



Engineering
& Design

Stormwater Management Report

October 18, 2024

Revision 1: December 20, 2024

Revision 2: July 1, 2025

Proposed Residential Improvements

Block 106, Lot 24.01

Town of West Orange, Essex County, New Jersey

Prepared for:

The Waymaker, LLC
40 Eagle Ridge Way
West Orange, NJ 07052

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Project No. 24006174A

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Limitation

The sole purpose of this report and the associated services performed by Colliers Engineering & Design, Inc., is to undertake a hydrologic assessment for the proposed residential development in accordance with the scope of services set out in the contract between Colliers Engineering & Design and The Waymaker, LLC.

Colliers Engineering & Design derived the data in this report from a variety of sources. The sources are identified at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations, and conclusions expressed in this report. Colliers Engineering & Design has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose of the project and by reference to applicable standards, procedures, and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report.

This report should be read in full, and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Colliers Engineering & Design for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of The Waymaker, LLC and is subject to, and issued in connection with, the provisions of the agreement between Colliers Engineering & Design and The Waymaker, LLC.

Introduction

This Stormwater Management Report for the proposed project has been prepared by Colliers Engineering & Design for The Waymaker, LLC. Colliers Engineering & Design performed a hydrological assessment for the property located at 42 Eagle Ridge Way, West Orange, New Jersey, also defined as Block 106, Lot 24.01. The site is currently ± 3.09 -acres in size and was previously occupied by a single-family home and associated driveways and site improvements. The house was recently demolished and the property was cleared, and is currently occupied by stockpiles of gravel and other materials. The proposed development consists of the construction of a single-family home and a barn and indoor arena for the keeping of horses. There will also be an outdoor arena, grass paddocks, and associated driveways and pathways. The proposed development results in a total disturbance of approximately 3.13 acres and a total impervious area of approximately 0.40 acres (0.19-acre increase) within the proposed development area.

Purpose

This report assesses the hydrologic aspects, and the stormwater drainage conditions as a result of the proposed construction, including the house, barn, arenas, paddocks, landscaping areas, stormwater management facilities, associated utilities, and related site improvements.

The focus of the study is the identification of the existing drainage characteristics prior to the demolition of the house in comparison to post-development conditions. Calculations documenting the design of the stormwater management system are illustrated on the Site Plan drawing documents, prepared by Colliers Engineering & Design.

Method

Generally, stormwater runoff from the site flows overland from west to east and discharges to an existing drainage channel located at the northeastern corner of the site (Design Point 1). The remainder of the site drains overland to the south (Design Point 2). The area, curve number, and time of concentration for each existing watershed can be seen on the Existing Drainage Area Map included in the appendix. For the purposes of this analysis the existing conditions include the previously demolished house and site improvements.

Under proposed conditions, the site will generally mimic the existing drainage pattern; however, the majority of the proposed development will be captured and routed through a subsurface infiltration basin to attenuate peak flows. New inlets and pipes will be installed to convey the stormwater runoff from certain areas to the infiltration basins. Tributary areas to the infiltration basin are outlined on the Proposed Drainage Area Map and include the house, barn, arenas, and the majority of the proposed pathways and paddocks. The area, curve number, and time of concentration for each proposed watershed can be found on the Proposed Drainage Area Map and HydroCAD output included in the appendix.

Stormwater Quantity

1.1 Stormwater Management

As mentioned above, a subsurface infiltration basin has been designed to provide water quantity mitigation for the runoff discharging to the existing drainage channel. Initial geotechnical investigations on the site found bedrock in the area of the proposed basin at an approximate elevation of 613.00, and investigations on the neighboring property at 40 Eagle Ridge Way found infiltration rates of 6 in/hr. As the site is located in within the same soil type as 40 Eagle Ridge Way, it is anticipated that the site will have similar infiltration rates. The Geotechnical Data Report for 40 Eagle Ridge Way is included as an appendix to this report. Further soil testing to confirm the infiltration rate will be performed prior to construction. Full HydroCAD output calculations are provided in the appendix. The results are summarized in the table below.

1.2 Summary Table

<i>Description</i>	<i>2 Year Storm</i>	<i>10 Year Storm</i>	<i>100 Year Storm</i>
A. Existing Conditions			
Design Point 1	2.85 cfs	5.99 cfs	12.64 cfs
Required Reductions (50%, 75%, 80%)	1.43 cfs	4.49 cfs	10.11 cfs
Design Point 2	0.55 cfs	1.19 cfs	2.54 cfs
Required Reductions (50%, 75%, 80%)	0.28 cfs	0.89 cfs	2.03 cfs
B. Proposed Conditions			
Design Point 1	1.22 cfs	3.96 cfs	10.10 cfs
Design Point 2	0.26 cfs	0.55 cfs	1.14 cfs

According to §25-29.4.r of the Township of West Orange, stormwater management measures shall be designed so that the post-construction peak runoff rates for the 2-, 10-, and 100-year storm events are 50%, 75%, and 80%, respectively, of the preconstruction peak runoff rates. As can be seen in the Summary Table above, the post-construction peak runoff rates for the 2-, 10-, and 100-year storm events have been reduced below the required peak runoff rates.

1.3 Stormwater Management Facility Operations and Maintenance

The long-term operations and maintenance of the proposed stormwater management facilities shall be performed in accordance with the Stormwater Management Facility Operations & Maintenance Manual, which will be prepared prior to construction. This Manual will explain how often maintenance should be performed and how long it should take for the proposed on-site stormwater management systems to drain to ensure proper operation.

1.4 Conveyance System

Pipe sizing calculations are included in the appendix of this report. Pipe sizing calculations were performed using the Rational Method and 25-year design storm for capacity verification.

1.5 Downstream Stability

A scour hole is proposed at the outflow of the proposed basin to provide conduit outlet protection and downstream stability. Scour hole sizing calculations are included in the appendix of this report.

Stormwater Quality

As per NJDEP Regulations, stormwater management measures shall only be required for water quality control if an additional $\frac{1}{4}$ acre of regulated motor vehicle surface is being proposed on a development site. For this project, the existing motor vehicle surface area totals approximately 0.19 acres and the proposed motor vehicle surface area totals approximately 0.40 acres, which results in an increase of 0.21 acres. Therefore, as the proposed improvements result in less than $\frac{1}{4}$ acre of new regulated motor vehicle surfaces, water quality treatment is not required.

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

To meet Township and NJDEP requirements for groundwater recharge, the proposed development is designed to maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site. As the entire subject property falls within one (1) HUC-14 sub-watershed, compliance with the groundwater recharge standard is met by analyzing the site as a whole. The site is within the Passaic River Lower (Nwk Bay to Saddle) HUC-14 drainage area.

The New Jersey Groundwater Recharge Spreadsheet, Version 2.0, November 2003 is utilized to calculate the post-development annual recharge deficit for the project site and annual recharge volume for each proposed BMP. The following table provides a summary of the post-development deficit and proposed recharge volume. Full calculation spreadsheets and a summary of the proposed recharge volume for each BMP are provided in the Appendix.

Groundwater Recharge Summary

HUC-14 Drainage Area	Pre-Development Total Annual Recharge (cubic feet)	Proposed Annual Recharge Volume (cubic feet)	Percentage of Average Annual Pre-Construction Groundwater Recharge Volume
Passaic River Lower (Nwk Bay to Saddle)	150,467	155,572	103.39%

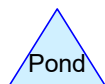
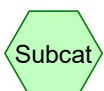
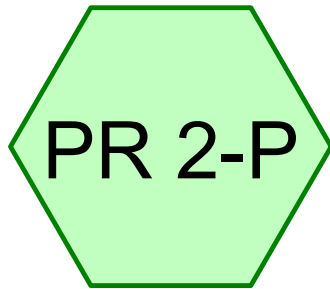
As shown in the above table, the proposed development is designed to maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site.

Conclusion

As discussed above, water quantity mitigation is provided for all watersheds for all storm events studied in accordance with NJDEP and Township of West Orange regulations. A subsurface infiltration basin was utilized to achieve the required reductions for all Design Points. Furthermore, water quality treatment is not required for this project site. As such, there should be no adverse impacts due to stormwater, on-site or off-site, as a result of the proposed development. Included in the appendix of this report is the HydroCAD output for back-up on both the existing and proposed conditions. Additionally, the aforementioned Existing and Proposed Drainage Area Maps, an Inlet Area Map and a Pipe Capacity Report are provided in the appendix of this report.

Appendix A

HydroCAD Output



Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	25-Year	NOAA 24-hr	D	Default	24.00	1	6.44	2
4	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2
5	WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2
6	50-Year	NOAA 24-hr	D	Default	24.00	1	7.49	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.148	74	>75% Grass cover, Good, HSG C (PR 2-P)
0.022	89	Gravel roads, HSG C (PR 2-P)
0.170	76	TOTAL AREA

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.170	HSG C	PR 2-P
0.000	HSG D	
0.000	Other	
0.170		TOTAL AREA

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Ground Covers (selected 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	0.148	0.000	0.000	0.148	>75% Grass cover, Good	PR 2-P
0.000	0.000	0.022	0.000	0.000	0.022	Gravel roads	PR 2-P
0.000	0.000	0.170	0.000	0.000	0.170	TOTAL AREA	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=1.32"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=0.26 cfs 0.019 af

Reach DP2-PR:

Inflow=0.26 cfs 0.019 af

Outflow=0.26 cfs 0.019 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.019 af Average Runoff Depth = 1.32"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.26 cfs @ 12.11 hrs, Volume= 0.019 af, Depth= 1.32"
 Routed to Reach DP2-PR :

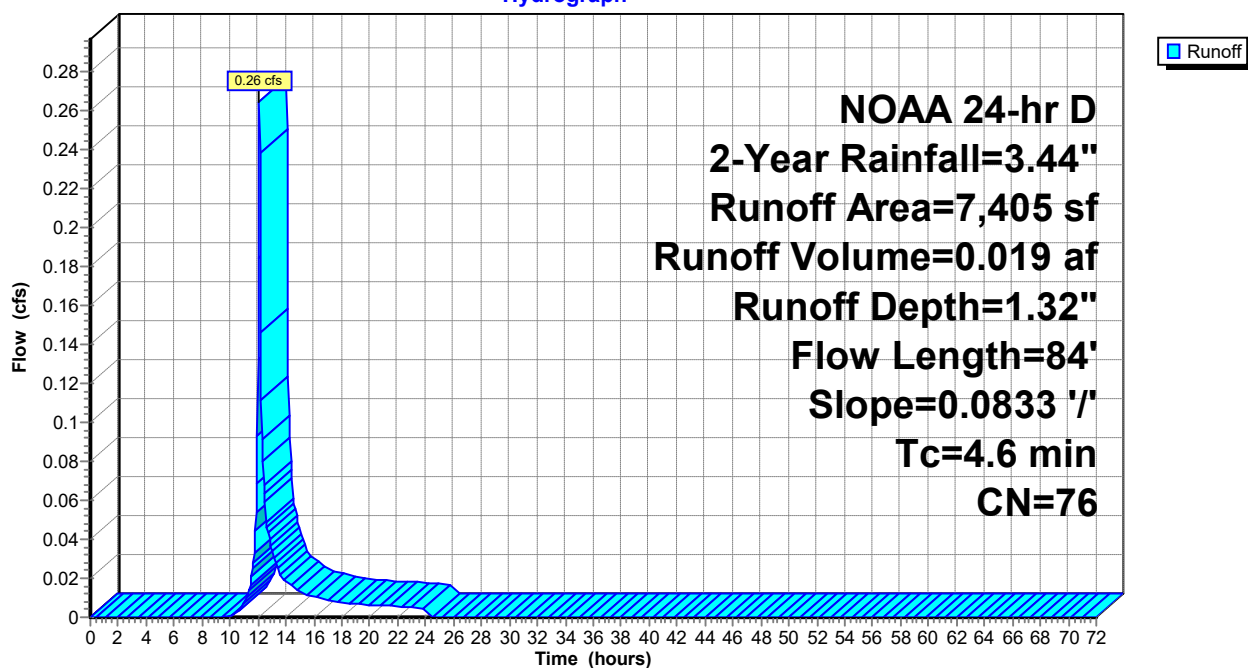
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt= 0.05$ hrs
 NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph

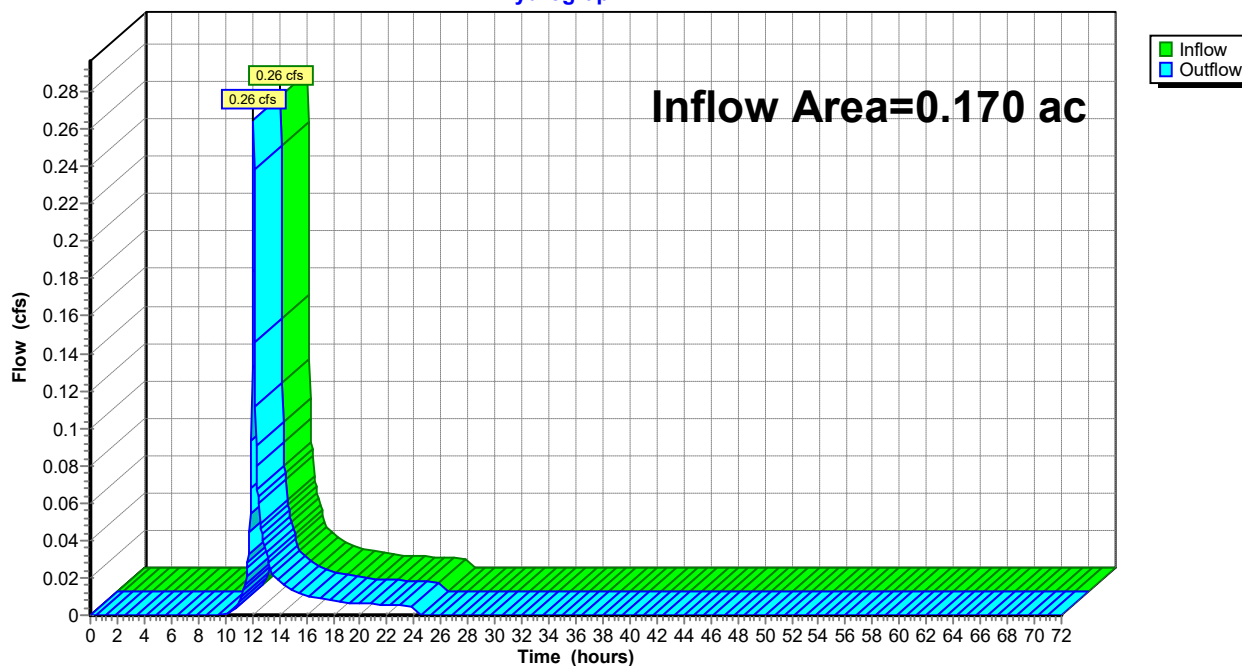


Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 1.32" for 2-Year event
Inflow = 0.26 cfs @ 12.11 hrs, Volume= 0.019 af
Outflow = 0.26 cfs @ 12.11 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

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

Reach DP2-PR:**Hydrograph**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=2.72"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=0.55 cfs 0.039 af

Reach DP2-PR:

Inflow=0.55 cfs 0.039 af

Outflow=0.55 cfs 0.039 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.039 af Average Runoff Depth = 2.72"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.55 cfs @ 12.11 hrs, Volume= 0.039 af, Depth= 2.72"
 Routed to Reach DP2-PR :

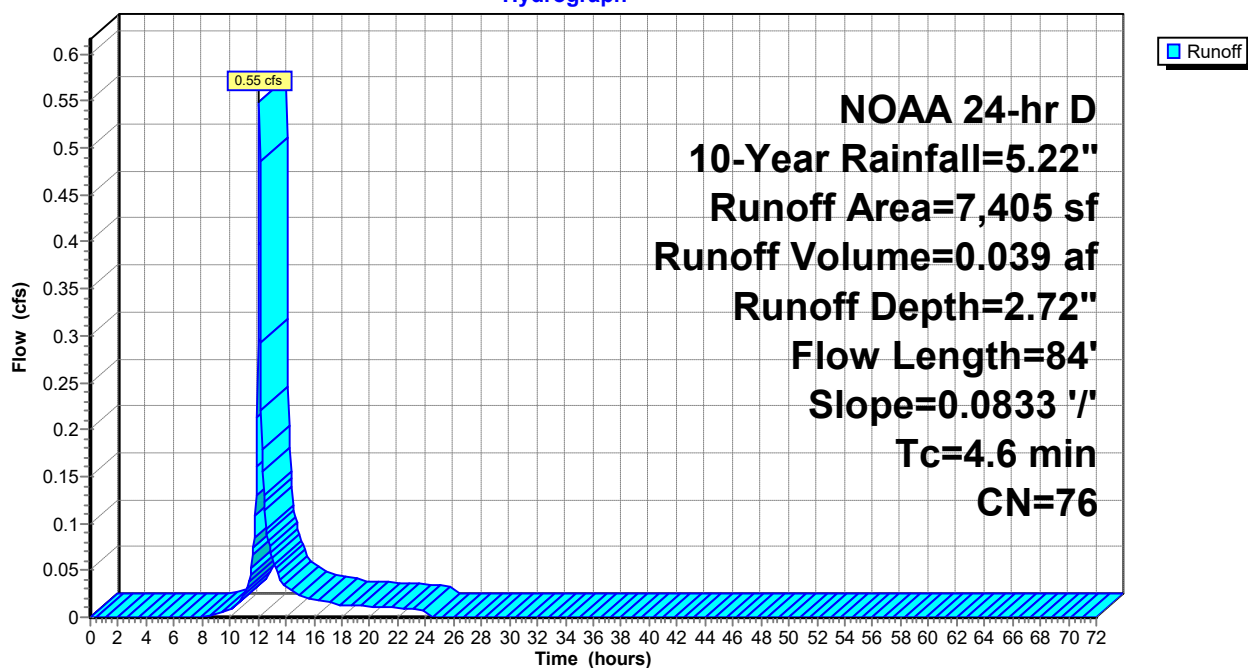
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph

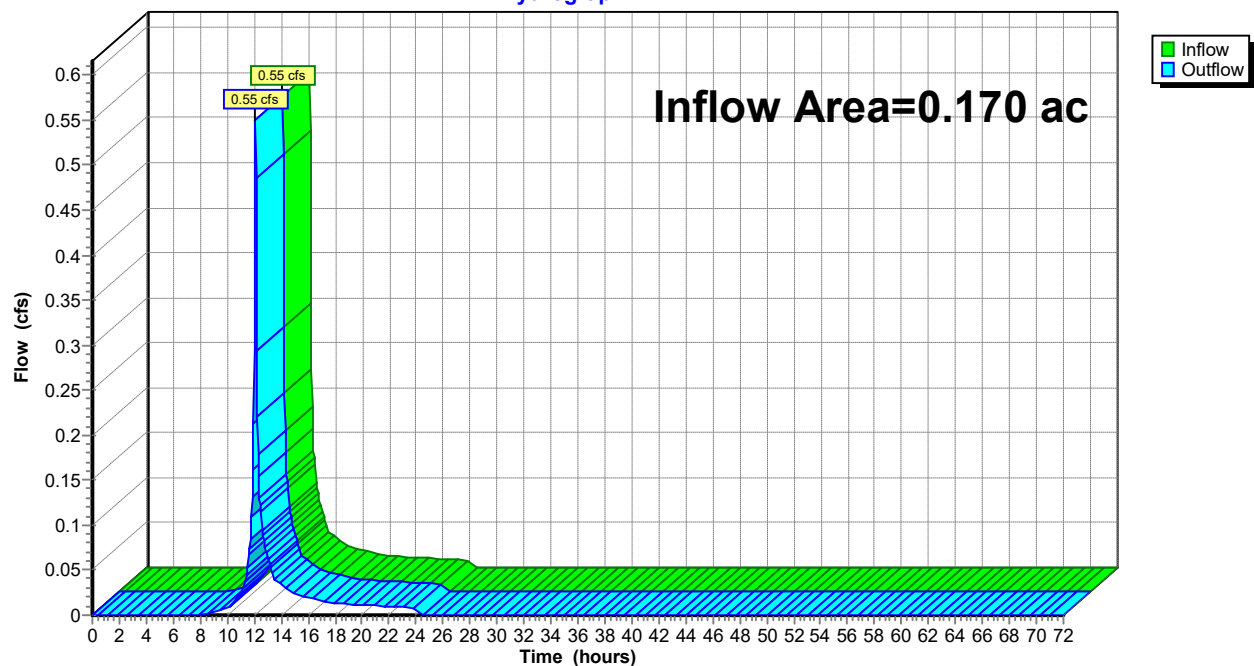


Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 2.72" for 10-Year event
Inflow = 0.55 cfs @ 12.11 hrs, Volume= 0.039 af
Outflow = 0.55 cfs @ 12.11 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

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

Reach DP2-PR:**Hydrograph**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=3.76"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=0.76 cfs 0.053 af

Reach DP2-PR:

Inflow=0.76 cfs 0.053 af

Outflow=0.76 cfs 0.053 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.053 af Average Runoff Depth = 3.76"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.053 af, Depth= 3.76"
 Routed to Reach DP2-PR :

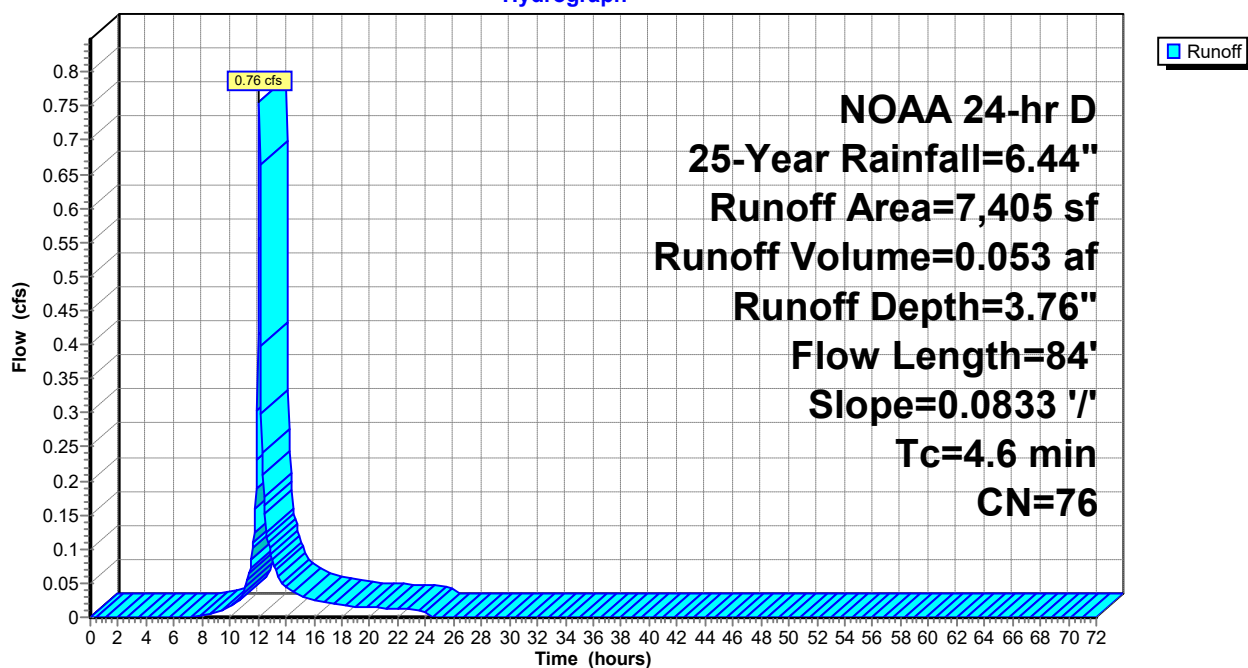
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph

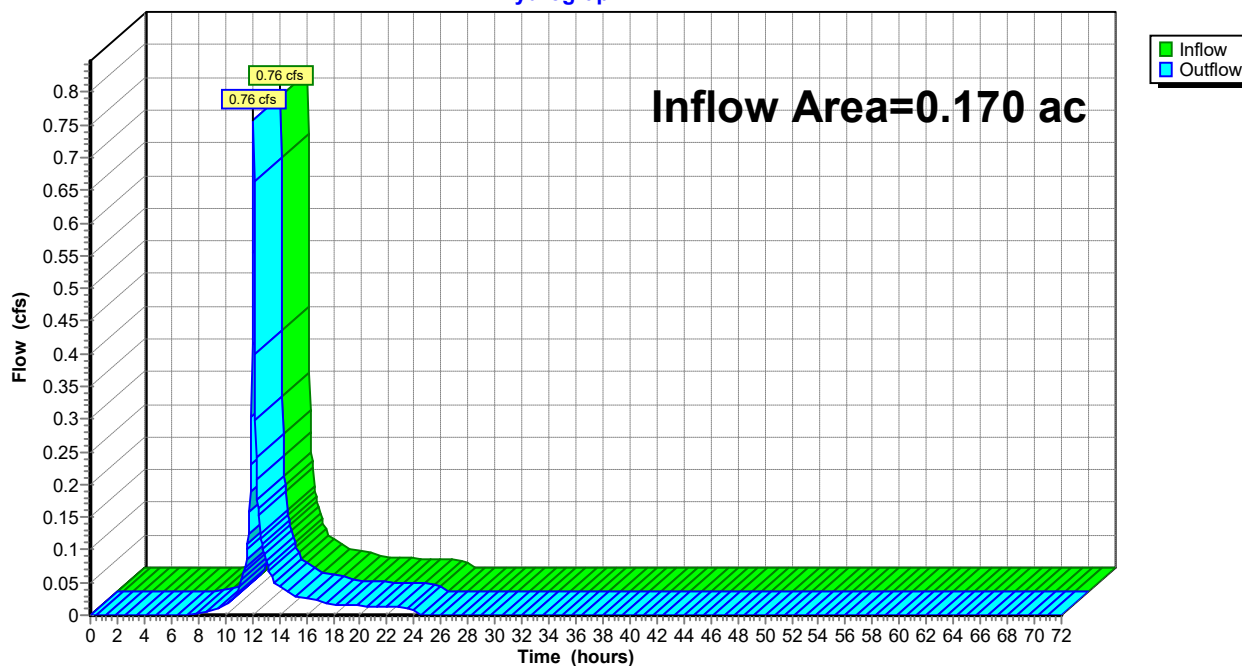


Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 3.76" for 25-Year event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.053 af
Outflow = 0.76 cfs @ 12.11 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

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

Reach DP2-PR:**Hydrograph**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=5.76"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=1.14 cfs 0.082 af

Reach DP2-PR:

Inflow=1.14 cfs 0.082 af

Outflow=1.14 cfs 0.082 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.082 af Average Runoff Depth = 5.76"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.14 cfs @ 12.11 hrs, Volume= 0.082 af, Depth= 5.76"
 Routed to Reach DP2-PR :

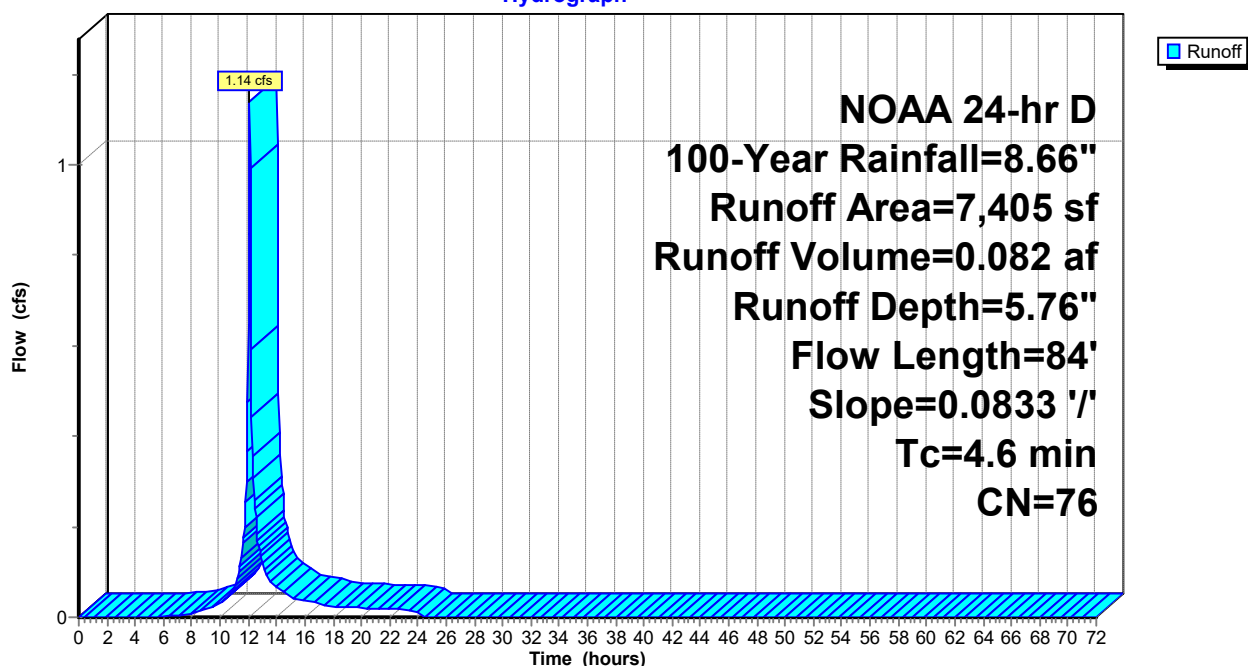
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph

