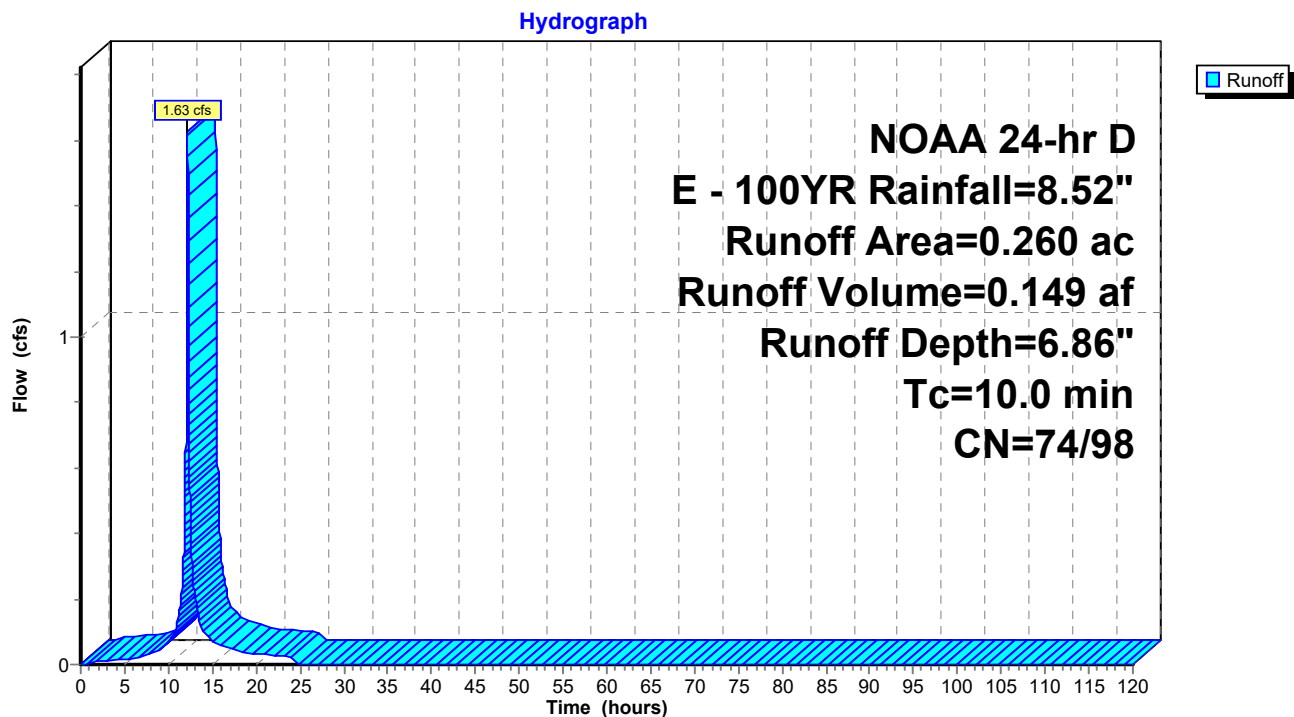
Runoff = 1.63 cfs @ 12.17 hrs, Volume= 0.149 af, Depth= 6.86"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt= 0.01
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
* 0.132	98	Paved parking
0.128	74	>75% Grass cover, Good, HSG C
0.260	86	Weighted Average
0.128	74	49.23% Pervious Area
0.132	98	50.77% Impervious Area

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

Subcatchment 5S: Ex. Drainage Area 4



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 55

Hydrograph for Subcatchment 5S: Ex. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.02
10.00	1.69	0.22	1.47	0.07
15.00	7.17	4.19	6.93	0.07
20.00	8.07	4.99	7.83	0.03
25.00	8.52	5.39	8.28	0.00
30.00	8.52	5.39	8.28	0.00
35.00	8.52	5.39	8.28	0.00
40.00	8.52	5.39	8.28	0.00
45.00	8.52	5.39	8.28	0.00
50.00	8.52	5.39	8.28	0.00
55.00	8.52	5.39	8.28	0.00
60.00	8.52	5.39	8.28	0.00
65.00	8.52	5.39	8.28	0.00
70.00	8.52	5.39	8.28	0.00
75.00	8.52	5.39	8.28	0.00
80.00	8.52	5.39	8.28	0.00
85.00	8.52	5.39	8.28	0.00
90.00	8.52	5.39	8.28	0.00
95.00	8.52	5.39	8.28	0.00
100.00	8.52	5.39	8.28	0.00
105.00	8.52	5.39	8.28	0.00
110.00	8.52	5.39	8.28	0.00
115.00	8.52	5.39	8.28	0.00
120.00	8.52	5.39	8.28	0.00

210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 56

Summary for Pond 5P: Pipe Storage

[93] Warning: Storage range exceeded by 0.03'

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=9)

Inflow Area = 1.998 ac, 95.45% Impervious, Inflow Depth = 8.13" for E - 100YR event
 Inflow = 13.22 cfs @ 12.19 hrs, Volume= 1.354 af
 Outflow = 13.54 cfs @ 12.18 hrs, Volume= 1.354 af, Atten= 0%, Lag= 0.0 min
 Primary = 13.54 cfs @ 12.18 hrs, Volume= 1.354 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 118.65' @ 12.18 hrs Surf.Area= 0.005 ac Storage= 0.081 af

Plug-Flow detention time= 11.9 min calculated for 1.354 af (100% of inflow)
 Center-of-Mass det. time= 12.0 min (761.0 - 749.0)

Volume	Invert	Avail.Storage	Storage Description
#1	113.00'	0.031 af	36.0" Round Pipe Storage x 2 L= 97.0'
#2	113.00'	0.022 af	36.0" Round Pipe Storage L= 135.0'
#3	113.00'	0.028 af	Custom Stage Data (Prismatic) Listed below (Recalc) x 5
		0.081 af	Total Available Storage

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
113.00	0.001	0.000	0.000
118.62	0.001	0.006	0.006

Device	Routing	Invert	Outlet Devices
#1	Primary	113.00'	15.0" Round Culvert L= 61.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 113.00' / 112.96' S= 0.0007 ' S= 0.0007 ' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	118.55'	48.0" x 42.0" Horiz. Orifice/Grate X 5.00 C= 0.600 Limited to weir flow at low heads

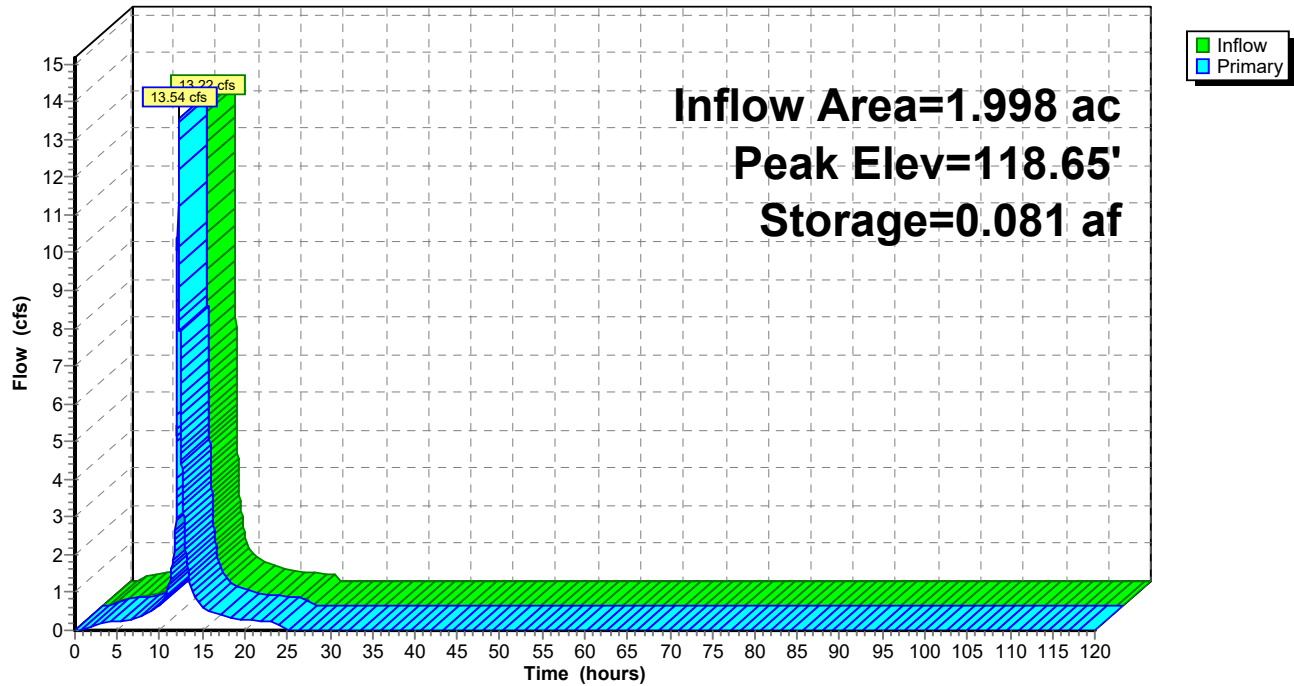
Primary OutFlow Max=13.50 cfs @ 12.18 hrs HW=118.65' TW=117.47' (Dynamic Tailwater)

1=Culvert (Outlet Controls 6.25 cfs @ 5.09 fps)

2=Orifice/Grate (Weir Controls 7.25 cfs @ 1.01 fps)

Pond 5P: Pipe Storage

Hydrograph



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 58

Hydrograph for Pond 5P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	113.00	0.00
5.00	0.25	0.006	113.39	0.24
10.00	0.73	0.012	113.68	0.69
15.00	0.59	0.012	113.64	0.63
20.00	0.26	0.007	113.42	0.27
25.00	0.00	0.001	113.12	0.02
30.00	0.00	0.000	113.02	0.00
35.00	0.00	0.000	113.01	0.00
40.00	0.00	0.000	113.01	0.00
45.00	0.00	0.000	113.01	0.00
50.00	0.00	0.000	113.00	0.00
55.00	0.00	0.000	113.00	0.00
60.00	0.00	0.000	113.00	0.00
65.00	0.00	0.000	113.00	0.00
70.00	0.00	0.000	113.00	0.00
75.00	0.00	0.000	113.00	0.00
80.00	0.00	0.000	113.00	0.00
85.00	0.00	0.000	113.00	0.00
90.00	0.00	0.000	113.00	0.00
95.00	0.00	0.000	113.00	0.00
100.00	0.00	0.000	113.00	0.00
105.00	0.00	0.000	113.00	0.00
110.00	0.00	0.000	113.00	0.00
115.00	0.00	0.000	113.00	0.00
120.00	0.00	0.000	113.00	0.00

210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 59

Summary for Pond 6P: Pipe Storage

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 3.887 ac, 97.66% Impervious, Inflow Depth = 8.20" for E - 100YR event
 Inflow = 27.34 cfs @ 12.10 hrs, Volume= 2.657 af
 Outflow = 28.17 cfs @ 12.10 hrs, Volume= 2.657 af, Atten= 0%, Lag= 0.0 min
 Primary = 28.17 cfs @ 12.10 hrs, Volume= 2.657 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 117.53' @ 12.10 hrs Surf.Area= 0.014 ac Storage= 0.163 af

Plug-Flow detention time= 11.5 min calculated for 2.657 af (100% of inflow)
 Center-of-Mass det. time= 11.4 min (760.8 - 749.5)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 ' / Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=27.72 cfs @ 12.10 hrs HW=117.52' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Barrel Controls 16.44 cfs @ 9.30 fps)
 — **2=Orifice/Grate** (Weir Controls 11.28 cfs @ 1.00 fps)

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

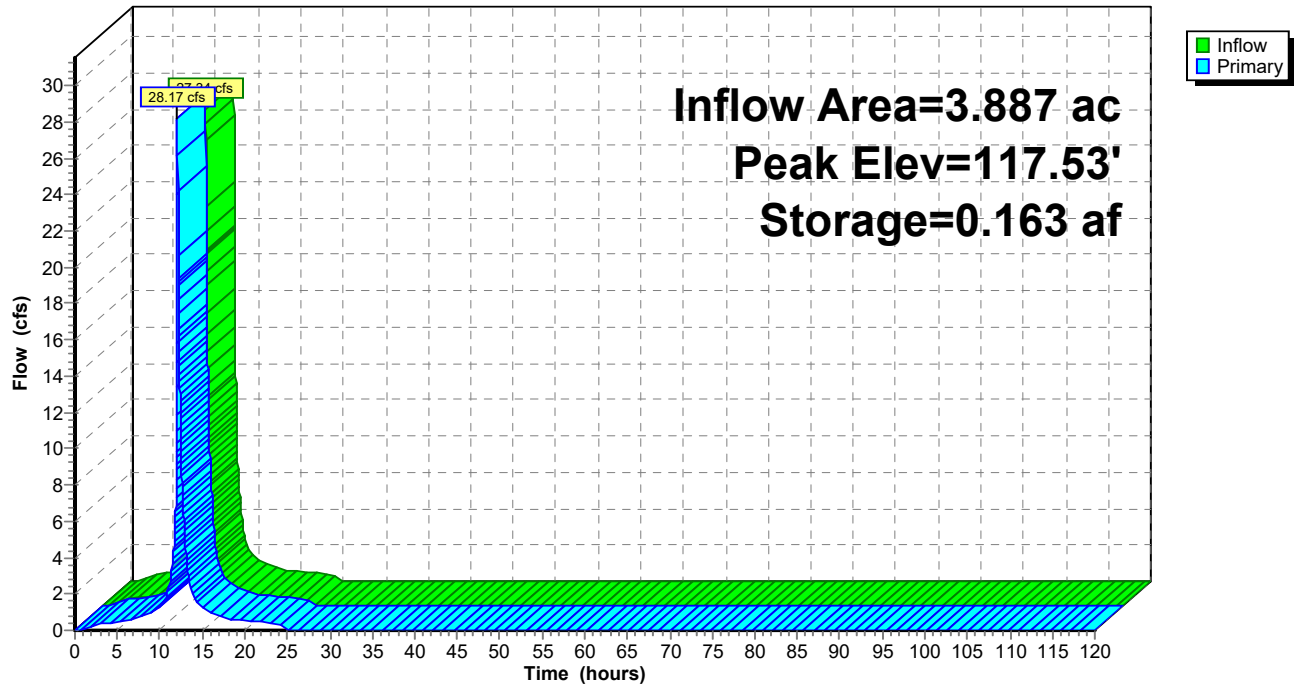
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 60

Pond 6P: Pipe Storage

Hydrograph



210600 Existing Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 61

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.49	0.011	113.31	0.48
10.00	1.44	0.023	113.57	1.37
15.00	1.16	0.021	113.54	1.23
20.00	0.52	0.012	113.33	0.52
25.00	0.02	0.003	113.08	0.05
30.00	0.00	0.000	112.98	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.97	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 62

Summary for Link 4L: Analysis Point 1

Inflow Area = 6.229 ac, 95.26% Impervious, Inflow Depth = 8.16" for E - 100YR event

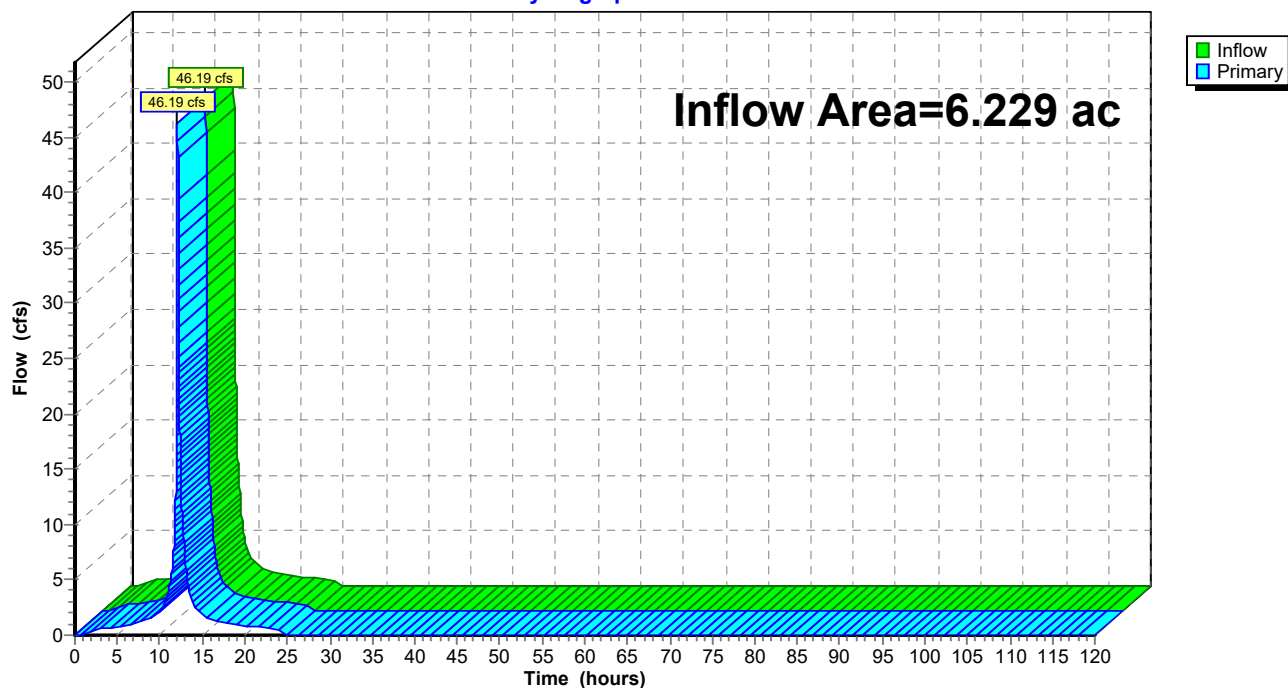
Inflow = 46.19 cfs @ 12.10 hrs, Volume= 4.234 af

Primary = 46.19 cfs @ 12.10 hrs, Volume= 4.234 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 1

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 63

Hydrograph for Link 4L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.38	0.00	0.38	106.00	0.00	0.00	0.00
4.00	0.67	0.00	0.67	108.00	0.00	0.00	0.00
6.00	0.83	0.00	0.83	110.00	0.00	0.00	0.00
8.00	1.28	0.00	1.28	112.00	0.00	0.00	0.00
10.00	2.25	0.00	2.25	114.00	0.00	0.00	0.00
12.00	19.79	0.00	19.79	116.00	0.00	0.00	0.00
14.00	2.78	0.00	2.78	118.00	0.00	0.00	0.00
16.00	1.48	0.00	1.48	120.00	0.00	0.00	0.00
18.00	1.01	0.00	1.01				
20.00	0.83	0.00	0.83				
22.00	0.72	0.00	0.72				
24.00	0.60	0.00	0.60				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 64

Summary for Link 6L: Analysis Point 2

Inflow Area = 0.260 ac, 50.77% Impervious, Inflow Depth = 6.86" for E - 100YR event

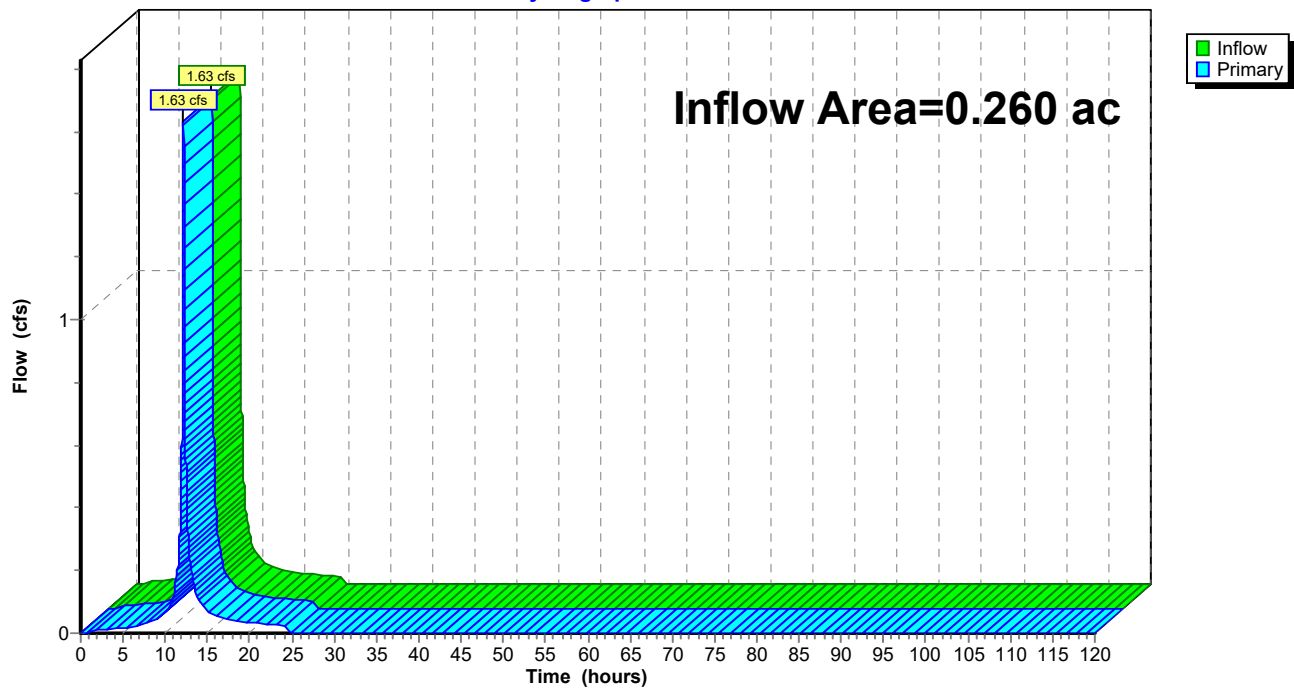
Inflow = 1.63 cfs @ 12.17 hrs, Volume= 0.149 af

Primary = 1.63 cfs @ 12.17 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 6L: Analysis Point 2

Hydrograph



210600 Existing Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

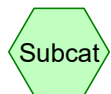
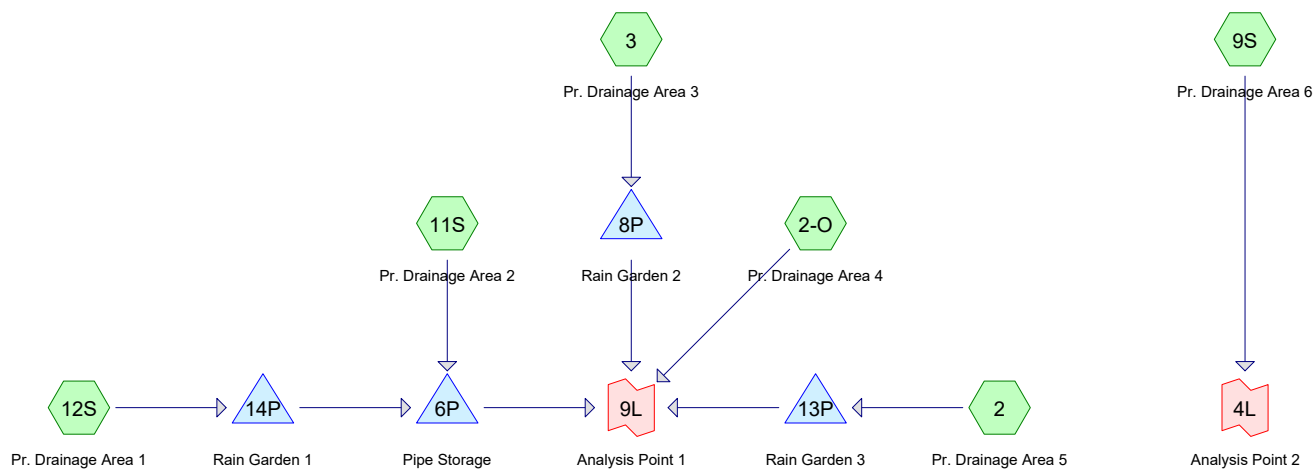
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 65

Hydrograph for Link 6L: Analysis Point 2

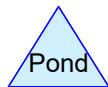
Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.01	0.00	0.01	106.00	0.00	0.00	0.00
4.00	0.02	0.00	0.02	108.00	0.00	0.00	0.00
6.00	0.02	0.00	0.02	110.00	0.00	0.00	0.00
8.00	0.03	0.00	0.03	112.00	0.00	0.00	0.00
10.00	0.07	0.00	0.07	114.00	0.00	0.00	0.00
12.00	0.75	0.00	0.75	116.00	0.00	0.00	0.00
14.00	0.10	0.00	0.10	118.00	0.00	0.00	0.00
16.00	0.06	0.00	0.06	120.00	0.00	0.00	0.00
18.00	0.04	0.00	0.04				
20.00	0.03	0.00	0.03				
22.00	0.03	0.00	0.03				
24.00	0.02	0.00	0.02				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				



Subcat



Reach



Pond



Link

Routing Diagram for 210600 Proposed Conditions

Prepared by Maser Consulting, Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2
2	B - 2YR	NOAA 24-hr	D	Default	24.00	1	3.32	2
3	C - 10YR	NOAA 24-hr	D	Default	24.00	1	5.07	2
4	D - 25YR	NOAA 24-hr	D	Default	24.00	1	6.29	2
5	E - 100YR	NOAA 24-hr	D	Default	24.00	1	8.52	2

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 3

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.494	74	>75% Grass cover, Good, HSG C (2, 2-O, 9S, 11S, 12S)
0.586	80	>75% Grass cover, Good, HSG D (2-O, 3, 11S)
4.049	98	Paved parking (2, 2-O, 3, 11S, 12S)
1.360	98	Roofs (2-O, 11S)
6.489	95	TOTAL AREA

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.494	0.586	0.000	1.080	>75% Grass cover, Good	2, 2-O, 3, 9S, 11S, 12S
0.000	0.000	0.000	0.000	4.049	4.049	Paved parking	2, 2-O, 3, 11S, 12S
0.000	0.000	0.000	0.000	1.360	1.360	Roofs	2-O, 11S
0.000	0.000	0.494	0.586	5.409	6.489	TOTAL AREA	

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2-O	0.00	0.00	181.0	0.0750	0.012	15.0	0.0	0.0
2	2-O	0.00	0.00	45.0	0.0100	0.012	15.0	0.0	0.0
3	2-O	0.00	0.00	22.0	0.0100	0.012	18.0	0.0	0.0
4	2-O	0.00	0.00	499.0	0.0010	0.015	36.0	0.0	0.0
5	11S	0.00	0.00	70.0	0.0100	0.012	15.0	0.0	0.0
6	6P	112.96	112.68	54.0	0.0052	0.013	18.0	0.0	0.0
7	8P	113.50	113.34	16.0	0.0100	0.013	15.0	0.0	0.0
8	13P	115.00	114.04	194.0	0.0049	0.013	15.0	0.0	0.0
9	14P	113.52	113.00	104.0	0.0050	0.013	15.0	0.0	0.0

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 6

Summary for Subcatchment 2: Pr. Drainage Area 5

Runoff = 1.08 cfs @ 12.13 hrs, Volume= 0.101 af, Depth= 2.31"

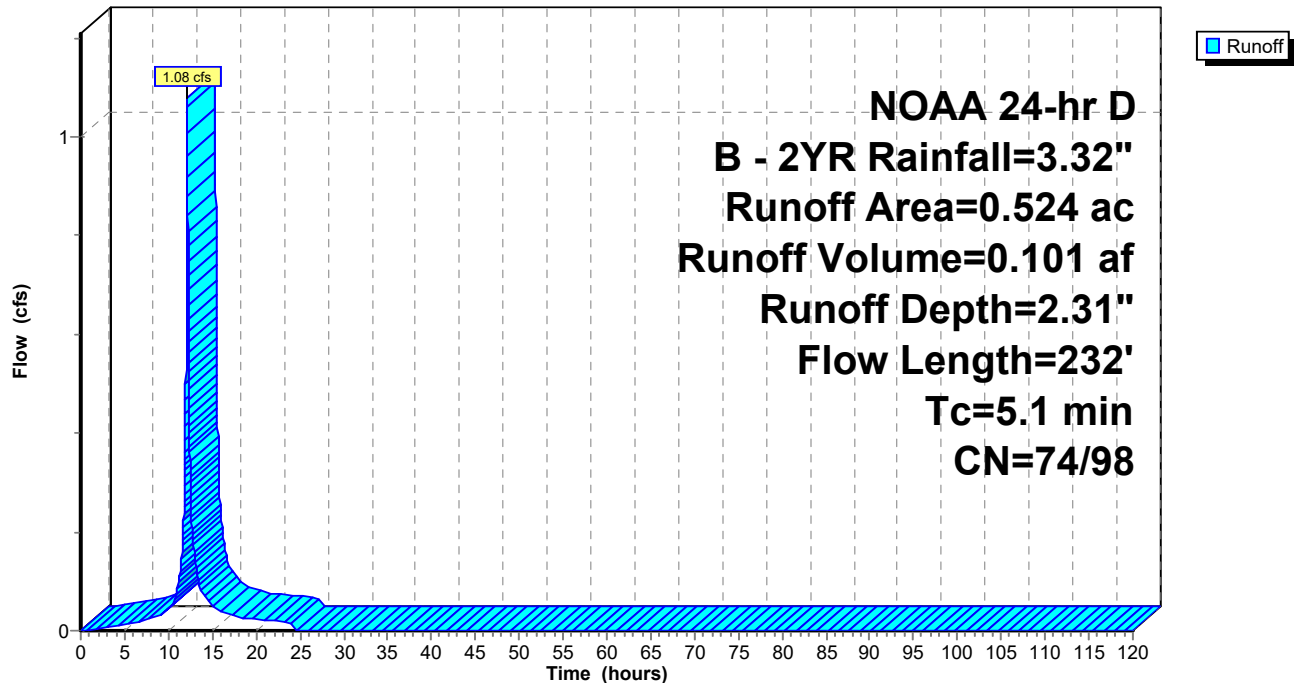
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
* 0.317	98	Paved parking
0.207	74	>75% Grass cover, Good, HSG C
0.524	89	Weighted Average
0.207	74	39.50% Pervious Area
0.317	98	60.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow
					Grass: Short n= 0.150 P2= 3.38"
2.7	207	0.0110	1.29		Sheet Flow, BC - Sheet Flow
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	12	0.2500	3.50		Shallow Concentrated Flow, CD - Shallow. Conc. Flow
					Short Grass Pasture Kv= 7.0 fps
5.1	232	Total			

Subcatchment 2: Pr. Drainage Area 5

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 7

Hydrograph for Subcatchment 2: Pr. Drainage Area 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.00	0.46	0.05
15.00	2.79	0.78	2.56	0.05
20.00	3.15	1.00	2.91	0.02
25.00	3.32	1.12	3.09	0.00
30.00	3.32	1.12	3.09	0.00
35.00	3.32	1.12	3.09	0.00
40.00	3.32	1.12	3.09	0.00
45.00	3.32	1.12	3.09	0.00
50.00	3.32	1.12	3.09	0.00
55.00	3.32	1.12	3.09	0.00
60.00	3.32	1.12	3.09	0.00
65.00	3.32	1.12	3.09	0.00
70.00	3.32	1.12	3.09	0.00
75.00	3.32	1.12	3.09	0.00
80.00	3.32	1.12	3.09	0.00
85.00	3.32	1.12	3.09	0.00
90.00	3.32	1.12	3.09	0.00
95.00	3.32	1.12	3.09	0.00
100.00	3.32	1.12	3.09	0.00
105.00	3.32	1.12	3.09	0.00
110.00	3.32	1.12	3.09	0.00
115.00	3.32	1.12	3.09	0.00
120.00	3.32	1.12	3.09	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 8

Summary for Subcatchment 2-O: Pr. Drainage Area 4

Runoff = 6.12 cfs @ 12.15 hrs, Volume= 0.645 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.098	74	>75% Grass cover, Good, HSG C
0.358	80	>75% Grass cover, Good, HSG D
* 2.163	98	Paved parking
* 0.132	98	Roofs
2.751	95	Weighted Average
0.456	79	16.58% Pervious Area
2.295	98	83.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	253	0.0090	1.24		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	181	0.0750	15.62	19.17	Pipe Channel, BC 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	45	0.0100	5.70	7.00	Pipe Channel, CD - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	22	0.0100	6.44	11.38	Pipe Channel, DE - Pipe Flow 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
3.2	499	0.0010	2.59	18.28	Pipe Channel, EF - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
7.0	1,000	Total			

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

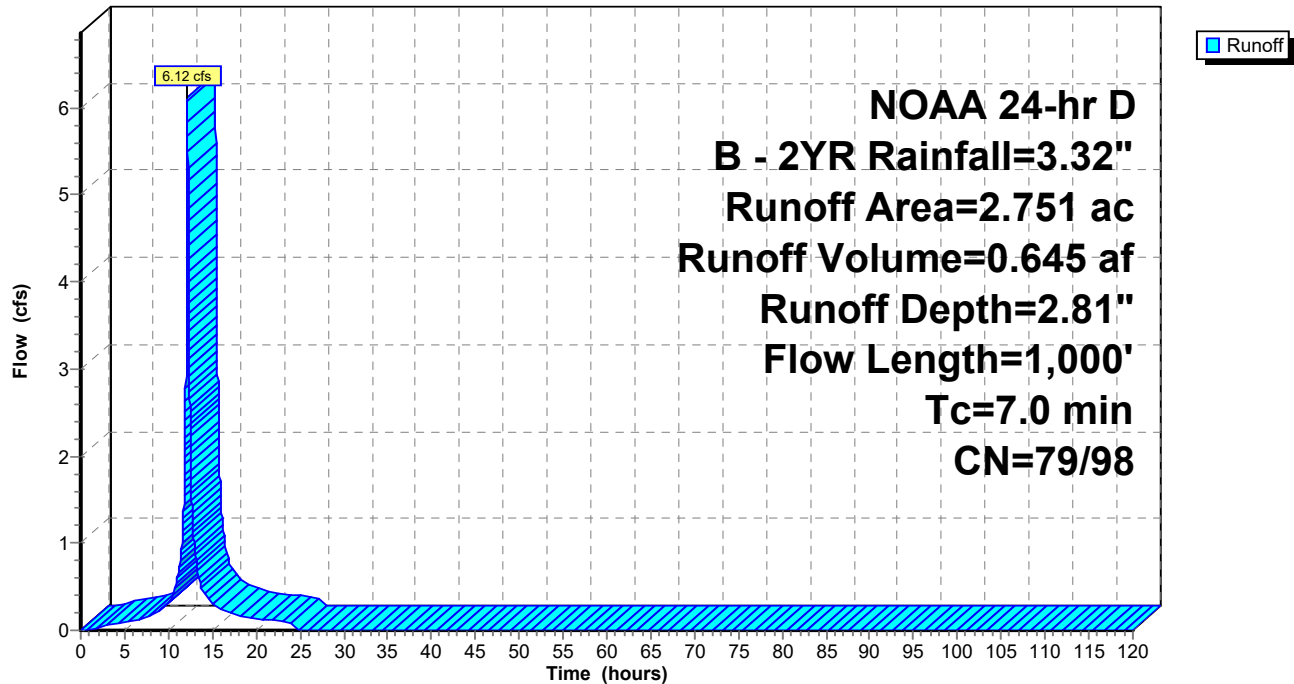
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 9

Subcatchment 2-O: Pr. Drainage Area 4

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 10

Hydrograph for Subcatchment 2-O: Pr. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.09
10.00	0.66	0.01	0.46	0.33
15.00	2.79	1.04	2.56	0.30
20.00	3.15	1.30	2.91	0.14
25.00	3.32	1.43	3.09	0.00
30.00	3.32	1.43	3.09	0.00
35.00	3.32	1.43	3.09	0.00
40.00	3.32	1.43	3.09	0.00
45.00	3.32	1.43	3.09	0.00
50.00	3.32	1.43	3.09	0.00
55.00	3.32	1.43	3.09	0.00
60.00	3.32	1.43	3.09	0.00
65.00	3.32	1.43	3.09	0.00
70.00	3.32	1.43	3.09	0.00
75.00	3.32	1.43	3.09	0.00
80.00	3.32	1.43	3.09	0.00
85.00	3.32	1.43	3.09	0.00
90.00	3.32	1.43	3.09	0.00
95.00	3.32	1.43	3.09	0.00
100.00	3.32	1.43	3.09	0.00
105.00	3.32	1.43	3.09	0.00
110.00	3.32	1.43	3.09	0.00
115.00	3.32	1.43	3.09	0.00
120.00	3.32	1.43	3.09	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 11

Summary for Subcatchment 3: Pr. Drainage Area 3

Runoff = 1.09 cfs @ 12.17 hrs, Volume= 0.126 af, Depth= 2.54"

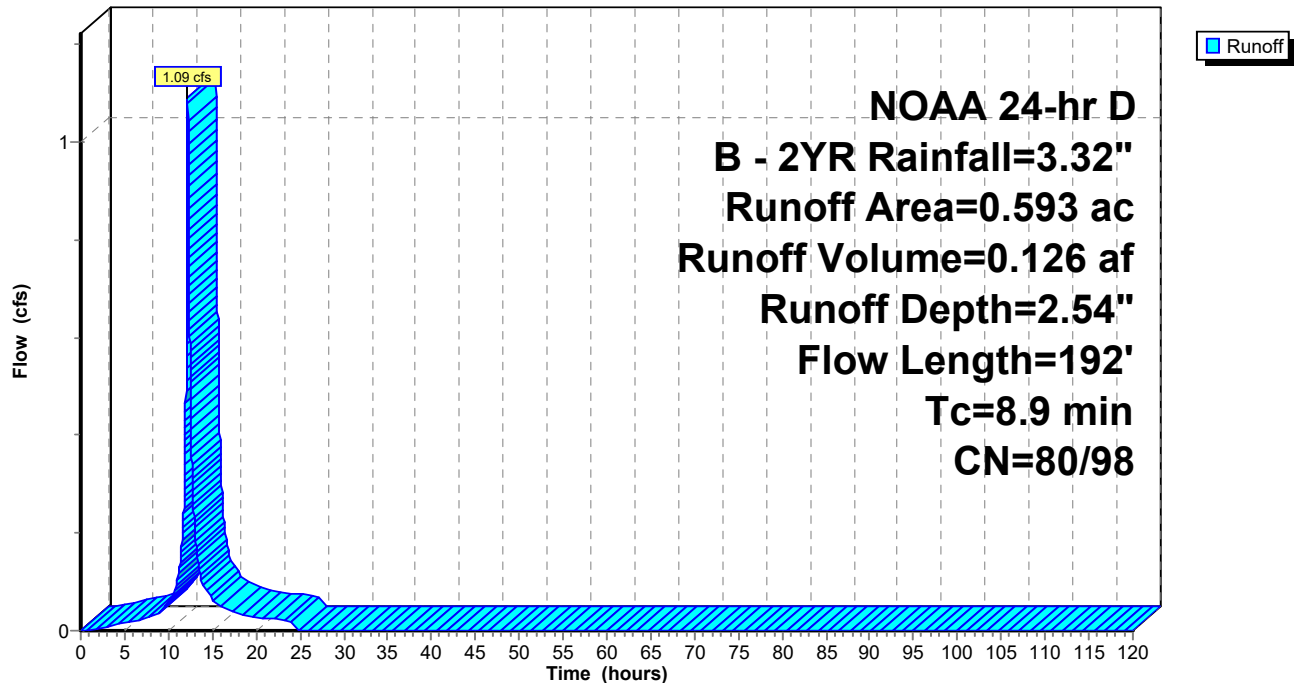
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.203	80	>75% Grass cover, Good, HSG D
* 0.390	98	Paved parking
0.593	92	Weighted Average
0.203	80	34.23% Pervious Area
0.390	98	65.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0080	0.11		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
0.5	71	0.0150	2.49		Shallow Concentrated Flow, BC - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	71	0.0290	2.55		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Grassed Waterway Kv= 15.0 fps
8.9	192	Total			

