



Engineering
& Design

Stormwater Management Report

June 2023 – Revised February 2025

Jernee Mill Industrial

Block 58, Lots 9 & 2.01

Borough of Sayreville, Middlesex County, New Jersey

Prepared for:

CP MD Jernee Mill Road Urban Renewal, LLC
32 Mount Kemble Avenue
Morristown, NJ 07960

Prepared by:

Daniel W. Busch, PE
N.J. Professional Engineer
License No. GE42093



Digitally signed by Daniel W. Busch
Date: 2025.03.03 18:17:09-04'00'

Colliers Engineering & Design

101 Crawfords Corner Road
Suite 3400

Holmdel, New Jersey 07733

Main: 877 627 3772

Colliersengineering.com

Project No. 10000657C

Table of Contents

Introduction.....	1
Site Characteristics	1
Floodplain	1
Soils	2
Wetlands	2
Stormwater Compliance Statement	2
Study Areas.....	2
Point of Analysis	3
Existing Hydrologic Analysis	3
Proposed Hydrologic Analysis	4
Stormwater Management Methodology.....	6
Stormwater Management Measures.....	6
Water Quantity (N.J.A.C. 7:8-5.6)	9
Water Quality (N.J.A.C. 7:8-5.5)	9
Groundwater Recharge (N.J.A.C. 7:8-5.4).....	11
Storm Sewer Design	11
Dam Safety	12
Soil Erosion and Sediment Control	12
Conclusion	13

Appendix A

Tax Map
USGS Map
FEMA Map
Aerial Map
Soil Survey Map
Watershed & Sub-Watershed Map

APPENDIX B

LSRP Letter

APPENDIX C

Existing Conditions Routing
Proposed Conditions Routing

APPENDIX D

Stormwater Conveyance Calculations

APPENDIX E

Conduit Outlet Protection Calculations
Emergency Spillway Analysis

APPENDIX F

Failure Analysis

APPENDIX G

Drainage Area Maps
Water Quality Exhibit

Introduction

This Stormwater Management Report is being submitted as part of the Preliminary and Final Major Site Plan for Jernee Mill Industrial, located on Block 58, Lots 2.01 & 9, as shown on Sheets 24 & 25 of the Official Tax Map of the Borough of Sayreville, Middlesex County, New Jersey. This report is prepared in accordance with Borough, local Soil Conservation District (SCD), and the New Jersey Department of Environmental Protection (NJDEP) standards, as well as current industry standards and practices for stormwater management. The purpose of this report is to summarize the stormwater management design as it pertains to the stormwater rules and to provide calculations to support the design.

This report should be reviewed concurrently with the most current set of site plans prepared by Colliers Engineering & Design entitled, "Preliminary and Final Major Site Plan for Jernee Mill Industrial, Block 58, Lots 2.01 & 9, Borough of Sayreville, Middlesex County, New Jersey".

Site Characteristics

The subject property contains approximately 46.485 acres with a limit of disturbance of approximately 15.809 acres located in the Borough of Sayreville. The subject property appears on the South Amboy, NJ quadrangle of the U.S. Geological Survey Map (U.S.G.S.) and is known as Block 58, Lots 2.01 and 9, per the Borough of Sayreville Tax Map. See Appendix for maps.

The project site is located along the west side of Jernee Mill Road (Middlesex County Route 675), opposite Red Oak Lane. The site is bound by Jernee Mill Road to the east and the South River to the west. Pond Creek is located along the northern property line and Duck Creek flows along the southern property lines, both of which flow into the South River. Portions of the site are within the flood hazard areas of the South River and tributaries. The eastern portion of the site along Jernee Mill Road is primarily wooded, with the exception of a commercial property (Lot 2.01) that is mostly paved. The central portion of the site contains a closed Superfund Site landfill, and the redevelopment is consistent with the Superfund remediation that was done.

Floodplain

Floodplains are mapped for the project site and surrounding area on the Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Map (FIRM), Panel number 34023C0153G dated January 31, 2014. A copy has been provided within the Appendix. The FIRM has mapped the majority of the site, excluding the upper part of the landfill, is within the AE Zone with a base flood elevation of 14 feet.

Both Pond Creek that runs along the north of the property and Duck Creek which runs along the south have 50' riparian zones. Both of these streams are tidally influenced.

Soils

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

Soil Symbol	Soil Name	Hydrologic Soil Group
GamB	Galloway loamy sand, 0-5% Slopes	A/D
HbmkB	Hammonton loamy sand, clayey substratum, 0-5% Slopes	B
PssA	Psamments, 0-3% Slopes	A
PstA	Psamments, sulfidic substratum, 0-3% Slopes	A

Test pits and soil borings were performed on site to determine the seasonal high-water table and permeability. A total of seventeen (17) test pits and twenty-nine (29) test borings were advanced to evaluate onsite soil conditions relative to stormwater management design, with Standard Penetration Test (SPTs) were conducted for all soil borings. For additional soils information refer to the following report:

- “Geotechnical Engineering Report, Jernee Mill Industrial” prepared by Geo-Technology Associates, Inc., dated March 29, 2024.

Wetlands

The NJDEP verified the location and resource value of freshwater wetlands on the subject property through an LOI issued June 29, 2023. The LOI indicated that the freshwater wetlands onsite are of either ordinary or intermediate resource value and, as such, have either no transition area (buffer) or a 50’ wide transition area (buffer) associated with them.

Stormwater Compliance Statement

The proposed stormwater management measures are designed to meet Borough of Sayreville, local Soil Conservation District (SCD), NJDEP, and current industry standards and practices for stormwater management. The site complies with the requirements for Green Infrastructure (GI), water quantity, water quality, groundwater recharge, and erosion control. Compliance with each of these requirements is outlined in greater detail below.

Study Areas

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

Point of Analysis

Runoff from the subject site is analyzed collectively at the South River. As the site is tidally influenced, the entire site is analyzed for stormwater reductions at this point, where all site drainage converges. In addition, four (4) points of discharge are analyzed to demonstrate compliance with the point of discharge stability in accordance with the Standards for Soil Erosion & Sediment Control in New Jersey.

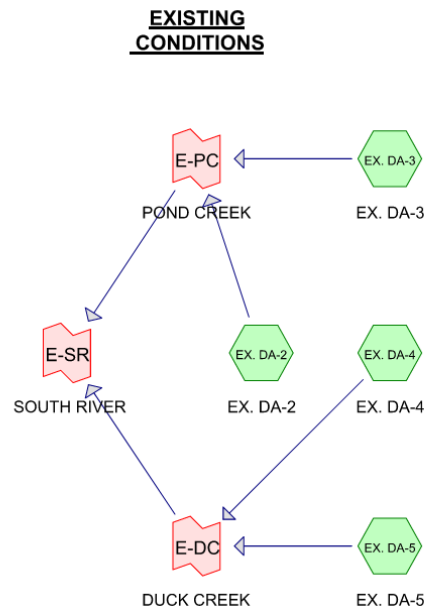
Existing Hydrologic Analysis

Under existing conditions, runoff leaves the site and drains to the north, west, and south towards the streams along the property lines. Pond Creek is located along the northern property boundary and Duck Creek is located along the southern boundary; both streams flow into the South River along the western boundary, which ultimately discharges into the Raritan River & Raritan Bay. A detailed breakdown of the drainage areas and the tributary drainage areas is described below:

Existing Drainage Areas:

EDA-2	The eastern portion of the grassed landfill area that flows towards Pond Creek and Duck Creek. Although located within soils classified as HSG A per USDA NRCS Web Soil Survey, this grassed area is analyzed as impervious surface due to the existing landfill cap & liner which limits infiltration into the subsoil, leaving all rainfall to drain as surface runoff. This area is analyzed separately from the western portion of the landfill (EDA-1) since they have different times of concentration.
EDA-3	The northeastern, wooded portion of the site that flows north towards Pond Creek before the stream flows into the South River.
EDA-4	The eastern, wooded portion of the site along Jernee Mill Road that flows towards Duck Creek to the south before the stream flows into the South River.
EDA-5	The southeastern, developed portion of the site that flows towards Duck Creek to the south before the stream flows into the South River. This area contains 1.25 Acres of impervious surface.

Existing Conditions Network Diagram:



Proposed Hydrologic Analysis

Under proposed conditions, runoff from the site will be managed by several interconnected stormwater BMPs and discharged through multiple stormwater outfalls near Pond Creek and Duck Creek. Primarily undeveloped portions around the perimeter of the site will continue to runoff to Pond Creek, Duck Creek, and the South River as done under existing conditions. Each proposed BMP and tributary drainage area is described below:

Proposed BMPs:

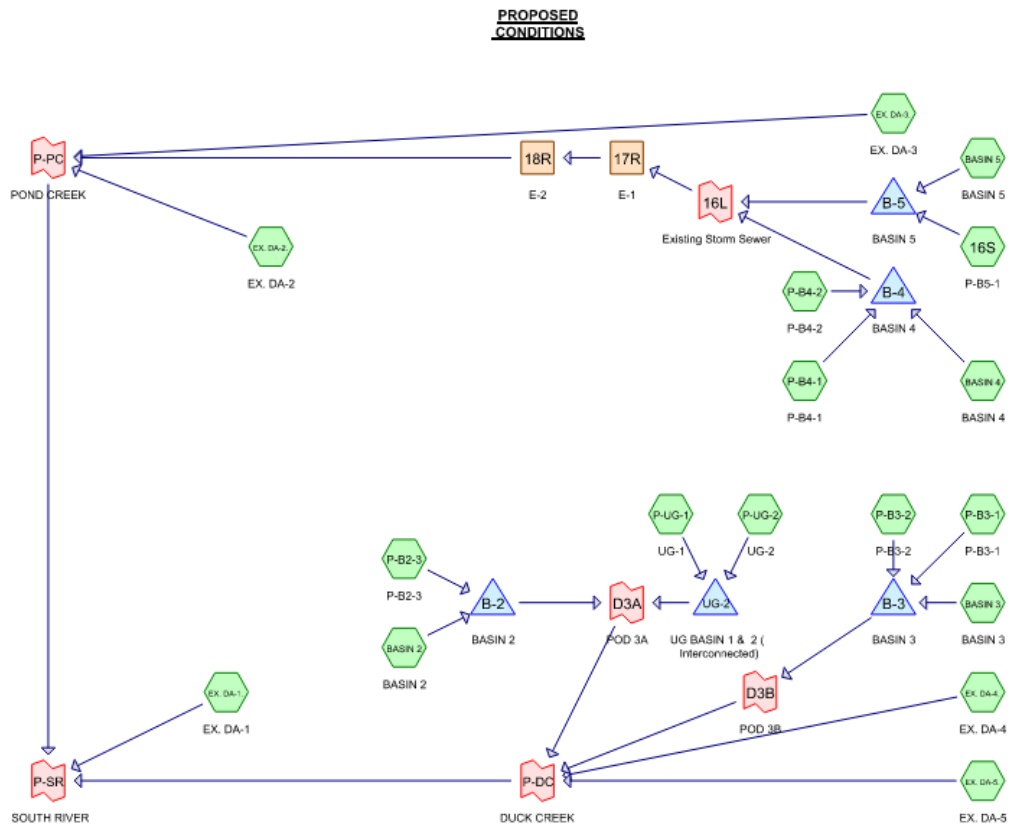
Basin 2	This basin receives and treats runoff from the parking area, grass areas, and the circulation driveways south of the building. Excess runoff from Porous Pavement 3 will be conveyed to this basin for additional water quantity detention. An outlet control structure will attenuate the runoff before discharging to an outfall at a wetland area near Duck Creek (POD 3A).
Basin 3	This basin receives and treats runoff from the southern portion of the loading area for the building and the circulation driveway south of the building. An outlet control structure will attenuate the runoff before discharging to an outfall at a wetland area near Duck Creek (POD 3B).

Basin 4	This basin receives and treats runoff from the parking areas for the proposed building, plus a portion of the expanded Jernee Mill Road and adjacent grass / wooded areas northeast of the building. An outlet control structure will attenuate the runoff before discharging to an existing storm sewer system within Jernee Mill Road, which ultimately discharges to Pond Creek.
Basin 5	This basin receives and treats runoff from the northern portion of the loading area of the building and the circulation driveway north of the building. An outlet control structure will attenuate the runoff before discharging to an existing storm sewer system within Jernee Mill Road, which ultimately discharges to Pond Creek.
Underground Detention Basin 1 & 2	This underground basin receives runoff from the building roof area. An outlet control structure will attenuate the runoff before discharging to an outfall at a wetland area near Duck Creek (POD 3A).

Proposed Drainage Areas:

EDA-1	Undetained portion of EDA-2 that flows towards Pond Creek.
EDA-2	Undetained portion of EDA-2 that flows towards Pond Creek.
EDA-3	Undetained portion of EDA-3 that flows towards Pond Creek.
EDA-4	Undetained portion of EDA-4 that flows towards Duck Creek.
EDA-5	Undetained portion of EDA-5 that flows towards Duck Creek.
BASIN-2	Area of proposed Basin 2.
P-B2-3	Area of proposed development draining to Basin 2 – grass area southeast of building.
BASIN-3	Area of proposed Basin 3.
P-B3-1	Area of proposed development draining to Basin 3 – driveway south of building.
P-B3-2	Area of proposed development draining to Basin 3 – southern portion of loading area for building.
BASIN-4	Area of proposed Basin 4.
P-B4-1	Area of proposed development draining to Basin 4 – portion of expanded Jernee Mill Road and adjacent grass / wooded areas northeast of building.
P-B4-2	Area of proposed development draining to Basin 4 – parking areas along south and east sides of building.
BASIN-5	Area of proposed Basin 5.
P-B5-1	Area of proposed development draining to Basin 5 – northern portion of loading area for building & circulation driveway north of building.
P-UG-1	Area of proposed development draining to Underground Detention Basin 1 – northern half of building roof
P-UG-2	Area of proposed development draining to Underground Detention Basin 1 – southern half of building roof

Proposed Conditions Network Diagram:



Stormwater Management Methodology

Modeling and analysis of existing and proposed conditions is performed utilizing HydroCAD v10.20-2g software by HydroCAD Software Solutions and the Soil Conservation Service’s Unit Hydrograph method with the Delmarva Unit Hydrograph. Time of concentration (Tc) calculations are based on the method prescribed in the National Engineering Handbook (NEH), Part 630, Chapter 15. Rainfall data, except for the NJDEP water quality storm, is based on the NEH, Part 650, Chapter 2, New Jersey Supplement. NOAA Type D storm distribution was utilized.

Stormwater Management Measures

Several stormwater management Best Management Practices (BMPs) are proposed to address the water quality and SCD water quantity requirements of the proposed development. The design of these BMPs is outlined below.

Green Infrastructure (GI). The proposed stormwater management design will utilize green infrastructure to meet water quality requirements. Proposed basins 2, 3, 4 and 5 are designed as small-scale bioretention basins, and multiple areas of pervious pavement are also proposed. The proposed contributory drainage area for each small-scale basin and pervious paving system is summarized below.

Small-Scale Basins¹

Basin	BMP Type	Contributory Drainage Area (Acres)
2	Small-Scale Bio-Retention Basin (w/ underdrain)	1.496
3	Small-Scale Bio-Retention Basin (w/ underdrain)	1.381
4	Small-Scale Bio-Retention Basin (w/ underdrain)	1.545
5	Small-Scale Bio-Retention Basin (w/ underdrain)	2.495

¹ Maximum contributory area for small-scale basins is 2.5 acres per N.J.A.C. 7:8-5.3(b).

Underground Detention Basin (Non-GI). As the proposed BMPs listed above achieve compliance with the water quality requirements of N.J.A.C. 7:8 for the site, Underground Detention Basin 1 & 2 are Non-GI BMPs designed to provide detention for SCD compliance. The surface systems capture runoff from the building’s roof; therefore, pretreatment will be provided by leaf screens. This basin is designed as a perforated HDPE pipe system with eighteen inches of clean stone on the end caps, six inches under the pipe system, 25 inches of spacing, eighteen inches of stone on the sides, and six inches of stone placed on top and wrapped with an impermeable liner around the entire system to avoid infiltration into the subsoil.

Basin and routing information is outlined below:

Basin	SHWT / GW EL	Top of Stone	Bottom of Stone	Separation from SHWT / Landfill Cap EL.	Pipe Invert of System EL.	Lowest Orifice EL
UG 1 & 2	±7.20 (B-1)	14.75	9.25	2.05	9.75	11.00

The basin performance during the 100-year storm event is summarized in the table below:

Basin	Peak Inflow (Cfs)	Peak Outflow (Cfs)	Peak Volume (Ac-Ft)	Water Quality Volume (Ac-ft)	Max WSE (Ft)
UG 1 & 2	39.25	25.92	1.925	0.495	14.45

Small-Scale Bioretention Basins (Table 5-1 BMPs). Small-scale bioretention basins are proposed primarily to provide water quality treatment. However, the basins also contribute to water quantity control for SCD compliance.

Basins 3, 4 and 5 are designed with an eighteen-inch-deep bioretention soil bed with terrestrial forested community vegetation to provide 80% TSS removal. Basin 2 is designed with a twenty four-inch-deep bioretention soil bed with terrestrial forested community vegetation to provide 90% TSS removal. As the subject site contains a landfill and contaminated soils, all proposed bioretention basins are designed with underdrains.

An outlet control structure (OCS) is proposed to control the peak rate of discharge from each basin. The lowest orifice on each OCS is positioned to retain the contributory water quality storm runoff volume in the basin, while not exceeding a max. separation of 12-inches above the basin bottoms. Storm events in excess of the water quality design storm are passed through the OCS of each basin and conveyed downstream.

BMP compliance is outlined below:

Basin	SHWT / GW EL	Bottom of Stone	Separation from SHWT / Landfill Cap EL.	Basin Bottom EL	Lowest Orifice EL
2	±11.50 (EG) ¹	11.97	0.47	15.00	16.00
3	± 6.00 (4.0' bgs - SPP-1)	7.00	1.00	10.50	11.30
4	± 8.25 (4.0' bgs - TP-2)	9.45	1.20	12.60	13.60
5	± 8.25 (4.0' bgs - TP-2)	9.45	1.20	12.60	13.90

¹ SHWT / GW elevation conservatively assumed at existing landfill liner (±2' below existing grade in landfill).

The basin performance during the 100-year storm event is summarized in the table below:

Basin	Peak Inflow (Cfs)	Peak Outflow (Cfs)	Peak Volume (Ac-Ft)	Max WSE (Ft)
2	13.03	12.08	0.311	17.82
3	14.29	12.02	0.442	12.28
4	9.75	8.25	0.282	15.37
5	16.87	13.32	0.550	15.51

A 4-inch underdrain at 0.5% slope is proposed for all basins. The capacity of the 4-inch pipe at that slope is 0.19 cfs which is 684 cubic foot / hour. The basins impound volume of runoff from the water quality storm and drain times are provided in the table below:

Basin	Water Quality Storm Volume (Ac -ft)	Water Quality Storm Volume Ac -ft * 43,560 ft ² (cf)	Drain time = Volume / Drain Rate (hrs)
2	0.120	5,227	18.85
3	0.126	5,488	36.85
4	0.089	3,885	18.10
5	0.212	9,215	21.85

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

As previously mentioned, the site drains to the South River, which is tidally influenced in this location and ultimately discharges to the Raritan Bay. As such, any increase in stormwater runoff volume resulting from the proposed development would not increase flood damages below the point of discharge. Therefore, in accordance with N.J.A.C. 7:8-5.6(b).4, a stormwater runoff quantity analysis is not required. This means peak flow reductions and stormwater management facilities for volume attenuation are not required.

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

For major developments resulting in an increase of one-quarter acre or more of motor vehicle surface, NJDEP regulations require the net increase in motor vehicle surface be treated to 80% TSS removal. Motor vehicle surfaces replacing existing motor vehicle surfaces are required to maintain the existing level of treatment, or be treated to 50% TSS removal, whichever is greater. Since the existing developed property does not have any existing water quality treatment, a 50% TSS removal rate is required for the existing motor vehicle impervious surfaces to be replaced. Calculations are provided below to demonstrate compliance with water quality standards.

In accordance with N.J.A.C. 7:8-5.2(e), a Linear Development Waiver is requested from strict compliance with the stormwater runoff quality requirements of N.J.A.C. 7:8-5.5, for the proposed widening of Jernee Mill Road along the project frontage.

The majority of the existing site is not curbed, and the stormwater flows off of the edge of pavement onto the project site where it may be receiving water quality treatment from the existing vegetation. Middlesex County will require the applicant to widen Jernee Mill Road and construct concrete curb along the project frontage. Per this County requirement, there is a public need for the project that cannot be accomplished by any other means, and the project meets Condition 1 under N.J.A.C. 7:8-5.2(e).

There is a high point in Jernee Mill Road at the approximate location of the northern proposed site access driveway. A portion of the stormwater runoff (447 SF of proposed roadway widening) flowing to the south of the site will be collected by a new proposed inlet in Jernee Mill Road, conveying runoff to Basin 4 which provides 80% TSS removal. As the proposed site grades are elevated to stay above the tidal flood hazard area elevation and groundwater elevation, the proposed site & stormwater BMPs are higher than the existing grades along Jernee Mill Road. As such, the proposed development cannot collect runoff from the remaining 7,494 SF of the roadway widening. Based upon this info, the selected option complies with the requirements of N.J.A.C. 7:8-5.5 for the proposed road widening to the maximum extent possible, and the project meets Condition 2 under N.J.A.C. 7:8-5.2(e).

Due to the existing site constraints such as the flood hazard area elevation and the proximity to the on-site wetlands, Pond Creek, and Duck Creek, collecting and treating the proposed widening area will result in increased disturbance to regulated areas and neighboring properties along Jernee Mill Road. To meet the requirements of N.J.A.C. 7:8-5.5 for the proposed road widening, there may be impacts to existing structures currently in use. As such, the project meets Condition 3 under N.J.A.C. 7:8-5.2(e).

As the existing road surface for Jernee Mill Road is located within a public right-of-way, the applicant does not own or have rights to areas that would provide additional opportunities to mitigate for requirements of N.J.A.C. 7:8-5.5 for the proposed road widening. As such, the project meets Condition 4 under N.J.A.C. 7:8-5.2(e).

A waiver is requested to allow the existing and proposed pavement to sheet flow through the existing vegetation without additional treatment.

Required Water Quality Treatment

Motor Vehicle Surface	TSS Removal (%)	M. V. Surface Area (Ac.)	TSS * Area (Ac.-%)
Existing Motor Vehicle Surface to Remain or Be Reconstructed	50%	0.963	0.482
Proposed New Motor Vehicle Surface	80%	4.596	3.677
Total		5.559	4.159
Required TSS Removal			74.82%

Provided Water Quality Treatment

BMP	TSS Removal (%)	Motor Vehicle Surface (Ac.)	TSS * MVS (Ac.-%)
Small-Scale Bioretention Basins 3, 4 & 5	80%	3.869	3.095

Small-Scale Bioretention Basin 2	90%	1.214	1.092
No Treatment	0%	0.476	0.000
Total		5.559	4.187
Provided TSS Removal			75.31%

The proposed stormwater management design provides water quality treatment in excess of what is required for the proposed development.

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

The groundwater recharge standards at N.J.A.C. 7:8-5.4 apply to major developments except for certain cases as described at N.J.A.C. 7:8-5.4(b)3.i. The regulations (N.J.A.C 7:8) allow for an exemption for areas where recharge would be inconsistent with NJDEP approved site remediation in accordance with N.J.A.C. 7:8 5.4 (b)3.i which states:

“The following types of stormwater shall not be recharged:” areas where recharge would be inconsistent with a remedial action work plan approved pursuant to the Administrative Requirements for the Remediation of Contaminated Sites rules, N.J.A.C. 7:26C, or a Department approved landfill closure plan.”

The project site is the location of a closed Superfund Site landfill, and a Remedial Action Work Plan was approved for the site. Recharge is inconsistent with the functionality of the capping and the Department approved RAWP. Therefore, no recharge measures are proposed.

A letter from the site’s LSRP attesting to same has been included in the appendix.

Storm Sewer Design

The proposed storm sewer is designed in accordance with current industry standards and the Borough ordinance, particularly section 26-99.3.2E. This section requires the pipe size determined to be adequate for the runoff computed shall be increased by at least one standard pipe size in order to provide adequate allowance for normal accumulation of sediment and debris. The minimum proposed pipe size is 15 inches.

The pipes were initially sized to provide a full flow pipe capacity equal to or greater than the peak flow discharging through the pipe. The proposed storm sewers were sized to convey the 25-year storm frequency using the Rational Method with a minimum time of concentration of 10 minutes and a ‘C’ coefficient of 0.99. PDFs of this excel spreadsheet analysis are provided in the Appendix. Once the initial pipe design was completed, each pipe section was upsized one standard pipe diameter in accordance with the Borough of Sayreville design standards.

The upsized pipes were then modeled using the 2-year tailwater elevation from each BMP to establish a hydraulic grade line for the storm systems. Hydraflow v96 Software by Autodesk was

utilized for this design, using the Trenton Intensity-Duration-Frequency Table and the same minimum time of concentration of 10 minutes and 'C' coefficient of 0.99.

The pipe diameters shown on the Plans are based on the upsized design. Refer to the Appendix for full pipe calculations.

Dam Safety

Basin 2 meets the definition of a Class IV dam. Below is a summary of the Class IV dam criteria in relation to Basin 2:

- Drainage area must be less than 150 acres. (*Tributary area = 1.496 acres*) **Complies**
- Dam height is less than 15 feet. (*Proposed height = 10.00 feet*) **Complies**
- Impound less than 15 acre-feet of water. (*Proposed volume = 0.335 acre-feet*) **Complies**
- Dam must pose low hazard potential. (*No structures immediately downstream*) **Complies**
- Spillway capacity must safely pass 150% of the 24-hour, 100-year frequency Type III storm (or any later storm type adopted by the USDA NRCS). **Complies**
- Minimum allowable diameter of pipe conduit used for principal spillway is 12 inches. (*24" proposed*). **Complies**

Soil Erosion and Sediment Control

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

- Silt Fences
- Stormwater Management Basins
- Stabilized Construction Access
- Topsoil Stockpiles
- Storm Sewer Inlet Protection
- Temporary and Permanent Stabilization
- Emergency Spillways

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

Point of discharge stability is provided at the stabilized discharge locations as follows:

- Point of Discharge 2 - Stability is provided by discharging to a wetlands area with a slope of less than 2.0%. Slopes of less than 2.0% are allowable slopes for sandy loam, loam per Table 21-1. A scour hole is provided at the end of the proposed outfall discharge pipe. Reductions for the 2 and 10-year storm are provided later in this report.
- Point of Discharge 3A - Stability is provided by discharging to a wetlands area with a slope of less than 2.0%. Slopes of less than 2.0% are allowable slopes for sandy loam, loam per Table 21-1. A scour hole is provided at the end of the proposed outfall discharge pipe. Reductions for the 2 and 10-year storm are provided later in this report.
- Point of Discharge 3B - Stability is provided by discharging to a wetlands area with a slope of less than 2.0%. Slopes of less than 2.0% are allowable slopes for sandy loam, loam per Table 21-1. A scour hole is provided at the end of the proposed outfall discharge pipe. In addition, the flow for the 2 and 10-year storm are under 2.0 cfs.
- Basins 4 & 5- Stability is provided by discharging to an existing, stable piped conveyance system within Jernee Mill Road.

Off-site stability downstream of the point of discharge is met at the Point of Analysis by complying with required peak rate reductions for the 2 and 10-year storm events. The following tables provide a summary of existing, allowable, and proposed flows to the point of analysis. Full calculations are provided in the Appendix.

Existing, Allowable and Proposed Peak Rates to Point of Discharge 2

Storm (Year)	EX. Runoff (cfs) (A)	Reductions (B)	Allowable (A*B=C)	PR. Runoff (cfs)
2	15.36	50%	7.68	5.70
10	24.98	75%	18.74	14.49

Existing, Allowable and Proposed Peak Rates to Point of Discharge 3A

Storm (Year)	EX. Runoff (cfs) (A)	Reductions (B)	Allowable (A*B=C)	PR. Runoff (cfs)
2	4.97	50%	2.49	1.31
10	8.47	75%	6.35	4.40

Conduit outlet protection was provided at outfalls into basins (designed based upon the 25-year frequency storm event) and at outfalls of basin discharges (designed based upon the 100-year frequency storm event). For detailed calculations, refer to the Appendix.

Conclusion

The stormwater design for the proposed development meets or exceeds the Borough, SCD, and NJDEP regulations for green infrastructure, water quantity, water quality, groundwater recharge, and erosion control.

Appendix A

Tax Map

USGS Map

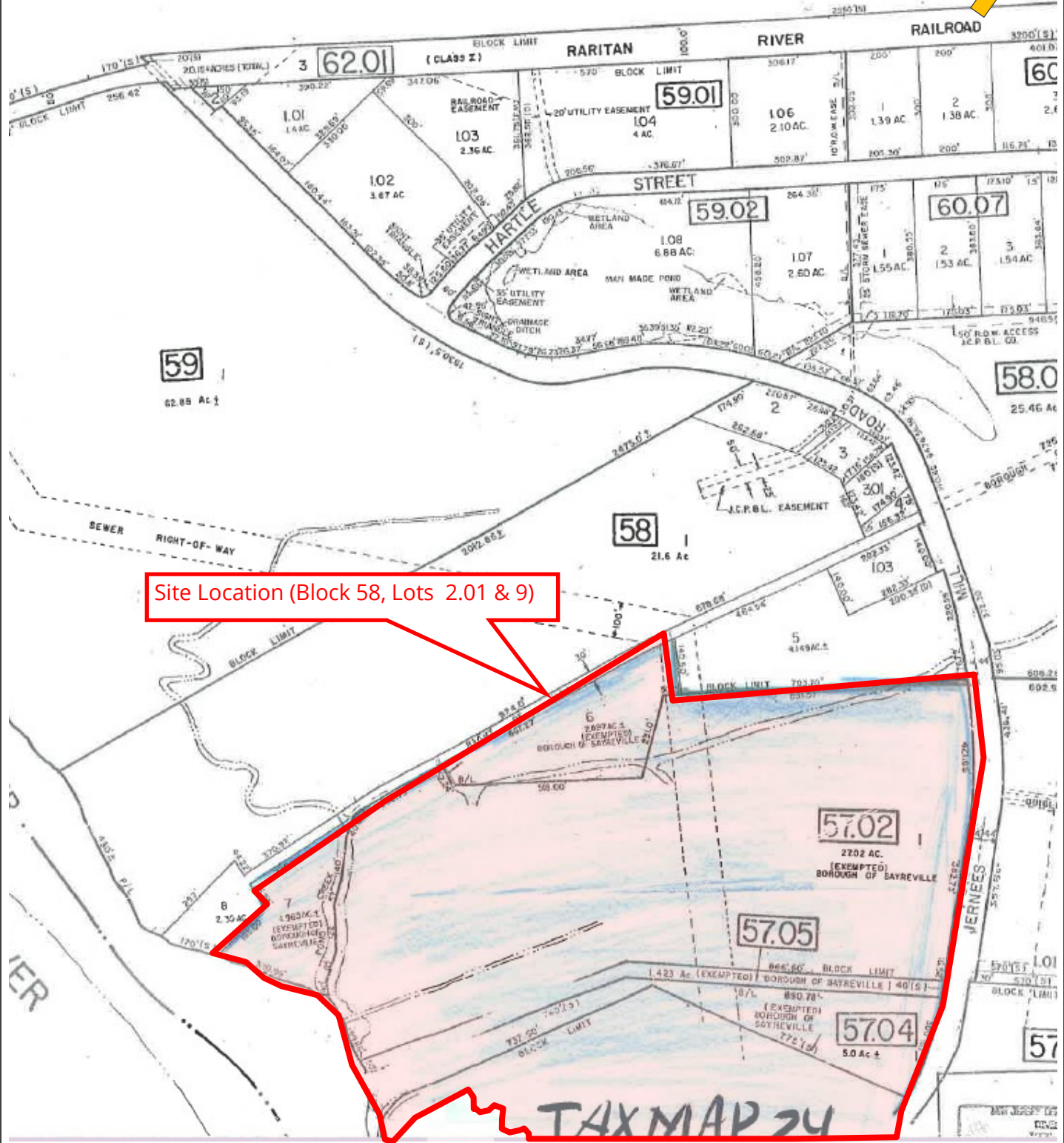
FEMA Map

Aerial Map

Soil Survey Map

Watershed & Sub-Watershed Map

Note - Site formerly known as Block 56, Lots 1.01, 2.01, 2.02; Block 57.02, Lot 1; Block 57.04, Lot 1; Block 57.05, Lot 1; and Block 58, Lots 6 & 7



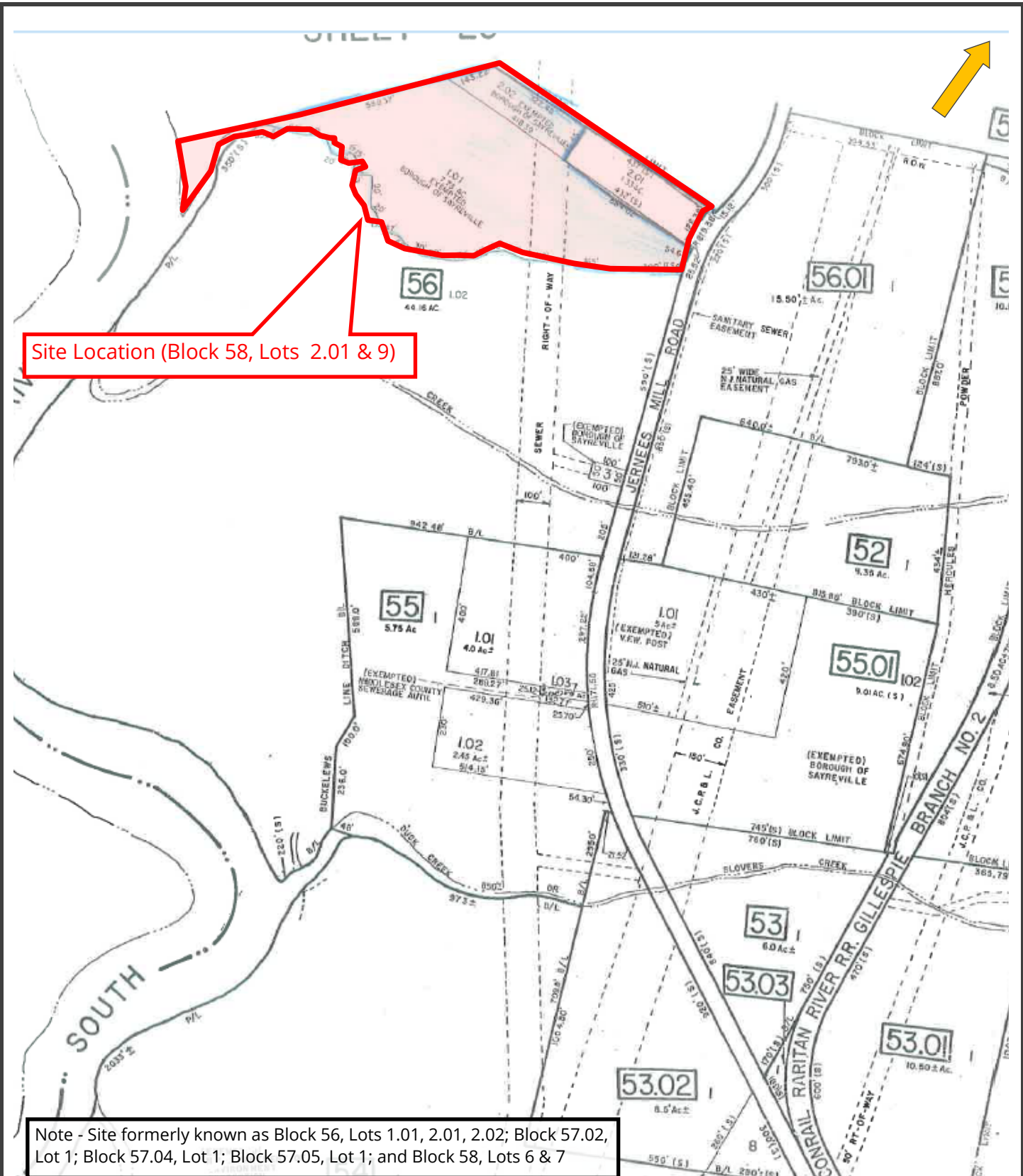
Site Location (Block 58, Lots 2.01 & 9)



Corporate Headquarters
101 Crawfords Corner
Road, Suite 3400
Holmdel, New Jersey
07733
T: 877 627-3772

Municipal Tax Map (1 of 2)
Block 58, Lots 2.01 & 9
Sayreville Borough, Middlesex County, NJ
Source: Sayreville Tax Map Sheet 25

Scale: Not to Scale
Date: October 4, 2022
CED Project No. 10000657C



Corporate Headquarters
 101 Crawfords Corner
 Road, Suite 3400
 Holmdel, New Jersey
 07733
 T: 877 627-3772

**Engineering
 & Design**

Municipal Tax Map (2 of 2)