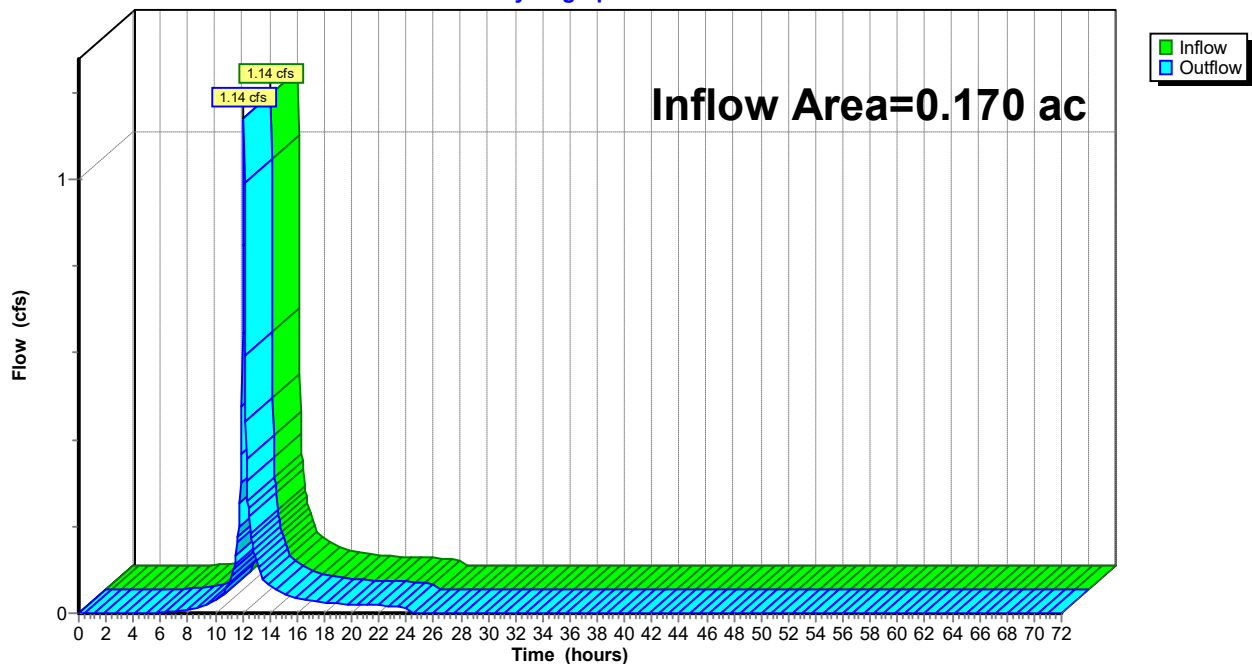


Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 5.76" for 100-Year event
Inflow = 1.14 cfs @ 12.11 hrs, Volume= 0.082 af
Outflow = 1.14 cfs @ 12.11 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

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

Reach DP2-PR:**Hydrograph**

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=0.10"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=0.04 cfs 0.001 af

Reach DP2-PR:

Inflow=0.04 cfs 0.001 af

Outflow=0.04 cfs 0.001 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.10"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.04 cfs @ 1.16 hrs, Volume= 0.001 af, Depth= 0.10"
 Routed to Reach DP2-PR :

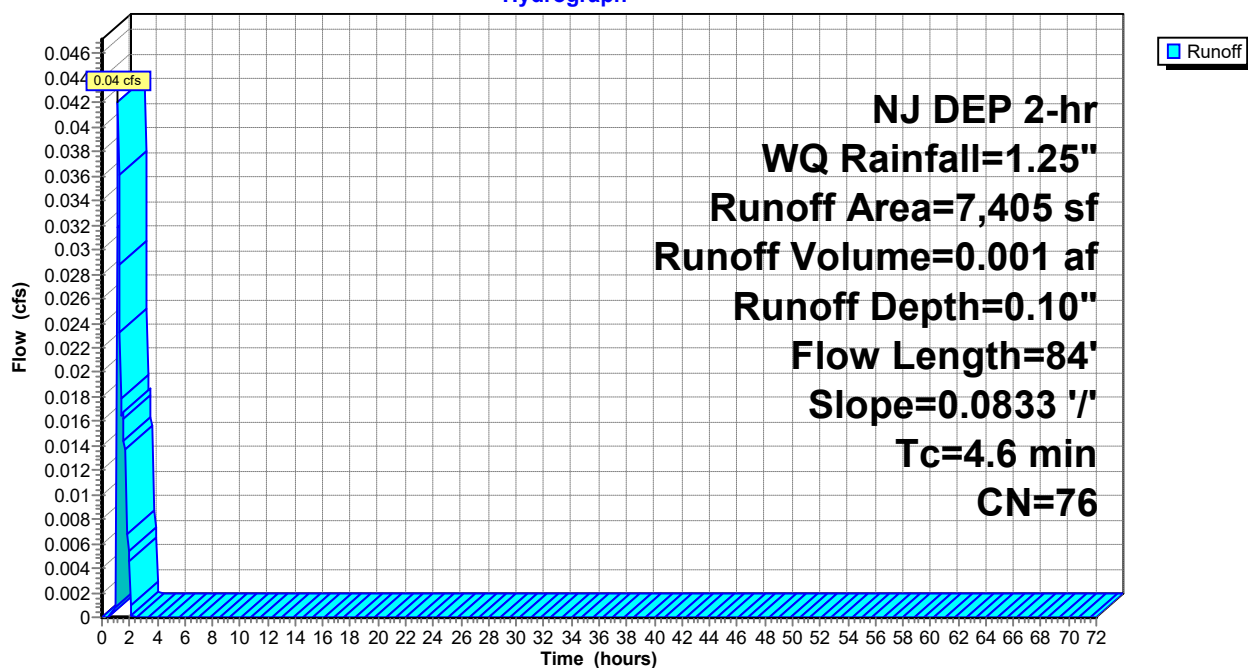
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph



Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 0.10" for WQ event

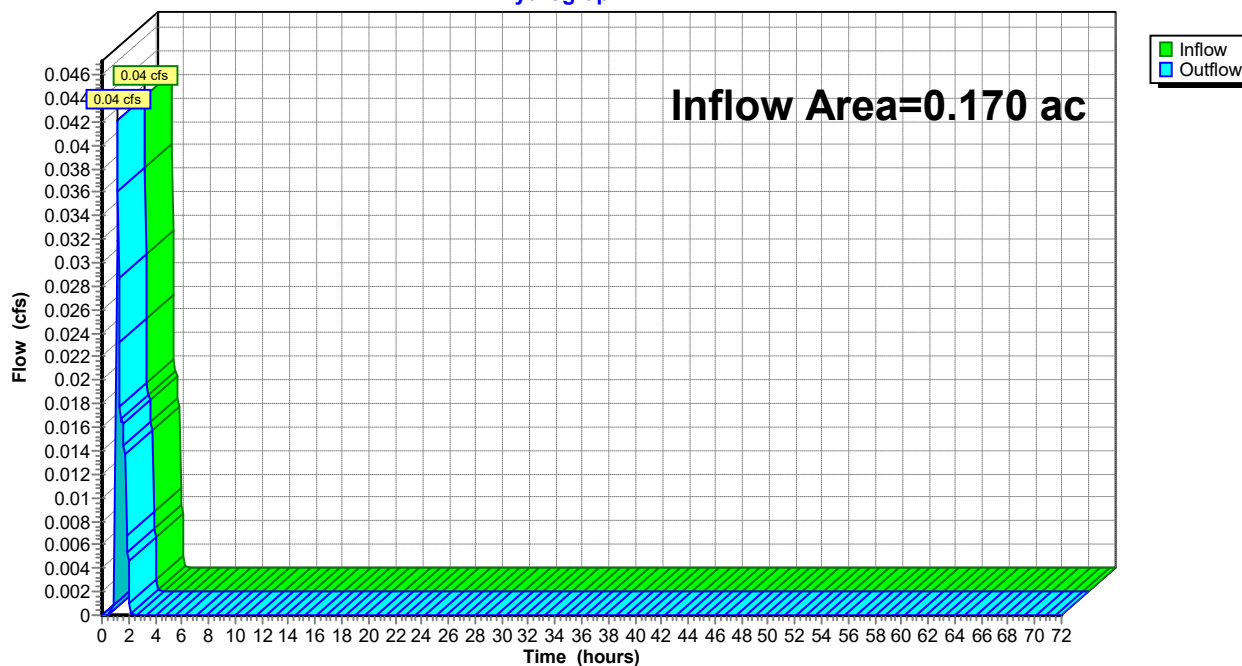
Inflow = 0.04 cfs @ 1.16 hrs, Volume= 0.001 af

Outflow = 0.04 cfs @ 1.16 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

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

Reach DP2-PR:

Hydrograph



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 2-P:

Runoff Area=7,405 sf 0.00% Impervious Runoff Depth=4.70"

Flow Length=84' Slope=0.0833 '/' Tc=4.6 min CN=76 Runoff=0.94 cfs 0.067 af

Reach DP2-PR:

Inflow=0.94 cfs 0.067 af

Outflow=0.94 cfs 0.067 af

Total Runoff Area = 0.170 ac Runoff Volume = 0.067 af Average Runoff Depth = 4.70"**100.00% Pervious = 0.170 ac 0.00% Impervious = 0.000 ac**

Summary for Subcatchment PR 2-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.94 cfs @ 12.11 hrs, Volume= 0.067 af, Depth= 4.70"
 Routed to Reach DP2-PR :

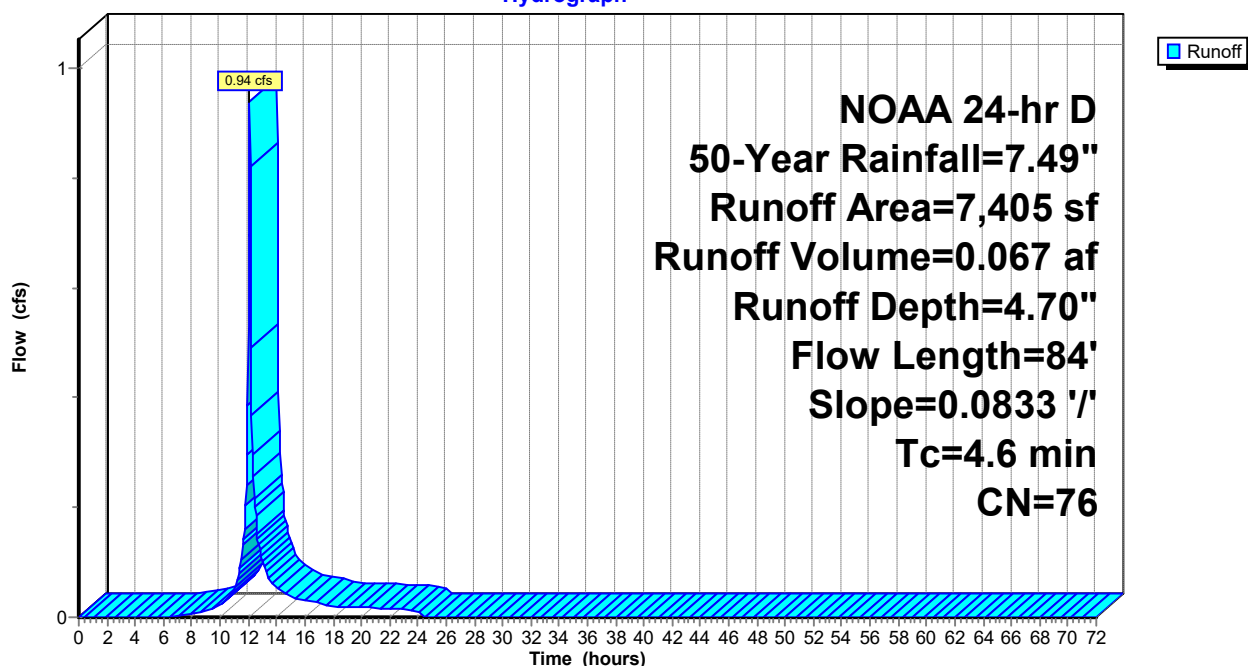
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt= 0.05$ hrs
 NOAA 24-hr D 50-Year Rainfall=7.49"

Area (sf)	CN	Description
6,447	74	>75% Grass cover, Good, HSG C
958	89	Gravel roads, HSG C
7,405	76	Weighted Average
7,405		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	84	0.0833	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"

Subcatchment PR 2-P:

Hydrograph

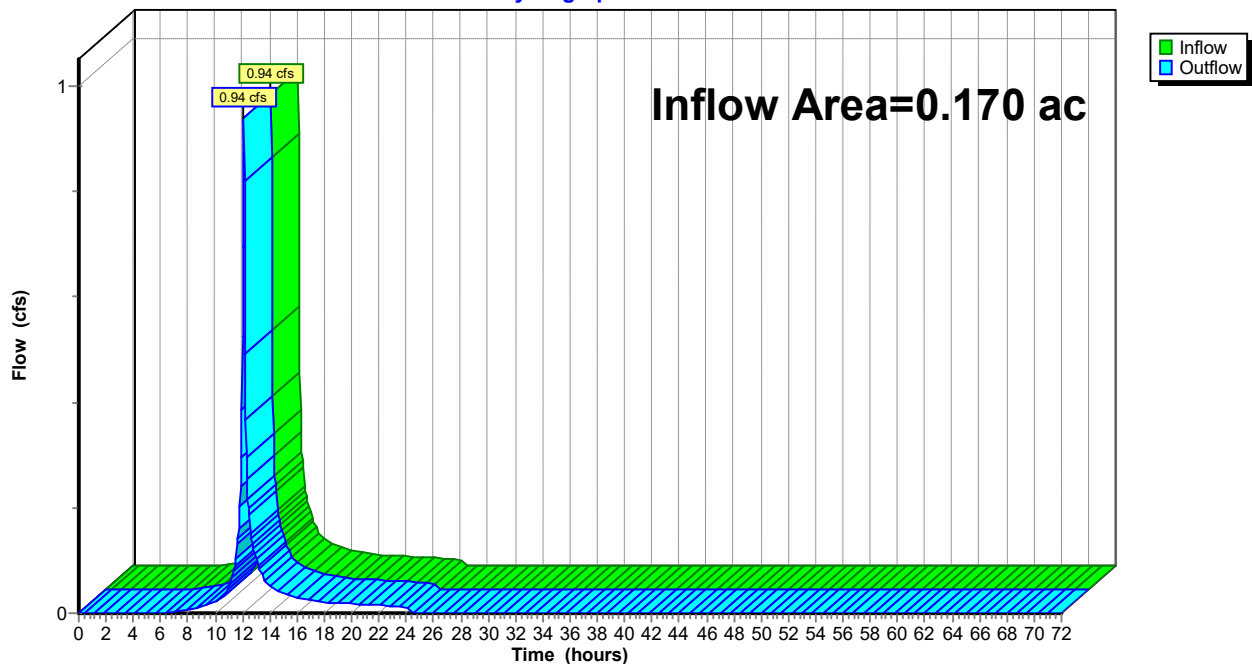


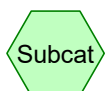
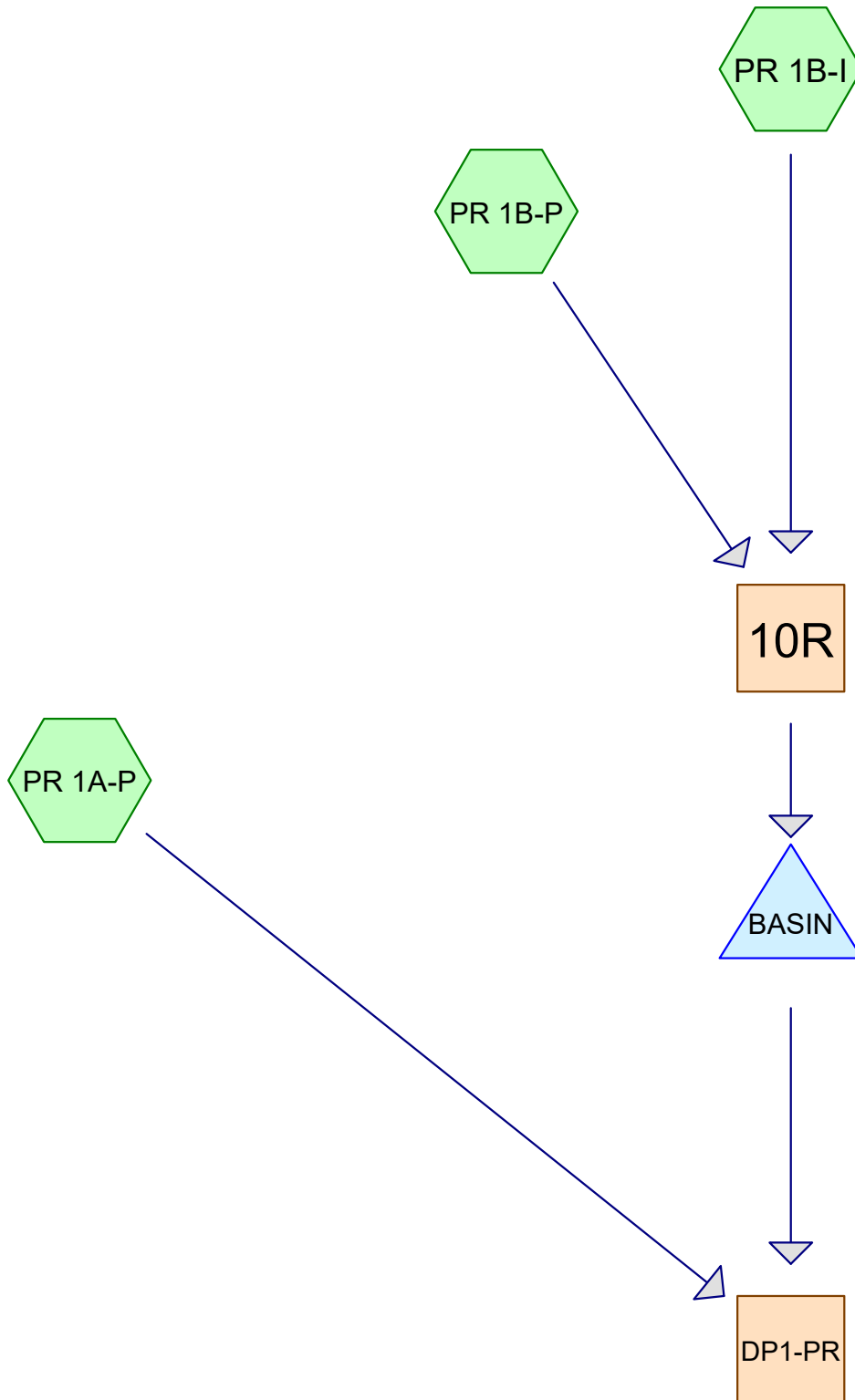
Summary for Reach DP2-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.170 ac, 0.00% Impervious, Inflow Depth = 4.70" for 50-Year event
Inflow = 0.94 cfs @ 12.11 hrs, Volume= 0.067 af
Outflow = 0.94 cfs @ 12.11 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min

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

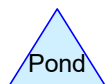
Reach DP2-PR:**Hydrograph**



Subcat



Reach



Pond



Link

Project Notes

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

Rainfall events imported from "NRCS2-Rain.txt" for 1167 NJ Essex-D

250624_42 ERW Waymaker

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA 24-hr	D	Default	24.00	1	3.44	2
2	10-Year	NOAA 24-hr	D	Default	24.00	1	5.22	2
3	25-Year	NOAA 24-hr	D	Default	24.00	1	6.44	2
4	100-Year	NOAA 24-hr	D	Default	24.00	1	8.66	2
5	WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2
6	50-Year	NOAA 24-hr	D	Default	24.00	1	7.49	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.453	74	>75% Grass cover, Good, HSG C (PR 1A-P, PR 1B-P)
0.621	89	Gravel roads, HSG C (PR 1A-P, PR 1B-P)
0.355	98	Paved parking, HSG C (PR 1B-I)
0.492	98	Roofs, HSG C (PR 1B-I)
2.922	84	TOTAL AREA

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.922	HSG C	PR 1A-P, PR 1B-I, PR 1B-P
0.000	HSG D	
0.000	Other	
2.922		TOTAL AREA

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Ground Covers (selected 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	1.453	0.000	0.000	1.453	>75% Grass cover, Good	PR 1A-P , PR 1B-P
0.000	0.000	0.621	0.000	0.000	0.621	Gravel roads	PR 1A-P , PR 1B-P
0.000	0.000	0.355	0.000	0.000	0.355	Paved parking	PR 1B-I
0.000	0.000	0.492	0.000	0.000	0.492	Roofs	PR 1B-I
0.000	0.000	2.922	0.000	0.000	2.922	TOTAL AREA	

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 1A-P:Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=1.45"
Flow Length=203' Tc=5.9 min CN=78 Runoff=0.50 cfs 0.037 af**Subcatchment PR 1B-I:**Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=3.21"
Flow Length=136' Tc=1.5 min CN=98 Runoff=3.04 cfs 0.226 af**Subcatchment PR 1B-P:**Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=1.52"
Flow Length=180' Tc=7.5 min CN=79 Runoff=2.95 cfs 0.224 af**Reach 10R:**Inflow=5.32 cfs 0.451 af
Outflow=5.32 cfs 0.451 af**Reach DP1-PR:**Inflow=1.22 cfs 0.132 af
Outflow=1.22 cfs 0.132 af**Pond BASIN:**Peak Elev=16.66' Storage=0.115 af Inflow=5.32 cfs 0.451 af
Discarded=0.60 cfs 0.355 af Primary=1.05 cfs 0.096 af Outflow=1.65 cfs 0.451 af**Total Runoff Area = 2.922 ac Runoff Volume = 0.487 af Average Runoff Depth = 2.00"**
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.50 cfs @ 12.13 hrs, Volume= 0.037 af, Depth= 1.45"
 Routed to Reach DP1-PR :

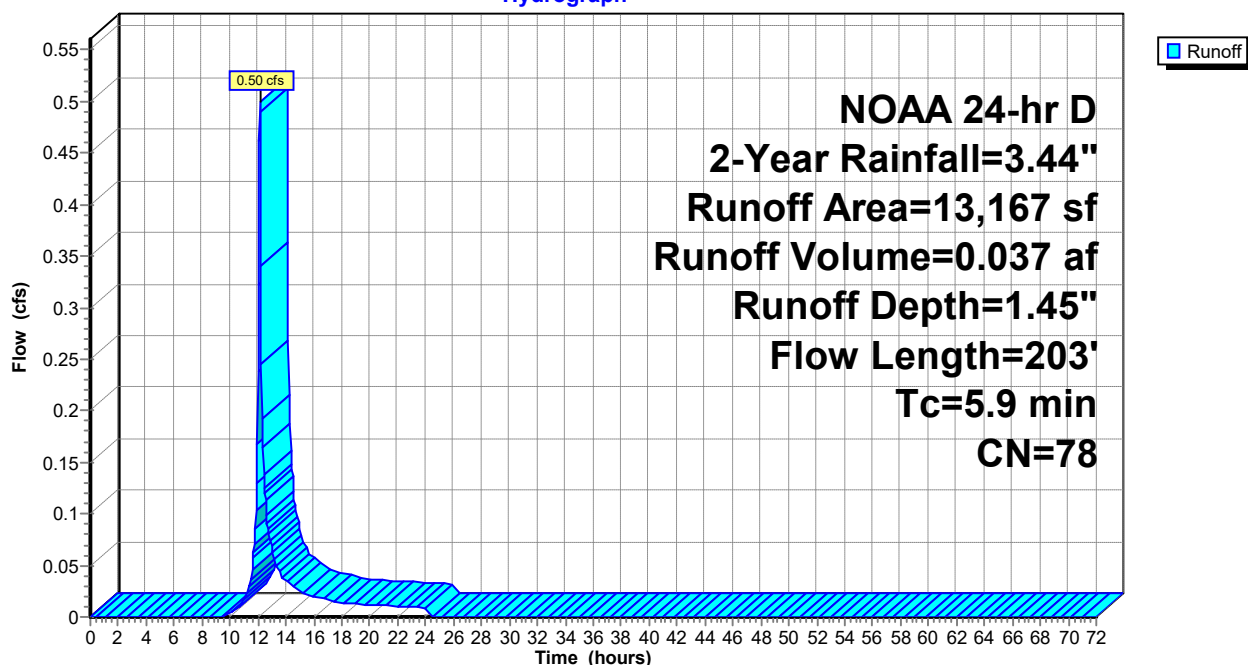
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Hydrograph



Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 3.04 cfs @ 12.07 hrs, Volume= 0.226 af, Depth= 3.21"
 Routed to Reach 10R :

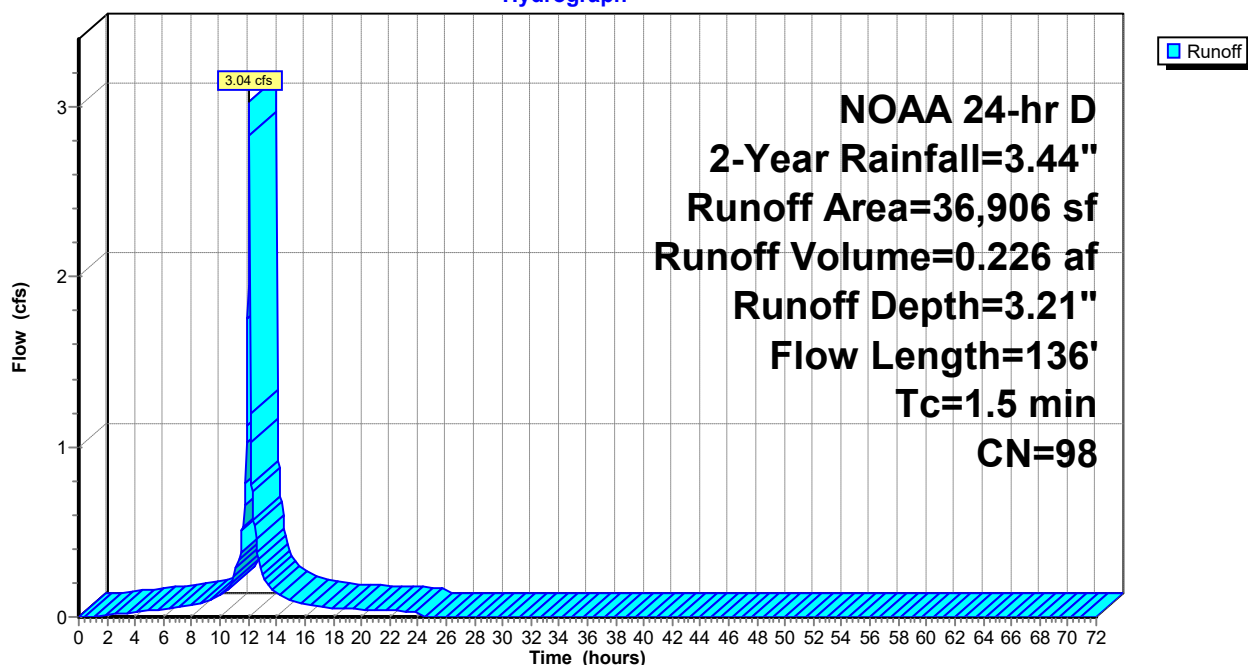
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 2.95 cfs @ 12.15 hrs, Volume= 0.224 af, Depth= 1.52"
 Routed to Reach 10R :