Subcatchment 3: Pr. Drainage Area 3

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 12

Hydrograph for Subcatchment 3: Pr. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.01	0.46	0.06
15.00	2.79	1.10	2.56	0.06
20.00	3.15	1.36	2.91	0.03
25.00	3.32	1.49	3.09	0.00
30.00	3.32	1.49	3.09	0.00
35.00	3.32	1.49	3.09	0.00
40.00	3.32	1.49	3.09	0.00
45.00	3.32	1.49	3.09	0.00
50.00	3.32	1.49	3.09	0.00
55.00	3.32	1.49	3.09	0.00
60.00	3.32	1.49	3.09	0.00
65.00	3.32	1.49	3.09	0.00
70.00	3.32	1.49	3.09	0.00
75.00	3.32	1.49	3.09	0.00
80.00	3.32	1.49	3.09	0.00
85.00	3.32	1.49	3.09	0.00
90.00	3.32	1.49	3.09	0.00
95.00	3.32	1.49	3.09	0.00
100.00	3.32	1.49	3.09	0.00
105.00	3.32	1.49	3.09	0.00
110.00	3.32	1.49	3.09	0.00
115.00	3.32	1.49	3.09	0.00
120.00	3.32	1.49	3.09	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 13

Summary for Subcatchment 9S: Pr. Drainage Area 6

Runoff = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af, Depth= 1.12"

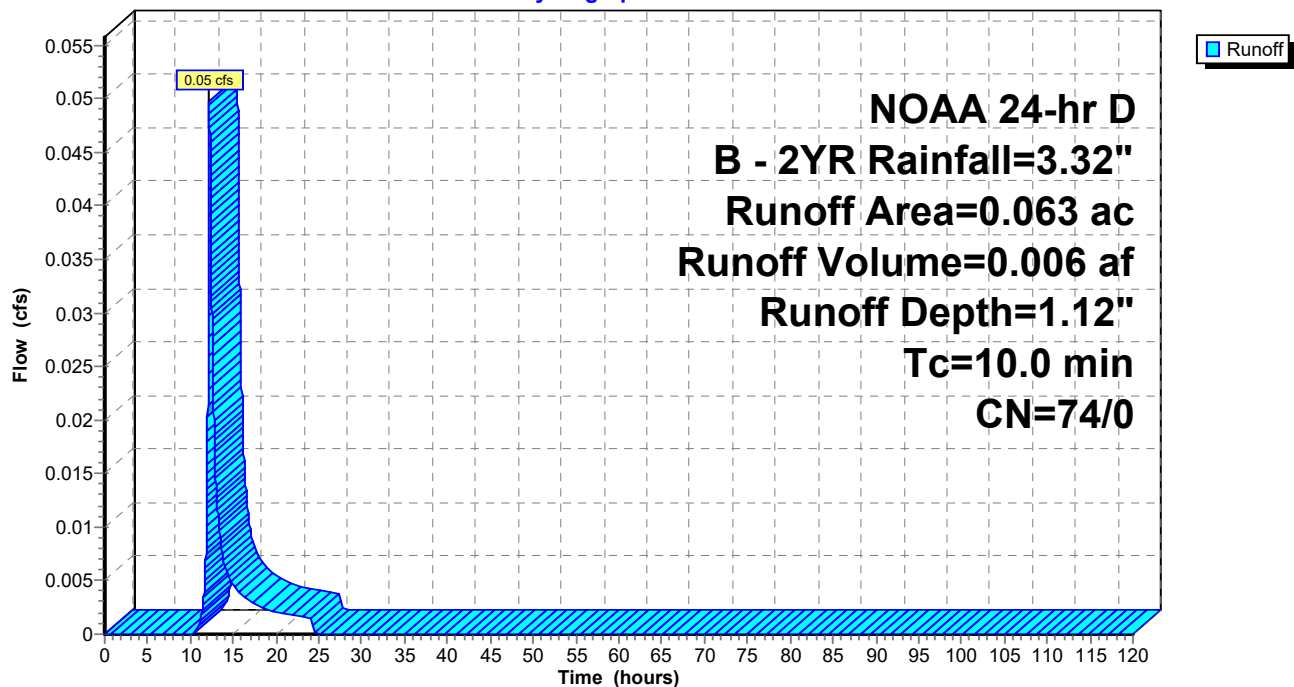
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.063	74	>75% Grass cover, Good, HSG C
0.063	74	100.00% Pervious Area

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

Subcatchment 9S: Pr. Drainage Area 6

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 14

Hydrograph for Subcatchment 9S: Pr. Drainage Area 6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.00	0.00
10.00	0.66	0.00	0.00	0.00
15.00	2.79	0.78	0.00	0.00
20.00	3.15	1.00	0.00	0.00
25.00	3.32	1.12	0.00	0.00
30.00	3.32	1.12	0.00	0.00
35.00	3.32	1.12	0.00	0.00
40.00	3.32	1.12	0.00	0.00
45.00	3.32	1.12	0.00	0.00
50.00	3.32	1.12	0.00	0.00
55.00	3.32	1.12	0.00	0.00
60.00	3.32	1.12	0.00	0.00
65.00	3.32	1.12	0.00	0.00
70.00	3.32	1.12	0.00	0.00
75.00	3.32	1.12	0.00	0.00
80.00	3.32	1.12	0.00	0.00
85.00	3.32	1.12	0.00	0.00
90.00	3.32	1.12	0.00	0.00
95.00	3.32	1.12	0.00	0.00
100.00	3.32	1.12	0.00	0.00
105.00	3.32	1.12	0.00	0.00
110.00	3.32	1.12	0.00	0.00
115.00	3.32	1.12	0.00	0.00
120.00	3.32	1.12	0.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 15

Summary for Subcatchment 11S: Pr. Drainage Area 2

[47] Hint: Peak is 103% of capacity of segment #2

Runoff = 7.19 cfs @ 12.11 hrs, Volume= 0.576 af, Depth= 3.05"

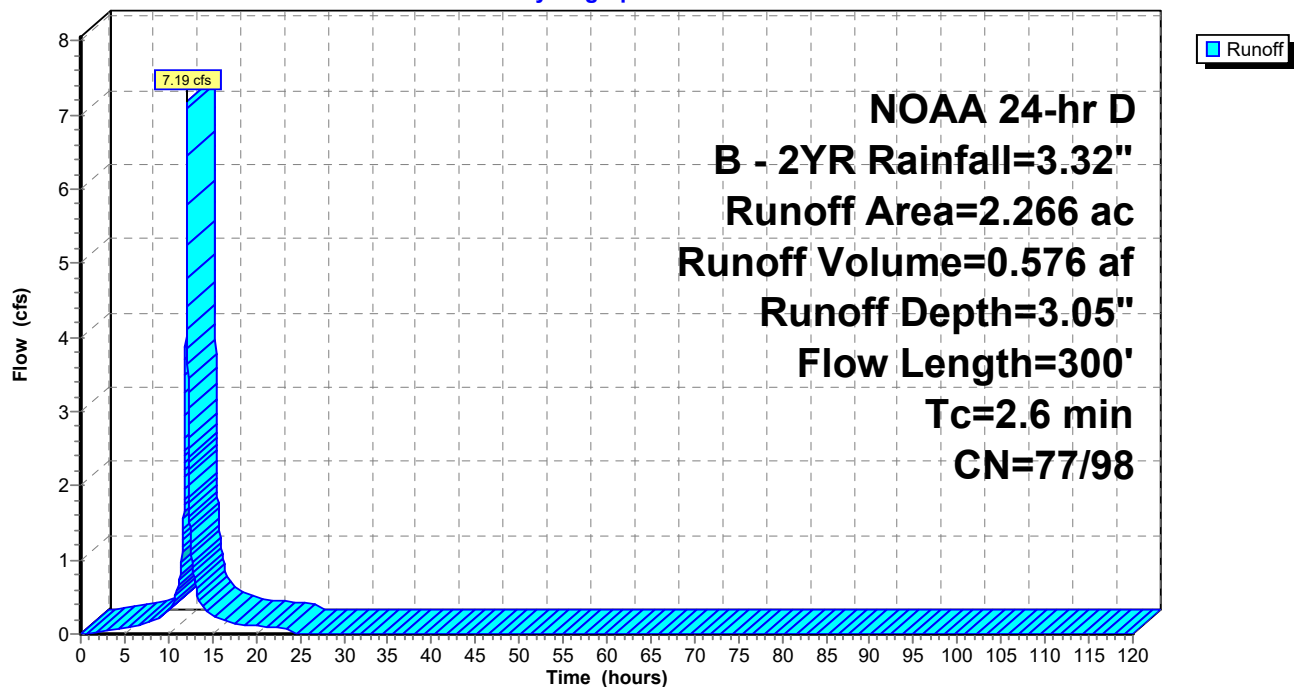
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.025	80	>75% Grass cover, Good, HSG D
* 0.991	98	Paved parking
* 1.228	98	Roofs
2.266	98	Weighted Average
0.047	77	2.07% Pervious Area
2.219	98	97.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	230	0.0170	1.56		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	70	0.0100	5.70	7.00	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
2.6	300	Total			

Subcatchment 11S: Pr. Drainage Area 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 16

Hydrograph for Subcatchment 11S: Pr. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.09
10.00	0.66	0.00	0.46	0.32
15.00	2.79	0.93	2.56	0.25
20.00	3.15	1.17	2.91	0.12
25.00	3.32	1.30	3.09	0.00
30.00	3.32	1.30	3.09	0.00
35.00	3.32	1.30	3.09	0.00
40.00	3.32	1.30	3.09	0.00
45.00	3.32	1.30	3.09	0.00
50.00	3.32	1.30	3.09	0.00
55.00	3.32	1.30	3.09	0.00
60.00	3.32	1.30	3.09	0.00
65.00	3.32	1.30	3.09	0.00
70.00	3.32	1.30	3.09	0.00
75.00	3.32	1.30	3.09	0.00
80.00	3.32	1.30	3.09	0.00
85.00	3.32	1.30	3.09	0.00
90.00	3.32	1.30	3.09	0.00
95.00	3.32	1.30	3.09	0.00
100.00	3.32	1.30	3.09	0.00
105.00	3.32	1.30	3.09	0.00
110.00	3.32	1.30	3.09	0.00
115.00	3.32	1.30	3.09	0.00
120.00	3.32	1.30	3.09	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 17

Summary for Subcatchment 12S: Pr. Drainage Area 1

Runoff = 0.66 cfs @ 12.12 hrs, Volume= 0.058 af, Depth= 2.39"

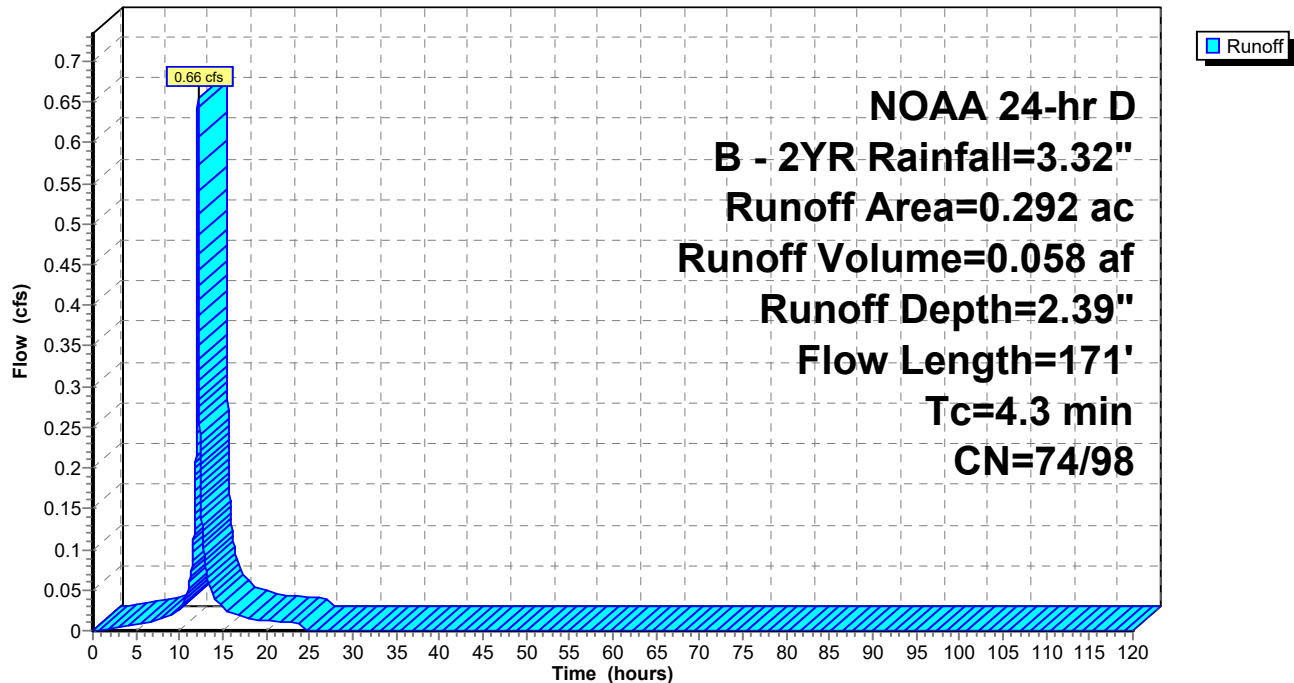
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.104	74	>75% Grass cover, Good, HSG C
* 0.188	98	Paved parking
0.292	89	Weighted Average
0.104	74	35.62% Pervious Area
0.188	98	64.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.0	147	0.0110	1.20		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	11	0.2500	7.50		Shallow Concentrated Flow, CD - Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
4.3	171	Total			

Subcatchment 12S: Pr. Drainage Area 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 18

Hydrograph for Subcatchment 12S: Pr. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.00	0.46	0.03
15.00	2.79	0.78	2.56	0.03
20.00	3.15	1.00	2.91	0.01
25.00	3.32	1.12	3.09	0.00
30.00	3.32	1.12	3.09	0.00
35.00	3.32	1.12	3.09	0.00
40.00	3.32	1.12	3.09	0.00
45.00	3.32	1.12	3.09	0.00
50.00	3.32	1.12	3.09	0.00
55.00	3.32	1.12	3.09	0.00
60.00	3.32	1.12	3.09	0.00
65.00	3.32	1.12	3.09	0.00
70.00	3.32	1.12	3.09	0.00
75.00	3.32	1.12	3.09	0.00
80.00	3.32	1.12	3.09	0.00
85.00	3.32	1.12	3.09	0.00
90.00	3.32	1.12	3.09	0.00
95.00	3.32	1.12	3.09	0.00
100.00	3.32	1.12	3.09	0.00
105.00	3.32	1.12	3.09	0.00
110.00	3.32	1.12	3.09	0.00
115.00	3.32	1.12	3.09	0.00
120.00	3.32	1.12	3.09	0.00

210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 19

Summary for Pond 6P: Pipe Storage

Inflow Area = 2.558 ac, 94.10% Impervious, Inflow Depth = 2.85" for B - 2YR event
 Inflow = 7.19 cfs @ 12.11 hrs, Volume= 0.607 af
 Outflow = 5.27 cfs @ 12.15 hrs, Volume= 0.607 af, Atten= 27%, Lag= 2.6 min
 Primary = 5.27 cfs @ 12.15 hrs, Volume= 0.607 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 114.31' @ 12.15 hrs Surf.Area= 0.056 ac Storage= 0.062 af

Plug-Flow detention time= 17.9 min calculated for 0.607 af (100% of inflow)
 Center-of-Mass det. time= 18.0 min (782.8 - 764.8)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.27 cfs @ 12.15 hrs HW=114.31' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 5.27 cfs @ 4.16 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

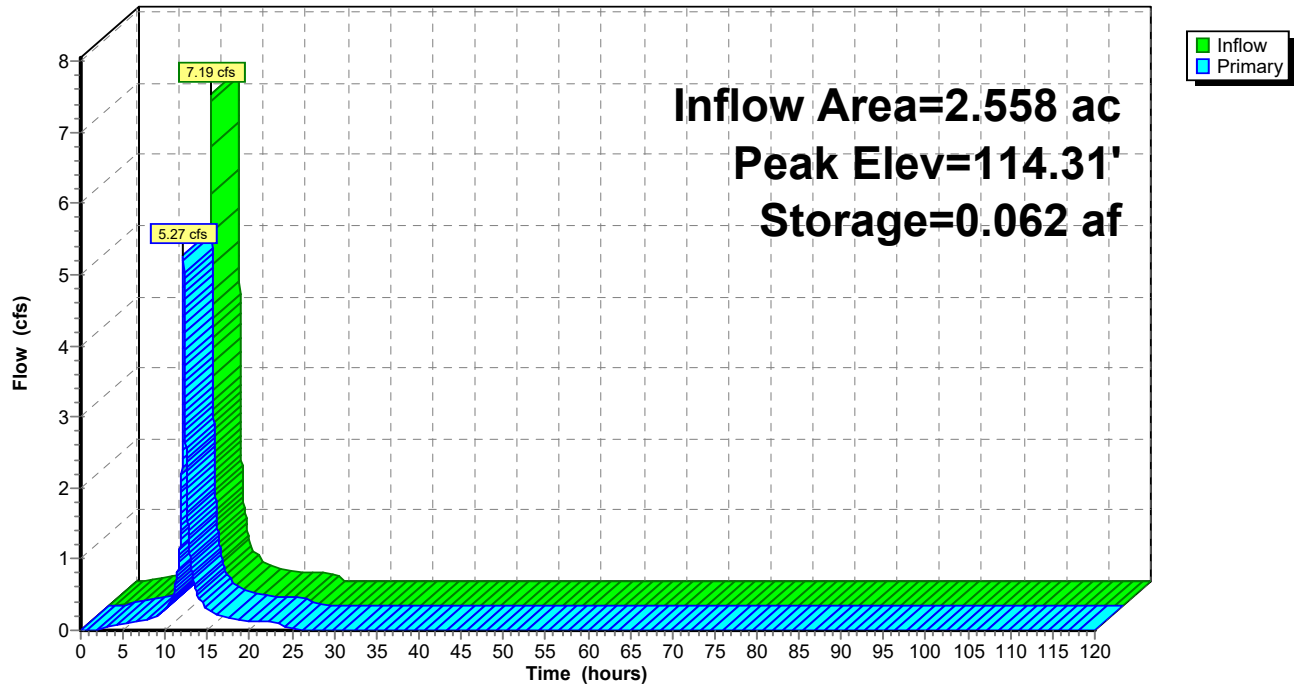
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 20

Pond 6P: Pipe Storage

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 21

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.09	0.004	113.11	0.08
10.00	0.32	0.009	113.24	0.30
15.00	0.27	0.009	113.24	0.30
20.00	0.13	0.005	113.15	0.13
25.00	0.00	0.001	113.02	0.01
30.00	0.00	0.000	112.97	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.96	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 22

Summary for Pond 8P: Rain Garden 2

Inflow Area = 0.593 ac, 65.77% Impervious, Inflow Depth = 2.54" for B - 2YR event
 Inflow = 1.09 cfs @ 12.17 hrs, Volume= 0.126 af
 Outflow = 1.08 cfs @ 12.19 hrs, Volume= 0.097 af, Atten= 1%, Lag= 1.1 min
 Primary = 1.08 cfs @ 12.19 hrs, Volume= 0.097 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 117.33' @ 12.19 hrs Surf.Area= 1,418 sf Storage= 1,333 cf

Plug-Flow detention time= 162.9 min calculated for 0.097 af (78% of inflow)
 Center-of-Mass det. time= 71.9 min (856.6 - 784.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	116.00'	1,570 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
116.00	550	121.0	0	0	550
117.00	1,260	276.0	881	881	5,451
117.50	1,500	285.0	689	1,570	5,876

Device	Routing	Invert	Outlet Devices
#1	Primary	113.50'	15.0" Round Culvert L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.50' / 113.34' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	117.25'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.08 cfs @ 12.19 hrs HW=117.33' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.08 cfs of 10.58 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.08 cfs @ 0.92 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

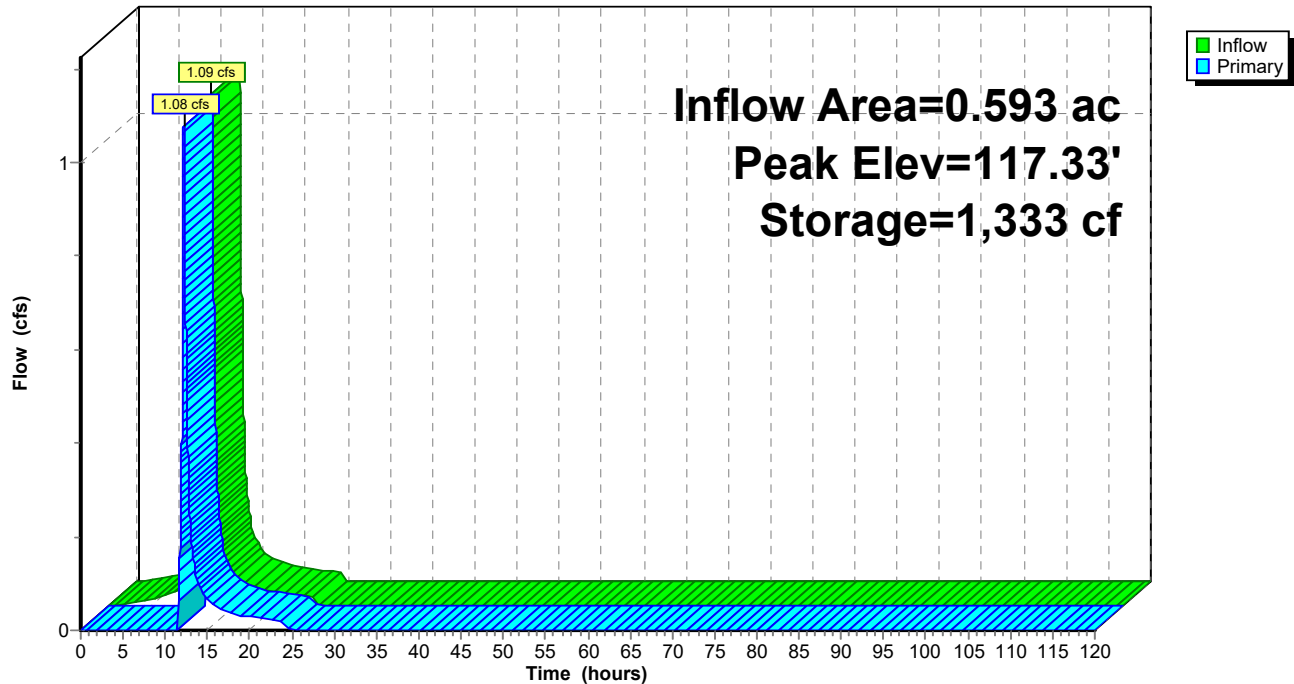
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 23

Pond 8P: Rain Garden 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 24

Hydrograph for Pond 8P: Rain Garden 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	116.00	0.00
5.00	0.01	113	116.13	0.00
10.00	0.06	616	116.70	0.00
15.00	0.06	1,242	117.26	0.06
20.00	0.03	1,235	117.26	0.03
25.00	0.00	1,226	117.25	0.00
30.00	0.00	1,225	117.25	0.00
35.00	0.00	1,225	117.25	0.00
40.00	0.00	1,225	117.25	0.00
45.00	0.00	1,225	117.25	0.00
50.00	0.00	1,225	117.25	0.00
55.00	0.00	1,225	117.25	0.00
60.00	0.00	1,225	117.25	0.00
65.00	0.00	1,225	117.25	0.00
70.00	0.00	1,225	117.25	0.00
75.00	0.00	1,225	117.25	0.00
80.00	0.00	1,225	117.25	0.00
85.00	0.00	1,225	117.25	0.00
90.00	0.00	1,225	117.25	0.00
95.00	0.00	1,225	117.25	0.00
100.00	0.00	1,225	117.25	0.00
105.00	0.00	1,225	117.25	0.00
110.00	0.00	1,225	117.25	0.00
115.00	0.00	1,225	117.25	0.00
120.00	0.00	1,225	117.25	0.00

210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 25

Summary for Pond 13P: Rain Garden 3

Inflow Area = 0.524 ac, 60.50% Impervious, Inflow Depth = 2.31" for B - 2YR event
 Inflow = 1.08 cfs @ 12.13 hrs, Volume= 0.101 af
 Outflow = 0.04 cfs @ 16.00 hrs, Volume= 0.019 af, Atten= 96%, Lag= 232.2 min
 Primary = 0.04 cfs @ 16.00 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 118.81' @ 16.00 hrs Surf.Area= 3,296 sf Storage= 3,606 cf

Plug-Flow detention time= 648.2 min calculated for 0.019 af (19% of inflow)
 Center-of-Mass det. time= 376.7 min (1,158.5 - 781.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	117.50'	4,252 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)
117.50	2,271	224.0	0	0	2,271
118.00	2,615	234.0	1,220	1,220	2,653
119.00	3,469	279.0	3,032	4,252	4,508

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	15.0" Round Culvert L= 194.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 114.04' S= 0.0049 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	118.80'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 16.00 hrs HW=118.81' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.04 cfs of 7.53 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 0.04 cfs @ 0.31 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

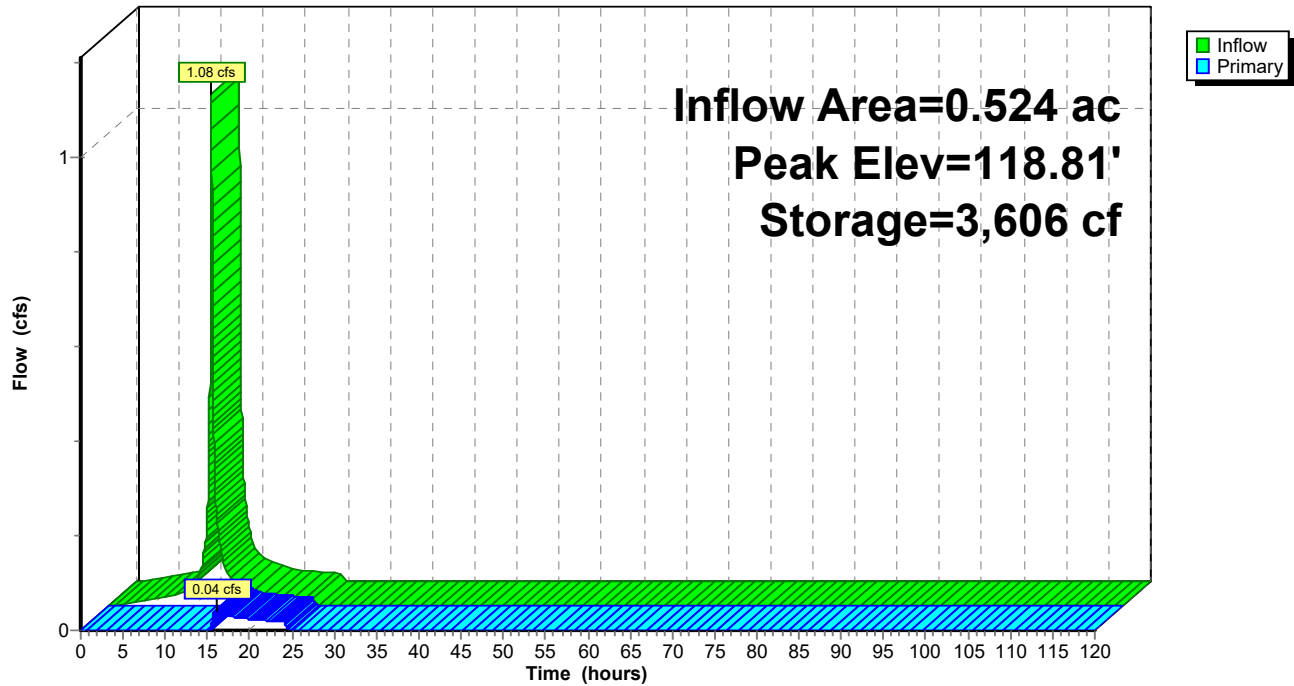
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 26

Pond 13P: Rain Garden 3

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 27

Hydrograph for Pond 13P: Rain Garden 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	117.50	0.00
5.00	0.01	96	117.54	0.00
10.00	0.05	512	117.72	0.00
15.00	0.05	3,512	118.78	0.00
20.00	0.02	3,597	118.81	0.02
25.00	0.00	3,579	118.80	0.00
30.00	0.00	3,577	118.80	0.00
35.00	0.00	3,577	118.80	0.00
40.00	0.00	3,577	118.80	0.00
45.00	0.00	3,577	118.80	0.00
50.00	0.00	3,577	118.80	0.00
55.00	0.00	3,577	118.80	0.00
60.00	0.00	3,577	118.80	0.00
65.00	0.00	3,577	118.80	0.00
70.00	0.00	3,577	118.80	0.00
75.00	0.00	3,577	118.80	0.00
80.00	0.00	3,577	118.80	0.00
85.00	0.00	3,577	118.80	0.00
90.00	0.00	3,577	118.80	0.00
95.00	0.00	3,577	118.80	0.00
100.00	0.00	3,577	118.80	0.00
105.00	0.00	3,577	118.80	0.00
110.00	0.00	3,577	118.80	0.00
115.00	0.00	3,577	118.80	0.00
120.00	0.00	3,577	118.80	0.00

210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 28

Summary for Pond 14P: Rain Garden 1

Inflow Area = 0.292 ac, 64.38% Impervious, Inflow Depth = 2.39" for B - 2YR event
 Inflow = 0.66 cfs @ 12.12 hrs, Volume= 0.058 af
 Outflow = 0.38 cfs @ 12.24 hrs, Volume= 0.031 af, Atten= 41%, Lag= 7.1 min
 Primary = 0.38 cfs @ 12.24 hrs, Volume= 0.031 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 119.04' @ 12.24 hrs Surf.Area= 1,386 sf Storage= 1,223 cf

Plug-Flow detention time= 266.3 min calculated for 0.031 af (54% of inflow)
 Center-of-Mass det. time= 132.5 min (910.3 - 777.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	118.00'	2,758 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)
118.00	979	121.0	0	0	979
119.00	1,370	140.0	1,169	1,169	1,395
120.00	1,818	159.0	1,589	2,758	1,871

Device	Routing	Invert	Outlet Devices
#1	Primary	113.52'	15.0" Round Culvert L= 104.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.52' / 113.00' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	119.00'	48.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.38 cfs @ 12.24 hrs HW=119.04' TW=114.18' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.38 cfs of 10.88 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 0.38 cfs @ 0.65 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

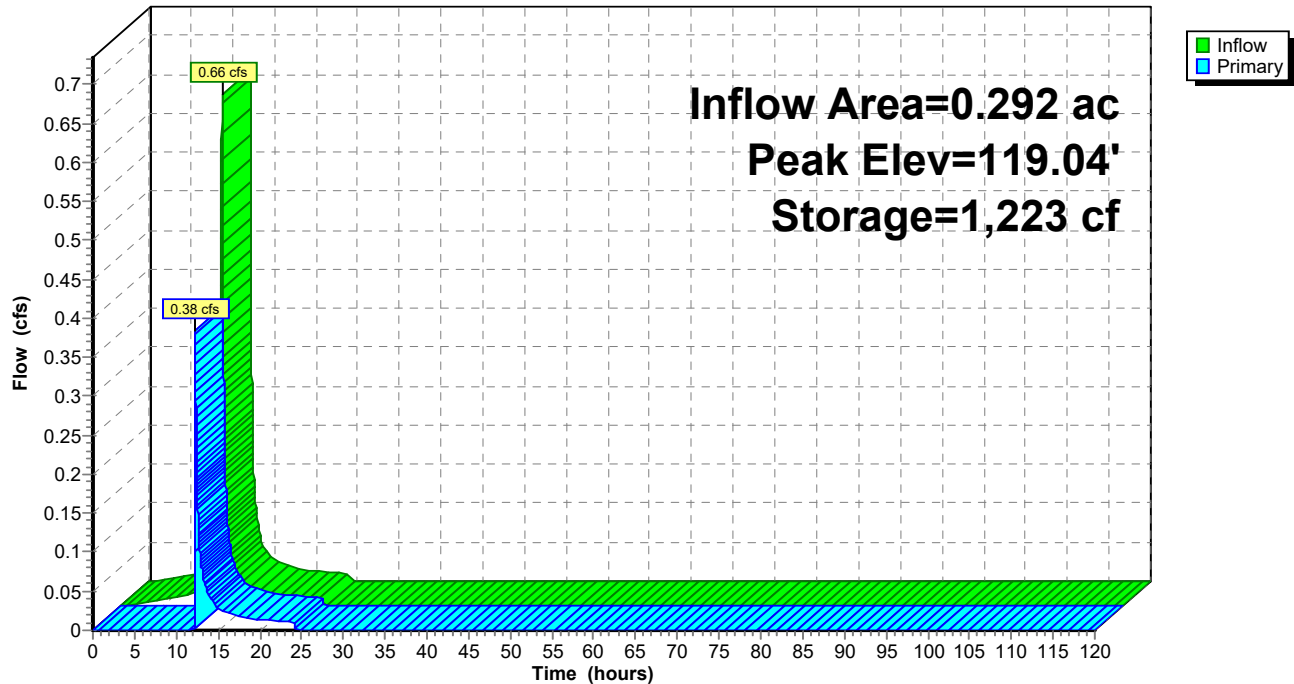
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 29

Pond 14P: Rain Garden 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 30

Hydrograph for Pond 14P: Rain Garden 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	118.00	0.00
5.00	0.01	58	118.06	0.00
10.00	0.03	306	118.30	0.00
15.00	0.03	1,179	119.01	0.03
20.00	0.01	1,175	119.00	0.01
25.00	0.00	1,169	119.00	0.00
30.00	0.00	1,169	119.00	0.00
35.00	0.00	1,169	119.00	0.00
40.00	0.00	1,169	119.00	0.00
45.00	0.00	1,169	119.00	0.00
50.00	0.00	1,169	119.00	0.00
55.00	0.00	1,169	119.00	0.00
60.00	0.00	1,169	119.00	0.00
65.00	0.00	1,169	119.00	0.00
70.00	0.00	1,169	119.00	0.00
75.00	0.00	1,169	119.00	0.00
80.00	0.00	1,169	119.00	0.00
85.00	0.00	1,169	119.00	0.00
90.00	0.00	1,169	119.00	0.00
95.00	0.00	1,169	119.00	0.00
100.00	0.00	1,169	119.00	0.00
105.00	0.00	1,169	119.00	0.00
110.00	0.00	1,169	119.00	0.00
115.00	0.00	1,169	119.00	0.00
120.00	0.00	1,169	119.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 31

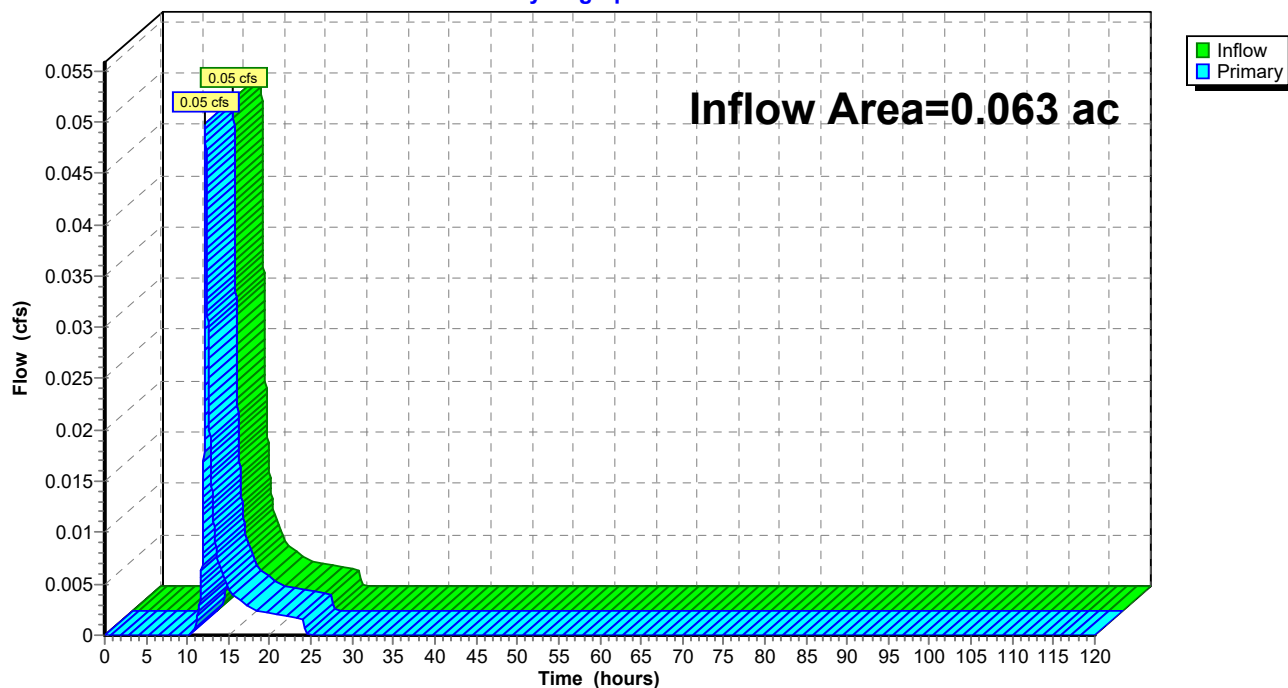
Summary for Link 4L: Analysis Point 2

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 1.12" for B - 2YR event
Inflow = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af
Primary = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 2

Hydrograph



210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 32

Hydrograph for Link 4L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	110.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	114.00	0.00	0.00	0.00
12.00	0.02	0.00	0.02	116.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	118.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	120.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00				
20.00	0.00	0.00	0.00				
22.00	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 33

Summary for Link 9L: Analysis Point 1

Inflow Area = 6.426 ac, 84.17% Impervious, Inflow Depth = 2.55" for B - 2YR event

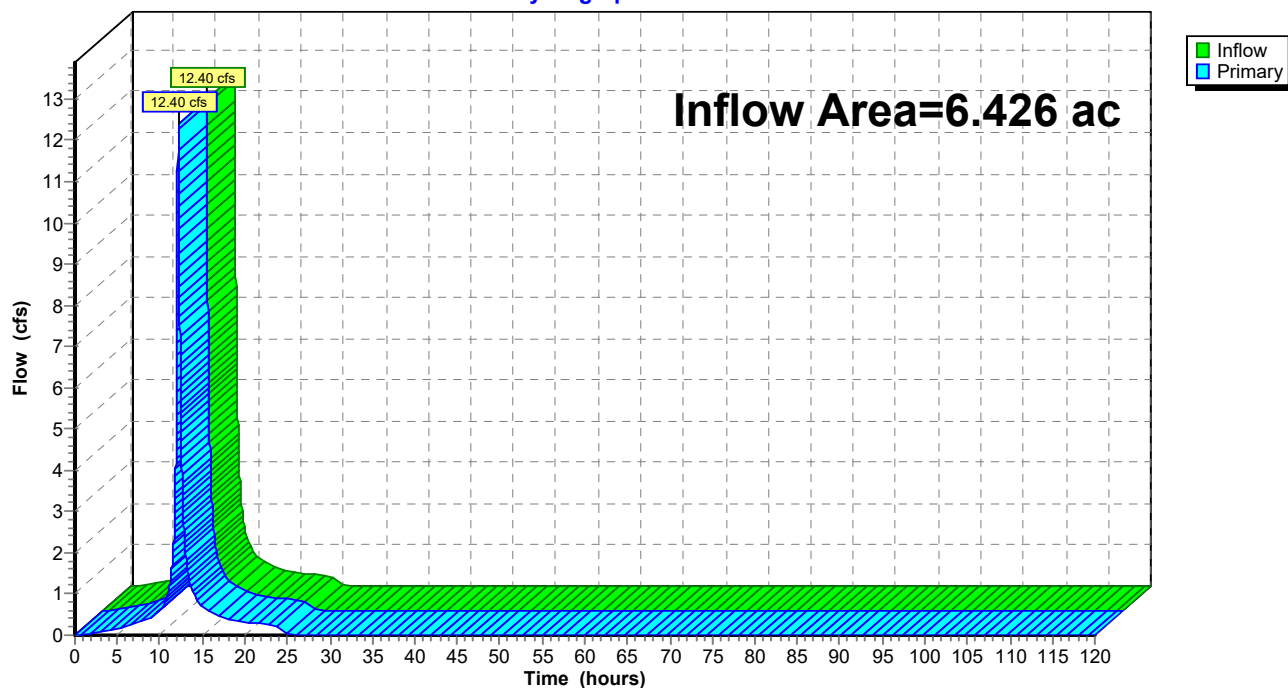
Inflow = 12.40 cfs @ 12.15 hrs, Volume= 1.368 af

Primary = 12.40 cfs @ 12.15 hrs, Volume= 1.368 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 9L: Analysis Point 1