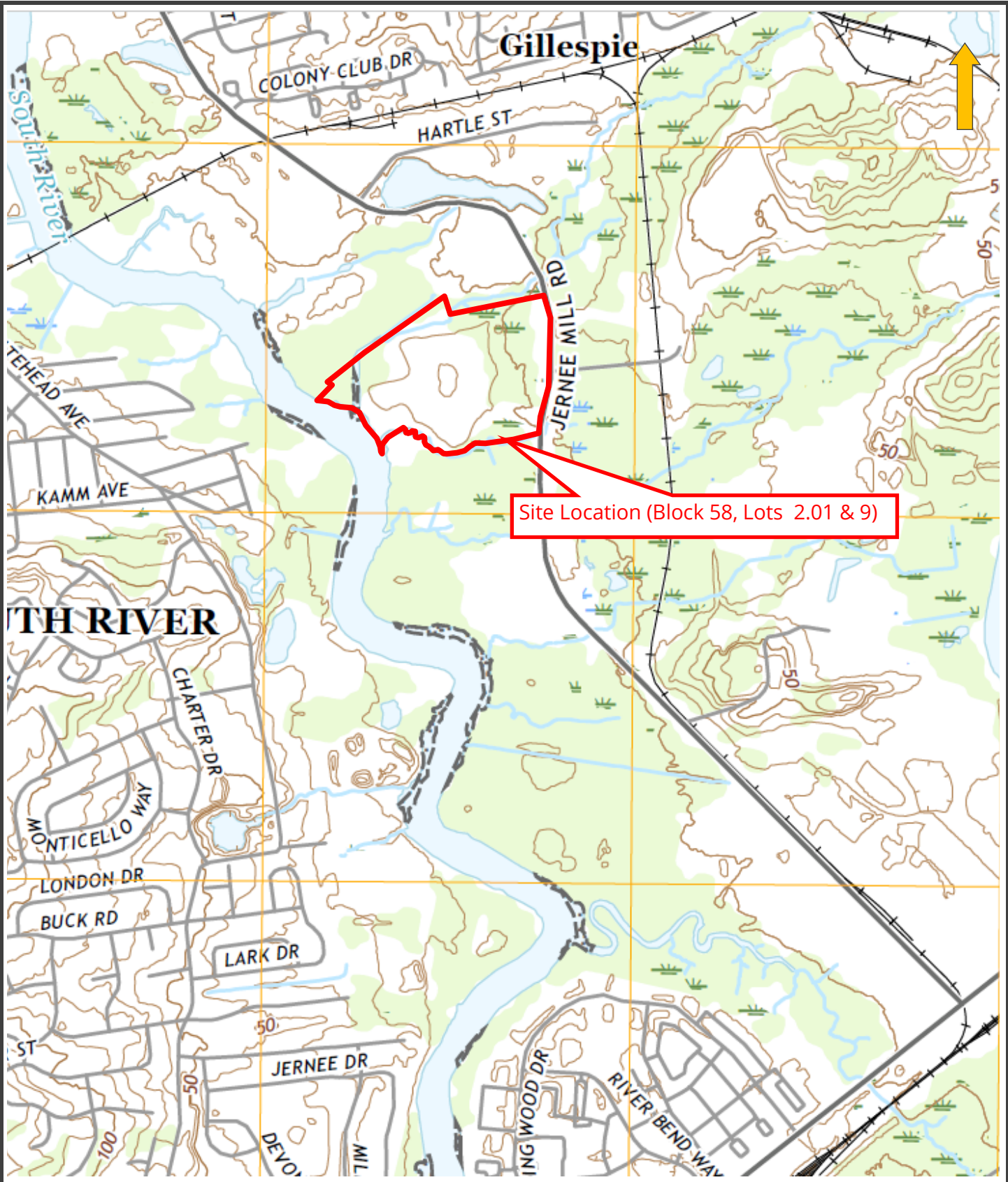
Block 58, Lots 2.01 & 9
 Sayreville Borough, Middlesex County, NJ

Source: Sayreville Tax Map Sheet 24

Scale: Not to Scale

Date: October 4, 2022

CED Project No. 10000657C



Site Location (Block 58, Lots 2.01 & 9)



Corporate Headquarters
 101 Crawfords Corner
 Road, Suite 3400
 Holmdel, New Jersey
 07733
 T: 877 627-3772

**Engineering
 & Design**

USGS Map

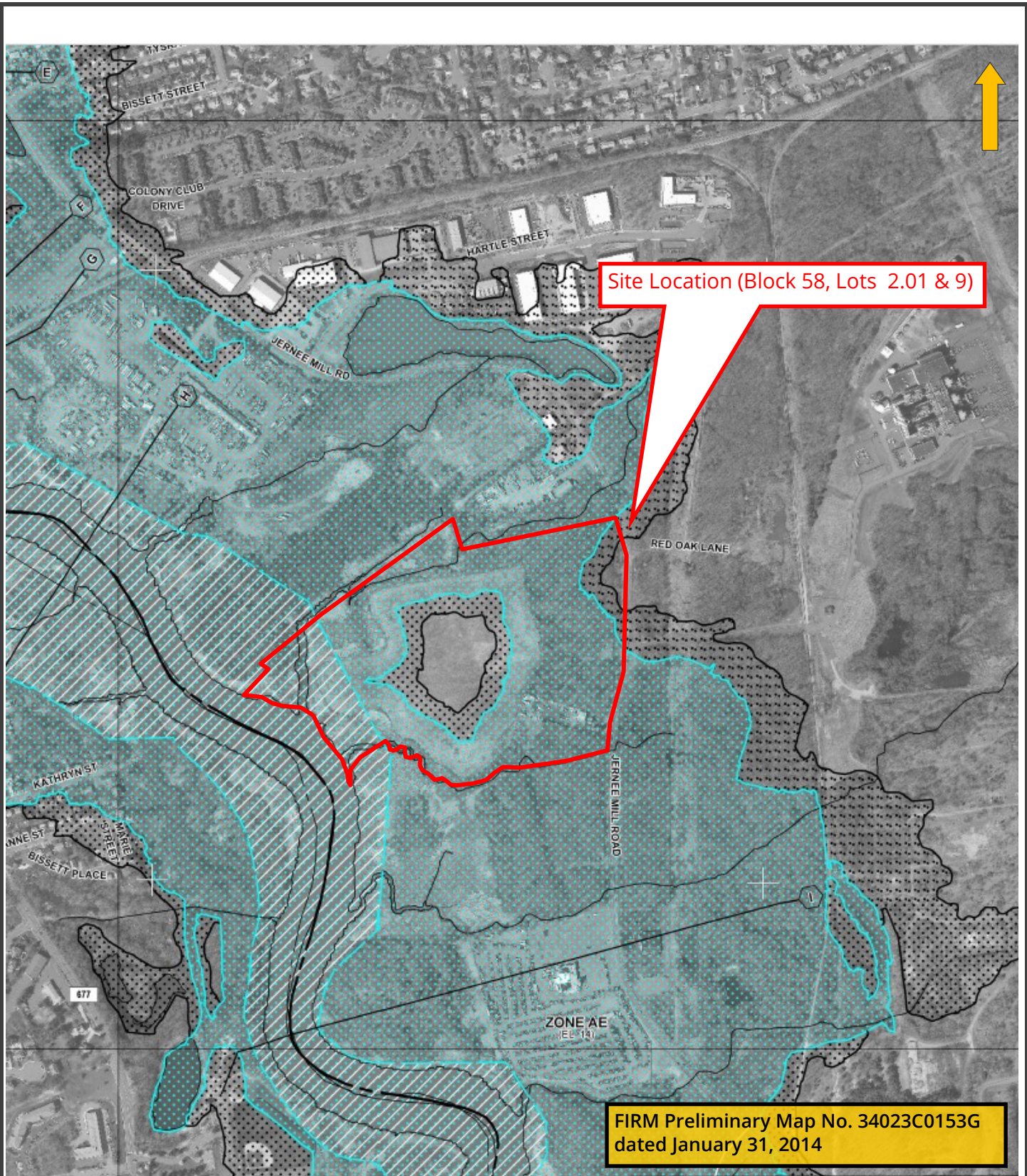
Block 58, Lots 2.01 & 9
 Sayville Borough, Middlesex County, NJ

Source: USGS South Amboy, NJ, NY Quadrangle 2019

Scale: Not to Scale

Date: October 4, 2022

CED Project No. 10000657C



Site Location (Block 58, Lots 2.01 & 9)

FIRM Preliminary Map No. 34023C0153G
dated January 31, 2014



Corporate Headquarters
101 Crawfords Corner
Road, Suite 3400
Holmdel, New Jersey
07733
T: 877 627-3772

FEMA FIRM Map
Block 58, Lots 2.01 & 9
Sayreville Borough, Middlesex County, NJ

Source: FIRM Preliminary Map No. 34023C0153G

Scale: Not to Scale

Date: May 11, 2023

CED Project No. 10000657C



Site Location (Block 58, Lots 2.01 & 9)



Engineering & Design

Corporate Headquarters
101 Crawford's Corner
Road, Suite 3400
Holmdel, New Jersey
07733
T: 877 627-3772

Aerial Map

Block 58, Lots 2.01 & 9
Sayreville Borough, Middlesex County, NJ

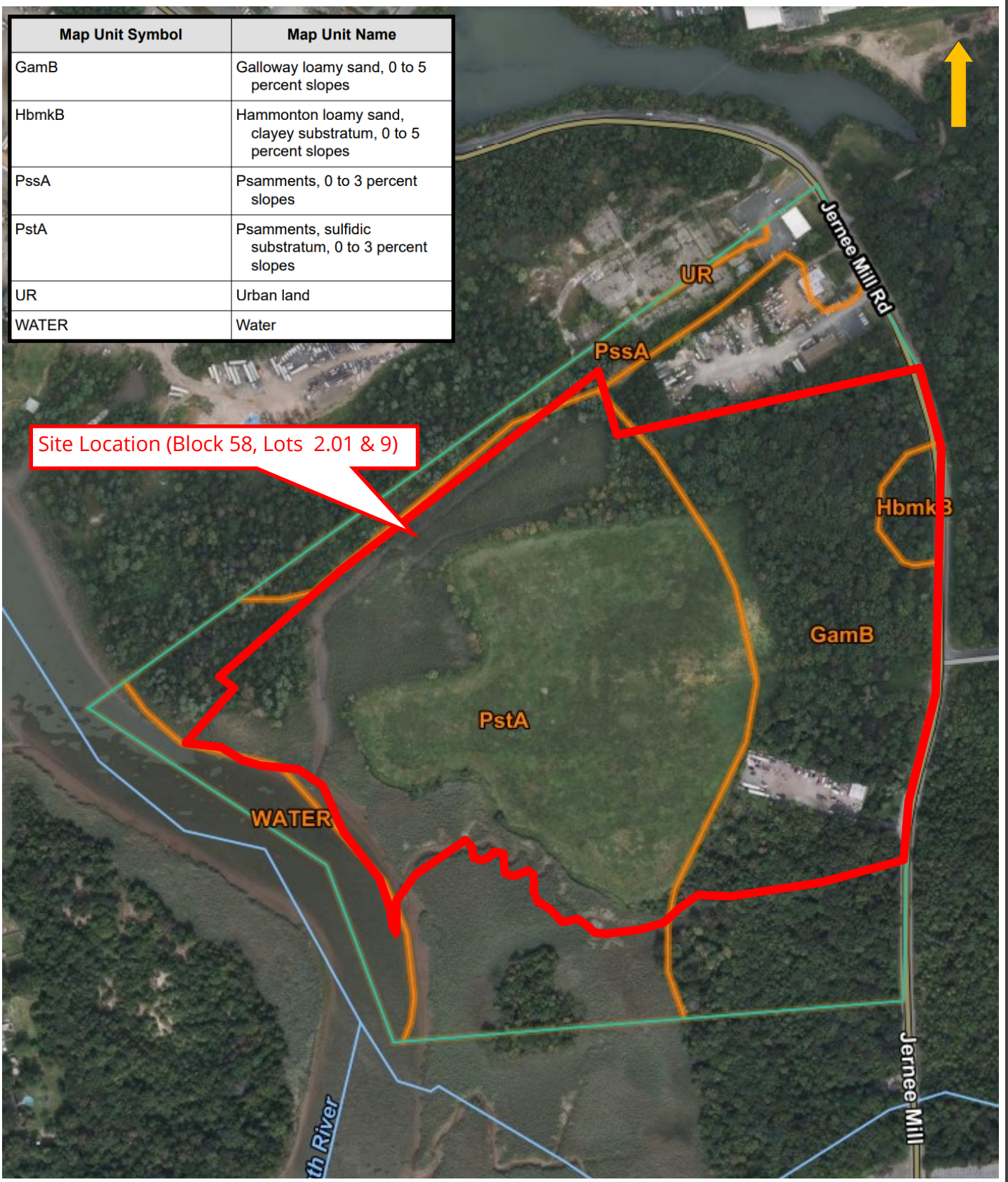
Source: NJ-GeoWeb

Scale: Not to Scale

Date: October 4, 2022

CED Project No. 10000657C

Map Unit Symbol	Map Unit Name
GamB	Galloway loamy sand, 0 to 5 percent slopes
HbmkB	Hammonton loamy sand, clayey substratum, 0 to 5 percent slopes
PssA	Psamments, 0 to 3 percent slopes
PstA	Psamments, sulfidic substratum, 0 to 3 percent slopes
UR	Urban land
WATER	Water



Site Location (Block 58, Lots 2.01 & 9)

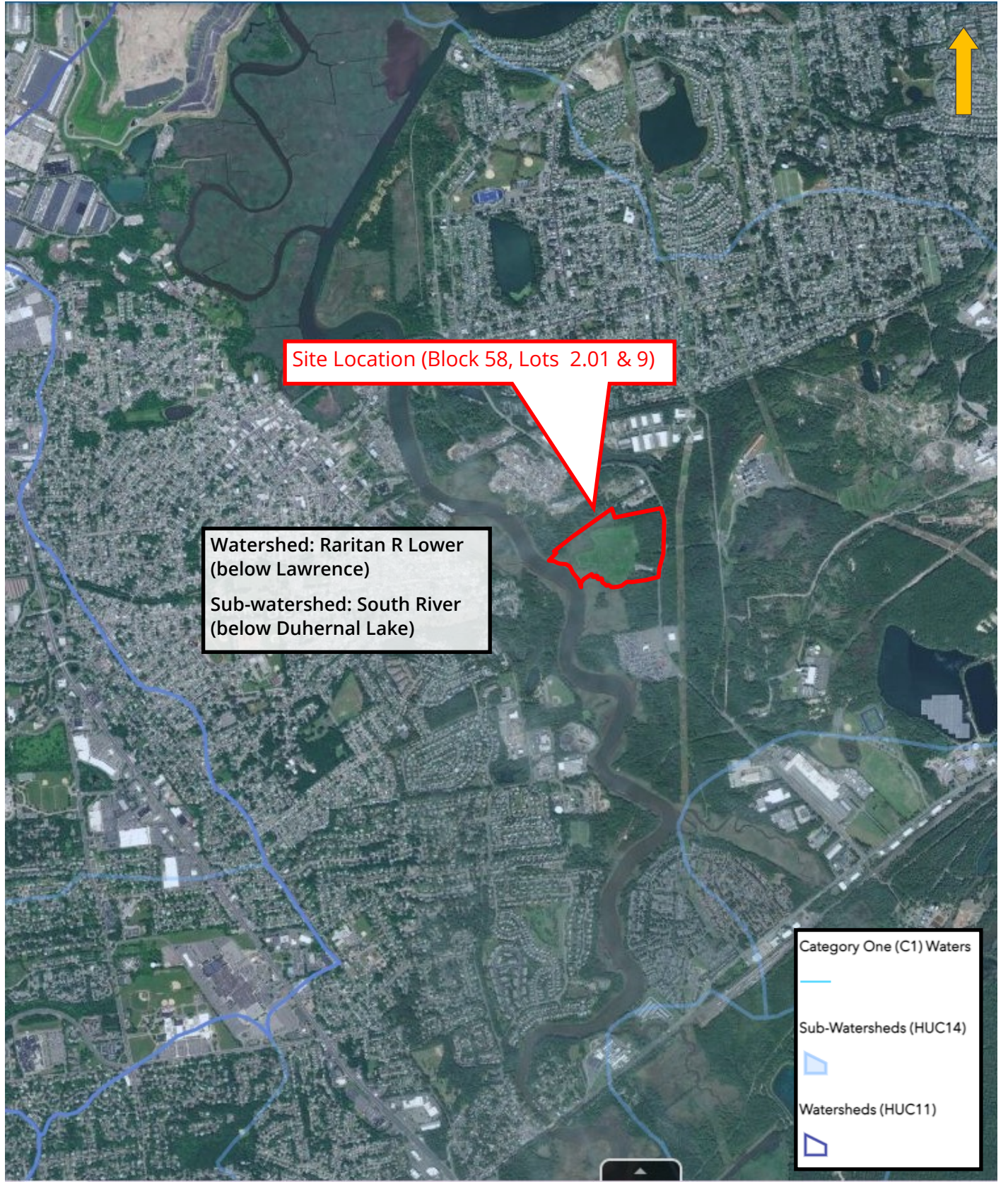


Corporate Headquarters
 101 Crawfords Corner
 Road, Suite 3400
 Holmdel, New Jersey
 07733
 T: 877 627-3772

Soil Map
 Block 58, Lots 2.01 & 9
 Sayreville Borough, Middlesex County, NJ

Source: USDA NRCS Web Soil Survey

Scale: Not to Scale
 Date: October 4, 2022
 CED Project No. 10000657C



Site Location (Block 58, Lots 2.01 & 9)

Watershed: Raritan R Lower
(below Lawrence)
Sub-watershed: South River
(below Duhernal Lake)

Category One (C1) Waters

Sub-Watersheds (HUC14)

Watersheds (HUC11)



Corporate Headquarters
101 Crawfords Corner
Road, Suite 3400
Holmdel, New Jersey
07733
T: 877 627-3772

Engineering
& Design

Watershed & Sub-Watershed Map
Block 58, Lots 2.01 & 9
Sayreville Borough, Middlesex County, NJ

Source: NJ-GeoWeb

Scale: Not to Scale

Date: October 4, 2022

CED Project No. 10000657C

APPENDIX B

LSRP Letter

June 8, 2023
via UPS

**CPMD Jernee Mill Rd, LLC c/o
Claremont Properties Acquisitions, LLC**
32 Mount Kemble Avenue
Morristown, New Jersey 07960

**Regarding: Stormwater Management Requirements
Former Sayreville Landfill
Block 58, Lots 2.01 & 9
Borough of Sayreville, Middlesex County, New Jersey
Dynamic Earth Project Number: 3184-22-01364**

To Whom It May Concern:

Dynamic Earth, LLC (Dynamic Earth) has prepared this letter in support of preparation of stormwater management plans for the proposed warehouse facility to be located along Jernee Mill Road (Block 58, Lots 2.01 & 9) in the Borough of Sayreville, New Jersey. A portion of the 46-acre site includes the former Sayreville Landfill III which operated as a solid waste disposal facility from 1971 to 1977. Based upon historical records reviewed, it is believed large quantities of hazardous materials were disposed of legally and illegally at the landfill. Impacts associated with this former land fill use include confirmed soil and groundwater contamination beneath the waste fill area. Additionally, groundwater contamination has been delineated beyond the limits of the waste fill area and a groundwater Classification Exception Area (CEA) has been established on site as part of the Remedial Action Workplan (RAWP) Addendum submitted to NJDEP in 2003. Groundwater contaminants of concern include metals: arsenic, chromium, nickel, lead, thallium; and Volatile Organic Compounds (VOCs): benzene and chlorobenzene. The existing RAWP for the former Sayreville Landfill III site includes engineering (capping of impacted soils) and institutional controls (site wide CEA with monitored natural attenuation of groundwater).

Proposed site redevelopment will include construction of a warehouse facility on the central and eastern portion of the property. Impacted soil and waste filled material will remain on site beneath the landfill cap and groundwater impacts associated with the former landfill will continue to be monitored under the CEA following Site redevelopment activities. To reduce the potential for the mobilization of contaminants within the vadose zone to groundwater through the infiltration of stormwater, the proposed redevelopment should exclude the use of stormwater recharge basins. Further, the use of stormwater recharge basins could result in localized changes to groundwater flow gradient which could affect the migration of impacted groundwater as established in the CEA for the Site. This recommendation to prohibit the use of stormwater recharge basins as a component of the stormwater management design for proposed warehouse redevelopment is consistent with the NJDEP Stormwater Management Regulation at N.J.A.C. 7:8-5.4(b)3.i which indicates:



“The following types of stormwater shall not be recharged:” ...“areas where recharge would be inconsistent with a remedial action work plan approved pursuant to the Administrative Requirements for the Remediation of Contaminated Sites rules, N.J.A.C. 7:26C, or a Department approved landfill closure plan, ...”

Should you have any questions or comments regarding the recommendations presented herein, please feel free to contact me at 267-685-0276.

Sincerely,

DYNAMIC EARTH, LLC

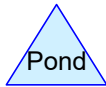
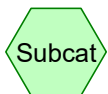
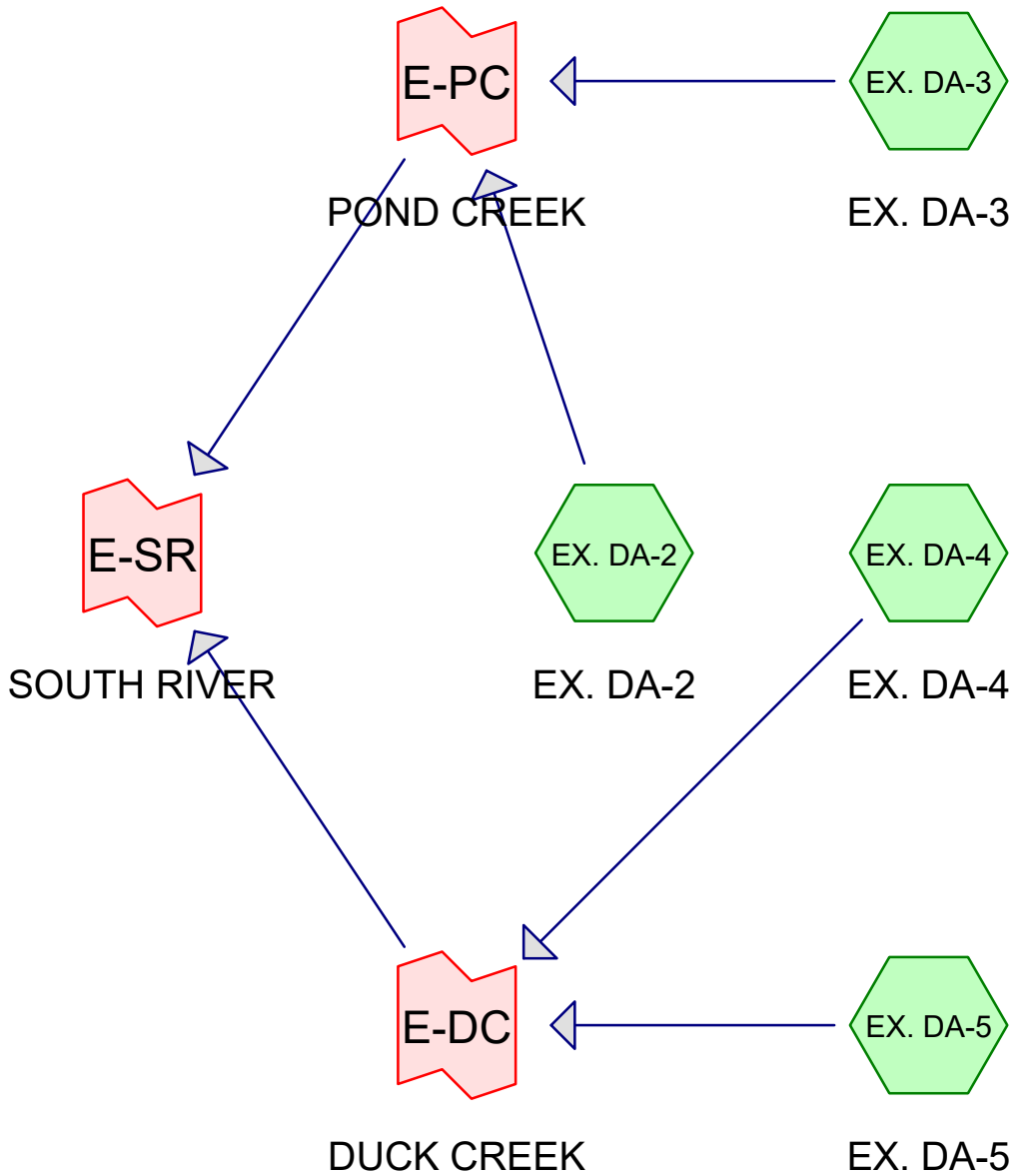
A handwritten signature in black ink, appearing to read 'Chris Zieger', written over a light blue horizontal line.

Christopher J. Zieger, LSRP
Senior Principal

APPENDIX C

Existing Conditions Routing Proposed Conditions Routing

EXISTING CONDITIONS



Routing Diagram for 250225 - Exist & Proposed Conditions
Prepared by Colliers Engineering & Design, Printed 2/26/2025
HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - 2YR	NOAA 24-hr	D	Default	24.00	1	3.35	2
2	B - 10YR	NOAA 24-hr	D	Default	24.00	1	5.13	2
3	C - 25YR	NOAA 24-hr	D	Default	24.00	1	6.38	2
4	D - 100YR	NOAA 24-hr	D	Default	24.00	1	8.67	2
5	E-NJDEP-WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.020	39	>75% Grass cover, Good, HSG A (EX. DA-5)
1.250	98	Paved parking, HSG A (EX. DA-5)
7.526	98	Paved parking, HSG D (EX. DA-2)
11.990	77	Woods, Good, HSG D (EX. DA-3, EX. DA-4)
1.430	79	Woods/grass comb., Good, HSG D (EX. DA-3, EX. DA-4)
22.216	85	TOTAL AREA

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
1.270	HSG A	EX. DA-5
0.000	HSG B	
0.000	HSG C	
20.946	HSG D	EX. DA-2, EX. DA-3, EX. DA-4
0.000	Other	
22.216		TOTAL AREA

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.020	0.000	0.000	0.000	0.000	0.020	>75% Grass cover, Good	EX. DA-5
1.250	0.000	0.000	7.526	0.000	8.776	Paved parking	EX. DA-2, EX. DA-5
0.000	0.000	0.000	11.990	0.000	11.990	Woods, Good	EX. DA-3, EX. DA-4
0.000	0.000	0.000	1.430	0.000	1.430	Woods/grass comb., Good	EX. DA-3, EX. DA-4
1.270	0.000	0.000	20.946	0.000	22.216	TOTAL AREA	

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 6

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	EX. DA-4	0.00	0.00	140.0	0.0010	0.013	0.0	15.0	0.0	
2	EX. DA-5	0.00	0.00	140.0	0.0010	0.013	0.0	15.0	0.0	

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 7

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX. DA-2: EX. DA-2 Runoff Area=7.526 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=256' Tc=13.3 min CN=0/98 Runoff=13.86 cfs 1.955 af

SubcatchmentEX. DA-3: EX. DA-3 Runoff Area=5.920 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=720' Tc=36.3 min CN=77/0 Runoff=2.77 cfs 0.651 af

SubcatchmentEX. DA-4: EX. DA-4 Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=1,443' Tc=51.6 min CN=77/0 Runoff=2.83 cfs 0.825 af

SubcatchmentEX. DA-5: EX. DA-5 Runoff Area=1.270 ac 98.43% Impervious Runoff Depth=3.07"
Flow Length=140' Slope=0.0010 '/' Tc=1.4 min CN=39/98 Runoff=4.33 cfs 0.325 af

Link E-DC: DUCK CREEK Inflow=4.97 cfs 1.150 af
Primary=4.97 cfs 1.150 af

Link E-PC: POND CREEK Inflow=15.36 cfs 2.606 af
Primary=15.36 cfs 2.606 af

Link E-SR: SOUTH RIVER Inflow=17.68 cfs 3.756 af
Primary=17.68 cfs 3.756 af

Total Runoff Area = 22.216 ac Runoff Volume = 3.756 af Average Runoff Depth = 2.03"
60.50% Pervious = 13.440 ac 39.50% Impervious = 8.776 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 8

Summary for Subcatchment EX. DA-2: EX. DA-2

Runoff = 13.86 cfs @ 12.23 hrs, Volume= 1.955 af, Depth= 3.12"
 Routed to Link E-PC : POND CREEK

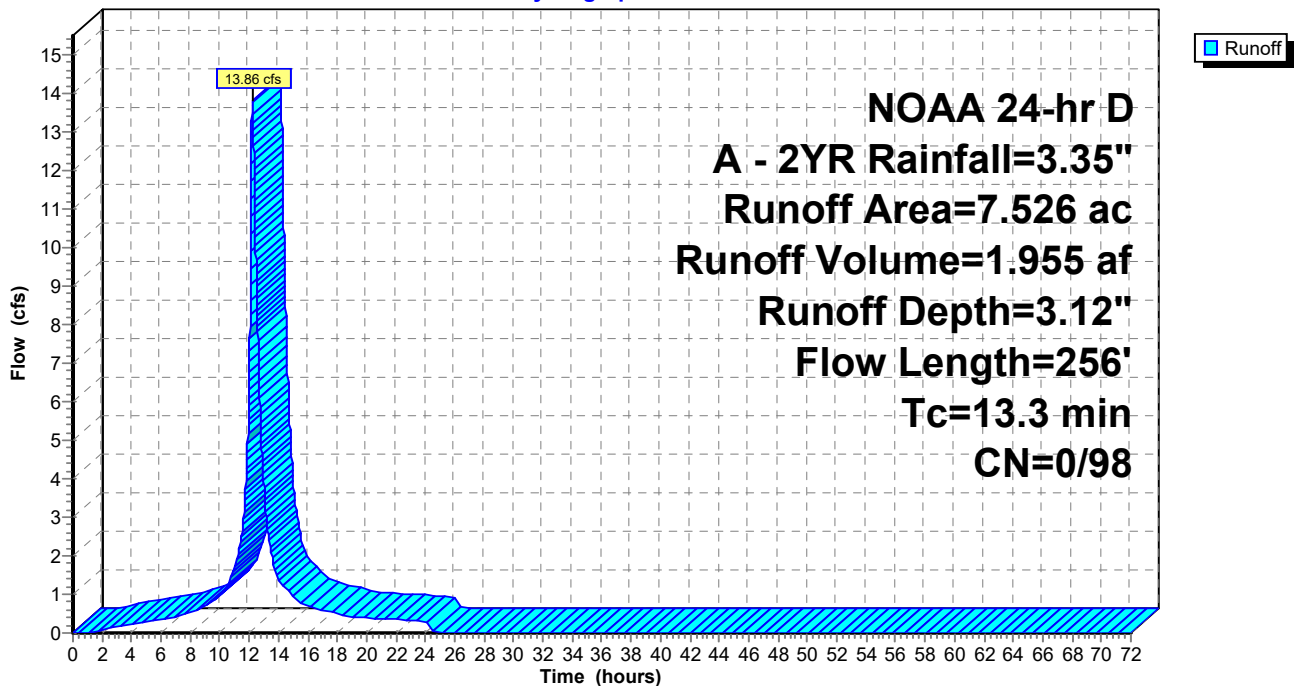
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
7.526	98	Paved parking, HSG D
7.526	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	85	0.0230	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.7	171	0.0600	1.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.3	256	Total			

Subcatchment EX. DA-2: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 9

Summary for Subcatchment EX. DA-3: EX. DA-3

Runoff = 2.77 cfs @ 12.58 hrs, Volume= 0.651 af, Depth= 1.32"
 Routed to Link E-PC : POND CREEK

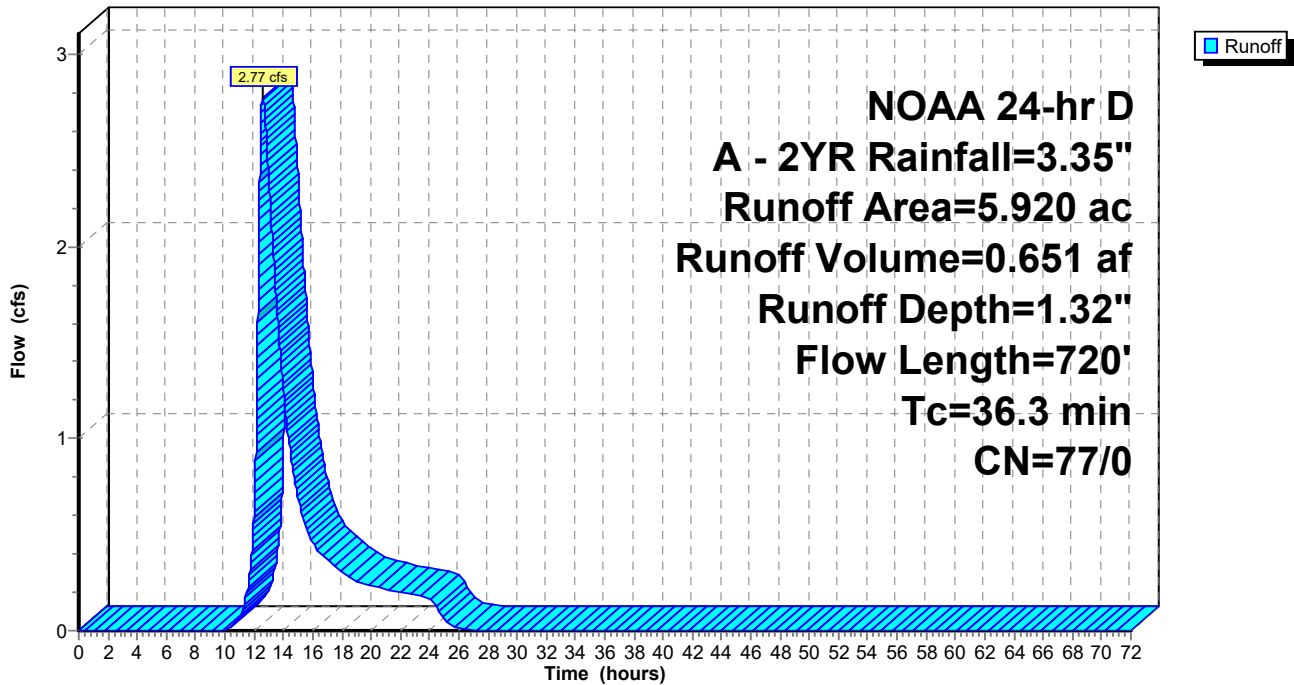
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.630	79	Woods/grass comb., Good, HSG D
5.290	77	Woods, Good, HSG D
5.920	77	Weighted Average
5.920	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	80	0.0125	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.3	720	Total			

Subcatchment EX. DA-3: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 10

Summary for Subcatchment EX. DA-4: EX. DA-4

[47] Hint: Peak is 138% of capacity of segment #5

Runoff = 2.83 cfs @ 12.84 hrs, Volume= 0.825 af, Depth= 1.32"
 Routed to Link E-DC : DUCK CREEK

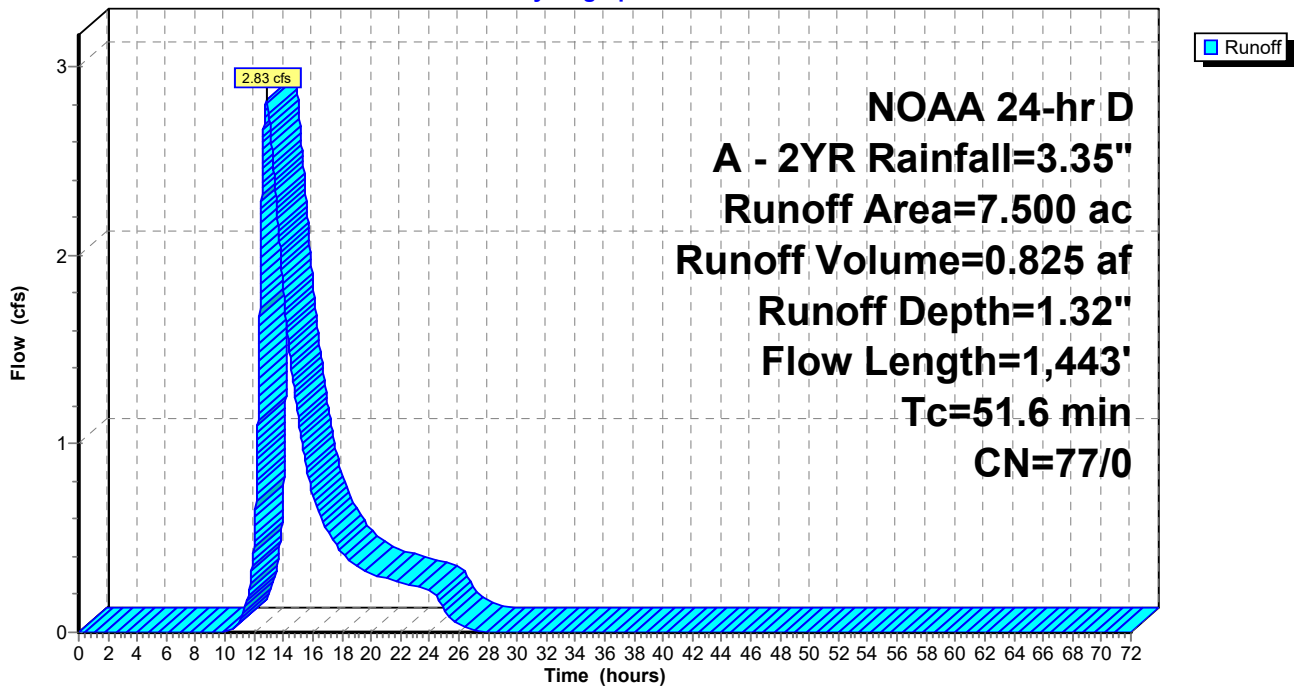
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.800	79	Woods/grass comb., Good, HSG D
6.700	77	Woods, Good, HSG D
7.500	77	Weighted Average
7.500	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	90	0.0390	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
12.8	470	0.0150	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.5	335	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
51.6	1,443	Total			

Subcatchment EX. DA-4: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment EX. DA-5: EX. DA-5

[47] Hint: Peak is 212% of capacity of segment #1

Runoff = 4.33 cfs @ 12.10 hrs, Volume= 0.325 af, Depth= 3.07"
 Routed to Link E-DC : DUCK CREEK