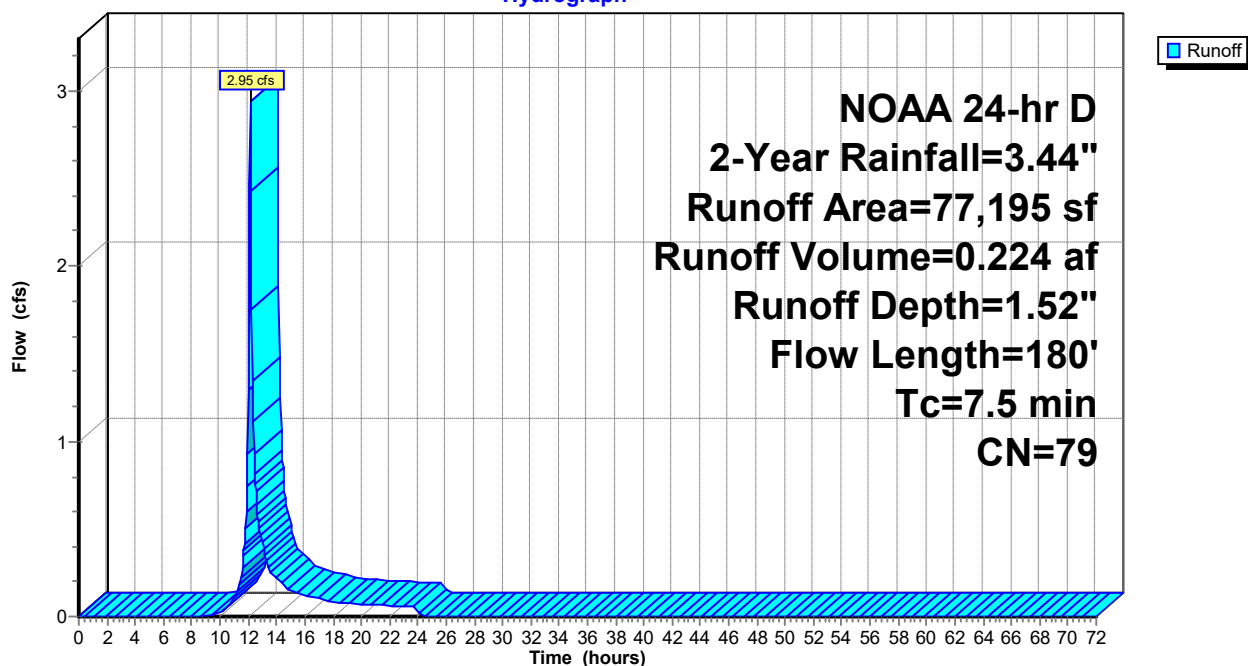
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 2-Year Rainfall=3.44"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

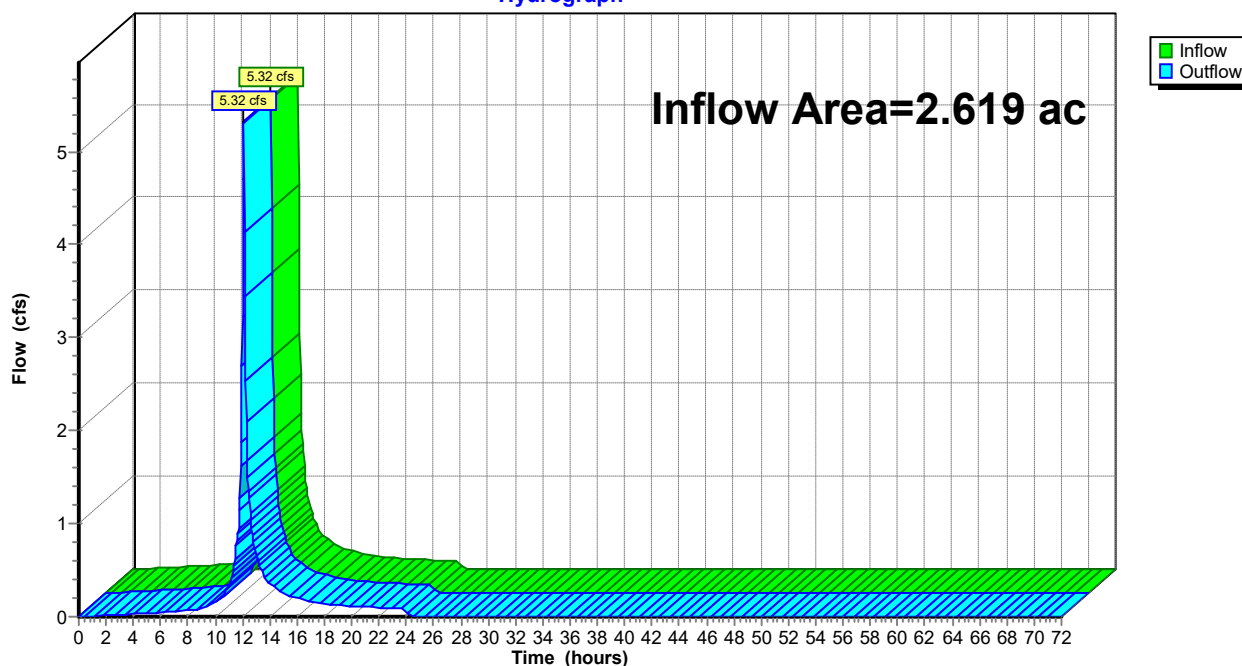


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 2.07" for 2-Year event
Inflow = 5.32 cfs @ 12.09 hrs, Volume= 0.451 af
Outflow = 5.32 cfs @ 12.09 hrs, Volume= 0.451 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

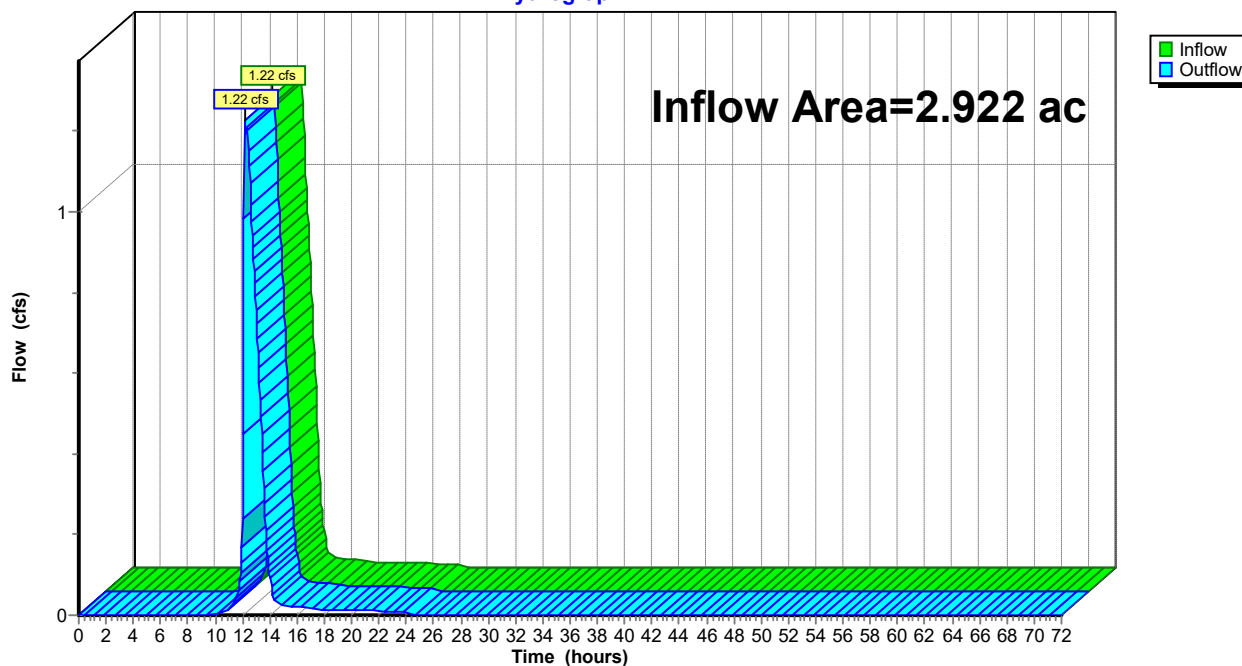
Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 0.54" for 2-Year event
Inflow = 1.22 cfs @ 12.15 hrs, Volume= 0.132 af
Outflow = 1.22 cfs @ 12.15 hrs, Volume= 0.132 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:**Hydrograph**

Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 2.07" for 2-Year event
 Inflow = 5.32 cfs @ 12.09 hrs, Volume= 0.451 af
 Outflow = 1.65 cfs @ 12.36 hrs, Volume= 0.451 af, Atten= 69%, Lag= 16.4 min
 Discarded = 0.60 cfs @ 12.37 hrs, Volume= 0.355 af
 Primary = 1.05 cfs @ 12.36 hrs, Volume= 0.096 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 16.66' @ 12.37 hrs Surf.Area= 0.108 ac Storage= 0.115 af

Plug-Flow detention time= 39.5 min calculated for 0.450 af (100% of inflow)
 Center-of-Mass det. time= 39.5 min (842.9 - 803.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=0.60 cfs @ 12.37 hrs HW=16.66' (Free Discharge)
 ↑ **4=Exfiltration** (Controls 0.60 cfs)

Primary OutFlow Max=1.05 cfs @ 12.36 hrs HW=16.66' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 0.96 cfs @ 3.58 fps)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.12 fps)
 ↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

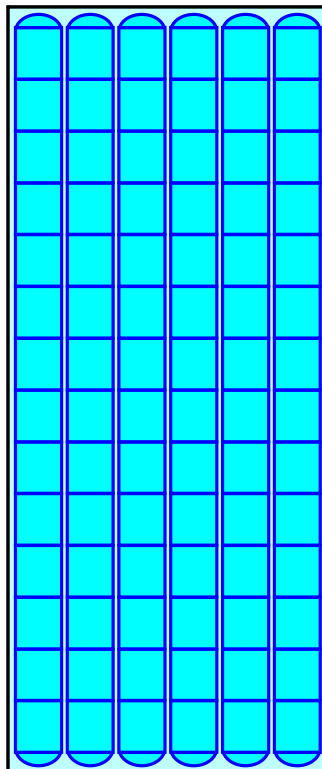
Overall Storage Efficiency = 64.1%

Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

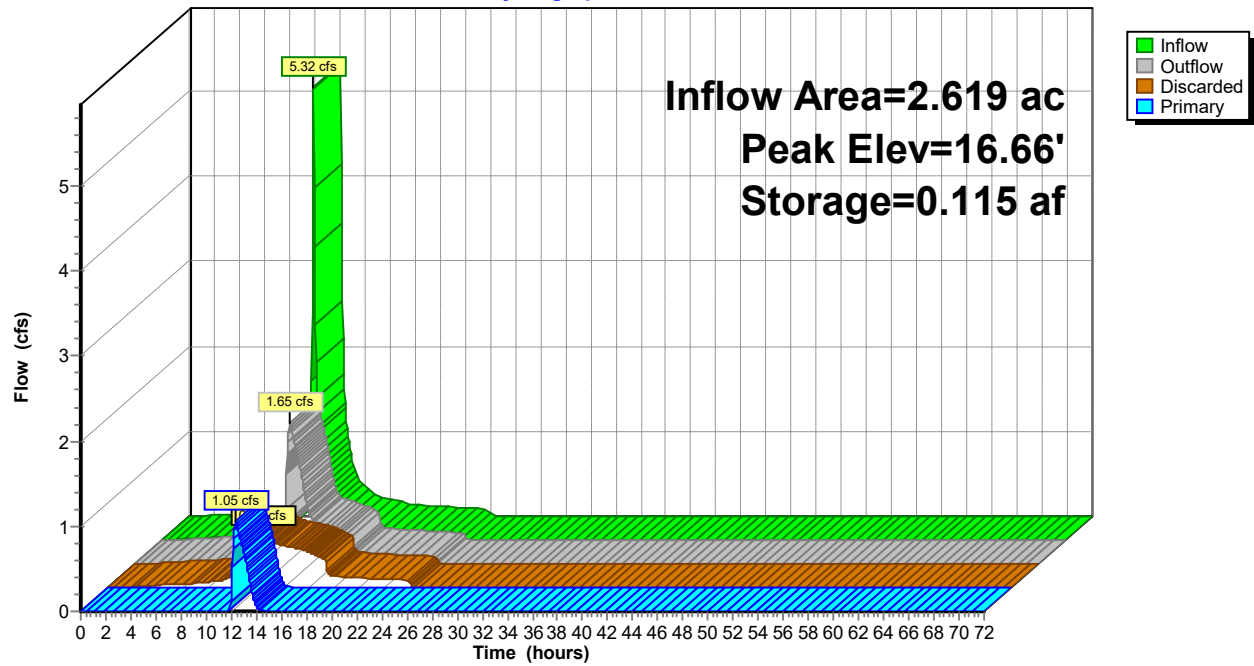
869.3 cy Field

520.6 cy Stone



Pond BASIN:

Hydrograph



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

Subcatchment PR 1A-P: Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=2.90"
Flow Length=203' Tc=5.9 min CN=78 Runoff=1.00 cfs 0.073 af

Subcatchment PR 1B-I: Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=4.98"
Flow Length=136' Tc=1.5 min CN=98 Runoff=4.63 cfs 0.352 af

Subcatchment PR 1B-P: Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=2.99"
Flow Length=180' Tc=7.5 min CN=79 Runoff=5.79 cfs 0.442 af

Reach 10R: Inflow=9.28 cfs 0.794 af
Outflow=9.28 cfs 0.794 af

Reach DP1-PR: Inflow=3.96 cfs 0.367 af
Outflow=3.96 cfs 0.367 af

Pond BASIN: Peak Elev=17.57' Storage=0.194 af Inflow=9.28 cfs 0.794 af
Discarded=0.74 cfs 0.500 af Primary=3.33 cfs 0.294 af Outflow=4.07 cfs 0.794 af

Total Runoff Area = 2.922 ac Runoff Volume = 0.867 af Average Runoff Depth = 3.56"
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

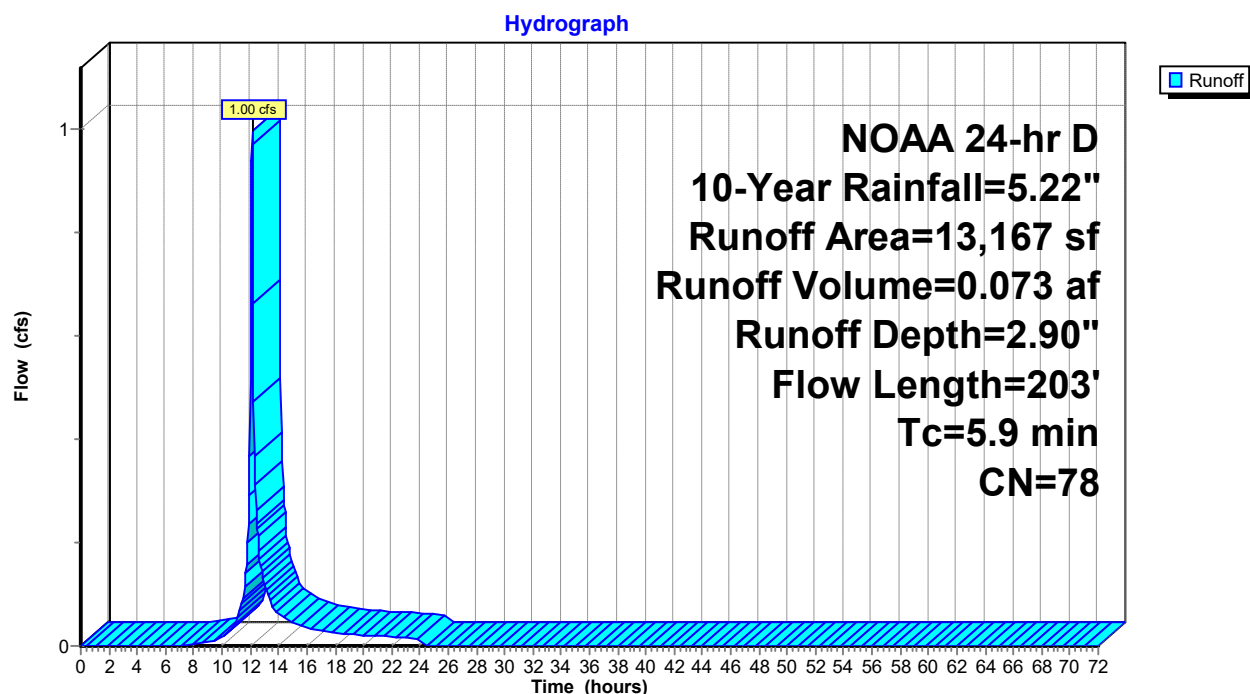
Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.00 cfs @ 12.13 hrs, Volume= 0.073 af, Depth= 2.90"
 Routed to Reach DP1-PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 4.63 cfs @ 12.07 hrs, Volume= 0.352 af, Depth= 4.98"
 Routed to Reach 10R :

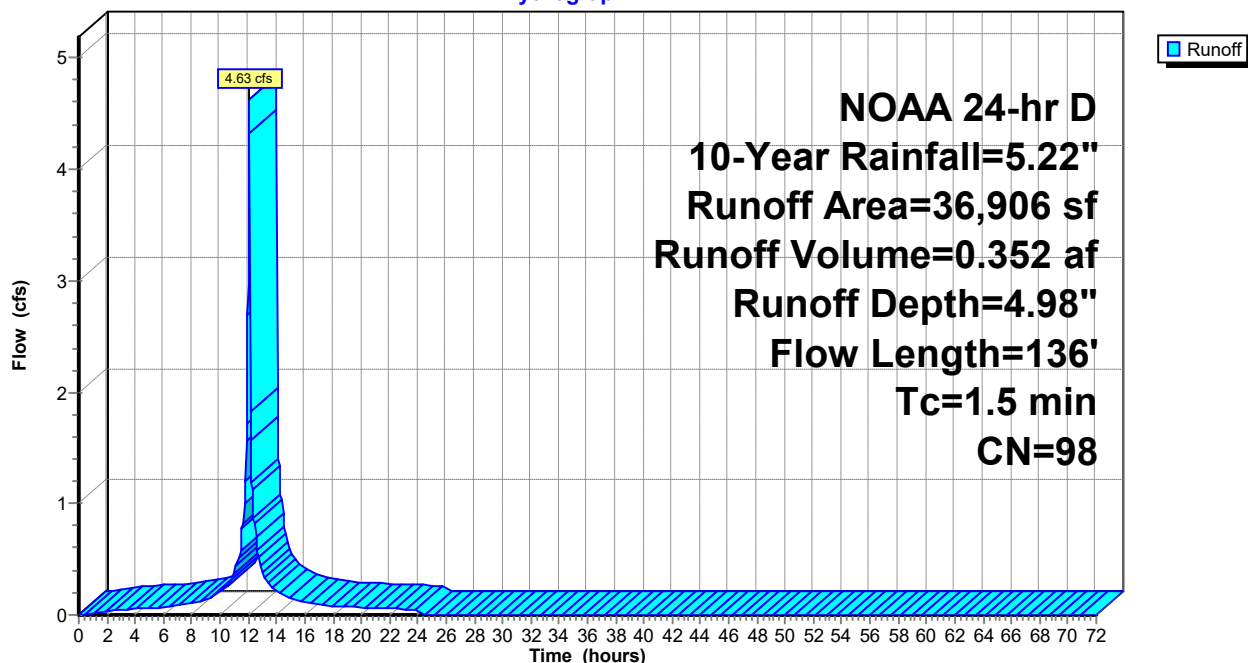
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

T_c (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces $n=0.011$ $P2=3.44"$
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved $K_v=20.3$ fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 5.79 cfs @ 12.15 hrs, Volume= 0.442 af, Depth= 2.99"
 Routed to Reach 10R :

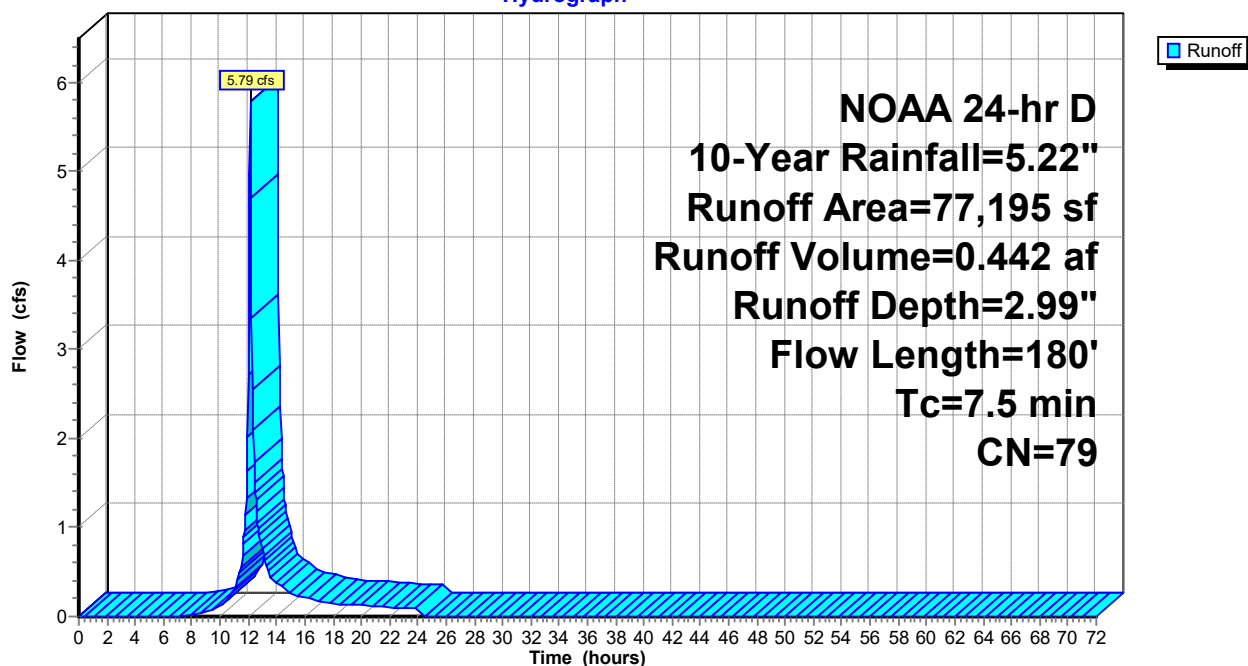
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 10-Year Rainfall=5.22"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

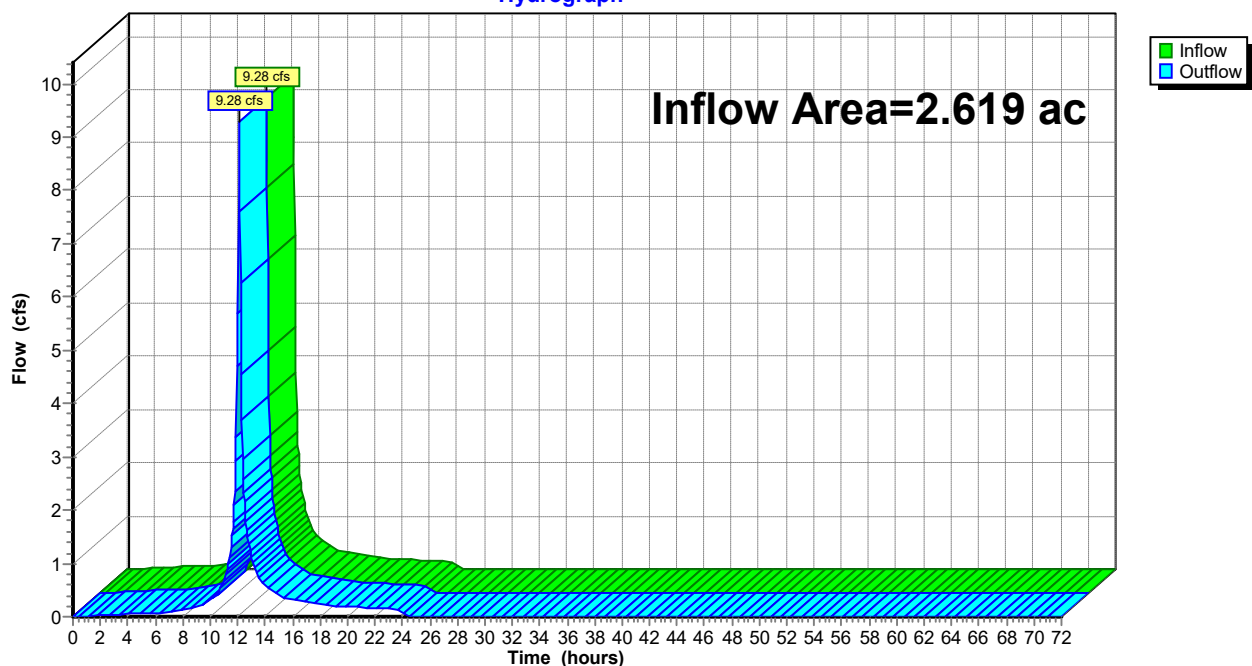


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 3.64" for 10-Year event
Inflow = 9.28 cfs @ 12.10 hrs, Volume= 0.794 af
Outflow = 9.28 cfs @ 12.10 hrs, Volume= 0.794 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

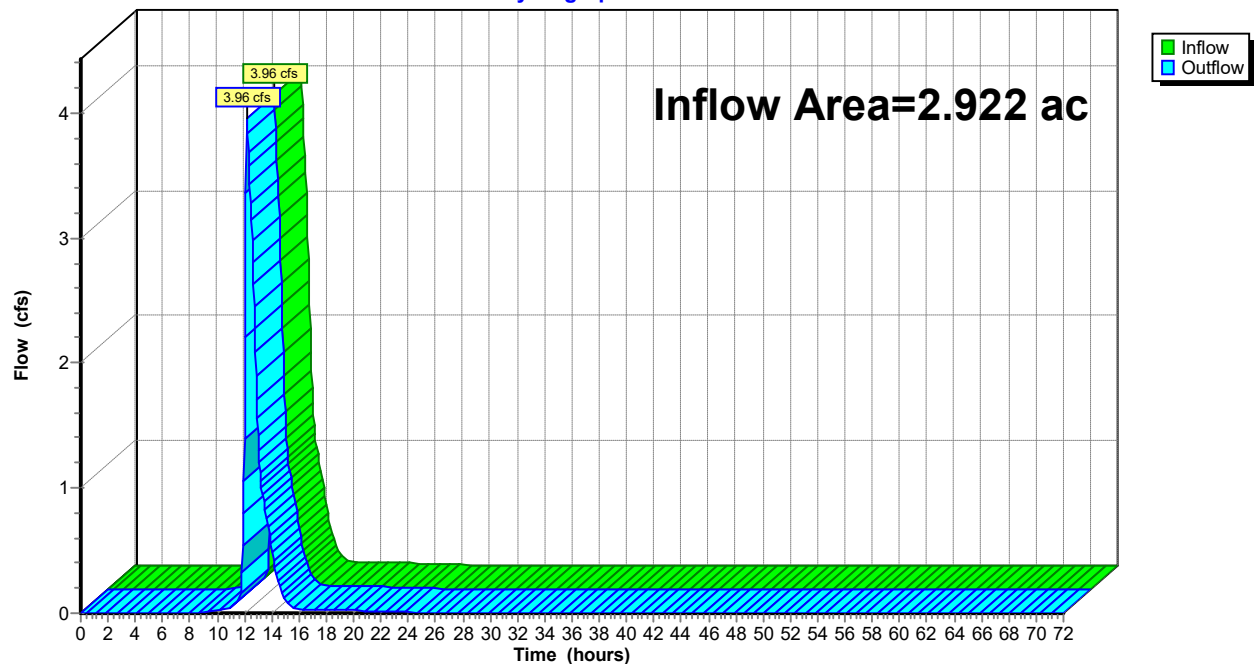
Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 1.51" for 10-Year event
Inflow = 3.96 cfs @ 12.17 hrs, Volume= 0.367 af
Outflow = 3.96 cfs @ 12.17 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:**Hydrograph**

Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 3.64" for 10-Year event
 Inflow = 9.28 cfs @ 12.10 hrs, Volume= 0.794 af
 Outflow = 4.07 cfs @ 12.28 hrs, Volume= 0.794 af, Atten= 56%, Lag= 10.9 min
 Discarded = 0.74 cfs @ 12.28 hrs, Volume= 0.500 af
 Primary = 3.33 cfs @ 12.28 hrs, Volume= 0.294 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 17.57' @ 12.28 hrs Surf.Area= 0.108 ac Storage= 0.194 af

Plug-Flow detention time= 38.8 min calculated for 0.793 af (100% of inflow)
 Center-of-Mass det. time= 38.8 min (832.5 - 793.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=0.74 cfs @ 12.28 hrs HW=17.56' (Free Discharge)
 ↑ **4=Exfiltration** (Controls 0.74 cfs)

Primary OutFlow Max=3.32 cfs @ 12.28 hrs HW=17.56' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 1.55 cfs @ 5.81 fps)
 ↑ **2=Orifice/Grate** (Orifice Controls 1.77 cfs @ 4.32 fps)
 ↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

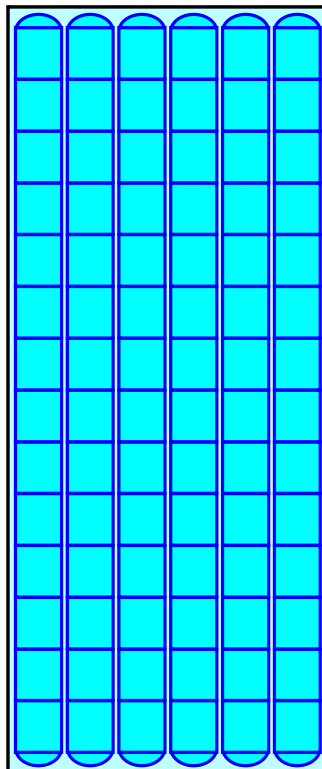
Overall Storage Efficiency = 64.1%

Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

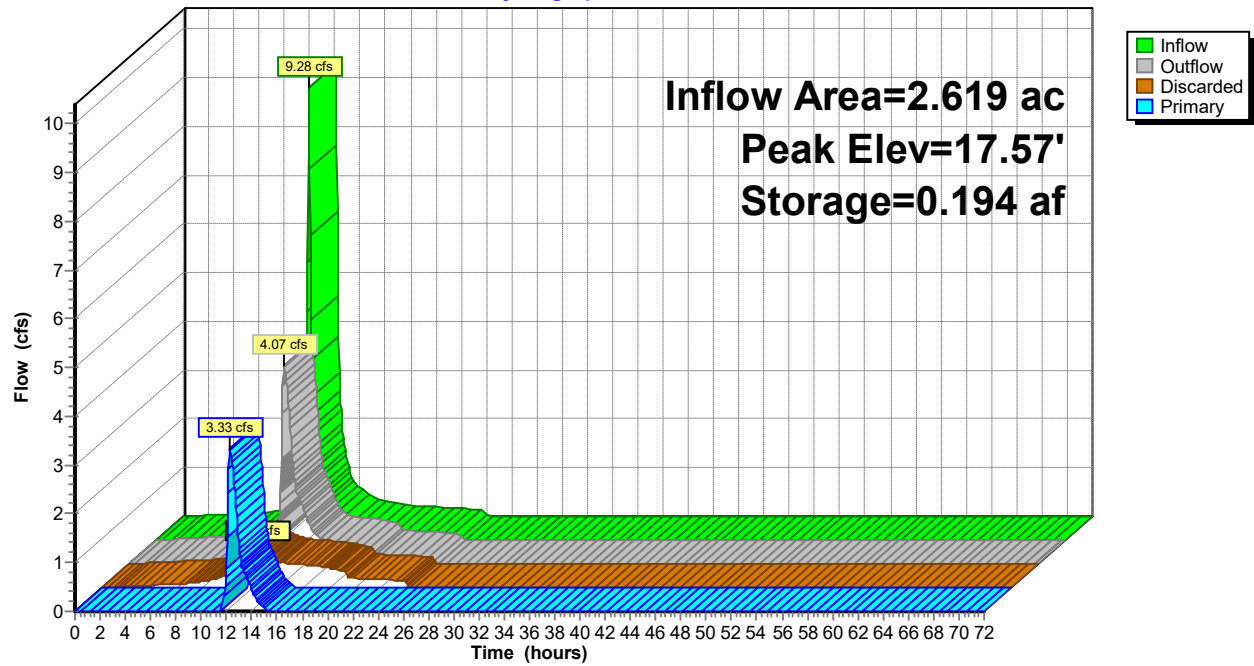
869.3 cy Field

520.6 cy Stone



Pond BASIN:

Hydrograph



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

Subcatchment PR 1A-P: Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=3.97"
Flow Length=203' Tc=5.9 min CN=78 Runoff=1.36 cfs 0.100 af

Subcatchment PR 1B-I: Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=6.20"
Flow Length=136' Tc=1.5 min CN=98 Runoff=5.73 cfs 0.438 af

Subcatchment PR 1B-P: Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=4.07"
Flow Length=180' Tc=7.5 min CN=79 Runoff=7.82 cfs 0.602 af

Reach 10R: Inflow=12.08 cfs 1.040 af
Outflow=12.08 cfs 1.040 af

Reach DP1-PR: Inflow=5.28 cfs 0.551 af
Outflow=5.28 cfs 0.551 af

Pond BASIN: Peak Elev=18.32' Storage=0.253 af Inflow=12.08 cfs 1.040 af
Discarded=0.87 cfs 0.589 af Primary=4.37 cfs 0.451 af Outflow=5.24 cfs 1.040 af

Total Runoff Area = 2.922 ac Runoff Volume = 1.140 af Average Runoff Depth = 4.68"
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

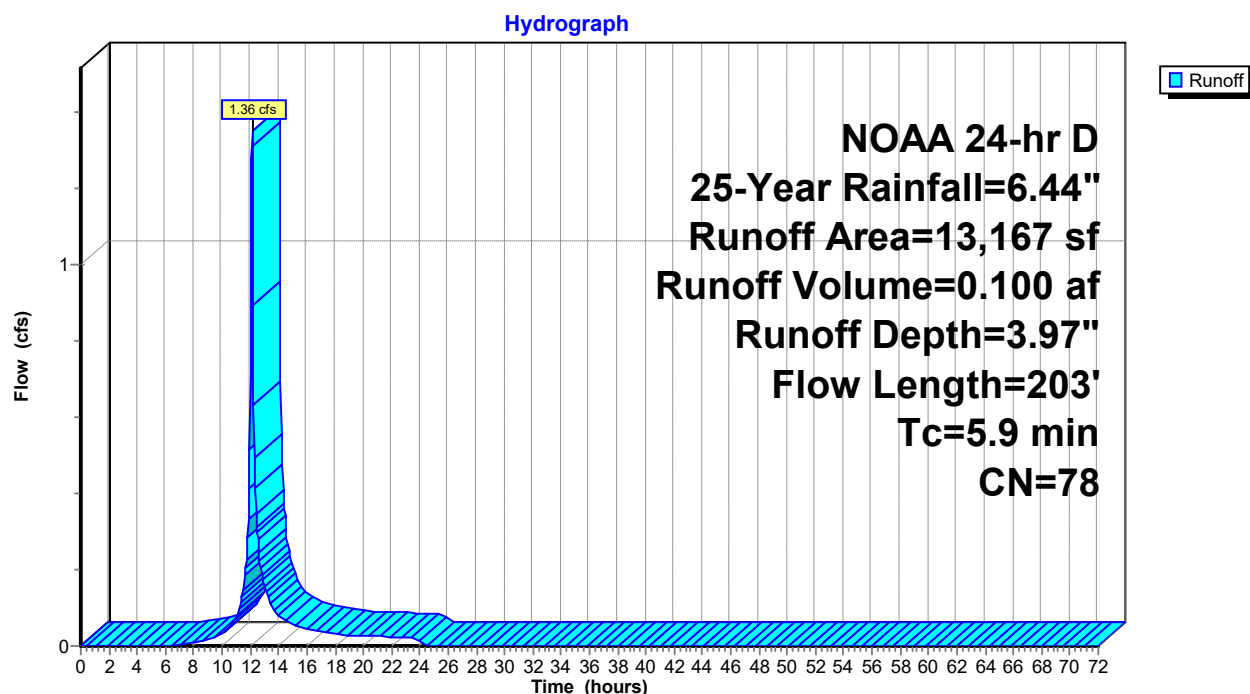
Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.36 cfs @ 12.13 hrs, Volume= 0.100 af, Depth= 3.97"
 Routed to Reach DP1-PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 5.73 cfs @ 12.07 hrs, Volume= 0.438 af, Depth= 6.20"
 Routed to Reach 10R :

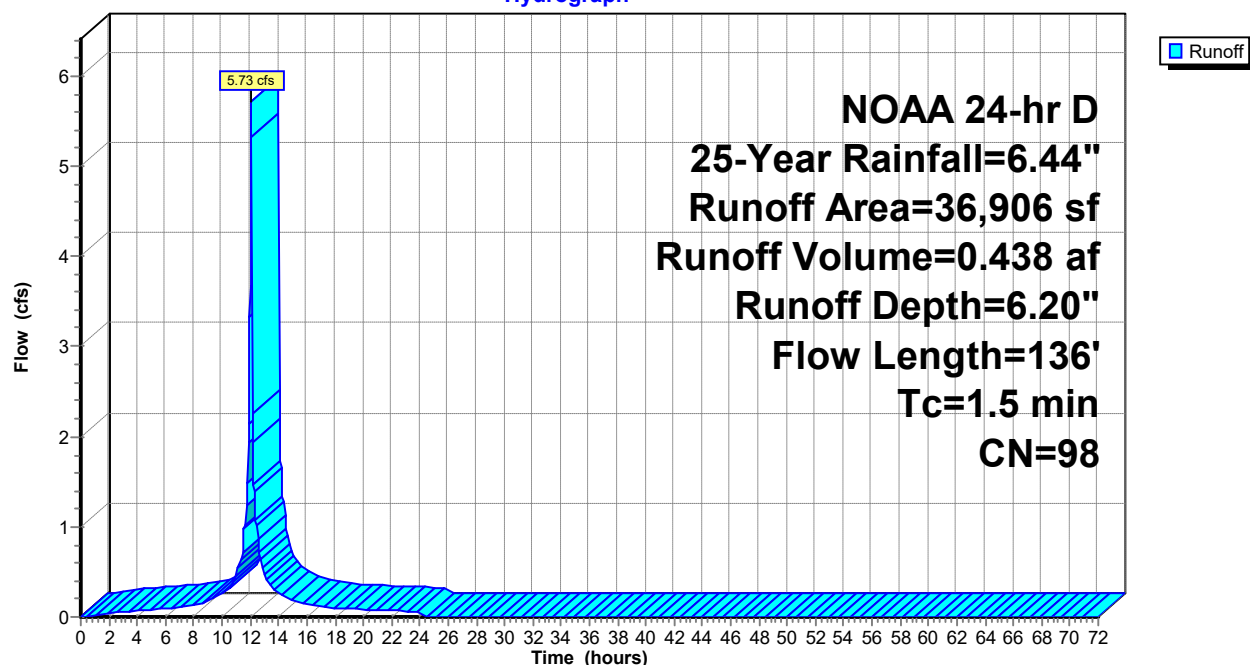
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces $n=0.011$ $P2=3.44"$
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved $K_v=20.3$ fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 7.82 cfs @ 12.15 hrs, Volume= 0.602 af, Depth= 4.07"
 Routed to Reach 10R :

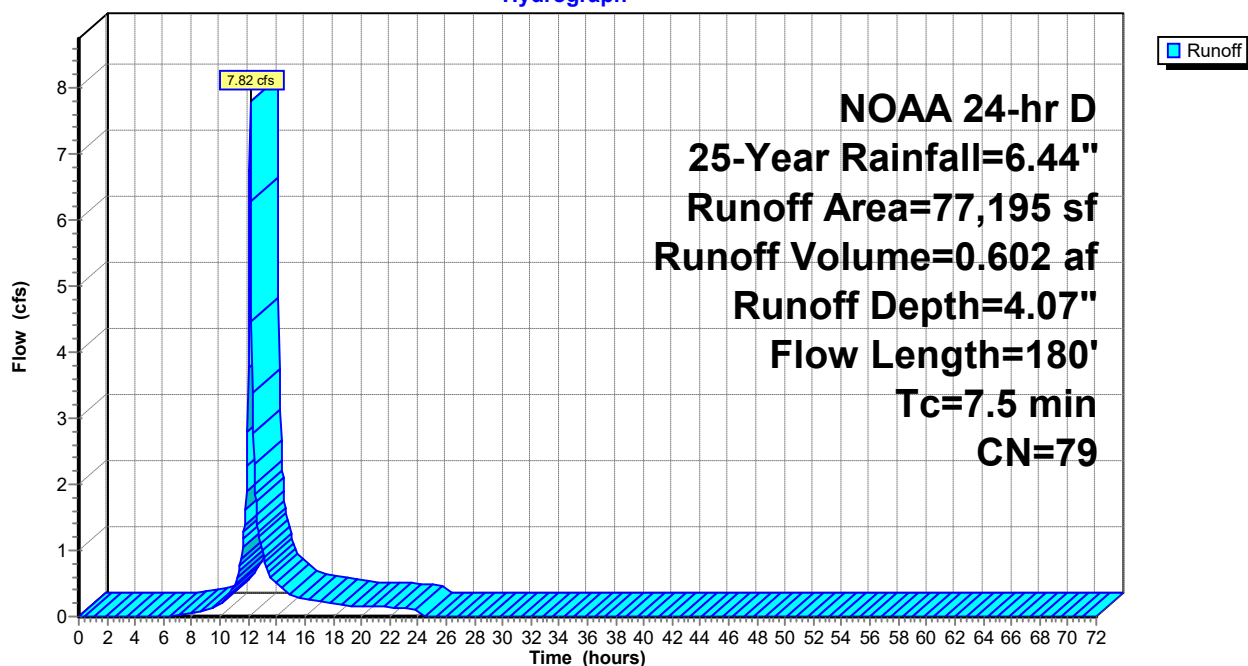
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 25-Year Rainfall=6.44"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

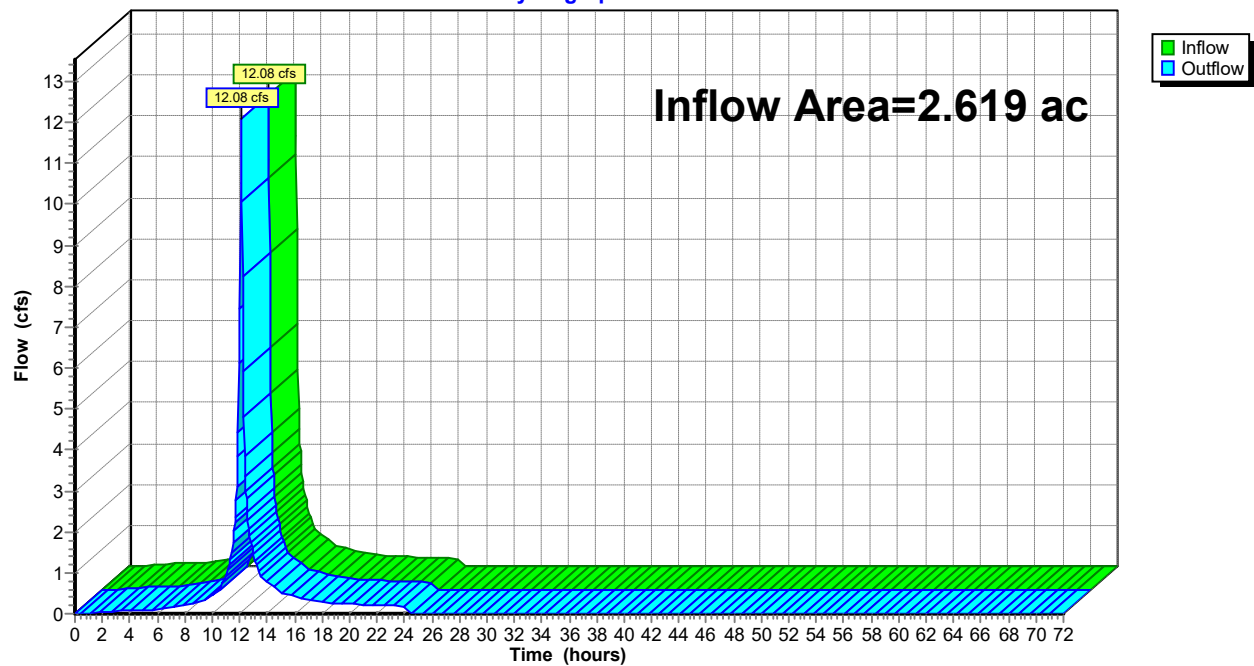


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 4.76" for 25-Year event
Inflow = 12.08 cfs @ 12.10 hrs, Volume= 1.040 af
Outflow = 12.08 cfs @ 12.10 hrs, Volume= 1.040 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

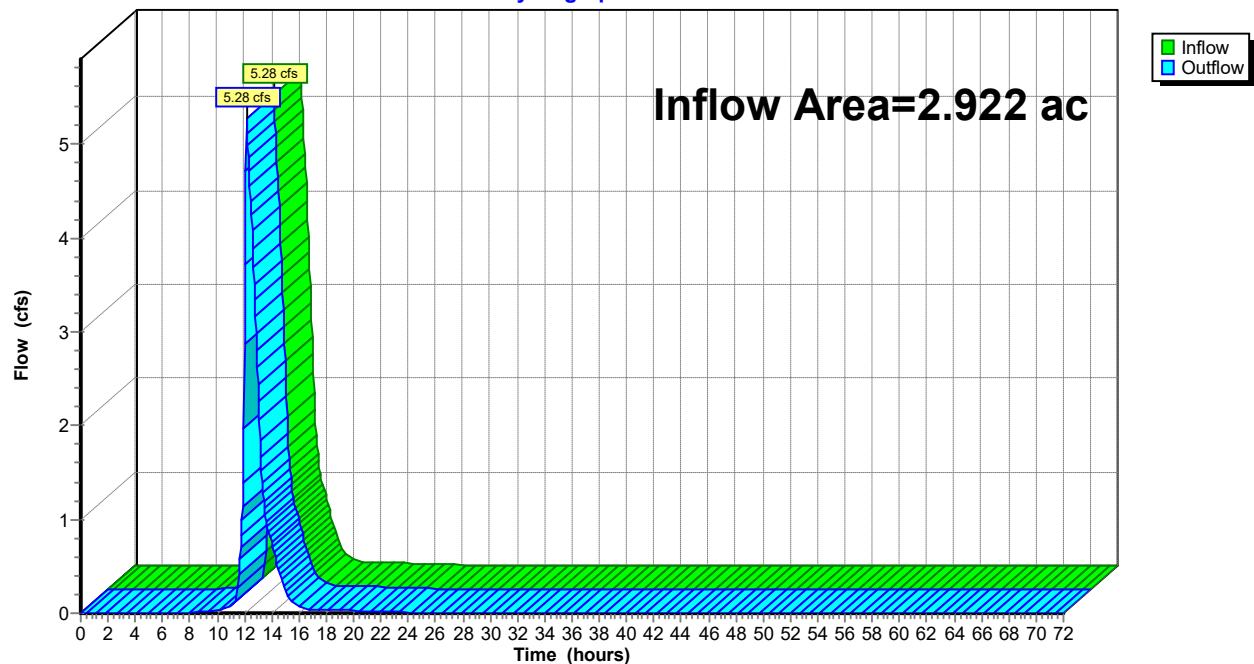
Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 2.26" for 25-Year event
Inflow = 5.28 cfs @ 12.17 hrs, Volume= 0.551 af
Outflow = 5.28 cfs @ 12.17 hrs, Volume= 0.551 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:**Hydrograph**

Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 4.76" for 25-Year event
 Inflow = 12.08 cfs @ 12.10 hrs, Volume= 1.040 af
 Outflow = 5.24 cfs @ 12.28 hrs, Volume= 1.040 af, Atten= 57%, Lag= 11.1 min
 Discarded = 0.87 cfs @ 12.28 hrs, Volume= 0.589 af
 Primary = 4.37 cfs @ 12.28 hrs, Volume= 0.451 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 18.32' @ 12.28 hrs Surf.Area= 0.108 ac Storage= 0.253 af

Plug-Flow detention time= 39.6 min calculated for 1.039 af (100% of inflow)
 Center-of-Mass det. time= 39.6 min (828.2 - 788.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=0.87 cfs @ 12.28 hrs HW=18.31' (Free Discharge)

↑ **4=Exfiltration** (Controls 0.87 cfs)

Primary OutFlow Max=4.37 cfs @ 12.28 hrs HW=18.31' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.91 cfs @ 7.15 fps)
 ↓ **2=Orifice/Grate** (Orifice Controls 2.45 cfs @ 6.00 fps)
 ↓ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

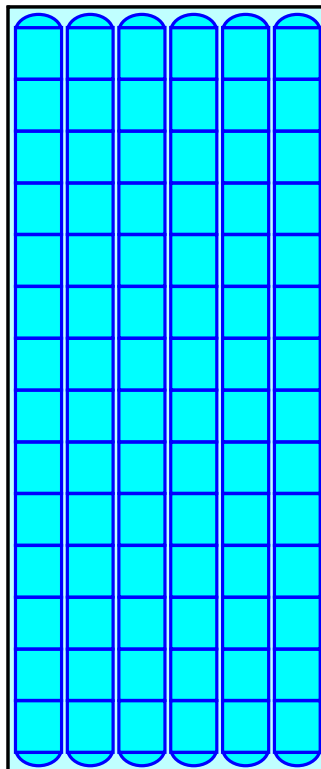
Overall Storage Efficiency = 64.1%

Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

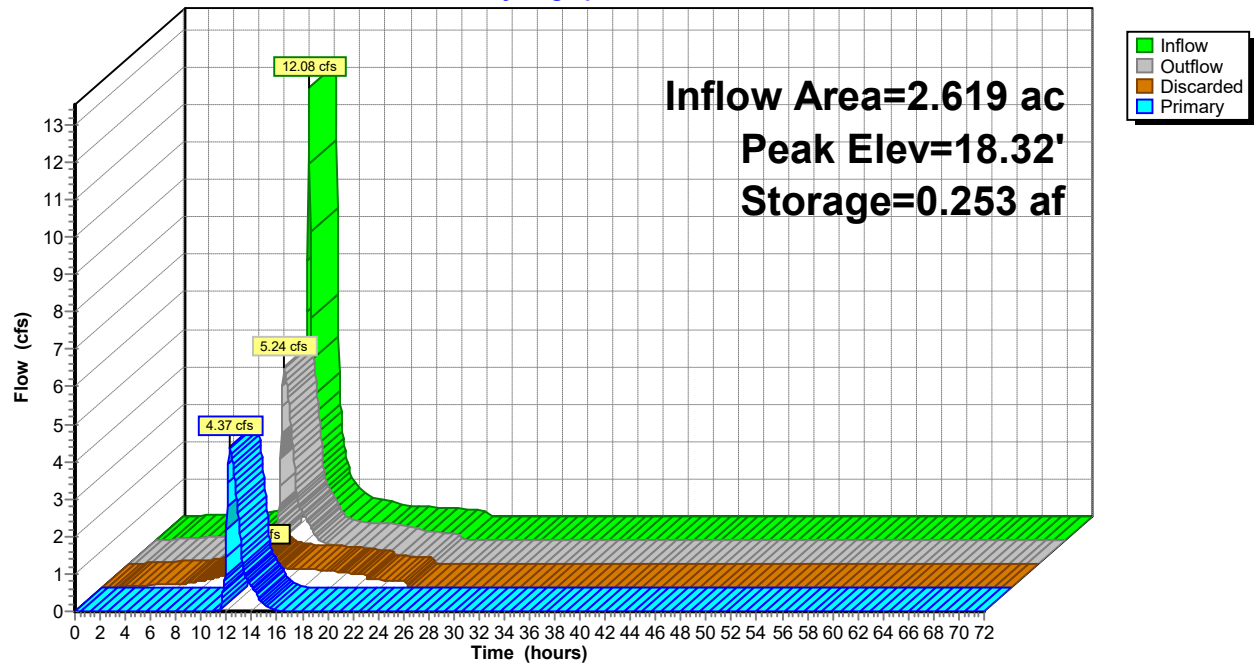
869.3 cy Field

520.6 cy Stone



Pond BASIN:

Hydrograph



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 1A-P:Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=6.00"
Flow Length=203' Tc=5.9 min CN=78 Runoff=2.01 cfs 0.151 af**Subcatchment PR 1B-I:**Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=8.42"
Flow Length=136' Tc=1.5 min CN=98 Runoff=7.71 cfs 0.594 af**Subcatchment PR 1B-P:**Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=6.13"
Flow Length=180' Tc=7.5 min CN=79 Runoff=11.55 cfs 0.905 af**Reach 10R:**Inflow=17.23 cfs 1.499 af
Outflow=17.23 cfs 1.499 af**Reach DP1-PR:**Inflow=10.10 cfs 0.921 af
Outflow=10.10 cfs 0.921 af**Pond BASIN:**Peak Elev=19.83' Storage=0.338 af Inflow=17.23 cfs 1.499 af
Discarded=1.11 cfs 0.729 af Primary=8.90 cfs 0.770 af Outflow=10.01 cfs 1.499 af**Total Runoff Area = 2.922 ac Runoff Volume = 1.650 af Average Runoff Depth = 6.78"**
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

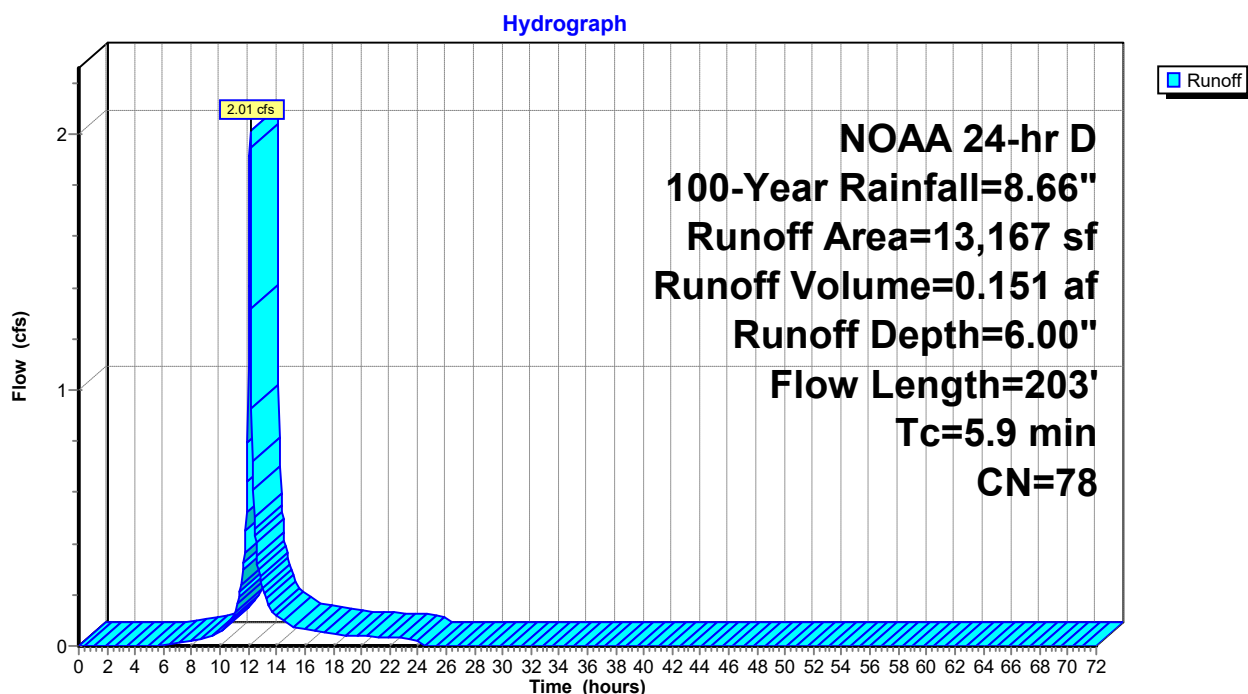
Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.01 cfs @ 12.13 hrs, Volume= 0.151 af, Depth= 6.00"
 Routed to Reach DP1-PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 7.71 cfs @ 12.07 hrs, Volume= 0.594 af, Depth= 8.42"
 Routed to Reach 10R :