Hydrograph



210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 34

Hydrograph for Link 9L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.03	0.00	0.03	106.00	0.00	0.00	0.00
4.00	0.13	0.00	0.13	108.00	0.00	0.00	0.00
6.00	0.20	0.00	0.20	110.00	0.00	0.00	0.00
8.00	0.34	0.00	0.34	112.00	0.00	0.00	0.00
10.00	0.62	0.00	0.62	114.00	0.00	0.00	0.00
12.00	6.49	0.00	6.49	116.00	0.00	0.00	0.00
14.00	0.97	0.00	0.97	118.00	0.00	0.00	0.00
16.00	0.56	0.00	0.56	120.00	0.00	0.00	0.00
18.00	0.39	0.00	0.39				
20.00	0.32	0.00	0.32				
22.00	0.28	0.00	0.28				
24.00	0.23	0.00	0.23				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 35

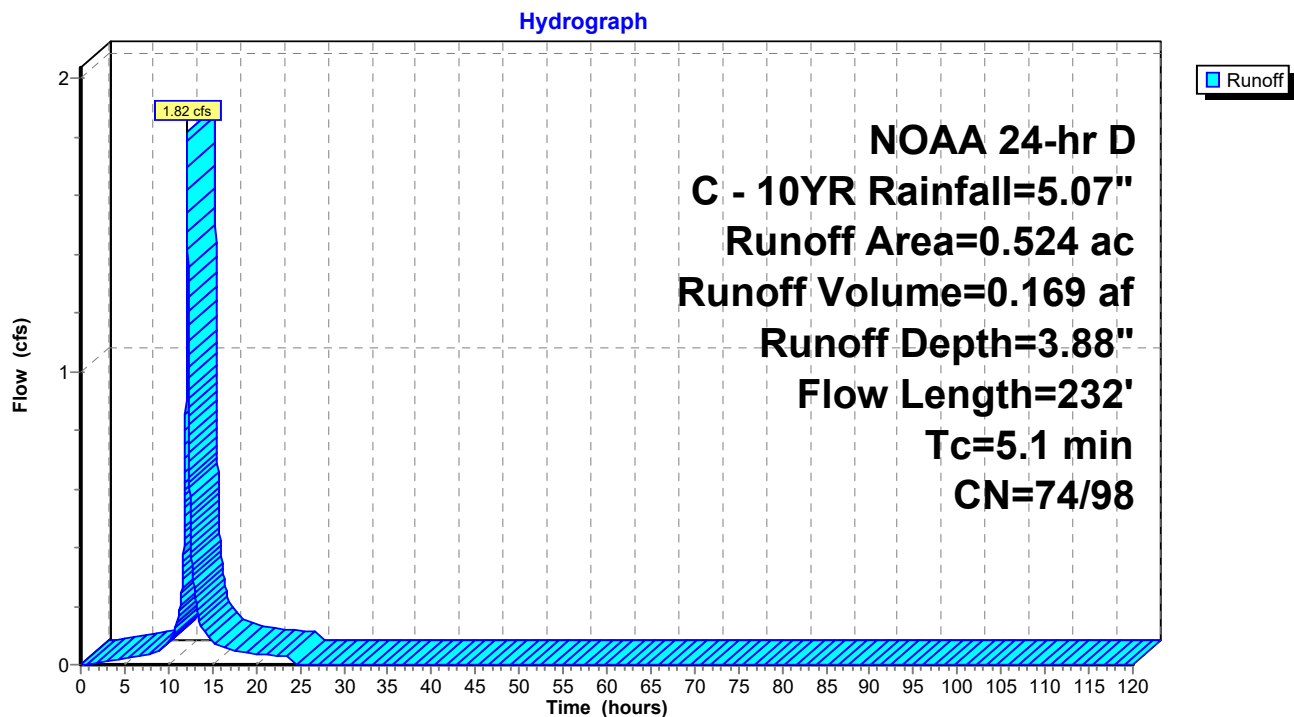
Summary for Subcatchment 2: Pr. Drainage Area 5

Runoff = 1.82 cfs @ 12.13 hrs, Volume= 0.169 af, Depth= 3.88"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
* 0.317	98	Paved parking
0.207	74	>75% Grass cover, Good, HSG C
0.524	89	Weighted Average
0.207	74	39.50% Pervious Area
0.317	98	60.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.7	207	0.0110	1.29		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.1	12	0.2500	3.50		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
5.1	232	Total			

Subcatchment 2: Pr. Drainage Area 5

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 36

Hydrograph for Subcatchment 2: Pr. Drainage Area 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.02
10.00	1.01	0.02	0.80	0.08
15.00	4.27	1.79	4.03	0.08
20.00	4.80	2.21	4.57	0.04
25.00	5.07	2.42	4.83	0.00
30.00	5.07	2.42	4.83	0.00
35.00	5.07	2.42	4.83	0.00
40.00	5.07	2.42	4.83	0.00
45.00	5.07	2.42	4.83	0.00
50.00	5.07	2.42	4.83	0.00
55.00	5.07	2.42	4.83	0.00
60.00	5.07	2.42	4.83	0.00
65.00	5.07	2.42	4.83	0.00
70.00	5.07	2.42	4.83	0.00
75.00	5.07	2.42	4.83	0.00
80.00	5.07	2.42	4.83	0.00
85.00	5.07	2.42	4.83	0.00
90.00	5.07	2.42	4.83	0.00
95.00	5.07	2.42	4.83	0.00
100.00	5.07	2.42	4.83	0.00
105.00	5.07	2.42	4.83	0.00
110.00	5.07	2.42	4.83	0.00
115.00	5.07	2.42	4.83	0.00
120.00	5.07	2.42	4.83	0.00

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 37

Summary for Subcatchment 2-O: Pr. Drainage Area 4

[47] Hint: Peak is 139% of capacity of segment #3

Runoff = 9.70 cfs @ 12.15 hrs, Volume= 1.033 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.098	74	>75% Grass cover, Good, HSG C
0.358	80	>75% Grass cover, Good, HSG D
* 2.163	98	Paved parking
* 0.132	98	Roofs
2.751	95	Weighted Average
0.456	79	16.58% Pervious Area
2.295	98	83.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	253	0.0090	1.24		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	181	0.0750	15.62	19.17	Pipe Channel, BC 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	45	0.0100	5.70	7.00	Pipe Channel, CD - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	22	0.0100	6.44	11.38	Pipe Channel, DE - Pipe Flow 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
3.2	499	0.0010	2.59	18.28	Pipe Channel, EF - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
7.0	1,000	Total			

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

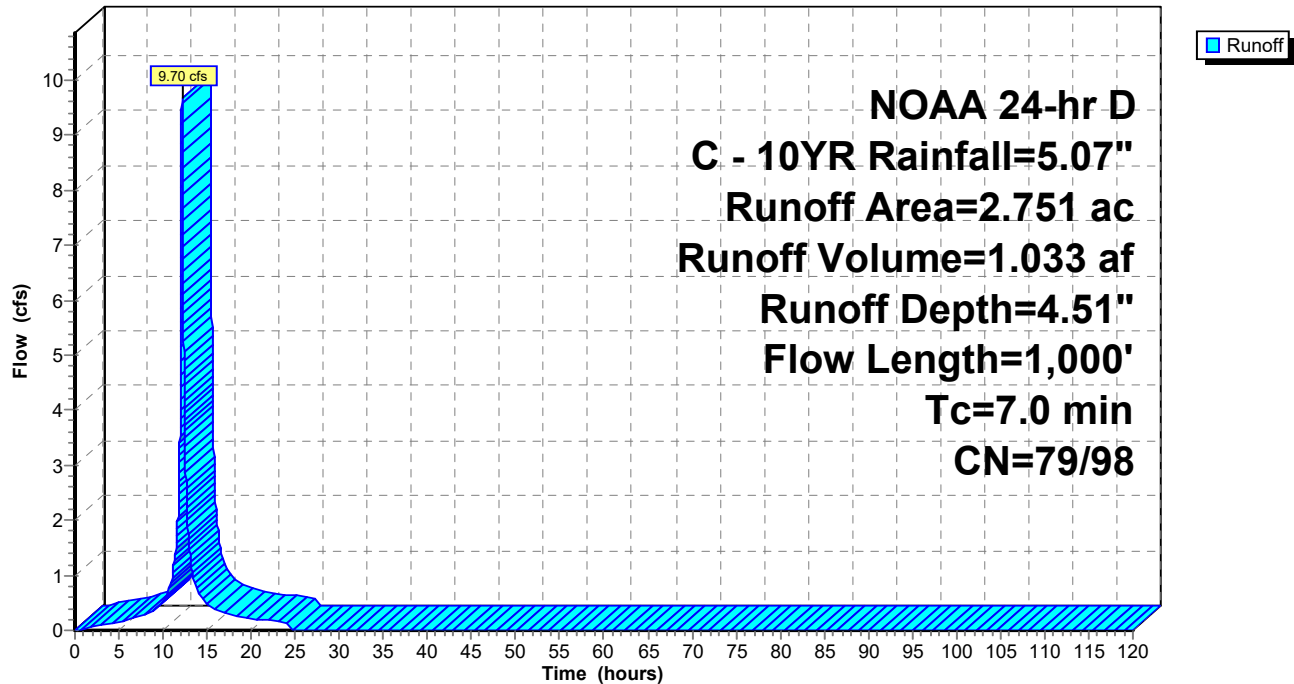
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 38

Subcatchment 2-O: Pr. Drainage Area 4

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 39

Hydrograph for Subcatchment 2-O: Pr. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.16
10.00	1.01	0.07	0.80	0.53
15.00	4.27	2.18	4.03	0.47
20.00	4.80	2.63	4.57	0.21
25.00	5.07	2.86	4.83	0.00
30.00	5.07	2.86	4.83	0.00
35.00	5.07	2.86	4.83	0.00
40.00	5.07	2.86	4.83	0.00
45.00	5.07	2.86	4.83	0.00
50.00	5.07	2.86	4.83	0.00
55.00	5.07	2.86	4.83	0.00
60.00	5.07	2.86	4.83	0.00
65.00	5.07	2.86	4.83	0.00
70.00	5.07	2.86	4.83	0.00
75.00	5.07	2.86	4.83	0.00
80.00	5.07	2.86	4.83	0.00
85.00	5.07	2.86	4.83	0.00
90.00	5.07	2.86	4.83	0.00
95.00	5.07	2.86	4.83	0.00
100.00	5.07	2.86	4.83	0.00
105.00	5.07	2.86	4.83	0.00
110.00	5.07	2.86	4.83	0.00
115.00	5.07	2.86	4.83	0.00
120.00	5.07	2.86	4.83	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 40

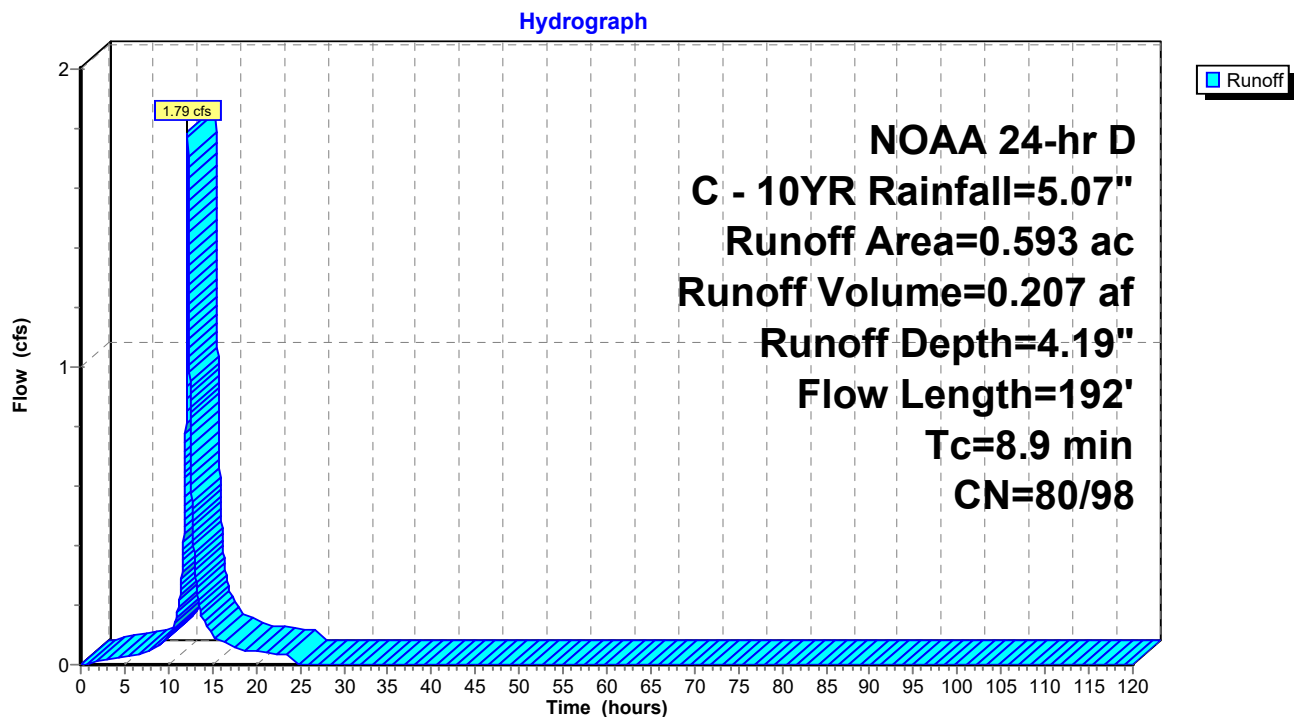
Summary for Subcatchment 3: Pr. Drainage Area 3

Runoff = 1.79 cfs @ 12.17 hrs, Volume= 0.207 af, Depth= 4.19"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.203	80	>75% Grass cover, Good, HSG D
* 0.390	98	Paved parking
0.593	92	Weighted Average
0.203	80	34.23% Pervious Area
0.390	98	65.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0080	0.11		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
0.5	71	0.0150	2.49		Shallow Concentrated Flow, BC - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	71	0.0290	2.55		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Grassed Waterway Kv= 15.0 fps
8.9	192	Total			

Subcatchment 3: Pr. Drainage Area 3

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 41

Hydrograph for Subcatchment 3: Pr. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.03
10.00	1.01	0.08	0.80	0.10
15.00	4.27	2.26	4.03	0.10
20.00	4.80	2.72	4.57	0.05
25.00	5.07	2.95	4.83	0.00
30.00	5.07	2.95	4.83	0.00
35.00	5.07	2.95	4.83	0.00
40.00	5.07	2.95	4.83	0.00
45.00	5.07	2.95	4.83	0.00
50.00	5.07	2.95	4.83	0.00
55.00	5.07	2.95	4.83	0.00
60.00	5.07	2.95	4.83	0.00
65.00	5.07	2.95	4.83	0.00
70.00	5.07	2.95	4.83	0.00
75.00	5.07	2.95	4.83	0.00
80.00	5.07	2.95	4.83	0.00
85.00	5.07	2.95	4.83	0.00
90.00	5.07	2.95	4.83	0.00
95.00	5.07	2.95	4.83	0.00
100.00	5.07	2.95	4.83	0.00
105.00	5.07	2.95	4.83	0.00
110.00	5.07	2.95	4.83	0.00
115.00	5.07	2.95	4.83	0.00
120.00	5.07	2.95	4.83	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 42

Summary for Subcatchment 9S: Pr. Drainage Area 6

Runoff = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af, Depth= 2.42"

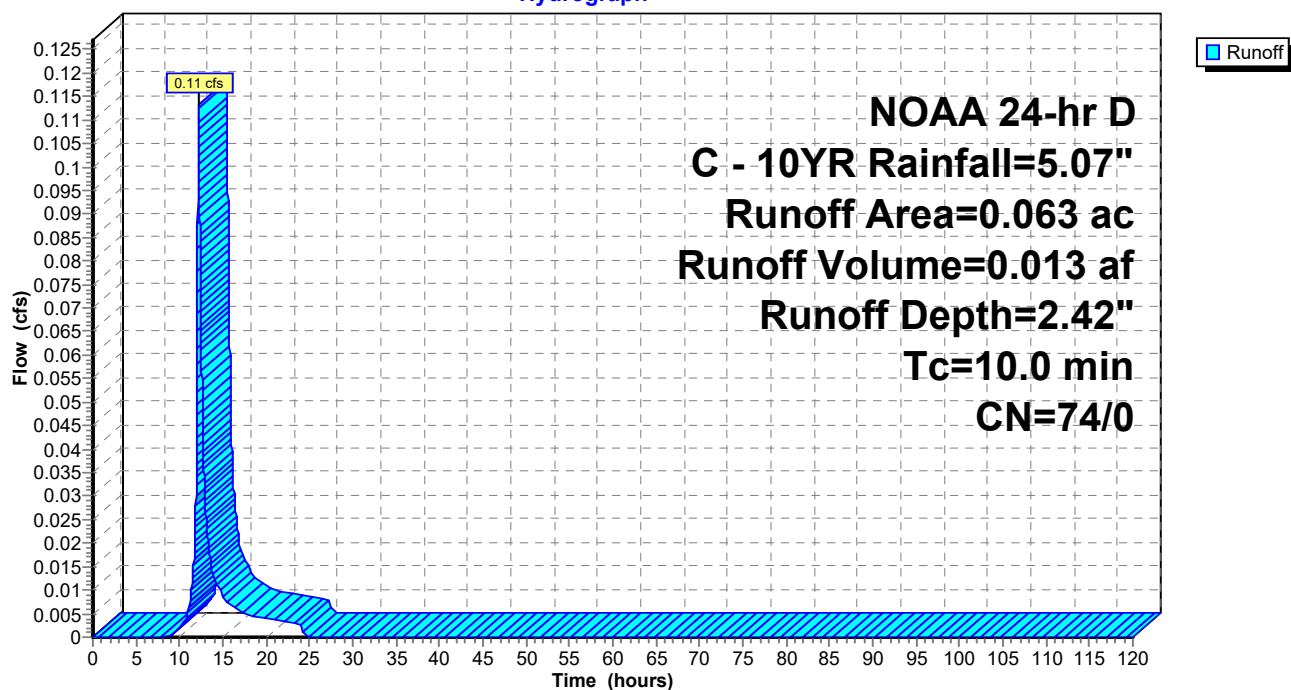
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.063	74	>75% Grass cover, Good, HSG C
0.063	74	100.00% Pervious Area

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

Subcatchment 9S: Pr. Drainage Area 6

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 43

Hydrograph for Subcatchment 9S: Pr. Drainage Area 6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.00	0.00
10.00	1.01	0.02	0.00	0.00
15.00	4.27	1.79	0.00	0.01
20.00	4.80	2.21	0.00	0.00
25.00	5.07	2.42	0.00	0.00
30.00	5.07	2.42	0.00	0.00
35.00	5.07	2.42	0.00	0.00
40.00	5.07	2.42	0.00	0.00
45.00	5.07	2.42	0.00	0.00
50.00	5.07	2.42	0.00	0.00
55.00	5.07	2.42	0.00	0.00
60.00	5.07	2.42	0.00	0.00
65.00	5.07	2.42	0.00	0.00
70.00	5.07	2.42	0.00	0.00
75.00	5.07	2.42	0.00	0.00
80.00	5.07	2.42	0.00	0.00
85.00	5.07	2.42	0.00	0.00
90.00	5.07	2.42	0.00	0.00
95.00	5.07	2.42	0.00	0.00
100.00	5.07	2.42	0.00	0.00
105.00	5.07	2.42	0.00	0.00
110.00	5.07	2.42	0.00	0.00
115.00	5.07	2.42	0.00	0.00
120.00	5.07	2.42	0.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 44

Summary for Subcatchment 11S: Pr. Drainage Area 2

[47] Hint: Peak is 158% of capacity of segment #2

Runoff = 11.09 cfs @ 12.11 hrs, Volume= 0.904 af, Depth= 4.79"

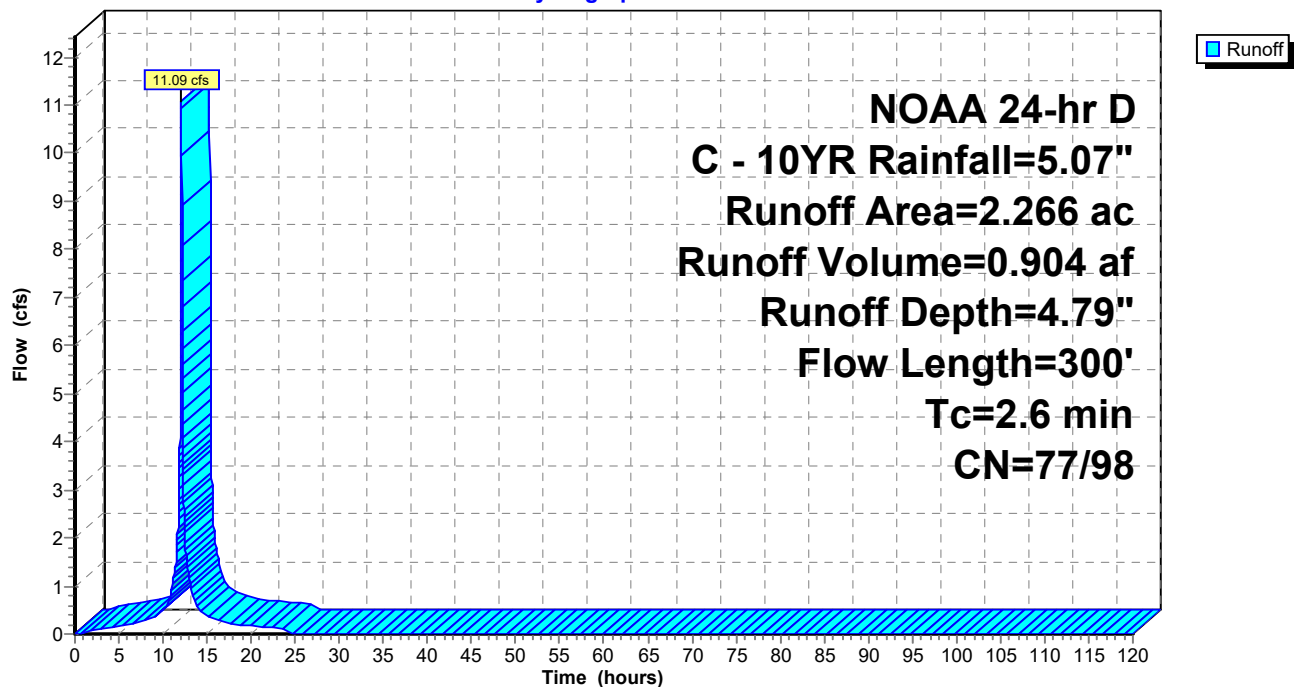
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.025	80	>75% Grass cover, Good, HSG D
* 0.991	98	Paved parking
* 1.228	98	Roofs
2.266	98	Weighted Average
0.047	77	2.07% Pervious Area
2.219	98	97.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	230	0.0170	1.56		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	70	0.0100	5.70	7.00	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
2.6	300	Total			

Subcatchment 11S: Pr. Drainage Area 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 45

Hydrograph for Subcatchment 11S: Pr. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.16
10.00	1.01	0.05	0.80	0.51
15.00	4.27	2.02	4.03	0.38
20.00	4.80	2.46	4.57	0.18
25.00	5.07	2.68	4.83	0.00
30.00	5.07	2.68	4.83	0.00
35.00	5.07	2.68	4.83	0.00
40.00	5.07	2.68	4.83	0.00
45.00	5.07	2.68	4.83	0.00
50.00	5.07	2.68	4.83	0.00
55.00	5.07	2.68	4.83	0.00
60.00	5.07	2.68	4.83	0.00
65.00	5.07	2.68	4.83	0.00
70.00	5.07	2.68	4.83	0.00
75.00	5.07	2.68	4.83	0.00
80.00	5.07	2.68	4.83	0.00
85.00	5.07	2.68	4.83	0.00
90.00	5.07	2.68	4.83	0.00
95.00	5.07	2.68	4.83	0.00
100.00	5.07	2.68	4.83	0.00
105.00	5.07	2.68	4.83	0.00
110.00	5.07	2.68	4.83	0.00
115.00	5.07	2.68	4.83	0.00
120.00	5.07	2.68	4.83	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 46

Summary for Subcatchment 12S: Pr. Drainage Area 1

Runoff = 1.09 cfs @ 12.12 hrs, Volume= 0.097 af, Depth= 3.97"

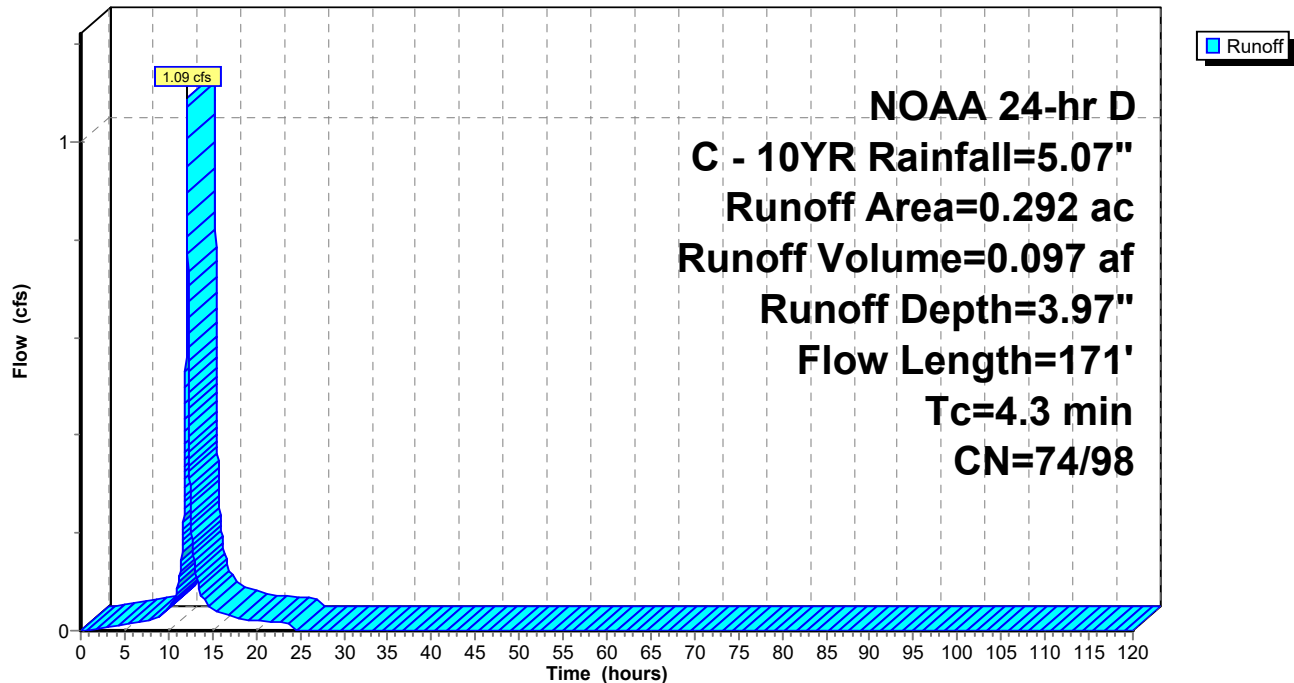
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.104	74	>75% Grass cover, Good, HSG C
* 0.188	98	Paved parking
0.292	89	Weighted Average
0.104	74	35.62% Pervious Area
0.188	98	64.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.0	147	0.0110	1.20		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	11	0.2500	7.50		Shallow Concentrated Flow, CD - Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
4.3	171	Total			

Subcatchment 12S: Pr. Drainage Area 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 47

Hydrograph for Subcatchment 12S: Pr. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.01
10.00	1.01	0.02	0.80	0.05
15.00	4.27	1.79	4.03	0.05
20.00	4.80	2.21	4.57	0.02
25.00	5.07	2.42	4.83	0.00
30.00	5.07	2.42	4.83	0.00
35.00	5.07	2.42	4.83	0.00
40.00	5.07	2.42	4.83	0.00
45.00	5.07	2.42	4.83	0.00
50.00	5.07	2.42	4.83	0.00
55.00	5.07	2.42	4.83	0.00
60.00	5.07	2.42	4.83	0.00
65.00	5.07	2.42	4.83	0.00
70.00	5.07	2.42	4.83	0.00
75.00	5.07	2.42	4.83	0.00
80.00	5.07	2.42	4.83	0.00
85.00	5.07	2.42	4.83	0.00
90.00	5.07	2.42	4.83	0.00
95.00	5.07	2.42	4.83	0.00
100.00	5.07	2.42	4.83	0.00
105.00	5.07	2.42	4.83	0.00
110.00	5.07	2.42	4.83	0.00
115.00	5.07	2.42	4.83	0.00
120.00	5.07	2.42	4.83	0.00

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 48

Summary for Pond 6P: Pipe Storage

Inflow Area = 2.558 ac, 94.10% Impervious, Inflow Depth = 4.57" for C - 10YR event
 Inflow = 12.07 cfs @ 12.11 hrs, Volume= 0.974 af
 Outflow = 8.13 cfs @ 12.16 hrs, Volume= 0.974 af, Atten= 33%, Lag= 3.4 min
 Primary = 8.13 cfs @ 12.16 hrs, Volume= 0.974 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 115.00' @ 12.16 hrs Surf.Area= 0.053 ac Storage= 0.100 af

Plug-Flow detention time= 15.5 min calculated for 0.974 af (100% of inflow)
 Center-of-Mass det. time= 15.4 min (771.8 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.12 cfs @ 12.16 hrs HW=115.00' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 8.12 cfs @ 4.60 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

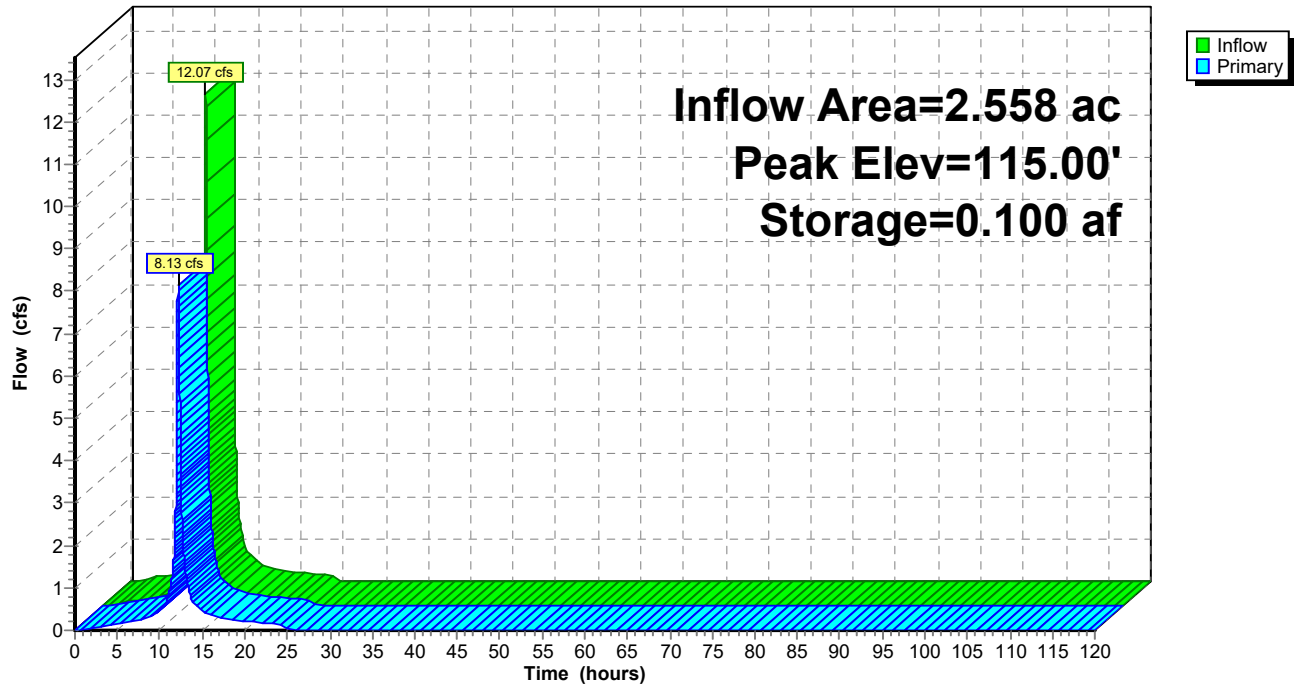
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 49

Pond 6P: Pipe Storage

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 50

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.16	0.006	113.16	0.15
10.00	0.51	0.011	113.31	0.48
15.00	0.42	0.011	113.31	0.46
20.00	0.20	0.007	113.19	0.20
25.00	0.00	0.002	113.03	0.02
30.00	0.00	0.000	112.97	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.96	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 51

Summary for Pond 8P: Rain Garden 2

Inflow Area = 0.593 ac, 65.77% Impervious, Inflow Depth = 4.19" for C - 10YR event
 Inflow = 1.79 cfs @ 12.17 hrs, Volume= 0.207 af
 Outflow = 1.77 cfs @ 12.19 hrs, Volume= 0.179 af, Atten= 1%, Lag= 1.0 min
 Primary = 1.77 cfs @ 12.19 hrs, Volume= 0.179 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 117.36' @ 12.19 hrs Surf.Area= 1,432 sf Storage= 1,376 cf

Plug-Flow detention time= 122.1 min calculated for 0.179 af (86% of inflow)
 Center-of-Mass det. time= 55.5 min (832.2 - 776.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	116.00'	1,570 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
116.00	550	121.0	0	0	550
117.00	1,260	276.0	881	881	5,451
117.50	1,500	285.0	689	1,570	5,876

Device	Routing	Invert	Outlet Devices
#1	Primary	113.50'	15.0" Round Culvert L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.50' / 113.34' S= 0.0100 ' / ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	117.25'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.77 cfs @ 12.19 hrs HW=117.36' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.77 cfs of 10.63 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.77 cfs @ 1.08 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

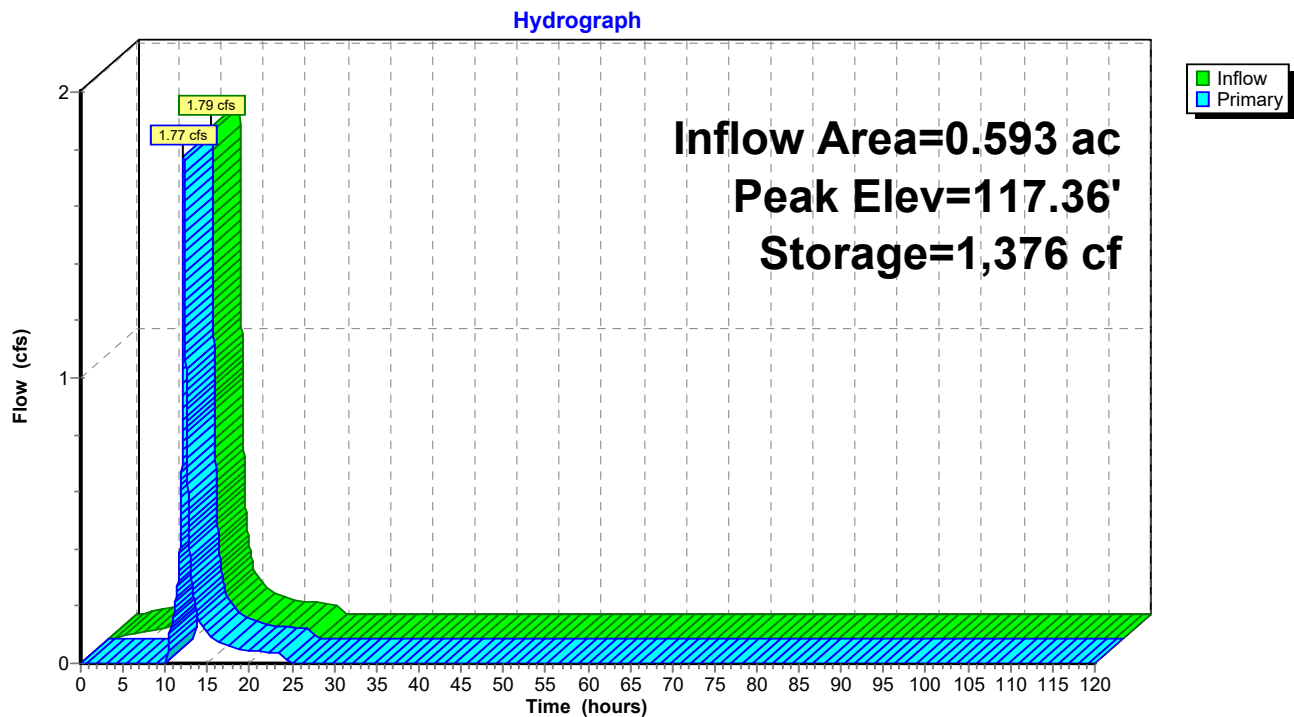
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 52

Pond 8P: Rain Garden 2



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 53

Hydrograph for Pond 8P: Rain Garden 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	116.00	0.00
5.00	0.03	237	116.27	0.00
10.00	0.10	1,107	117.16	0.00
15.00	0.10	1,248	117.27	0.10
20.00	0.05	1,238	117.26	0.05
25.00	0.00	1,226	117.25	0.00
30.00	0.00	1,225	117.25	0.00
35.00	0.00	1,225	117.25	0.00
40.00	0.00	1,225	117.25	0.00
45.00	0.00	1,225	117.25	0.00
50.00	0.00	1,225	117.25	0.00
55.00	0.00	1,225	117.25	0.00
60.00	0.00	1,225	117.25	0.00
65.00	0.00	1,225	117.25	0.00
70.00	0.00	1,225	117.25	0.00
75.00	0.00	1,225	117.25	0.00
80.00	0.00	1,225	117.25	0.00
85.00	0.00	1,225	117.25	0.00
90.00	0.00	1,225	117.25	0.00
95.00	0.00	1,225	117.25	0.00
100.00	0.00	1,225	117.25	0.00
105.00	0.00	1,225	117.25	0.00
110.00	0.00	1,225	117.25	0.00
115.00	0.00	1,225	117.25	0.00
120.00	0.00	1,225	117.25	0.00

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 54

Summary for Pond 13P: Rain Garden 3

Inflow Area = 0.524 ac, 60.50% Impervious, Inflow Depth = 3.88" for C - 10YR event
 Inflow = 1.82 cfs @ 12.13 hrs, Volume= 0.169 af
 Outflow = 0.83 cfs @ 12.33 hrs, Volume= 0.087 af, Atten= 54%, Lag= 12.2 min
 Primary = 0.83 cfs @ 12.33 hrs, Volume= 0.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 118.87' @ 12.33 hrs Surf.Area= 3,348 sf Storage= 3,796 cf

Plug-Flow detention time= 282.8 min calculated for 0.087 af (52% of inflow)
 Center-of-Mass det. time= 144.4 min (920.0 - 775.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	117.50'	4,252 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)
117.50	2,271	224.0	0	0	2,271
118.00	2,615	234.0	1,220	1,220	2,653
119.00	3,469	279.0	3,032	4,252	4,508

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	15.0" Round Culvert L= 194.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 114.04' S= 0.0049 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	118.80'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.83 cfs @ 12.33 hrs HW=118.87' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.83 cfs of 7.59 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 0.83 cfs @ 0.84 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