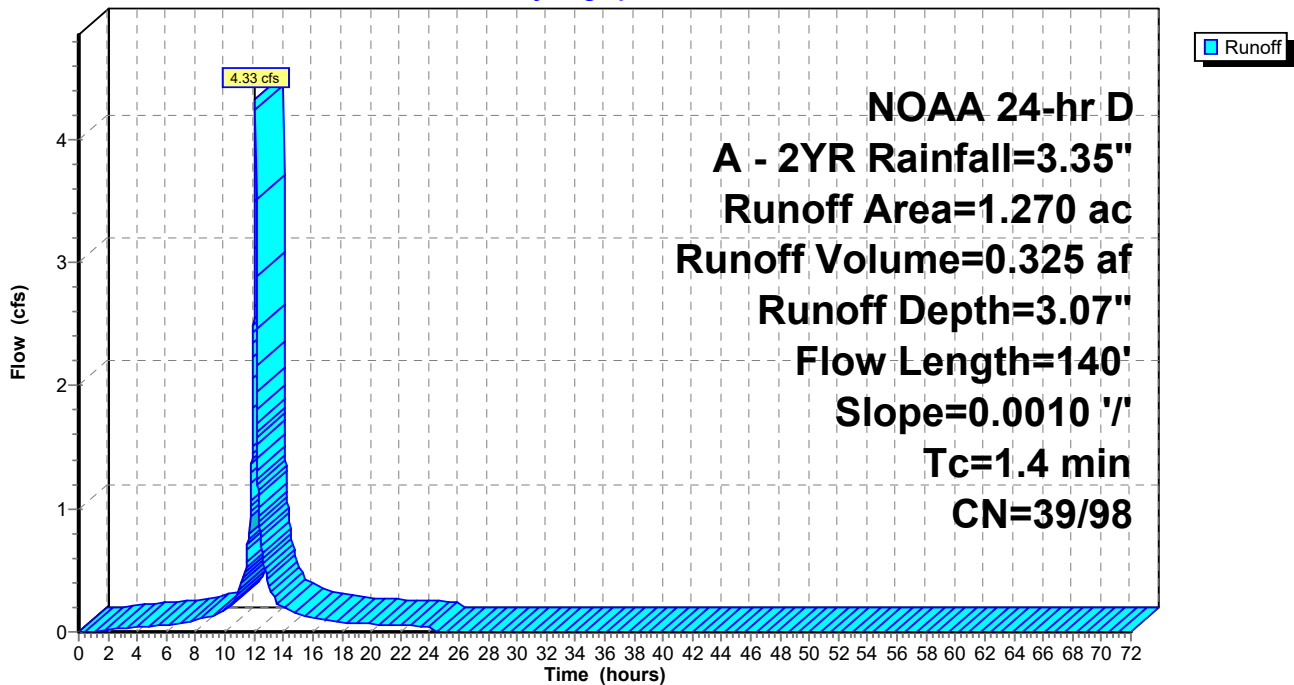
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
1.250	98	Paved parking, HSG A
0.020	39	>75% Grass cover, Good, HSG A
1.270	97	Weighted Average
0.020	39	1.57% Pervious Area
1.250	98	98.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013

Subcatchment EX. DA-5: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 13

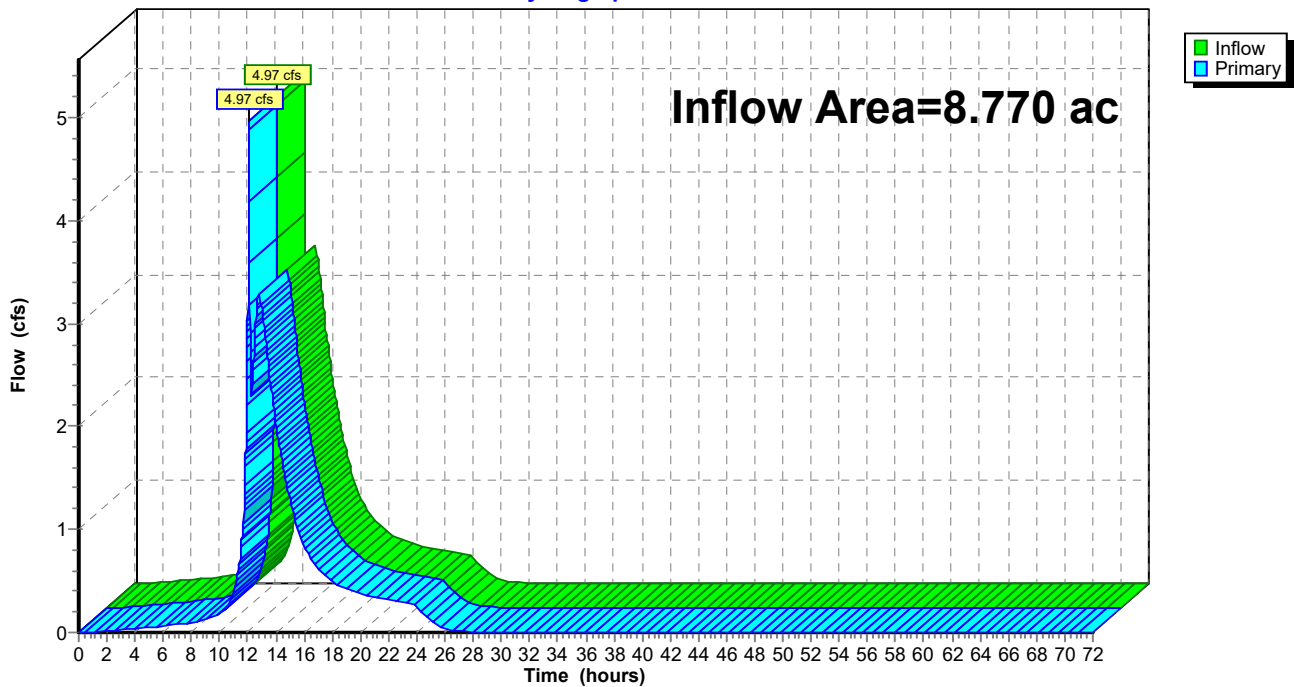
Summary for Link E-DC: DUCK CREEK

Inflow Area = 8.770 ac, 14.25% Impervious, Inflow Depth = 1.57" for A - 2YR event
Inflow = 4.97 cfs @ 12.10 hrs, Volume= 1.150 af
Primary = 4.97 cfs @ 12.10 hrs, Volume= 1.150 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-DC: DUCK CREEK

Hydrograph



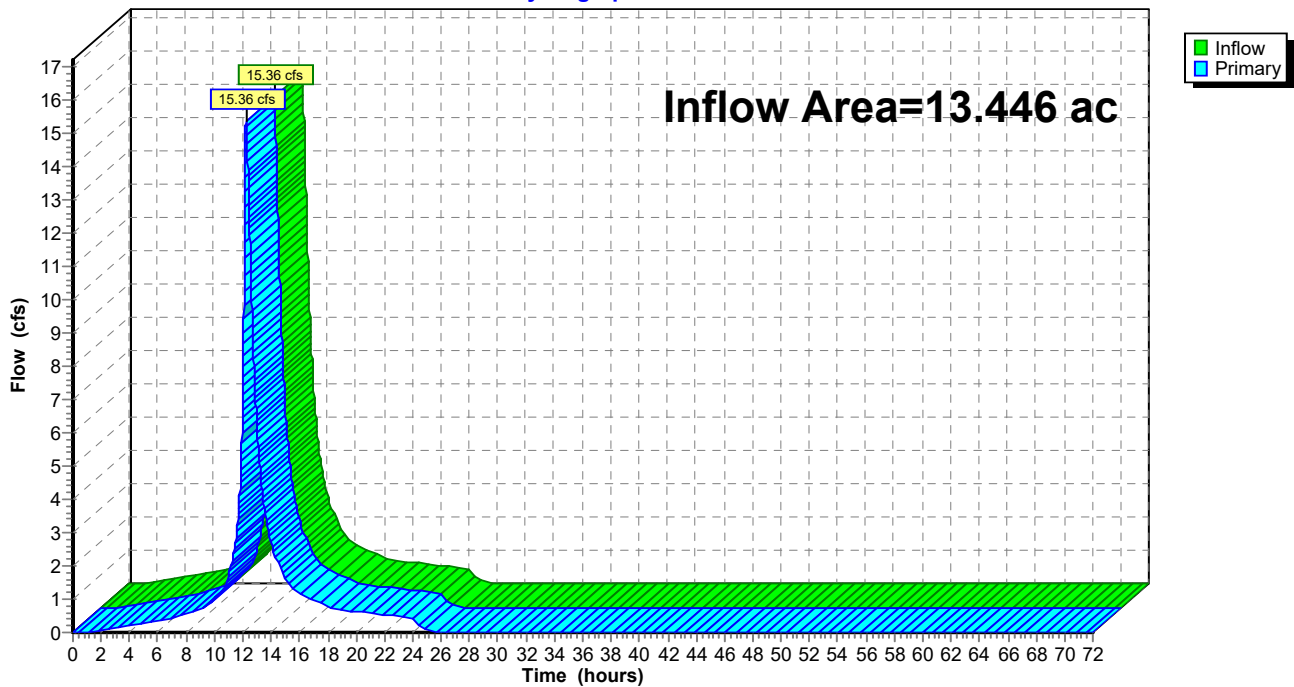
Summary for Link E-PC: POND CREEK

Inflow Area = 13.446 ac, 55.97% Impervious, Inflow Depth = 2.33" for A - 2YR event
Inflow = 15.36 cfs @ 12.24 hrs, Volume= 2.606 af
Primary = 15.36 cfs @ 12.24 hrs, Volume= 2.606 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-PC: POND CREEK

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 15

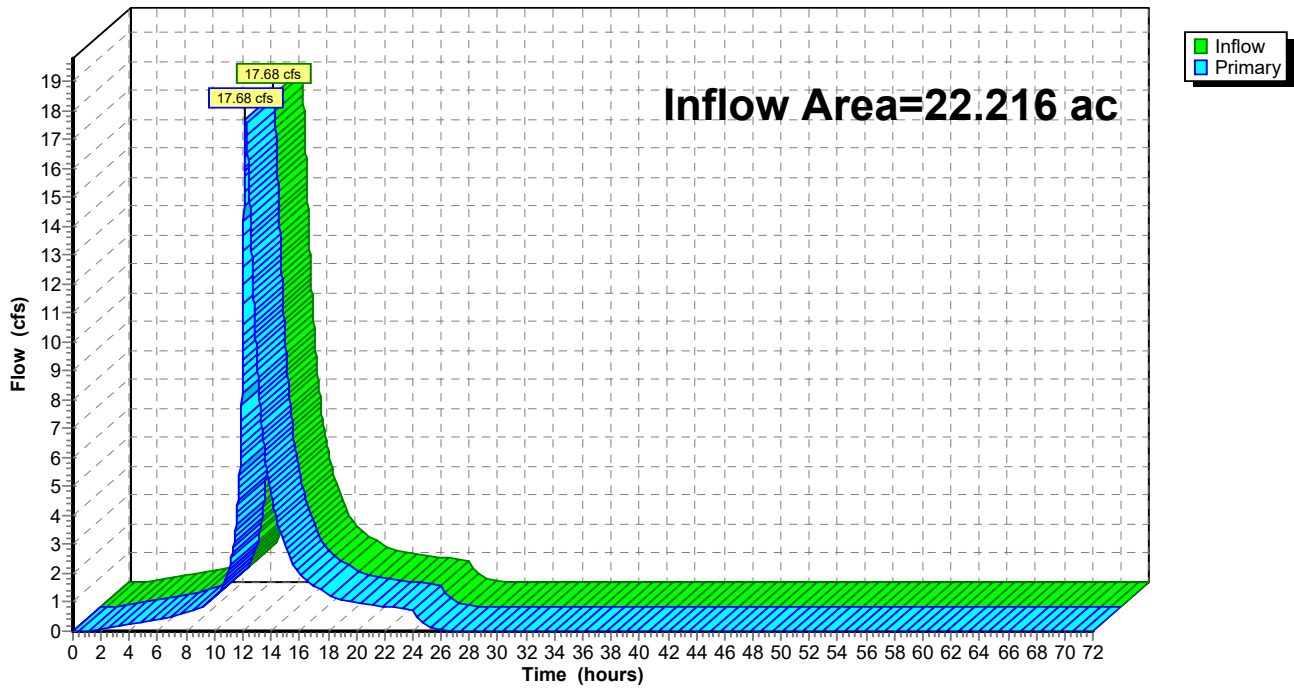
Summary for Link E-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 39.50% Impervious, Inflow Depth = 2.03" for A - 2YR event
Inflow = 17.68 cfs @ 12.21 hrs, Volume= 3.756 af
Primary = 17.68 cfs @ 12.21 hrs, Volume= 3.756 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 16

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX. DA-2: EX. DA-2 Runoff Area=7.526 ac 100.00% Impervious Runoff Depth=4.89"
Flow Length=256' Tc=13.3 min CN=0/98 Runoff=21.38 cfs 3.069 af

SubcatchmentEX. DA-3: EX. DA-3 Runoff Area=5.920 ac 0.00% Impervious Runoff Depth=2.73"
Flow Length=720' Tc=36.3 min CN=77/0 Runoff=6.00 cfs 1.348 af

SubcatchmentEX. DA-4: EX. DA-4 Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=2.73"
Flow Length=1,443' Tc=51.6 min CN=77/0 Runoff=6.13 cfs 1.708 af

SubcatchmentEX. DA-5: EX. DA-5 Runoff Area=1.270 ac 98.43% Impervious Runoff Depth=4.82"
Flow Length=140' Slope=0.0010 '/' Tc=1.4 min CN=39/98 Runoff=6.67 cfs 0.510 af

Link E-DC: DUCK CREEK Inflow=8.47 cfs 2.218 af
Primary=8.47 cfs 2.218 af

Link E-PC: POND CREEK Inflow=24.98 cfs 4.417 af
Primary=24.98 cfs 4.417 af

Link E-SR: SOUTH RIVER Inflow=29.60 cfs 6.634 af
Primary=29.60 cfs 6.634 af

Total Runoff Area = 22.216 ac Runoff Volume = 6.634 af Average Runoff Depth = 3.58"
60.50% Pervious = 13.440 ac 39.50% Impervious = 8.776 ac

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 17

Summary for Subcatchment EX. DA-2: EX. DA-2

Runoff = 21.38 cfs @ 12.23 hrs, Volume= 3.069 af, Depth= 4.89"
 Routed to Link E-PC : POND CREEK

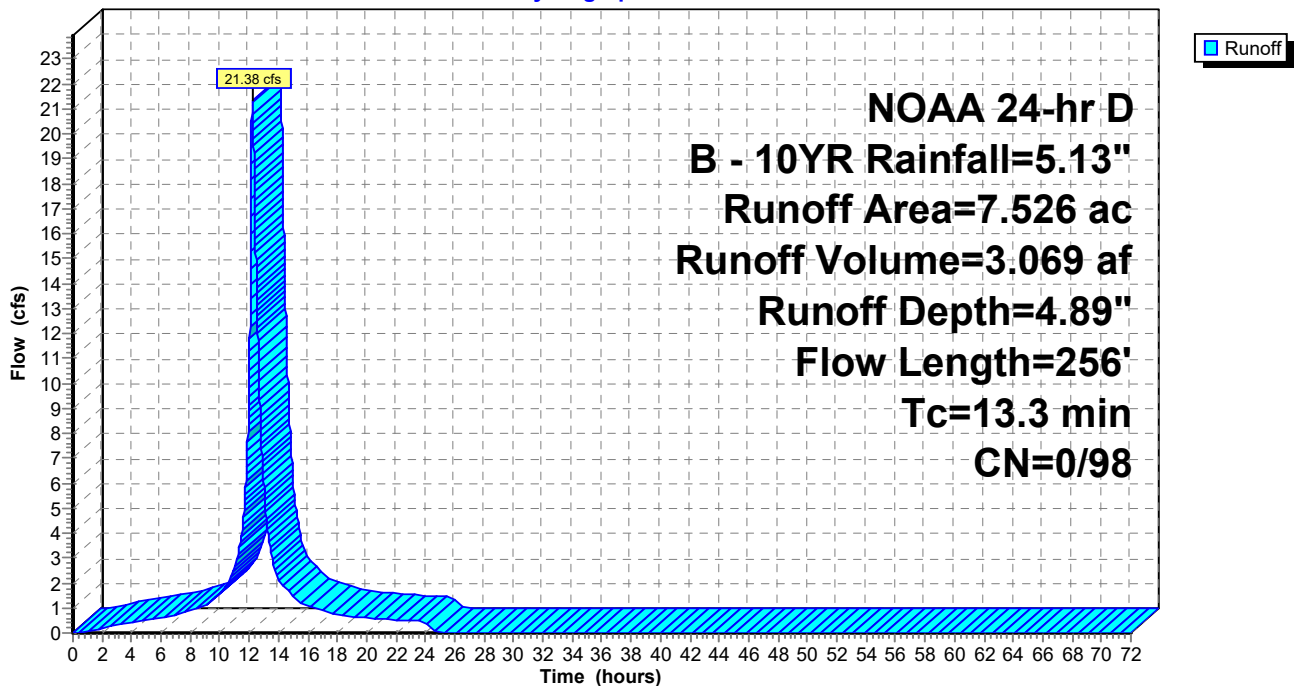
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
7.526	98	Paved parking, HSG D
7.526	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	85	0.0230	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.7	171	0.0600	1.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.3	256	Total			

Subcatchment EX. DA-2: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 18

Summary for Subcatchment EX. DA-3: EX. DA-3

Runoff = 6.00 cfs @ 12.58 hrs, Volume= 1.348 af, Depth= 2.73"
 Routed to Link E-PC : POND CREEK

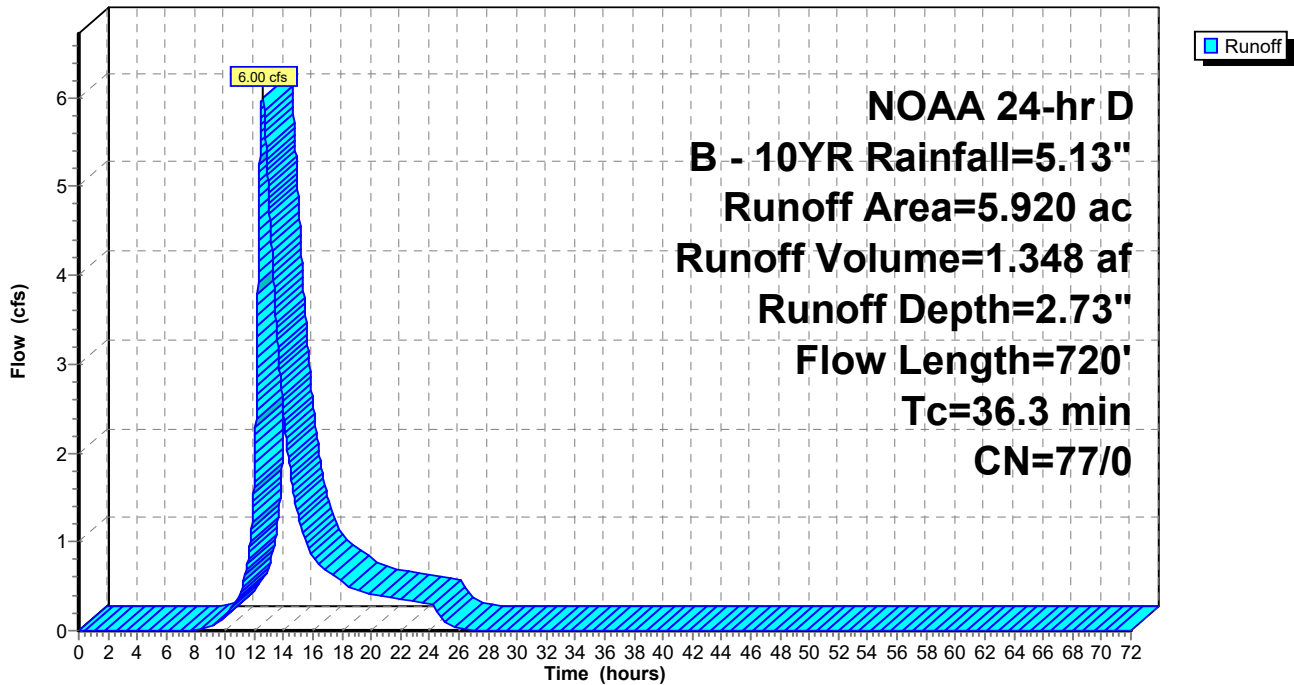
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.630	79	Woods/grass comb., Good, HSG D
5.290	77	Woods, Good, HSG D
5.920	77	Weighted Average
5.920	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	80	0.0125	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.3	720	Total			

Subcatchment EX. DA-3: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 19

Summary for Subcatchment EX. DA-4: EX. DA-4

[47] Hint: Peak is 300% of capacity of segment #5

Runoff = 6.13 cfs @ 12.73 hrs, Volume= 1.708 af, Depth= 2.73"
 Routed to Link E-DC : DUCK CREEK

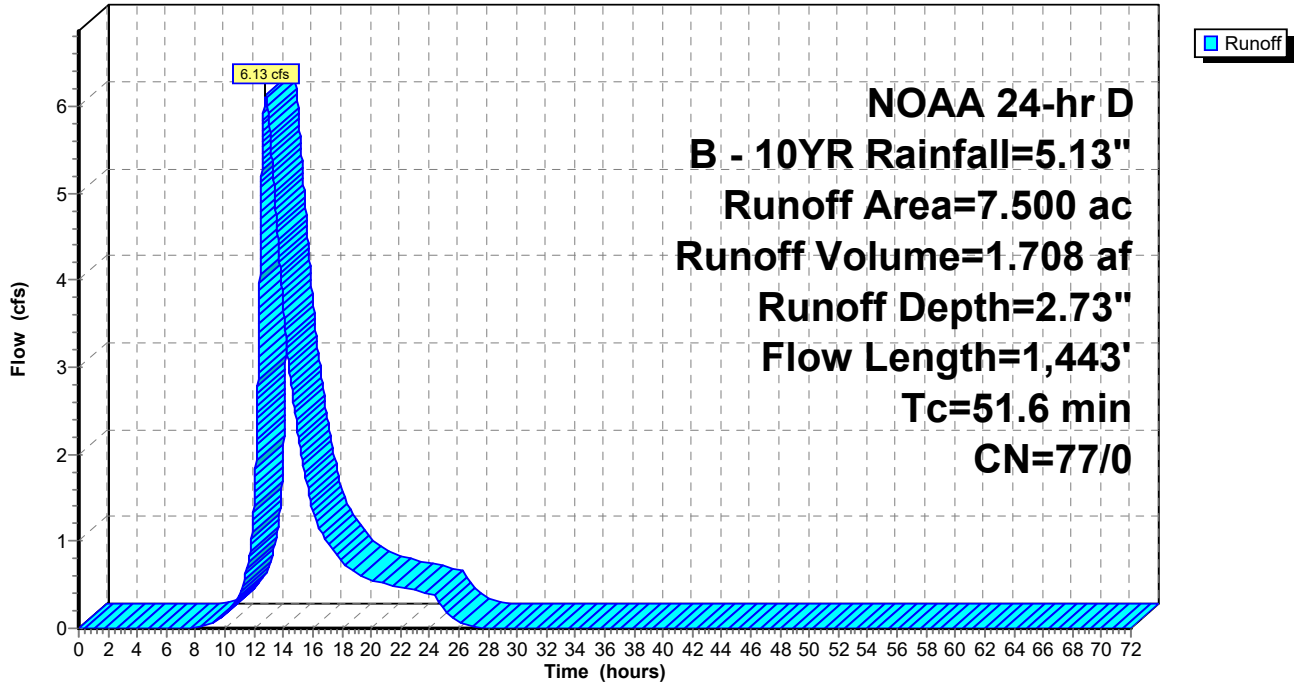
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.800	79	Woods/grass comb., Good, HSG D
6.700	77	Woods, Good, HSG D
7.500	77	Weighted Average
7.500	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	90	0.0390	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
12.8	470	0.0150	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.5	335	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
51.6	1,443	Total			

Subcatchment EX. DA-4: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 21

Summary for Subcatchment EX. DA-5: EX. DA-5

[47] Hint: Peak is 327% of capacity of segment #1

Runoff = 6.67 cfs @ 12.10 hrs, Volume= 0.510 af, Depth= 4.82"
 Routed to Link E-DC : DUCK CREEK

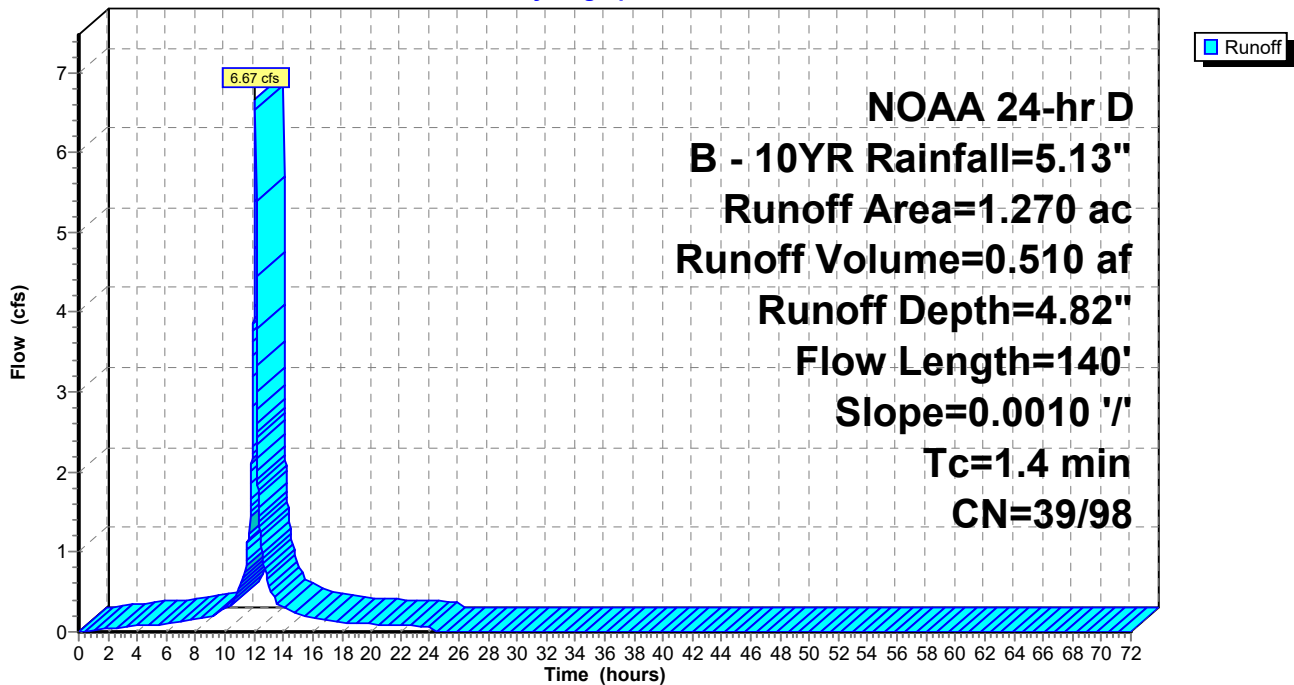
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
1.250	98	Paved parking, HSG A
0.020	39	>75% Grass cover, Good, HSG A
1.270	97	Weighted Average
0.020	39	1.57% Pervious Area
1.250	98	98.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013

Subcatchment EX. DA-5: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 22

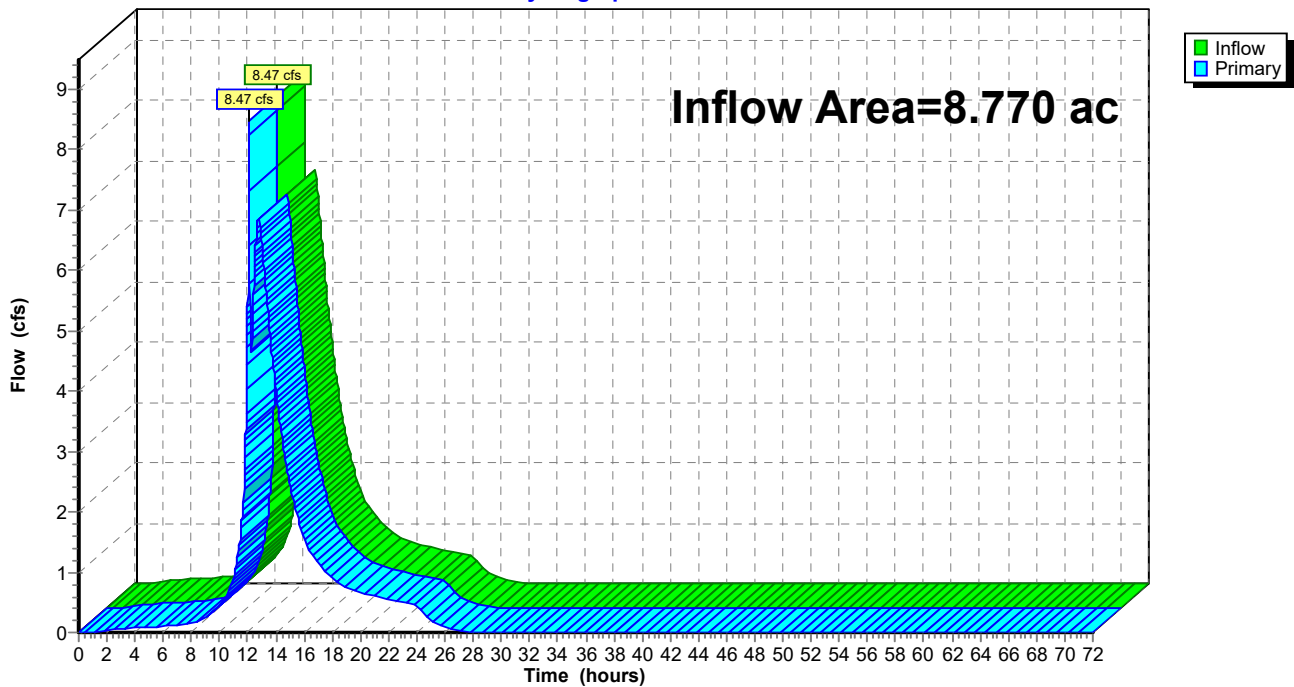
Summary for Link E-DC: DUCK CREEK

Inflow Area = 8.770 ac, 14.25% Impervious, Inflow Depth = 3.03" for B - 10YR event
Inflow = 8.47 cfs @ 12.10 hrs, Volume= 2.218 af
Primary = 8.47 cfs @ 12.10 hrs, Volume= 2.218 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-DC: DUCK CREEK

Hydrograph



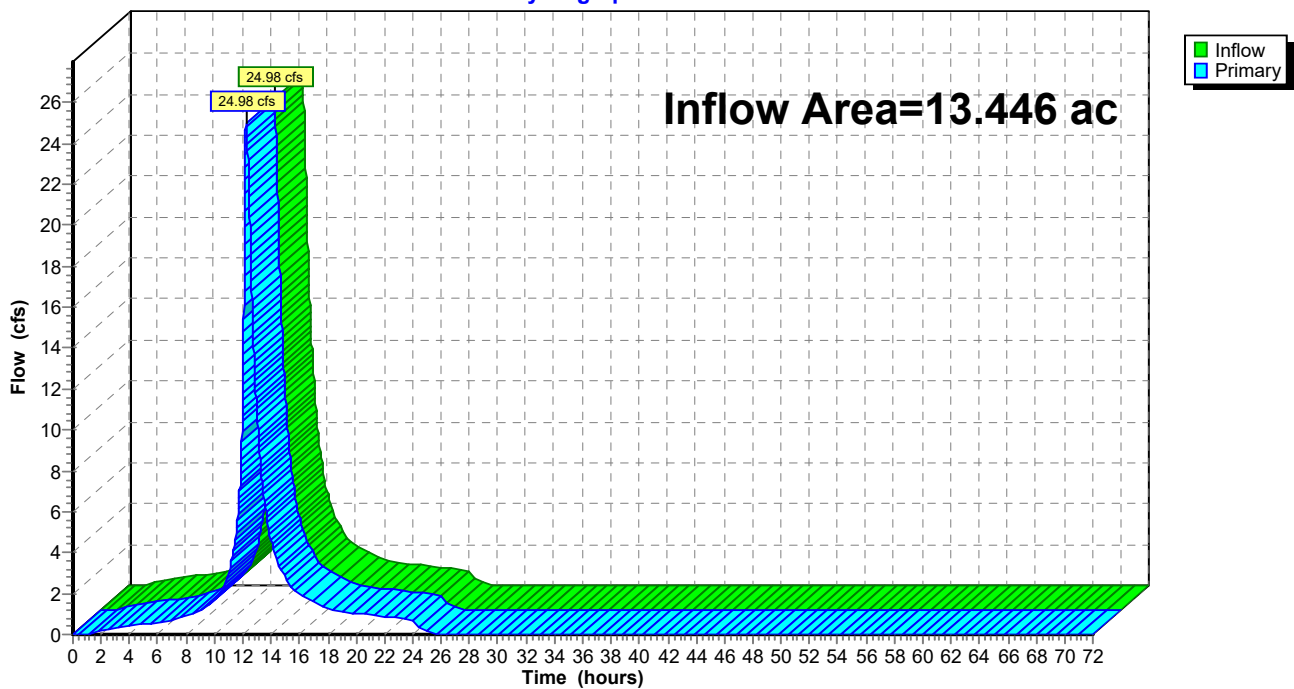
Summary for Link E-PC: POND CREEK

Inflow Area = 13.446 ac, 55.97% Impervious, Inflow Depth = 3.94" for B - 10YR event
Inflow = 24.98 cfs @ 12.24 hrs, Volume= 4.417 af
Primary = 24.98 cfs @ 12.24 hrs, Volume= 4.417 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-PC: POND CREEK

Hydrograph



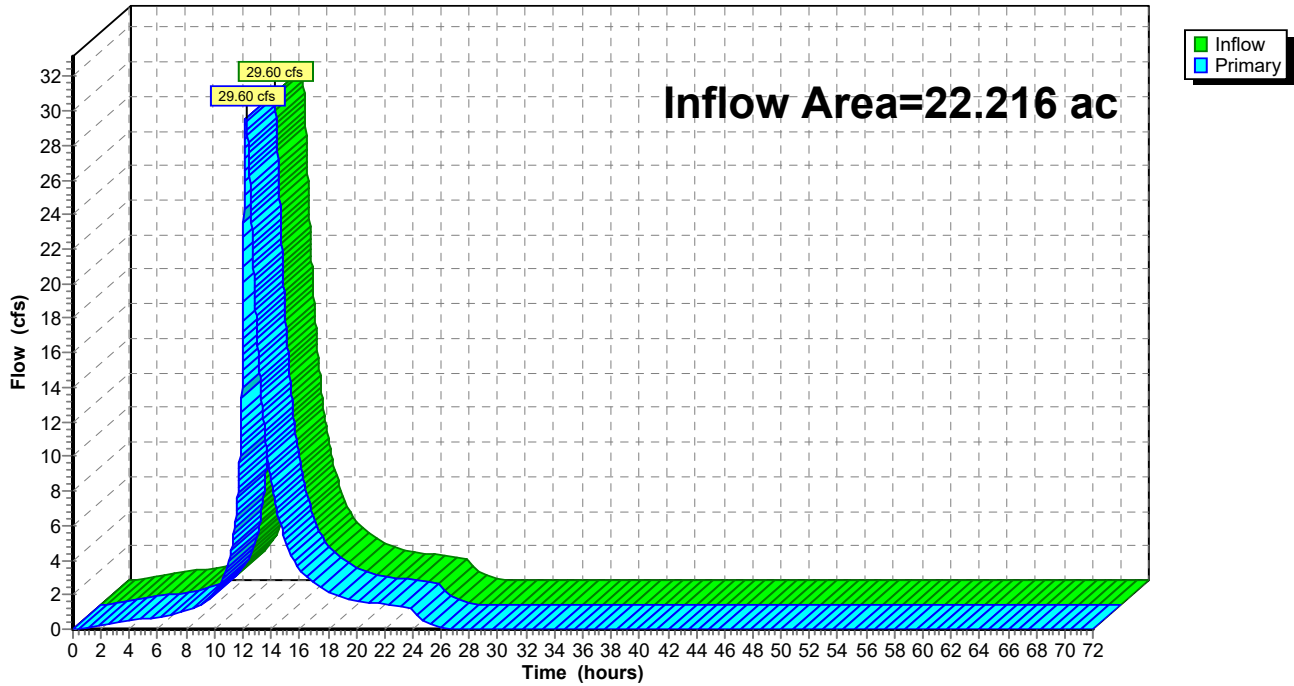
Summary for Link E-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 39.50% Impervious, Inflow Depth = 3.58" for B - 10YR event
Inflow = 29.60 cfs @ 12.24 hrs, Volume= 6.634 af
Primary = 29.60 cfs @ 12.24 hrs, Volume= 6.634 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 25

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX. DA-2: EX. DA-2 Runoff Area=7.526 ac 100.00% Impervious Runoff Depth=6.14"
 Flow Length=256' Tc=13.3 min CN=0/98 Runoff=26.65 cfs 3.852 af

SubcatchmentEX. DA-3: EX. DA-3 Runoff Area=5.920 ac 0.00% Impervious Runoff Depth=3.81"
 Flow Length=720' Tc=36.3 min CN=77/0 Runoff=8.45 cfs 1.881 af

SubcatchmentEX. DA-4: EX. DA-4 Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=3.81"
 Flow Length=1,443' Tc=51.6 min CN=77/0 Runoff=8.65 cfs 2.383 af

SubcatchmentEX. DA-5: EX. DA-5 Runoff Area=1.270 ac 98.43% Impervious Runoff Depth=6.05"
 Flow Length=140' Slope=0.0010 '/' Tc=1.4 min CN=39/98 Runoff=8.32 cfs 0.641 af