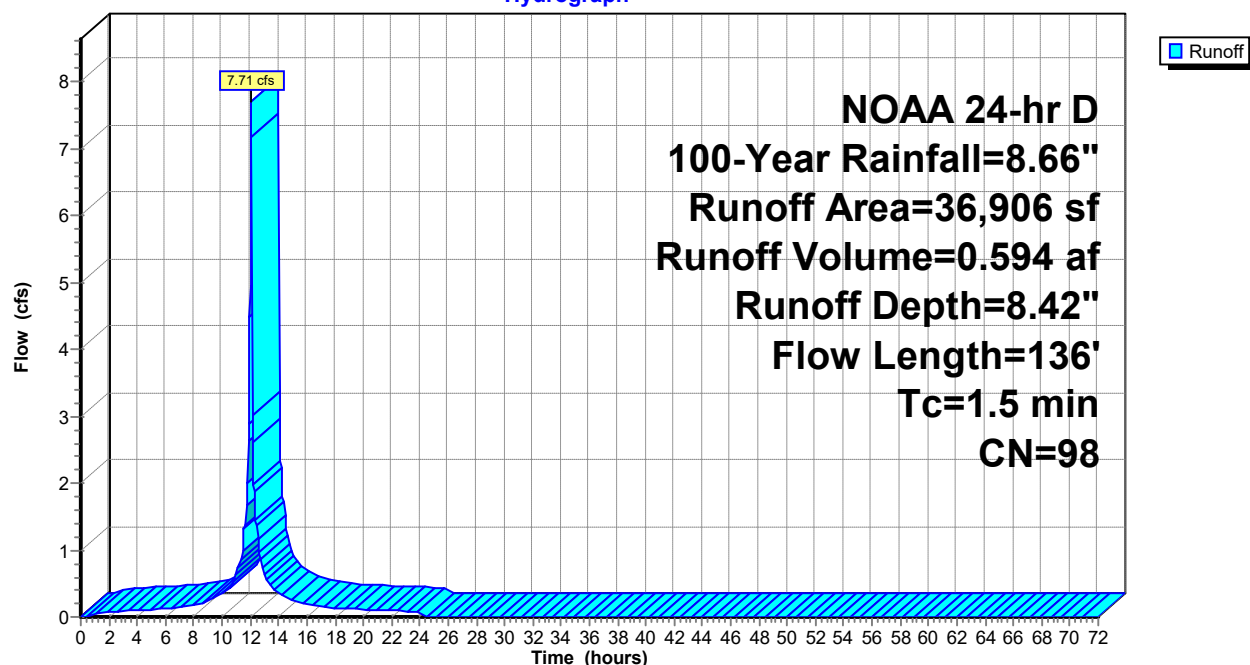
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces $n=0.011$ $P2=3.44"$
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved $K_v=20.3$ fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 11.55 cfs @ 12.14 hrs, Volume= 0.905 af, Depth= 6.13"
 Routed to Reach 10R :

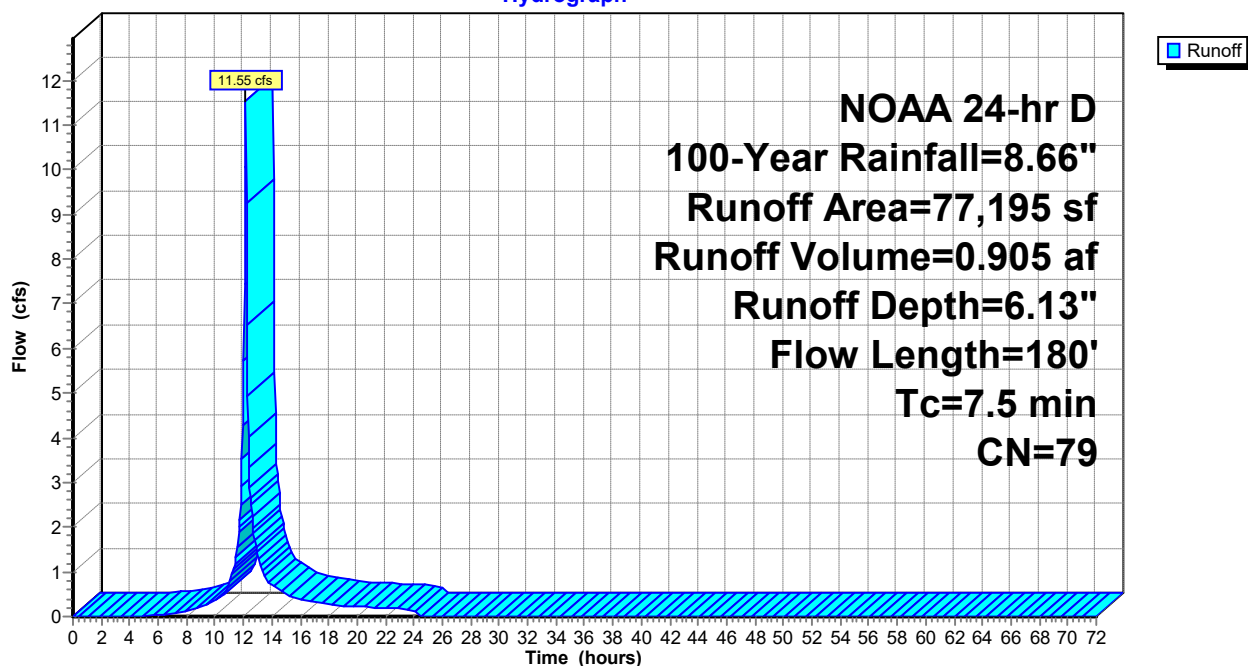
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 100-Year Rainfall=8.66"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

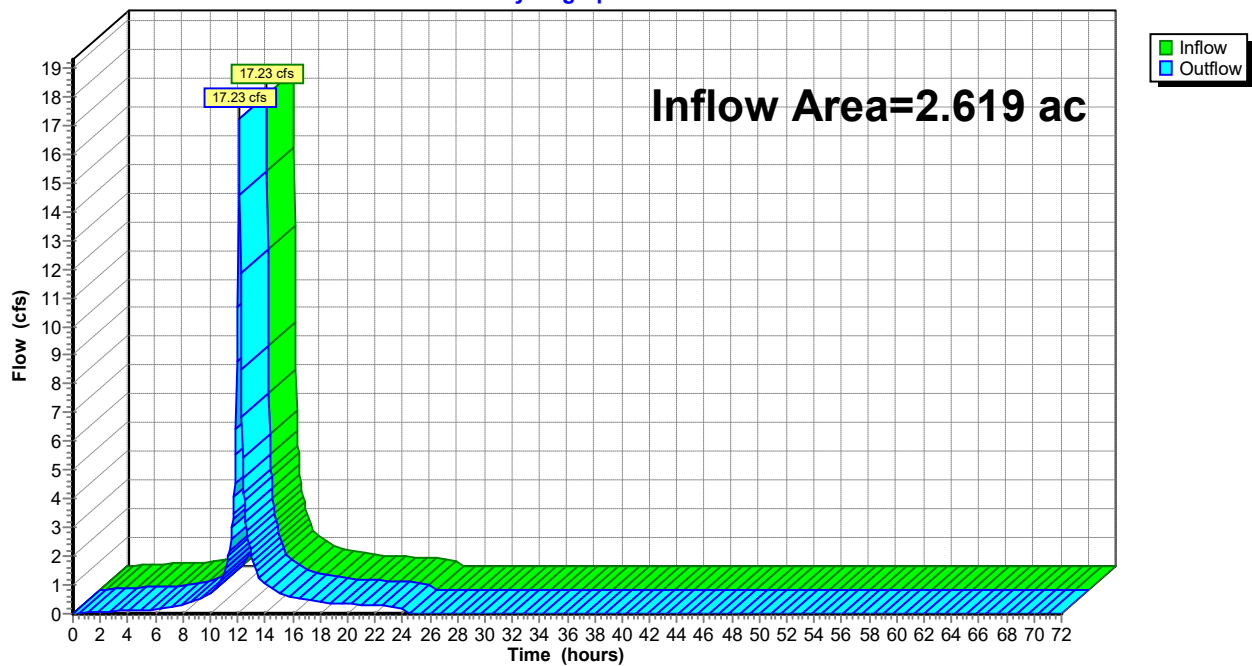


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 6.87" for 100-Year event
Inflow = 17.23 cfs @ 12.10 hrs, Volume= 1.499 af
Outflow = 17.23 cfs @ 12.10 hrs, Volume= 1.499 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

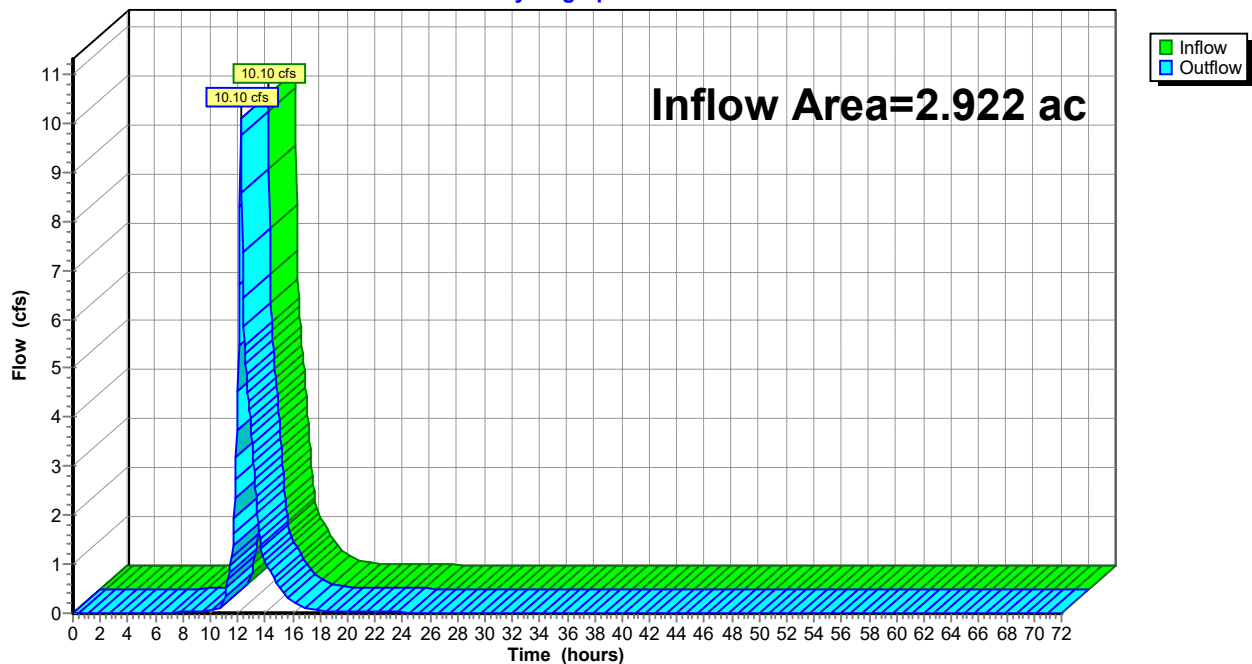
Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 3.78" for 100-Year event
Inflow = 10.10 cfs @ 12.22 hrs, Volume= 0.921 af
Outflow = 10.10 cfs @ 12.22 hrs, Volume= 0.921 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:**Hydrograph**

Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 6.87" for 100-Year event
 Inflow = 17.23 cfs @ 12.10 hrs, Volume= 1.499 af
 Outflow = 10.01 cfs @ 12.23 hrs, Volume= 1.499 af, Atten= 42%, Lag= 8.1 min
 Discarded = 1.11 cfs @ 12.23 hrs, Volume= 0.729 af
 Primary = 8.90 cfs @ 12.23 hrs, Volume= 0.770 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.83' @ 12.23 hrs Surf.Area= 0.108 ac Storage= 0.338 af

Plug-Flow detention time= 40.5 min calculated for 1.499 af (100% of inflow)
 Center-of-Mass det. time= 40.5 min (821.8 - 781.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=1.11 cfs @ 12.23 hrs HW=19.81' (Free Discharge)
 ↑ **4=Exfiltration** (Controls 1.11 cfs)

Primary OutFlow Max=8.76 cfs @ 12.23 hrs HW=19.81' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 2.48 cfs @ 9.26 fps)
 ↓ **2=Orifice/Grate** (Orifice Controls 3.44 cfs @ 8.40 fps)
 ↓ **3=Broad-Crested Rectangular Weir** (Weir Controls 2.85 cfs @ 3.15 fps)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

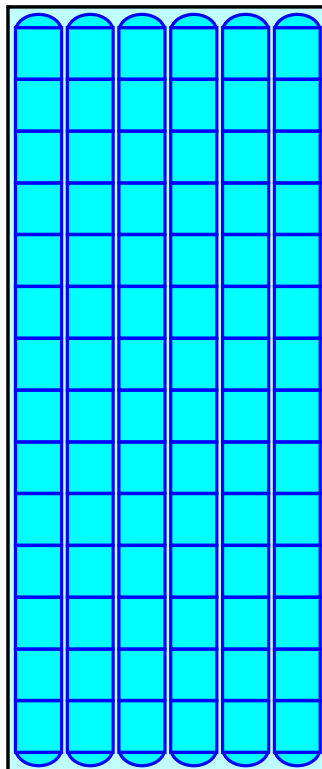
Overall Storage Efficiency = 64.1%

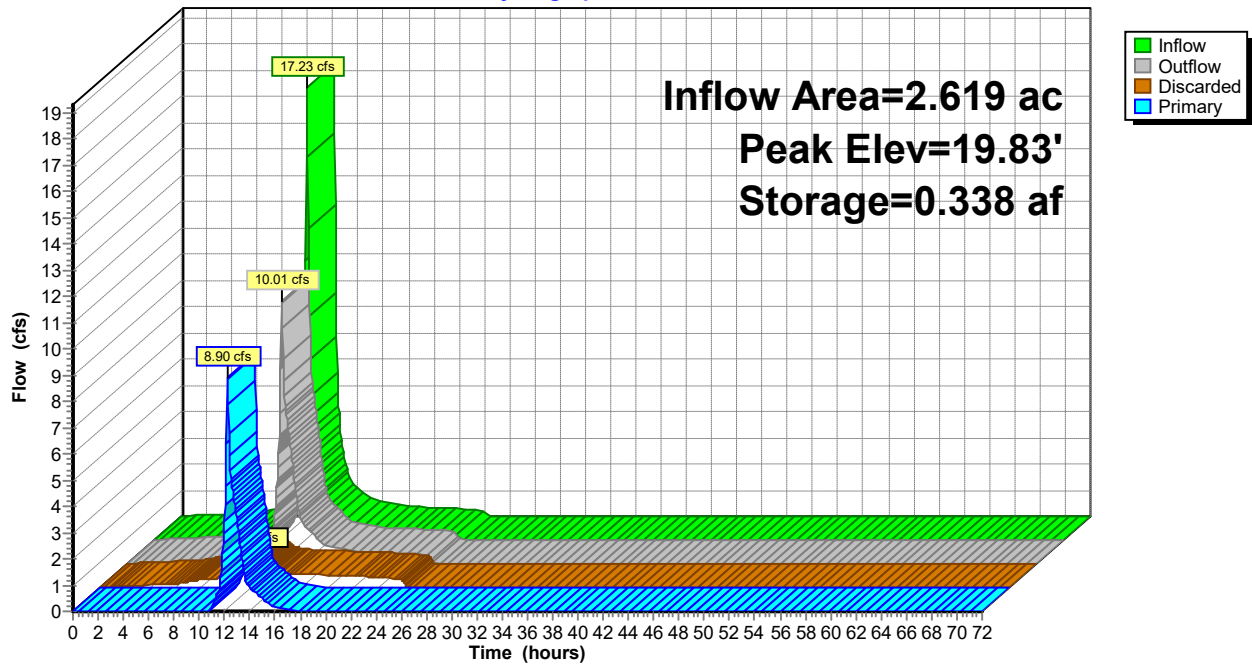
Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

869.3 cy Field

520.6 cy Stone



Pond BASIN:**Hydrograph**

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

Subcatchment PR 1A-P: Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=0.13"
Flow Length=203' Tc=5.9 min CN=78 Runoff=0.11 cfs 0.003 af

Subcatchment PR 1B-I: Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=1.03"
Flow Length=136' Tc=1.5 min CN=98 Runoff=2.63 cfs 0.073 af

Subcatchment PR 1B-P: Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=0.15"
Flow Length=180' Tc=7.5 min CN=79 Runoff=0.68 cfs 0.023 af

Reach 10R: Inflow=2.67 cfs 0.096 af
Outflow=2.67 cfs 0.096 af

Reach DP1-PR: Inflow=0.11 cfs 0.003 af
Outflow=0.11 cfs 0.003 af

Pond BASIN: Peak Elev=15.96' Storage=0.052 af Inflow=2.67 cfs 0.096 af
Discarded=0.48 cfs 0.096 af Primary=0.00 cfs 0.000 af Outflow=0.48 cfs 0.096 af

Total Runoff Area = 2.922 ac Runoff Volume = 0.099 af Average Runoff Depth = 0.41"
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.11 cfs @ 1.16 hrs, Volume= 0.003 af, Depth= 0.13"
 Routed to Reach DP1-PR :

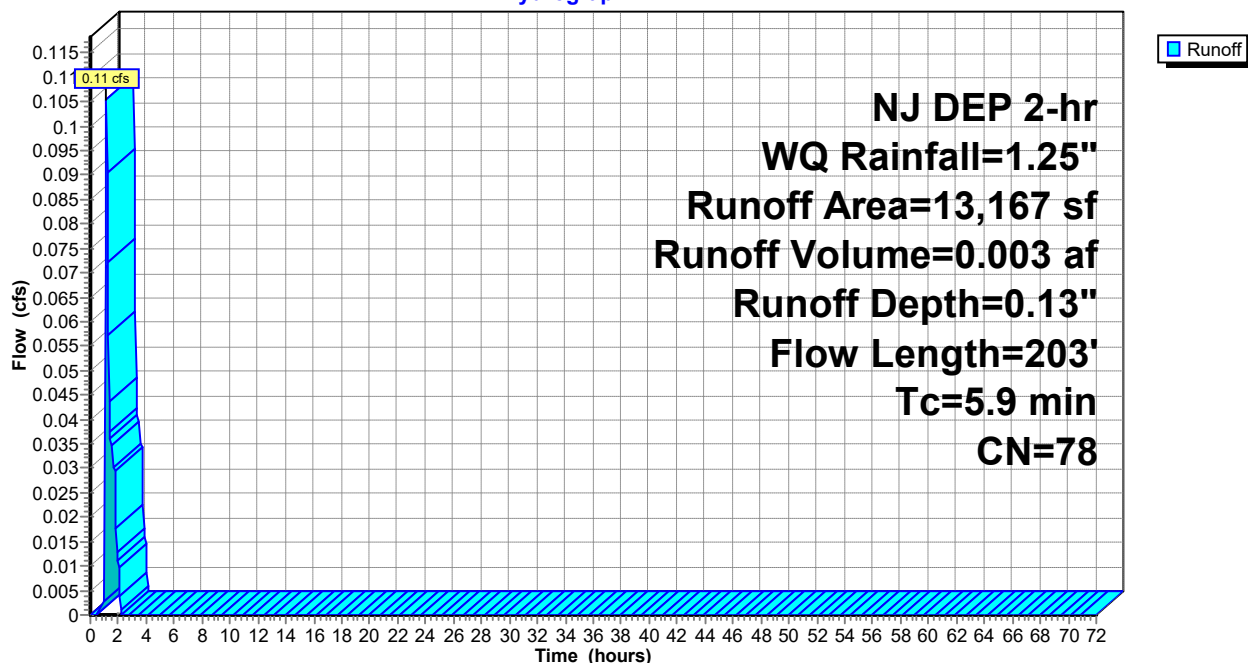
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

T _c (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved K _v = 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Hydrograph



Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 2.63 cfs @ 1.03 hrs, Volume= 0.073 af, Depth= 1.03"
 Routed to Reach 10R :

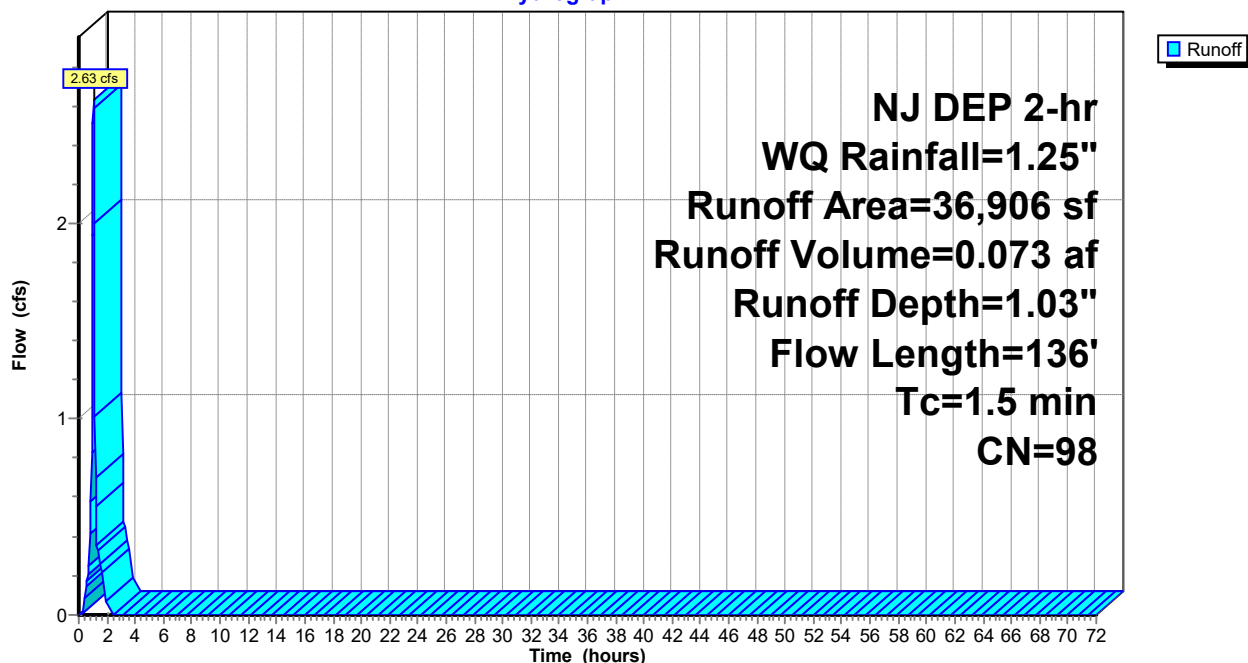
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 0.68 cfs @ 1.17 hrs, Volume= 0.023 af, Depth= 0.15"
 Routed to Reach 10R :

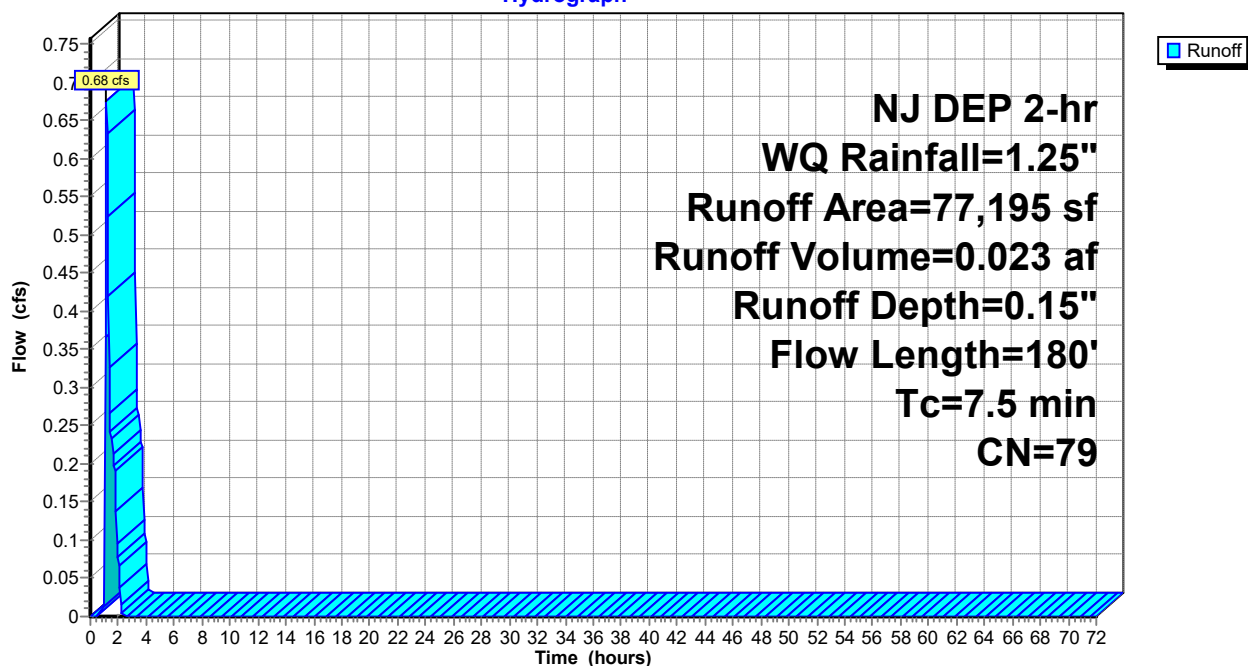
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

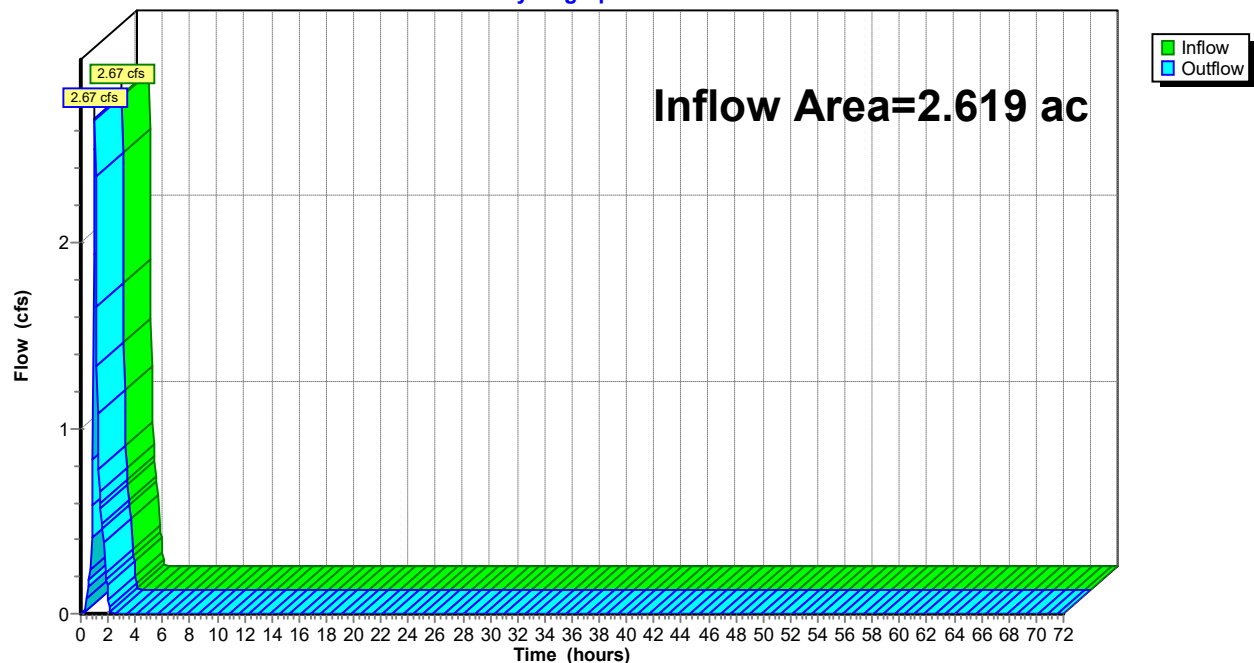


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 0.44" for WQ event
Inflow = 2.67 cfs @ 1.04 hrs, Volume= 0.096 af
Outflow = 2.67 cfs @ 1.04 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 0.01" for WQ event