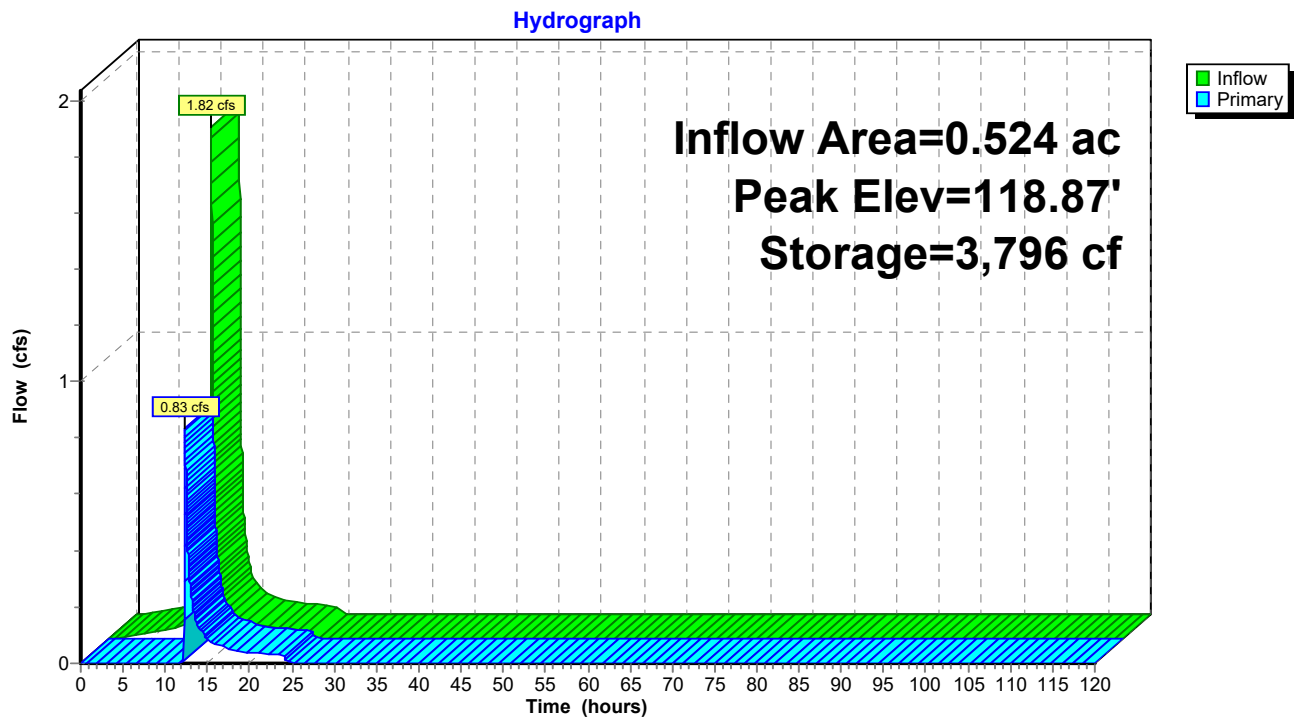
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 55

Pond 13P: Rain Garden 3



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 56

Hydrograph for Pond 13P: Rain Garden 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	117.50	0.00
5.00	0.02	201	117.59	0.00
10.00	0.08	897	117.87	0.00
15.00	0.08	3,624	118.81	0.09
20.00	0.04	3,605	118.81	0.04
25.00	0.00	3,579	118.80	0.00
30.00	0.00	3,577	118.80	0.00
35.00	0.00	3,577	118.80	0.00
40.00	0.00	3,577	118.80	0.00
45.00	0.00	3,577	118.80	0.00
50.00	0.00	3,577	118.80	0.00
55.00	0.00	3,577	118.80	0.00
60.00	0.00	3,577	118.80	0.00
65.00	0.00	3,577	118.80	0.00
70.00	0.00	3,577	118.80	0.00
75.00	0.00	3,577	118.80	0.00
80.00	0.00	3,577	118.80	0.00
85.00	0.00	3,577	118.80	0.00
90.00	0.00	3,577	118.80	0.00
95.00	0.00	3,577	118.80	0.00
100.00	0.00	3,577	118.80	0.00
105.00	0.00	3,577	118.80	0.00
110.00	0.00	3,577	118.80	0.00
115.00	0.00	3,577	118.80	0.00
120.00	0.00	3,577	118.80	0.00

210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 57

Summary for Pond 14P: Rain Garden 1

Inflow Area = 0.292 ac, 64.38% Impervious, Inflow Depth = 3.97" for C - 10YR event
 Inflow = 1.09 cfs @ 12.12 hrs, Volume= 0.097 af
 Outflow = 1.06 cfs @ 12.14 hrs, Volume= 0.070 af, Atten= 3%, Lag= 0.9 min
 Primary = 1.06 cfs @ 12.14 hrs, Volume= 0.070 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 119.08' @ 12.14 hrs Surf.Area= 1,402 sf Storage= 1,277 cf

Plug-Flow detention time= 189.3 min calculated for 0.070 af (72% of inflow)
 Center-of-Mass det. time= 86.7 min (858.1 - 771.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	118.00'	2,758 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)
118.00	979	121.0	0	0	979
119.00	1,370	140.0	1,169	1,169	1,395
120.00	1,818	159.0	1,589	2,758	1,871

Device	Routing	Invert	Outlet Devices
#1	Primary	113.52'	15.0" Round Culvert L= 104.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.52' / 113.00' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	119.00'	48.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.06 cfs @ 12.14 hrs HW=119.08' TW=114.96' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.06 cfs of 10.09 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.06 cfs @ 0.91 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

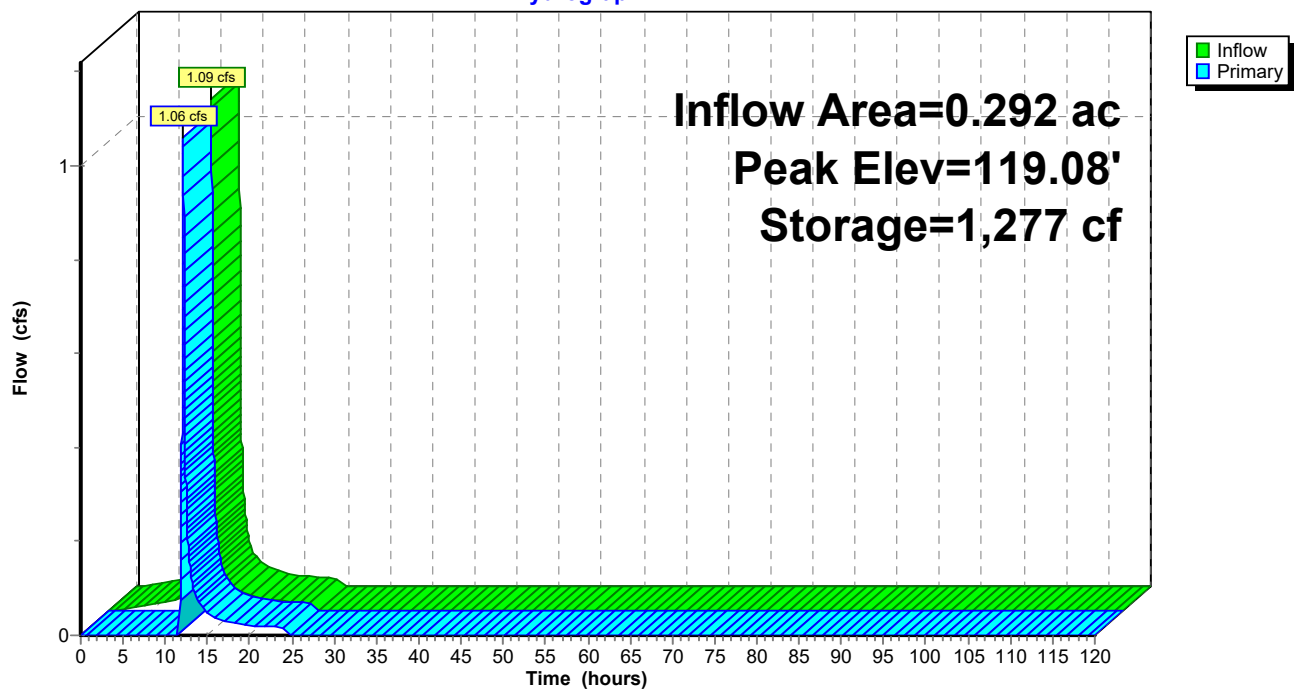
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 58

Pond 14P: Rain Garden 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 59

Hydrograph for Pond 14P: Rain Garden 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	118.00	0.00
5.00	0.01	120	118.12	0.00
10.00	0.05	534	118.50	0.00
15.00	0.05	1,182	119.01	0.05
20.00	0.02	1,177	119.01	0.02
25.00	0.00	1,169	119.00	0.00
30.00	0.00	1,169	119.00	0.00
35.00	0.00	1,169	119.00	0.00
40.00	0.00	1,169	119.00	0.00
45.00	0.00	1,169	119.00	0.00
50.00	0.00	1,169	119.00	0.00
55.00	0.00	1,169	119.00	0.00
60.00	0.00	1,169	119.00	0.00
65.00	0.00	1,169	119.00	0.00
70.00	0.00	1,169	119.00	0.00
75.00	0.00	1,169	119.00	0.00
80.00	0.00	1,169	119.00	0.00
85.00	0.00	1,169	119.00	0.00
90.00	0.00	1,169	119.00	0.00
95.00	0.00	1,169	119.00	0.00
100.00	0.00	1,169	119.00	0.00
105.00	0.00	1,169	119.00	0.00
110.00	0.00	1,169	119.00	0.00
115.00	0.00	1,169	119.00	0.00
120.00	0.00	1,169	119.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 60

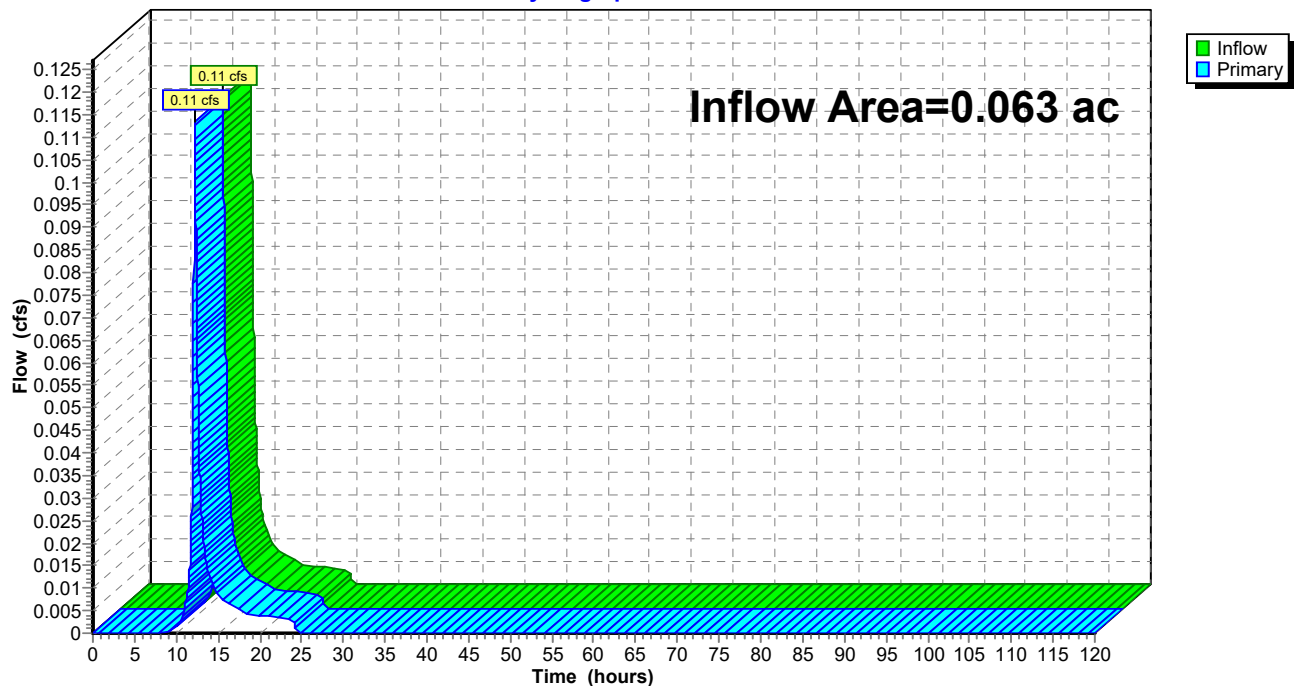
Summary for Link 4L: Analysis Point 2

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 2.42" for C - 10YR event
Inflow = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af
Primary = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 61

Hydrograph for Link 4L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	110.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	114.00	0.00	0.00	0.00
12.00	0.05	0.00	0.05	116.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	118.00	0.00	0.00	0.00
16.00	0.01	0.00	0.01	120.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00				
20.00	0.00	0.00	0.00				
22.00	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 62

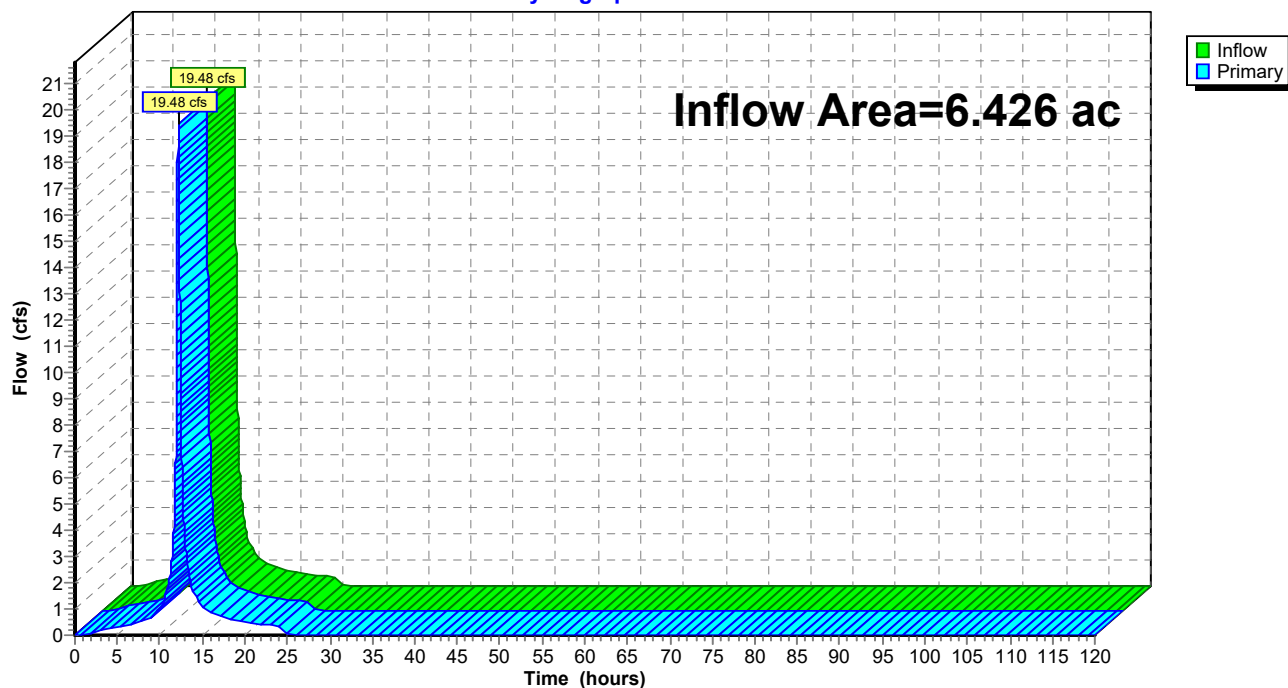
Summary for Link 9L: Analysis Point 1

Inflow Area = 6.426 ac, 84.17% Impervious, Inflow Depth = 4.25" for C - 10YR event
Inflow = 19.48 cfs @ 12.16 hrs, Volume= 2.273 af
Primary = 19.48 cfs @ 12.16 hrs, Volume= 2.273 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 9L: Analysis Point 1

Hydrograph



210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 63

Hydrograph for Link 9L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.11	0.00	0.11	106.00	0.00	0.00	0.00
4.00	0.26	0.00	0.26	108.00	0.00	0.00	0.00
6.00	0.35	0.00	0.35	110.00	0.00	0.00	0.00
8.00	0.56	0.00	0.56	112.00	0.00	0.00	0.00
10.00	1.01	0.00	1.01	114.00	0.00	0.00	0.00
12.00	10.67	0.00	10.67	116.00	0.00	0.00	0.00
14.00	1.63	0.00	1.63	118.00	0.00	0.00	0.00
16.00	0.88	0.00	0.88	120.00	0.00	0.00	0.00
18.00	0.60	0.00	0.60				
20.00	0.50	0.00	0.50				
22.00	0.43	0.00	0.43				
24.00	0.36	0.00	0.36				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 64

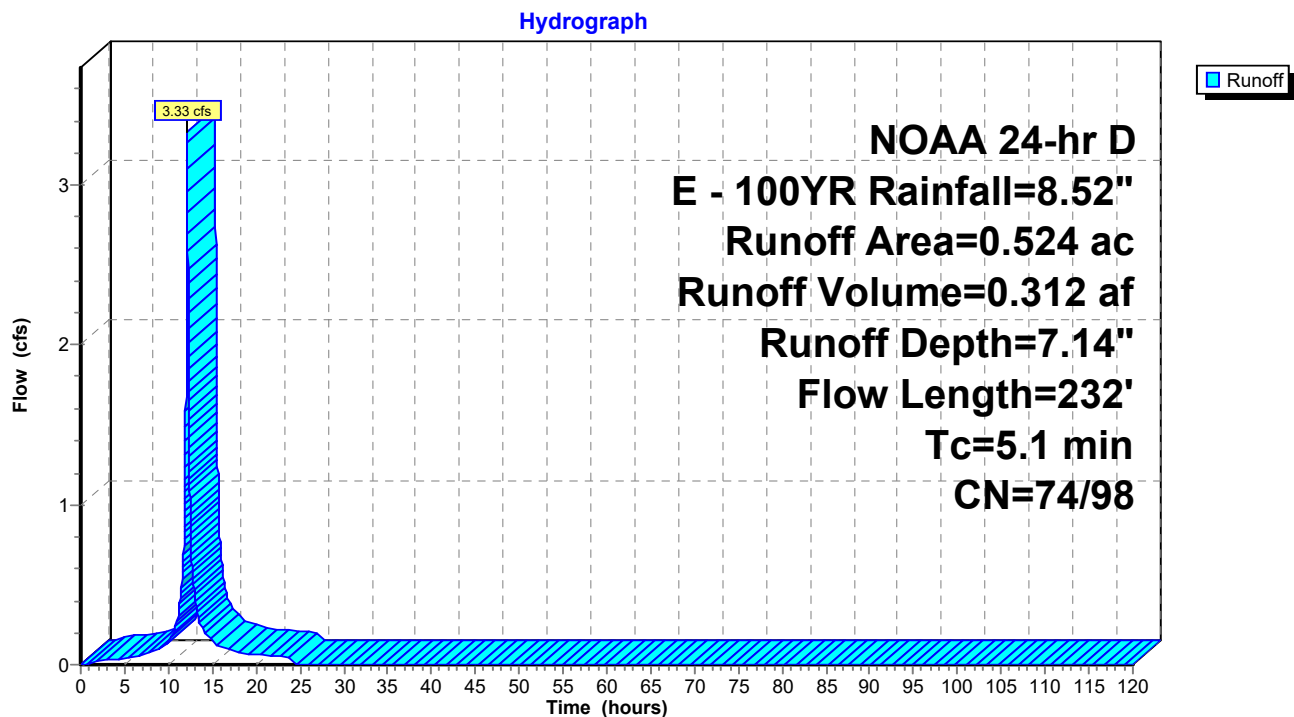
Summary for Subcatchment 2: Pr. Drainage Area 5

Runoff = 3.33 cfs @ 12.13 hrs, Volume= 0.312 af, Depth= 7.14"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
* 0.317	98	Paved parking
0.207	74	>75% Grass cover, Good, HSG C
0.524	89	Weighted Average
0.207	74	39.50% Pervious Area
0.317	98	60.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.7	207	0.0110	1.29		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.1	12	0.2500	3.50		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
5.1	232	Total			

Subcatchment 2: Pr. Drainage Area 5

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 65

Hydrograph for Subcatchment 2: Pr. Drainage Area 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.04
10.00	1.69	0.22	1.47	0.15
15.00	7.17	4.19	6.93	0.14
20.00	8.07	4.99	7.83	0.07
25.00	8.52	5.39	8.28	0.00
30.00	8.52	5.39	8.28	0.00
35.00	8.52	5.39	8.28	0.00
40.00	8.52	5.39	8.28	0.00
45.00	8.52	5.39	8.28	0.00
50.00	8.52	5.39	8.28	0.00
55.00	8.52	5.39	8.28	0.00
60.00	8.52	5.39	8.28	0.00
65.00	8.52	5.39	8.28	0.00
70.00	8.52	5.39	8.28	0.00
75.00	8.52	5.39	8.28	0.00
80.00	8.52	5.39	8.28	0.00
85.00	8.52	5.39	8.28	0.00
90.00	8.52	5.39	8.28	0.00
95.00	8.52	5.39	8.28	0.00
100.00	8.52	5.39	8.28	0.00
105.00	8.52	5.39	8.28	0.00
110.00	8.52	5.39	8.28	0.00
115.00	8.52	5.39	8.28	0.00
120.00	8.52	5.39	8.28	0.00

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 66

Summary for Subcatchment 2-O: Pr. Drainage Area 4

[47] Hint: Peak is 240% of capacity of segment #3

[47] Hint: Peak is 148% of capacity of segment #4

Runoff = 16.79 cfs @ 12.15 hrs, Volume= 1.811 af, Depth= 7.90"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
0.098	74	>75% Grass cover, Good, HSG C
0.358	80	>75% Grass cover, Good, HSG D
* 2.163	98	Paved parking
* 0.132	98	Roofs
2.751	95	Weighted Average
0.456	79	16.58% Pervious Area
2.295	98	83.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	253	0.0090	1.24		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	181	0.0750	15.62	19.17	Pipe Channel, BC 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	45	0.0100	5.70	7.00	Pipe Channel, CD - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	22	0.0100	6.44	11.38	Pipe Channel, DE - Pipe Flow 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
3.2	499	0.0010	2.59	18.28	Pipe Channel, EF - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
7.0	1,000	Total			

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

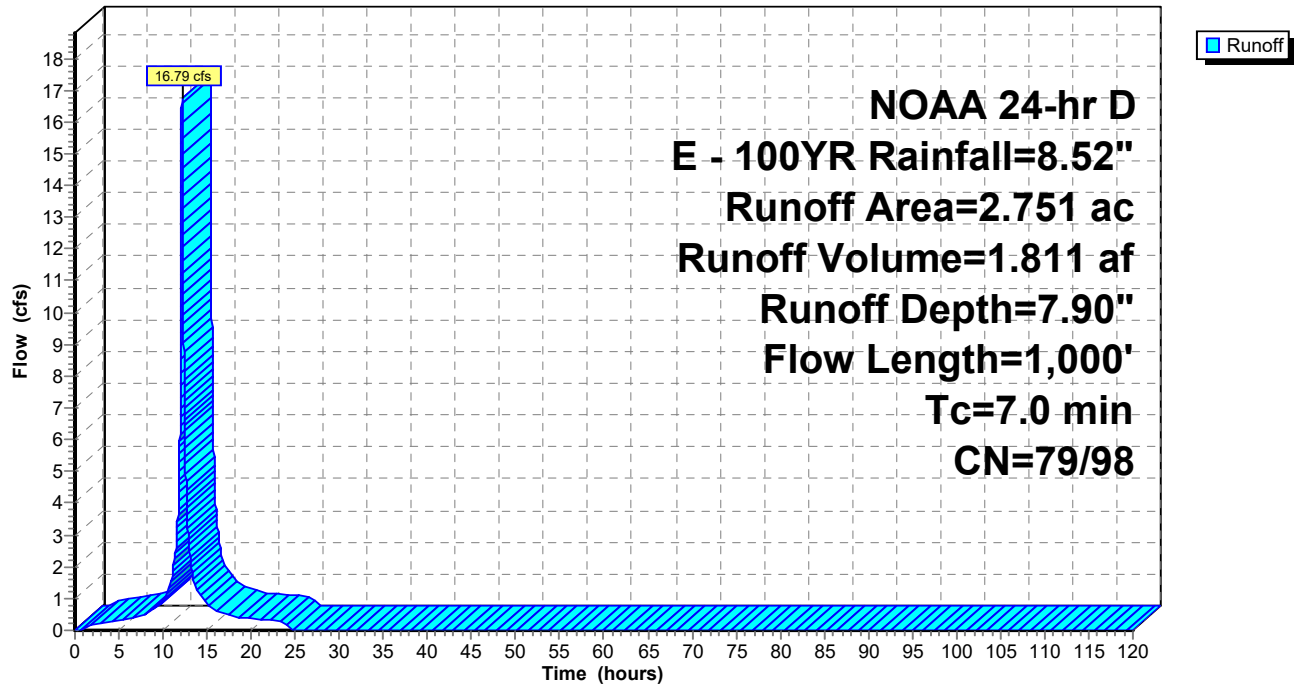
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 67

Subcatchment 2-O: Pr. Drainage Area 4

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 68

Hydrograph for Subcatchment 2-O: Pr. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.30
10.00	1.69	0.35	1.47	0.96
15.00	7.17	4.74	6.93	0.80
20.00	8.07	5.58	7.83	0.36
25.00	8.52	5.99	8.28	0.00
30.00	8.52	5.99	8.28	0.00
35.00	8.52	5.99	8.28	0.00
40.00	8.52	5.99	8.28	0.00
45.00	8.52	5.99	8.28	0.00
50.00	8.52	5.99	8.28	0.00
55.00	8.52	5.99	8.28	0.00
60.00	8.52	5.99	8.28	0.00
65.00	8.52	5.99	8.28	0.00
70.00	8.52	5.99	8.28	0.00
75.00	8.52	5.99	8.28	0.00
80.00	8.52	5.99	8.28	0.00
85.00	8.52	5.99	8.28	0.00
90.00	8.52	5.99	8.28	0.00
95.00	8.52	5.99	8.28	0.00
100.00	8.52	5.99	8.28	0.00
105.00	8.52	5.99	8.28	0.00
110.00	8.52	5.99	8.28	0.00
115.00	8.52	5.99	8.28	0.00
120.00	8.52	5.99	8.28	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 69

Summary for Subcatchment 3: Pr. Drainage Area 3

Runoff = 3.18 cfs @ 12.17 hrs, Volume= 0.373 af, Depth= 7.54"

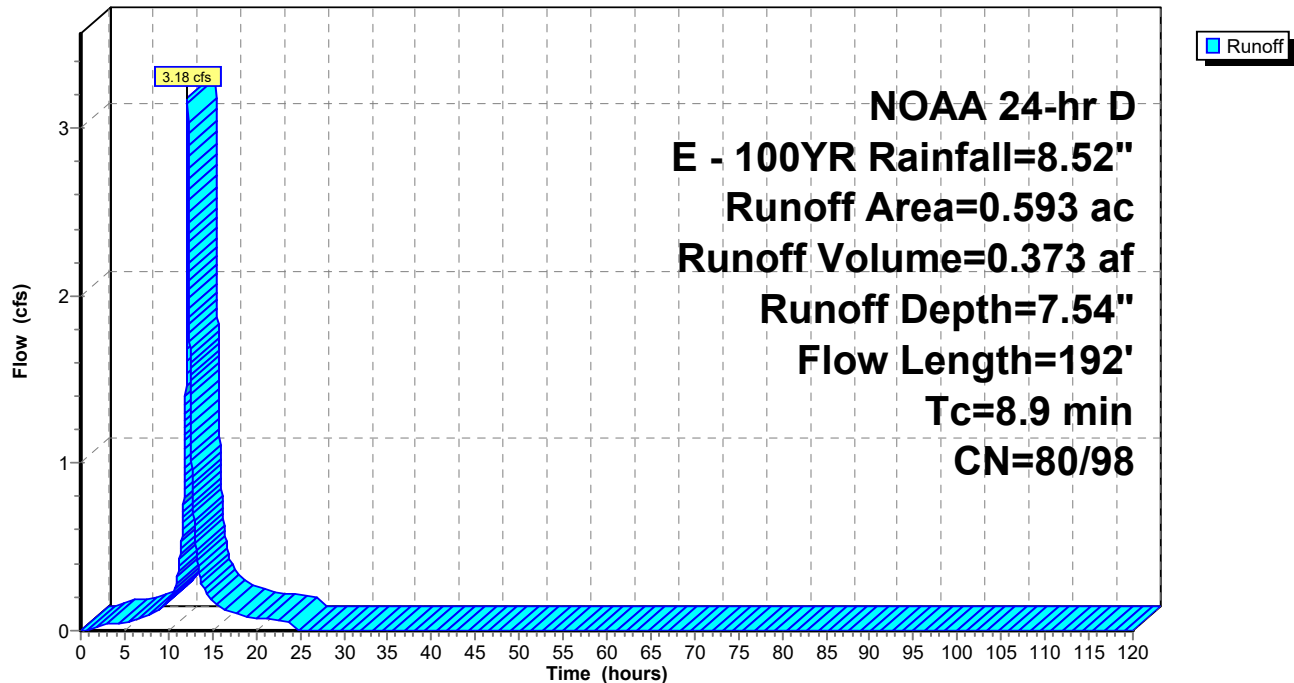
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
0.203	80	>75% Grass cover, Good, HSG D
* 0.390	98	Paved parking
0.593	92	Weighted Average
0.203	80	34.23% Pervious Area
0.390	98	65.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0080	0.11		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
0.5	71	0.0150	2.49		Shallow Concentrated Flow, BC - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	71	0.0290	2.55		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Grassed Waterway Kv= 15.0 fps
8.9	192	Total			

Subcatchment 3: Pr. Drainage Area 3

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 70

Hydrograph for Subcatchment 3: Pr. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.05
10.00	1.69	0.38	1.47	0.18
15.00	7.17	4.85	6.93	0.17
20.00	8.07	5.69	7.83	0.08
25.00	8.52	6.11	8.28	0.00
30.00	8.52	6.11	8.28	0.00
35.00	8.52	6.11	8.28	0.00
40.00	8.52	6.11	8.28	0.00
45.00	8.52	6.11	8.28	0.00
50.00	8.52	6.11	8.28	0.00
55.00	8.52	6.11	8.28	0.00
60.00	8.52	6.11	8.28	0.00
65.00	8.52	6.11	8.28	0.00
70.00	8.52	6.11	8.28	0.00
75.00	8.52	6.11	8.28	0.00
80.00	8.52	6.11	8.28	0.00
85.00	8.52	6.11	8.28	0.00
90.00	8.52	6.11	8.28	0.00
95.00	8.52	6.11	8.28	0.00
100.00	8.52	6.11	8.28	0.00
105.00	8.52	6.11	8.28	0.00
110.00	8.52	6.11	8.28	0.00
115.00	8.52	6.11	8.28	0.00
120.00	8.52	6.11	8.28	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 71

Summary for Subcatchment 9S: Pr. Drainage Area 6

Runoff = 0.25 cfs @ 12.18 hrs, Volume= 0.028 af, Depth= 5.39"

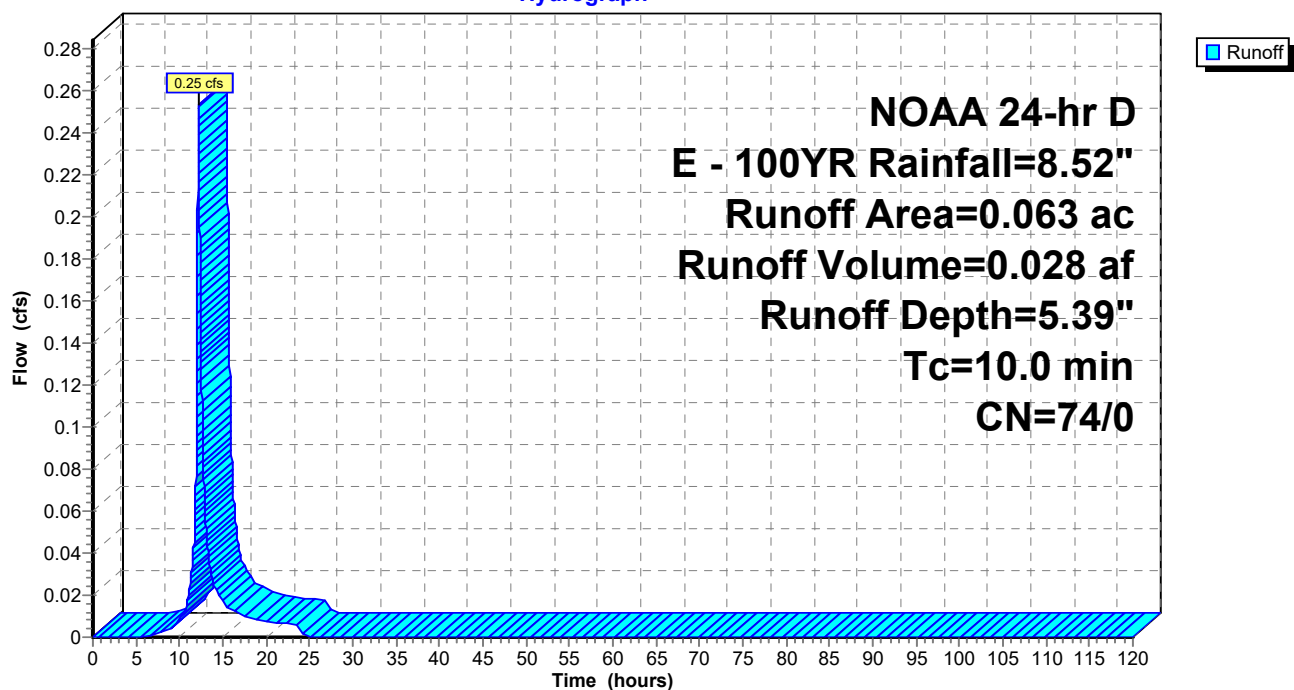
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
0.063	74	>75% Grass cover, Good, HSG C
0.063	74	100.00% Pervious Area

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

Subcatchment 9S: Pr. Drainage Area 6

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 72

Hydrograph for Subcatchment 9S: Pr. Drainage Area 6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.00	0.00
10.00	1.69	0.22	0.00	0.01
15.00	7.17	4.19	0.00	0.02
20.00	8.07	4.99	0.00	0.01
25.00	8.52	5.39	0.00	0.00
30.00	8.52	5.39	0.00	0.00
35.00	8.52	5.39	0.00	0.00
40.00	8.52	5.39	0.00	0.00
45.00	8.52	5.39	0.00	0.00
50.00	8.52	5.39	0.00	0.00
55.00	8.52	5.39	0.00	0.00
60.00	8.52	5.39	0.00	0.00
65.00	8.52	5.39	0.00	0.00
70.00	8.52	5.39	0.00	0.00
75.00	8.52	5.39	0.00	0.00
80.00	8.52	5.39	0.00	0.00
85.00	8.52	5.39	0.00	0.00
90.00	8.52	5.39	0.00	0.00
95.00	8.52	5.39	0.00	0.00
100.00	8.52	5.39	0.00	0.00
105.00	8.52	5.39	0.00	0.00
110.00	8.52	5.39	0.00	0.00
115.00	8.52	5.39	0.00	0.00
120.00	8.52	5.39	0.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 73

Summary for Subcatchment 11S: Pr. Drainage Area 2

[47] Hint: Peak is 268% of capacity of segment #2

Runoff = 18.76 cfs @ 12.11 hrs, Volume= 1.554 af, Depth= 8.23"

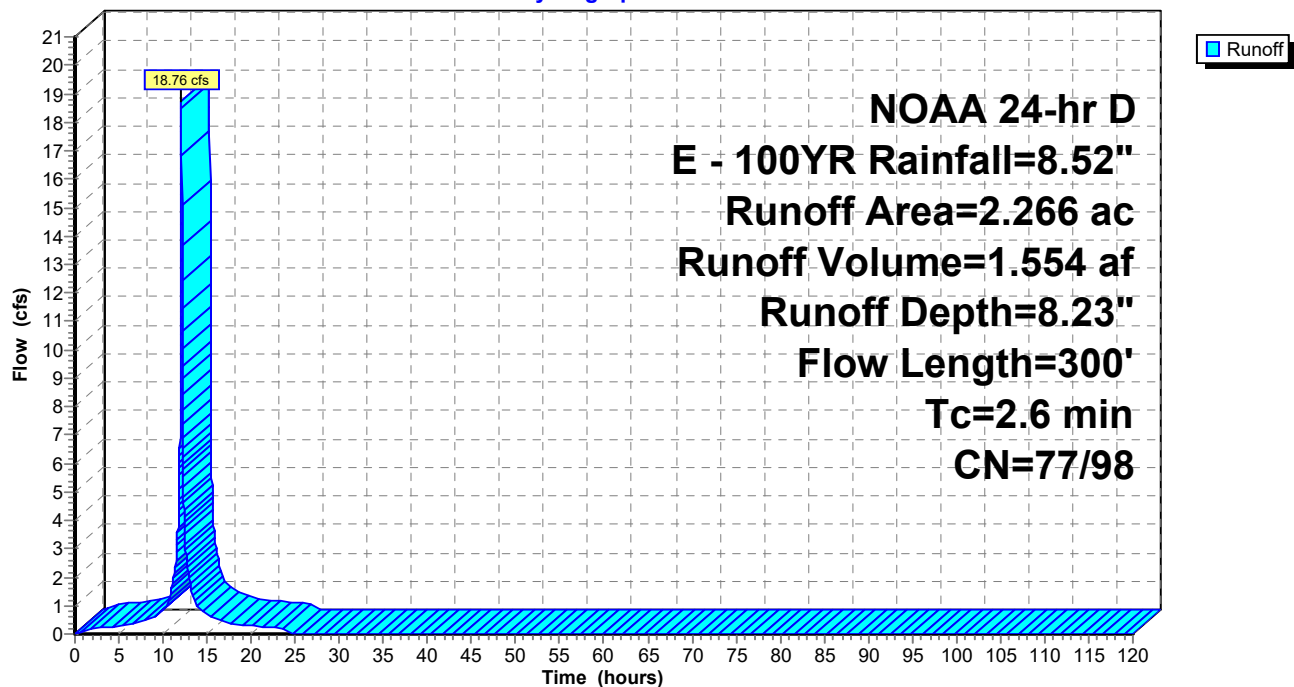
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.025	80	>75% Grass cover, Good, HSG D
* 0.991	98	Paved parking
* 1.228	98	Roofs
2.266	98	Weighted Average
0.047	77	2.07% Pervious Area
2.219	98	97.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	230	0.0170	1.56		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	70	0.0100	5.70	7.00	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
2.6	300	Total			

Subcatchment 11S: Pr. Drainage Area 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 74

Hydrograph for Subcatchment 11S: Pr. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.29
10.00	1.69	0.29	1.47	0.88
15.00	7.17	4.52	6.93	0.64
20.00	8.07	5.34	7.83	0.30
25.00	8.52	5.75	8.28	0.00
30.00	8.52	5.75	8.28	0.00
35.00	8.52	5.75	8.28	0.00
40.00	8.52	5.75	8.28	0.00
45.00	8.52	5.75	8.28	0.00
50.00	8.52	5.75	8.28	0.00
55.00	8.52	5.75	8.28	0.00
60.00	8.52	5.75	8.28	0.00
65.00	8.52	5.75	8.28	0.00
70.00	8.52	5.75	8.28	0.00
75.00	8.52	5.75	8.28	0.00
80.00	8.52	5.75	8.28	0.00
85.00	8.52	5.75	8.28	0.00
90.00	8.52	5.75	8.28	0.00
95.00	8.52	5.75	8.28	0.00
100.00	8.52	5.75	8.28	0.00
105.00	8.52	5.75	8.28	0.00
110.00	8.52	5.75	8.28	0.00
115.00	8.52	5.75	8.28	0.00
120.00	8.52	5.75	8.28	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 75

Summary for Subcatchment 12S: Pr. Drainage Area 1

Runoff = 1.98 cfs @ 12.12 hrs, Volume= 0.176 af, Depth= 7.25"