Link E-DC: DUCK CREEK Inflow=11.07 cfs 3.024 af
 Primary=11.07 cfs 3.024 af

Link E-PC: POND CREEK Inflow=31.88 cfs 5.733 af
 Primary=31.88 cfs 5.733 af

Link E-SR: SOUTH RIVER Inflow=38.28 cfs 8.757 af
 Primary=38.28 cfs 8.757 af

Total Runoff Area = 22.216 ac Runoff Volume = 8.757 af Average Runoff Depth = 4.73"
60.50% Pervious = 13.440 ac 39.50% Impervious = 8.776 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 26

Summary for Subcatchment EX. DA-2: EX. DA-2

Runoff = 26.65 cfs @ 12.23 hrs, Volume= 3.852 af, Depth= 6.14"
 Routed to Link E-PC : POND CREEK

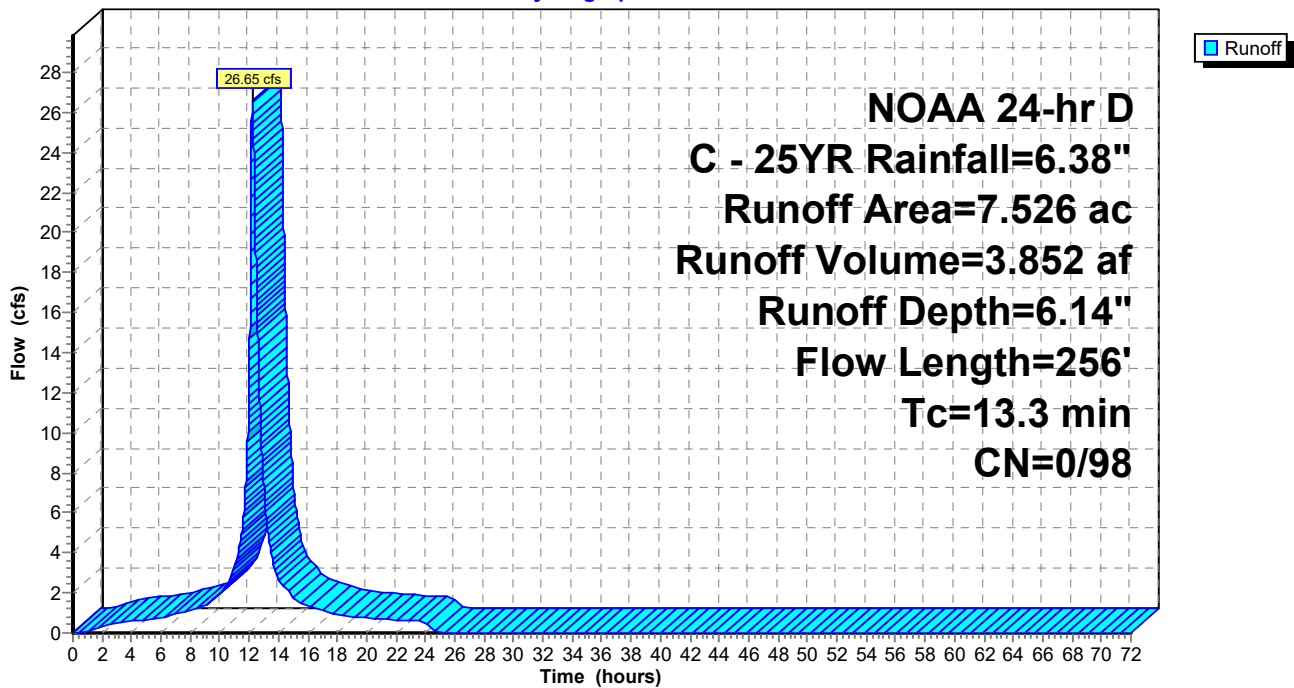
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
7.526	98	Paved parking, HSG D
7.526	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	85	0.0230	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.7	171	0.0600	1.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.3	256	Total			

Subcatchment EX. DA-2: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 27

Summary for Subcatchment EX. DA-3: EX. DA-3

Runoff = 8.45 cfs @ 12.51 hrs, Volume= 1.881 af, Depth= 3.81"
 Routed to Link E-PC : POND CREEK

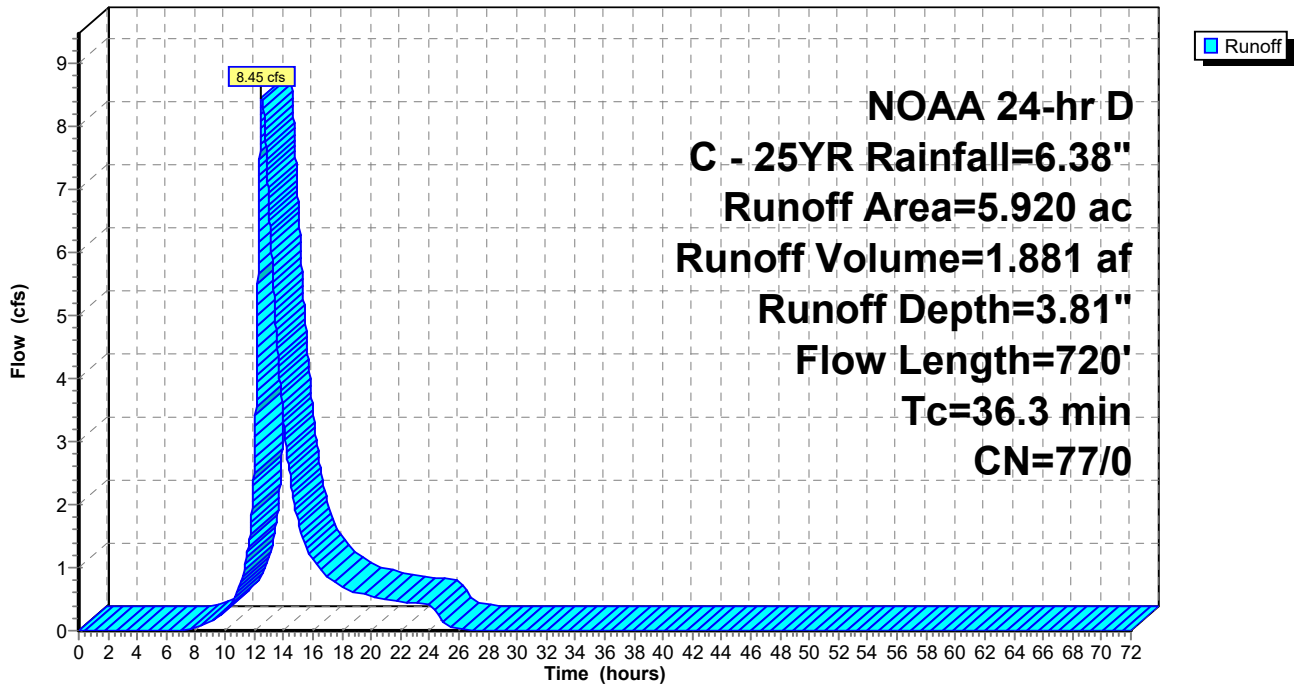
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.630	79	Woods/grass comb., Good, HSG D
5.290	77	Woods, Good, HSG D
5.920	77	Weighted Average
5.920	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	80	0.0125	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.3	720	Total			

Subcatchment EX. DA-3: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 28

Summary for Subcatchment EX. DA-4: EX. DA-4

[47] Hint: Peak is 424% of capacity of segment #5

Runoff = 8.65 cfs @ 12.73 hrs, Volume= 2.383 af, Depth= 3.81"
 Routed to Link E-DC : DUCK CREEK

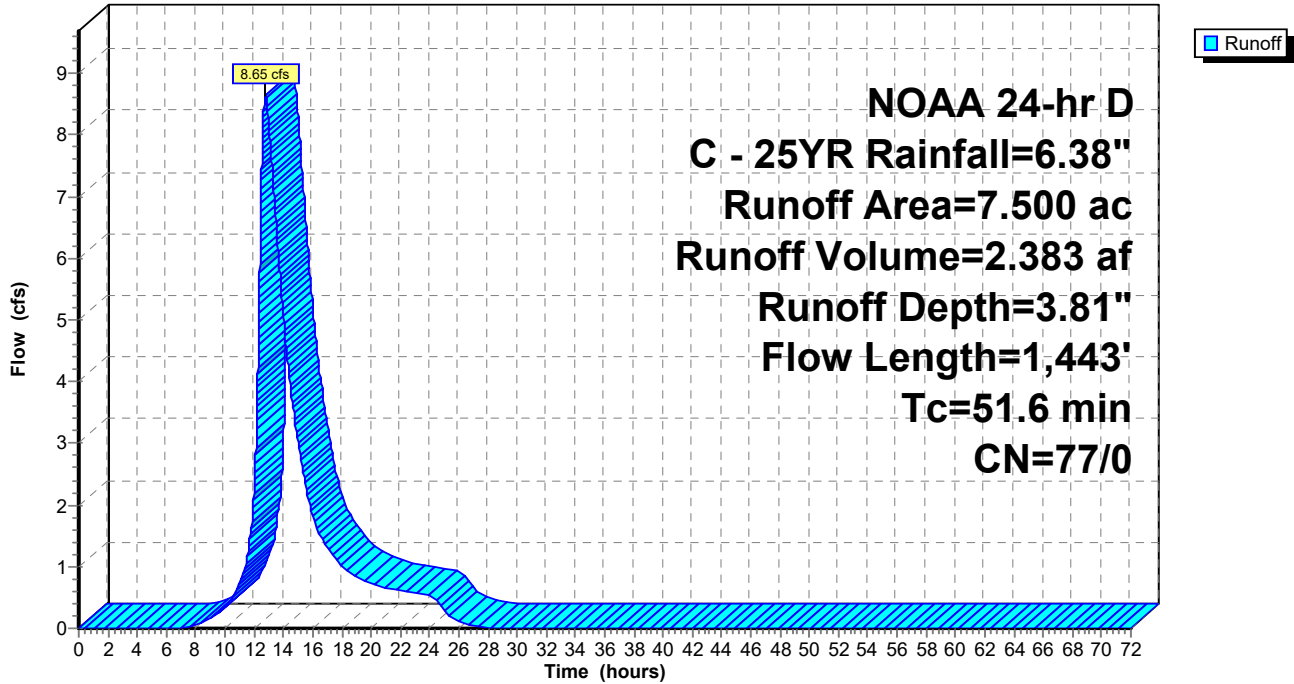
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.800	79	Woods/grass comb., Good, HSG D
6.700	77	Woods, Good, HSG D
7.500	77	Weighted Average
7.500	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	90	0.0390	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
12.8	470	0.0150	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.5	335	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
51.6	1,443	Total			

Subcatchment EX. DA-4: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 30

Summary for Subcatchment EX. DA-5: EX. DA-5

[47] Hint: Peak is 407% of capacity of segment #1

Runoff = 8.32 cfs @ 12.10 hrs, Volume= 0.641 af, Depth= 6.05"
 Routed to Link E-DC : DUCK CREEK

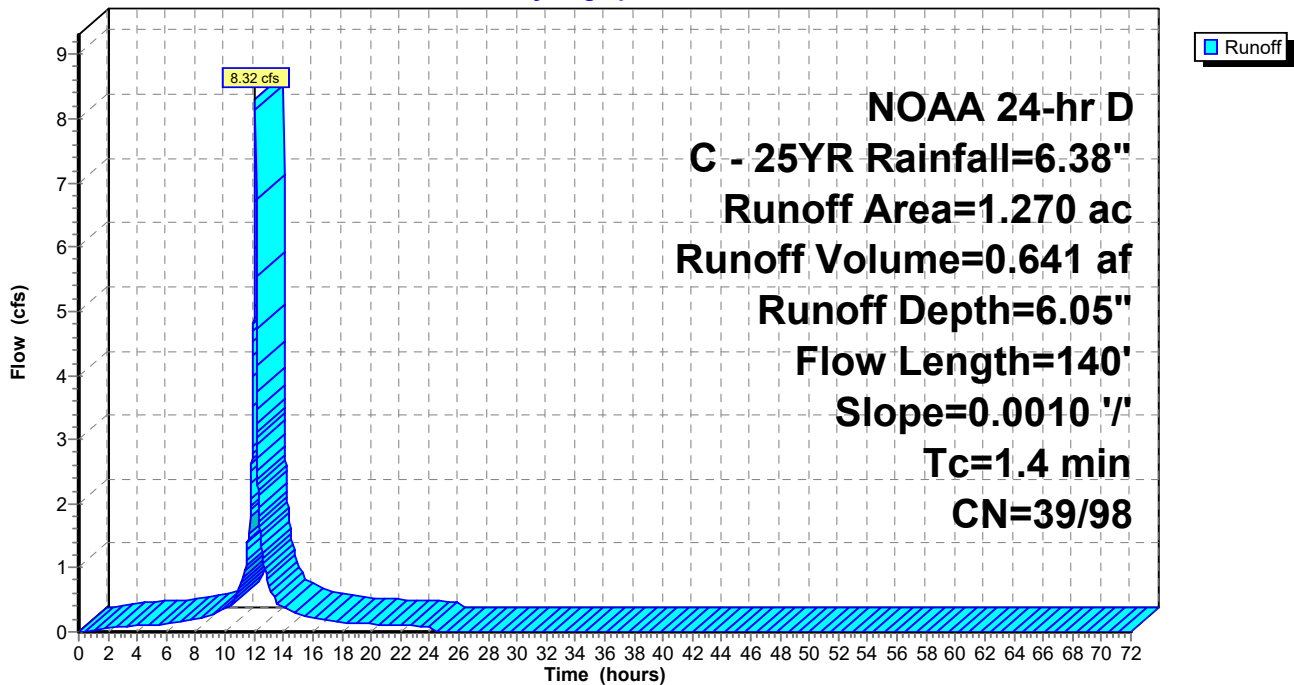
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
1.250	98	Paved parking, HSG A
0.020	39	>75% Grass cover, Good, HSG A
1.270	97	Weighted Average
0.020	39	1.57% Pervious Area
1.250	98	98.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013

Subcatchment EX. DA-5: EX. DA-5

Hydrograph



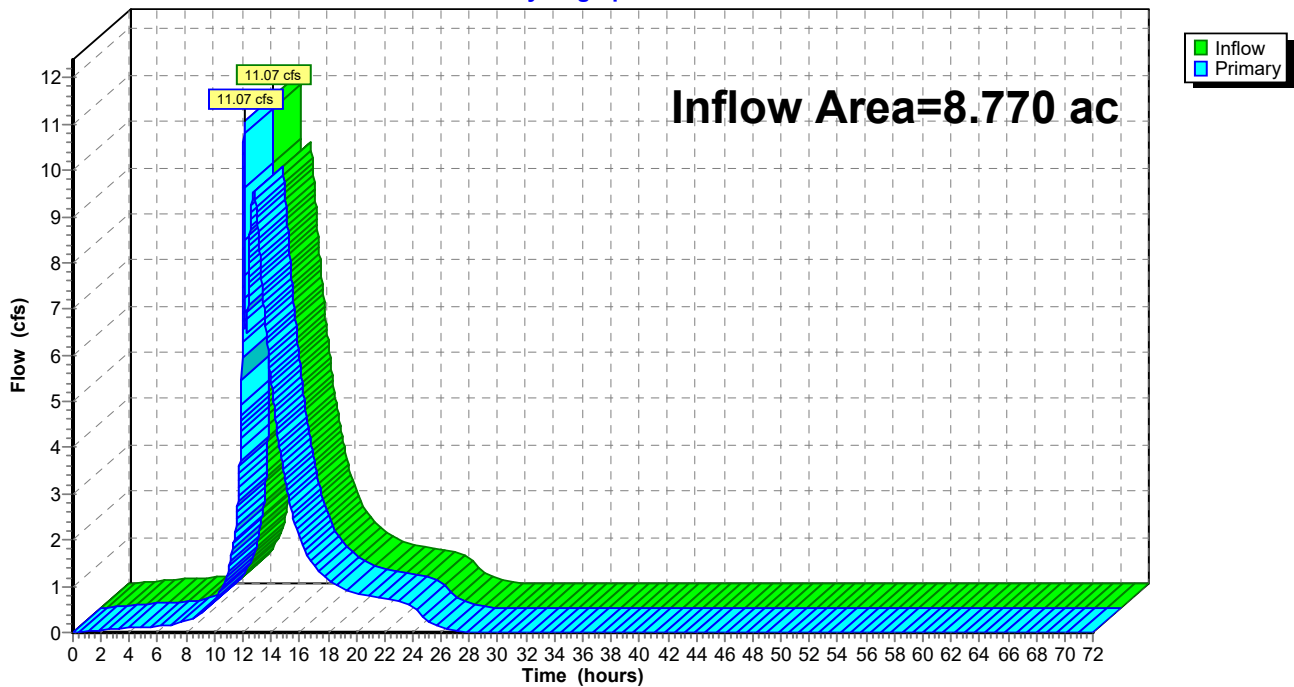
Summary for Link E-DC: DUCK CREEK

Inflow Area = 8.770 ac, 14.25% Impervious, Inflow Depth = 4.14" for C - 25YR event
Inflow = 11.07 cfs @ 12.10 hrs, Volume= 3.024 af
Primary = 11.07 cfs @ 12.10 hrs, Volume= 3.024 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-DC: DUCK CREEK

Hydrograph



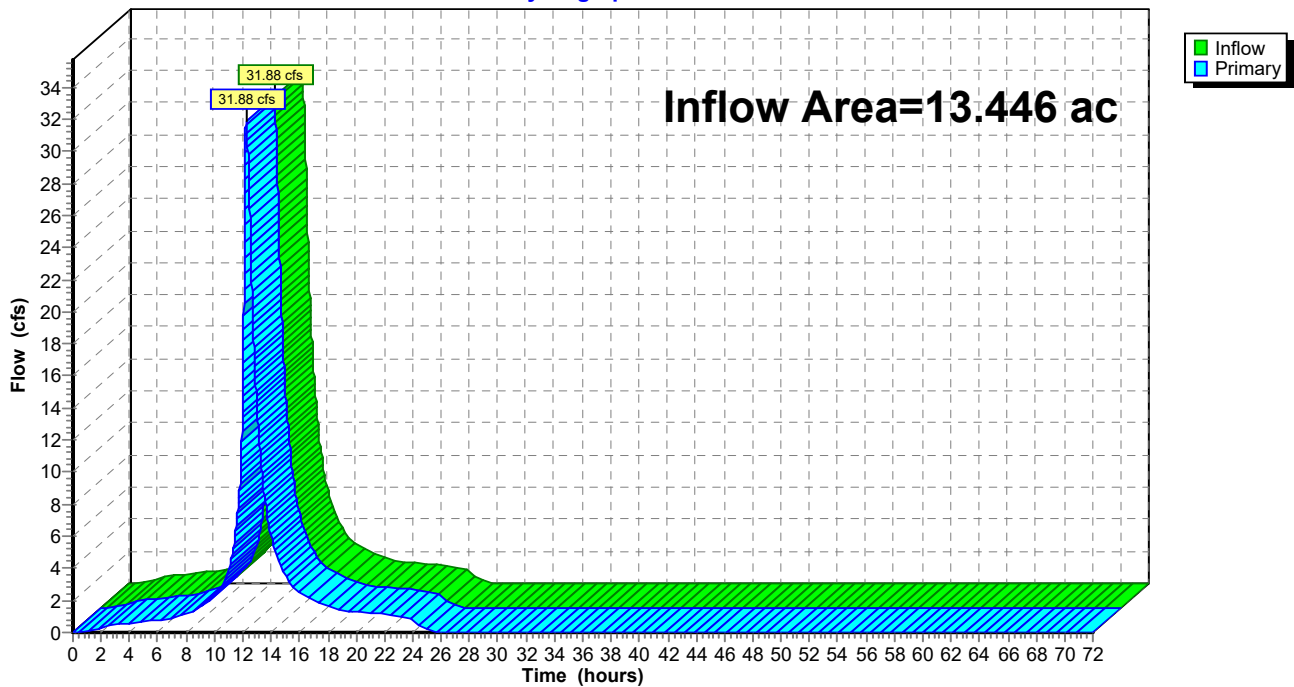
Summary for Link E-PC: POND CREEK

Inflow Area = 13.446 ac, 55.97% Impervious, Inflow Depth = 5.12" for C - 25YR event
Inflow = 31.88 cfs @ 12.24 hrs, Volume= 5.733 af
Primary = 31.88 cfs @ 12.24 hrs, Volume= 5.733 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-PC: POND CREEK

Hydrograph



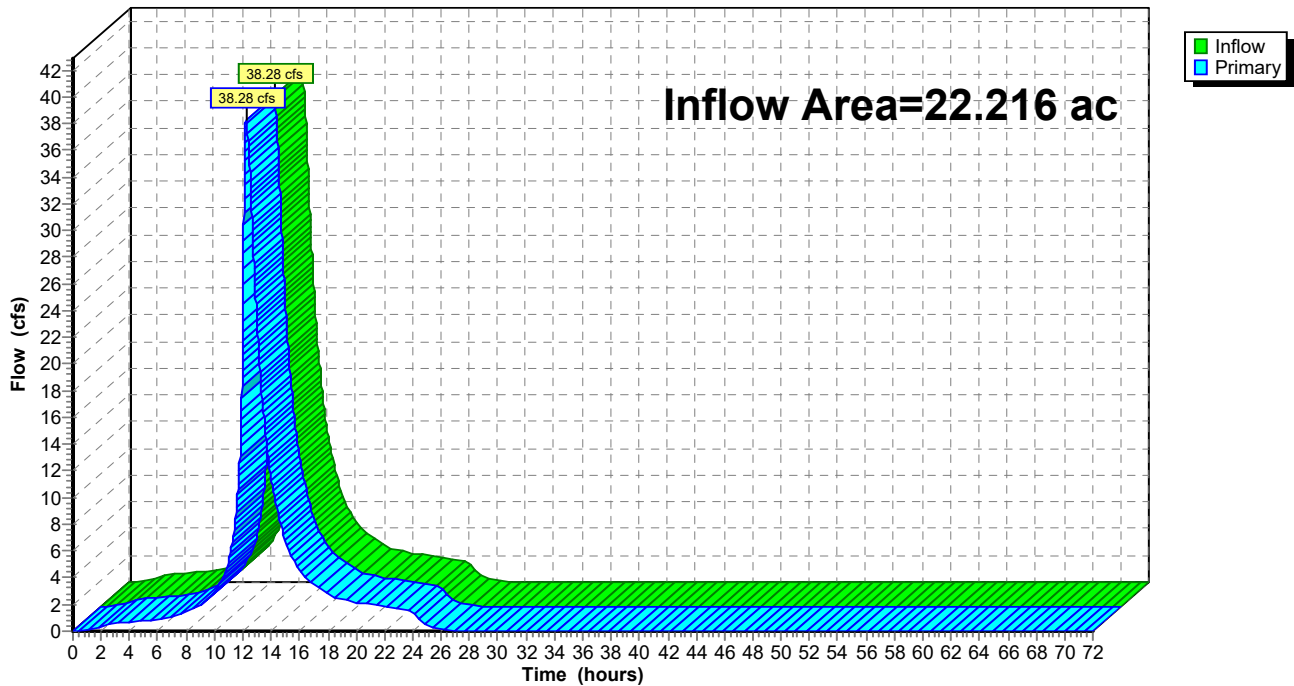
Summary for Link E-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 39.50% Impervious, Inflow Depth = 4.73" for C - 25YR event
Inflow = 38.28 cfs @ 12.24 hrs, Volume= 8.757 af
Primary = 38.28 cfs @ 12.24 hrs, Volume= 8.757 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 34

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX. DA-2: EX. DA-2 Runoff Area=7.526 ac 100.00% Impervious Runoff Depth=8.43"
Flow Length=256' Tc=13.3 min CN=0/98 Runoff=36.28 cfs 5.287 af

SubcatchmentEX. DA-3: EX. DA-3 Runoff Area=5.920 ac 0.00% Impervious Runoff Depth=5.89"
Flow Length=720' Tc=36.3 min CN=77/0 Runoff=13.09 cfs 2.907 af

SubcatchmentEX. DA-4: EX. DA-4 Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=5.89"
Flow Length=1,443' Tc=51.6 min CN=77/0 Runoff=13.43 cfs 3.683 af

SubcatchmentEX. DA-5: EX. DA-5 Runoff Area=1.270 ac 98.43% Impervious Runoff Depth=8.32"
Flow Length=140' Slope=0.0010 '/' Tc=1.4 min CN=39/98 Runoff=11.34 cfs 0.881 af

Link E-DC: DUCK CREEK Inflow=15.97 cfs 4.563 af
Primary=15.97 cfs 4.563 af

Link E-PC: POND CREEK Inflow=44.66 cfs 8.194 af
Primary=44.66 cfs 8.194 af

Link E-SR: SOUTH RIVER Inflow=54.48 cfs 12.757 af
Primary=54.48 cfs 12.757 af

Total Runoff Area = 22.216 ac Runoff Volume = 12.757 af Average Runoff Depth = 6.89"
60.50% Pervious = 13.440 ac 39.50% Impervious = 8.776 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 35

Summary for Subcatchment EX. DA-2: EX. DA-2

Runoff = 36.28 cfs @ 12.23 hrs, Volume= 5.287 af, Depth= 8.43"
 Routed to Link E-PC : POND CREEK

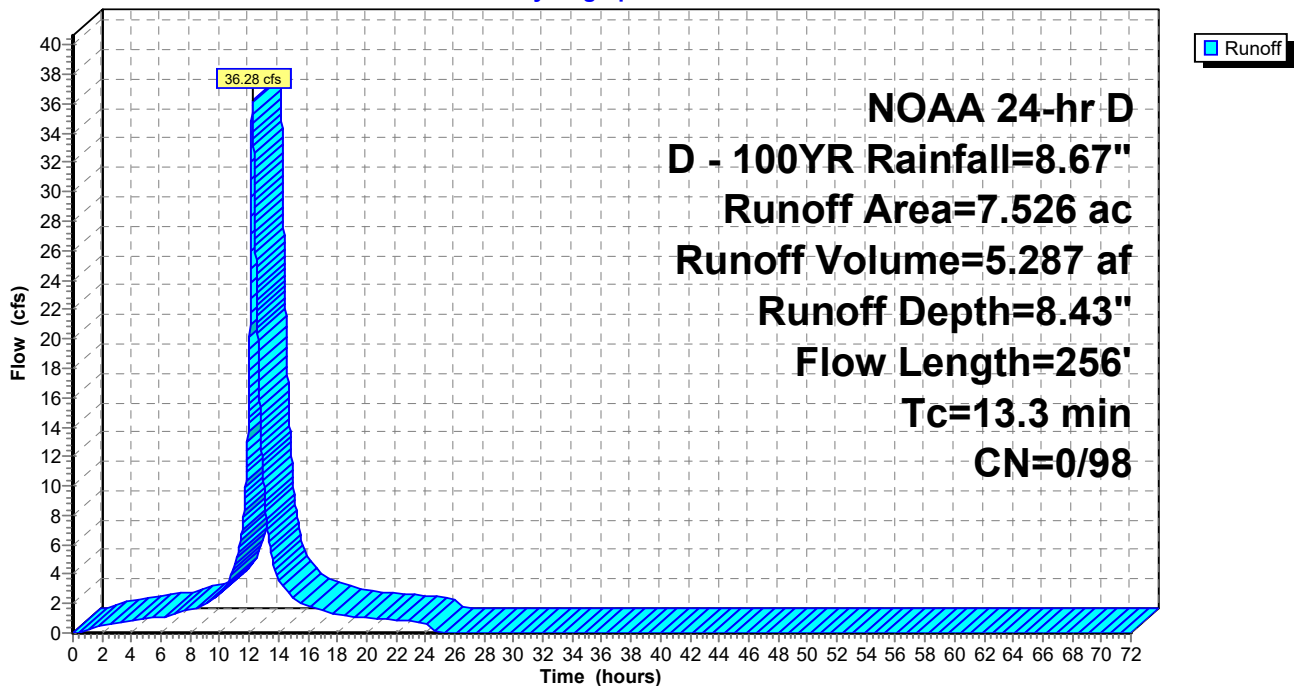
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
7.526	98	Paved parking, HSG D
7.526	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	85	0.0230	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.7	171	0.0600	1.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.3	256	Total			

Subcatchment EX. DA-2: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 36

Summary for Subcatchment EX. DA-3: EX. DA-3

Runoff = 13.09 cfs @ 12.51 hrs, Volume= 2.907 af, Depth= 5.89"
 Routed to Link E-PC : POND CREEK

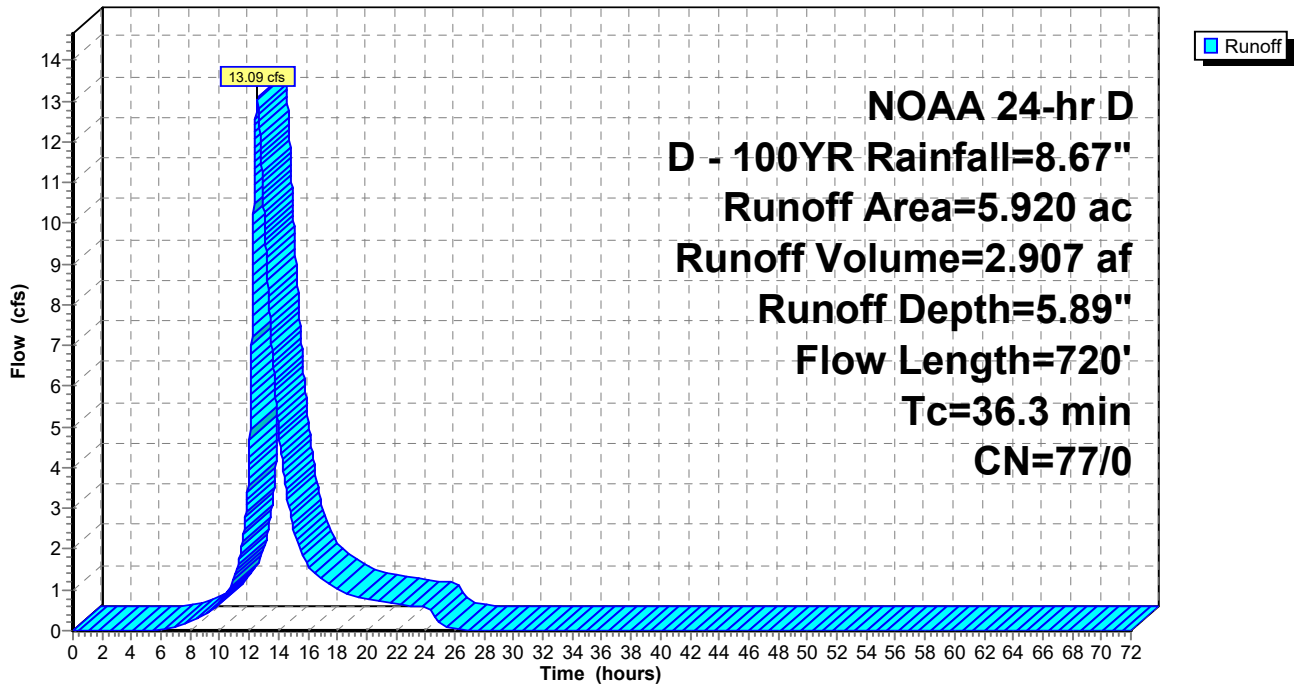
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.630	79	Woods/grass comb., Good, HSG D
5.290	77	Woods, Good, HSG D
5.920	77	Weighted Average
5.920	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	80	0.0125	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.3	720	Total			

Subcatchment EX. DA-3: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 37

Summary for Subcatchment EX. DA-4: EX. DA-4

[47] Hint: Peak is 657% of capacity of segment #5

Runoff = 13.43 cfs @ 12.73 hrs, Volume= 3.683 af, Depth= 5.89"
 Routed to Link E-DC : DUCK CREEK

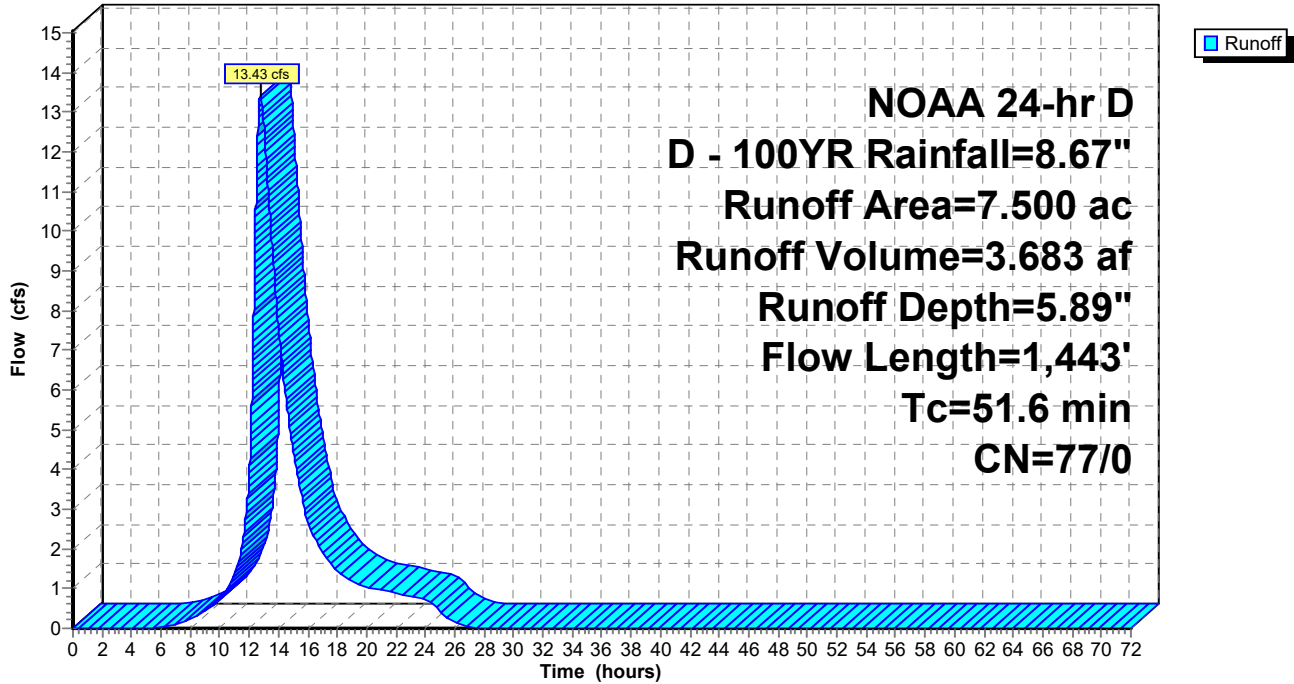
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.800	79	Woods/grass comb., Good, HSG D
6.700	77	Woods, Good, HSG D
7.500	77	Weighted Average
7.500	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	90	0.0390	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
12.8	470	0.0150	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.5	335	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
51.6	1,443	Total			

Subcatchment EX. DA-4: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 39

Summary for Subcatchment EX. DA-5: EX. DA-5

[47] Hint: Peak is 555% of capacity of segment #1

Runoff = 11.34 cfs @ 12.10 hrs, Volume= 0.881 af, Depth= 8.32"
 Routed to Link E-DC : DUCK CREEK

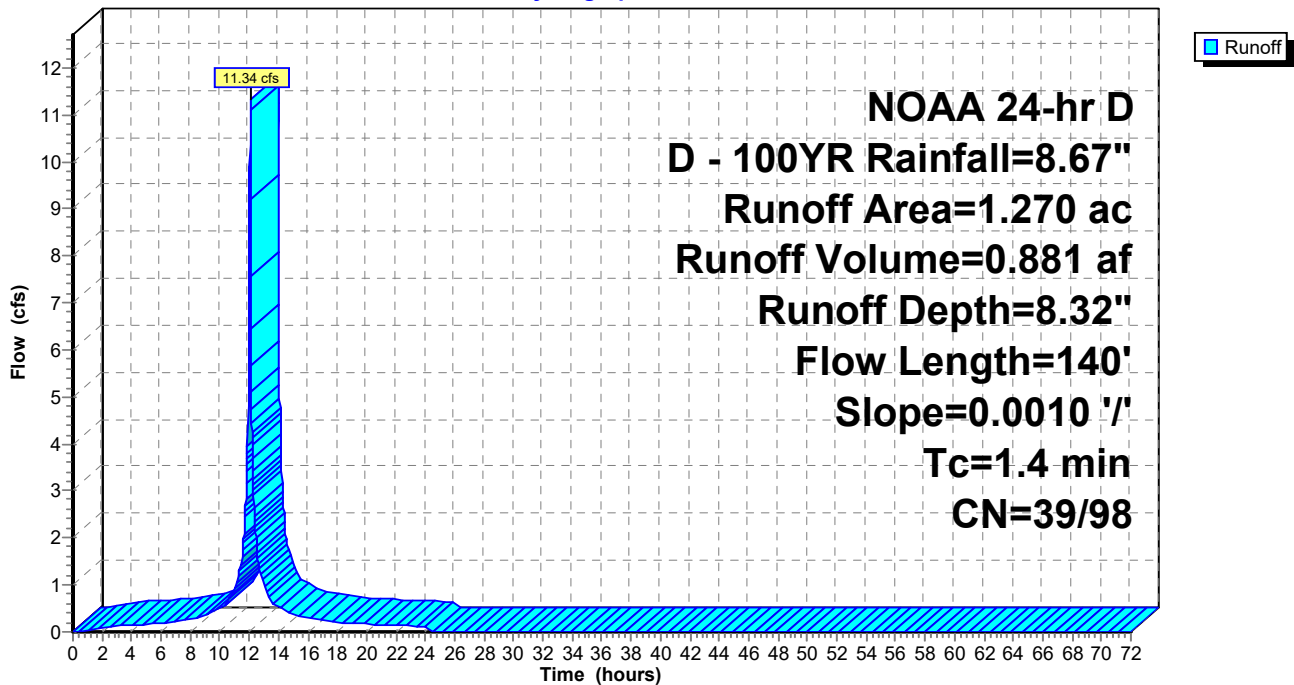
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
1.250	98	Paved parking, HSG A
0.020	39	>75% Grass cover, Good, HSG A
1.270	97	Weighted Average
0.020	39	1.57% Pervious Area
1.250	98	98.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013