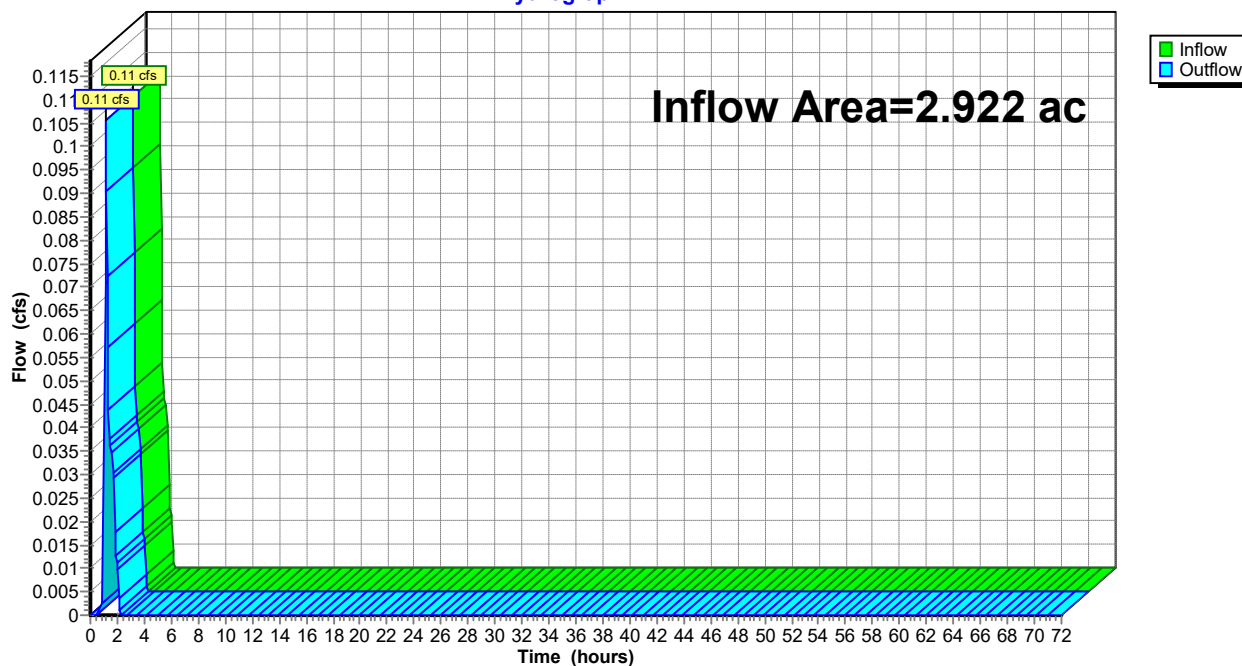
Inflow = 0.11 cfs @ 1.16 hrs, Volume= 0.003 af

Outflow = 0.11 cfs @ 1.16 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:

Hydrograph



Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 0.44" for WQ event
 Inflow = 2.67 cfs @ 1.04 hrs, Volume= 0.096 af
 Outflow = 0.48 cfs @ 1.57 hrs, Volume= 0.096 af, Atten= 82%, Lag= 31.5 min
 Discarded = 0.48 cfs @ 1.57 hrs, Volume= 0.096 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.96' @ 1.57 hrs Surf.Area= 0.108 ac Storage= 0.052 af

Plug-Flow detention time= 49.3 min calculated for 0.096 af (100% of inflow)
 Center-of-Mass det. time= 49.3 min (119.9 - 70.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=0.48 cfs @ 1.57 hrs HW=15.96' (Free Discharge)
 ↑ **4=Exfiltration** (Controls 0.48 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=15.00' (Free Discharge)
 ↑ **1=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **2=Orifice/Grate** (Controls 0.00 cfs)
 ↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

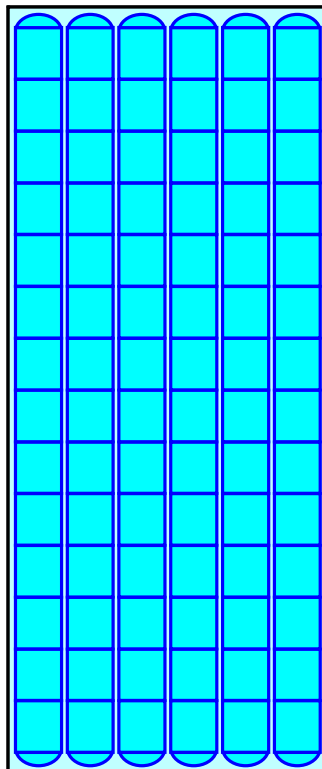
Overall Storage Efficiency = 64.1%

Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

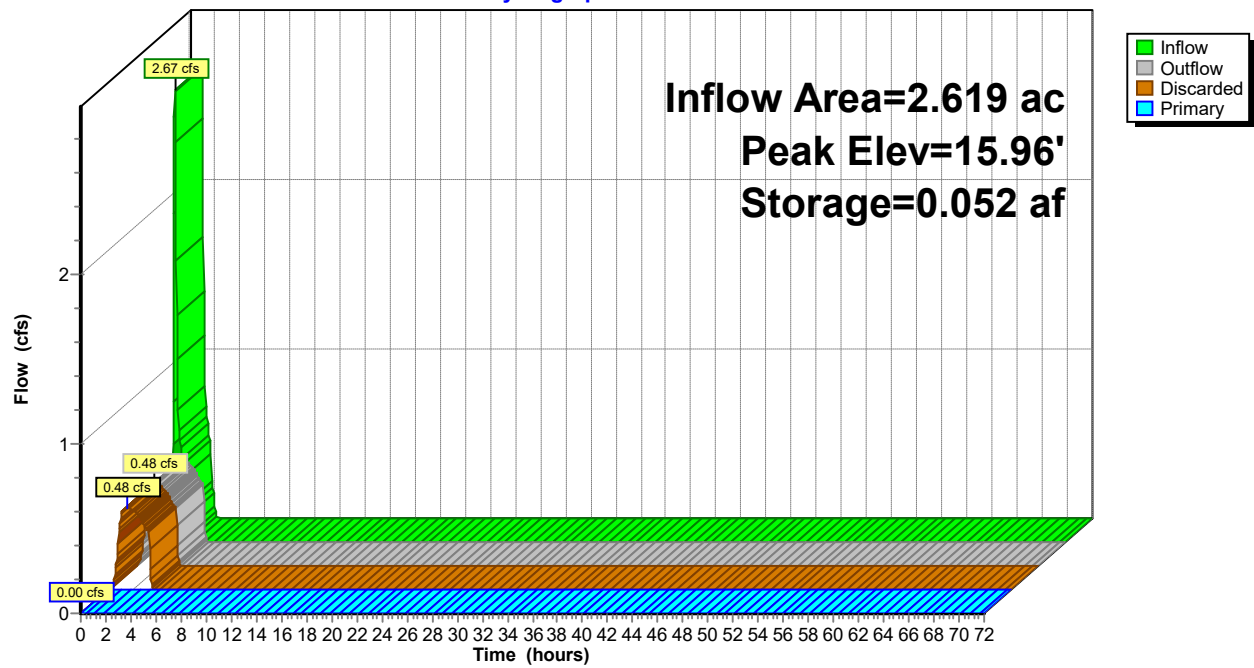
869.3 cy Field

520.6 cy Stone



Pond BASIN:

Hydrograph



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

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

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR 1A-P:Runoff Area=13,167 sf 0.00% Impervious Runoff Depth=4.92"
Flow Length=203' Tc=5.9 min CN=78 Runoff=1.67 cfs 0.124 af**Subcatchment PR 1B-I:**Runoff Area=36,906 sf 100.00% Impervious Runoff Depth=7.25"
Flow Length=136' Tc=1.5 min CN=98 Runoff=6.66 cfs 0.512 af**Subcatchment PR 1B-P:**Runoff Area=77,195 sf 0.00% Impervious Runoff Depth=5.03"
Flow Length=180' Tc=7.5 min CN=79 Runoff=9.58 cfs 0.744 af**Reach 10R:**Inflow=14.51 cfs 1.255 af
Outflow=14.51 cfs 1.255 af**Reach DP1-PR:**Inflow=6.31 cfs 0.720 af
Outflow=6.31 cfs 0.720 af**Pond BASIN:**Peak Elev=19.07' Storage=0.303 af Inflow=14.51 cfs 1.255 af
Discarded=0.99 cfs 0.660 af Primary=5.40 cfs 0.596 af Outflow=6.39 cfs 1.255 af**Total Runoff Area = 2.922 ac Runoff Volume = 1.379 af Average Runoff Depth = 5.67"**
71.00% Pervious = 2.074 ac 29.00% Impervious = 0.847 ac

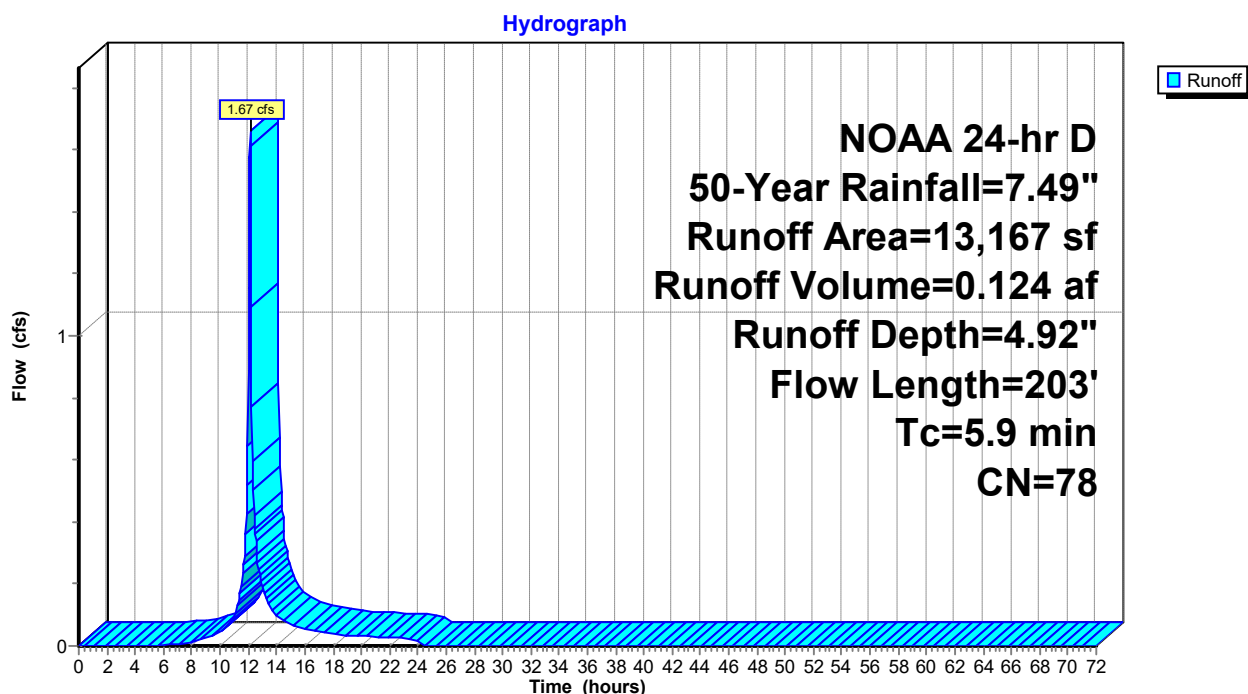
Summary for Subcatchment PR 1A-P:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 1.67 cfs @ 12.13 hrs, Volume= 0.124 af, Depth= 4.92"
 Routed to Reach DP1-PR :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 50-Year Rainfall=7.49"

Area (sf)	CN	Description
9,975	74	>75% Grass cover, Good, HSG C
3,192	89	Gravel roads, HSG C
13,167	78	Weighted Average
13,167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0725	0.30		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	103	0.1090	5.32		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.9	203	Total			

Subcatchment PR 1A-P:

Summary for Subcatchment PR 1B-I:[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 6.66 cfs @ 12.07 hrs, Volume= 0.512 af, Depth= 7.25"
 Routed to Reach 10R :

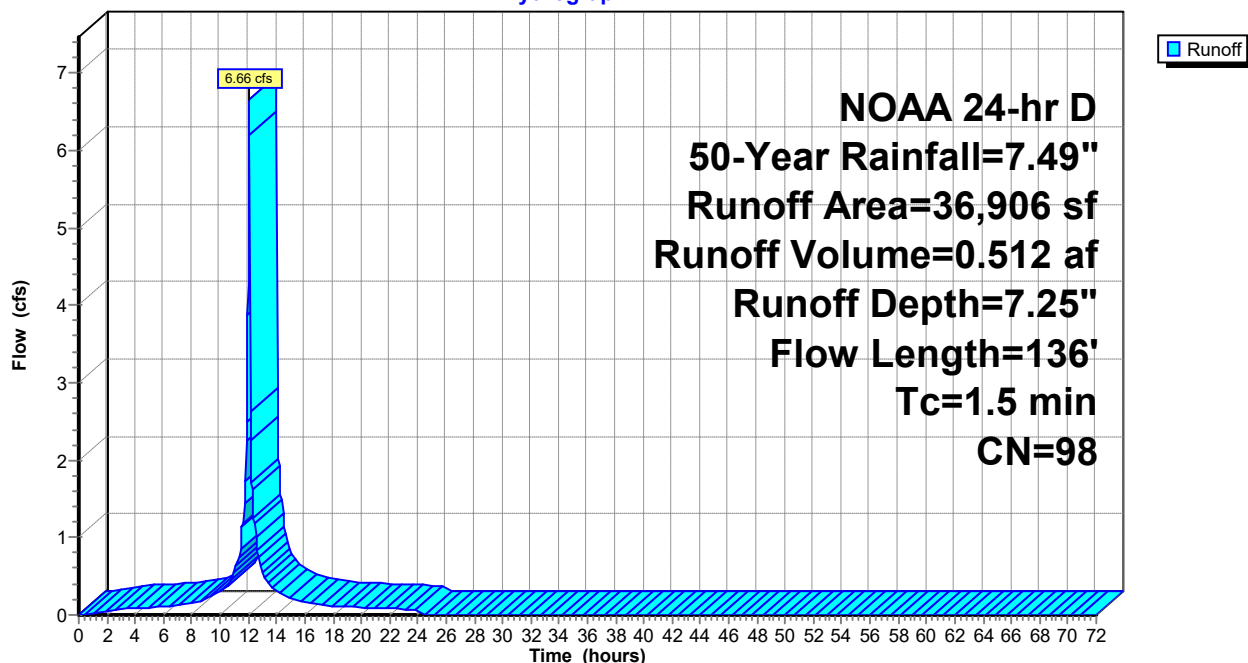
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, $dt=0.05$ hrs
 NOAA 24-hr D 50-Year Rainfall=7.49"

Area (sf)	CN	Description
21,449	98	Roofs, HSG C
15,457	98	Paved parking, HSG C
36,906	98	Weighted Average
36,906		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	100	0.0200	1.43		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.44"
0.3	36	0.0139	2.39		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.5	136	Total			

Subcatchment PR 1B-I:

Hydrograph



Summary for Subcatchment PR 1B-P:

Runoff = 9.58 cfs @ 12.15 hrs, Volume= 0.744 af, Depth= 5.03"
 Routed to Reach 10R :

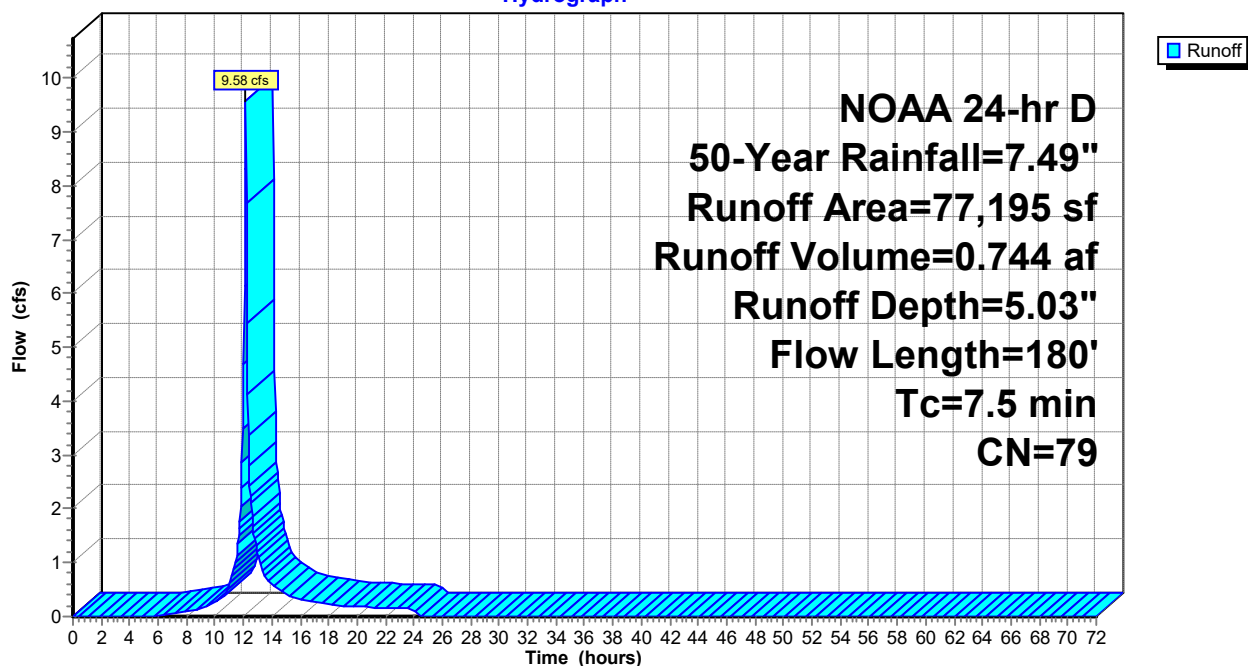
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 NOAA 24-hr D 50-Year Rainfall=7.49"

Area (sf)	CN	Description
53,321	74	>75% Grass cover, Good, HSG C
23,874	89	Gravel roads, HSG C
77,195	79	Weighted Average
77,195		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0400	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.44"
0.3	80	0.0812	4.59		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
7.5	180	Total			

Subcatchment PR 1B-P:

Hydrograph

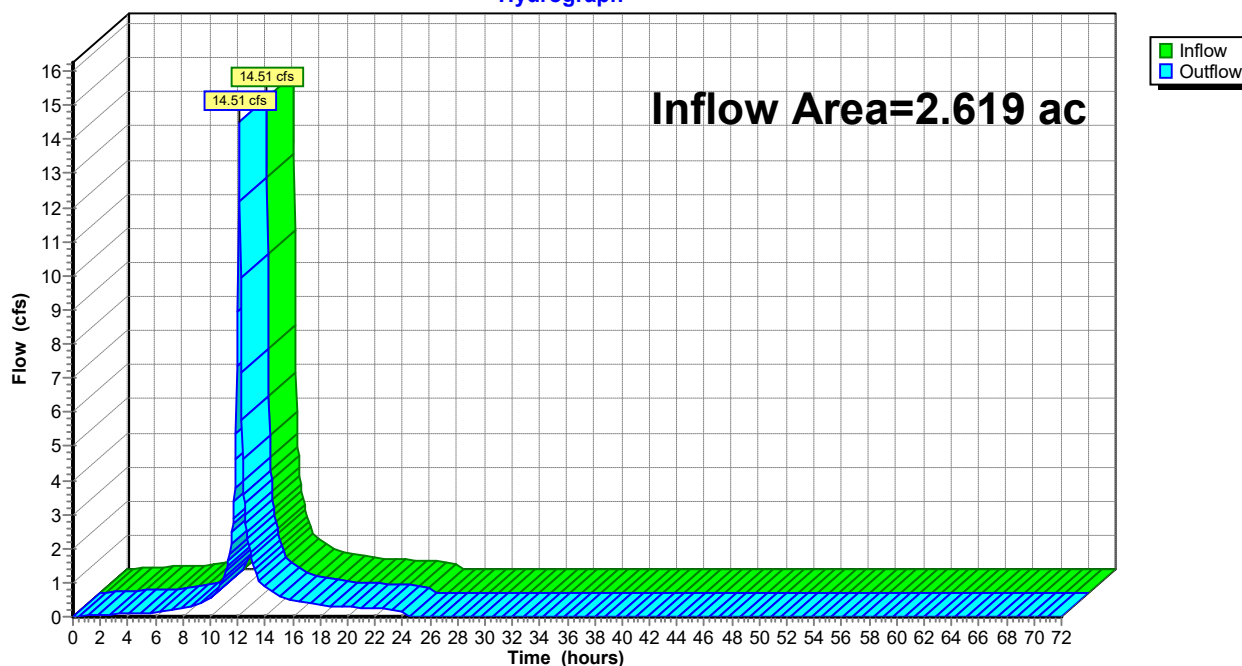


Summary for Reach 10R:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 5.75" for 50-Year event
Inflow = 14.51 cfs @ 12.10 hrs, Volume= 1.255 af
Outflow = 14.51 cfs @ 12.10 hrs, Volume= 1.255 af, Atten= 0%, Lag= 0.0 min
Routed to Pond BASIN :

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

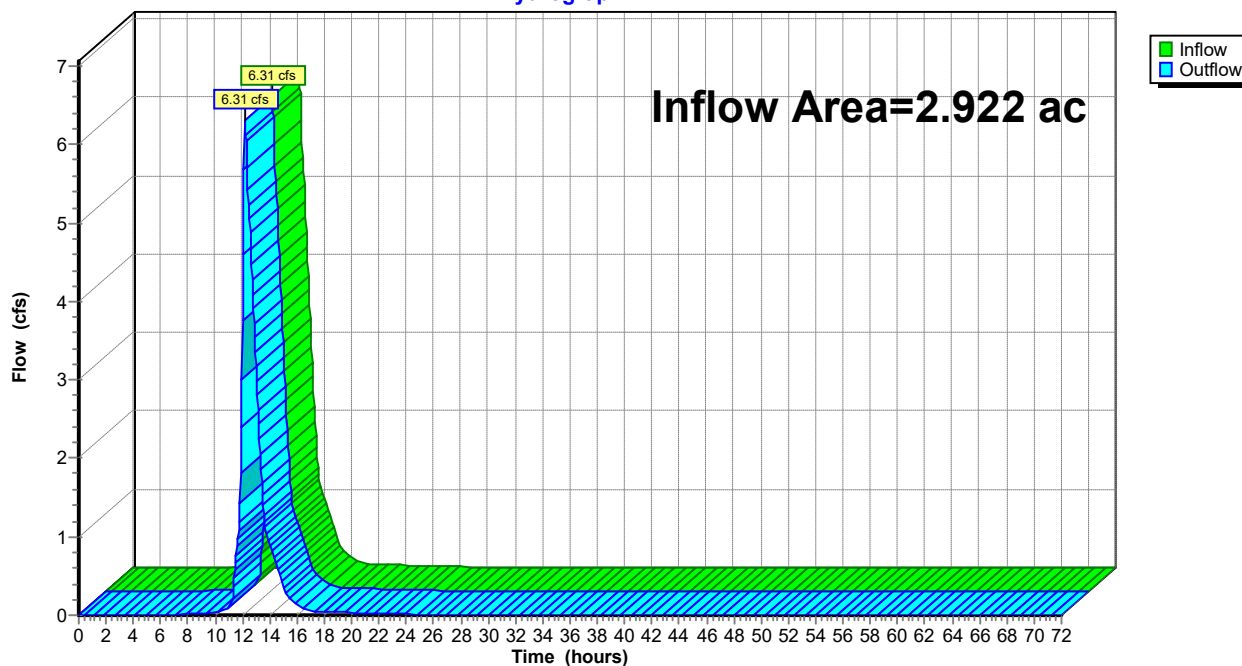
Reach 10R:**Hydrograph**

Summary for Reach DP1-PR:

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.922 ac, 29.00% Impervious, Inflow Depth = 2.96" for 50-Year event
Inflow = 6.31 cfs @ 12.16 hrs, Volume= 0.720 af
Outflow = 6.31 cfs @ 12.16 hrs, Volume= 0.720 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1-PR:**Hydrograph**

Summary for Pond BASIN:

Inflow Area = 2.619 ac, 32.35% Impervious, Inflow Depth = 5.75" for 50-Year event
 Inflow = 14.51 cfs @ 12.10 hrs, Volume= 1.255 af
 Outflow = 6.39 cfs @ 12.28 hrs, Volume= 1.255 af, Atten= 56%, Lag= 10.9 min
 Discarded = 0.99 cfs @ 12.28 hrs, Volume= 0.660 af
 Primary = 5.40 cfs @ 12.28 hrs, Volume= 0.596 af
 Routed to Reach DP1-PR :

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 19.07' @ 12.28 hrs Surf.Area= 0.108 ac Storage= 0.303 af

Plug-Flow detention time= 40.5 min calculated for 1.255 af (100% of inflow)
 Center-of-Mass det. time= 40.5 min (825.3 - 784.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	15.00'	0.129 af	44.25'W x 106.08'L x 5.00'H Field A 0.539 af Overall - 0.216 af Embedded = 0.323 af x 40.0% Voids
#2A	15.75'	0.216 af	ADS_StormTech MC-3500 d +Cap x 84 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 84 Chambers in 6 Rows Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf
		0.345 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	15.96'	3.5" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	16.55'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	18.90'	1.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	15.00'	3.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 13.00'

Discarded OutFlow Max=0.99 cfs @ 12.28 hrs HW=19.06' (Free Discharge)
 ↑ **4=Exfiltration** (Controls 0.99 cfs)

Primary OutFlow Max=5.37 cfs @ 12.28 hrs HW=19.06' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 2.21 cfs @ 8.27 fps)
 ↑ **2=Orifice/Grate** (Orifice Controls 2.99 cfs @ 7.30 fps)
 ↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 0.18 cfs @ 1.11 fps)

Pond BASIN: - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)

Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf

Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap

Cap Storage= 14.9 cf x 2 x 6 rows = 178.8 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

14 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 104.08' Row Length +12.0" End Stone x 2 = 106.08' Base Length

6 Rows x 77.0" Wide + 9.0" Spacing x 5 + 12.0" Side Stone x 2 = 44.25' Base Width

9.0" Stone Base + 45.0" Chamber Height + 6.0" Stone Cover = 5.00' Field Height

84 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 6 Rows = 9,414.8 cf Chamber Storage

23,470.2 cf Field - 9,414.8 cf Chambers = 14,055.4 cf Stone x 40.0% Voids = 5,622.2 cf Stone Storage

Chamber Storage + Stone Storage = 15,036.9 cf = 0.345 af

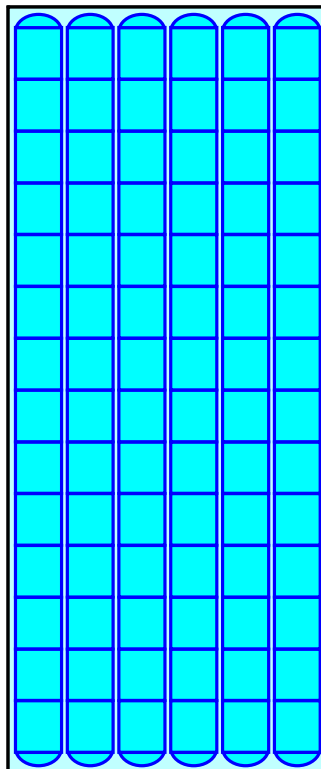
Overall Storage Efficiency = 64.1%

Overall System Size = 106.08' x 44.25' x 5.00'