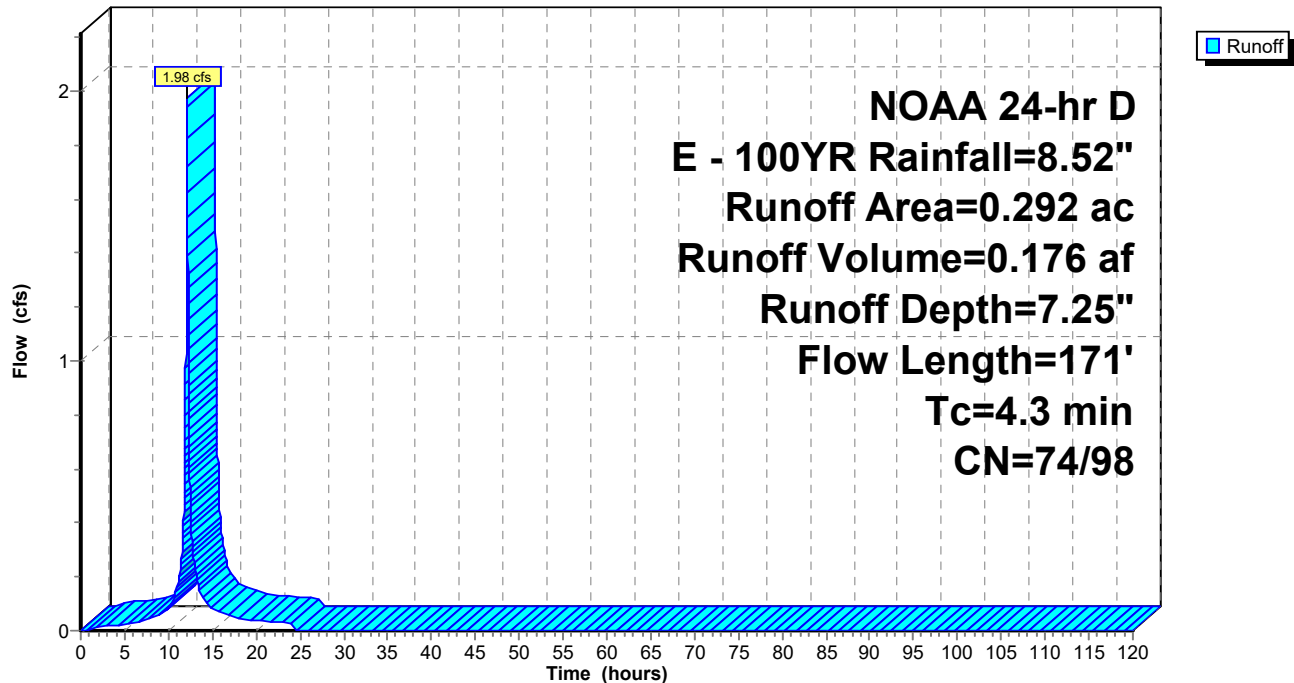
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D E - 100YR Rainfall=8.52"

Area (ac)	CN	Description
0.104	74	>75% Grass cover, Good, HSG C
* 0.188	98	Paved parking
0.292	89	Weighted Average
0.104	74	35.62% Pervious Area
0.188	98	64.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.0	147	0.0110	1.20		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	11	0.2500	7.50		Shallow Concentrated Flow, CD - Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
4.3	171	Total			

Subcatchment 12S: Pr. Drainage Area 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 76

Hydrograph for Subcatchment 12S: Pr. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.58	0.00	0.39	0.02
10.00	1.69	0.22	1.47	0.09
15.00	7.17	4.19	6.93	0.08
20.00	8.07	4.99	7.83	0.04
25.00	8.52	5.39	8.28	0.00
30.00	8.52	5.39	8.28	0.00
35.00	8.52	5.39	8.28	0.00
40.00	8.52	5.39	8.28	0.00
45.00	8.52	5.39	8.28	0.00
50.00	8.52	5.39	8.28	0.00
55.00	8.52	5.39	8.28	0.00
60.00	8.52	5.39	8.28	0.00
65.00	8.52	5.39	8.28	0.00
70.00	8.52	5.39	8.28	0.00
75.00	8.52	5.39	8.28	0.00
80.00	8.52	5.39	8.28	0.00
85.00	8.52	5.39	8.28	0.00
90.00	8.52	5.39	8.28	0.00
95.00	8.52	5.39	8.28	0.00
100.00	8.52	5.39	8.28	0.00
105.00	8.52	5.39	8.28	0.00
110.00	8.52	5.39	8.28	0.00
115.00	8.52	5.39	8.28	0.00
120.00	8.52	5.39	8.28	0.00

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 77

Summary for Pond 6P: Pipe Storage

Inflow Area = 2.558 ac, 94.10% Impervious, Inflow Depth = 7.99" for E - 100YR event
 Inflow = 20.57 cfs @ 12.11 hrs, Volume= 1.703 af
 Outflow = 16.10 cfs @ 12.15 hrs, Volume= 1.703 af, Atten= 22%, Lag= 2.3 min
 Primary = 16.10 cfs @ 12.15 hrs, Volume= 1.703 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 117.39' @ 12.15 hrs Surf.Area= 0.014 ac Storage= 0.161 af

Plug-Flow detention time= 12.9 min calculated for 1.703 af (100% of inflow)
 Center-of-Mass det. time= 13.0 min (761.2 - 748.2)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=16.08 cfs @ 12.15 hrs HW=117.38' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 16.08 cfs @ 9.10 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

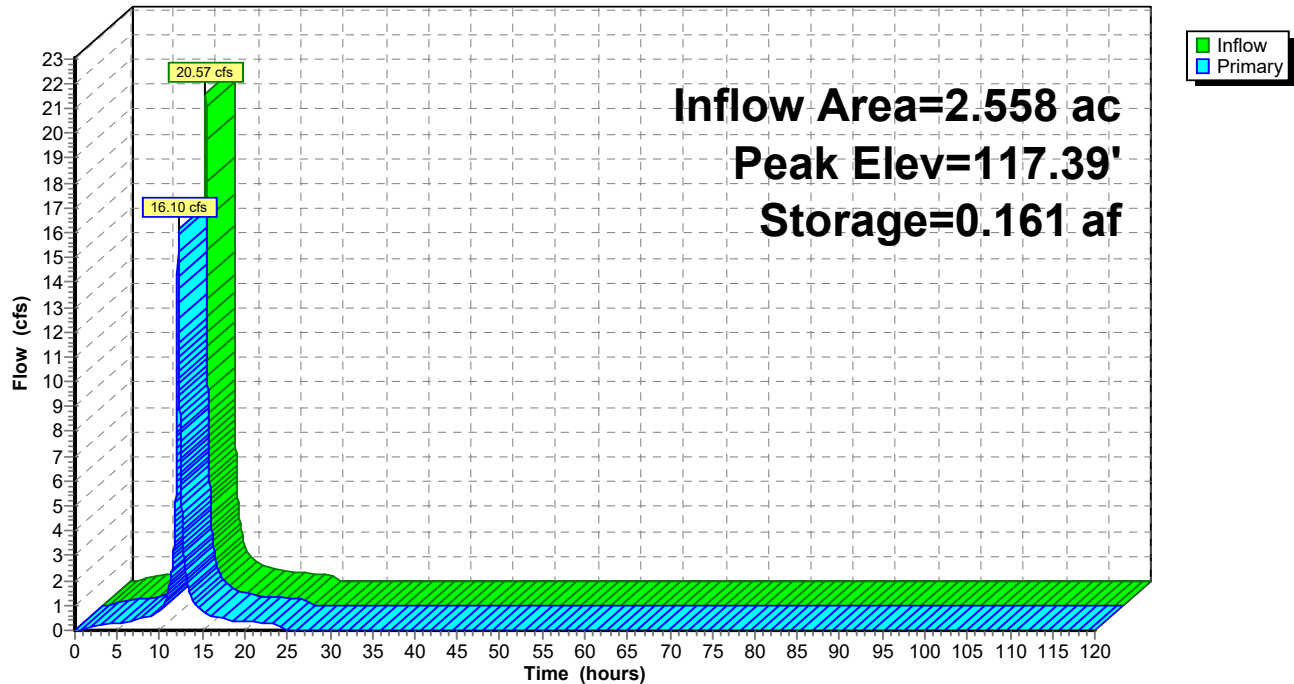
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 78

Pond 6P: Pipe Storage

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 79

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.29	0.008	113.23	0.28
10.00	0.88	0.017	113.43	0.83
15.00	0.72	0.016	113.41	0.77
20.00	0.34	0.009	113.26	0.34
25.00	0.00	0.002	113.04	0.02
30.00	0.00	0.000	112.97	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.96	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 80

Summary for Pond 8P: Rain Garden 2

Inflow Area = 0.593 ac, 65.77% Impervious, Inflow Depth = 7.54" for E - 100YR event
 Inflow = 3.18 cfs @ 12.17 hrs, Volume= 0.373 af
 Outflow = 3.16 cfs @ 12.18 hrs, Volume= 0.344 af, Atten= 1%, Lag= 0.8 min
 Primary = 3.16 cfs @ 12.18 hrs, Volume= 0.344 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 117.41' @ 12.18 hrs Surf.Area= 1,457 sf Storage= 1,447 cf

Plug-Flow detention time= 82.5 min calculated for 0.344 af (92% of inflow)
 Center-of-Mass det. time= 39.5 min (807.2 - 767.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	116.00'	1,570 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
116.00	550	121.0	0	0	550
117.00	1,260	276.0	881	881	5,451
117.50	1,500	285.0	689	1,570	5,876

Device	Routing	Invert	Outlet Devices
#1	Primary	113.50'	15.0" Round Culvert L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.50' / 113.34' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	117.25'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.16 cfs @ 12.18 hrs HW=117.41' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 3.16 cfs of 10.71 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 3.16 cfs @ 1.31 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

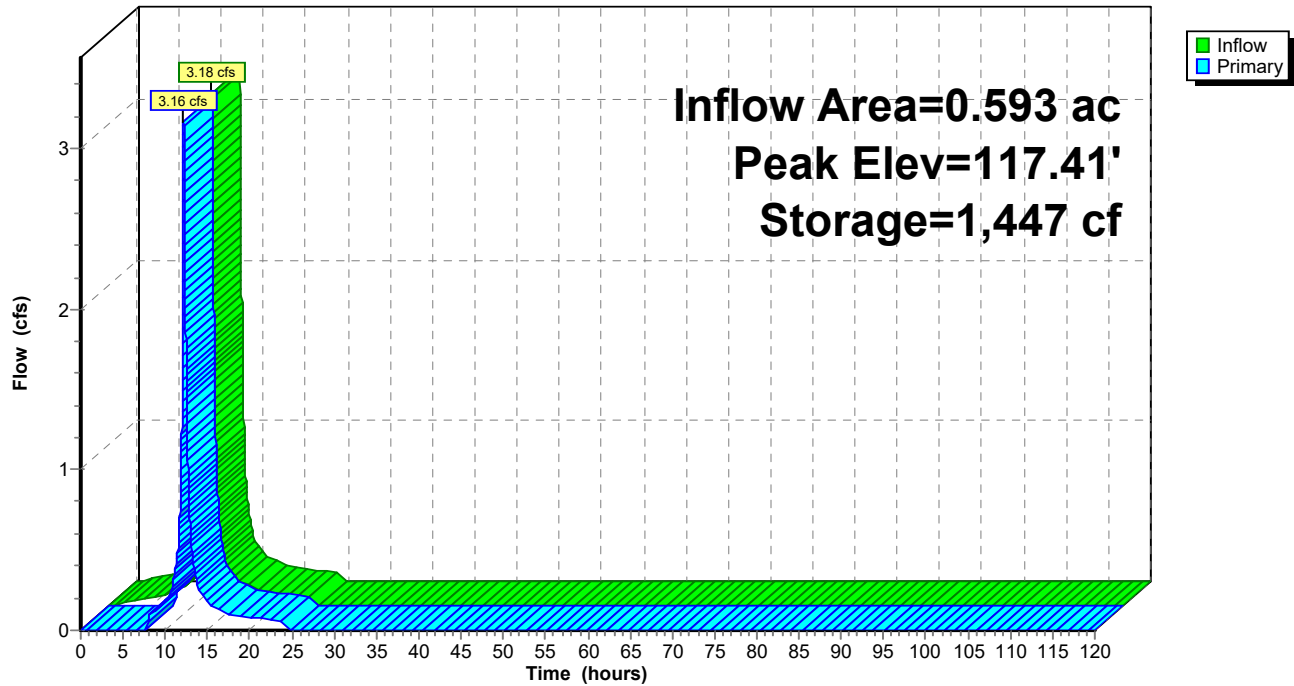
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 81

Pond 8P: Rain Garden 2

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 82

Hydrograph for Pond 8P: Rain Garden 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	116.00	0.00
5.00	0.05	517	116.59	0.00
10.00	0.18	1,258	117.27	0.18
15.00	0.17	1,258	117.27	0.18
20.00	0.08	1,244	117.26	0.08
25.00	0.00	1,226	117.25	0.00
30.00	0.00	1,225	117.25	0.00
35.00	0.00	1,225	117.25	0.00
40.00	0.00	1,225	117.25	0.00
45.00	0.00	1,225	117.25	0.00
50.00	0.00	1,225	117.25	0.00
55.00	0.00	1,225	117.25	0.00
60.00	0.00	1,225	117.25	0.00
65.00	0.00	1,225	117.25	0.00
70.00	0.00	1,225	117.25	0.00
75.00	0.00	1,225	117.25	0.00
80.00	0.00	1,225	117.25	0.00
85.00	0.00	1,225	117.25	0.00
90.00	0.00	1,225	117.25	0.00
95.00	0.00	1,225	117.25	0.00
100.00	0.00	1,225	117.25	0.00
105.00	0.00	1,225	117.25	0.00
110.00	0.00	1,225	117.25	0.00
115.00	0.00	1,225	117.25	0.00
120.00	0.00	1,225	117.25	0.00

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 83

Summary for Pond 13P: Rain Garden 3

Inflow Area = 0.524 ac, 60.50% Impervious, Inflow Depth = 7.14" for E - 100YR event
 Inflow = 3.33 cfs @ 12.13 hrs, Volume= 0.312 af
 Outflow = 3.14 cfs @ 12.16 hrs, Volume= 0.230 af, Atten= 6%, Lag= 1.6 min
 Primary = 3.14 cfs @ 12.16 hrs, Volume= 0.230 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 118.96' @ 12.16 hrs Surf.Area= 3,432 sf Storage= 4,114 cf

Plug-Flow detention time= 186.8 min calculated for 0.230 af (74% of inflow)
 Center-of-Mass det. time= 87.4 min (855.0 - 767.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	117.50'	4,252 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)
117.50	2,271	224.0	0	0	2,271
118.00	2,615	234.0	1,220	1,220	2,653
119.00	3,469	279.0	3,032	4,252	4,508

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	15.0" Round Culvert L= 194.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 114.04' S= 0.0049 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	118.80'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.13 cfs @ 12.16 hrs HW=118.96' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 3.13 cfs of 7.69 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 3.13 cfs @ 1.31 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

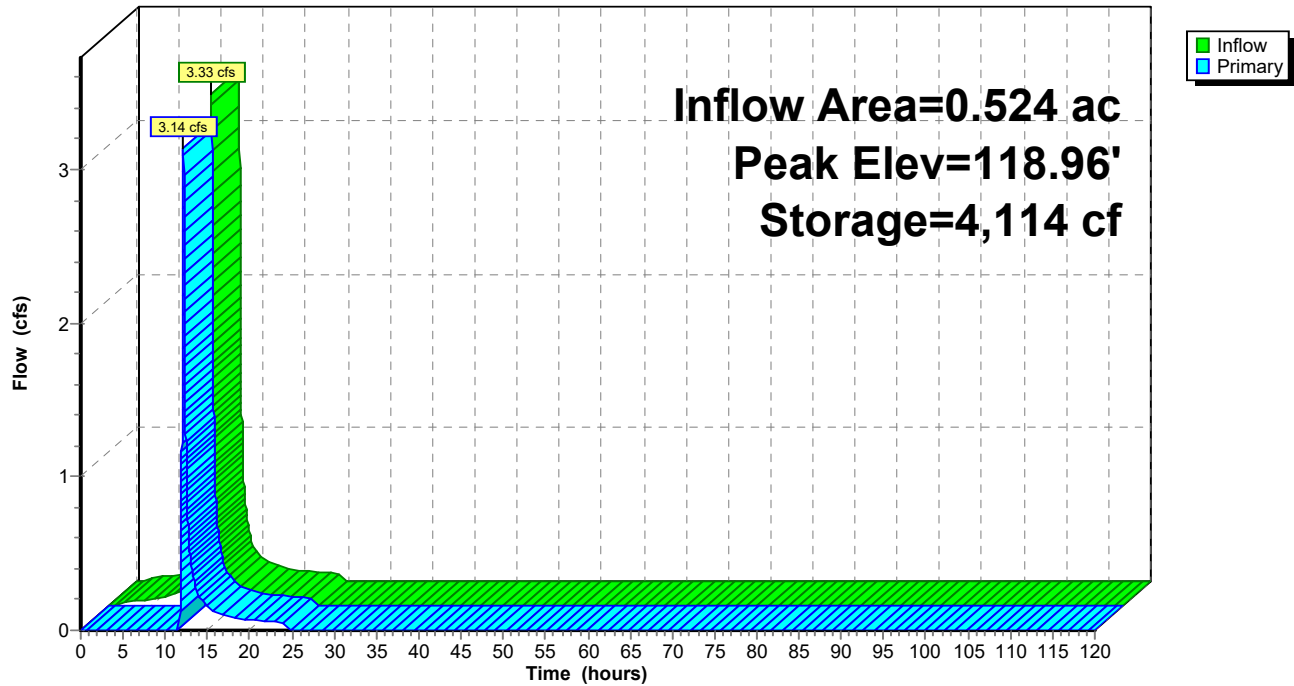
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 84

Pond 13P: Rain Garden 3

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 85

Hydrograph for Pond 13P: Rain Garden 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	117.50	0.00
5.00	0.04	433	117.69	0.00
10.00	0.15	1,777	118.21	0.00
15.00	0.14	3,646	118.82	0.15
20.00	0.07	3,617	118.81	0.07
25.00	0.00	3,580	118.80	0.00
30.00	0.00	3,577	118.80	0.00
35.00	0.00	3,577	118.80	0.00
40.00	0.00	3,577	118.80	0.00
45.00	0.00	3,577	118.80	0.00
50.00	0.00	3,577	118.80	0.00
55.00	0.00	3,577	118.80	0.00
60.00	0.00	3,577	118.80	0.00
65.00	0.00	3,577	118.80	0.00
70.00	0.00	3,577	118.80	0.00
75.00	0.00	3,577	118.80	0.00
80.00	0.00	3,577	118.80	0.00
85.00	0.00	3,577	118.80	0.00
90.00	0.00	3,577	118.80	0.00
95.00	0.00	3,577	118.80	0.00
100.00	0.00	3,577	118.80	0.00
105.00	0.00	3,577	118.80	0.00
110.00	0.00	3,577	118.80	0.00
115.00	0.00	3,577	118.80	0.00
120.00	0.00	3,577	118.80	0.00

210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 86

Summary for Pond 14P: Rain Garden 1

Inflow Area = 0.292 ac, 64.38% Impervious, Inflow Depth = 7.25" for E - 100YR event
 Inflow = 1.98 cfs @ 12.12 hrs, Volume= 0.176 af
 Outflow = 1.94 cfs @ 12.14 hrs, Volume= 0.150 af, Atten= 2%, Lag= 0.8 min
 Primary = 1.94 cfs @ 12.14 hrs, Volume= 0.150 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 119.12' @ 12.14 hrs Surf.Area= 1,419 sf Storage= 1,331 cf

Plug-Flow detention time= 134.7 min calculated for 0.150 af (85% of inflow)
 Center-of-Mass det. time= 62.3 min (826.0 - 763.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	118.00'	2,758 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)
118.00	979	121.0	0	0	979
119.00	1,370	140.0	1,169	1,169	1,395
120.00	1,818	159.0	1,589	2,758	1,871

Device	Routing	Invert	Outlet Devices
#1	Primary	113.52'	15.0" Round Culvert L= 104.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.52' / 113.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	119.00'	48.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.93 cfs @ 12.14 hrs HW=119.12' TW=117.33' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.93 cfs of 6.64 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.93 cfs @ 1.11 fps)

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

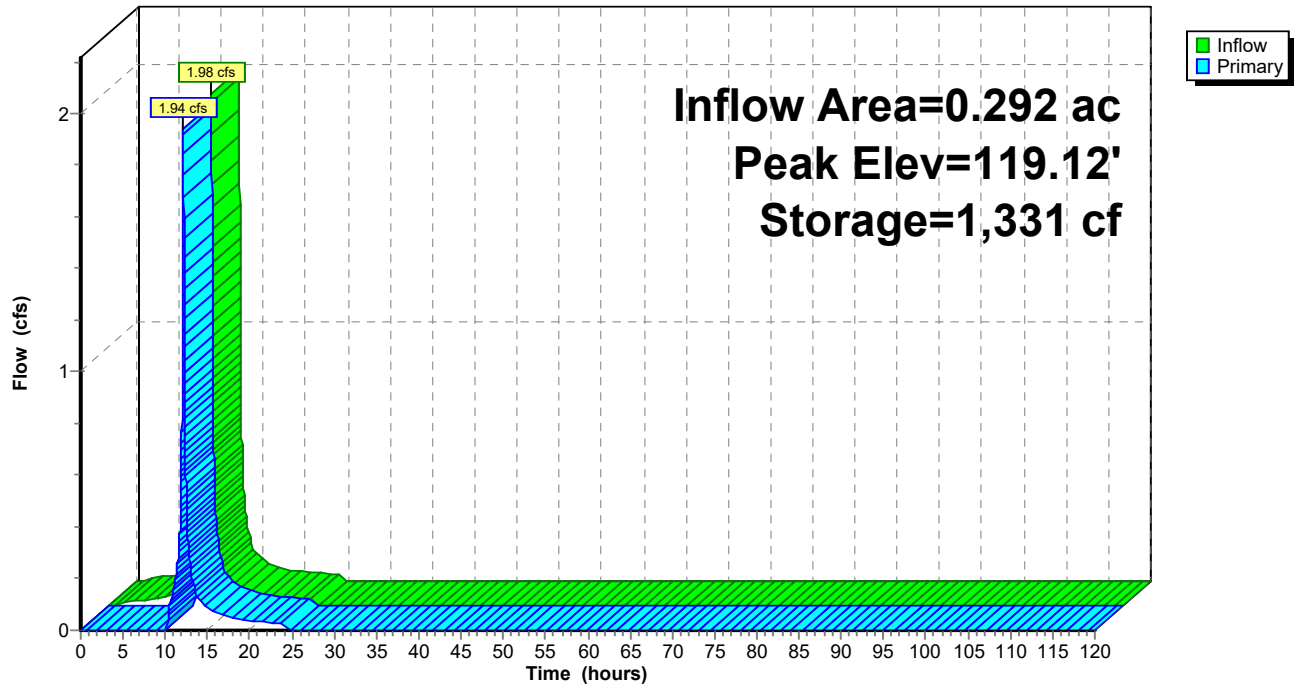
NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 87

Pond 14P: Rain Garden 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 88

Hydrograph for Pond 14P: Rain Garden 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	118.00	0.00
5.00	0.02	259	118.25	0.00
10.00	0.09	1,047	118.91	0.00
15.00	0.08	1,188	119.01	0.08
20.00	0.04	1,181	119.01	0.04
25.00	0.00	1,169	119.00	0.00
30.00	0.00	1,169	119.00	0.00
35.00	0.00	1,169	119.00	0.00
40.00	0.00	1,169	119.00	0.00
45.00	0.00	1,169	119.00	0.00
50.00	0.00	1,169	119.00	0.00
55.00	0.00	1,169	119.00	0.00
60.00	0.00	1,169	119.00	0.00
65.00	0.00	1,169	119.00	0.00
70.00	0.00	1,169	119.00	0.00
75.00	0.00	1,169	119.00	0.00
80.00	0.00	1,169	119.00	0.00
85.00	0.00	1,169	119.00	0.00
90.00	0.00	1,169	119.00	0.00
95.00	0.00	1,169	119.00	0.00
100.00	0.00	1,169	119.00	0.00
105.00	0.00	1,169	119.00	0.00
110.00	0.00	1,169	119.00	0.00
115.00	0.00	1,169	119.00	0.00
120.00	0.00	1,169	119.00	0.00

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 89

Summary for Link 4L: Analysis Point 2

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 5.39" for E - 100YR event

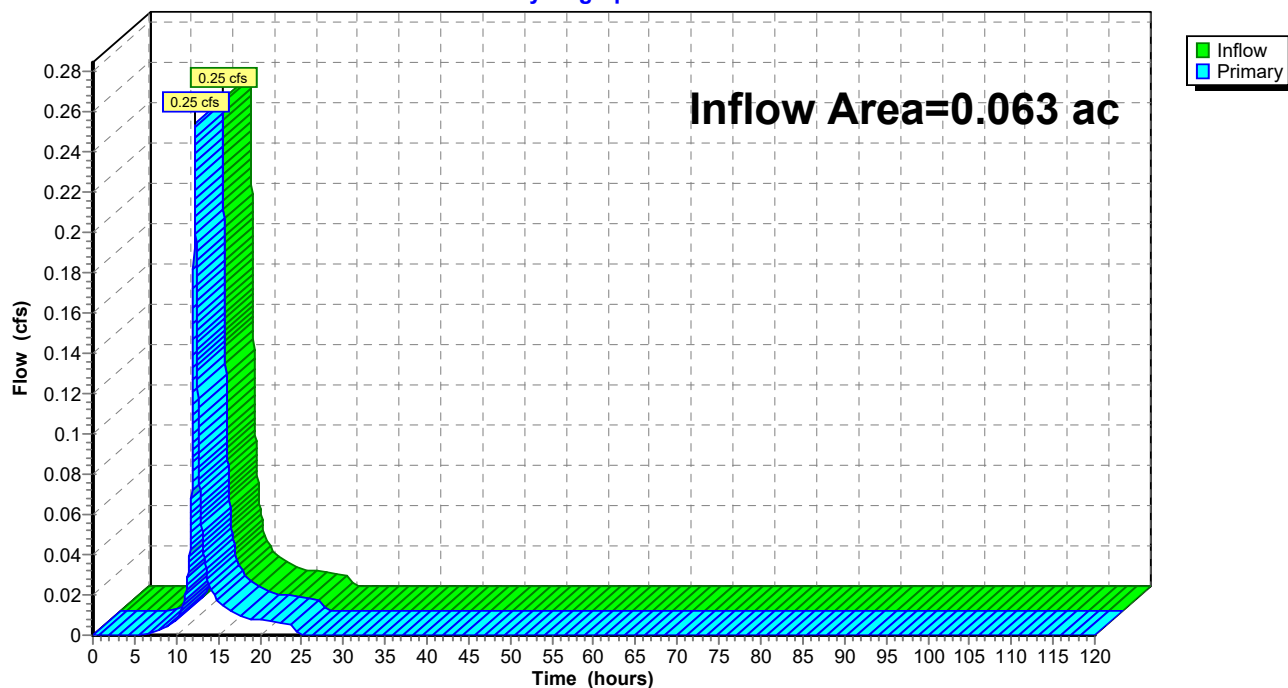
Inflow = 0.25 cfs @ 12.18 hrs, Volume= 0.028 af

Primary = 0.25 cfs @ 12.18 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 2

Hydrograph



210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 90

Hydrograph for Link 4L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	110.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00
10.00	0.01	0.00	0.01	114.00	0.00	0.00	0.00
12.00	0.12	0.00	0.12	116.00	0.00	0.00	0.00
14.00	0.02	0.00	0.02	118.00	0.00	0.00	0.00
16.00	0.01	0.00	0.01	120.00	0.00	0.00	0.00
18.00	0.01	0.00	0.01				
20.00	0.01	0.00	0.01				
22.00	0.01	0.00	0.01				
24.00	0.01	0.00	0.01				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 Proposed Conditions

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D E - 100YR Rainfall=8.52"

Printed 8/10/2021

Page 91

Summary for Link 9L: Analysis Point 1

Inflow Area = 6.426 ac, 84.17% Impervious, Inflow Depth = 7.64" for E - 100YR event

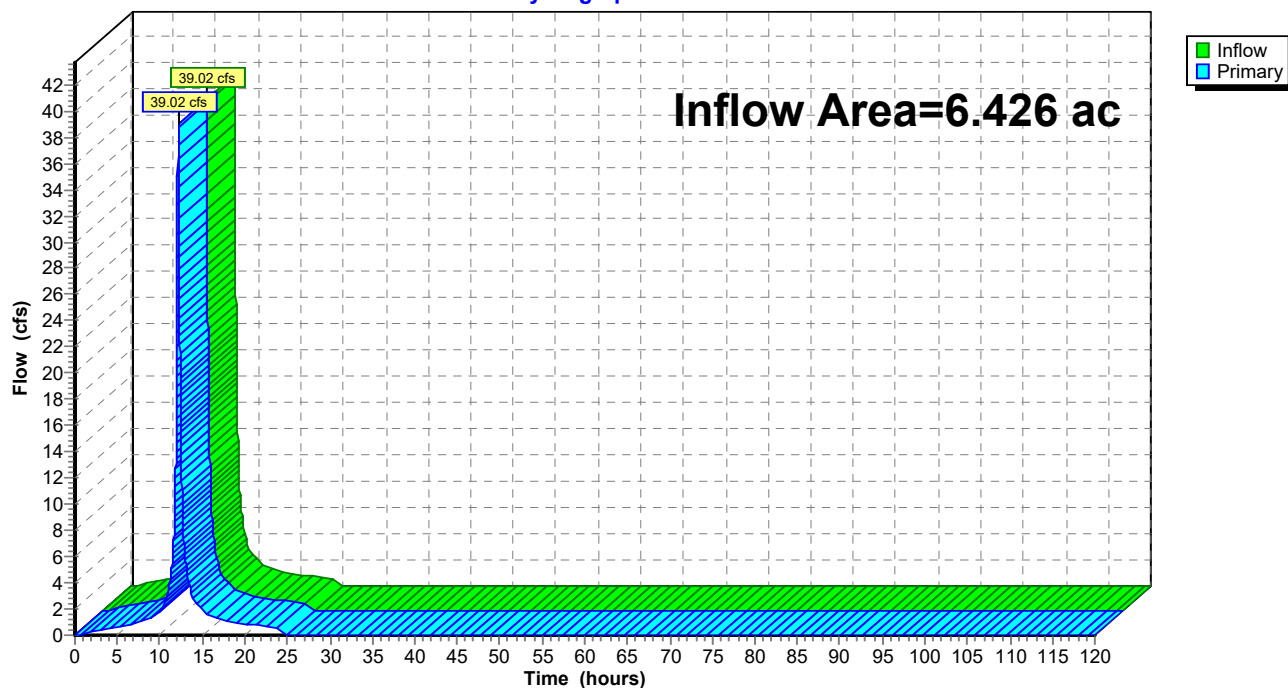
Inflow = 39.02 cfs @ 12.15 hrs, Volume= 4.089 af

Primary = 39.02 cfs @ 12.15 hrs, Volume= 4.089 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 9L: Analysis Point 1

Hydrograph



210600 Proposed Conditions

NOAA 24-hr D E - 100YR Rainfall=8.52"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

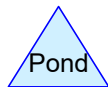
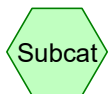
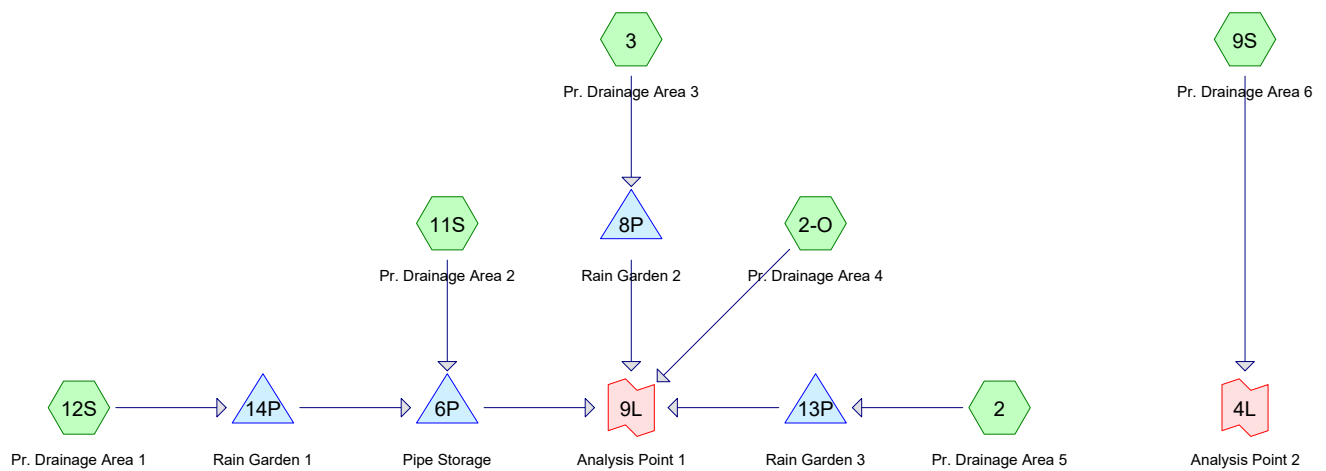
Page 92

Hydrograph for Link 9L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.31	0.00	0.31	106.00	0.00	0.00	0.00
4.00	0.51	0.00	0.51	108.00	0.00	0.00	0.00
6.00	0.64	0.00	0.64	110.00	0.00	0.00	0.00
8.00	1.09	0.00	1.09	112.00	0.00	0.00	0.00
10.00	1.97	0.00	1.97	114.00	0.00	0.00	0.00
12.00	19.80	0.00	19.80	116.00	0.00	0.00	0.00
14.00	2.77	0.00	2.77	118.00	0.00	0.00	0.00
16.00	1.50	0.00	1.50	120.00	0.00	0.00	0.00
18.00	1.02	0.00	1.02				
20.00	0.85	0.00	0.85				
22.00	0.73	0.00	0.73				
24.00	0.61	0.00	0.61				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

Appendix C

SCD Failure Analysis



Routing Diagram for 210600 SCD Failure Analysis
 Prepared by Maser Consulting, Printed 8/10/2021
 HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2
2	B - 2YR	NOAA 24-hr	D	Default	24.00	1	3.32	2
3	C - 10YR	NOAA 24-hr	D	Default	24.00	1	5.07	2
4	D - 25YR	NOAA 24-hr	D	Default	24.00	1	6.29	2
5	E - 100YR	NOAA 24-hr	D	Default	24.00	1	8.52	2

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 3

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.494	74	>75% Grass cover, Good, HSG C (2, 2-O, 9S, 11S, 12S)
0.586	80	>75% Grass cover, Good, HSG D (2-O, 3, 11S)
4.049	98	Paved parking (2, 2-O, 3, 11S, 12S)
1.360	98	Roofs (2-O, 11S)
6.489	95	TOTAL AREA

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.494	0.586	0.000	1.080	>75% Grass cover, Good	2, 2-O, 3, 9S, 11S, 12S
0.000	0.000	0.000	0.000	4.049	4.049	Paved parking	2, 2-O, 3, 11S, 12S
0.000	0.000	0.000	0.000	1.360	1.360	Roofs	2-O, 11S
0.000	0.000	0.494	0.586	5.409	6.489	TOTAL AREA	

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Printed 8/10/2021

Page 5

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2-O	0.00	0.00	181.0	0.0750	0.012	15.0	0.0	0.0
2	2-O	0.00	0.00	45.0	0.0100	0.012	15.0	0.0	0.0
3	2-O	0.00	0.00	22.0	0.0100	0.012	18.0	0.0	0.0
4	2-O	0.00	0.00	499.0	0.0010	0.015	36.0	0.0	0.0
5	11S	0.00	0.00	70.0	0.0100	0.012	15.0	0.0	0.0
6	6P	112.96	112.68	54.0	0.0052	0.013	18.0	0.0	0.0
7	8P	113.50	113.34	16.0	0.0100	0.013	15.0	0.0	0.0
8	13P	115.00	114.04	194.0	0.0049	0.013	15.0	0.0	0.0
9	14P	113.52	113.00	104.0	0.0050	0.013	15.0	0.0	0.0

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 6

Summary for Subcatchment 2: Pr. Drainage Area 5

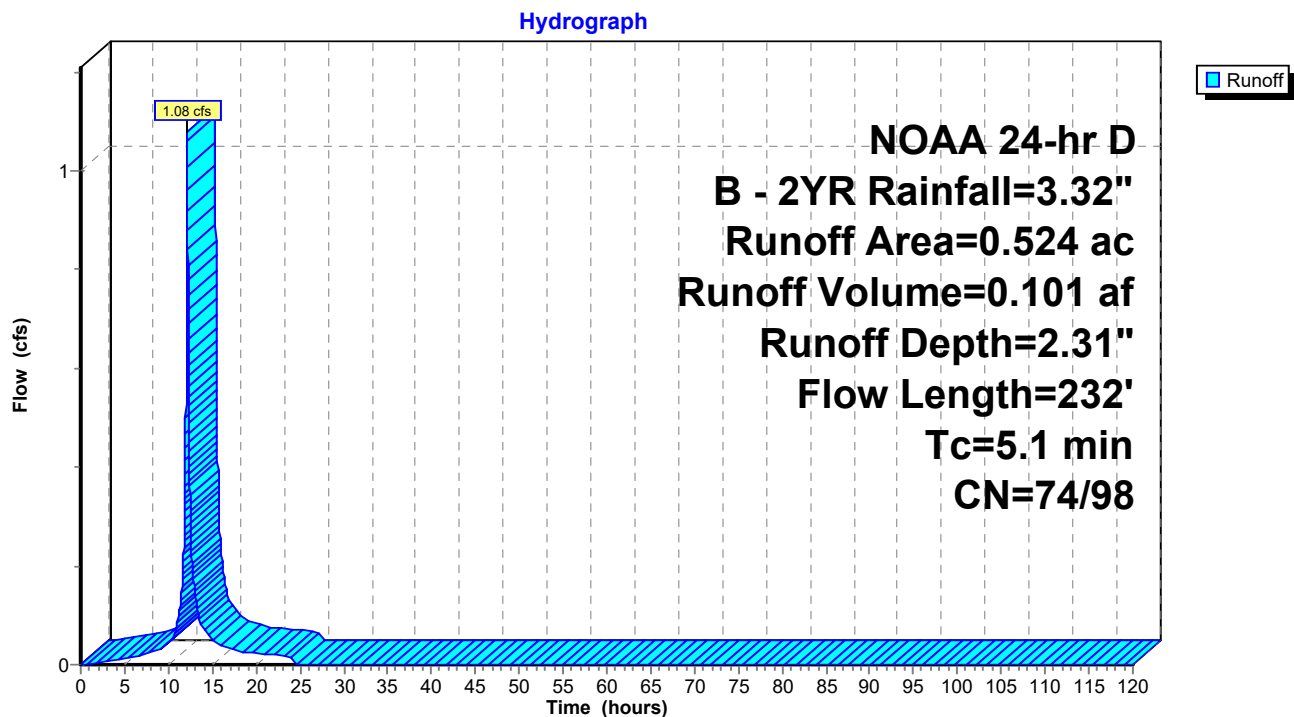
Runoff = 1.08 cfs @ 12.13 hrs, Volume= 0.101 af, Depth= 2.31"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
* 0.317	98	Paved parking
0.207	74	>75% Grass cover, Good, HSG C
0.524	89	Weighted Average
0.207	74	39.50% Pervious Area
0.317	98	60.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.7	207	0.0110	1.29		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.1	12	0.2500	3.50		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
5.1	232	Total			

Subcatchment 2: Pr. Drainage Area 5



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 7

Hydrograph for Subcatchment 2: Pr. Drainage Area 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.00	0.46	0.05
15.00	2.79	0.78	2.56	0.05
20.00	3.15	1.00	2.91	0.02
25.00	3.32	1.12	3.09	0.00
30.00	3.32	1.12	3.09	0.00
35.00	3.32	1.12	3.09	0.00
40.00	3.32	1.12	3.09	0.00
45.00	3.32	1.12	3.09	0.00
50.00	3.32	1.12	3.09	0.00
55.00	3.32	1.12	3.09	0.00
60.00	3.32	1.12	3.09	0.00
65.00	3.32	1.12	3.09	0.00
70.00	3.32	1.12	3.09	0.00
75.00	3.32	1.12	3.09	0.00
80.00	3.32	1.12	3.09	0.00
85.00	3.32	1.12	3.09	0.00
90.00	3.32	1.12	3.09	0.00
95.00	3.32	1.12	3.09	0.00
100.00	3.32	1.12	3.09	0.00
105.00	3.32	1.12	3.09	0.00
110.00	3.32	1.12	3.09	0.00
115.00	3.32	1.12	3.09	0.00
120.00	3.32	1.12	3.09	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 8