Subcatchment EX. DA-5: EX. DA-5

Hydrograph



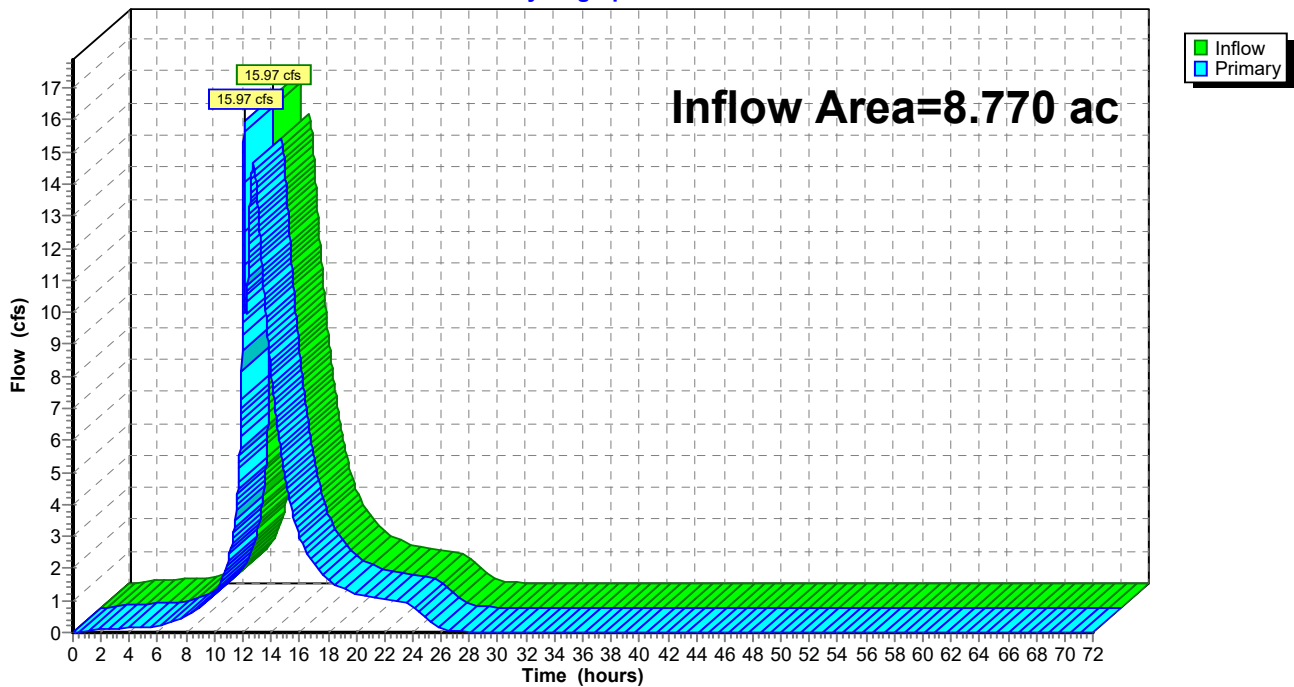
Summary for Link E-DC: DUCK CREEK

Inflow Area = 8.770 ac, 14.25% Impervious, Inflow Depth = 6.24" for D - 100YR event
Inflow = 15.97 cfs @ 12.10 hrs, Volume= 4.563 af
Primary = 15.97 cfs @ 12.10 hrs, Volume= 4.563 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-DC: DUCK CREEK

Hydrograph



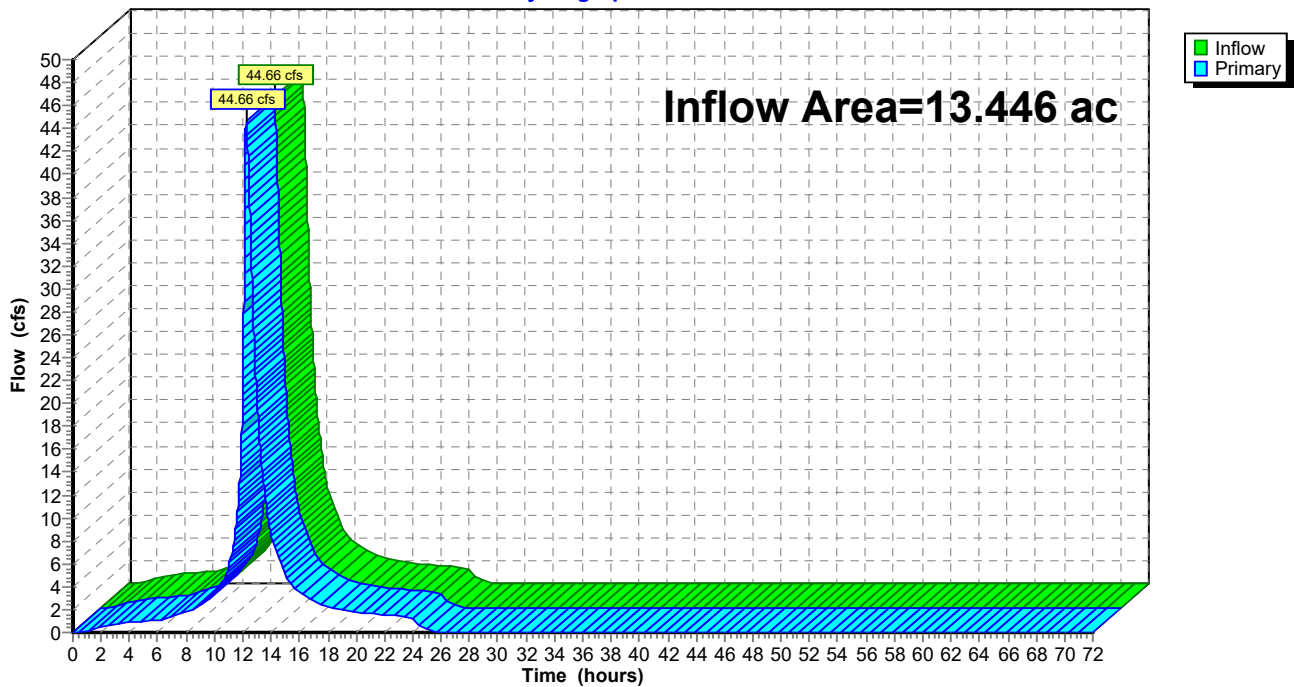
Summary for Link E-PC: POND CREEK

Inflow Area = 13.446 ac, 55.97% Impervious, Inflow Depth = 7.31" for D - 100YR event
Inflow = 44.66 cfs @ 12.24 hrs, Volume= 8.194 af
Primary = 44.66 cfs @ 12.24 hrs, Volume= 8.194 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-PC: POND CREEK

Hydrograph



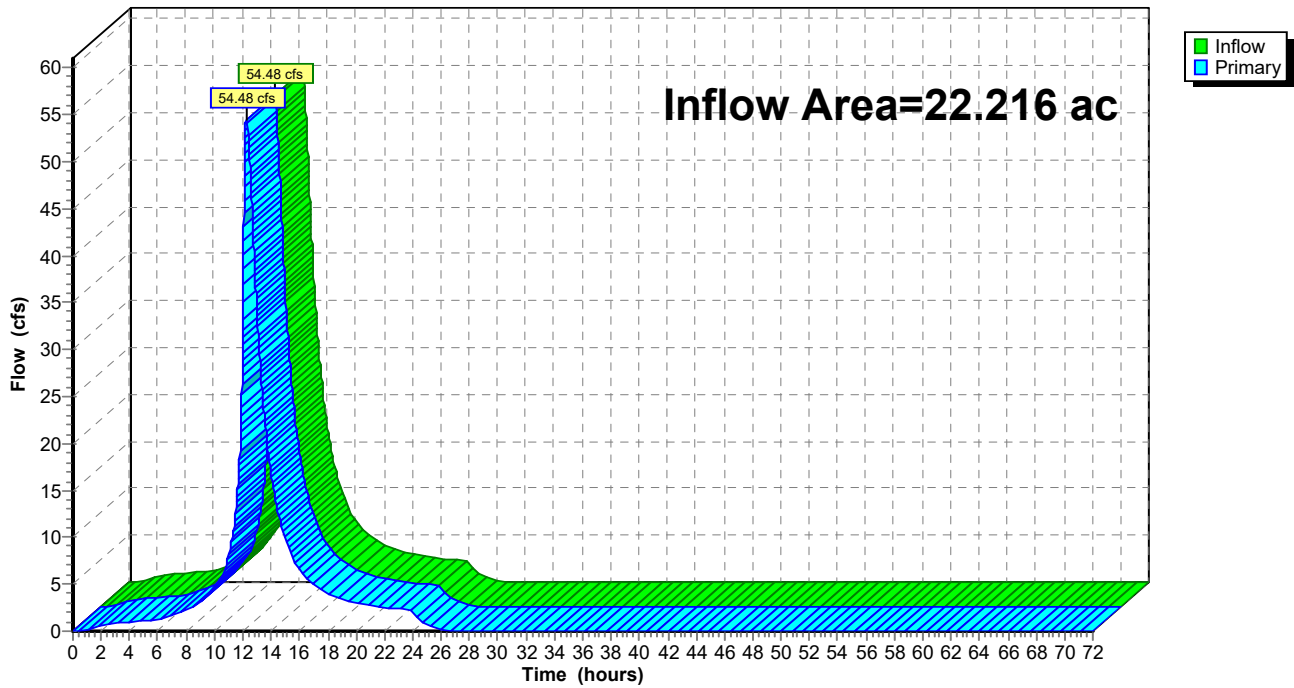
Summary for Link E-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 39.50% Impervious, Inflow Depth = 6.89" for D - 100YR event
Inflow = 54.48 cfs @ 12.24 hrs, Volume= 12.757 af
Primary = 54.48 cfs @ 12.24 hrs, Volume= 12.757 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 43

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX. DA-2: EX. DA-2 Runoff Area=7.526 ac 100.00% Impervious Runoff Depth=1.03"
 Flow Length=256' Tc=13.3 min CN=0/98 Runoff=12.02 cfs 0.649 af

SubcatchmentEX. DA-3: EX. DA-3 Runoff Area=5.920 ac 0.00% Impervious Runoff Depth=0.12"
 Flow Length=720' Tc=36.3 min CN=77/0 Runoff=0.49 cfs 0.058 af

SubcatchmentEX. DA-4: EX. DA-4 Runoff Area=7.500 ac 0.00% Impervious Runoff Depth=0.12"
 Flow Length=1,443' Tc=51.6 min CN=77/0 Runoff=0.51 cfs 0.073 af

SubcatchmentEX. DA-5: EX. DA-5 Runoff Area=1.270 ac 98.43% Impervious Runoff Depth=1.02"
 Flow Length=140' Slope=0.0010 '/' Tc=1.4 min CN=39/98 Runoff=3.84 cfs 0.108 af

Link E-DC: DUCK CREEK Inflow=3.84 cfs 0.181 af
 Primary=3.84 cfs 0.181 af

Link E-PC: POND CREEK Inflow=12.06 cfs 0.707 af
 Primary=12.06 cfs 0.707 af

Link E-SR: SOUTH RIVER Inflow=13.25 cfs 0.887 af
 Primary=13.25 cfs 0.887 af

Total Runoff Area = 22.216 ac Runoff Volume = 0.887 af Average Runoff Depth = 0.48"
60.50% Pervious = 13.440 ac 39.50% Impervious = 8.776 ac

250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 44

Summary for Subcatchment EX. DA-2: EX. DA-2

Runoff = 12.02 cfs @ 1.21 hrs, Volume= 0.649 af, Depth= 1.03"
 Routed to Link E-PC : POND CREEK

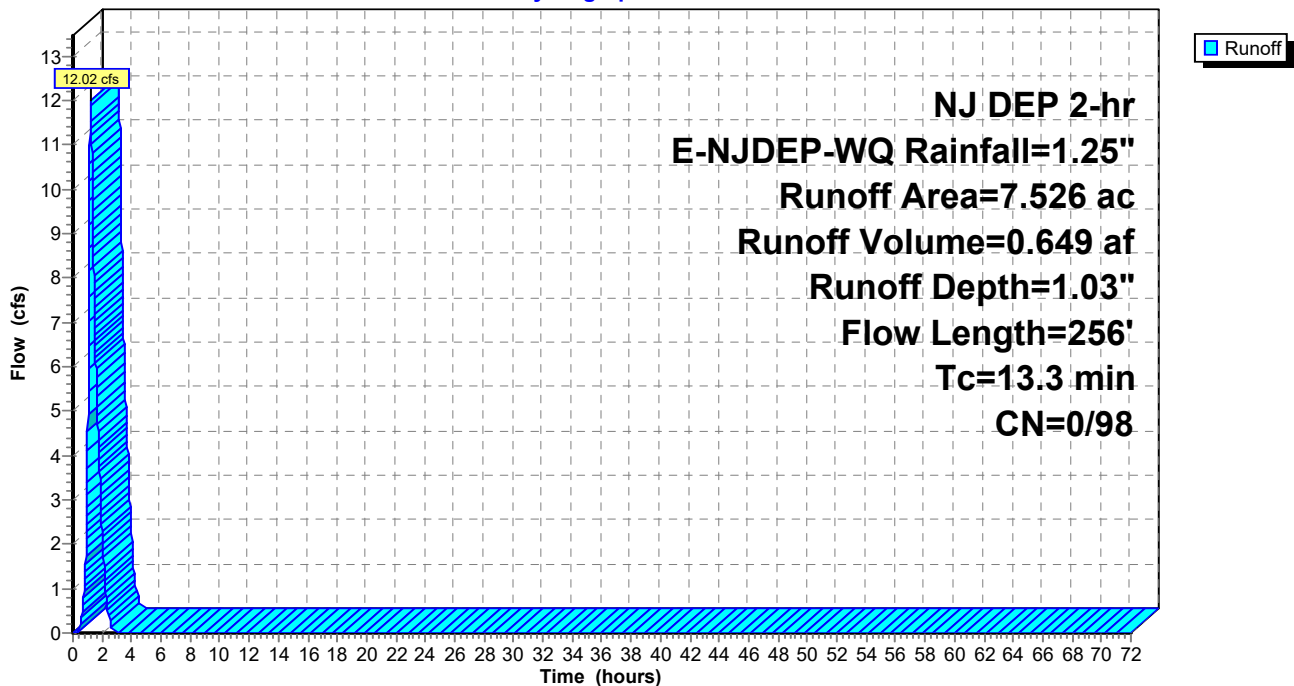
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
7.526	98	Paved parking, HSG D
7.526	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	85	0.0230	0.12		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.7	171	0.0600	1.71		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
13.3	256	Total			

Subcatchment EX. DA-2: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 45

Summary for Subcatchment EX. DA-3: EX. DA-3

Runoff = 0.49 cfs @ 1.93 hrs, Volume= 0.058 af, Depth= 0.12"
 Routed to Link E-PC : POND CREEK

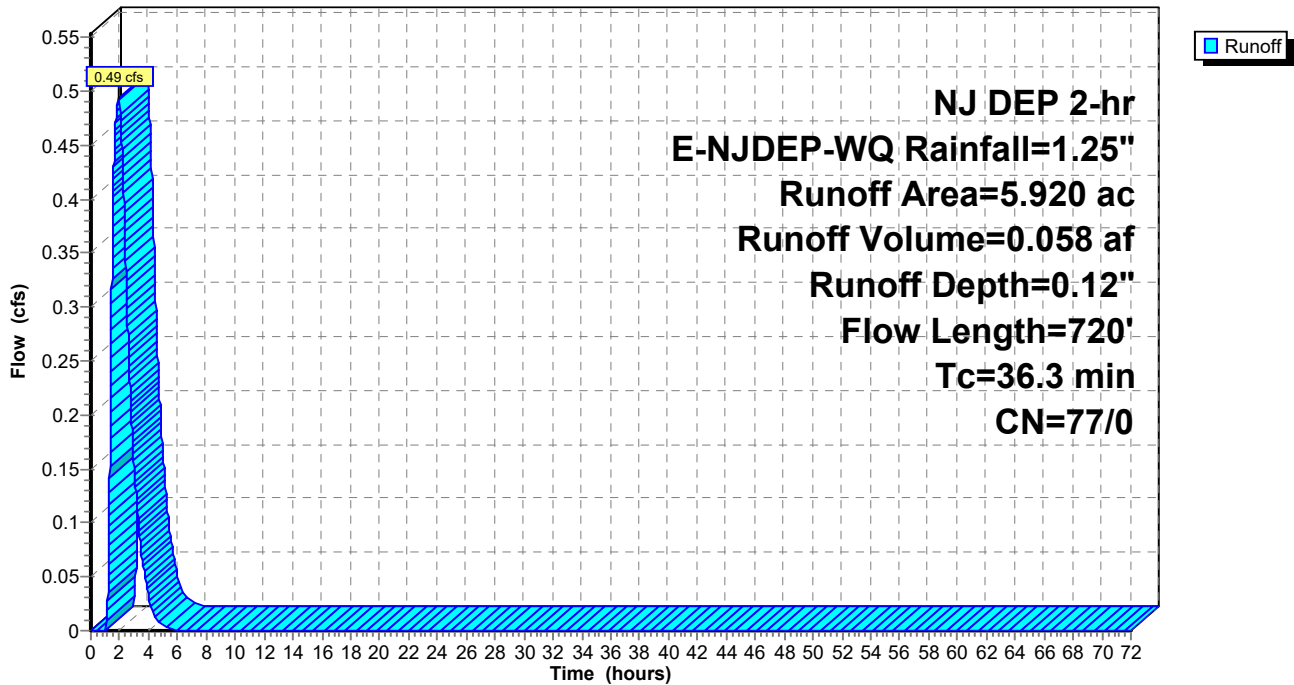
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.630	79	Woods/grass comb., Good, HSG D
5.290	77	Woods, Good, HSG D
5.920	77	Weighted Average
5.920	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.2	80	0.0125	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.3	720	Total			

Subcatchment EX. DA-3: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 46

Summary for Subcatchment EX. DA-4: EX. DA-4

Runoff = 0.51 cfs @ 2.07 hrs, Volume= 0.073 af, Depth= 0.12"
 Routed to Link E-DC : DUCK CREEK

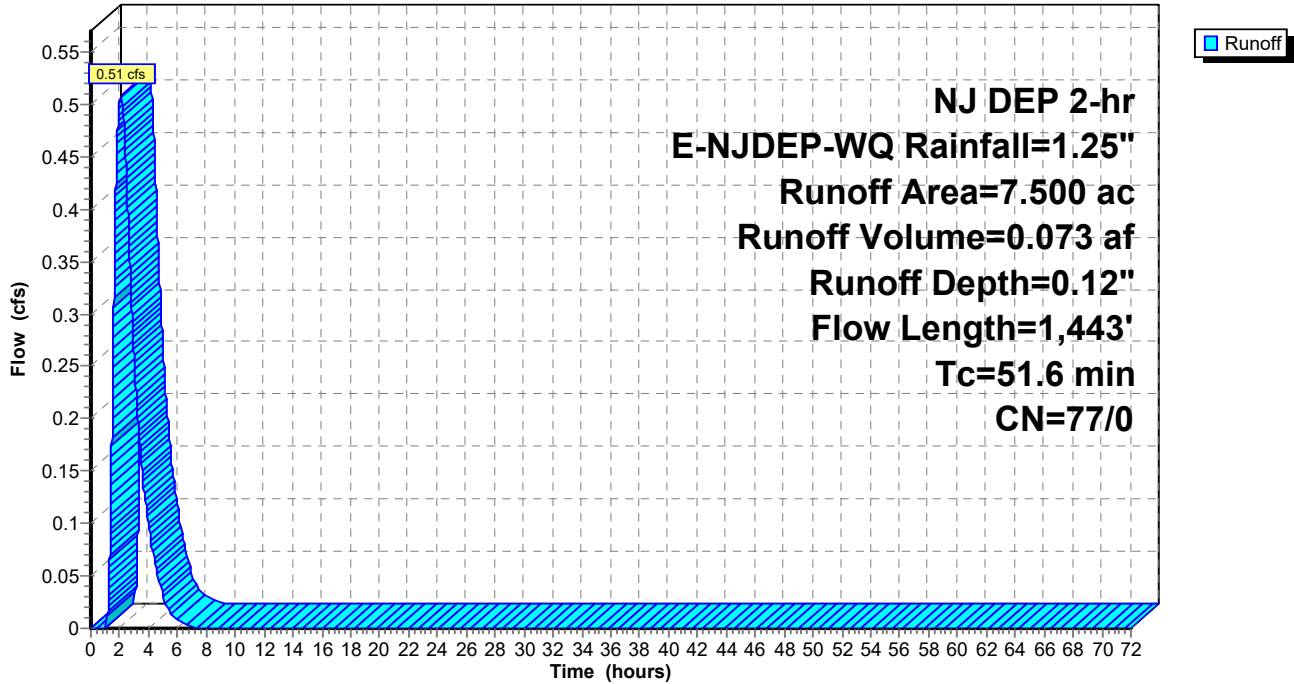
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt=
 NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.800	79	Woods/grass comb., Good, HSG D
6.700	77	Woods, Good, HSG D
7.500	77	Weighted Average
7.500	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.8	90	0.0390	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
12.8	470	0.0150	0.61		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
10.1	408	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
12.5	335	0.0080	0.45		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013
51.6	1,443	Total			

Subcatchment EX. DA-4: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 48

Summary for Subcatchment EX. DA-5: EX. DA-5

[47] Hint: Peak is 188% of capacity of segment #1

Runoff = 3.84 cfs @ 1.08 hrs, Volume= 0.108 af, Depth= 1.02"
 Routed to Link E-DC : DUCK CREEK

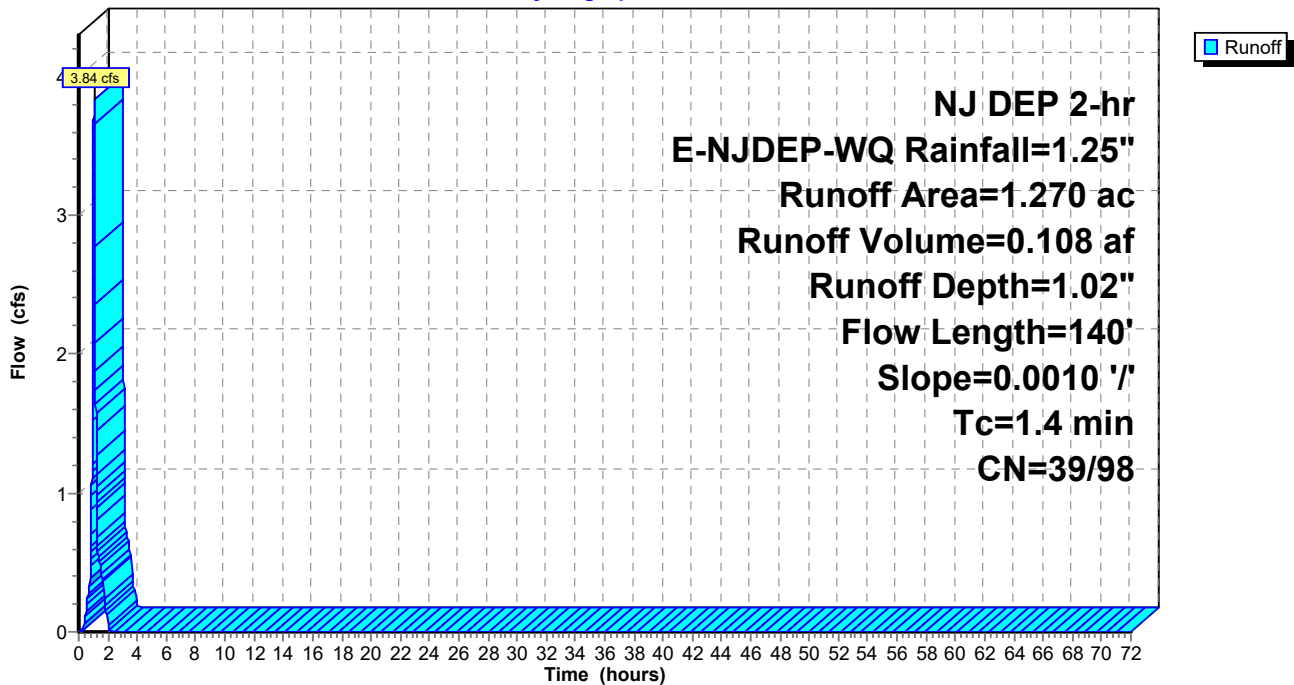
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
1.250	98	Paved parking, HSG A
0.020	39	>75% Grass cover, Good, HSG A
1.270	97	Weighted Average
0.020	39	1.57% Pervious Area
1.250	98	98.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	140	0.0010	1.66	2.04	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013

Subcatchment EX. DA-5: EX. DA-5

Hydrograph



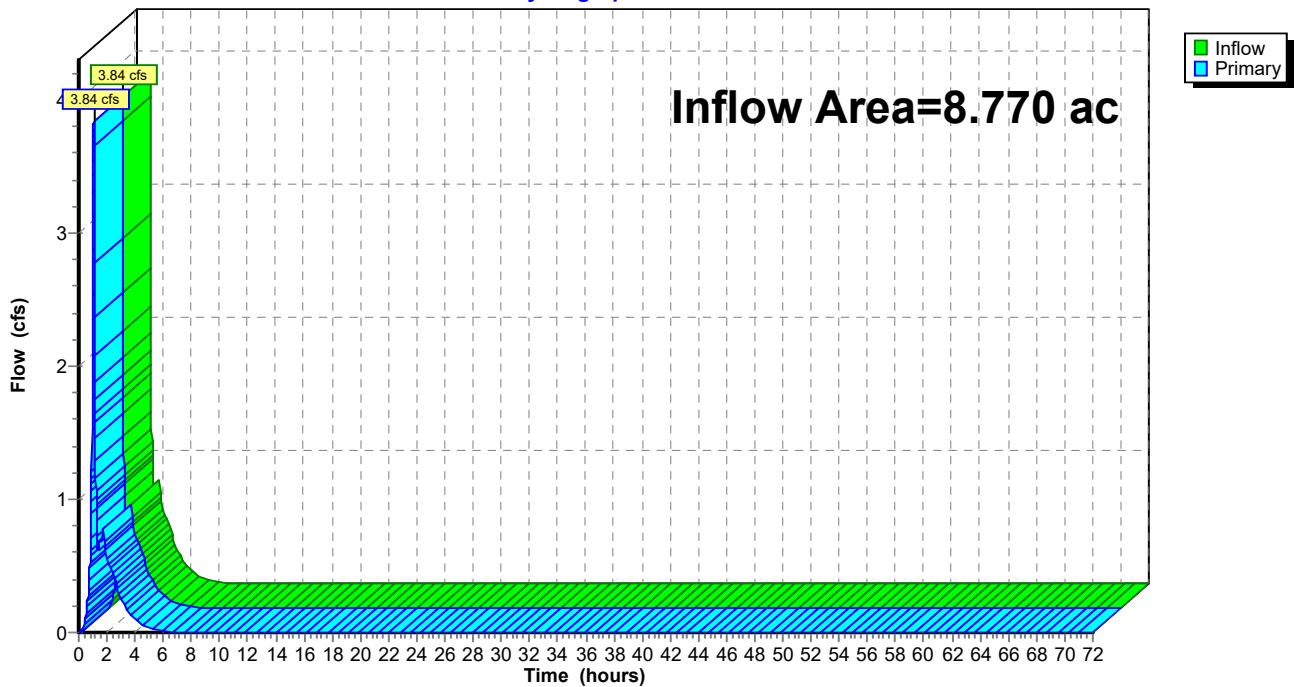
Summary for Link E-DC: DUCK CREEK

Inflow Area = 8.770 ac, 14.25% Impervious, Inflow Depth = 0.25" for E-NJDEP-WQ event
Inflow = 3.84 cfs @ 1.08 hrs, Volume= 0.181 af
Primary = 3.84 cfs @ 1.08 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-DC: DUCK CREEK

Hydrograph



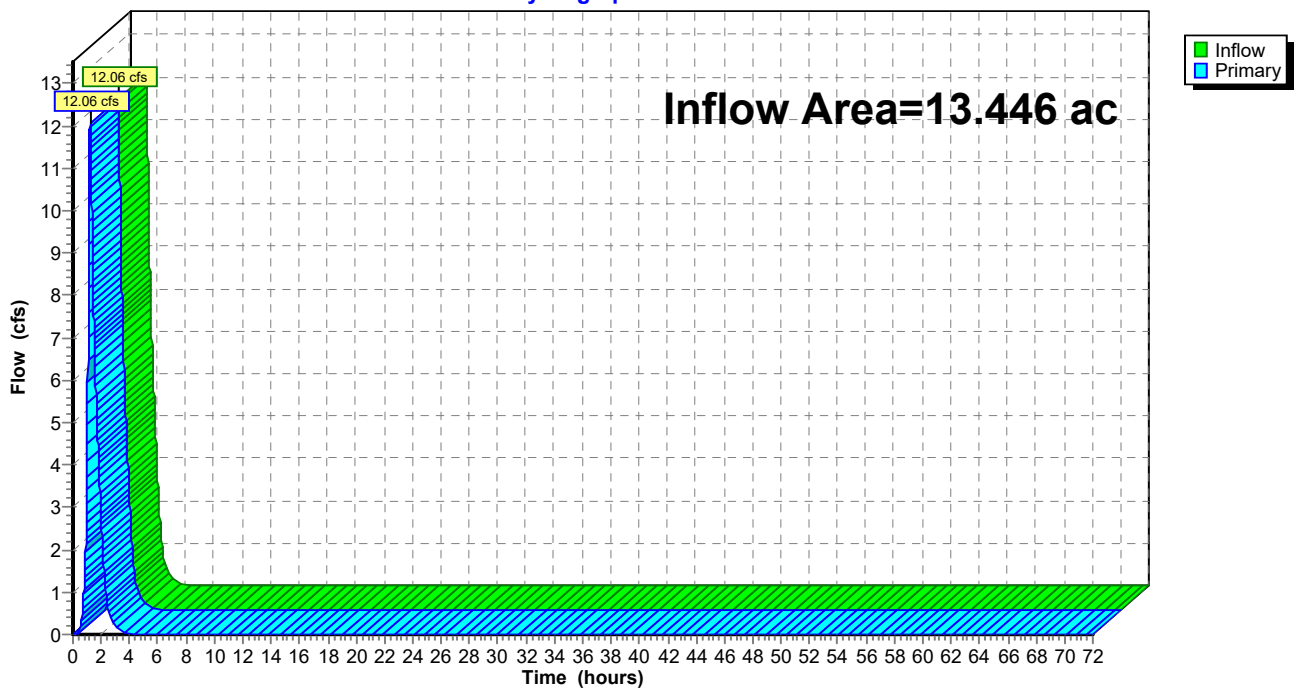
Summary for Link E-PC: POND CREEK

Inflow Area = 13.446 ac, 55.97% Impervious, Inflow Depth = 0.63" for E-NJDEP-WQ event
Inflow = 12.06 cfs @ 1.21 hrs, Volume= 0.707 af
Primary = 12.06 cfs @ 1.21 hrs, Volume= 0.707 af, Atten= 0%, Lag= 0.0 min
Routed to Link E-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-PC: POND CREEK

Hydrograph



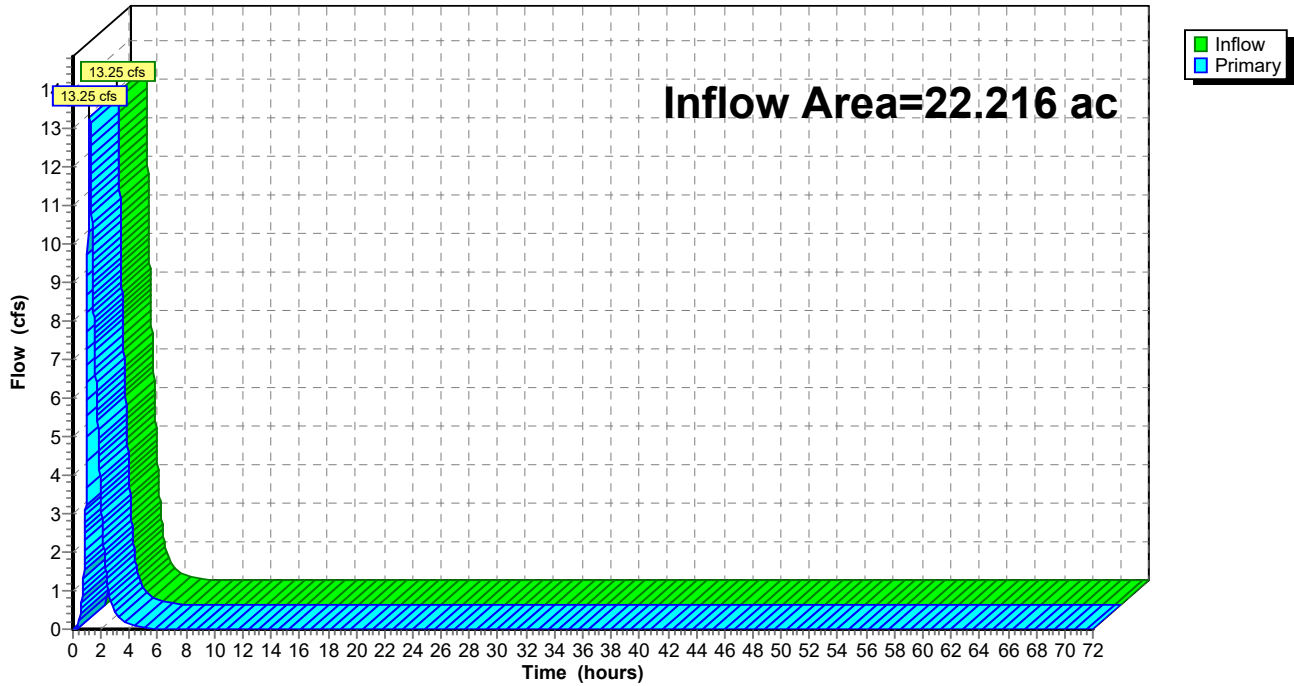
Summary for Link E-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 39.50% Impervious, Inflow Depth = 0.48" for E-NJDEP-WQ event
Inflow = 13.25 cfs @ 1.18 hrs, Volume= 0.887 af
Primary = 13.25 cfs @ 1.18 hrs, Volume= 0.887 af, Atten= 0%, Lag= 0.0 min

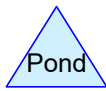
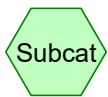
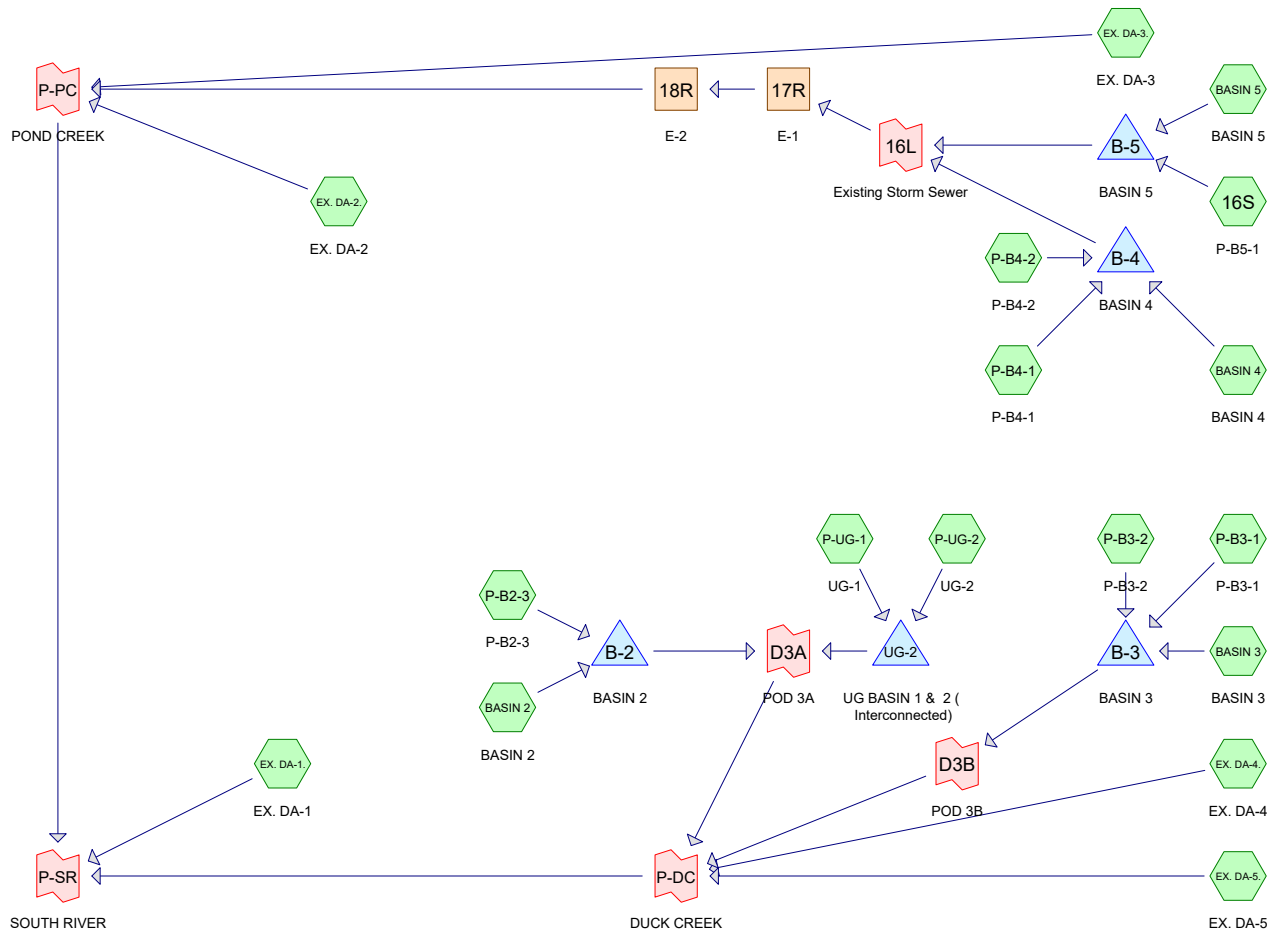
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link E-SR: SOUTH RIVER