84 Chambers

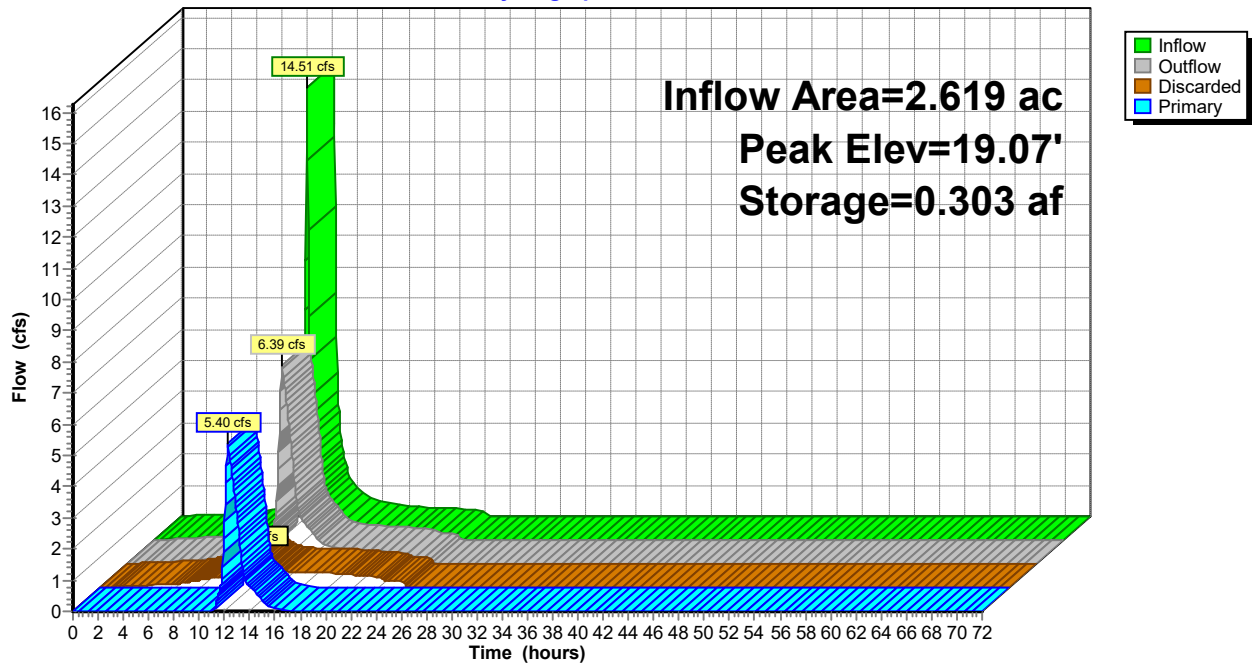
869.3 cy Field

520.6 cy Stone



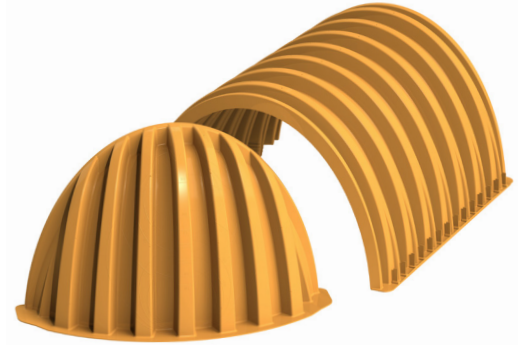
Pond BASIN:

Hydrograph



StormTech® MC-3500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



Nominal Chamber Specifications (not to scale)

Size (L x W x H)
90" x 77" x 45"
2286 mm x 1956 mm x 1143 mm

Chamber Storage
109.9 ft³ (3.11 m³)

Min. Installed Storage*
175.0 ft³ (4.96 m³)

Weight
134 lbs (60.8 kg)

Shipping
15 chambers/pallet
7 end caps/pallet
7 pallets/truck

Nominal End Cap Specifications (not to scale)

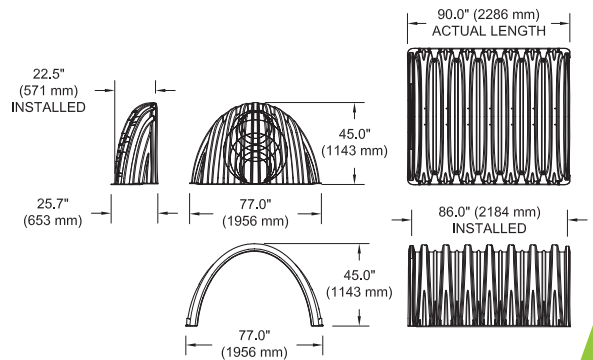
Size (L x W x H)
26.5" x 71" x 45.1"
673 mm x 1803 mm x 1145 mm

End Cap Storage
14.9 ft³ (0.42 m³)

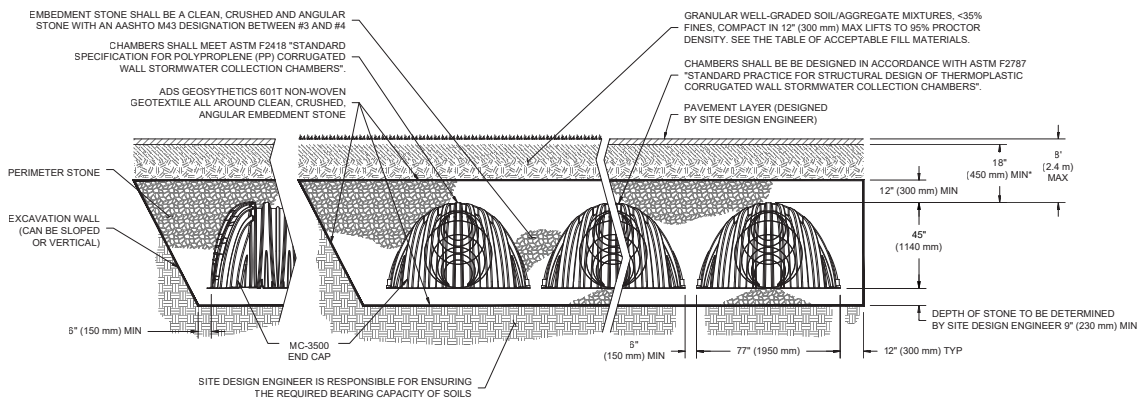
Min. Installed Storage*
45.1 ft³ (1.28 m³)

Weight
49 lbs (22.2 kg)

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 6" (150 mm) of stone perimeter, 6" (150 mm) of stone between chambers/ end caps and 40% stone porosity.



*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 6" (150 mm) of stone between chambers/ end caps and 40% stone porosity.



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

StormTech MC-3500 Specifications

Storage Volume Per Chamber

	Bare Chamber Storage ft ³ (m ³)	Chamber and Stone Foundation Depth in. (mm)			
		9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	109.9 (3.11)	175.0 (4.96)	179.9 (5.09)	184.9 (5.24)	189.9 (5.38)
End Cap	14.9 (0.42)	45.1 (1.28)	46.6 (1.32)	48.3 (1.37)	49.9 (1.41)

Note: Assumes 6" (150 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume.

Amount of Stone Per Chamber

English Tons (yds ³)	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	8.5 (6.0)	9.1 (6.5)	9.7 (6.9)	10.4 (7.4)
End Cap	3.9 (2.8)	4.1 (2.9)	4.3 (3.1)	4.5 (3.2)
Metric Kilograms (m ³)	230 mm	300 mm	375 mm	450 mm
Chamber	7711 (4.6)	8255 (5.0)	8800 (5.3)	9435 (5.7)
End Cap	3538 (2.1)	3719 (2.2)	3901 (2.4)	4082 (2.5)

Note: Assumes 12" (300 mm) of stone above and 6" (150 mm) row spacing and 6" (150 mm) of perimeter stone in front of end caps.

Volume Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375mm)	18 in (450 mm)
Chamber	11.9 (9.1)	12.4 (9.5)	12.8 (9.8)	13.3 (10.2)
End Cap	4.0 (3.1)	4.1 (3.3)	4.3 (3.3)	4.4 (3.4)

Note: Assumes 6" (150 mm) of separation between chamber rows and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTM F2922, comply with all requirements in the Build America, Buy America (BABA) Act.

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Appendix B

Recharge Worksheet

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., WEST ORANGE TOWN	49.0	1.67

Project Name:	Waymaker
Description:	Proposed Site Improvements
Analysis Date:	07/01/25

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.319	Impervious areas	Boonton	0.0	-
2	2.773	Open space	Boonton	14.9	150,467
3					
4					
5					
6					
7					
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.1			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				13.4	150,467

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.847	Impervious areas	Boonton	0.0	-
2	2.245	Open space	Boonton	14.9	121,817
3					
4					
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	3.1			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				10.9	121,817

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	36,895
Post-Development Annual Recharge Deficit=	28,650	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	3.59	(in)	DRWC=	0.00	(in)
ERWC =	0.59	(in)	EDRWC=	0.00	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Waymaker	Proposed Site Improvements	07/01/25	Subsurface Infiltration Basin

Recharge BMP Input Parameters				Root Zone Water capacity Calculated Parameters				Recharge Design Parameters			
Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit	Parameter	Symbol	Value	Unit
BMP Area	ABMP	4708.0	sq.ft	Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.61	in	Inches of Runoff to capture	Qdesign	1.61	in
BMP Effective Depth, this is the design variable	dBMP	3.6	in	ERWC Modified to consider dEXC	EDRWC	0.00	in	Inches of Rainfall to capture	Pdesign	1.83	in
Upper level of the BMP surface (negative if above ground)	dBMPu	108.0	in	Empty Portion of RWC under Infiltr. BMP	RERWC	0.00	in	Recharge Provided Avg. over Imp. Area		35.8	in
Depth of lower surface of BMP, must be >= dBMPu	dEXC	117.0	in					Runoff Captured Avg. over imp. Area		35.8	in
Post-development Land Segment Location of BMP, Input Zero if Location is distributed or undetermined	SegBMP	2	unitless								

BMP Calculated Size Parameters				CALCULATION CHECK MESSAGES	
ABMP/Aimp	Aratio	0.42	unitless	Volume Balance-->	Solve Problem to satisfy Annual Recharge
BMP Volume	VBMP	1,412	cu.ft	dBMP Check-->	OK
				dEXC Check-->	OK
				BMP Location-->	OK

Parameters from Annual Recharge Worksheet				System Performance Calculated Parameters			
Post-D Deficit Recharge (or desired recharge volume)	Vdef	28,650	cu.ft	Annual BMP Recharge Volume		33,755	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	11,326	sq.ft	Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
Root Zone Water Capacity	RWC	3.69	in	%Rainfall became Runoff		78.5%	%
RWC Modified to consider dEXC	DRWC	0.00	in	%Runoff Infiltrated		93.0%	%
Climatic Factor	C-factor	1.67	no units	%Runoff Recharged		28.5%	%
Average Annual P	Pavg	49.0	in	%Rainfall Recharged		22.4%	%
Recharge Requirement over Imp. Area	dr	9.3	in				

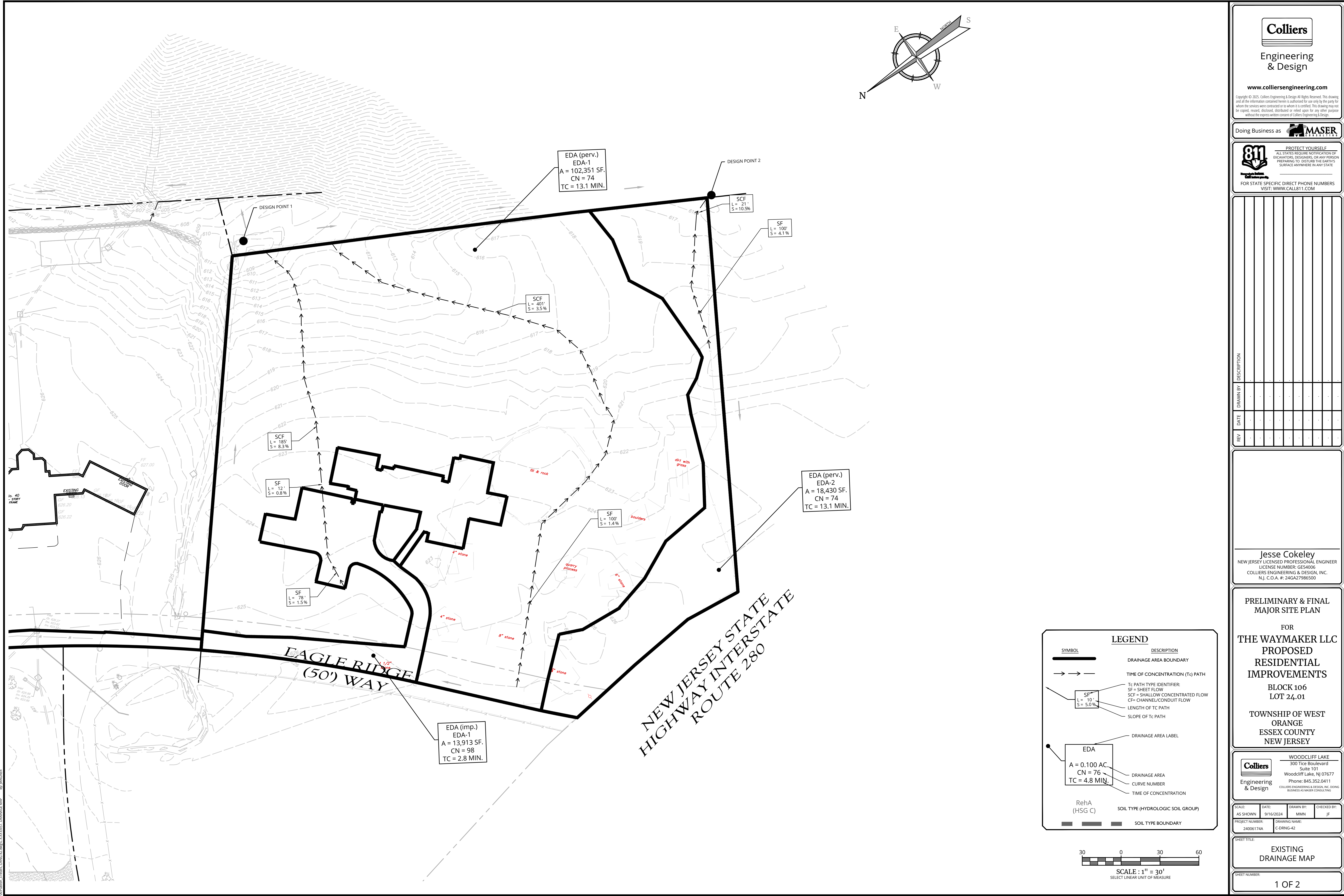
OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensitive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP. To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration click the "Default Vdef & Aimp" button.

Appendix C

Existing and Proposed Drainage Area Map



\\apl01h1\7246\CDRNG-42\dwg\CDRNG-42.dwg DATE: 9/16/2024 BY: JAWAGNER

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Jesse Cokeley
NEW JERSEY LICENSED PROFESSIONAL ENGINEER
LICENSE NUMBER: GE54006
COLLIERS ENGINEERING & DESIGN, INC.
N.J. C.O.A. #: 24GA27986500

PRELIMINARY & FINAL
MAJOR SITE PLAN

FOR
THE WAYMAKER LLC
PROPOSED
RESIDENTIAL
IMPROVEMENTS

BLOCK 106
LOT 24.01

TOWNSHIP OF WEST
ORANGE
ESSEX COUNTY
NEW JERSEY

Colliers

Engineering
& Design

WOODCLIFF LAKE
300 Tice Boulevard
Suite 101
Woodcliff Lake, NJ 07677
Phone: 845.352.0411
COLLIERS ENGINEERING & DESIGN, INC. DOING
BUSINESS AS MASER CONSULTING

SCALE: AS SHOWN. DATE: 9/16/2024. DRAWN BY: MMN. CHECKED BY: JF.
PROJECT NUMBER: 24006174A. DRAWING NAME: C-DRNG-42.

SHEET TITLE:
EXISTING
DRAINAGE MAP

SHEET NUMBER:
1 OF 2

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.

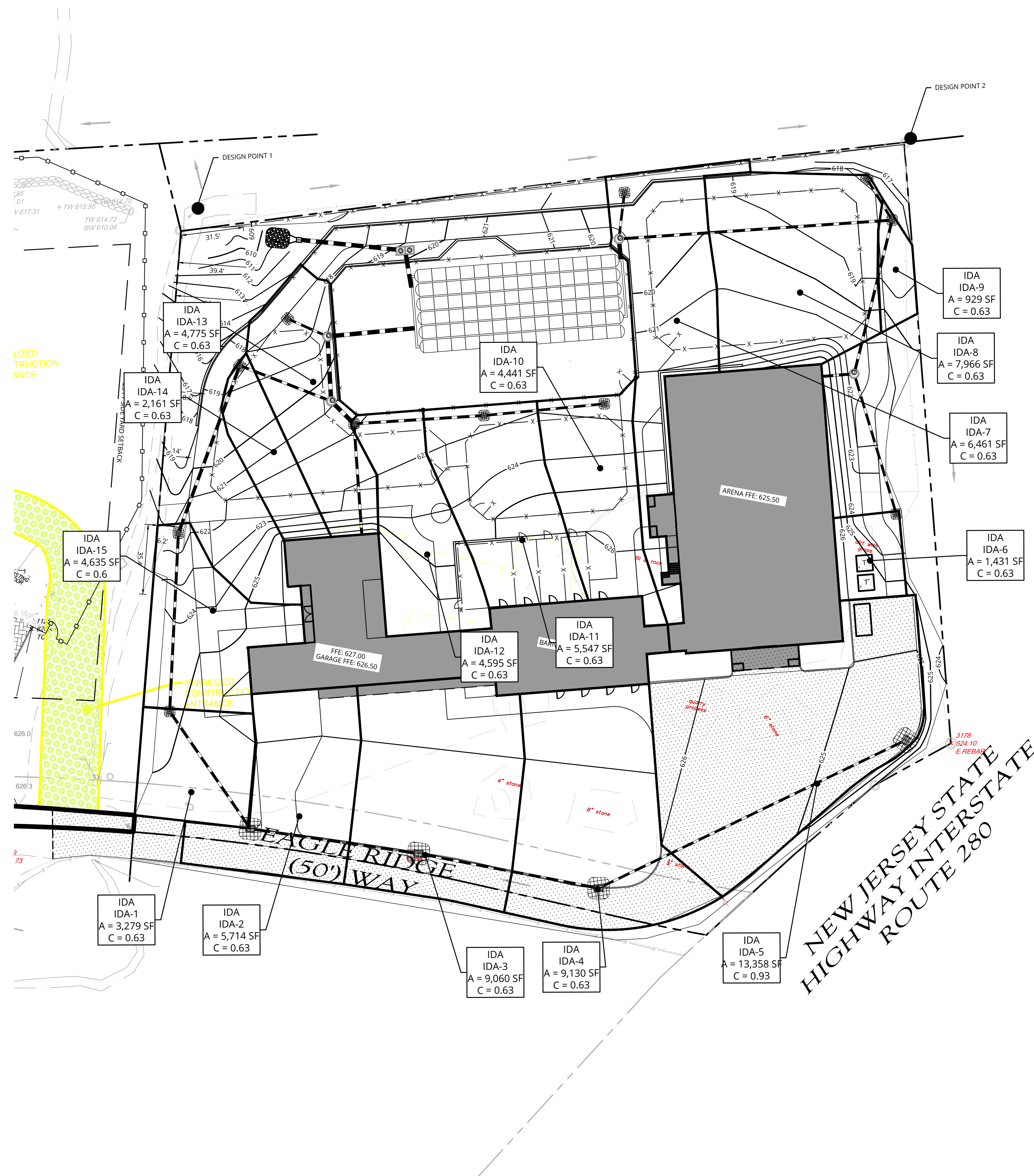
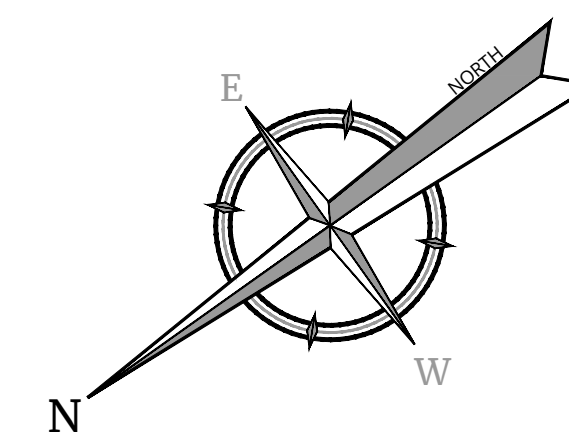
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ENTER CLIENT
NAME

ENTER PLAN
TYPE HERE

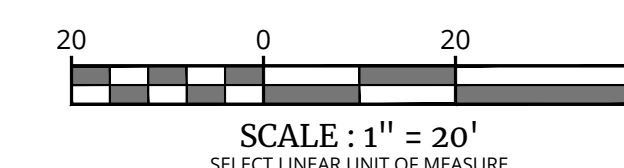
ENTER PROJECT
NAME HERE

ENTER ADDRESS
MUNICIPALITY
COUNTY, STATE



LEGEND

SYMBOL	DESCRIPTION
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION (T) PATH
	TC PATH TYPE IDENTIFIER: SF = SHEET FLOW SCF = SHALLOW CONCENTRATED FLOW CF = CHANNEL/CONDUIT FLOW
	LENGTH OF TC PATH
	SLOPE OF TC PATH
	DRAINAGE AREA LABEL
	POA-BASIN LABEL-DRAINAGE AREA
	DRAINAGE AREA CURVE NUMBER TIME OF CONCENTRATION
	SOIL TYPE (HYDROLOGIC SOIL GROUP)
	SOIL TYPE BOUNDARY



Colliers
Engineering

SCALE:	DRAWN BY:
AS SHOWN	XXX
DESIGNED BY:	REVIEWED BY:
XXX	XXX
DATE ISSUED:	PROJECT NUMBER:
XX/XX/XX	XXXXXXXXXX

SHEET NAME

INLET DRAINAGE MAP

DRAWING NUMBER:

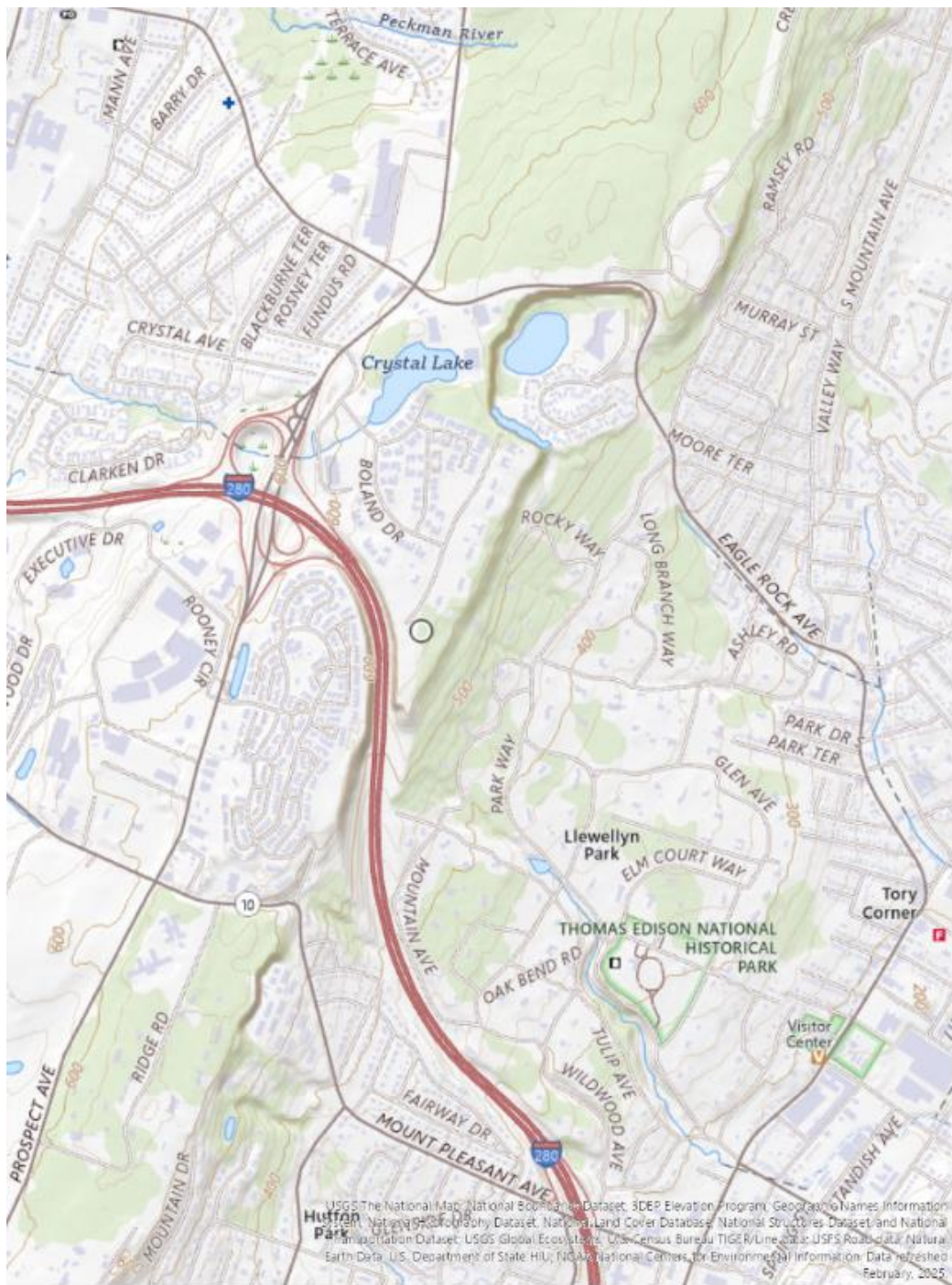
of. xx XX

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Appendix D

USGS

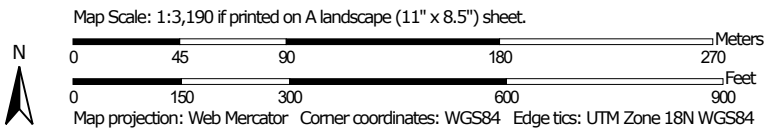
Soil Survey Location Map



Hydrologic Soil Group—Essex County, New Jersey



Soil Map may not be valid at this scale.



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

6/24/2024
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: Essex County, New Jersey
 Survey Area Data: Version 19, Aug 29, 2023

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

Date(s) aerial images were photographed: Oct 10, 2022—Oct 16, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BooBc	Boonton silt loam, red sandstone lowland, 0 to 8 percent slopes, extremely stony	C	0.6	1.7%
BooCc	Boonton silt loam, red sandstone lowland, 8 to 15 percent slopes, extremely stony	C	8.1	22.1%
BouB	Boonton - Urban land, Boonton substratum complex, 0 to 8 percent slopes	C	1.4	3.8%
BowrB	Boonton - Urban land, Boonton substratum complex, red sandstone lowland, 0 to 8 percent slopes	C	1.6	4.4%
BowrC	Boonton - Urban land, Boonton substratum complex, red sandstone lowland, 8 to 15 percent slopes	C	5.6	15.1%
RNAAC	Rock outcrop		0.9	2.4%
USBONB	Urban land, Boonton substratum - Boonton complex, 0 to 8 percent slopes		3.2	8.7%
YamnBc	Yalesville loam, 0 to 8 percent slopes, extremely stony	C	10.2	27.7%
YaohEh	Yalesville - Holyoke complex, 35 to 60 percent slopes, very rocky	C	5.2	14.1%
Totals for Area of Interest			36.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix E - Geotechnical Data Report

GEOTECHNICAL DATA REPORT

(Stormwater Infiltration Testing)

February 27, 2025

40 Eagle Ridge Way
Block 106; Lot 20.03
Township of West Orange
Essex County, New Jersey

Prepared for:

TheWaymaker LLC
40 Eagle Ridge Way
West Orange, NJ 07052

Prepared by:



Francisco Sanchez-Dominici
New Jersey Professional Engineer
License No. GE061874



Ahmed Elmekati
New Jersey Professional Engineer
License No. GE053487

Colliers Engineering & Design, Inc.

300 Tice Blvd, Suite 101
Woodcliff Lake, NJ 07677
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Project No. 24006174A

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<i>USDA Web Soil Survey</i>	1
<i>Soil Stratification</i>	2
<i>General Groundwater Observations</i>	2
In-situ Infiltration Testing	2
<i>Proposed Stormwater Facilities</i>	2
<i>Measured Field Intake Rate</i>	2
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Test Pit Logs	2
In-situ Infiltration Test Result	3

Table

Table 1: Summary of In-Situ Infiltration Test

Figure

Figure 1: Hydrogeologic Map (USDA Web Soil Survey)

Drawing

B-01-ELP..... Exploration Location Plan

Appendices

Appendix A Test Pit Logs

Appendix B..... In-Situ Infiltration Test Result

Introduction

In accordance with our proposal dated February 17, 2025, Colliers Engineering & Design, Inc. (CED), performed a subsurface exploration program for the proposed stormwater infiltration BMP areas of the site located at 40 Eagle Ridge Way, Township of West Orange, Essex County, New Jersey.

This report presents a summary of the data collected during CED's field presence and result of the performed in-situ infiltration test.