Summary for Subcatchment 2-O: Pr. Drainage Area 4

Runoff = 6.12 cfs @ 12.15 hrs, Volume= 0.645 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.098	74	>75% Grass cover, Good, HSG C
0.358	80	>75% Grass cover, Good, HSG D
* 2.163	98	Paved parking
* 0.132	98	Roofs
2.751	95	Weighted Average
0.456	79	16.58% Pervious Area
2.295	98	83.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	253	0.0090	1.24		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	181	0.0750	15.62	19.17	Pipe Channel, BC 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	45	0.0100	5.70	7.00	Pipe Channel, CD - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	22	0.0100	6.44	11.38	Pipe Channel, DE - Pipe Flow 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
3.2	499	0.0010	2.59	18.28	Pipe Channel, EF - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
7.0	1,000	Total			

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

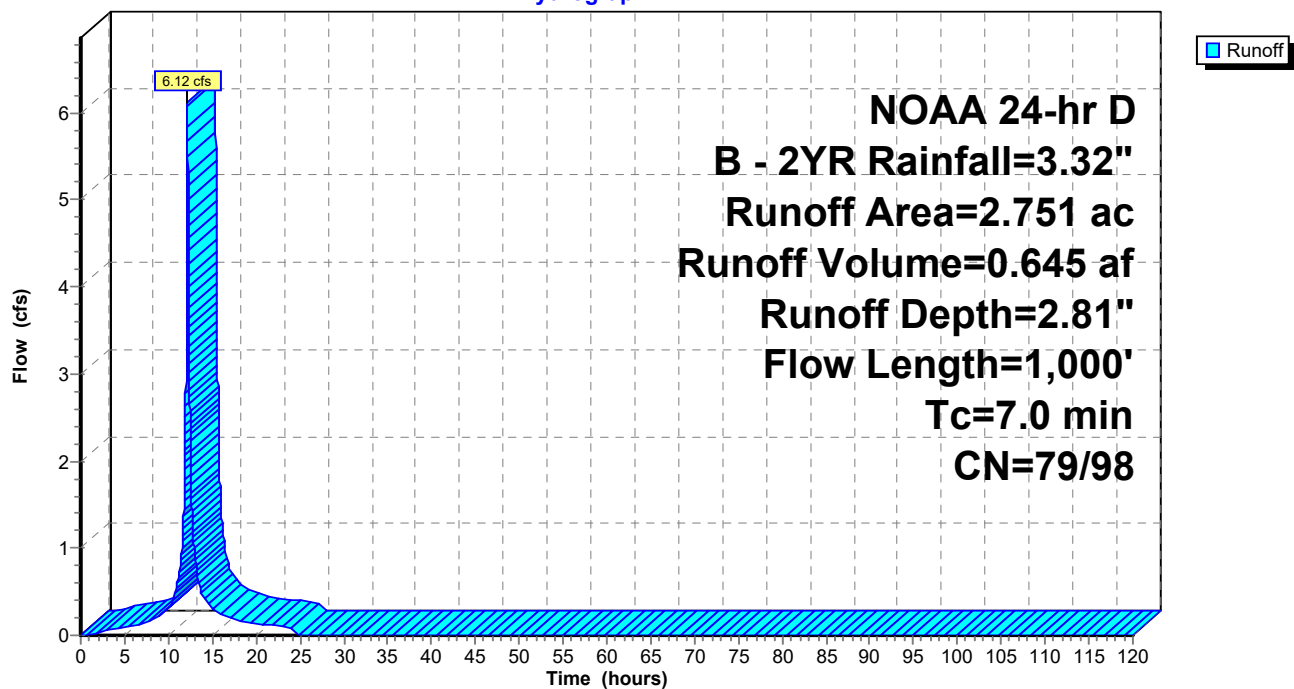
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 9

Subcatchment 2-O: Pr. Drainage Area 4

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 10

Hydrograph for Subcatchment 2-O: Pr. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.09
10.00	0.66	0.01	0.46	0.33
15.00	2.79	1.04	2.56	0.30
20.00	3.15	1.30	2.91	0.14
25.00	3.32	1.43	3.09	0.00
30.00	3.32	1.43	3.09	0.00
35.00	3.32	1.43	3.09	0.00
40.00	3.32	1.43	3.09	0.00
45.00	3.32	1.43	3.09	0.00
50.00	3.32	1.43	3.09	0.00
55.00	3.32	1.43	3.09	0.00
60.00	3.32	1.43	3.09	0.00
65.00	3.32	1.43	3.09	0.00
70.00	3.32	1.43	3.09	0.00
75.00	3.32	1.43	3.09	0.00
80.00	3.32	1.43	3.09	0.00
85.00	3.32	1.43	3.09	0.00
90.00	3.32	1.43	3.09	0.00
95.00	3.32	1.43	3.09	0.00
100.00	3.32	1.43	3.09	0.00
105.00	3.32	1.43	3.09	0.00
110.00	3.32	1.43	3.09	0.00
115.00	3.32	1.43	3.09	0.00
120.00	3.32	1.43	3.09	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 11

Summary for Subcatchment 3: Pr. Drainage Area 3

Runoff = 1.09 cfs @ 12.17 hrs, Volume= 0.126 af, Depth= 2.54"

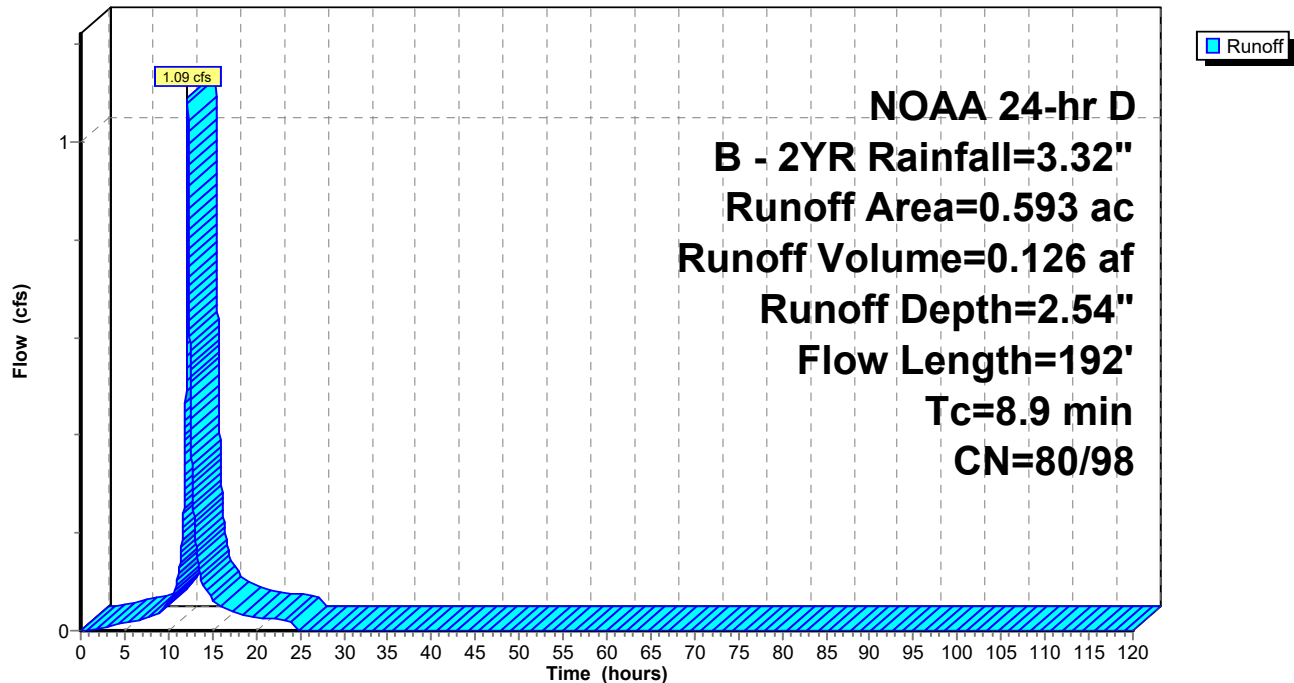
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.203	80	>75% Grass cover, Good, HSG D
* 0.390	98	Paved parking
0.593	92	Weighted Average
0.203	80	34.23% Pervious Area
0.390	98	65.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0080	0.11		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
0.5	71	0.0150	2.49		Shallow Concentrated Flow, BC - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	71	0.0290	2.55		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Grassed Waterway Kv= 15.0 fps
8.9	192	Total			

Subcatchment 3: Pr. Drainage Area 3

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 12

Hydrograph for Subcatchment 3: Pr. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.01	0.46	0.06
15.00	2.79	1.10	2.56	0.06
20.00	3.15	1.36	2.91	0.03
25.00	3.32	1.49	3.09	0.00
30.00	3.32	1.49	3.09	0.00
35.00	3.32	1.49	3.09	0.00
40.00	3.32	1.49	3.09	0.00
45.00	3.32	1.49	3.09	0.00
50.00	3.32	1.49	3.09	0.00
55.00	3.32	1.49	3.09	0.00
60.00	3.32	1.49	3.09	0.00
65.00	3.32	1.49	3.09	0.00
70.00	3.32	1.49	3.09	0.00
75.00	3.32	1.49	3.09	0.00
80.00	3.32	1.49	3.09	0.00
85.00	3.32	1.49	3.09	0.00
90.00	3.32	1.49	3.09	0.00
95.00	3.32	1.49	3.09	0.00
100.00	3.32	1.49	3.09	0.00
105.00	3.32	1.49	3.09	0.00
110.00	3.32	1.49	3.09	0.00
115.00	3.32	1.49	3.09	0.00
120.00	3.32	1.49	3.09	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 13

Summary for Subcatchment 9S: Pr. Drainage Area 6

Runoff = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af, Depth= 1.12"

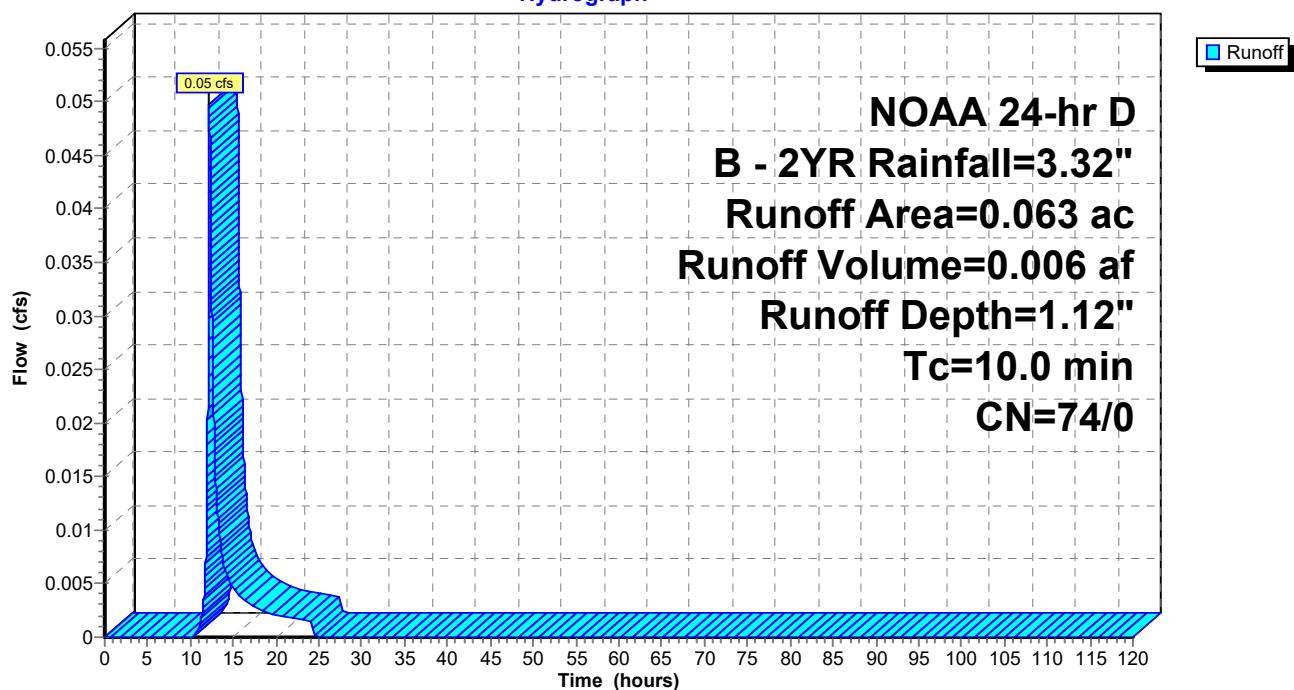
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.063	74	>75% Grass cover, Good, HSG C
0.063	74	100.00% Pervious Area

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

Subcatchment 9S: Pr. Drainage Area 6

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 14

Hydrograph for Subcatchment 9S: Pr. Drainage Area 6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.00	0.00
10.00	0.66	0.00	0.00	0.00
15.00	2.79	0.78	0.00	0.00
20.00	3.15	1.00	0.00	0.00
25.00	3.32	1.12	0.00	0.00
30.00	3.32	1.12	0.00	0.00
35.00	3.32	1.12	0.00	0.00
40.00	3.32	1.12	0.00	0.00
45.00	3.32	1.12	0.00	0.00
50.00	3.32	1.12	0.00	0.00
55.00	3.32	1.12	0.00	0.00
60.00	3.32	1.12	0.00	0.00
65.00	3.32	1.12	0.00	0.00
70.00	3.32	1.12	0.00	0.00
75.00	3.32	1.12	0.00	0.00
80.00	3.32	1.12	0.00	0.00
85.00	3.32	1.12	0.00	0.00
90.00	3.32	1.12	0.00	0.00
95.00	3.32	1.12	0.00	0.00
100.00	3.32	1.12	0.00	0.00
105.00	3.32	1.12	0.00	0.00
110.00	3.32	1.12	0.00	0.00
115.00	3.32	1.12	0.00	0.00
120.00	3.32	1.12	0.00	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 15

Summary for Subcatchment 11S: Pr. Drainage Area 2

[47] Hint: Peak is 103% of capacity of segment #2

Runoff = 7.19 cfs @ 12.11 hrs, Volume= 0.576 af, Depth= 3.05"

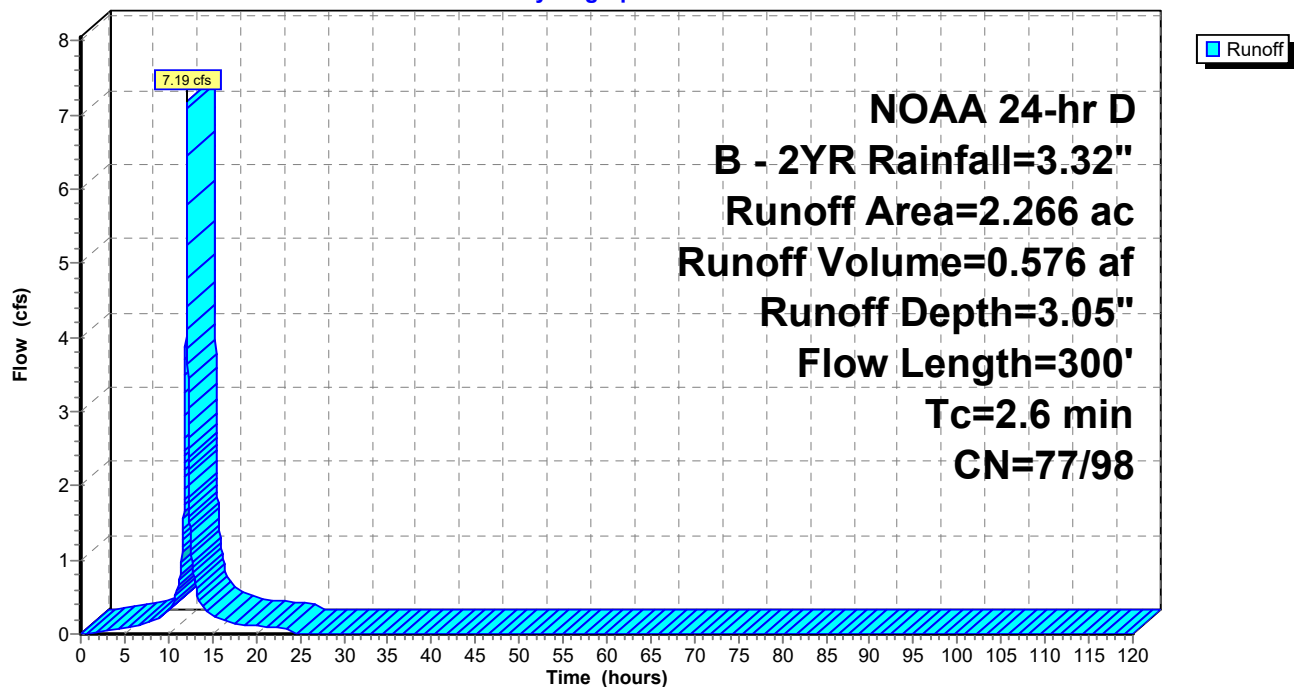
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.025	80	>75% Grass cover, Good, HSG D
* 0.991	98	Paved parking
* 1.228	98	Roofs
2.266	98	Weighted Average
0.047	77	2.07% Pervious Area
2.219	98	97.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	230	0.0170	1.56		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	70	0.0100	5.70	7.00	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
2.6	300	Total			

Subcatchment 11S: Pr. Drainage Area 2

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 16

Hydrograph for Subcatchment 11S: Pr. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.09
10.00	0.66	0.00	0.46	0.32
15.00	2.79	0.93	2.56	0.25
20.00	3.15	1.17	2.91	0.12
25.00	3.32	1.30	3.09	0.00
30.00	3.32	1.30	3.09	0.00
35.00	3.32	1.30	3.09	0.00
40.00	3.32	1.30	3.09	0.00
45.00	3.32	1.30	3.09	0.00
50.00	3.32	1.30	3.09	0.00
55.00	3.32	1.30	3.09	0.00
60.00	3.32	1.30	3.09	0.00
65.00	3.32	1.30	3.09	0.00
70.00	3.32	1.30	3.09	0.00
75.00	3.32	1.30	3.09	0.00
80.00	3.32	1.30	3.09	0.00
85.00	3.32	1.30	3.09	0.00
90.00	3.32	1.30	3.09	0.00
95.00	3.32	1.30	3.09	0.00
100.00	3.32	1.30	3.09	0.00
105.00	3.32	1.30	3.09	0.00
110.00	3.32	1.30	3.09	0.00
115.00	3.32	1.30	3.09	0.00
120.00	3.32	1.30	3.09	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 17

Summary for Subcatchment 12S: Pr. Drainage Area 1

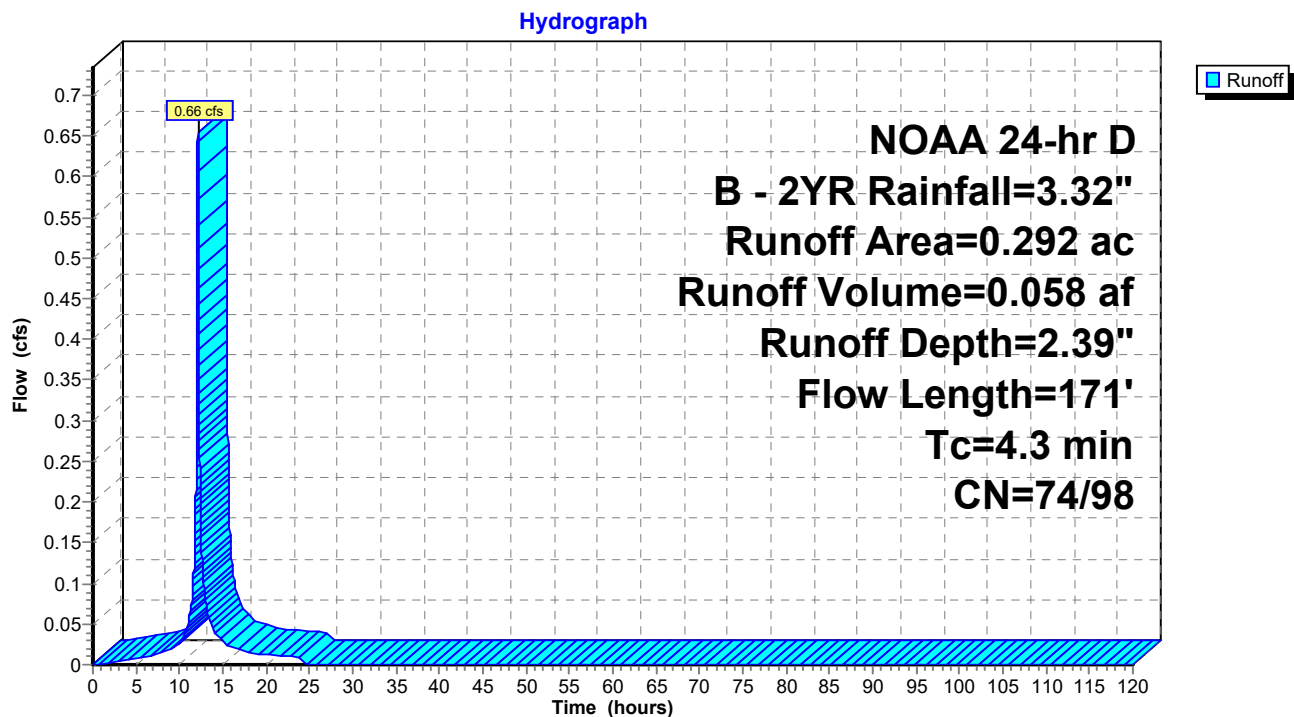
Runoff = 0.66 cfs @ 12.12 hrs, Volume= 0.058 af, Depth= 2.39"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D B - 2YR Rainfall=3.32"

Area (ac)	CN	Description
0.104	74	>75% Grass cover, Good, HSG C
* 0.188	98	Paved parking
0.292	89	Weighted Average
0.104	74	35.62% Pervious Area
0.188	98	64.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.0	147	0.0110	1.20		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	11	0.2500	7.50		Shallow Concentrated Flow, CD - Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
4.3	171	Total			

Subcatchment 12S: Pr. Drainage Area 1



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 18

Hydrograph for Subcatchment 12S: Pr. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.23	0.00	0.09	0.01
10.00	0.66	0.00	0.46	0.03
15.00	2.79	0.78	2.56	0.03
20.00	3.15	1.00	2.91	0.01
25.00	3.32	1.12	3.09	0.00
30.00	3.32	1.12	3.09	0.00
35.00	3.32	1.12	3.09	0.00
40.00	3.32	1.12	3.09	0.00
45.00	3.32	1.12	3.09	0.00
50.00	3.32	1.12	3.09	0.00
55.00	3.32	1.12	3.09	0.00
60.00	3.32	1.12	3.09	0.00
65.00	3.32	1.12	3.09	0.00
70.00	3.32	1.12	3.09	0.00
75.00	3.32	1.12	3.09	0.00
80.00	3.32	1.12	3.09	0.00
85.00	3.32	1.12	3.09	0.00
90.00	3.32	1.12	3.09	0.00
95.00	3.32	1.12	3.09	0.00
100.00	3.32	1.12	3.09	0.00
105.00	3.32	1.12	3.09	0.00
110.00	3.32	1.12	3.09	0.00
115.00	3.32	1.12	3.09	0.00
120.00	3.32	1.12	3.09	0.00

210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 19

Summary for Pond 6P: Pipe Storage

Inflow Area = 2.558 ac, 94.10% Impervious, Inflow Depth = 2.97" for B - 2YR event
 Inflow = 7.77 cfs @ 12.11 hrs, Volume= 0.634 af
 Outflow = 5.70 cfs @ 12.15 hrs, Volume= 0.634 af, Atten= 27%, Lag= 2.7 min
 Primary = 5.70 cfs @ 12.15 hrs, Volume= 0.634 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 114.38' @ 12.15 hrs Surf.Area= 0.056 ac Storage= 0.066 af

Plug-Flow detention time= 17.8 min calculated for 0.634 af (100% of inflow)
 Center-of-Mass det. time= 17.7 min (776.9 - 759.2)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.70 cfs @ 12.15 hrs HW=114.38' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 5.70 cfs @ 4.24 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

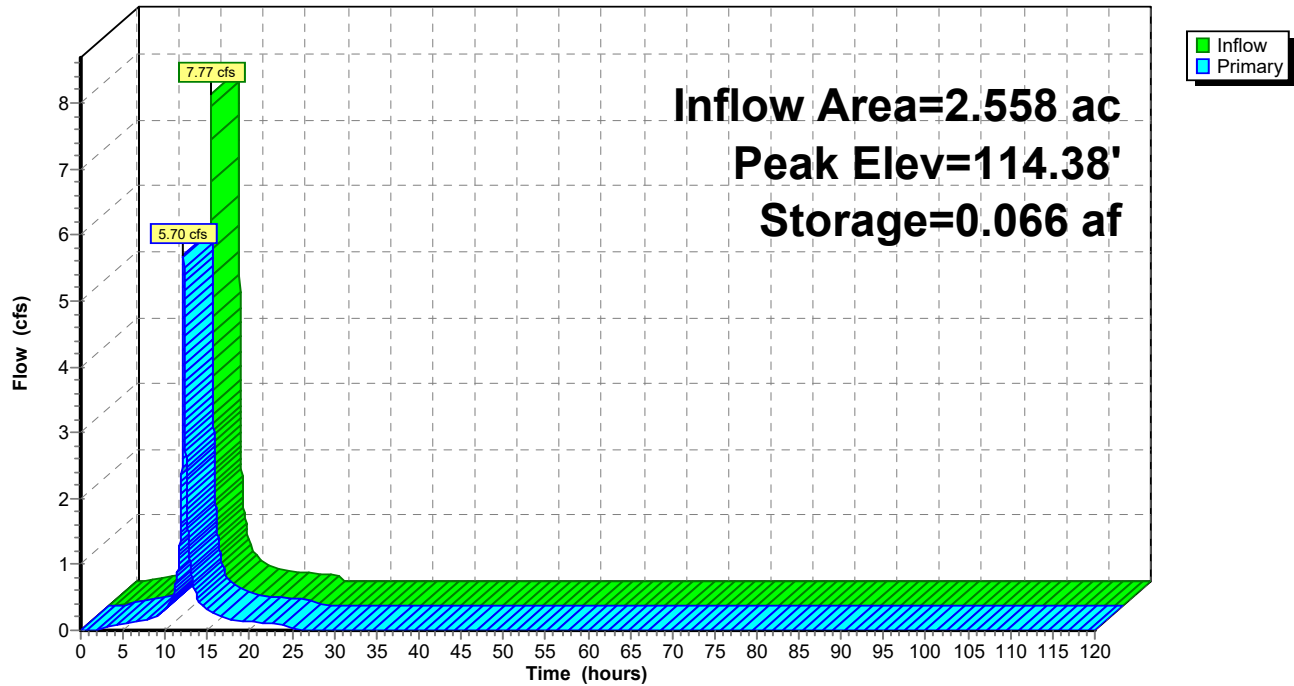
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 20

Pond 6P: Pipe Storage

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 21

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.10	0.004	113.11	0.09
10.00	0.35	0.009	113.25	0.32
15.00	0.27	0.009	113.24	0.30
20.00	0.13	0.005	113.15	0.13
25.00	0.00	0.001	113.02	0.01
30.00	0.00	0.000	112.97	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.96	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 22

Summary for Pond 8P: Rain Garden 2

Inflow Area = 0.593 ac, 65.77% Impervious, Inflow Depth = 2.54" for B - 2YR event
 Inflow = 1.09 cfs @ 12.17 hrs, Volume= 0.126 af
 Outflow = 1.08 cfs @ 12.19 hrs, Volume= 0.126 af, Atten= 1%, Lag= 1.1 min
 Primary = 1.08 cfs @ 12.19 hrs, Volume= 0.126 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Starting Elev= 117.25' Surf.Area= 1,380 sf Storage= 1,225 cf
 Peak Elev= 117.33' @ 12.19 hrs Surf.Area= 1,418 sf Storage= 1,333 cf (108 cf above start)

Plug-Flow detention time= 163.0 min calculated for 0.097 af (78% of inflow)
 Center-of-Mass det. time= 3.6 min (788.2 - 784.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	116.00'	1,570 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
116.00	550	121.0	0	0	550
117.00	1,260	276.0	881	881	5,451
117.50	1,500	285.0	689	1,570	5,876

Device	Routing	Invert	Outlet Devices
#1	Primary	113.50'	15.0" Round Culvert L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.50' / 113.34' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	117.25'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.08 cfs @ 12.19 hrs HW=117.33' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.08 cfs of 10.58 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.08 cfs @ 0.92 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

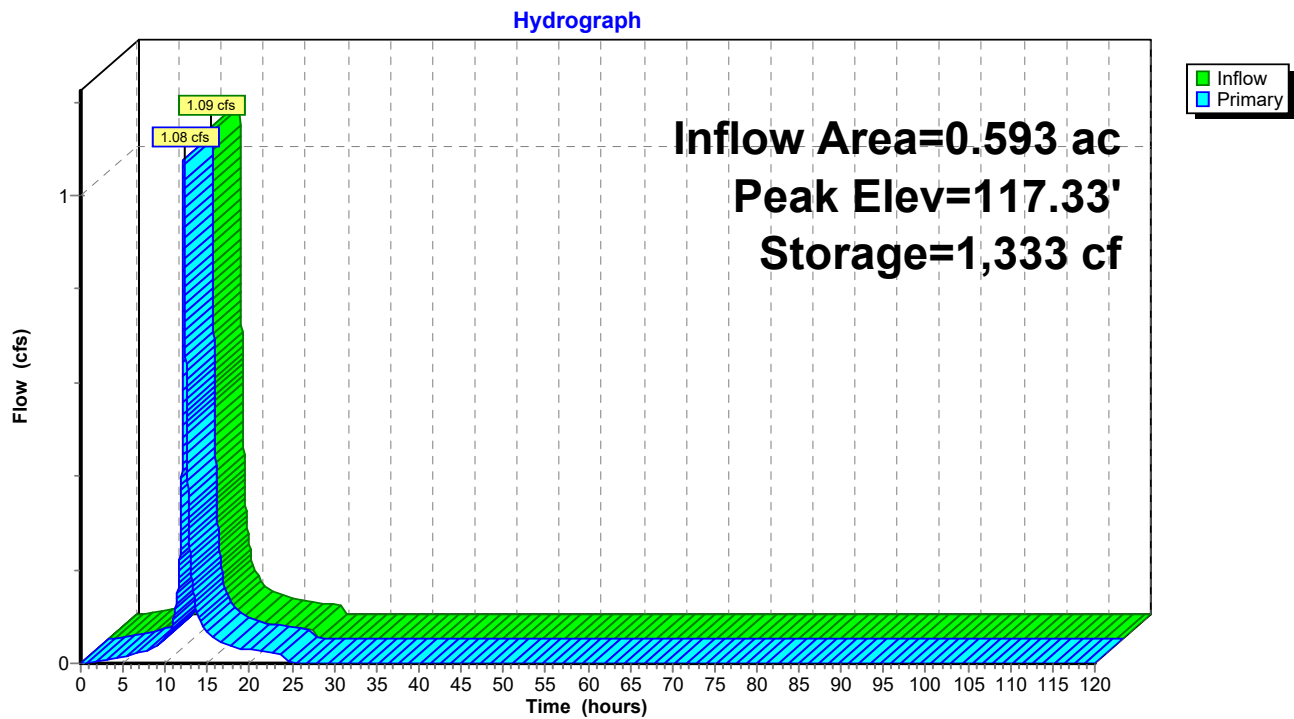
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 23

Pond 8P: Rain Garden 2



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 24

Hydrograph for Pond 8P: Rain Garden 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	1,225	117.25	0.00
5.00	0.01	1,232	117.25	0.01
10.00	0.06	1,240	117.26	0.05
15.00	0.06	1,242	117.26	0.06
20.00	0.03	1,235	117.26	0.03
25.00	0.00	1,226	117.25	0.00
30.00	0.00	1,225	117.25	0.00
35.00	0.00	1,225	117.25	0.00
40.00	0.00	1,225	117.25	0.00
45.00	0.00	1,225	117.25	0.00
50.00	0.00	1,225	117.25	0.00
55.00	0.00	1,225	117.25	0.00
60.00	0.00	1,225	117.25	0.00
65.00	0.00	1,225	117.25	0.00
70.00	0.00	1,225	117.25	0.00
75.00	0.00	1,225	117.25	0.00
80.00	0.00	1,225	117.25	0.00
85.00	0.00	1,225	117.25	0.00
90.00	0.00	1,225	117.25	0.00
95.00	0.00	1,225	117.25	0.00
100.00	0.00	1,225	117.25	0.00
105.00	0.00	1,225	117.25	0.00
110.00	0.00	1,225	117.25	0.00
115.00	0.00	1,225	117.25	0.00
120.00	0.00	1,225	117.25	0.00

210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 25

Summary for Pond 13P: Rain Garden 3

Inflow Area = 0.524 ac, 60.50% Impervious, Inflow Depth = 2.31" for B - 2YR event
 Inflow = 1.08 cfs @ 12.13 hrs, Volume= 0.101 af
 Outflow = 0.97 cfs @ 12.17 hrs, Volume= 0.101 af, Atten= 10%, Lag= 2.2 min
 Primary = 0.97 cfs @ 12.17 hrs, Volume= 0.101 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Starting Elev= 118.80' Surf.Area= 3,289 sf Storage= 3,577 cf
 Peak Elev= 118.87' @ 12.17 hrs Surf.Area= 3,354 sf Storage= 3,820 cf (244 cf above start)

Plug-Flow detention time= 648.1 min calculated for 0.019 af (19% of inflow)
 Center-of-Mass det. time= 9.2 min (791.0 - 781.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	117.50'	4,252 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)
117.50	2,271	224.0	0	0	2,271
118.00	2,615	234.0	1,220	1,220	2,653
119.00	3,469	279.0	3,032	4,252	4,508

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	15.0" Round Culvert L= 194.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 114.04' S= 0.0049 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	118.80'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.97 cfs @ 12.17 hrs HW=118.87' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.97 cfs of 7.60 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 0.97 cfs @ 0.89 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

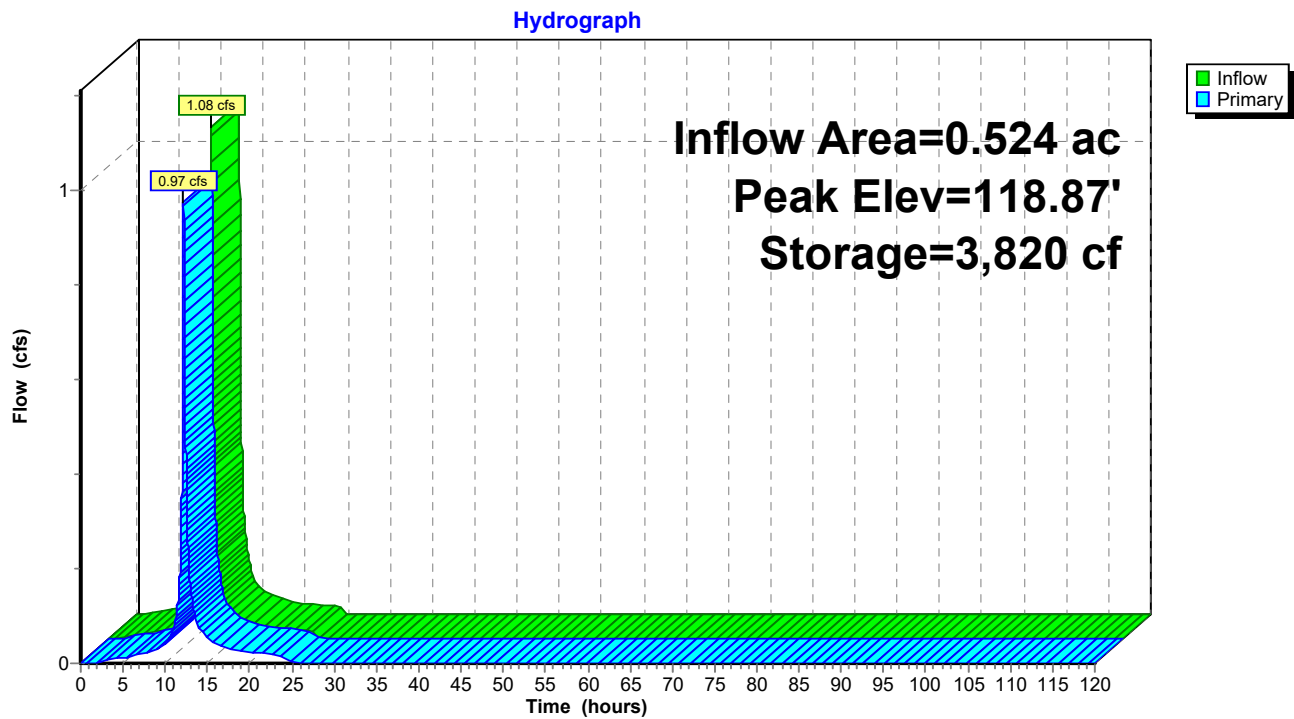
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 26

Pond 13P: Rain Garden 3



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 27

Hydrograph for Pond 13P: Rain Garden 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	3,577	118.80	0.00
5.00	0.01	3,590	118.80	0.01
10.00	0.05	3,607	118.81	0.04
15.00	0.05	3,611	118.81	0.05
20.00	0.02	3,597	118.81	0.02
25.00	0.00	3,579	118.80	0.00
30.00	0.00	3,577	118.80	0.00
35.00	0.00	3,577	118.80	0.00
40.00	0.00	3,577	118.80	0.00
45.00	0.00	3,577	118.80	0.00
50.00	0.00	3,577	118.80	0.00
55.00	0.00	3,577	118.80	0.00
60.00	0.00	3,577	118.80	0.00
65.00	0.00	3,577	118.80	0.00
70.00	0.00	3,577	118.80	0.00
75.00	0.00	3,577	118.80	0.00
80.00	0.00	3,577	118.80	0.00
85.00	0.00	3,577	118.80	0.00
90.00	0.00	3,577	118.80	0.00
95.00	0.00	3,577	118.80	0.00
100.00	0.00	3,577	118.80	0.00
105.00	0.00	3,577	118.80	0.00
110.00	0.00	3,577	118.80	0.00
115.00	0.00	3,577	118.80	0.00
120.00	0.00	3,577	118.80	0.00

210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 28

Summary for Pond 14P: Rain Garden 1

Inflow Area = 0.292 ac, 64.38% Impervious, Inflow Depth = 2.39" for B - 2YR event
 Inflow = 0.66 cfs @ 12.12 hrs, Volume= 0.058 af
 Outflow = 0.63 cfs @ 12.14 hrs, Volume= 0.058 af, Atten= 4%, Lag= 1.1 min
 Primary = 0.63 cfs @ 12.14 hrs, Volume= 0.058 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Starting Elev= 119.00' Surf.Area= 1,370 sf Storage= 1,169 cf
 Peak Elev= 119.05' @ 12.14 hrs Surf.Area= 1,393 sf Storage= 1,245 cf (76 cf above start)

Plug-Flow detention time= 266.4 min calculated for 0.031 af (54% of inflow)
 Center-of-Mass det. time= 4.6 min (782.4 - 777.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	118.00'	2,758 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)
118.00	979	121.0	0	0	979
119.00	1,370	140.0	1,169	1,169	1,395
120.00	1,818	159.0	1,589	2,758	1,871

Device	Routing	Invert	Outlet Devices
#1	Primary	113.52'	15.0" Round Culvert L= 104.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.52' / 113.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	119.00'	48.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.63 cfs @ 12.14 hrs HW=119.05' TW=114.38' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 0.63 cfs of 10.75 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 0.63 cfs @ 0.77 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