Hydrograph



**PROPOSED
CONDITIONS**



Routing Diagram for 250225 - Exist & Proposed Conditions
 Prepared by Colliers Engineering & Design, Printed 2/26/2025
 HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - 2YR	NOAA 24-hr	D	Default	24.00	1	3.35	2
2	B - 10YR	NOAA 24-hr	D	Default	24.00	1	5.13	2
3	C - 25YR	NOAA 24-hr	D	Default	24.00	1	6.38	2
4	D - 100YR	NOAA 24-hr	D	Default	24.00	1	8.67	2
5	E-NJDEP-WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.192	39	>75% Grass cover, Good, HSG A (EX. DA-5.)
1.164	80	>75% Grass cover, Good, HSG D (16S, BASIN 4, EX. DA-4., P-B3-1, P-B4-1, P-B4-2)
0.899	98	>75% Grass cover, Good, HSG D (16S, P-B2-3, P-B3-1, P-B3-2)
0.090	98	Concrete, HSG D (16S, EX. DA-1., P-B3-1, P-B4-2)
2.723	98	DA - Paved parking, HSG D (16S, P-B4-1, P-B4-2)
1.568	98	Grass, HSG D (EX. DA-1., EX. DA-2.)
1.063	78	Meadow, non-grazed, HSG D (BASIN 2, BASIN 3, BASIN 5)
0.111	98	Paved parking, HSG A (EX. DA-5.)
2.811	98	Paved parking, HSG D (EX. DA-4., P-B2-3, P-B3-1, P-B3-2)
5.739	98	Roof, HSG D (P-UG-1, P-UG-2)
5.856	77	Woods, Good, HSG D (EX. DA-3., EX. DA-4., P-B4-1)
22.216	90	TOTAL AREA

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.303	HSG A	EX. DA-5.
0.000	HSG B	
0.000	HSG C	
21.913	HSG D	16S, BASIN 2, BASIN 3, BASIN 4, BASIN 5, EX. DA-1., EX. DA-2., EX. DA-3., EX. DA-4., P-B2-3, P-B3-1, P-B3-2, P-B4-1, P-B4-2, P-UG-1, P-UG-2
0.000	Other	
22.216		TOTAL AREA

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.192	0.000	0.000	2.063	0.000	2.255	>75% Grass cover, Good	16S, BASIN 4, EX. DA-4., EX. DA-5., P-B2-3, P-B3-1, P-B3-2, P-B4-1, P-B4-2
0.000	0.000	0.000	0.090	0.000	0.090	Concrete	16S, EX. DA-1., P-B3-1, P-B4-2
0.000	0.000	0.000	2.723	0.000	2.723	DA - Paved parking	16S, P-B4-1, P-B4-2
0.000	0.000	0.000	1.568	0.000	1.568	Grass	EX. DA-1., EX. DA-2.
0.000	0.000	0.000	1.063	0.000	1.063	Meadow, non-grazed	BASIN 2, BASIN 3, BASIN 5
0.111	0.000	0.000	2.811	0.000	2.922	Paved parking	EX. DA-4., EX. DA-5., P-B2-3, P-B3-1, P-B3-2
0.000	0.000	0.000	5.739	0.000	5.739	Roof	P-UG-1, P-UG-2
0.000	0.000	0.000	5.856	0.000	5.856	Woods, Good	EX. DA-3., EX. DA-4., P-B4-1

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 6

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.303	0.000	0.000	21.913	0.000	22.216	TOTAL AREA	

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/26/2025

Page 7

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	16S	0.00	0.00	840.0	0.0045	0.012	0.0	30.0	0.0	
2	P-B2-3	0.00	0.00	49.0	0.0050	0.013	0.0	24.0	0.0	
3	P-B3-1	0.00	0.00	50.0	0.0050	0.013	0.0	15.0	0.0	
4	P-B3-2	0.00	0.00	500.0	0.0100	0.013	0.0	24.0	0.0	
5	P-B4-1	0.00	0.00	33.0	0.0050	0.012	0.0	15.0	0.0	
6	P-B4-2	0.00	0.00	677.0	0.0050	0.012	0.0	18.0	0.0	
7	P-UG-1	0.00	0.00	1,140.0	0.0050	0.013	0.0	30.0	0.0	
8	P-UG-2	0.00	0.00	18.0	0.0050	0.013	0.0	15.0	0.0	
9	17R	7.93	6.64	238.0	0.0054	0.013	0.0	28.0	0.0	
10	18R	6.64	5.60	229.0	0.0045	0.013	0.0	28.0	0.0	
11	B-2	15.00	14.52	52.0	0.0092	0.013	0.0	24.0	0.0	
12	B-3	6.35	6.00	70.0	0.0050	0.013	0.0	24.0	0.0	
13	B-4	9.68	9.63	11.0	0.0045	0.013	0.0	15.0	0.0	
14	B-5	9.18	9.13	10.0	0.0050	0.013	0.0	15.0	0.0	
15	UG-2	6.34	6.14	41.0	0.0049	0.012	0.0	24.0	0.0	

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 8

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=3.04" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=5.50 cfs 0.632 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.27 cfs 0.016 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=0.83 cfs 0.056 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=1.52" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.40 cfs 0.037 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=0.53 cfs 0.050 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=1.36 cfs 0.245 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=1.67 cfs 0.165 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=1.32" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=2.49 cfs 0.589 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=2.10" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=1.57 cfs 0.164 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=1.14" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.30 cfs 0.029 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=4.64 cfs 0.389 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=2.98" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.00 cfs 0.090 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=3.15 cfs 0.276 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=1.68" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=0.63 cfs 0.077 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=2.82" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=2.11 cfs 0.233 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=7.09 cfs 0.745 af

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 9

SubcatchmentP-UG-2: UG-2 Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=3.12"
 Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=8.05 cfs 0.745 af

Reach 17R: E-1 Avg. Flow Depth=0.53' Max Vel=3.91 fps Inflow=2.88 cfs 0.708 af
 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=2.88 cfs 0.708 af

Reach 18R: E-2 Avg. Flow Depth=0.56' Max Vel=3.67 fps Inflow=2.88 cfs 0.708 af
 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=2.88 cfs 0.708 af

Pond B-2: BASIN 2 Peak Elev=17.11' Storage=0.219 af Inflow=4.86 cfs 0.405 af
 Outflow=0.82 cfs 0.311 af

Pond B-3: BASIN 3 Peak Elev=11.71' Storage=0.293 af Inflow=4.96 cfs 0.422 af
 Outflow=0.25 cfs 0.225 af

Pond B-4: BASIN 4 Peak Elev=14.33' Storage=7,173 cf Inflow=3.09 cfs 0.347 af
 Outflow=1.02 cfs 0.256 af

Pond B-5: BASIN 5 Peak Elev=14.63' Storage=16,077 cf Inflow=6.03 cfs 0.683 af
 Outflow=1.86 cfs 0.452 af

Pond UG-2: UG BASIN 1 & 2 (Peak Elev=12.23' Storage=1.108 af Inflow=15.01 cfs 1.491 af
 Outflow=0.61 cfs 0.925 af

Link 16L: Existing Storm Sewer Inflow=2.88 cfs 0.708 af
 Primary=2.88 cfs 0.708 af

Link D3A: POD 3A Inflow=1.31 cfs 1.236 af
 Primary=1.31 cfs 1.236 af

Link D3B: POD 3B Inflow=0.25 cfs 0.225 af
 Primary=0.25 cfs 0.225 af

Link P-DC: DUCK CREEK Inflow=2.77 cfs 1.653 af
 Primary=2.77 cfs 1.653 af

Link P-PC: POND CREEK Inflow=5.70 cfs 1.462 af
 Primary=5.70 cfs 1.462 af

Link P-SR: SOUTH RIVER Inflow=8.76 cfs 3.360 af
 Primary=8.76 cfs 3.360 af

Total Runoff Area = 22.216 ac Runoff Volume = 4.538 af Average Runoff Depth = 2.45"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 10

Summary for Subcatchment 16S: P-B5-1

Runoff = 5.50 cfs @ 12.17 hrs, Volume= 0.632 af, Depth= 3.04"
 Routed to Pond B-5 : BASIN 5

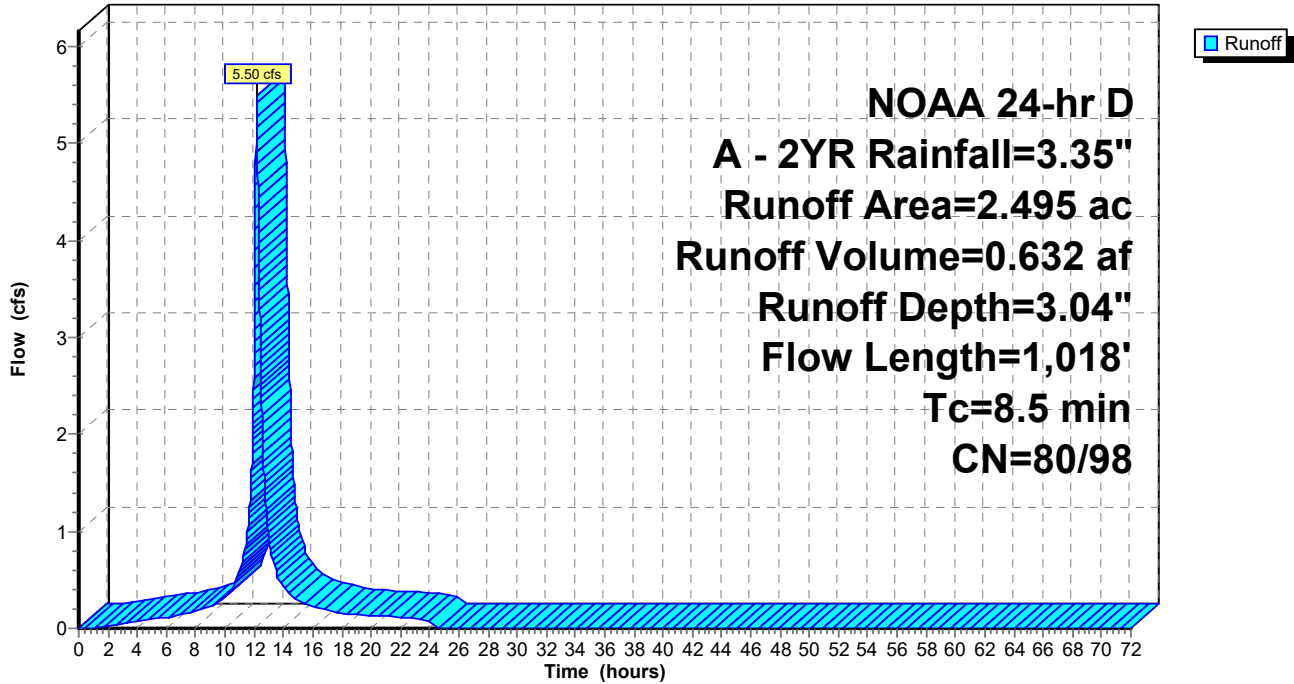
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 1.38"
Routed to Pond B-2 : BASIN 2

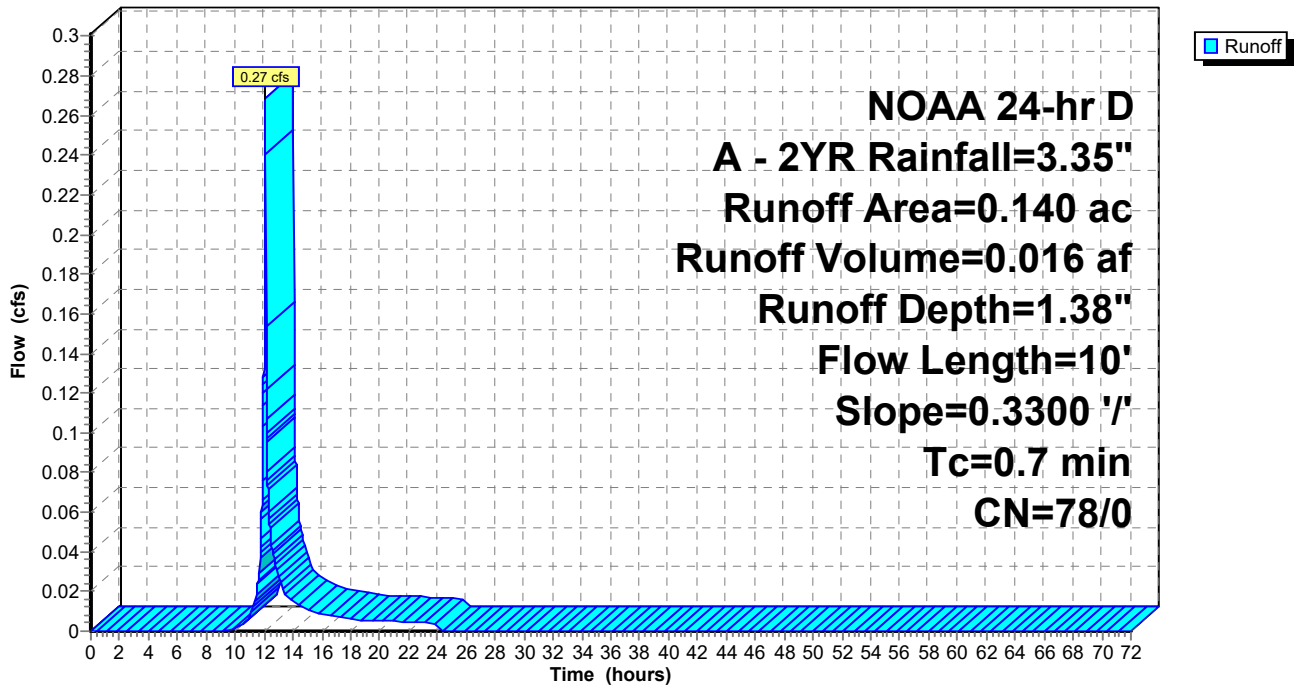
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 13

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 0.83 cfs @ 12.11 hrs, Volume= 0.056 af, Depth= 1.38"
 Routed to Pond B-3 : BASIN 3

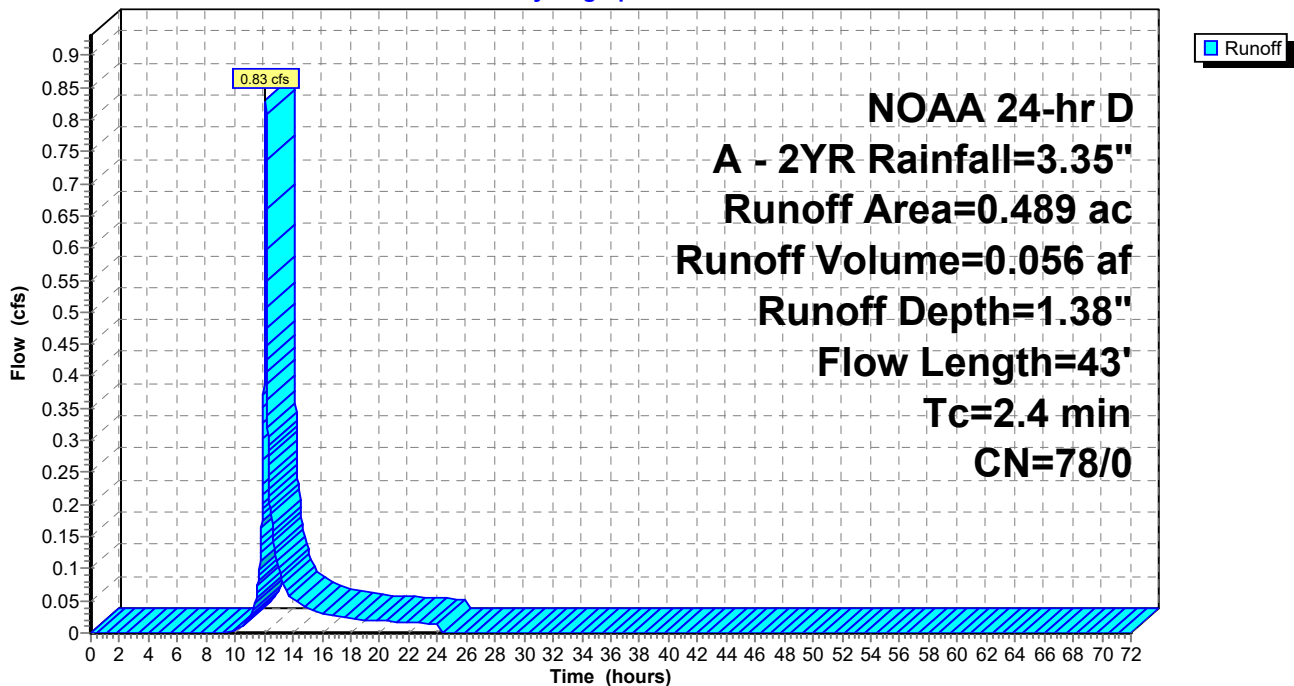
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 14

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.40 cfs @ 12.15 hrs, Volume= 0.037 af, Depth= 1.52"
 Routed to Pond B-4 : BASIN 4

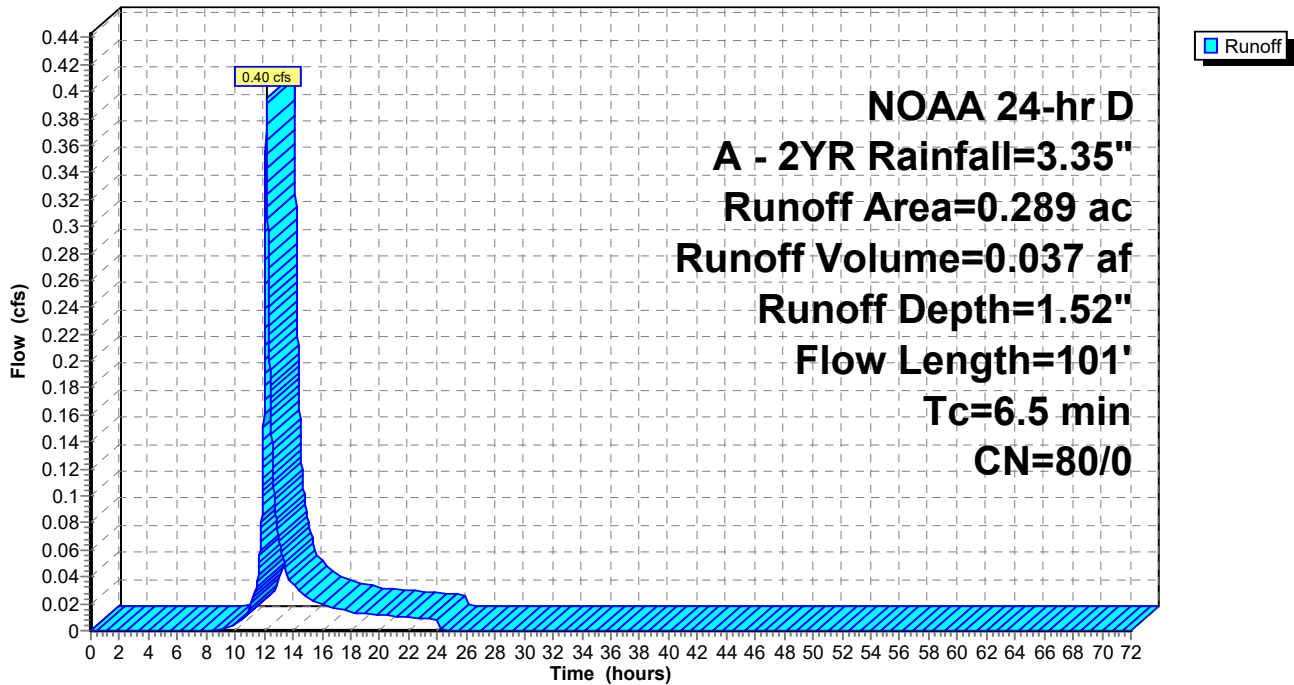
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 15

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 0.53 cfs @ 12.15 hrs, Volume= 0.050 af, Depth= 1.38"
 Routed to Pond B-5 : BASIN 5

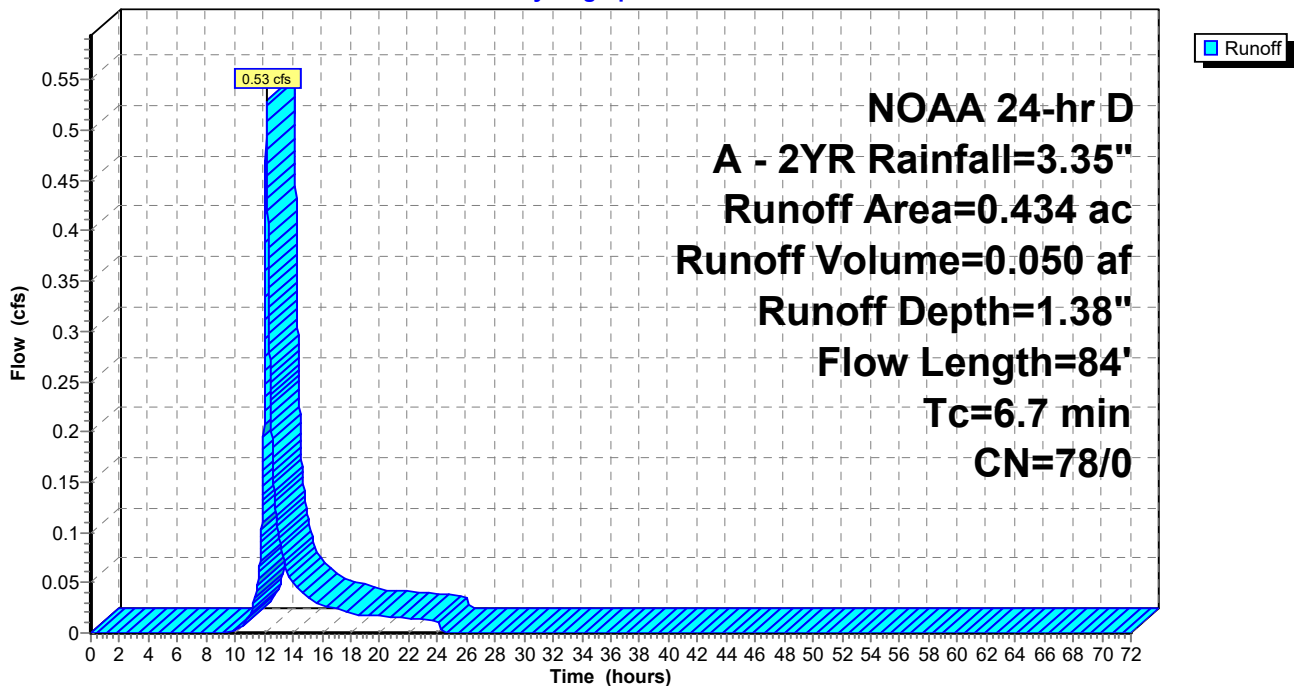
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 16

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 1.36 cfs @ 12.34 hrs, Volume= 0.245 af, Depth= 3.12"
 Routed to Link P-SR : SOUTH RIVER

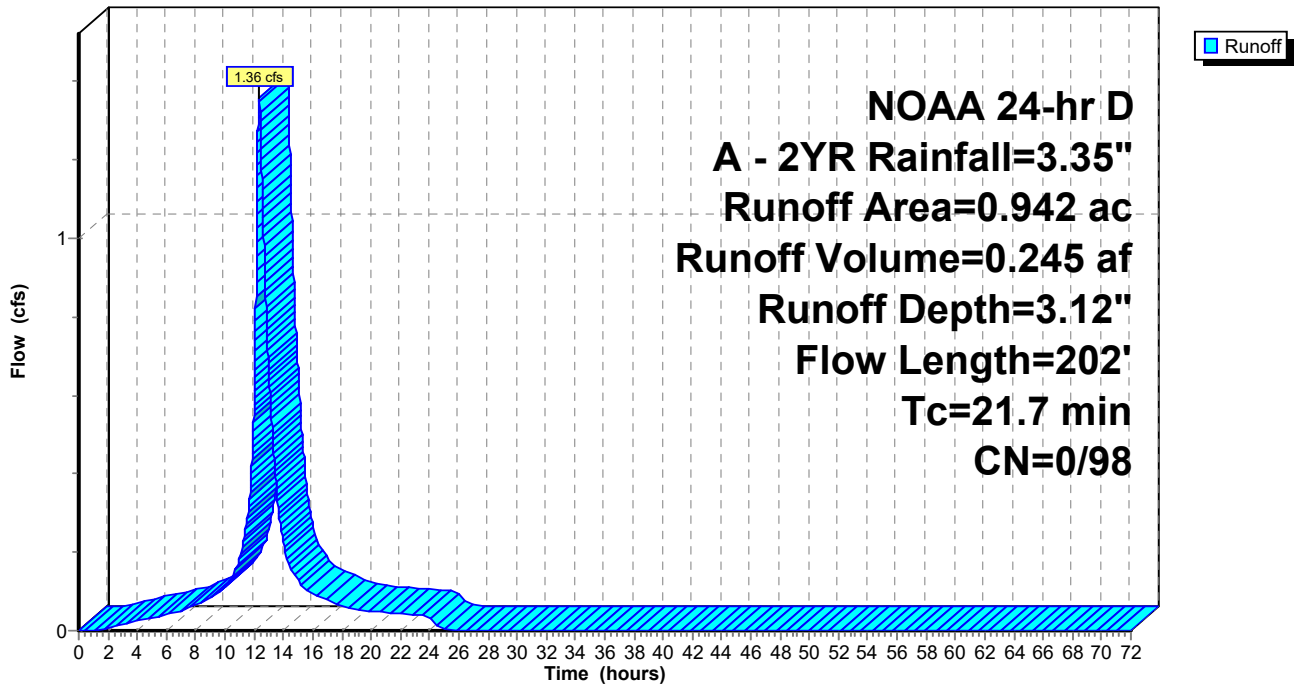
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 17

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 1.67 cfs @ 12.14 hrs, Volume= 0.165 af, Depth= 3.12"
 Routed to Link P-PC : POND CREEK

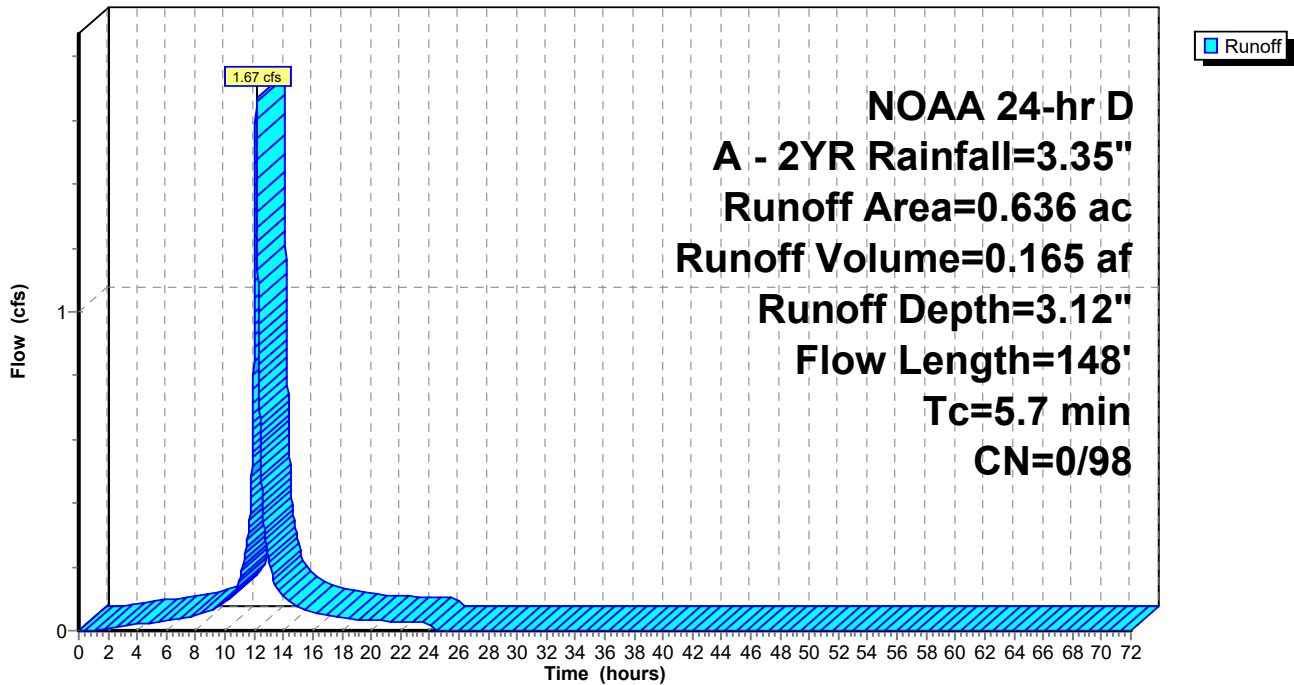
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 18

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 2.49 cfs @ 12.59 hrs, Volume= 0.589 af, Depth= 1.32"
 Routed to Link P-PC : POND CREEK

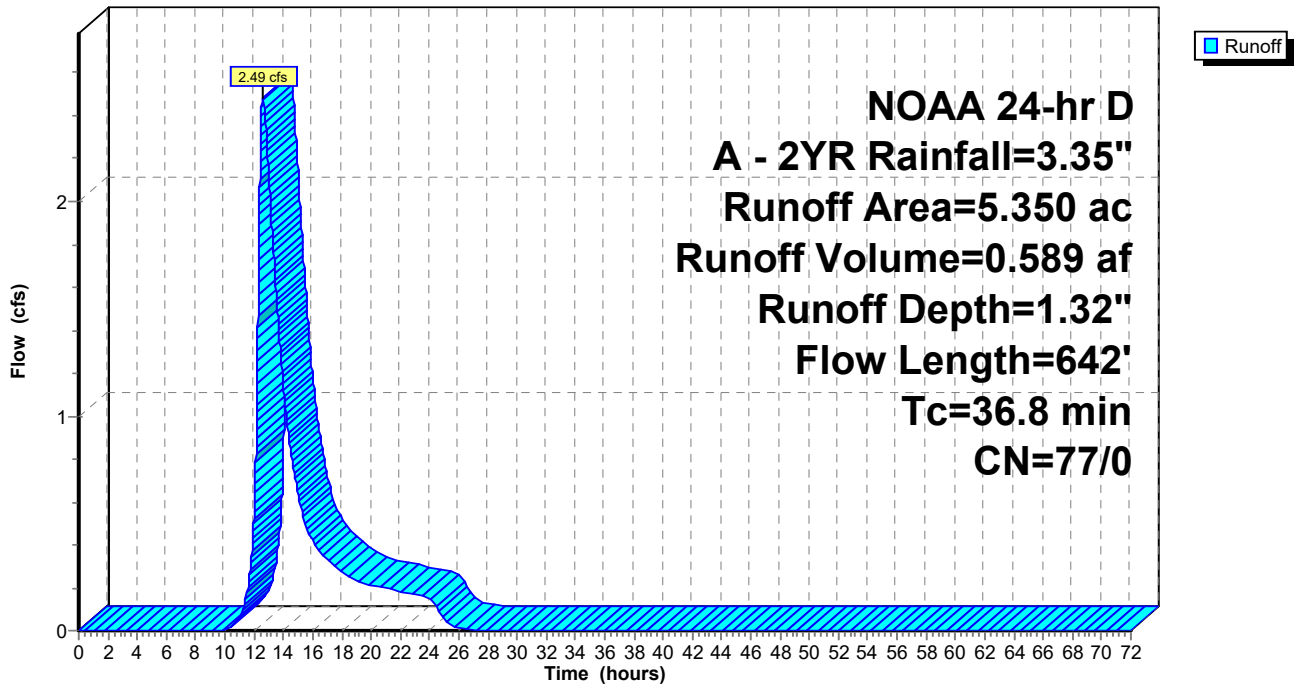
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 19

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 1.57 cfs @ 12.16 hrs, Volume= 0.164 af, Depth= 2.10"
 Routed to Link P-DC : DUCK CREEK

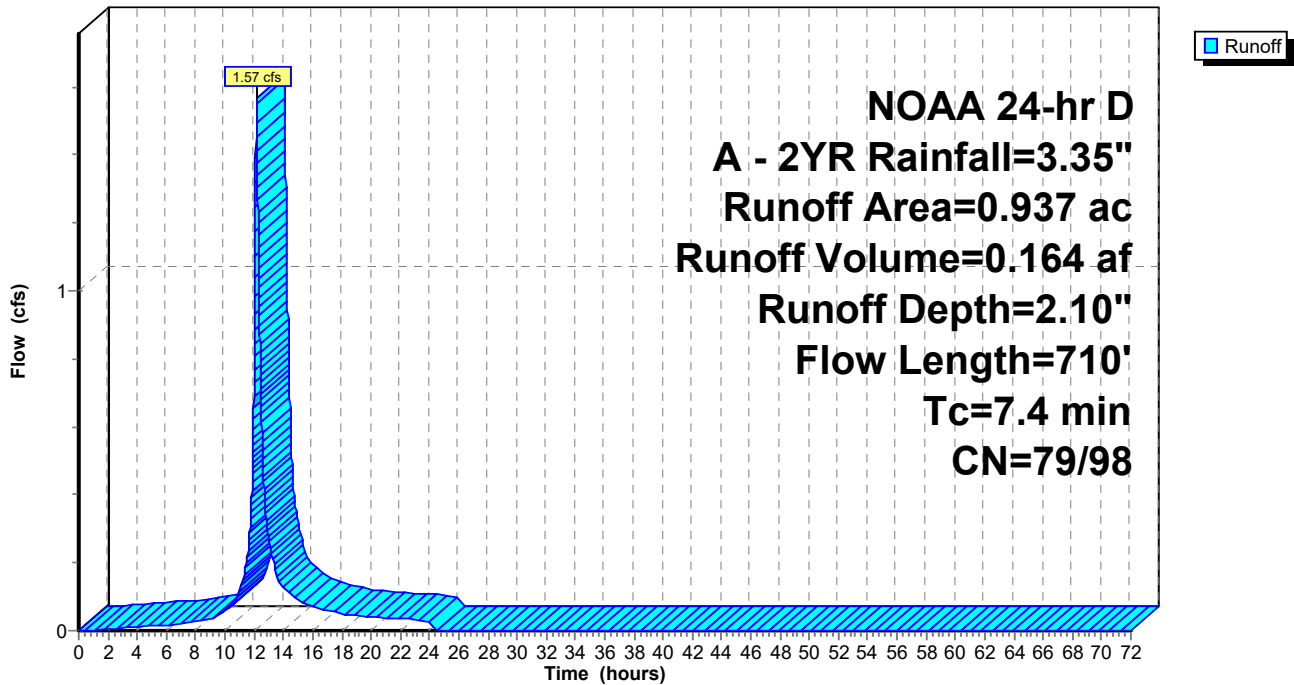
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 20

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.30 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 1.14"
 Routed to Link P-DC : DUCK CREEK

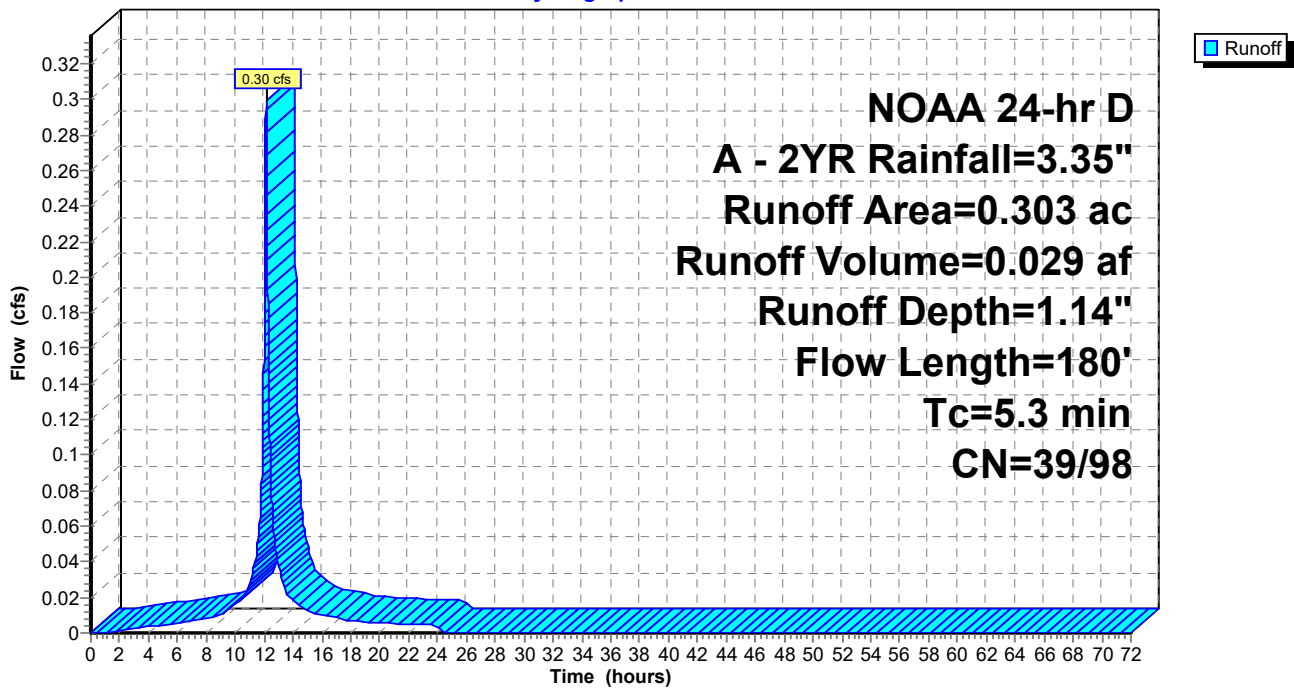
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 21