Available Information

1. Drawing titled, "Demolition Plan", by Colliers Engineering & Design, dated September 17, 2024.

Site and Project Description

The project site is located at 40 Eagle Ridge Way, Township of West Orange, Essex County, New Jersey. The site is identified as Block 106, Lot 20.03 on the corresponding tax map. The site is bound by Eagle Ridge Way towards West. A residential development is located towards North, and wooded areas are located towards East. A vacant lot bounds the south side of the site. The site is currently occupied by a residential development with several structures and appurtenant site features. Surface grades generally slope downward from El. 628± towards West to El. 603± towards East.

We understand stormwater management facilities are proposed at several locations on the eastern side of the site.

Stormwater Subsurface Exploration

CED performed a subsurface exploration program consisting of five test pits, TP-01 through TP-05. The test pits were performed at locations selected by the site-civil engineer and extended up to 12.5 ft below existing surface grades. Drawing B-01-ELP presents the location of the test pits.

The test pits were performed by Grabowski Construction, Inc. of West Orange, New Jersey, on February 18, 2025, under the continuous observation of CED representative, Mr. Francisco Sanchez-Dominici, PE. Our representative located the test pits based on existing site features and handheld GPS equipment. The test pits were backfilled upon completion.

Subsurface Conditions

USDA Web Soil Survey

Available information from the Web Soil Survey Tool provided by the United States Department of Agriculture Natural Resources Conservation Service suggests that there are up to two soil types and reports depths to the water table, noted as rating, within the project site limits as presented in Figure 1.

Soil Stratification

The test pits encountered the site soils exposed at the surface. The site soils generally consist of silt loam, silt clay loam, loamy sand, varying amounts of gravel/boulders. The test pits were terminated within these soils.

The test pit logs are presented in Appendix A. Soils encountered were classified in the field in general accordance with the USDA Soil Classification System, a summary of which is presented in Appendix A.

General Groundwater Observations

Groundwater conditions were not encountered within the test pits during the time of our exploration.

Groundwater observations noted above reflect the conditions at the time of our onsite presence. Note that groundwater levels can fluctuate with locations, seasonal changes, precipitation, nearby construction activities, foreign influences such as leakage into and out of utilities, and other factors. Pockets or seams of gravels, sands, silts, or open fractures and joints can store and transmit “perched” groundwater flow or seepage.

In-situ Infiltration Testing

Proposed Stormwater Facilities

Test pit TP-01 was terminated before reaching the bottom of the proposed stormwater facility due to concerns of damaging existing subsurface utilities at the request of the general contractor.

Test Pits TP-04 and TP-05 were terminated before reaching the bottom of the proposed stormwater facility due to refusal on bedrock at depths ranging up to 12.5 ft below existing grades.

Test Pits TP-02 and TP-03 were terminated at depths ranging up to 9 ft below existing grades due to refusal on bedrock. A single ring infiltrometer test was performed within Test Pit TP-03. The single ring infiltrometer test was performed in accordance with Chapter 12 of the New Jersey BMP Manual. A summary of the single ring infiltrometer test is presented in Table 1.

Measured Field Intake Rate

Table 1 presents a summary of the in-situ infiltration test performed and corresponding result. The result of the in-situ infiltrations test is presented in Appendix B.

Table 1. Summary of In-Situ Infiltration Test

Location ID	Test Depth (ft)	Soil Description (see logs for full description)	Test Type	Measured Field Intake Rate (in/hr)
TP-03	3.5	Loamy Sand	Single Ring	6.2 in/hr

Closing

The data presented in this report is based on field observations and measured test results. The number, location, and depth of the explorations were completed as requested by the project team.

Limitations

This data report and all supporting documentation have been prepared exclusively for the use of **TheWaymaker LLC** pursuant to the Agreement between Colliers Engineering & Design (DBA Maser Consulting) and **TheWaymaker LLC**. All provisions set forth in the Agreement and the General Terms and Conditions attached thereto are incorporated herein by reference. No warranty, express or implied, is made herein.

The field observations and data contained in this report are based on limited exploration and testing of the subsurface at the referenced project site, at the locations and depths indicated in this report. The explorations indicate subsurface conditions at the specific locations, depths, and times explored.

This report is intended to serve as a data report. CED is not responsible for any claims, damages, or liability associated with interpretation of subsurface data or reuse of the subsurface data or engineering analysis without the expressed written authorization of CED.

This data report and related documentation are instruments of service. The subject matter of this data report is limited to the facts and matters stated herein.

The scope of this subsurface exploration did not include geotechnical interpretation or evaluation of the findings, or investigation or evaluation of any environmental issues, such as wetlands, or hazardous or toxic materials on, below, or in the vicinity of the subject site. Any statements in this report or supporting documentation regarding odors or unusual or suspicious items or conditions observed are strictly for information only.

Figure

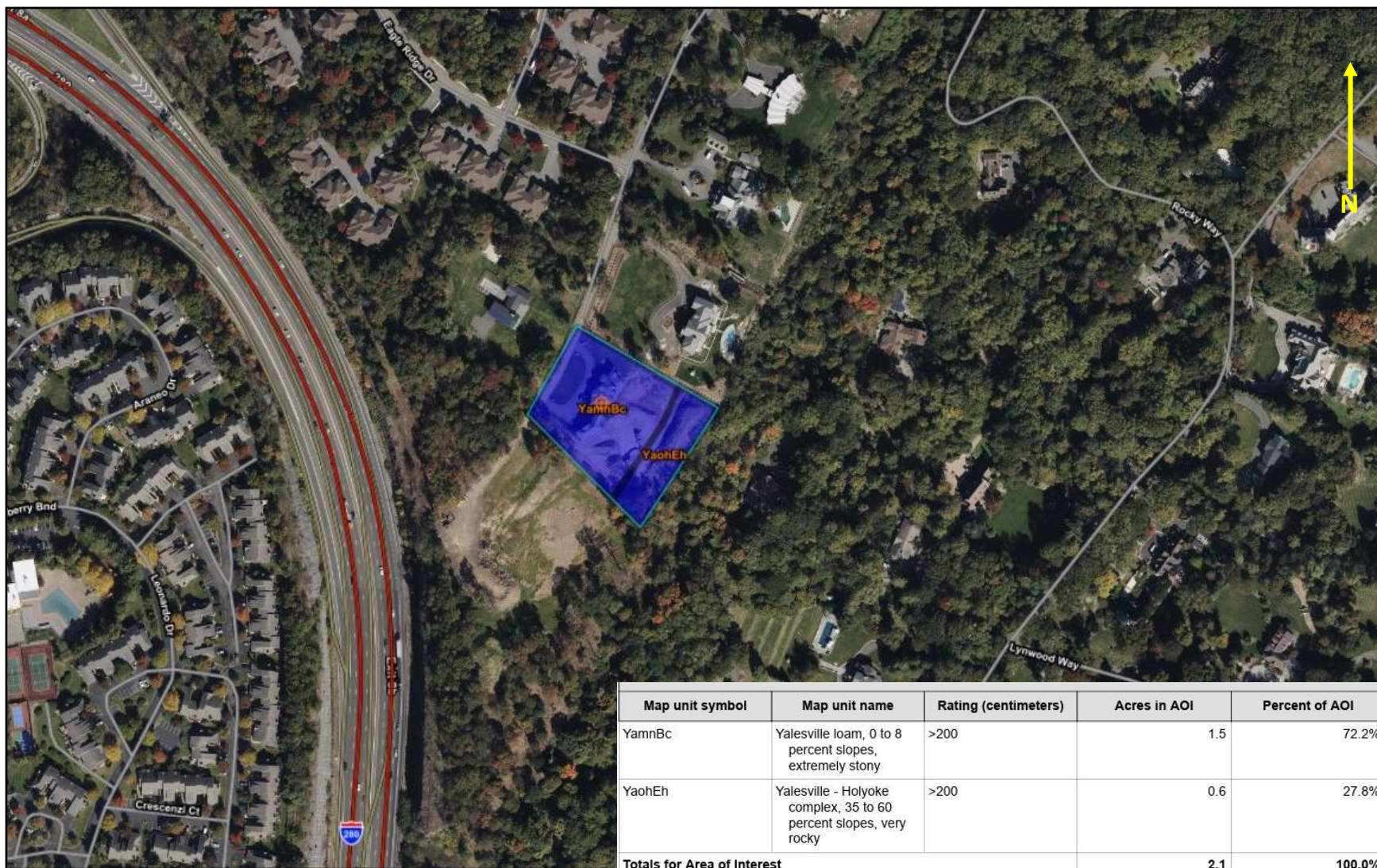


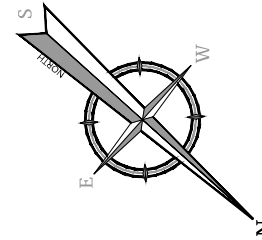
Figure 1

Hydrogeologic Map (NRCS Web Soil Survey)

PROJECT:
40 EAGLE RIDGE WAY
TOWNSHIP OF WEST ORANGE,
ESSEX COUNTY, NEW JERSEY

Project No.: 24006174A

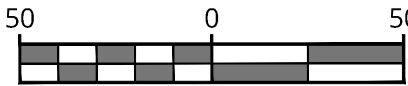
Drawing



1. BASE PLANS BASED ON DRAWING TITLED "DEMOLITION PLAN" DATED SEPTEMBER 17, 2024, BY COLLIERS ENGINEERING & DESIGN.
2. THIS DRAWING IS PART OF COLLIERS ENGINEERING & DESIGN'S REPORT (PROJECT NO. 24006174A) AND SHOULD ONLY BE USED IN CONJUNCTION WITH THE REPORT.
3. TEST PIT SERIES TP-XX PERFORMED BY GRABOWSKI CONSTRUCTION, INC. ON FEBRUARY 18, 2025, UNDER CONTINUOUS OBSERVATION OF CED.
4. TEST PITS BACKFILLED WITH CUTTINGS UPON COMPLETION.

TP-XX

TEST PIT LOCATION (FEBRUARY, 2025)



SCALE : 1" = 50'

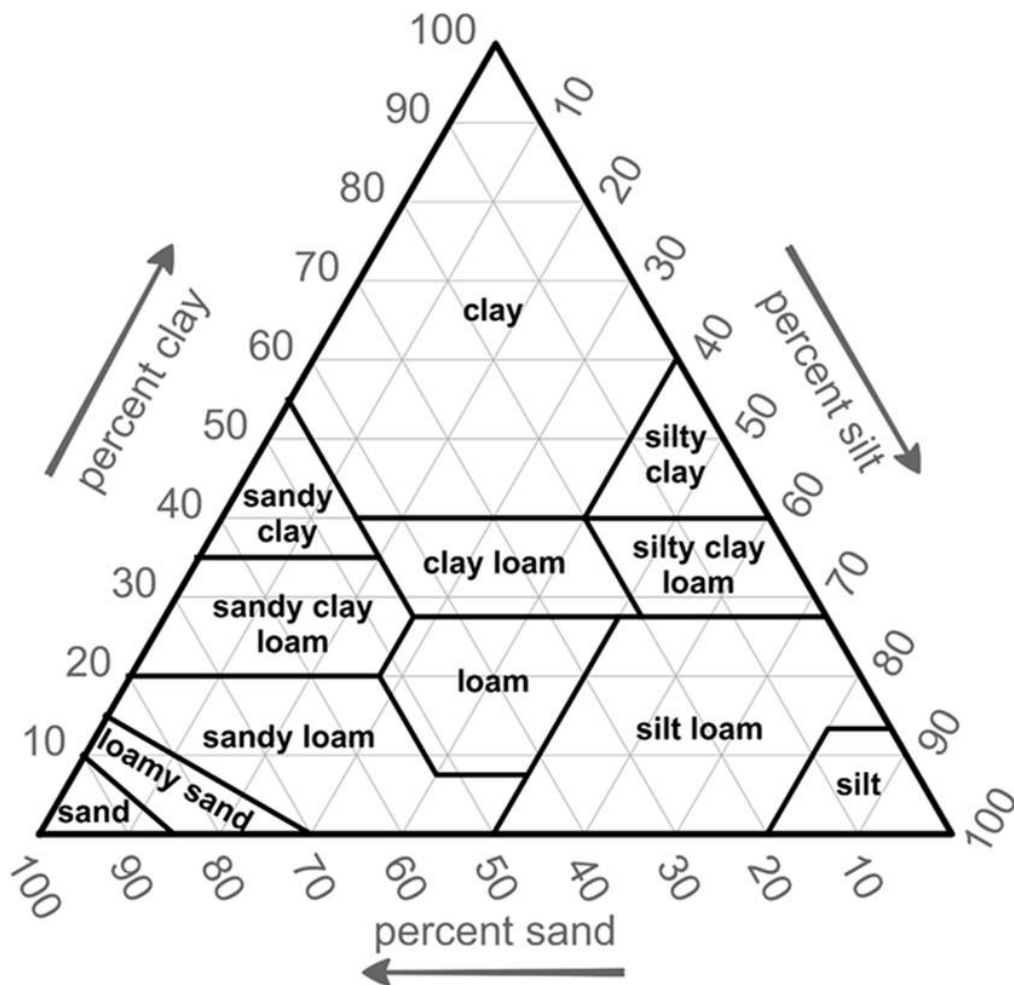
Linear unit of measure: US Survey Foot (1 ft = 1200/3937 m)

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FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM		STATE REQUIRED FILE NUMBER	
REV		DATE	
DRAWN BY		DESCRIPTION	
EXPLORATION LOCATION PLAN FOR THEWAYMAKER LLC BLOCK 106; LOT 20.03 40 EAGLE RIDGE WAY TOWNSHIP OF WEST ORANGE ESSEX COUNTY, NEW JERSEY			
 Engineering & Design		WOODCLIFF LAKE 300 Tice Boulevard Suite 101 Woodcliff Lake, NJ 07677 Phone: 845.352.0411 COLLIERS ENGINEERING & DESIGN, INC. DOING BUSINESS AS MASER CONSULTANTS	
SCALE: AS SHOWN	DATE: 02/27/25	DRAWN BY: FSD	CHECKED BY: AHE
PROJECT NUMBER: 24006174A	DRAWING NAME: B-EPL		
SHEET TITLE: FIELD BOOK: XX PAGE: XX			
EXPLORATION LOCATION PLAN			
SHEET NUMBER: B-01-ELP			

Appendix A

Test Pit Logs

USDA Classification System





Engineering & Design

300 Tice Blvd., Suite 101, Woodcliff Lake, NJ 07677

PROJECT: 40 Eagle Ridge Way

LOCATION: West Orange, NJ

PROJECT NO. 24006174A

TEST PIT: TP-01

PAGE 1 OF 1

GROUND ELEVATION (ft): +/-622
ELEV. FROM: Survey

GROUNDWATER: DEPTH (ft) DATE
First Encountered  N/E
At Completion (0 hrs.)  N/E

CONTRACTOR: Grabowski Construction, Inc.
EQUIPMENT: Excavator

FIELD OBSERVER: FSD
CHECKED BY: AHE

DATE STARTED 02/18/25

DATE FINISHED 02/18/25

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		10YR 3/6 Silt Clay Loam, 40% coarse fragments, subangular blocky, friable. (moist)
5		
10		120" -10.0 END OF TEST PIT AT 120 INCHES
15		
20		
25		
30		

NOTES: Exposed soils at surface.
Boulders encountered from the ground surface up to 10 ft below existing grades.
Stone backfill encountered at 10 ft below existing grades. Test pit terminated at the request of the general contractor.

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-01

PAGE 1 OF 1



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300 Tice Blvd., Suite 101, Woodcliff Lake, NJ 07677

PROJECT: 40 Eagle Ridge Way

LOCATION: West Orange, NJ

PROJECT NO. 24006174A

TEST PIT: TP-02

PAGE 1 OF 1

GROUND ELEVATION (ft): +/-624
ELEV. FROM: Survey

GROUNDWATER: DEPTH (ft) DATE
First Encountered  N/E _____
At Completion (0 hrs.)  N/E _____

CONTRACTOR: Grabowski Construction, Inc.
EQUIPMENT: Excavator

FIELD OBSERVER: FSD
CHECKED BY: AHE

DATE STARTED 02/18/25

DATE FINISHED 02/18/25

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		10YR 3/6 Silt Clay Loam, 20% coarse fragments, subangular blocky, friable. (moist)
5		
10		108" -9.0 END OF TEST PIT AT 108 INCHES DUE TO REFUSAL ON BEDROCK
15		
20		
25		
30		

NOTES: Exposed soils at surface.

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-02

PAGE 1 OF 1



Engineering & Design

300 Tice Blvd., Suite 101, Woodcliff Lake, NJ 07677

PROJECT: 40 Eagle Ridge Way

LOCATION: West Orange, NJ

PROJECT NO. 24006174A

TEST PIT: TP-03

PAGE 1 OF 1

GROUND ELEVATION (ft): +/-625
ELEV. FROM: Survey

GROUNDWATER: DEPTH (ft) DATE
First Encountered  N/E _____
At Completion (0 hrs.)  N/E _____

CONTRACTOR: Grabowski Construction, Inc.
EQUIPMENT: Excavator

FIELD OBSERVER: FSD
CHECKED BY: AHE

DATE STARTED 02/18/25

DATE FINISHED 02/18/25

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		10YR 3/6 Brown Loamy Sand, 50% coarse fragments, subangular blocky, friable. (moist)
5		66"
	-5.5	END OF TEST PIT AT 66 INCHES DUE TO REFUSAL ON BEDROCK
10		
15		
20		
25		
30		

NOTES: Exposed soils at surface.
Boulders encountered from the ground surface to 5.5 ft below existing grades.
Single ring infiltration test performed at 3.5 ft below existing grades.

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-03

PAGE 1 OF 1



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300 Tice Blvd., Suite 101, Woodcliff Lake, NJ 07677

PROJECT: 40 Eagle Ridge Way

LOCATION: West Orange, NJ

PROJECT NO. 24006174A

TEST PIT: TP-04

PAGE 1 OF 1

GROUND ELEVATION (ft): +/-622
ELEV. FROM: Survey

GROUNDWATER: DEPTH (ft) DATE
First Encountered  N/E
At Completion (0 hrs.)  N/E

CONTRACTOR: Grabowski Construction, Inc.
EQUIPMENT: Excavator

FIELD OBSERVER: FSD
CHECKED BY: AHE

DATE STARTED 02/18/25

DATE FINISHED 02/18/25

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		10YR 3/6 Silt Clay Loam, 40% coarse fragments, blocky, friable. (moist)
5		
10		108" -9.0 END OF TEST PIT AT 108 INCHES DUE TO REFUSAL ON BEDROCK
15		
20		
25		
30		

NOTES: Exposed soils at surface
Boulders encountered from the ground surface to 9 ft below existing grades.

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-04

PAGE 1 OF 1



Engineering & Design

300 Tice Blvd., Suite 101, Woodcliff Lake, NJ 07677

PROJECT: 40 Eagle Ridge Way

LOCATION: West Orange, NJ

PROJECT NO. 24006174A

TEST PIT: TP-05

PAGE 1 OF 1

GROUND ELEVATION (ft): +/-617
ELEV. FROM: Survey

GROUNDWATER: DEPTH (ft) DATE
First Encountered  N/E
At Completion (0 hrs.)  N/E

CONTRACTOR: Grabowski Construction, Inc.
EQUIPMENT: Excavator

FIELD OBSERVER: FSD
CHECKED BY: AHE

DATE STARTED 02/18/25

DATE FINISHED 02/18/25

DEPTH (ft.)	WATER SYMBOL	DESCRIPTION
0		10YR 3/6 Silt Loam, 20% coarse fragments, subangular blocky, friable. (moist)
5		
10		120"
		10YR 6/4 Silt Clay Loam, 0% coarse fragments, subangular blocky, friable. (GLE1 8/N soil staining)(moist)
		150"
		-12.5
15		END OF TEST PIT AT 150 INCHES DUE TO REFUSAL ON BEDROCK
20		
25		
30		

NOTES: Exposed soils at surface.
Boulders encountered from the ground surface to 10 ft. below existing grades.

Perched Water Conditions - Not Encountered
Est. Seasonal High Groundwater - Not Detected

TEST PIT: TP-05

PAGE 1 OF 1

Appendix B

In-situ Infiltration Test Result

Colliers Engineering & Design Project Number: 24006174A

Location: TP-03

Page: 1 of 1

Single Ring Infiltration Test Data:

Date: 2/18/2025

1. Test No.: TP-03

2. Depth: 42" (3.5 ft) Soil Description:

Loamy Sand

3. Presoak: Time Elapsed to Drain Completely (3"):

15 min

4. Rate of Fall Data For 1" Drop:

(Min. of 3 Meas. & Elapsed Time has Stabilized; min. 2 consecutive meas. within 5 sec.)

Meas. #	Elapsed Time		Observed Field Intake Rate (in/hr)
	(min)	(sec)	
1	10	37	5.7
2	9	40	6.2
3	9	37	6.2
4	9	40	6.2

If 2 consecutive meas. are >60 min, the test is ended & Observed Field Intake Rate is <1 in/hr.

5. Conversion to Hydraulic Conductivity (per chart below):

a. Average Stabilized Observed Field Intake Rate (in/hr):

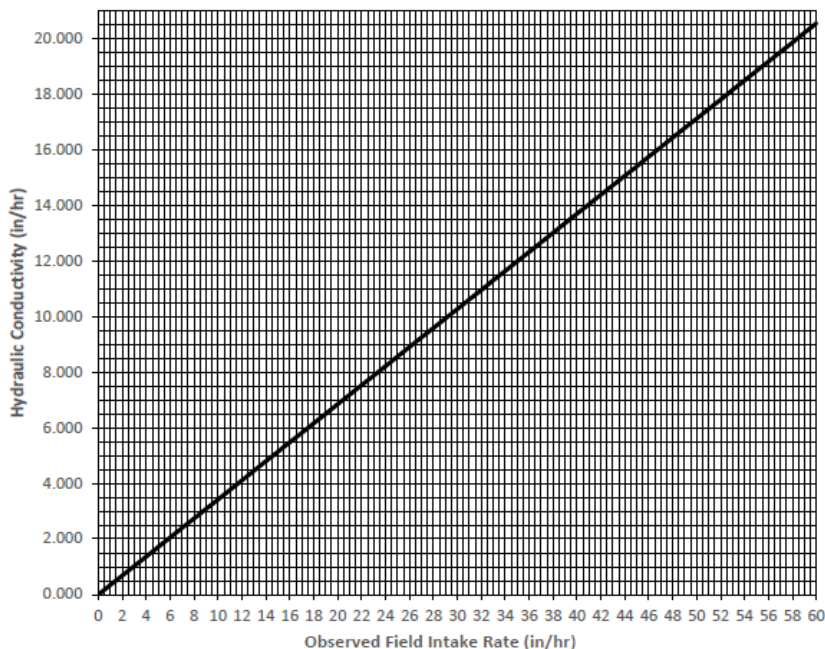
6.1

b. Soil Hydraulic Conductivity (in/hr):

2.1

(5a. x 0.3424 = 5b.)

Single Ring Test Conversion of
Observed Field Intake Rate to Hydraulic Conductivity



Source: New Jersey
Stormwater Best
Management Practices
Manual, Chapter 12: Soil
Testing Criteria, pg. 47,
(April 2022).

Notes: Test performed in 6" dia. metal ring with height of 6", set 3" into undisturbed soil layer.



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Appendix F -

Stormwater Conveyance System Conduit Outlet Protection Calculations

Line No.	Line ID	Flow Rate	Line Size (Rise x Span)	Line Type	Line Length	Invert Elev. Down	Invert Elev. Up	Line Slope	HGL Down	HGL Up	Minor Loss	HGL Junct	Dn Str Line No.
		(cfs)	(in)		(ft)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	
1	P-8	0.00	24	Cir	33.000	615.75	615.90	0.45	616.61	616.78	n/a	616.78	Outfall
2	P-77	0.00	12	Cir	22.114	615.75	615.90	0.68	616.78	616.78	n/a	616.78	1
3	P-12	0.00	30	Cir	32.815	613.68	614.01	1.01	616.78	616.78*	n/a	616.78	1
4	P-11	0.00	24	Cir	16.264	614.11	614.27	0.98	616.78	616.78*	n/a	616.78	3
5	P-10	0.00	15	Cir	65.973	614.37	615.03	1.00	616.78	616.79*	n/a	616.80	4
6	P-9	0.00	15	Cir	61.244	615.13	615.74	1.00	616.80	616.80	n/a	616.80	5
7	P-7	0.00	15	Cir	33.880	616.00	616.15	0.44	617.02	617.17	n/a	617.38	1
8	P-6	0.00	15	Cir	90.437	616.15	617.05	1.00	617.38	617.91	n/a	617.91	7
9	P-5	0.00	15	Cir	90.334	617.15	618.05	1.00	617.91	618.88	n/a	618.88	8
10	P-4	0.00	15	Cir	72.127	618.15	618.91	1.05	618.88	619.71	n/a	619.71	9
11	P-3	0.00	15	Cir	85.970	619.01	619.87	1.00	619.71	620.62	n/a	620.62	10
12	P-2	0.00	15	Cir	92.997	619.97	620.90	1.00	620.62	621.56	n/a	621.56	11
13	P-1	0.00	12	Cir	151.000	620.90	622.10	0.79	621.56	622.70	n/a	622.70	12
14	P-20	0.00	12	Cir	10.300	613.68	613.68	0.00	614.42	614.52	n/a	614.72	Outfall
15	P-19	0.00	12	Cir	138.747	613.78	615.17	1.00	614.72	615.79	n/a	615.79	14
16	P-17	0.00	12	Cir	80.159	615.18	615.97	0.99	615.79	616.50	n/a	616.50	15
17	P-16	0.00	12	Cir	74.113	616.07	616.81	1.00	616.50	616.96	n/a	616.96	16
18	P-18	0.00	12	Cir	24.604	615.18	615.44	1.06	615.79	615.81	n/a	615.81	15
19	P-21	0.00	12	Cir	23.685	613.78	614.02	1.01	614.72	614.35	n/a	614.35	14
20	P-24	0.00	12	Cir	16.000	617.35	617.50	0.94	617.84	618.07	n/a	618.07	16
21	P-15	0.00	24	Cir	50.597	609.00	610.00	1.98	615.50	615.52*	n/a	615.57	Outfall
	Notes: *Surcharged (HGL above crown).												

Calculated By: MN
 Checked By: JF

Conduit Outlet Protection Calculations

Scour Hole # S1

Design Parameters:

Design Storm Flow for 25 Year, Q	5.24 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW^1	0.50 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	12 in
	OFF

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 4.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 6.00$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 10.00$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 12.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 2.62 cfs per foot

• Case I: $y = 1/2 D_o$

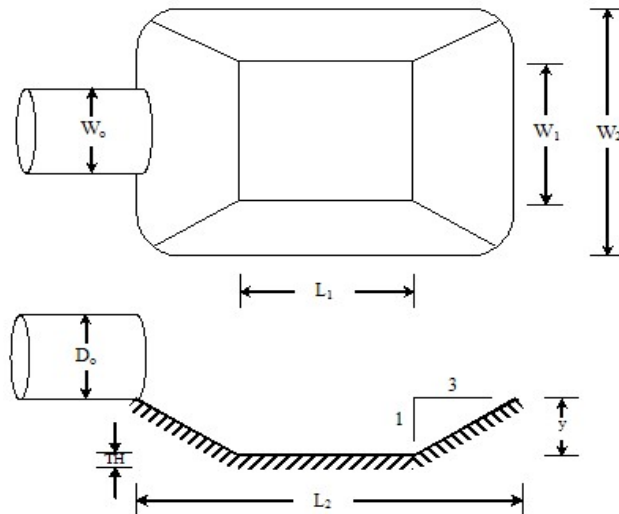
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 1.08$ in Therefore, use $d_{50} = 4$ in

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric $TH = 8$ in

• Case II: $y = D_o$

Median Stone, $d_{50} = \frac{0.0082 q^{1.33}}{TW} =$

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric



Notes:

1. The side slopes shall be 3:1 or flatter.
2. The bottom grade shall be 0.0% (level).
3. There shall be no overfall at the end of the apron or at the end of the culvert.
4. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50} . The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
5. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
6. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
7. Where the scour hole is to be placed within an existing or proposed waterway:
 - a. The scour hole sidewalls should be eliminated to maintain a smooth hydraulic line along the waterway bottom to avoid inviting turbulent flow from a sudden depression in the waterway.
 - b. If the flow in the waterway is greater than the flow from the proposed outlet, the rip-rap used to construct the scour hole should be sized based on the greater flow value according to the standard rip-rap.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.



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