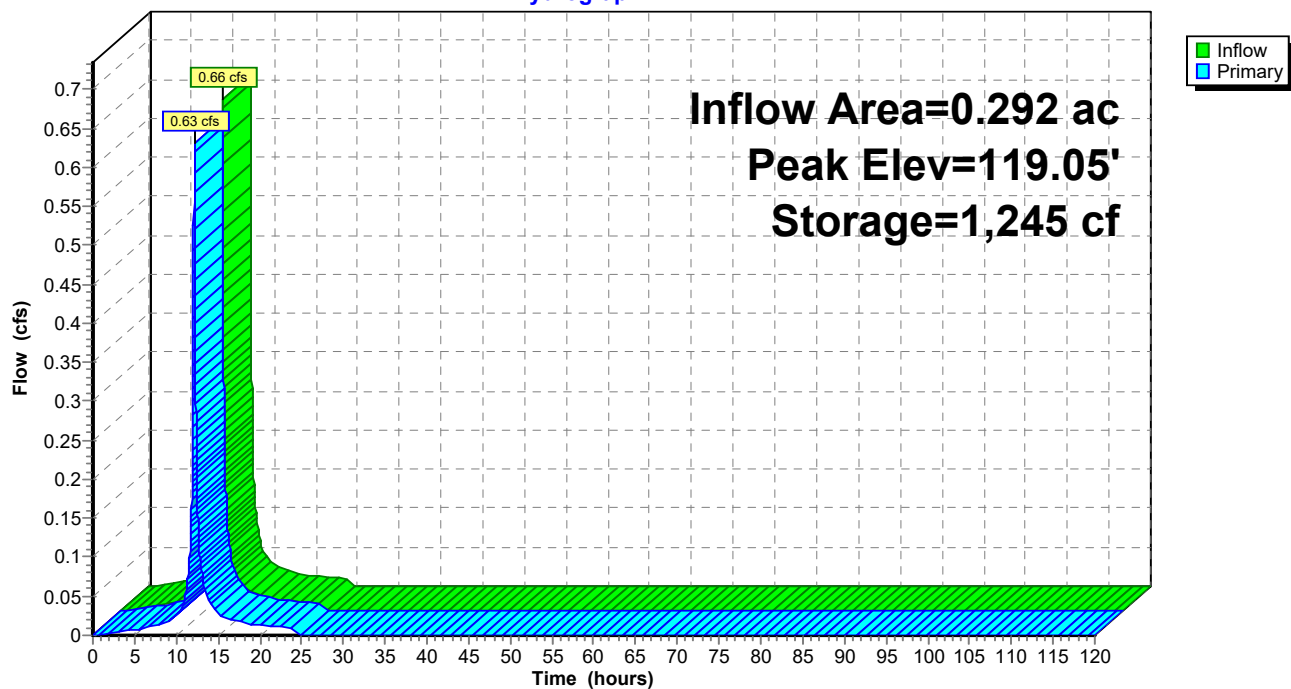
NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 29

Pond 14P: Rain Garden 1

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 30

Hydrograph for Pond 14P: Rain Garden 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	1,169	119.00	0.00
5.00	0.01	1,173	119.00	0.01
10.00	0.03	1,178	119.01	0.03
15.00	0.03	1,179	119.01	0.03
20.00	0.01	1,175	119.00	0.01
25.00	0.00	1,169	119.00	0.00
30.00	0.00	1,169	119.00	0.00
35.00	0.00	1,169	119.00	0.00
40.00	0.00	1,169	119.00	0.00
45.00	0.00	1,169	119.00	0.00
50.00	0.00	1,169	119.00	0.00
55.00	0.00	1,169	119.00	0.00
60.00	0.00	1,169	119.00	0.00
65.00	0.00	1,169	119.00	0.00
70.00	0.00	1,169	119.00	0.00
75.00	0.00	1,169	119.00	0.00
80.00	0.00	1,169	119.00	0.00
85.00	0.00	1,169	119.00	0.00
90.00	0.00	1,169	119.00	0.00
95.00	0.00	1,169	119.00	0.00
100.00	0.00	1,169	119.00	0.00
105.00	0.00	1,169	119.00	0.00
110.00	0.00	1,169	119.00	0.00
115.00	0.00	1,169	119.00	0.00
120.00	0.00	1,169	119.00	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 31

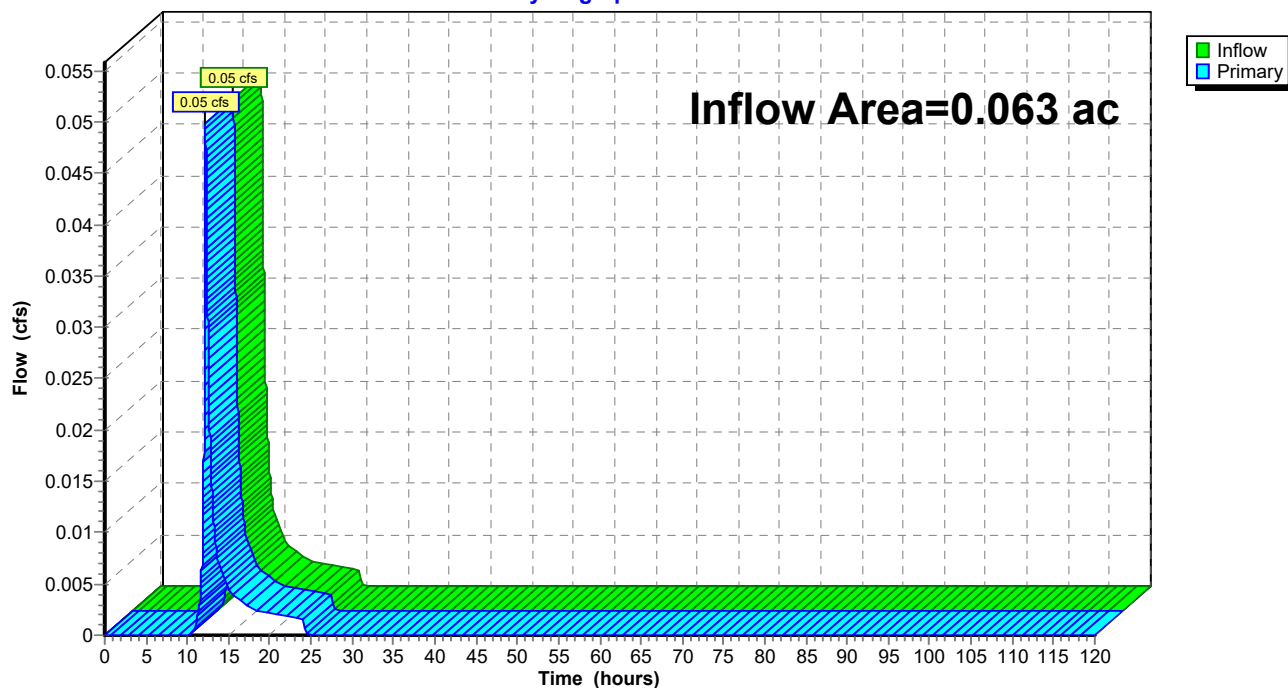
Summary for Link 4L: Analysis Point 2

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 1.12" for B - 2YR event
Inflow = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af
Primary = 0.05 cfs @ 12.20 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 2

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 32

Hydrograph for Link 4L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	110.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	114.00	0.00	0.00	0.00
12.00	0.02	0.00	0.02	116.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	118.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	120.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00				
20.00	0.00	0.00	0.00				
22.00	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 2YR Rainfall=3.32"

Printed 8/10/2021

Page 33

Summary for Link 9L: Analysis Point 1

Inflow Area = 6.426 ac, 84.17% Impervious, Inflow Depth = 2.81" for B - 2YR event

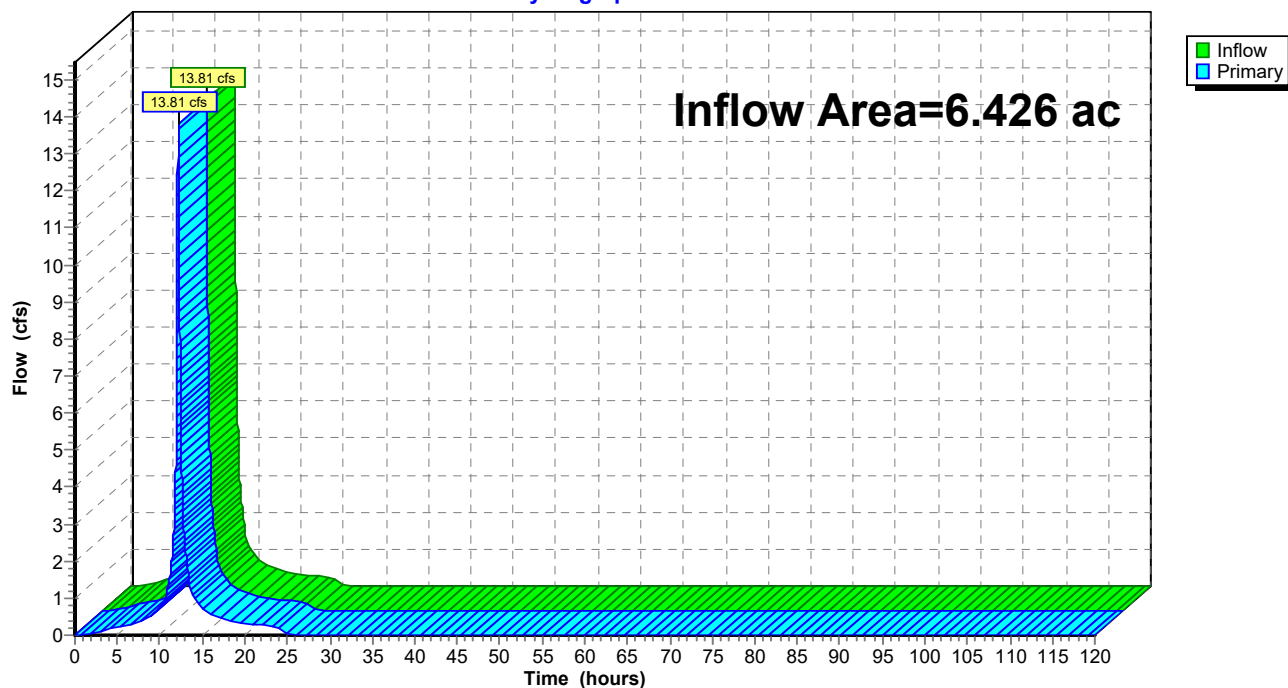
Inflow = 13.81 cfs @ 12.15 hrs, Volume= 1.505 af

Primary = 13.81 cfs @ 12.15 hrs, Volume= 1.505 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 9L: Analysis Point 1

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D B - 2YR Rainfall=3.32"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 34

Hydrograph for Link 9L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.04	0.00	0.04	106.00	0.00	0.00	0.00
4.00	0.16	0.00	0.16	108.00	0.00	0.00	0.00
6.00	0.24	0.00	0.24	110.00	0.00	0.00	0.00
8.00	0.40	0.00	0.40	112.00	0.00	0.00	0.00
10.00	0.75	0.00	0.75	114.00	0.00	0.00	0.00
12.00	7.15	0.00	7.15	116.00	0.00	0.00	0.00
14.00	1.05	0.00	1.05	118.00	0.00	0.00	0.00
16.00	0.57	0.00	0.57	120.00	0.00	0.00	0.00
18.00	0.39	0.00	0.39				
20.00	0.32	0.00	0.32				
22.00	0.28	0.00	0.28				
24.00	0.23	0.00	0.23				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 35

Summary for Subcatchment 2: Pr. Drainage Area 5

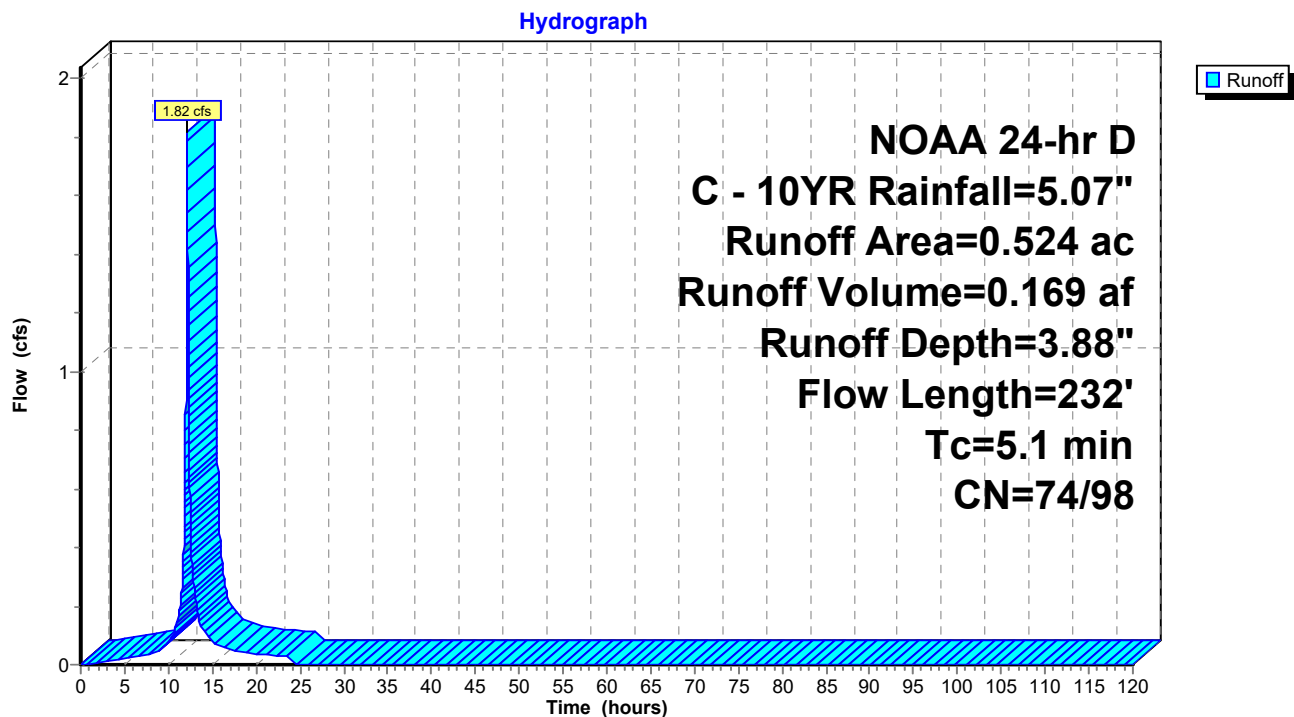
Runoff = 1.82 cfs @ 12.13 hrs, Volume= 0.169 af, Depth= 3.88"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
* 0.317	98	Paved parking
0.207	74	>75% Grass cover, Good, HSG C
0.524	89	Weighted Average
0.207	74	39.50% Pervious Area
0.317	98	60.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.7	207	0.0110	1.29		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.1	12	0.2500	3.50		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Short Grass Pasture Kv= 7.0 fps
5.1	232	Total			

Subcatchment 2: Pr. Drainage Area 5



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 36

Hydrograph for Subcatchment 2: Pr. Drainage Area 5

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.02
10.00	1.01	0.02	0.80	0.08
15.00	4.27	1.79	4.03	0.08
20.00	4.80	2.21	4.57	0.04
25.00	5.07	2.42	4.83	0.00
30.00	5.07	2.42	4.83	0.00
35.00	5.07	2.42	4.83	0.00
40.00	5.07	2.42	4.83	0.00
45.00	5.07	2.42	4.83	0.00
50.00	5.07	2.42	4.83	0.00
55.00	5.07	2.42	4.83	0.00
60.00	5.07	2.42	4.83	0.00
65.00	5.07	2.42	4.83	0.00
70.00	5.07	2.42	4.83	0.00
75.00	5.07	2.42	4.83	0.00
80.00	5.07	2.42	4.83	0.00
85.00	5.07	2.42	4.83	0.00
90.00	5.07	2.42	4.83	0.00
95.00	5.07	2.42	4.83	0.00
100.00	5.07	2.42	4.83	0.00
105.00	5.07	2.42	4.83	0.00
110.00	5.07	2.42	4.83	0.00
115.00	5.07	2.42	4.83	0.00
120.00	5.07	2.42	4.83	0.00

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 37

Summary for Subcatchment 2-O: Pr. Drainage Area 4

[47] Hint: Peak is 139% of capacity of segment #3

Runoff = 9.70 cfs @ 12.15 hrs, Volume= 1.033 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.098	74	>75% Grass cover, Good, HSG C
0.358	80	>75% Grass cover, Good, HSG D
* 2.163	98	Paved parking
* 0.132	98	Roofs
2.751	95	Weighted Average
0.456	79	16.58% Pervious Area
2.295	98	83.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	253	0.0090	1.24		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	181	0.0750	15.62	19.17	Pipe Channel, BC 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	45	0.0100	5.70	7.00	Pipe Channel, CD - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
0.1	22	0.0100	6.44	11.38	Pipe Channel, DE - Pipe Flow 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
3.2	499	0.0010	2.59	18.28	Pipe Channel, EF - Pipe Flow 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.015 Concrete sewer w/manholes & inlets
7.0	1,000	Total			

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

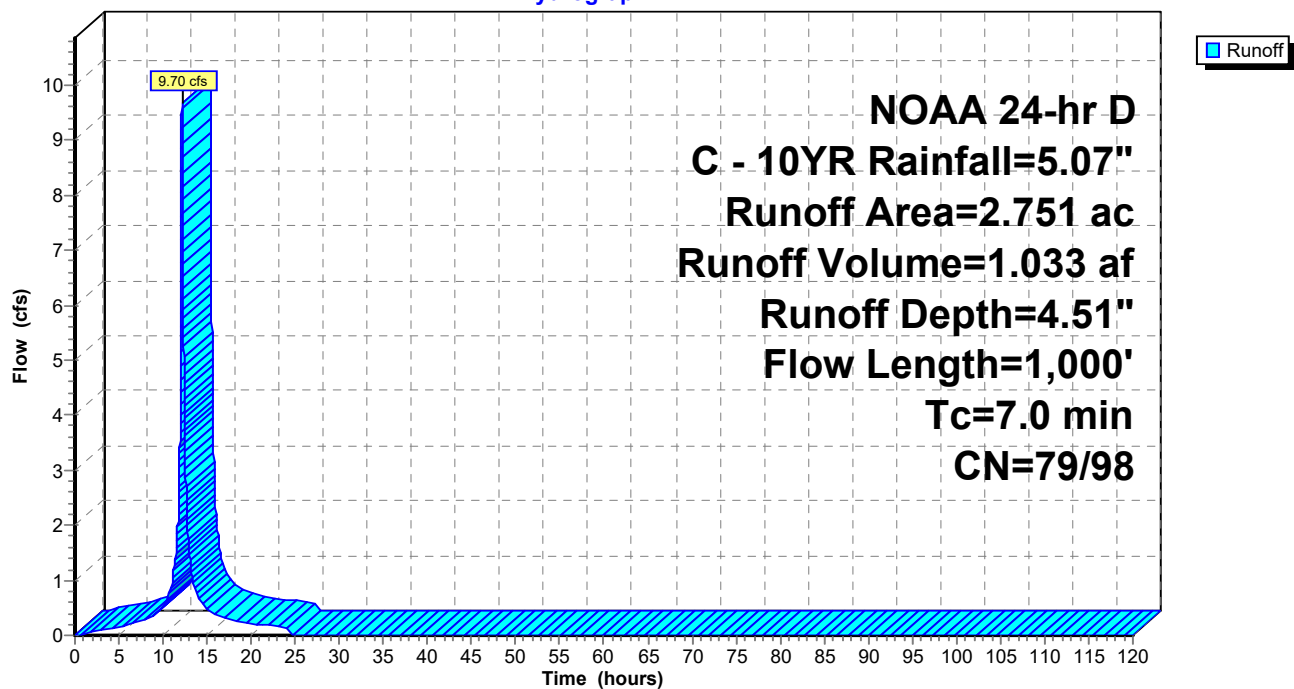
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 38

Subcatchment 2-O: Pr. Drainage Area 4

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 39

Hydrograph for Subcatchment 2-O: Pr. Drainage Area 4

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.16
10.00	1.01	0.07	0.80	0.53
15.00	4.27	2.18	4.03	0.47
20.00	4.80	2.63	4.57	0.21
25.00	5.07	2.86	4.83	0.00
30.00	5.07	2.86	4.83	0.00
35.00	5.07	2.86	4.83	0.00
40.00	5.07	2.86	4.83	0.00
45.00	5.07	2.86	4.83	0.00
50.00	5.07	2.86	4.83	0.00
55.00	5.07	2.86	4.83	0.00
60.00	5.07	2.86	4.83	0.00
65.00	5.07	2.86	4.83	0.00
70.00	5.07	2.86	4.83	0.00
75.00	5.07	2.86	4.83	0.00
80.00	5.07	2.86	4.83	0.00
85.00	5.07	2.86	4.83	0.00
90.00	5.07	2.86	4.83	0.00
95.00	5.07	2.86	4.83	0.00
100.00	5.07	2.86	4.83	0.00
105.00	5.07	2.86	4.83	0.00
110.00	5.07	2.86	4.83	0.00
115.00	5.07	2.86	4.83	0.00
120.00	5.07	2.86	4.83	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 40

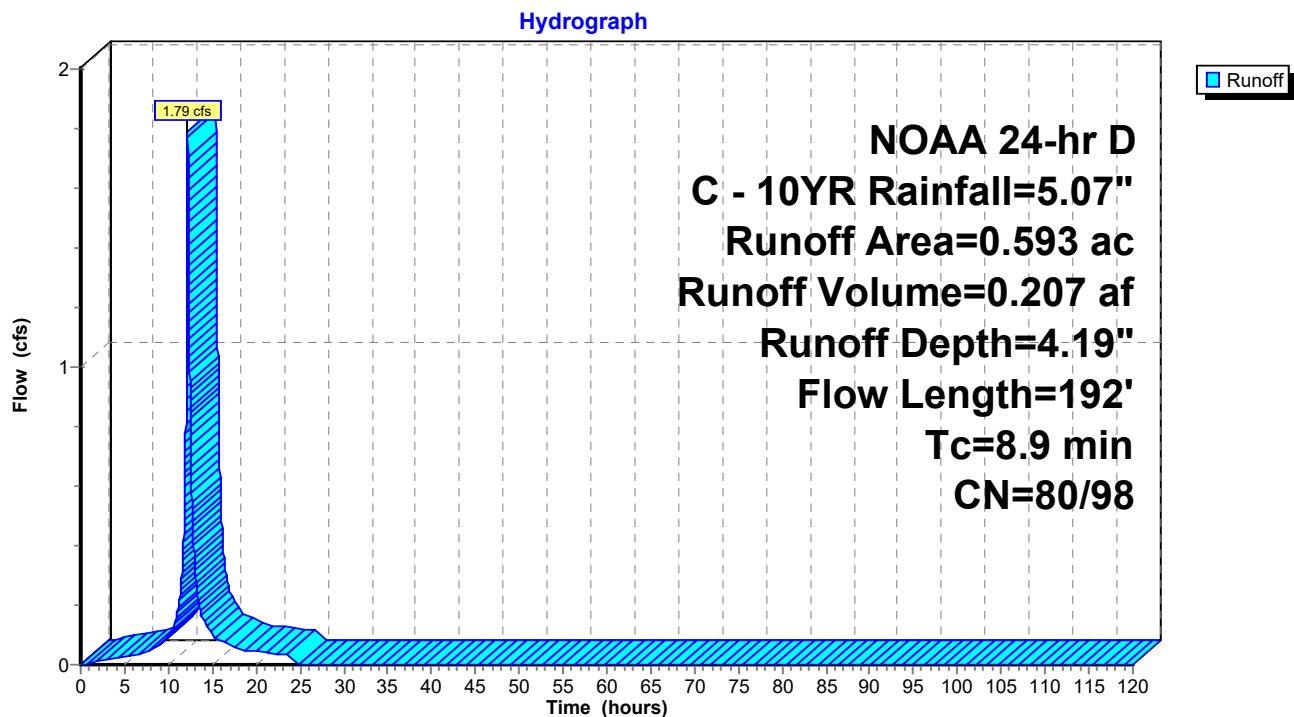
Summary for Subcatchment 3: Pr. Drainage Area 3

Runoff = 1.79 cfs @ 12.17 hrs, Volume= 0.207 af, Depth= 4.19"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.203	80	>75% Grass cover, Good, HSG D
* 0.390	98	Paved parking
0.593	92	Weighted Average
0.203	80	34.23% Pervious Area
0.390	98	65.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0080	0.11		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
0.5	71	0.0150	2.49		Shallow Concentrated Flow, BC - Shallow. Conc. Flow Paved Kv= 20.3 fps
0.5	71	0.0290	2.55		Shallow Concentrated Flow, CD - Shallow. Conc. Flow Grassed Waterway Kv= 15.0 fps
8.9	192	Total			

Subcatchment 3: Pr. Drainage Area 3

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 41

Hydrograph for Subcatchment 3: Pr. Drainage Area 3

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.03
10.00	1.01	0.08	0.80	0.10
15.00	4.27	2.26	4.03	0.10
20.00	4.80	2.72	4.57	0.05
25.00	5.07	2.95	4.83	0.00
30.00	5.07	2.95	4.83	0.00
35.00	5.07	2.95	4.83	0.00
40.00	5.07	2.95	4.83	0.00
45.00	5.07	2.95	4.83	0.00
50.00	5.07	2.95	4.83	0.00
55.00	5.07	2.95	4.83	0.00
60.00	5.07	2.95	4.83	0.00
65.00	5.07	2.95	4.83	0.00
70.00	5.07	2.95	4.83	0.00
75.00	5.07	2.95	4.83	0.00
80.00	5.07	2.95	4.83	0.00
85.00	5.07	2.95	4.83	0.00
90.00	5.07	2.95	4.83	0.00
95.00	5.07	2.95	4.83	0.00
100.00	5.07	2.95	4.83	0.00
105.00	5.07	2.95	4.83	0.00
110.00	5.07	2.95	4.83	0.00
115.00	5.07	2.95	4.83	0.00
120.00	5.07	2.95	4.83	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 42

Summary for Subcatchment 9S: Pr. Drainage Area 6

Runoff = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af, Depth= 2.42"

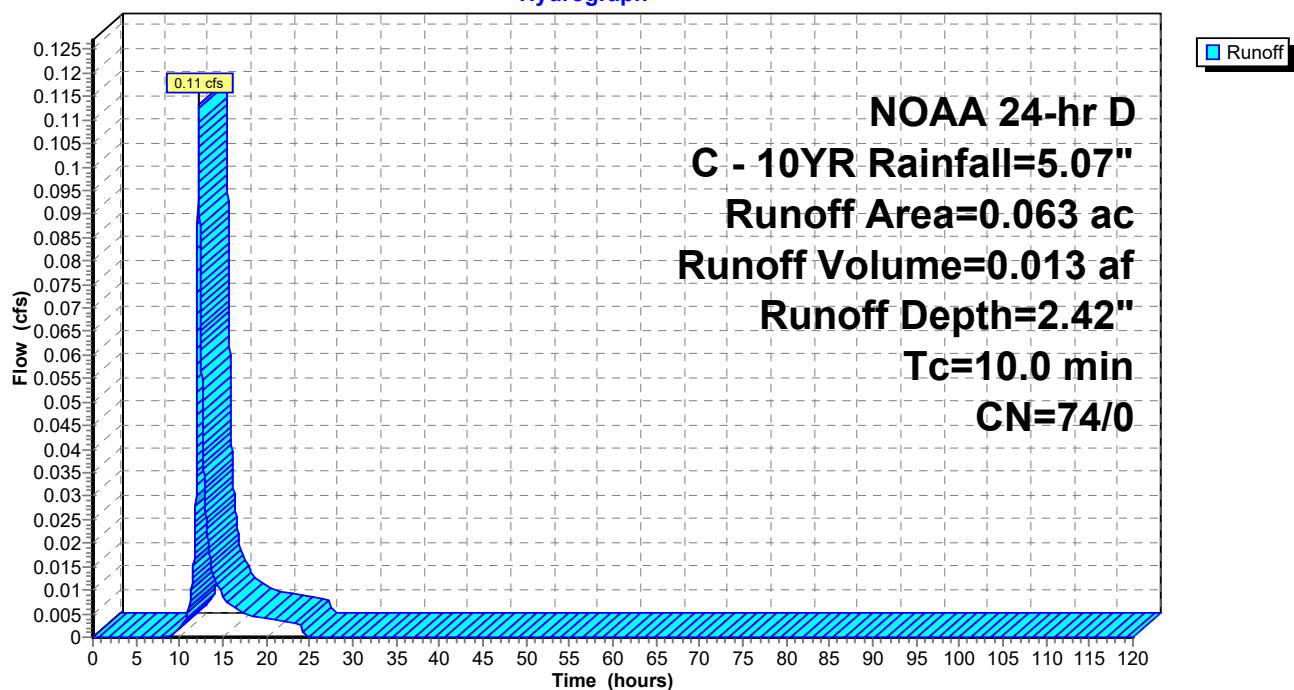
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.063	74	>75% Grass cover, Good, HSG C
0.063	74	100.00% Pervious Area

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

Subcatchment 9S: Pr. Drainage Area 6

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 43

Hydrograph for Subcatchment 9S: Pr. Drainage Area 6

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.00	0.00
10.00	1.01	0.02	0.00	0.00
15.00	4.27	1.79	0.00	0.01
20.00	4.80	2.21	0.00	0.00
25.00	5.07	2.42	0.00	0.00
30.00	5.07	2.42	0.00	0.00
35.00	5.07	2.42	0.00	0.00
40.00	5.07	2.42	0.00	0.00
45.00	5.07	2.42	0.00	0.00
50.00	5.07	2.42	0.00	0.00
55.00	5.07	2.42	0.00	0.00
60.00	5.07	2.42	0.00	0.00
65.00	5.07	2.42	0.00	0.00
70.00	5.07	2.42	0.00	0.00
75.00	5.07	2.42	0.00	0.00
80.00	5.07	2.42	0.00	0.00
85.00	5.07	2.42	0.00	0.00
90.00	5.07	2.42	0.00	0.00
95.00	5.07	2.42	0.00	0.00
100.00	5.07	2.42	0.00	0.00
105.00	5.07	2.42	0.00	0.00
110.00	5.07	2.42	0.00	0.00
115.00	5.07	2.42	0.00	0.00
120.00	5.07	2.42	0.00	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 44

Summary for Subcatchment 11S: Pr. Drainage Area 2

[47] Hint: Peak is 158% of capacity of segment #2

Runoff = 11.09 cfs @ 12.11 hrs, Volume= 0.904 af, Depth= 4.79"

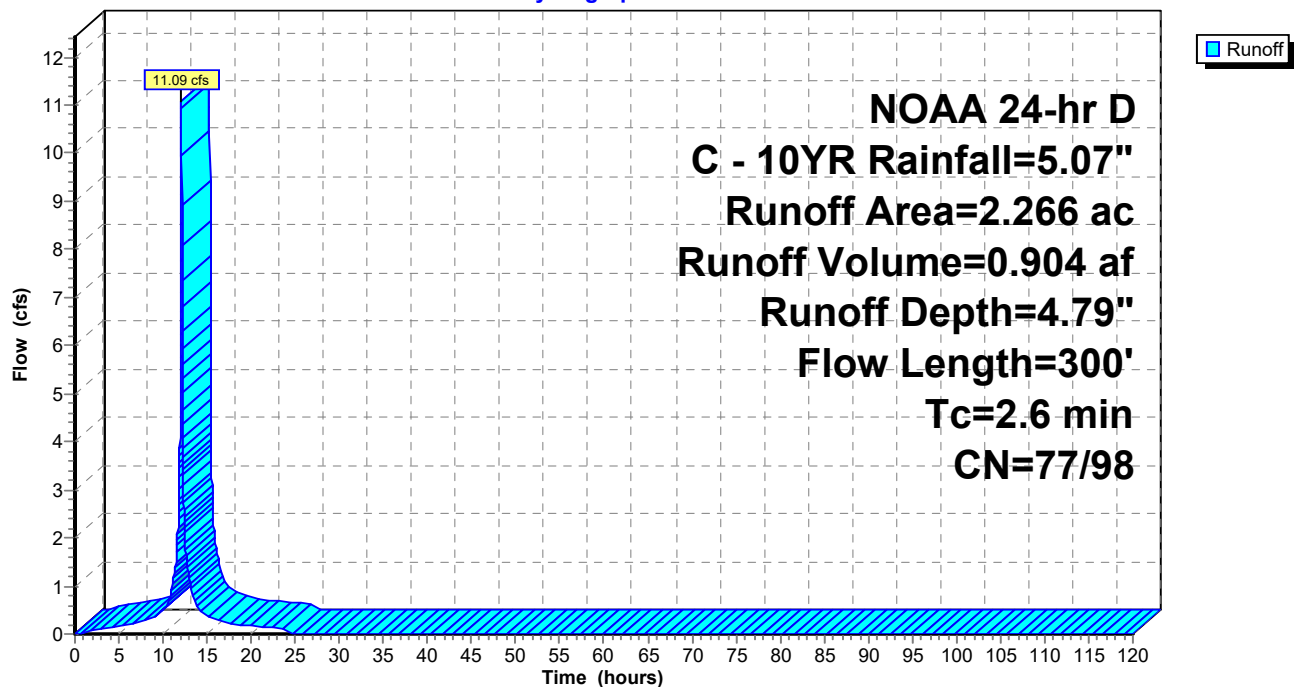
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.022	74	>75% Grass cover, Good, HSG C
0.025	80	>75% Grass cover, Good, HSG D
* 0.991	98	Paved parking
* 1.228	98	Roofs
2.266	98	Weighted Average
0.047	77	2.07% Pervious Area
2.219	98	97.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	230	0.0170	1.56		Sheet Flow, AB - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.2	70	0.0100	5.70	7.00	Pipe Channel, BC - Pipe Flow 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
2.6	300	Total			

Subcatchment 11S: Pr. Drainage Area 2

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 45

Hydrograph for Subcatchment 11S: Pr. Drainage Area 2

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.16
10.00	1.01	0.05	0.80	0.51
15.00	4.27	2.02	4.03	0.38
20.00	4.80	2.46	4.57	0.18
25.00	5.07	2.68	4.83	0.00
30.00	5.07	2.68	4.83	0.00
35.00	5.07	2.68	4.83	0.00
40.00	5.07	2.68	4.83	0.00
45.00	5.07	2.68	4.83	0.00
50.00	5.07	2.68	4.83	0.00
55.00	5.07	2.68	4.83	0.00
60.00	5.07	2.68	4.83	0.00
65.00	5.07	2.68	4.83	0.00
70.00	5.07	2.68	4.83	0.00
75.00	5.07	2.68	4.83	0.00
80.00	5.07	2.68	4.83	0.00
85.00	5.07	2.68	4.83	0.00
90.00	5.07	2.68	4.83	0.00
95.00	5.07	2.68	4.83	0.00
100.00	5.07	2.68	4.83	0.00
105.00	5.07	2.68	4.83	0.00
110.00	5.07	2.68	4.83	0.00
115.00	5.07	2.68	4.83	0.00
120.00	5.07	2.68	4.83	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 46

Summary for Subcatchment 12S: Pr. Drainage Area 1

Runoff = 1.09 cfs @ 12.12 hrs, Volume= 0.097 af, Depth= 3.97"

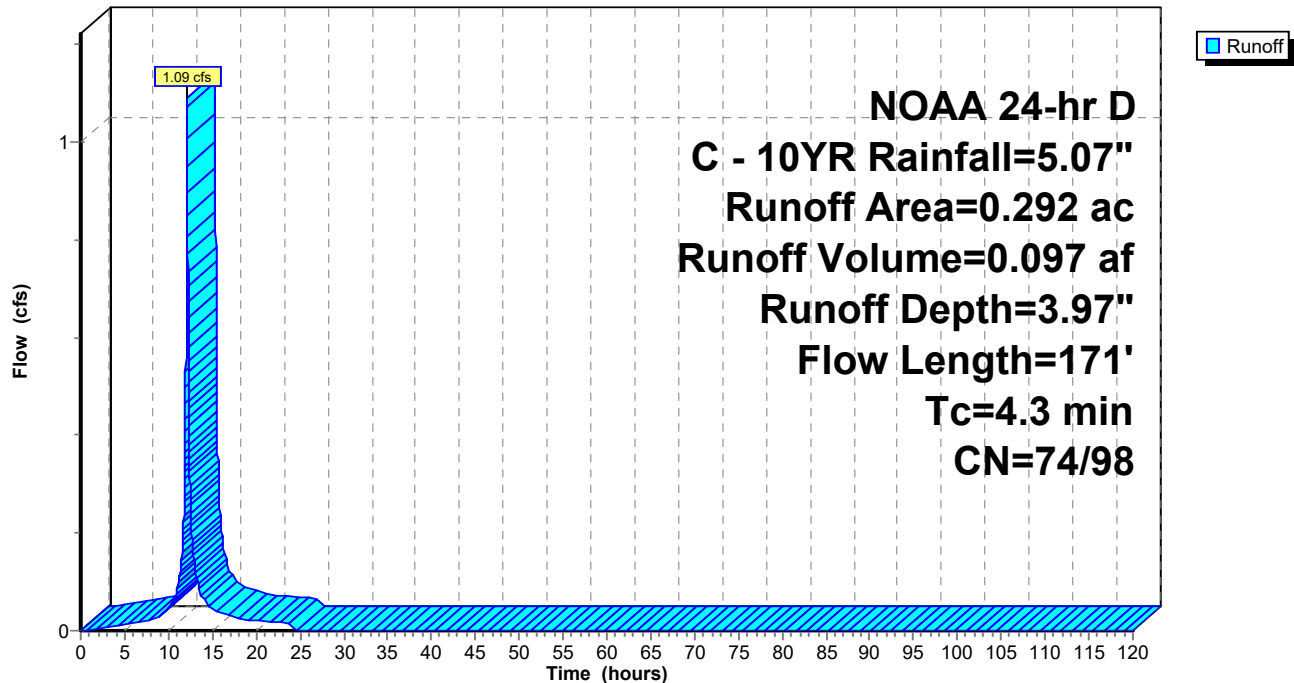
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-120.00 hrs, dt=1.00 hrs
NOAA 24-hr D C - 10YR Rainfall=5.07"

Area (ac)	CN	Description
0.104	74	>75% Grass cover, Good, HSG C
* 0.188	98	Paved parking
0.292	89	Weighted Average
0.104	74	35.62% Pervious Area
0.188	98	64.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	13	0.0120	0.09		Sheet Flow, AB - Sheet Flow Grass: Short n= 0.150 P2= 3.38"
2.0	147	0.0110	1.20		Sheet Flow, BC - Sheet Flow Smooth surfaces n= 0.011 P2= 3.38"
0.0	11	0.2500	7.50		Shallow Concentrated Flow, CD - Shallow Conc. Flow Grassed Waterway Kv= 15.0 fps
4.3	171	Total			

Subcatchment 12S: Pr. Drainage Area 1

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 47

Hydrograph for Subcatchment 12S: Pr. Drainage Area 1

Time (hours)	Precip. (inches)	Perv.Excess (inches)	Imp.Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	0.00
5.00	0.35	0.00	0.18	0.01
10.00	1.01	0.02	0.80	0.05
15.00	4.27	1.79	4.03	0.05
20.00	4.80	2.21	4.57	0.02
25.00	5.07	2.42	4.83	0.00
30.00	5.07	2.42	4.83	0.00
35.00	5.07	2.42	4.83	0.00
40.00	5.07	2.42	4.83	0.00
45.00	5.07	2.42	4.83	0.00
50.00	5.07	2.42	4.83	0.00
55.00	5.07	2.42	4.83	0.00
60.00	5.07	2.42	4.83	0.00
65.00	5.07	2.42	4.83	0.00
70.00	5.07	2.42	4.83	0.00
75.00	5.07	2.42	4.83	0.00
80.00	5.07	2.42	4.83	0.00
85.00	5.07	2.42	4.83	0.00
90.00	5.07	2.42	4.83	0.00
95.00	5.07	2.42	4.83	0.00
100.00	5.07	2.42	4.83	0.00
105.00	5.07	2.42	4.83	0.00
110.00	5.07	2.42	4.83	0.00
115.00	5.07	2.42	4.83	0.00
120.00	5.07	2.42	4.83	0.00

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 48

Summary for Pond 6P: Pipe Storage

Inflow Area = 2.558 ac, 94.10% Impervious, Inflow Depth = 4.70" for C - 10YR event
 Inflow = 12.07 cfs @ 12.11 hrs, Volume= 1.001 af
 Outflow = 8.15 cfs @ 12.16 hrs, Volume= 1.001 af, Atten= 33%, Lag= 3.3 min
 Primary = 8.15 cfs @ 12.16 hrs, Volume= 1.001 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 115.00' @ 12.16 hrs Surf.Area= 0.053 ac Storage= 0.100 af

Plug-Flow detention time= 15.1 min calculated for 1.001 af (100% of inflow)
 Center-of-Mass det. time= 15.3 min (766.4 - 751.1)