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 4.64 cfs @ 12.11 hrs, Volume= 0.389 af, Depth= 3.12"
 Routed to Pond B-2 : BASIN 2

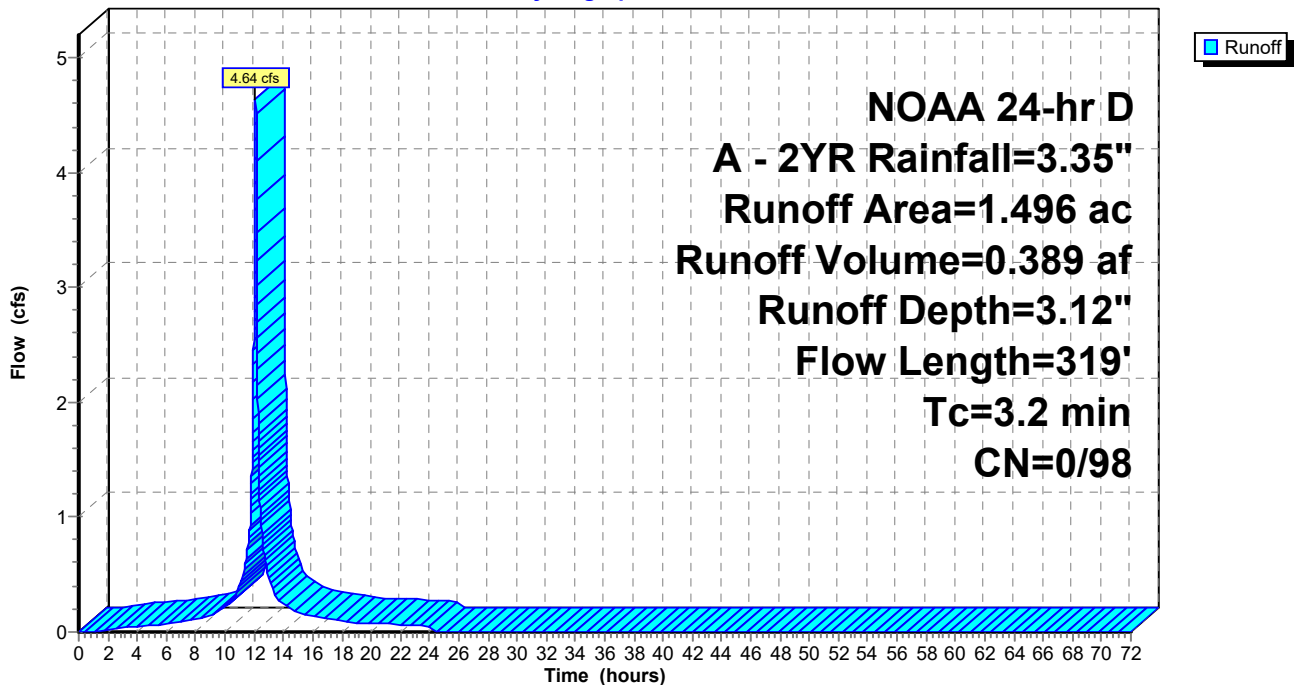
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 22

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.00 cfs @ 12.12 hrs, Volume= 0.090 af, Depth= 2.98"
 Routed to Pond B-3 : BASIN 3

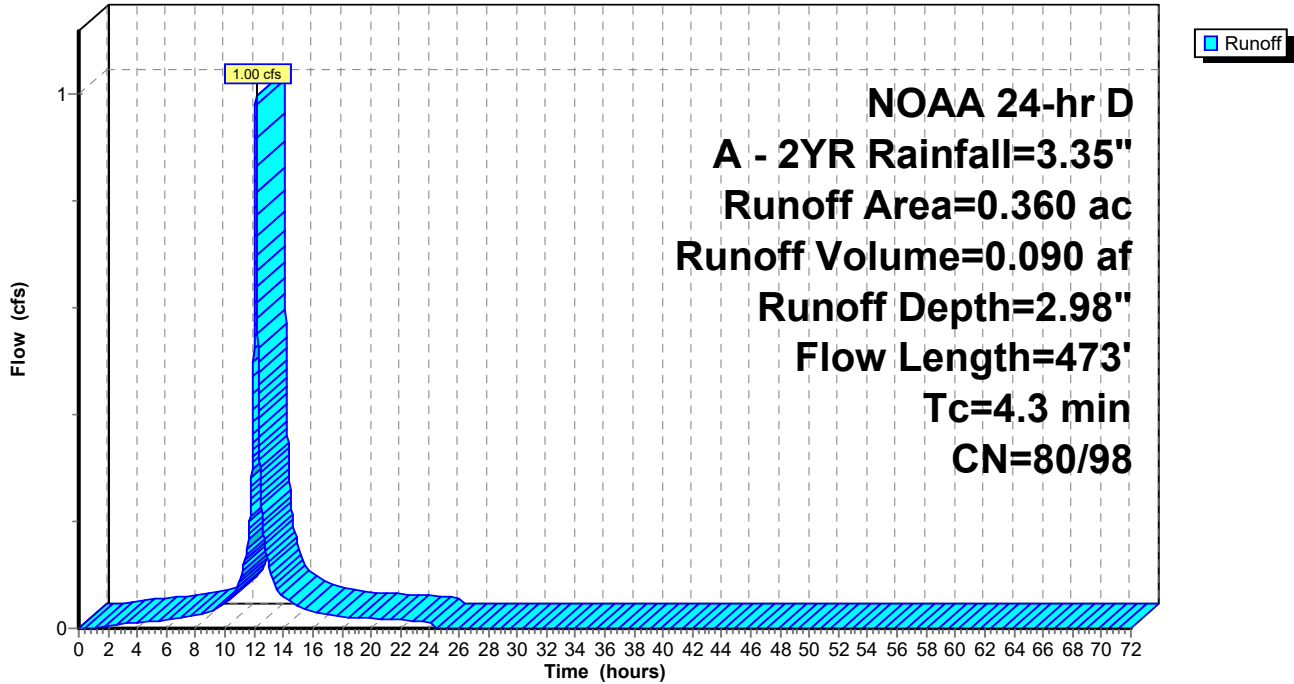
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 24

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 3.15 cfs @ 12.12 hrs, Volume= 0.276 af, Depth= 3.12"
 Routed to Pond B-3 : BASIN 3

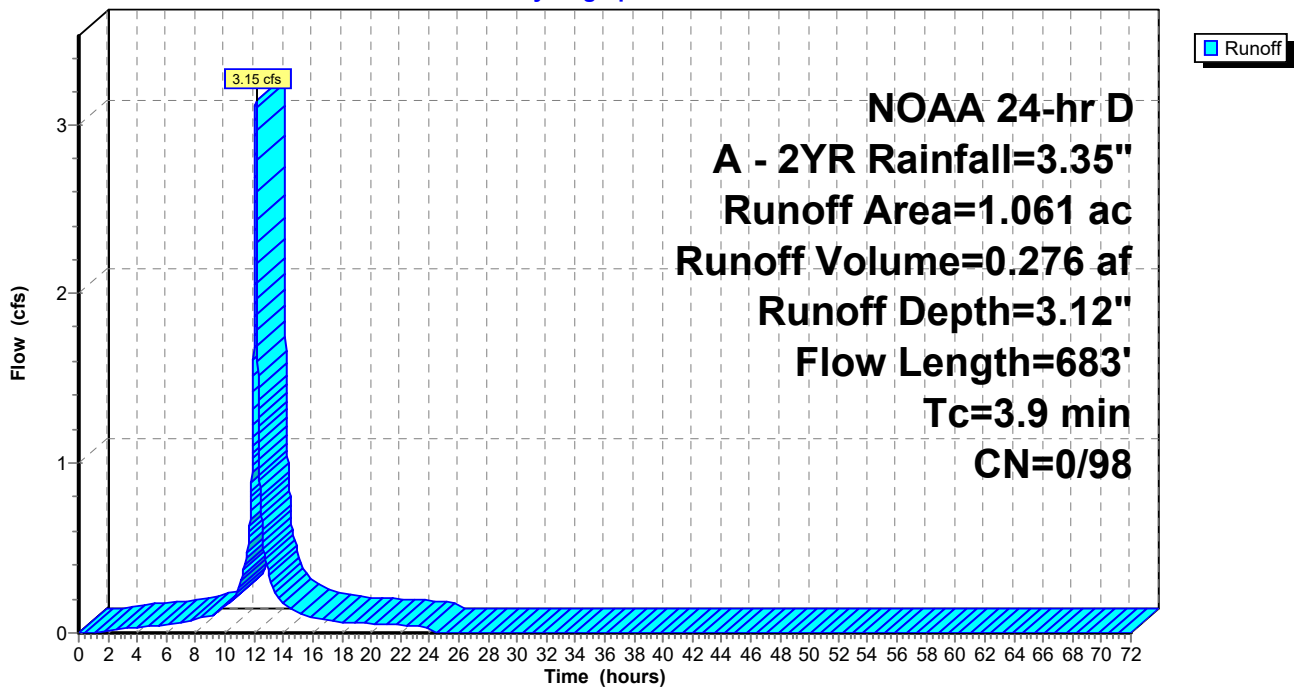
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 25

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 0.63 cfs @ 12.21 hrs, Volume= 0.077 af, Depth= 1.68"
 Routed to Pond B-4 : BASIN 4

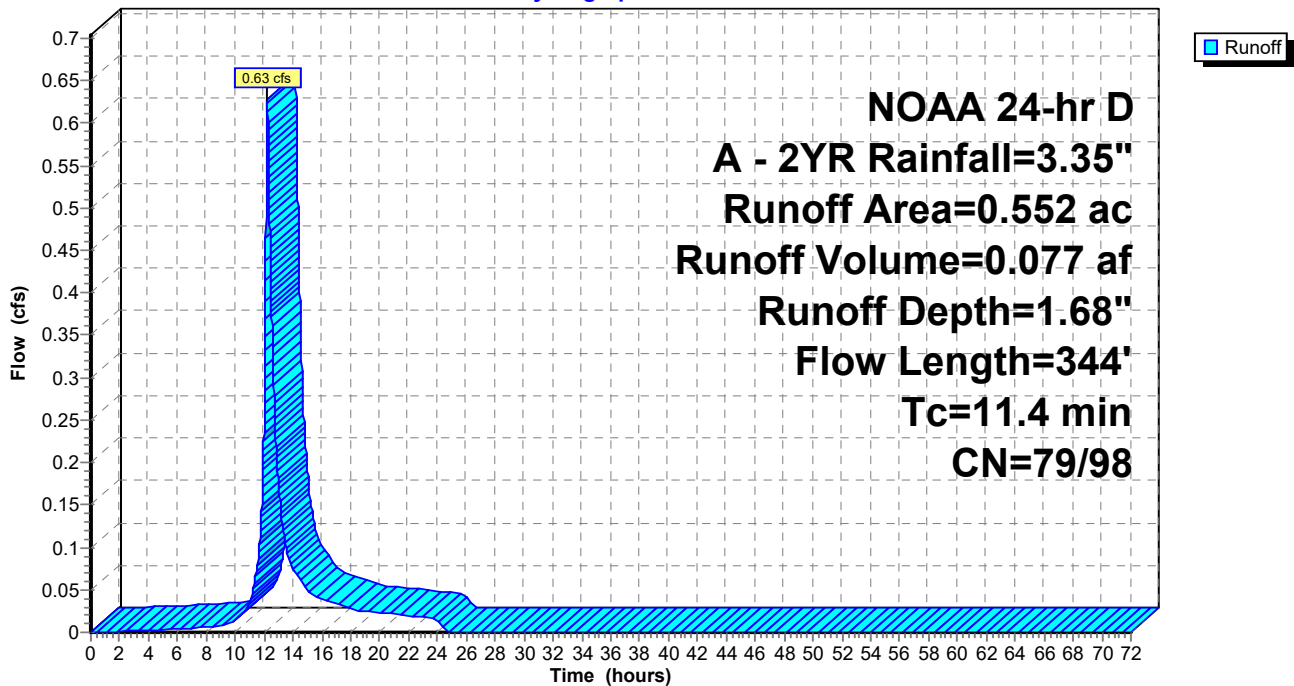
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 27

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 2.11 cfs @ 12.16 hrs, Volume= 0.233 af, Depth= 2.82"
 Routed to Pond B-4 : BASIN 4

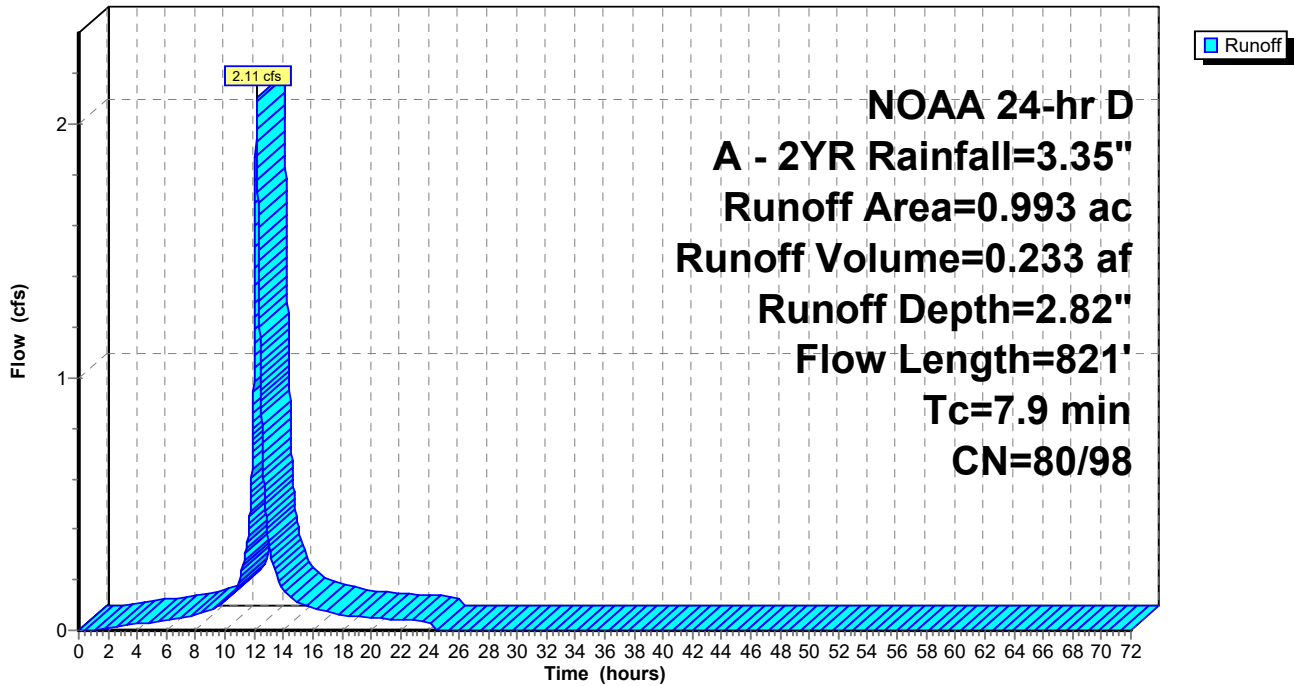
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 29

Summary for Subcatchment P-UG-1: UG-1

Runoff = 7.09 cfs @ 12.15 hrs, Volume= 0.745 af, Depth= 3.12"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

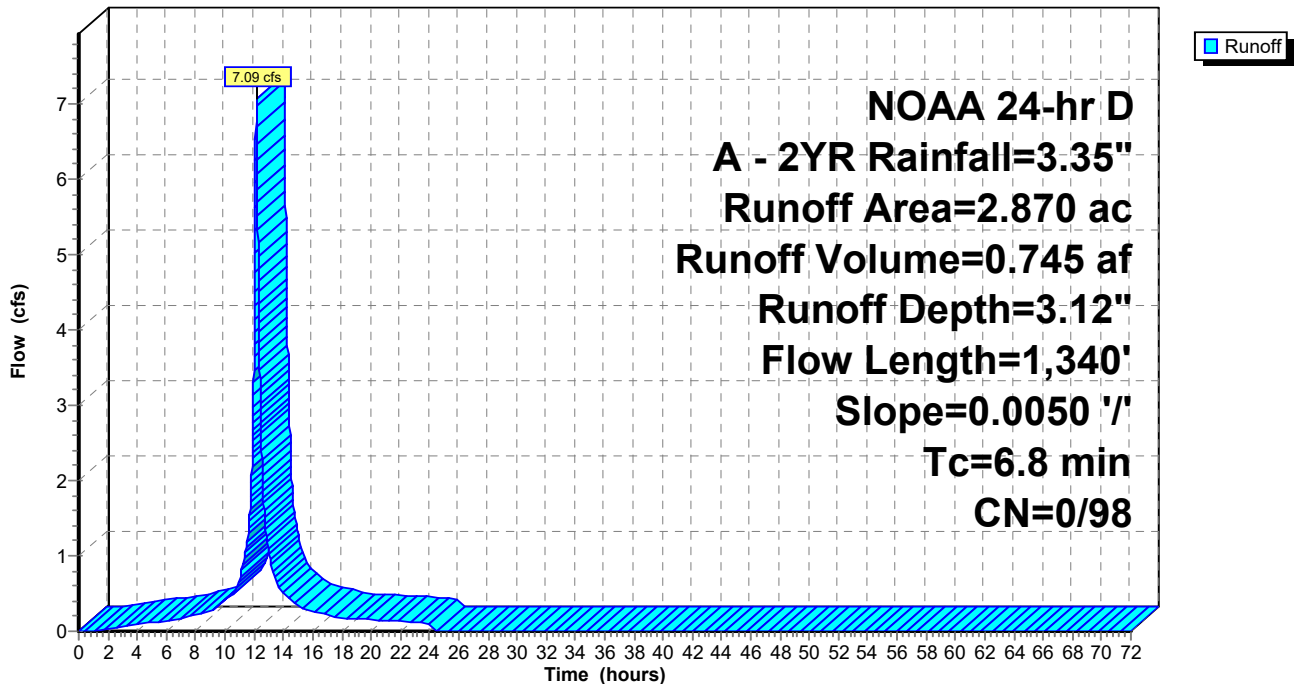
Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior

6.8 1,340 Total

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 30

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 176% of capacity of segment #3

Runoff = 8.05 cfs @ 12.13 hrs, Volume= 0.745 af, Depth= 3.12"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

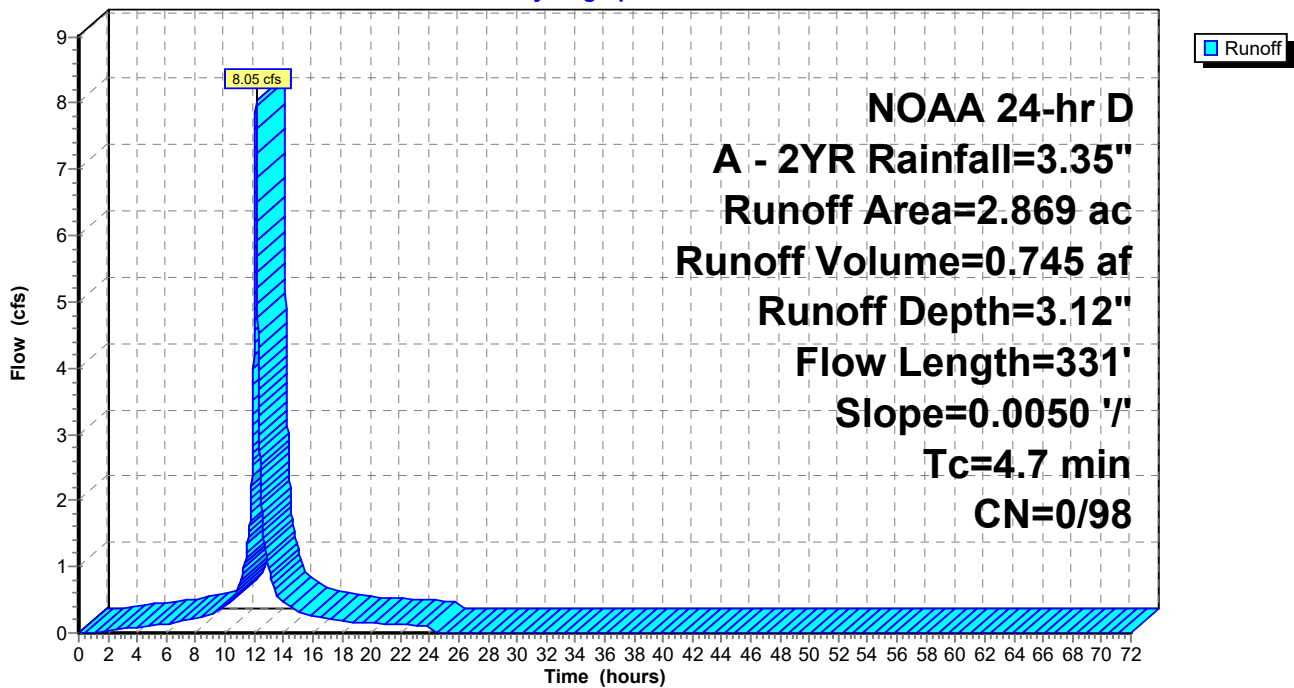
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 31

Summary for Reach 17R: E-1

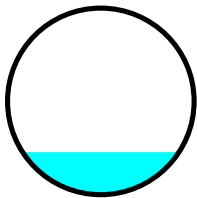
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth > 1.78" for A - 2YR event
Inflow = 2.88 cfs @ 12.64 hrs, Volume= 0.708 af
Outflow = 2.88 cfs @ 12.65 hrs, Volume= 0.708 af, Atten= 0%, Lag= 0.8 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.91 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 4.1 min

Peak Storage= 175 cf @ 12.65 hrs
Average Depth at Peak Storage= 0.53' , Surface Width= 1.96'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

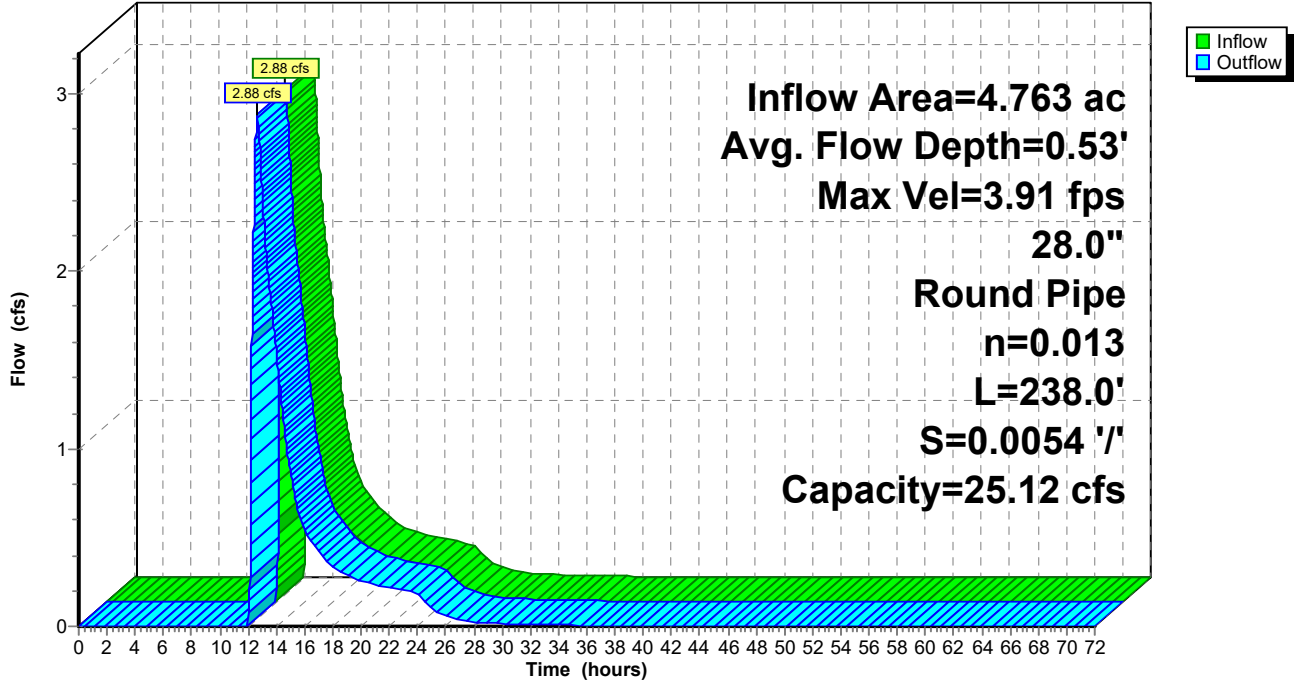
NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 32

Reach 17R: E-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 33

Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

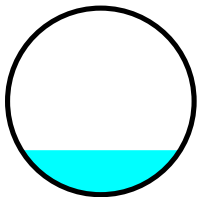
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.03' @ 12.79 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth > 1.78" for A - 2YR event
Inflow = 2.88 cfs @ 12.65 hrs, Volume= 0.708 af
Outflow = 2.88 cfs @ 12.67 hrs, Volume= 0.708 af, Atten= 0%, Lag= 0.8 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.67 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 4.3 min

Peak Storage= 179 cf @ 12.67 hrs
Average Depth at Peak Storage= 0.56' , Surface Width= 1.99'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

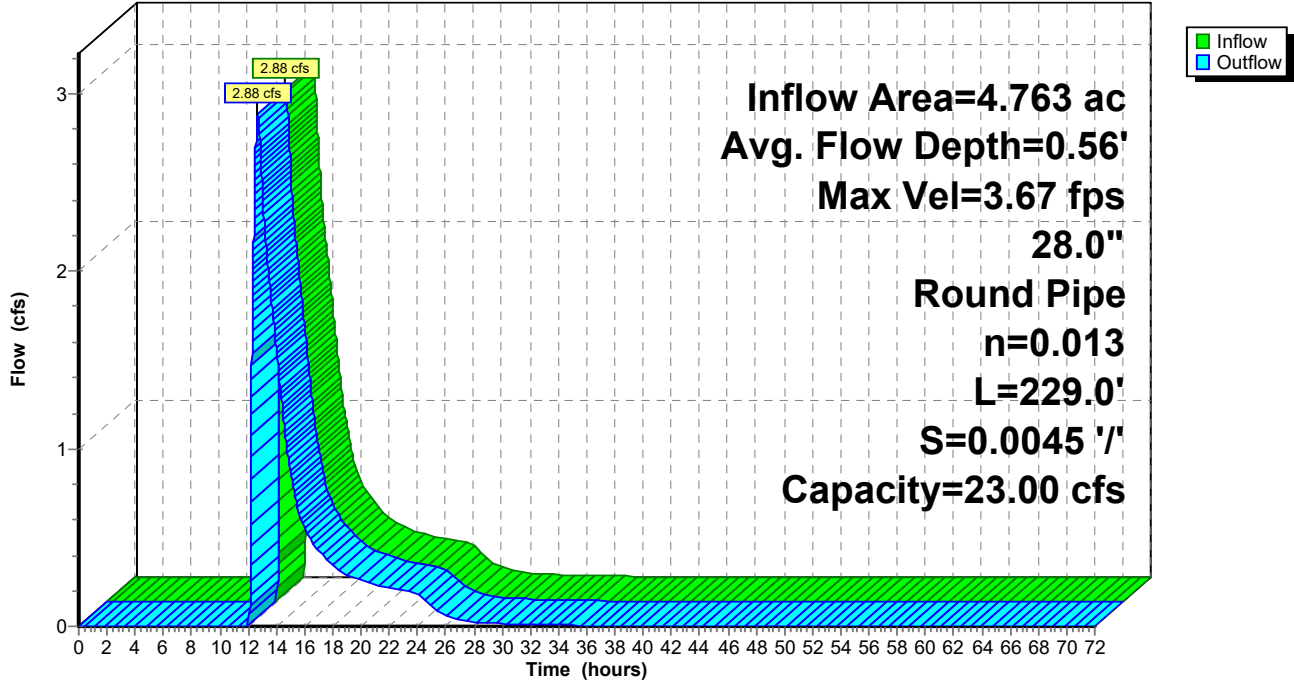
NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 34

Reach 18R: E-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 35

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 2.97" for A - 2YR event
 Inflow = 4.86 cfs @ 12.11 hrs, Volume= 0.405 af
 Outflow = 0.82 cfs @ 12.58 hrs, Volume= 0.311 af, Atten= 83%, Lag= 28.2 min
 Primary = 0.82 cfs @ 12.58 hrs, Volume= 0.311 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.11' @ 12.58 hrs Surf.Area= 0.123 ac Storage= 0.219 af

Plug-Flow detention time= 268.5 min calculated for 0.311 af (77% of inflow)
 Center-of-Mass det. time= 177.7 min (938.2 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

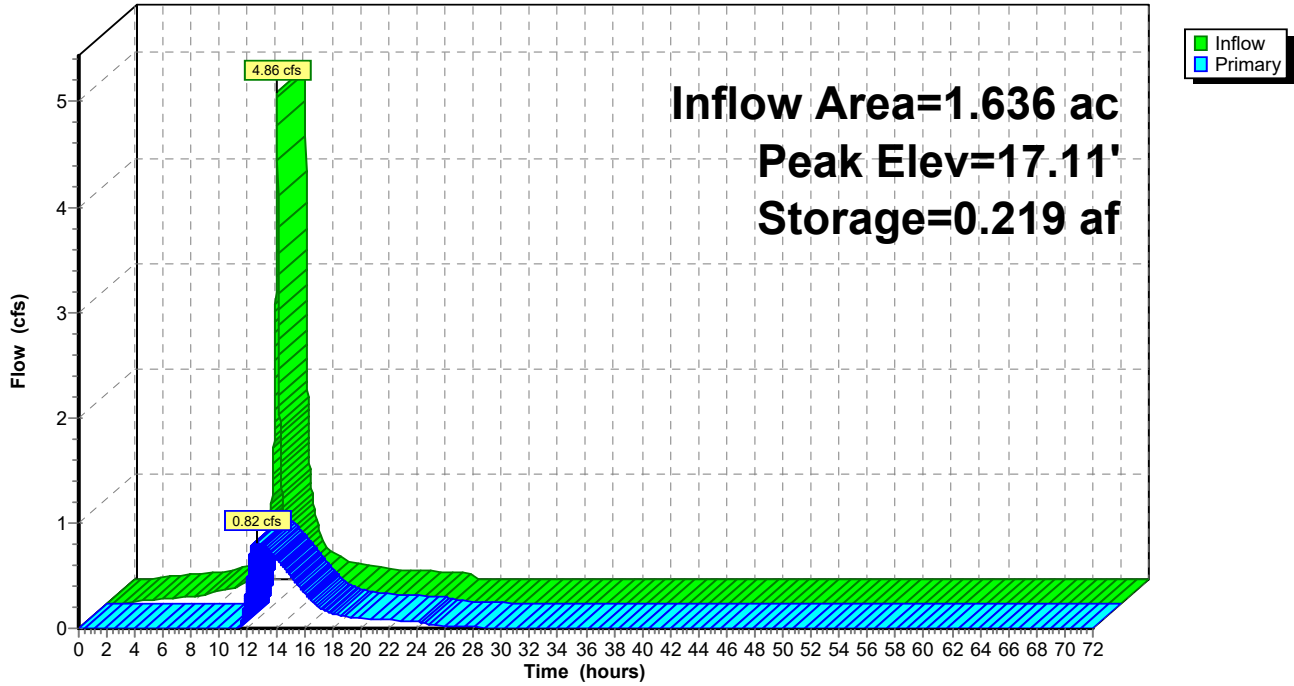
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.82 cfs @ 12.58 hrs HW=17.11' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.82 cfs of 15.22 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.82 cfs @ 4.69 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 37

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 2.65" for A - 2YR event
 Inflow = 4.96 cfs @ 12.12 hrs, Volume= 0.422 af
 Outflow = 0.25 cfs @ 14.42 hrs, Volume= 0.225 af, Atten= 95%, Lag= 138.2 min
 Primary = 0.25 cfs @ 14.42 hrs, Volume= 0.225 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 11.71' @ 14.42 hrs Surf.Area= 0.254 ac Storage= 0.293 af

Plug-Flow detention time= 598.9 min calculated for 0.225 af (53% of inflow)
 Center-of-Mass det. time= 466.4 min (1,238.3 - 771.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.50	0.231	569.6	0.000	0.000	0.231	
11.00	0.241	578.4	0.118	0.118	0.251	
12.00	0.259	596.0	0.250	0.368	0.291	
13.00	0.278	615.6	0.269	0.637	0.337	
13.50	0.295	633.5	0.143	0.780	0.378	

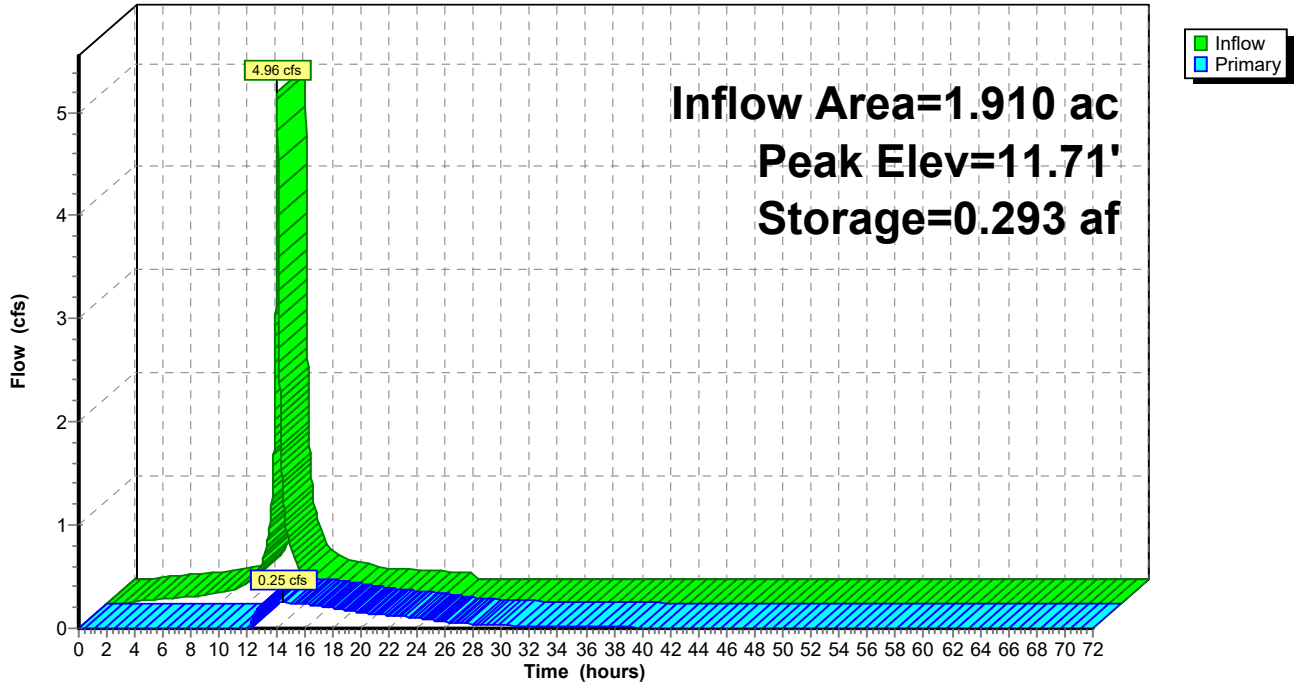
Device	Routing	Invert	Outlet Devices	
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf	
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads	

Primary OutFlow Max=0.25 cfs @ 14.42 hrs HW=11.71' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.25 cfs of 31.51 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.25 cfs @ 2.26 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 39

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 2.27" for A - 2YR event
 Inflow = 3.09 cfs @ 12.16 hrs, Volume= 0.347 af
 Outflow = 1.02 cfs @ 12.64 hrs, Volume= 0.256 af, Atten= 67%, Lag= 28.6 min
 Primary = 1.02 cfs @ 12.64 hrs, Volume= 0.256 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.33' @ 12.64 hrs Surf.Area= 4,599 sf Storage= 7,173 cf

Plug-Flow detention time= 247.0 min calculated for 0.256 af (74% of inflow)
 Center-of-Mass det. time= 147.0 min (944.2 - 797.2)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