Volume	Invert	Avail.Storage	Storage Description
#1	112.96'	0.097 af	36.0" Round Pipe Storage x 4 L= 150.0'
#2	112.96'	0.072 af	42.0" W x 60.0" H Box Pipe Storage x 2 L= 90.0'
		0.170 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.96'	18.0" Round Culvert L= 54.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 112.96' / 112.68' S= 0.0052 '/' Cc= 0.900 n= 0.013 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Primary	117.43'	48.0" x 42.0" Horiz. Orifice/Grate X 8.00 C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.14 cfs @ 12.16 hrs HW=115.00' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 8.14 cfs @ 4.61 fps)
 2=Orifice/Grate (Controls 0.00 cfs)

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

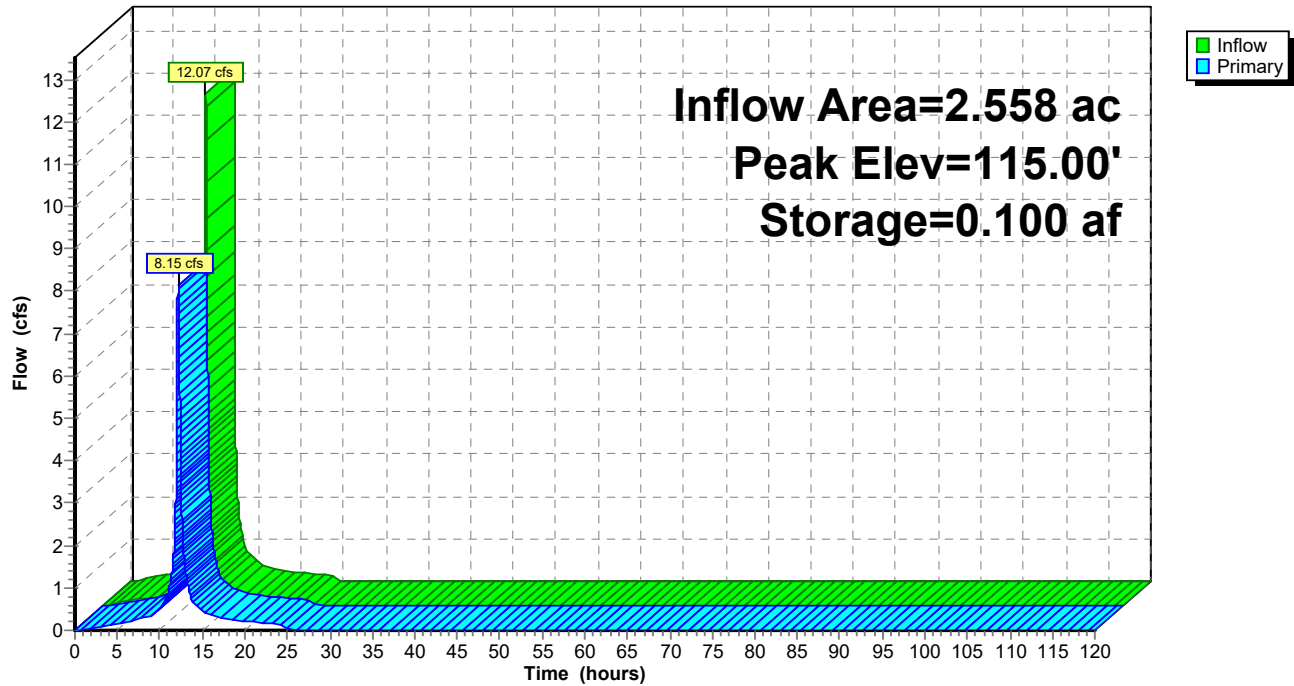
NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 49

Pond 6P: Pipe Storage

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 50

Hydrograph for Pond 6P: Pipe Storage

Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.000	112.96	0.00
5.00	0.17	0.006	113.17	0.16
10.00	0.56	0.012	113.33	0.52
15.00	0.42	0.011	113.31	0.46
20.00	0.20	0.007	113.19	0.20
25.00	0.00	0.002	113.03	0.02
30.00	0.00	0.000	112.97	0.00
35.00	0.00	0.000	112.97	0.00
40.00	0.00	0.000	112.97	0.00
45.00	0.00	0.000	112.96	0.00
50.00	0.00	0.000	112.96	0.00
55.00	0.00	0.000	112.96	0.00
60.00	0.00	0.000	112.96	0.00
65.00	0.00	0.000	112.96	0.00
70.00	0.00	0.000	112.96	0.00
75.00	0.00	0.000	112.96	0.00
80.00	0.00	0.000	112.96	0.00
85.00	0.00	0.000	112.96	0.00
90.00	0.00	0.000	112.96	0.00
95.00	0.00	0.000	112.96	0.00
100.00	0.00	0.000	112.96	0.00
105.00	0.00	0.000	112.96	0.00
110.00	0.00	0.000	112.96	0.00
115.00	0.00	0.000	112.96	0.00
120.00	0.00	0.000	112.96	0.00

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 51

Summary for Pond 8P: Rain Garden 2

Inflow Area = 0.593 ac, 65.77% Impervious, Inflow Depth = 4.19" for C - 10YR event
 Inflow = 1.79 cfs @ 12.17 hrs, Volume= 0.207 af
 Outflow = 1.77 cfs @ 12.19 hrs, Volume= 0.207 af, Atten= 1%, Lag= 1.0 min
 Primary = 1.77 cfs @ 12.19 hrs, Volume= 0.207 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2

Starting Elev= 117.25' Surf.Area= 1,380 sf Storage= 1,225 cf

Peak Elev= 117.36' @ 12.19 hrs Surf.Area= 1,432 sf Storage= 1,376 cf (151 cf above start)

Plug-Flow detention time= 122.2 min calculated for 0.179 af (86% of inflow)

Center-of-Mass det. time= 3.0 min (779.8 - 776.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	116.00'	1,570 cf	Custom Stage Data (Irregular) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
116.00	550	121.0	0	0	550
117.00	1,260	276.0	881	881	5,451
117.50	1,500	285.0	689	1,570	5,876

Device	Routing	Invert	Outlet Devices
#1	Primary	113.50'	15.0" Round Culvert L= 16.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.50' / 113.34' S= 0.0100 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	117.25'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.77 cfs @ 12.19 hrs HW=117.36' TW=0.00' (Dynamic Tailwater)↑ **1=Culvert** (Passes 1.77 cfs of 10.63 cfs potential flow)↑ **2=Orifice/Grate** (Weir Controls 1.77 cfs @ 1.08 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

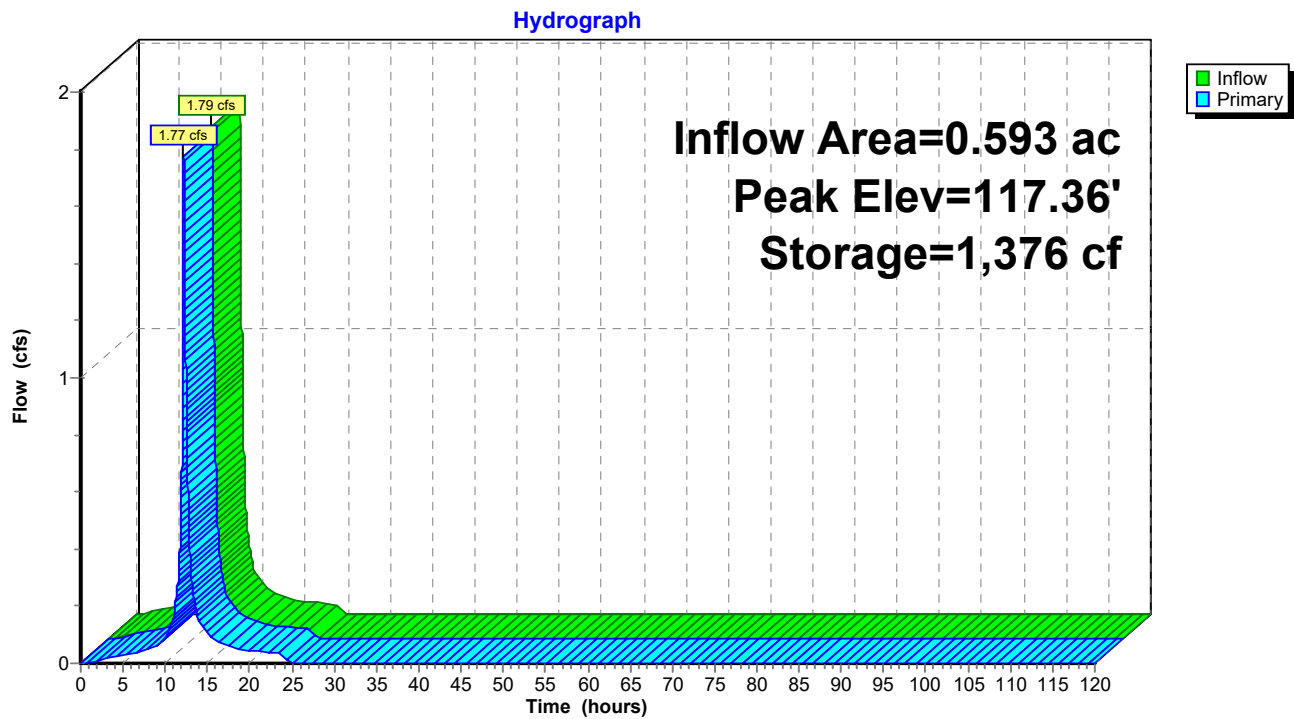
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 52

Pond 8P: Rain Garden 2



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 53

Hydrograph for Pond 8P: Rain Garden 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	1,225	117.25	0.00
5.00	0.03	1,235	117.26	0.03
10.00	0.10	1,247	117.27	0.10
15.00	0.10	1,248	117.27	0.10
20.00	0.05	1,238	117.26	0.05
25.00	0.00	1,226	117.25	0.00
30.00	0.00	1,225	117.25	0.00
35.00	0.00	1,225	117.25	0.00
40.00	0.00	1,225	117.25	0.00
45.00	0.00	1,225	117.25	0.00
50.00	0.00	1,225	117.25	0.00
55.00	0.00	1,225	117.25	0.00
60.00	0.00	1,225	117.25	0.00
65.00	0.00	1,225	117.25	0.00
70.00	0.00	1,225	117.25	0.00
75.00	0.00	1,225	117.25	0.00
80.00	0.00	1,225	117.25	0.00
85.00	0.00	1,225	117.25	0.00
90.00	0.00	1,225	117.25	0.00
95.00	0.00	1,225	117.25	0.00
100.00	0.00	1,225	117.25	0.00
105.00	0.00	1,225	117.25	0.00
110.00	0.00	1,225	117.25	0.00
115.00	0.00	1,225	117.25	0.00
120.00	0.00	1,225	117.25	0.00

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 54

Summary for Pond 13P: Rain Garden 3

Inflow Area = 0.524 ac, 60.50% Impervious, Inflow Depth = 3.88" for C - 10YR event
 Inflow = 1.82 cfs @ 12.13 hrs, Volume= 0.169 af
 Outflow = 1.68 cfs @ 12.16 hrs, Volume= 0.169 af, Atten= 8%, Lag= 1.9 min
 Primary = 1.68 cfs @ 12.16 hrs, Volume= 0.169 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2

Starting Elev= 118.80' Surf.Area= 3,289 sf Storage= 3,577 cf

Peak Elev= 118.91' @ 12.16 hrs Surf.Area= 3,383 sf Storage= 3,928 cf (352 cf above start)

Plug-Flow detention time= 283.1 min calculated for 0.087 af (52% of inflow)

Center-of-Mass det. time= 7.8 min (783.3 - 775.5)

Volume	Invert	Avail.Storage	Storage Description
#1	117.50'	4,252 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)
117.50	2,271	224.0	0	0	2,271
118.00	2,615	234.0	1,220	1,220	2,653
119.00	3,469	279.0	3,032	4,252	4,508

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	15.0" Round Culvert L= 194.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.00' / 114.04' S= 0.0049 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	118.80'	42.0" x 48.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.68 cfs @ 12.16 hrs HW=118.91' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.68 cfs of 7.63 cfs potential flow)
 ↑ **2=Orifice/Grate** (Weir Controls 1.68 cfs @ 1.06 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

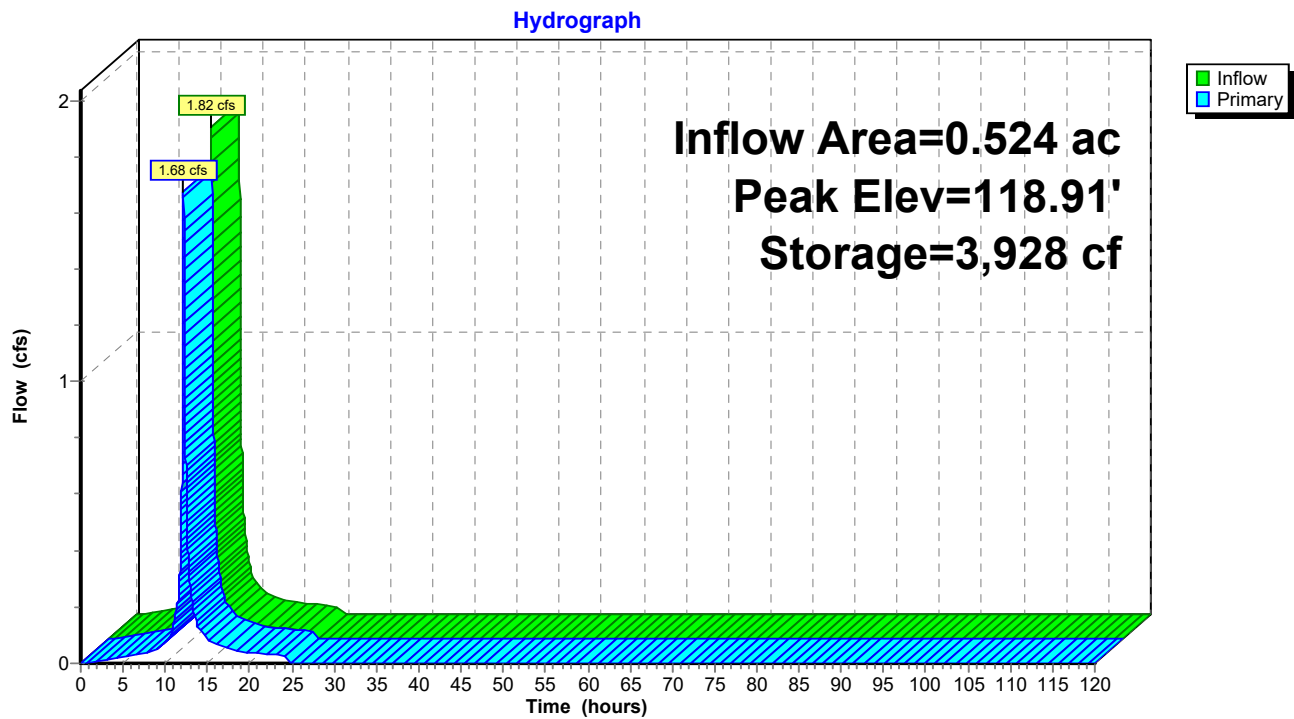
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 55

Pond 13P: Rain Garden 3



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 56

Hydrograph for Pond 13P: Rain Garden 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	3,577	118.80	0.00
5.00	0.02	3,596	118.81	0.02
10.00	0.08	3,620	118.81	0.07
15.00	0.08	3,624	118.81	0.09
20.00	0.04	3,605	118.81	0.04
25.00	0.00	3,579	118.80	0.00
30.00	0.00	3,577	118.80	0.00
35.00	0.00	3,577	118.80	0.00
40.00	0.00	3,577	118.80	0.00
45.00	0.00	3,577	118.80	0.00
50.00	0.00	3,577	118.80	0.00
55.00	0.00	3,577	118.80	0.00
60.00	0.00	3,577	118.80	0.00
65.00	0.00	3,577	118.80	0.00
70.00	0.00	3,577	118.80	0.00
75.00	0.00	3,577	118.80	0.00
80.00	0.00	3,577	118.80	0.00
85.00	0.00	3,577	118.80	0.00
90.00	0.00	3,577	118.80	0.00
95.00	0.00	3,577	118.80	0.00
100.00	0.00	3,577	118.80	0.00
105.00	0.00	3,577	118.80	0.00
110.00	0.00	3,577	118.80	0.00
115.00	0.00	3,577	118.80	0.00
120.00	0.00	3,577	118.80	0.00

210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 57

Summary for Pond 14P: Rain Garden 1

Inflow Area = 0.292 ac, 64.38% Impervious, Inflow Depth = 3.97" for C - 10YR event
 Inflow = 1.09 cfs @ 12.12 hrs, Volume= 0.097 af
 Outflow = 1.06 cfs @ 12.14 hrs, Volume= 0.097 af, Atten= 3%, Lag= 0.9 min
 Primary = 1.06 cfs @ 12.14 hrs, Volume= 0.097 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs / 2
 Starting Elev= 119.00' Surf.Area= 1,370 sf Storage= 1,169 cf
 Peak Elev= 119.08' @ 12.14 hrs Surf.Area= 1,402 sf Storage= 1,277 cf (108 cf above start)

Plug-Flow detention time= 189.3 min calculated for 0.070 af (72% of inflow)
 Center-of-Mass det. time= 3.9 min (775.3 - 771.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	118.00'	2,758 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)
118.00	979	121.0	0	0	979
119.00	1,370	140.0	1,169	1,169	1,395
120.00	1,818	159.0	1,589	2,758	1,871

Device	Routing	Invert	Outlet Devices
#1	Primary	113.52'	15.0" Round Culvert L= 104.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 113.52' / 113.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 1.23 sf
#2	Device 1	119.00'	48.0" x 42.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.06 cfs @ 12.14 hrs HW=119.08' TW=114.96' (Dynamic Tailwater)

↑ **1=Culvert** (Passes 1.06 cfs of 10.08 cfs potential flow)

↑ **2=Orifice/Grate** (Weir Controls 1.06 cfs @ 0.91 fps)

210600 SCD Failure Analysis

Prepared by Maser Consulting

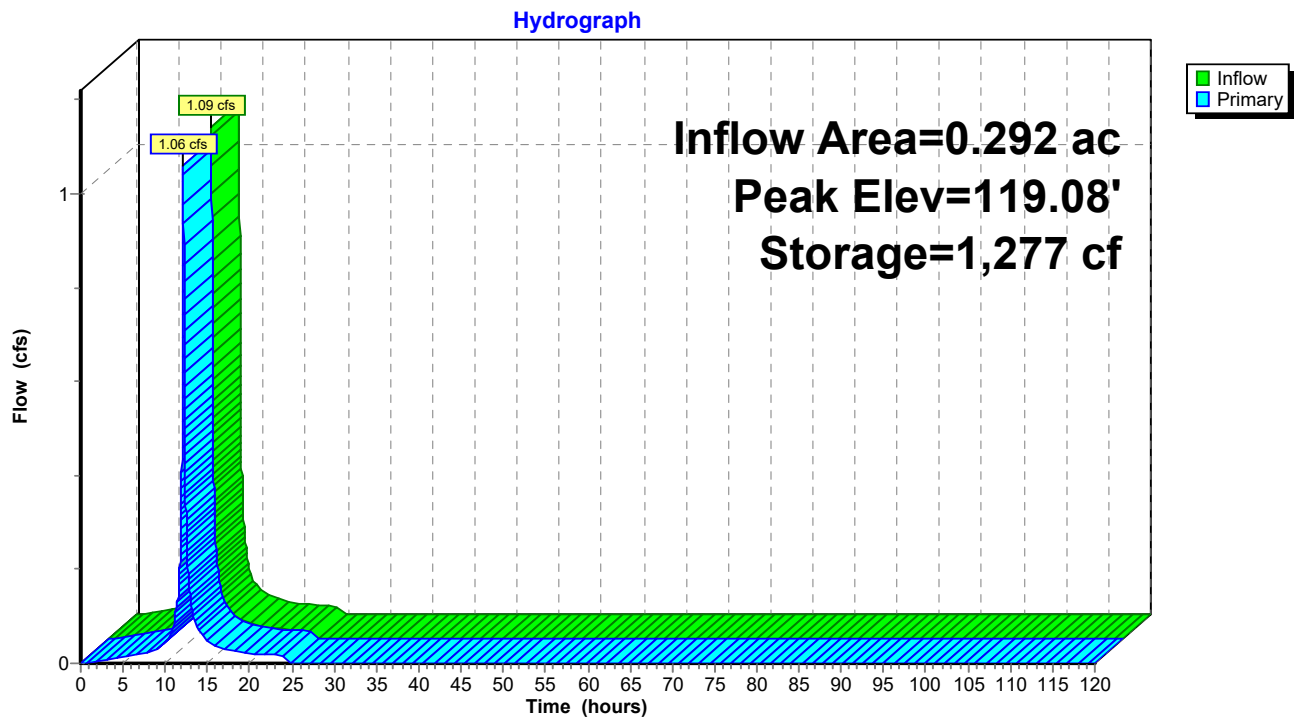
HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 58

Pond 14P: Rain Garden 1



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 59

Hydrograph for Pond 14P: Rain Garden 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	1,169	119.00	0.00
5.00	0.01	1,175	119.00	0.01
10.00	0.05	1,182	119.01	0.04
15.00	0.05	1,182	119.01	0.05
20.00	0.02	1,177	119.01	0.02
25.00	0.00	1,169	119.00	0.00
30.00	0.00	1,169	119.00	0.00
35.00	0.00	1,169	119.00	0.00
40.00	0.00	1,169	119.00	0.00
45.00	0.00	1,169	119.00	0.00
50.00	0.00	1,169	119.00	0.00
55.00	0.00	1,169	119.00	0.00
60.00	0.00	1,169	119.00	0.00
65.00	0.00	1,169	119.00	0.00
70.00	0.00	1,169	119.00	0.00
75.00	0.00	1,169	119.00	0.00
80.00	0.00	1,169	119.00	0.00
85.00	0.00	1,169	119.00	0.00
90.00	0.00	1,169	119.00	0.00
95.00	0.00	1,169	119.00	0.00
100.00	0.00	1,169	119.00	0.00
105.00	0.00	1,169	119.00	0.00
110.00	0.00	1,169	119.00	0.00
115.00	0.00	1,169	119.00	0.00
120.00	0.00	1,169	119.00	0.00

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 60

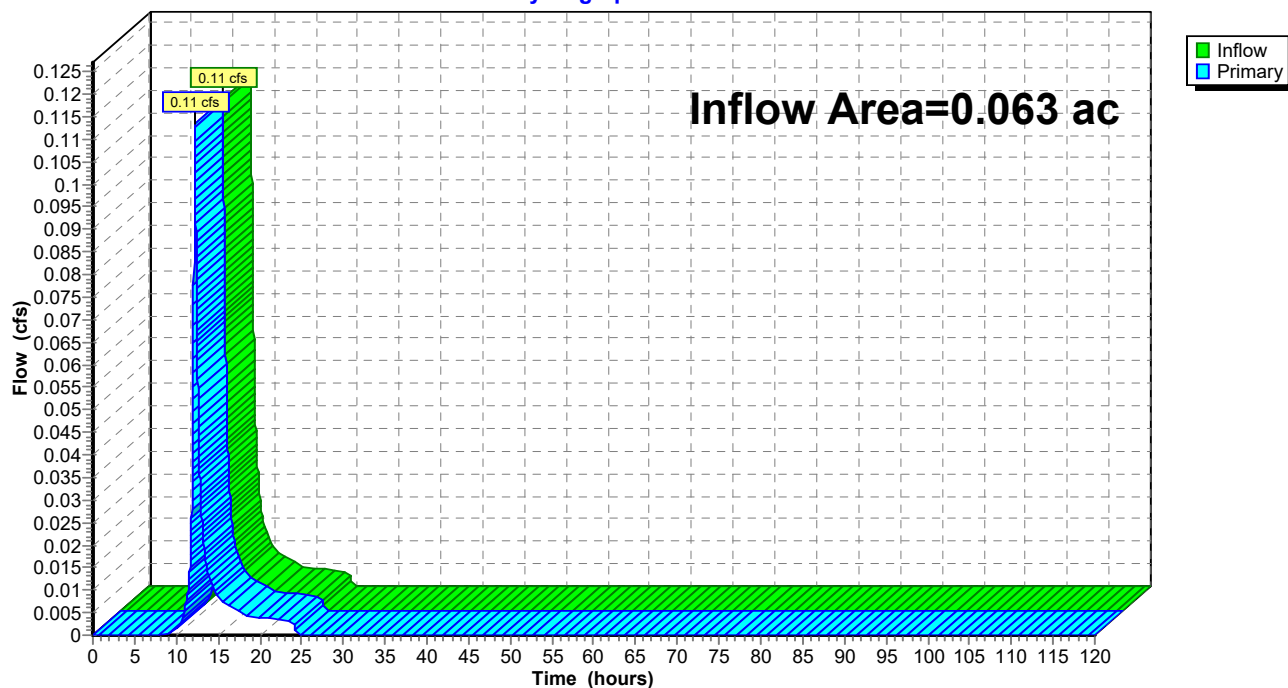
Summary for Link 4L: Analysis Point 2

Inflow Area = 0.063 ac, 0.00% Impervious, Inflow Depth = 2.42" for C - 10YR event
Inflow = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af
Primary = 0.11 cfs @ 12.20 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 4L: Analysis Point 2

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 61

Hydrograph for Link 4L: Analysis Point 2

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	106.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	108.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	110.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	112.00	0.00	0.00	0.00
10.00	0.00	0.00	0.00	114.00	0.00	0.00	0.00
12.00	0.05	0.00	0.05	116.00	0.00	0.00	0.00
14.00	0.01	0.00	0.01	118.00	0.00	0.00	0.00
16.00	0.01	0.00	0.01	120.00	0.00	0.00	0.00
18.00	0.00	0.00	0.00				
20.00	0.00	0.00	0.00				
22.00	0.00	0.00	0.00				
24.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

210600 SCD Failure Analysis

Prepared by Maser Consulting

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

NOAA 24-hr D C - 10YR Rainfall=5.07"

Printed 8/10/2021

Page 62

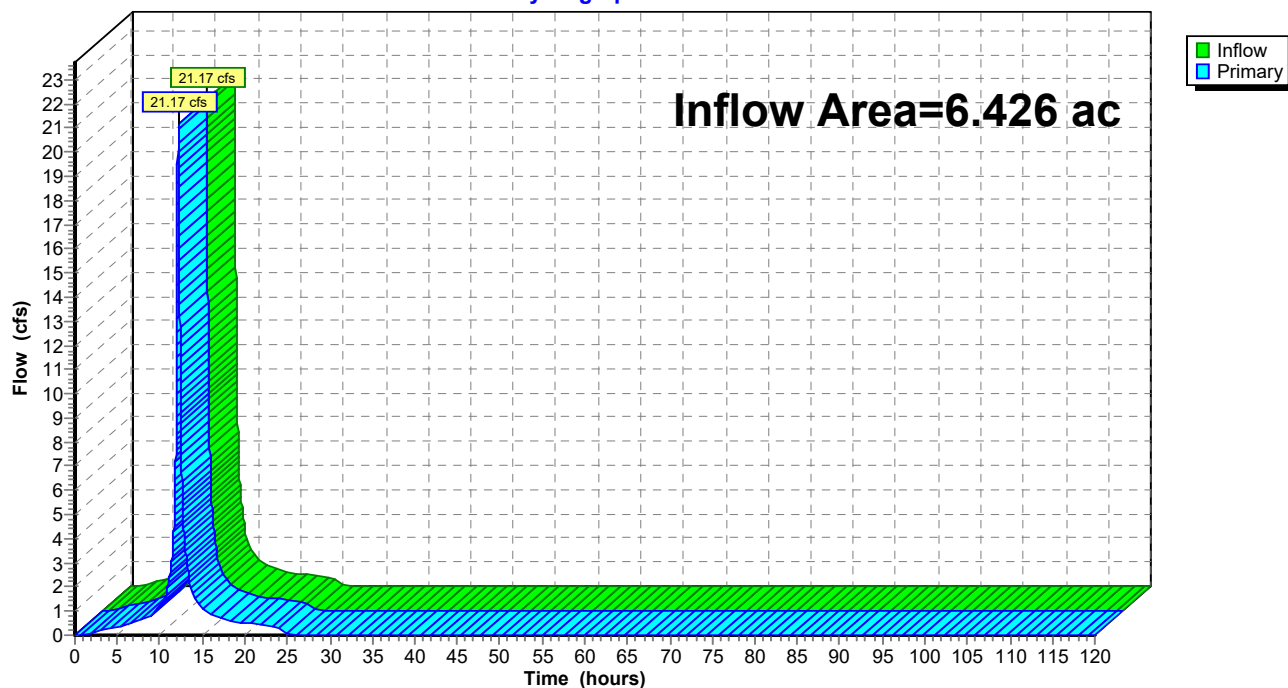
Summary for Link 9L: Analysis Point 1

Inflow Area = 6.426 ac, 84.17% Impervious, Inflow Depth = 4.50" for C - 10YR event
Inflow = 21.17 cfs @ 12.16 hrs, Volume= 2.410 af
Primary = 21.17 cfs @ 12.16 hrs, Volume= 2.410 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-120.00 hrs, dt= 0.01 hrs

Link 9L: Analysis Point 1

Hydrograph



210600 SCD Failure Analysis

NOAA 24-hr D C - 10YR Rainfall=5.07"

Prepared by Maser Consulting

Printed 8/10/2021

HydroCAD® 10.10-3a s/n 10901 © 2020 HydroCAD Software Solutions LLC

Page 63

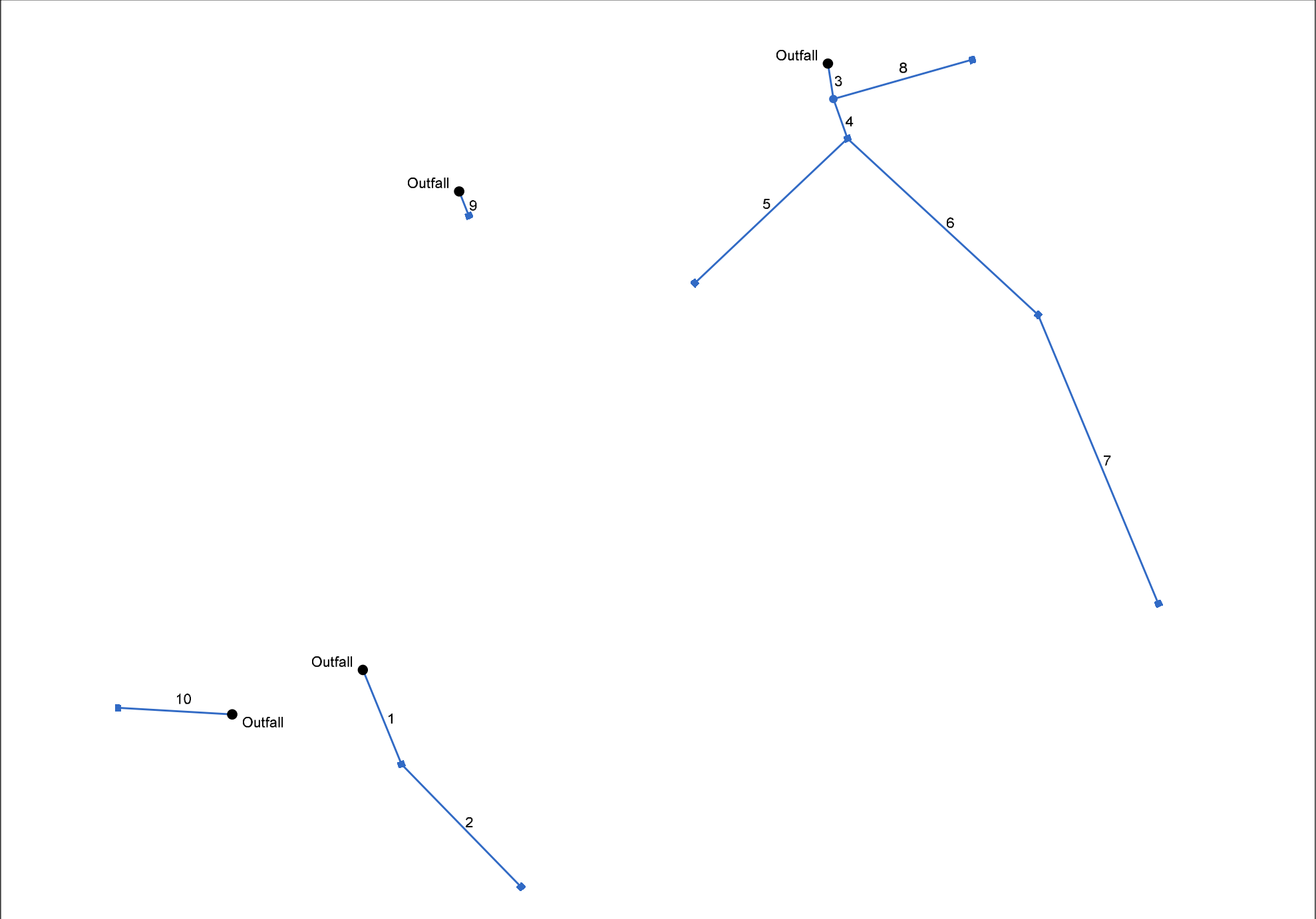
Hydrograph for Link 9L: Analysis Point 1

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	0.00	0.00	104.00	0.00	0.00	0.00
2.00	0.13	0.00	0.13	106.00	0.00	0.00	0.00
4.00	0.31	0.00	0.31	108.00	0.00	0.00	0.00
6.00	0.42	0.00	0.42	110.00	0.00	0.00	0.00
8.00	0.67	0.00	0.67	112.00	0.00	0.00	0.00
10.00	1.23	0.00	1.23	114.00	0.00	0.00	0.00
12.00	11.52	0.00	11.52	116.00	0.00	0.00	0.00
14.00	1.63	0.00	1.63	118.00	0.00	0.00	0.00
16.00	0.88	0.00	0.88	120.00	0.00	0.00	0.00
18.00	0.60	0.00	0.60				
20.00	0.50	0.00	0.50				
22.00	0.43	0.00	0.43				
24.00	0.36	0.00	0.36				
26.00	0.01	0.00	0.01				
28.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
54.00	0.00	0.00	0.00				
56.00	0.00	0.00	0.00				
58.00	0.00	0.00	0.00				
60.00	0.00	0.00	0.00				
62.00	0.00	0.00	0.00				
64.00	0.00	0.00	0.00				
66.00	0.00	0.00	0.00				
68.00	0.00	0.00	0.00				
70.00	0.00	0.00	0.00				
72.00	0.00	0.00	0.00				
74.00	0.00	0.00	0.00				
76.00	0.00	0.00	0.00				
78.00	0.00	0.00	0.00				
80.00	0.00	0.00	0.00				
82.00	0.00	0.00	0.00				
84.00	0.00	0.00	0.00				
86.00	0.00	0.00	0.00				
88.00	0.00	0.00	0.00				
90.00	0.00	0.00	0.00				
92.00	0.00	0.00	0.00				
94.00	0.00	0.00	0.00				
96.00	0.00	0.00	0.00				
98.00	0.00	0.00	0.00				
100.00	0.00	0.00	0.00				
102.00	0.00	0.00	0.00				

Appendix D

Stormwater Conveyance System Calculations

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 210729 Pipe Calcs.stm	Number of lines: 10	Date: 8/10/2021
-------------------------------------	---------------------	-----------------

Line No.	Line ID	Inlet ID	Drng Area	Runoff Coeff	Tc	i Sys	Q Capt	Total Runoff	Capac Full	Vel Ave	Line Type	n-val Pipe	Line Size	Line Slope	Line Length	Invert Up	Invert Dn	Gnd/Rim El Up	Gnd/Rim El Dn	
			(ac)	(C)	(min)	(in/hr)	(cfs)	(cfs)	(cfs)	(ft/s)			(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	
10	C-100	C-100	0.40	0.99	10.0	6.47	2.56	2.56	6.97	4.05	Cir	0.012	15	0.99	70.429	113.66	112.96	116.75	0.00	
9	E-100	E-100	0.00	0.00	0.0	0.00	2.26	0.00	6.41	3.48	Cir	0.013	15	0.98	16.250	113.50	113.34	117.25	0.00	
8	A-101	A-101	0.98	0.99	10.0	6.47	6.27	6.27	8.58	6.77	Cir	0.012	15	1.50	89.118	114.32	112.98	117.00	118.80	
7	A-130	A-130	0.00	0.00	0.0	0.00	1.99	0.00	4.92	2.72	Cir	0.012	15	0.50	193.791	115.00	114.04	118.80	118.25	
6	A-120	A-120	0.80	0.99	10.0	6.47	5.12	5.12	8.03	4.98	Cir	0.012	18	0.50	160.503	113.79	112.99	118.25	118.25	
5	A-111	A-111	0.34	0.99	10.0	6.47	2.18	2.18	6.07	3.00	Cir	0.012	15	0.75	130.000	114.22	113.24	119.10	118.25	
4	A-110	A-110	0.13	0.99	11.2	6.21	0.83	7.80	11.38	6.83	Cir	0.012	18	1.00	25.997	112.99	112.73	118.25	118.80	
3	A-100	A-100	0.00	0.00	11.3	6.19		13.79	19.77	6.45	Cir	0.013	24	0.76	22.255	112.23	112.06	118.80	0.00	
2	B-100	B-100	1.23	0.99	10.0	6.47	9.24	7.87	10.82	5.51	Cir	0.012	18	0.90	106.084	114.21	113.25	118.50	118.56	
1	Existing Pipe 1	Existing Inlet 1	0.14	0.99	10.3	6.39	0.90	8.67	9.98	6.43	Cir	0.013	18	0.90	63.049	113.25	112.68	118.56	0.00	

Project File: 210729 Pipe Calcs.stm

Number of lines: 10

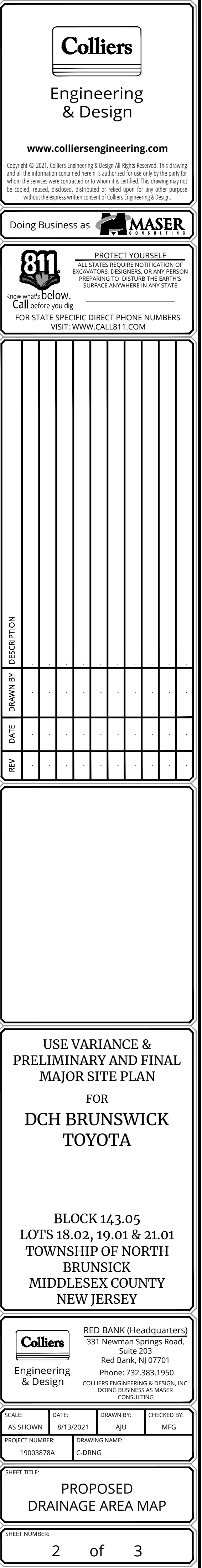
Date: 8/10/2021

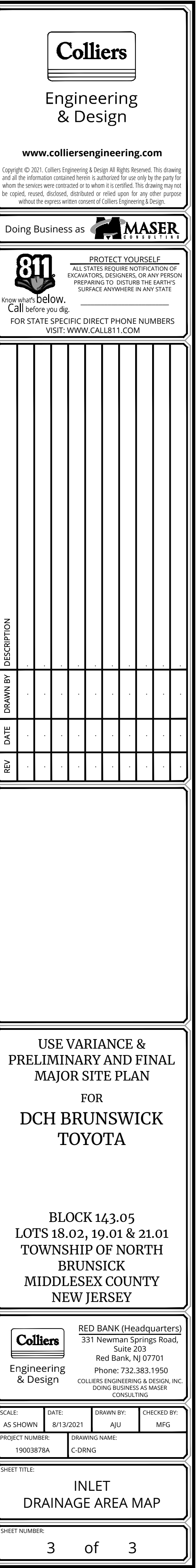
NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99 -- Return period = 25 Yrs. ; ** Critical depth

Appendix E

Drainage Area Maps

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION







Engineering
& Design

Colliers Engineering & Design is a trusted provider of multi-discipline engineering, design and consulting services providing customized solutions for public and private clients through a network of offices nationwide.

For a full listing of our office locations, please visit colliersengineering.com

1 877 627 3772



*Civil/Site • Traffic/Transportation • Governmental • Survey/Geospatial
Infrastructure • Geotechnical/Environmental • Telecommunications • Utilities/Energy*

Accelerating success.