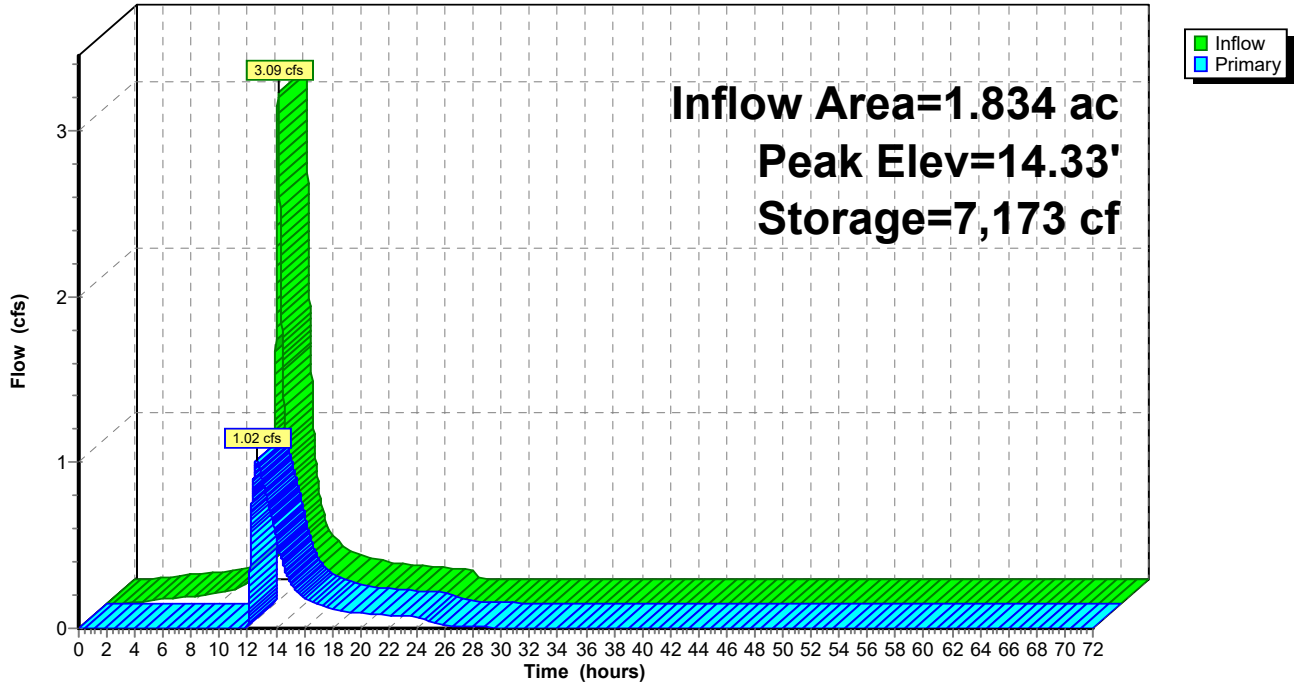
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.02 cfs @ 12.64 hrs HW=14.33' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.02 cfs of 11.85 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.95 cfs @ 3.48 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.07 cfs @ 0.92 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 41

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 2.80" for A - 2YR event
 Inflow = 6.03 cfs @ 12.16 hrs, Volume= 0.683 af
 Outflow = 1.86 cfs @ 12.64 hrs, Volume= 0.452 af, Atten= 69%, Lag= 28.5 min
 Primary = 1.86 cfs @ 12.64 hrs, Volume= 0.452 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.63' @ 12.64 hrs Surf.Area= 8,672 sf Storage= 16,077 cf

Plug-Flow detention time= 293.0 min calculated for 0.452 af (66% of inflow)
 Center-of-Mass det. time= 182.5 min (956.5 - 774.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	6,858	409.0	0	0	6,858	
13.00	7,629	429.0	2,896	2,896	8,202	
14.00	8,186	439.0	7,906	10,802	9,018	
14.10	8,239	440.0	821	11,623	9,101	
15.00	8,985	459.0	7,748	19,372	10,519	
16.00	9,537	468.1	9,260	28,631	11,335	

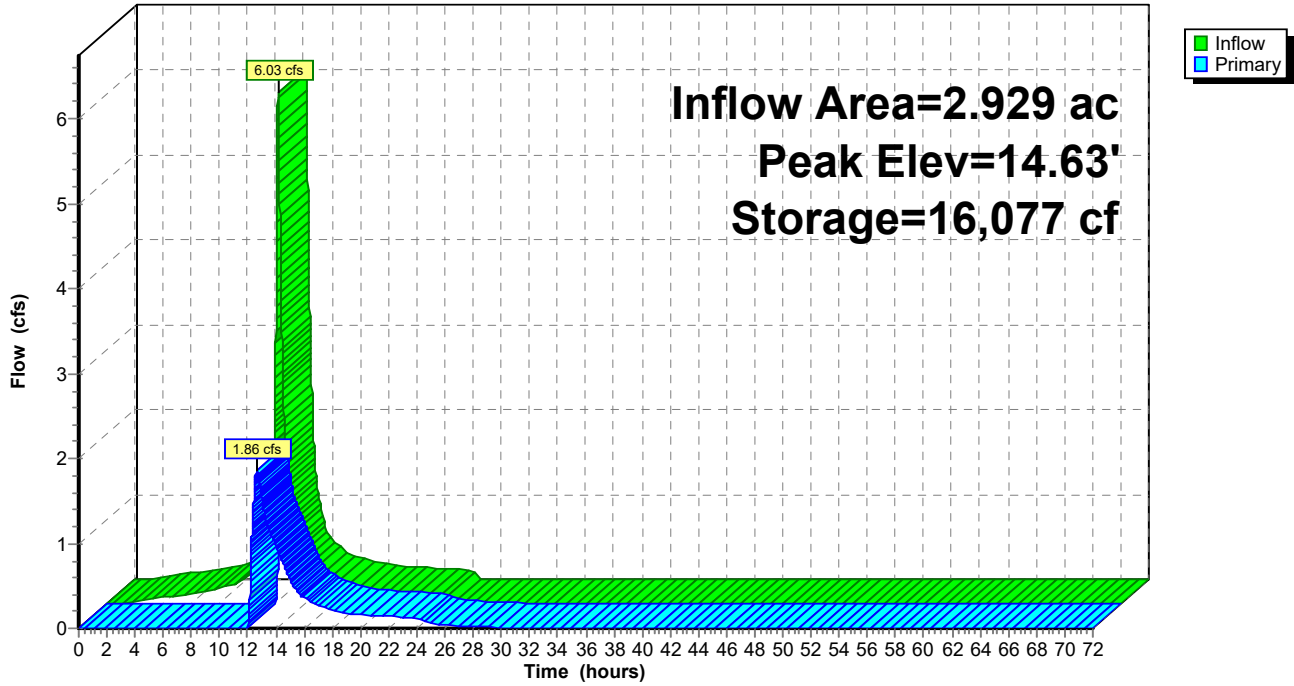
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.86 cfs @ 12.64 hrs HW=14.63' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.86 cfs of 12.98 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.42 cfs @ 3.47 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.44 cfs @ 1.16 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 43

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 3.12" for A - 2YR event
 Inflow = 15.01 cfs @ 12.13 hrs, Volume= 1.491 af
 Outflow = 0.61 cfs @ 15.19 hrs, Volume= 0.925 af, Atten= 96%, Lag= 183.1 min
 Primary = 0.61 cfs @ 15.19 hrs, Volume= 0.925 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.23' @ 15.19 hrs Surf.Area= 0.631 ac Storage= 1.108 af

Plug-Flow detention time= 868.5 min calculated for 0.925 af (62% of inflow)
 Center-of-Mass det. time= 752.4 min (1,513.0 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=0.61 cfs @ 15.19 hrs HW=12.23' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.61 cfs of 33.45 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.43 cfs @ 4.97 fps)
- 3=Orifice/Grate (Orifice Controls 0.17 cfs @ 2.53 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 44

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"

End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

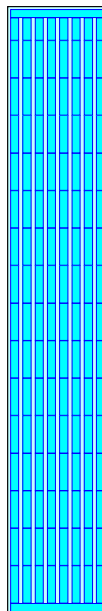
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 45

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0" End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

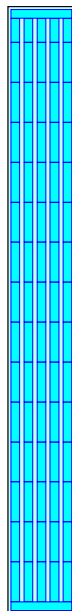
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

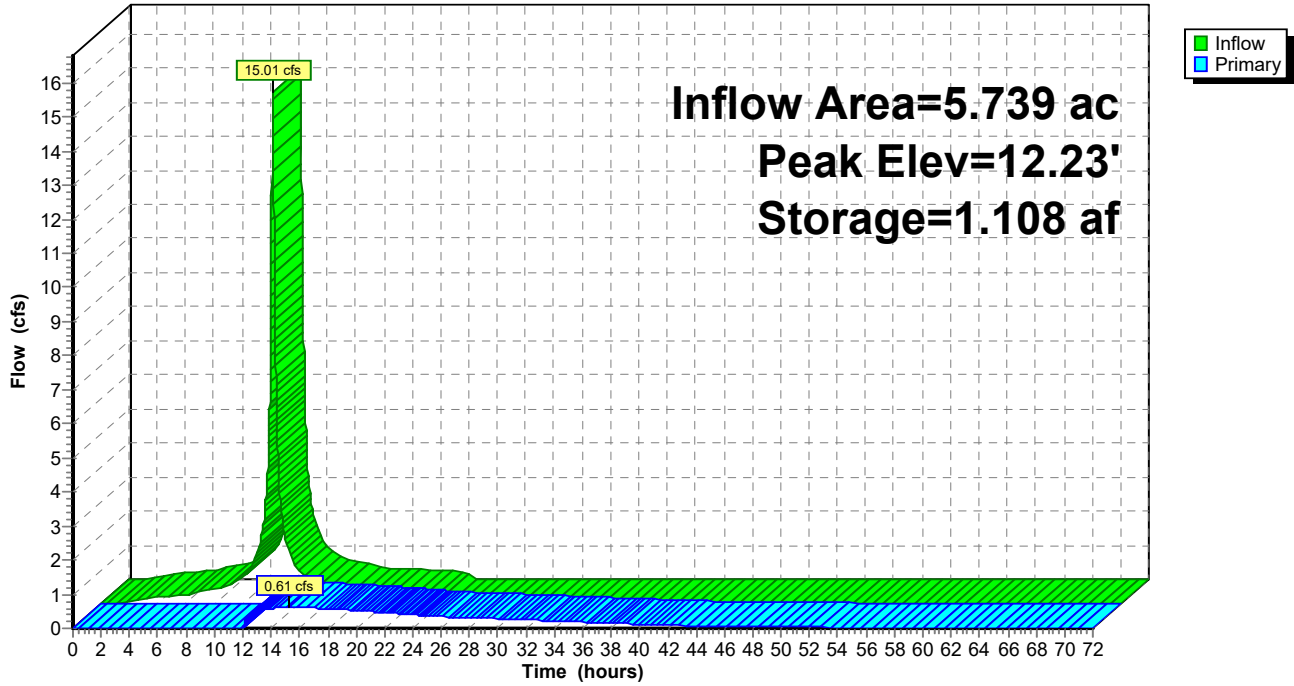
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 47

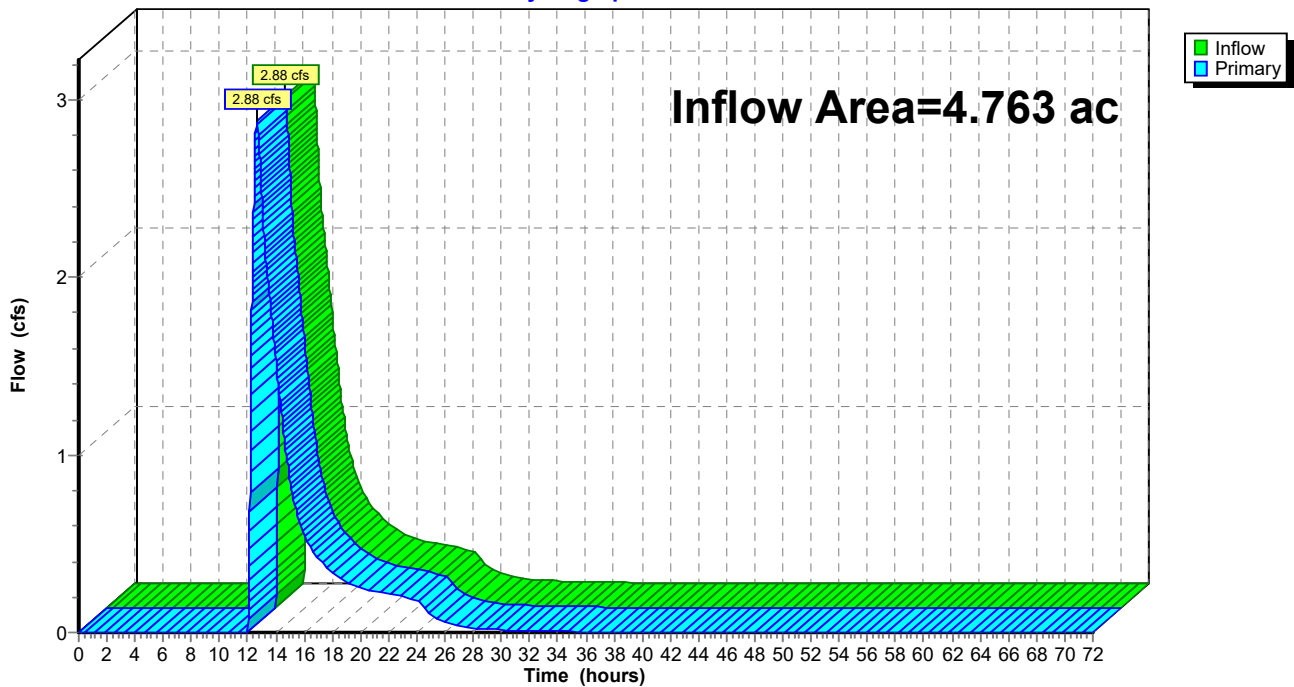
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth > 1.78" for A - 2YR event
Inflow = 2.88 cfs @ 12.64 hrs, Volume= 0.708 af
Primary = 2.88 cfs @ 12.64 hrs, Volume= 0.708 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 48

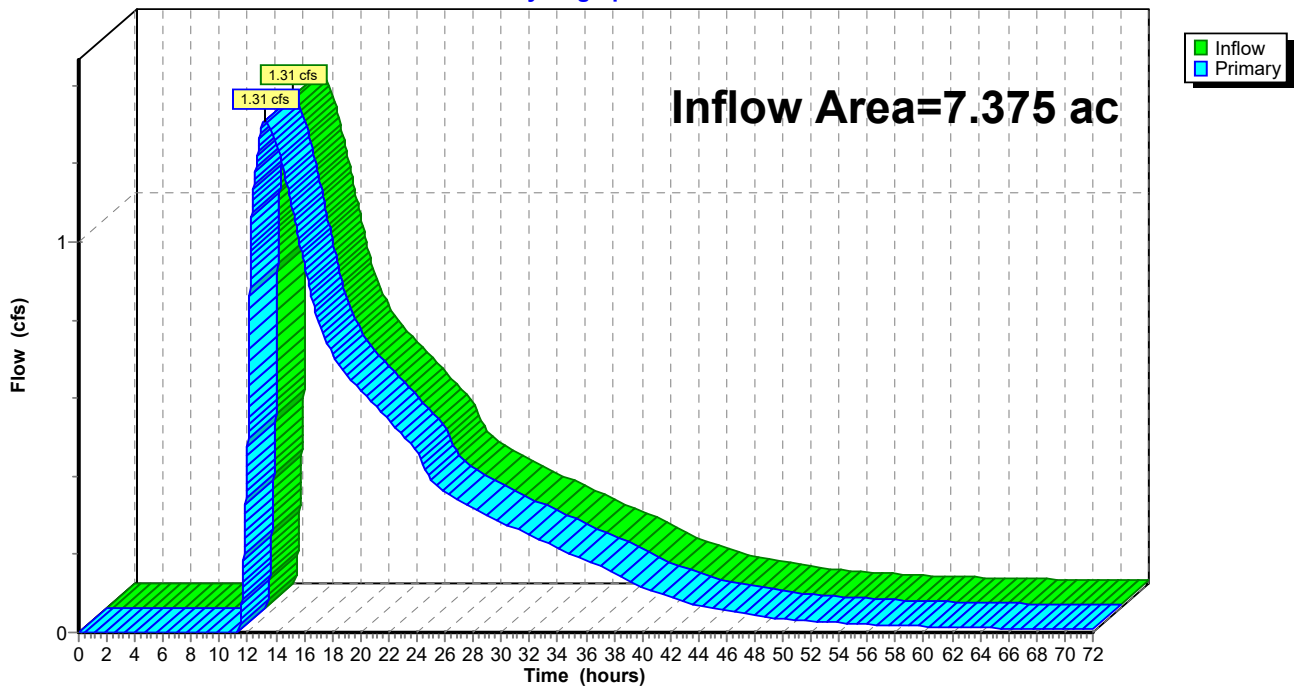
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 2.01" for A - 2YR event
Inflow = 1.31 cfs @ 13.25 hrs, Volume= 1.236 af
Primary = 1.31 cfs @ 13.25 hrs, Volume= 1.236 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 49

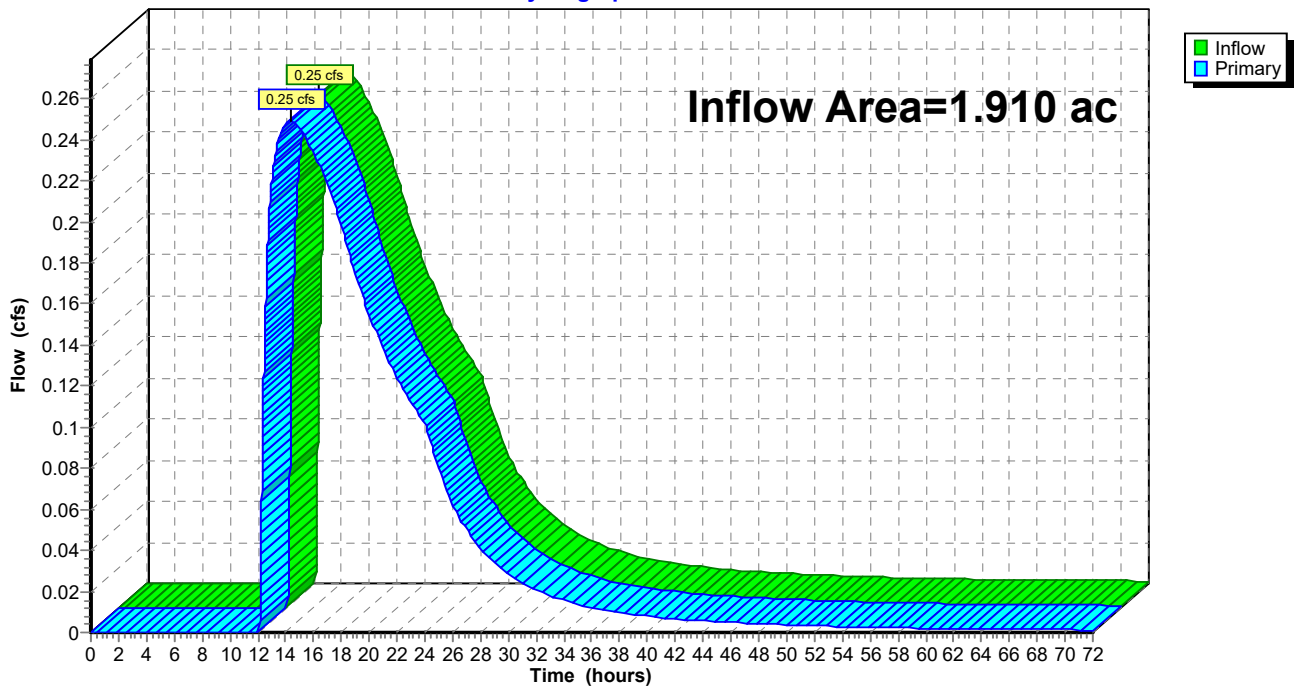
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 1.41" for A - 2YR event
Inflow = 0.25 cfs @ 14.42 hrs, Volume= 0.225 af
Primary = 0.25 cfs @ 14.42 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D A - 2YR Rainfall=3.35"

Printed 2/26/2025

Page 50

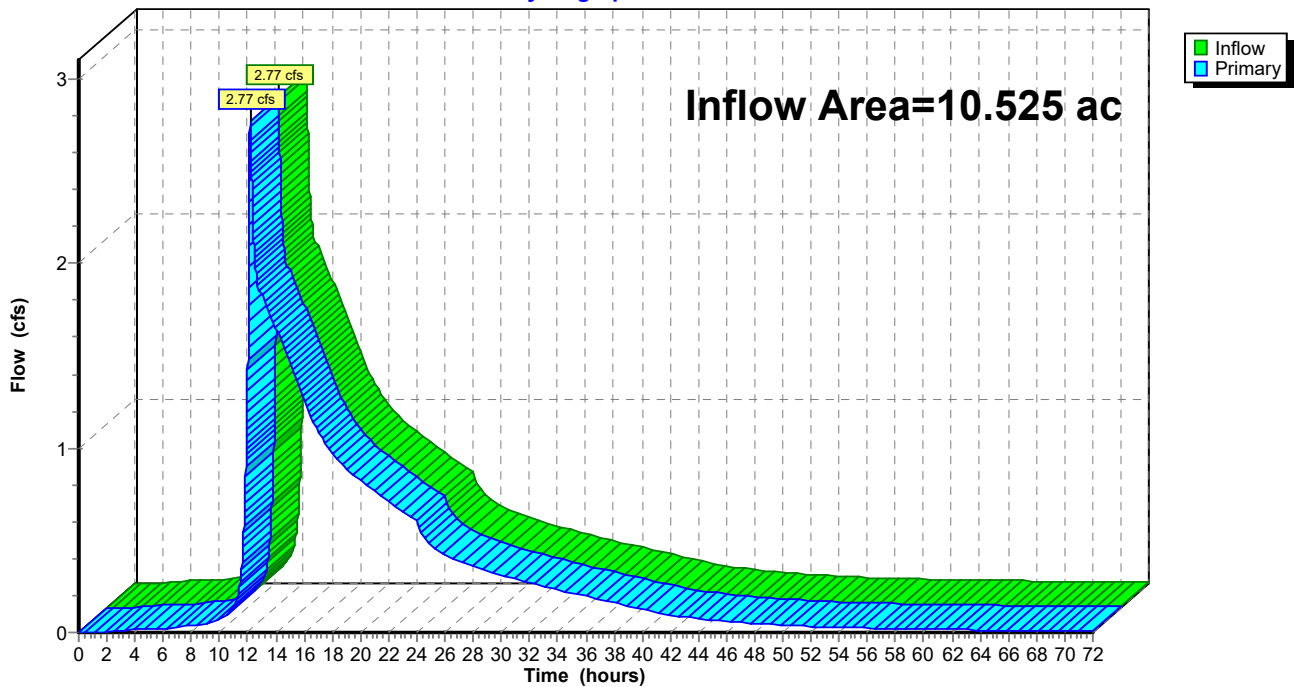
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 1.89" for A - 2YR event
Inflow = 2.77 cfs @ 12.17 hrs, Volume= 1.653 af
Primary = 2.77 cfs @ 12.17 hrs, Volume= 1.653 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



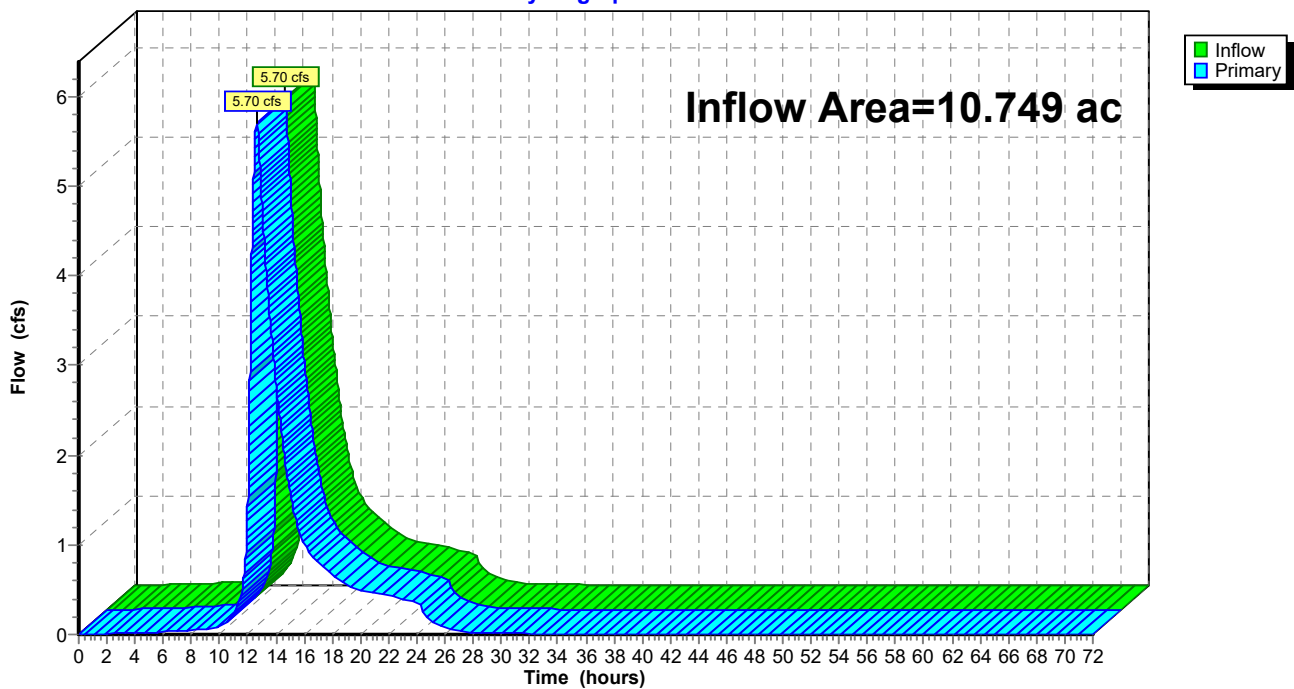
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 1.63" for A - 2YR event
Inflow = 5.70 cfs @ 12.60 hrs, Volume= 1.462 af
Primary = 5.70 cfs @ 12.60 hrs, Volume= 1.462 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 52

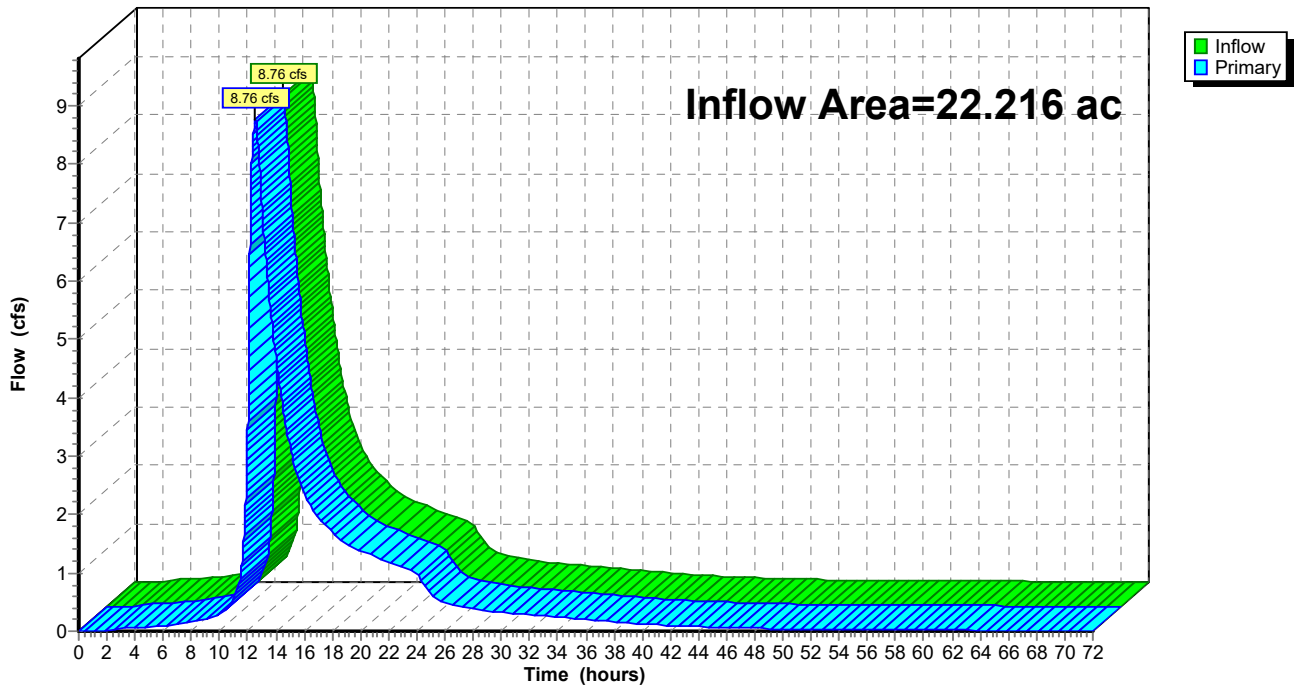
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 1.81" for A - 2YR event
Inflow = 8.76 cfs @ 12.53 hrs, Volume= 3.360 af
Primary = 8.76 cfs @ 12.53 hrs, Volume= 3.360 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 53

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=4.80" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=8.55 cfs 0.999 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.53 cfs 0.033 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=1.69 cfs 0.115 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=3.01" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.79 cfs 0.072 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=1.10 cfs 0.102 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=2.10 cfs 0.384 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=2.58 cfs 0.259 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=2.73" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=5.38 cfs 1.218 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=3.68" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=2.77 cfs 0.287 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=1.94" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.46 cfs 0.049 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=7.15 cfs 0.610 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=4.74" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.56 cfs 0.142 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=4.85 cfs 0.433 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=3.19" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=1.21 cfs 0.147 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=4.54" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=3.36 cfs 0.376 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=10.93 cfs 1.170 af

250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 54

SubcatchmentP-UG-2: UG-2 Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=4.89"
Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=12.41 cfs 1.170 af

Reach 17R: E-1 Avg. Flow Depth=0.94' Max Vel=5.32 fps Inflow=8.57 cfs 1.374 af
28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=8.57 cfs 1.374 af

Reach 18R: E-2 Avg. Flow Depth=0.99' Max Vel=4.98 fps Inflow=8.57 cfs 1.374 af
28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=8.57 cfs 1.374 af

Pond B-2: BASIN 2 Peak Elev=17.61' Storage=0.283 af Inflow=7.59 cfs 0.643 af
Outflow=3.67 cfs 0.549 af

Pond B-3: BASIN 3 Peak Elev=12.03' Storage=0.377 af Inflow=8.06 cfs 0.690 af
Outflow=2.19 cfs 0.493 af

Pond B-4: BASIN 4 Peak Elev=14.87' Storage=9,760 cf Inflow=5.28 cfs 0.595 af
Outflow=2.76 cfs 0.504 af

Pond B-5: BASIN 5 Peak Elev=15.06' Storage=19,895 cf Inflow=9.64 cfs 1.101 af
Outflow=5.86 cfs 0.871 af

Pond UG-2: UG BASIN 1 & 2 (Peak Elev=13.51' Storage=1.666 af Inflow=23.14 cfs 2.340 af
Outflow=1.40 cfs 1.769 af

Link 16L: Existing Storm Sewer Inflow=8.57 cfs 1.374 af
Primary=8.57 cfs 1.374 af

Link D3A: POD 3A Inflow=4.40 cfs 2.318 af
Primary=4.40 cfs 2.318 af

Link D3B: POD 3B Inflow=2.19 cfs 0.493 af
Primary=2.19 cfs 0.493 af

Link P-DC: DUCK CREEK Inflow=8.46 cfs 3.147 af
Primary=8.46 cfs 3.147 af

Link P-PC: POND CREEK Inflow=14.49 cfs 2.852 af
Primary=14.49 cfs 2.852 af

Link P-SR: SOUTH RIVER Inflow=23.64 cfs 6.383 af
Primary=23.64 cfs 6.383 af

Total Runoff Area = 22.216 ac Runoff Volume = 7.566 af Average Runoff Depth = 4.09"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 55

Summary for Subcatchment 16S: P-B5-1

Runoff = 8.55 cfs @ 12.17 hrs, Volume= 0.999 af, Depth= 4.80"
 Routed to Pond B-5 : BASIN 5

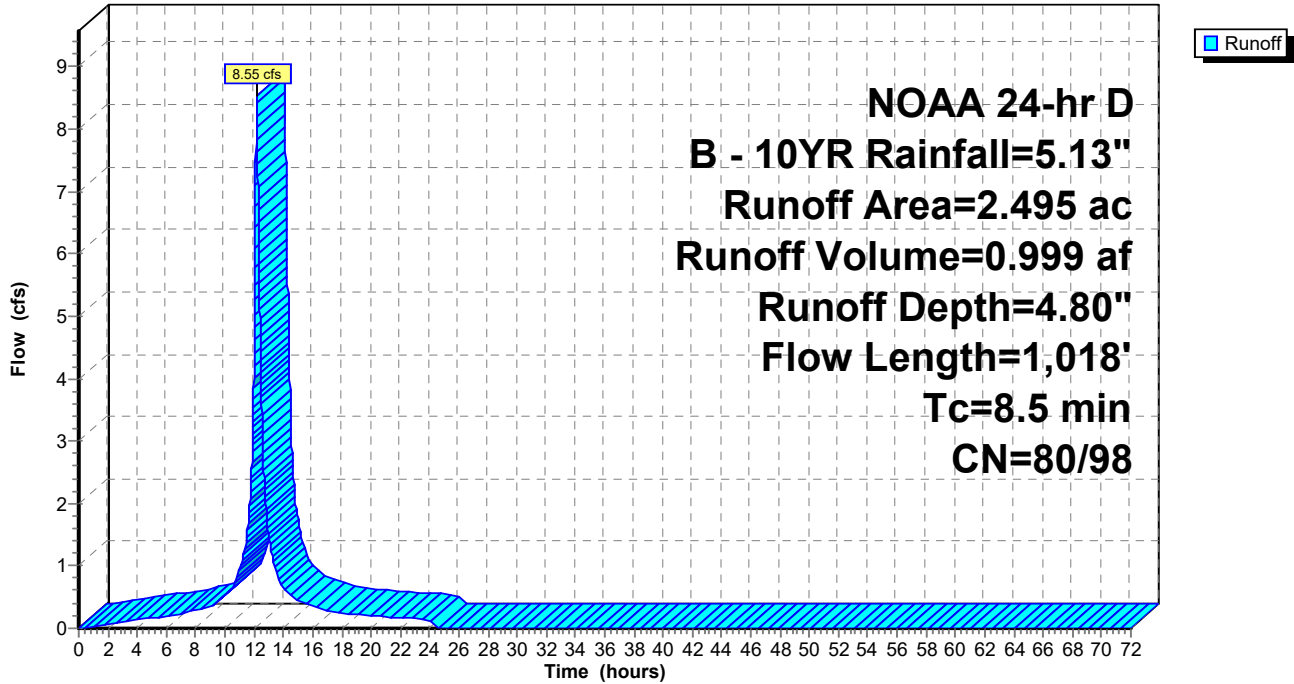
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 57

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.53 cfs @ 12.10 hrs, Volume= 0.033 af, Depth= 2.82"
 Routed to Pond B-2 : BASIN 2

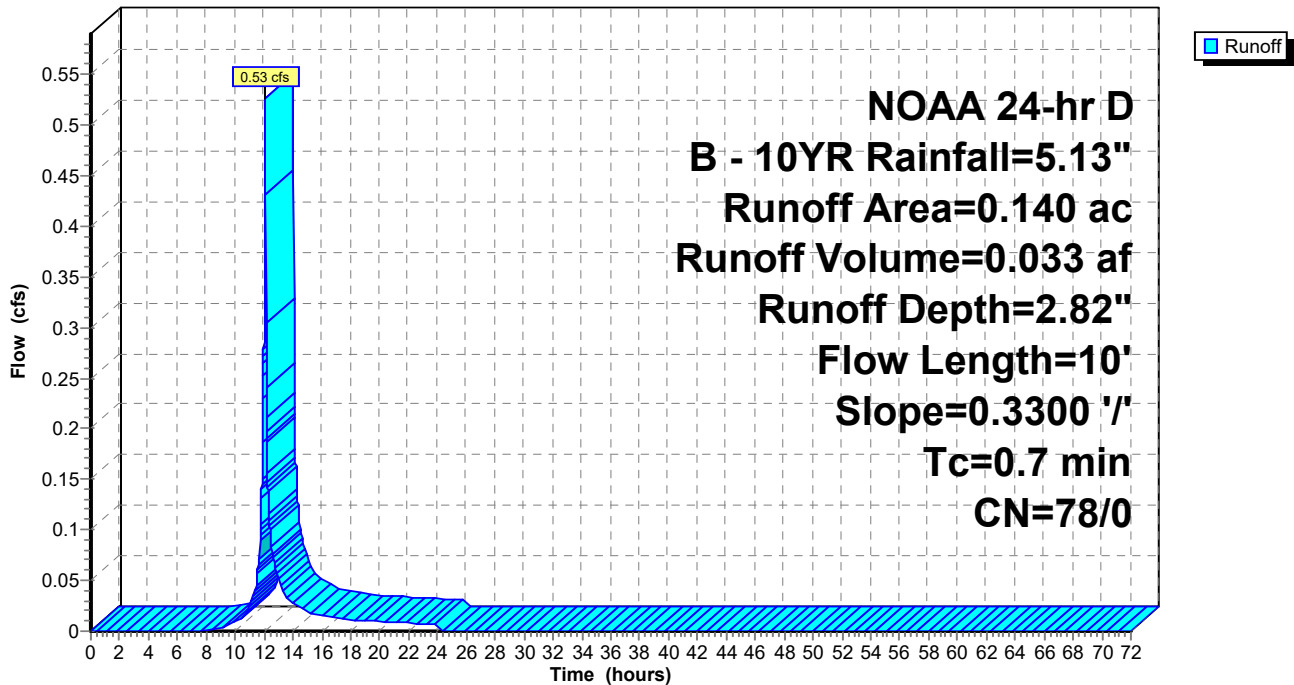
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 58

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 1.69 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 2.82"
 Routed to Pond B-3 : BASIN 3

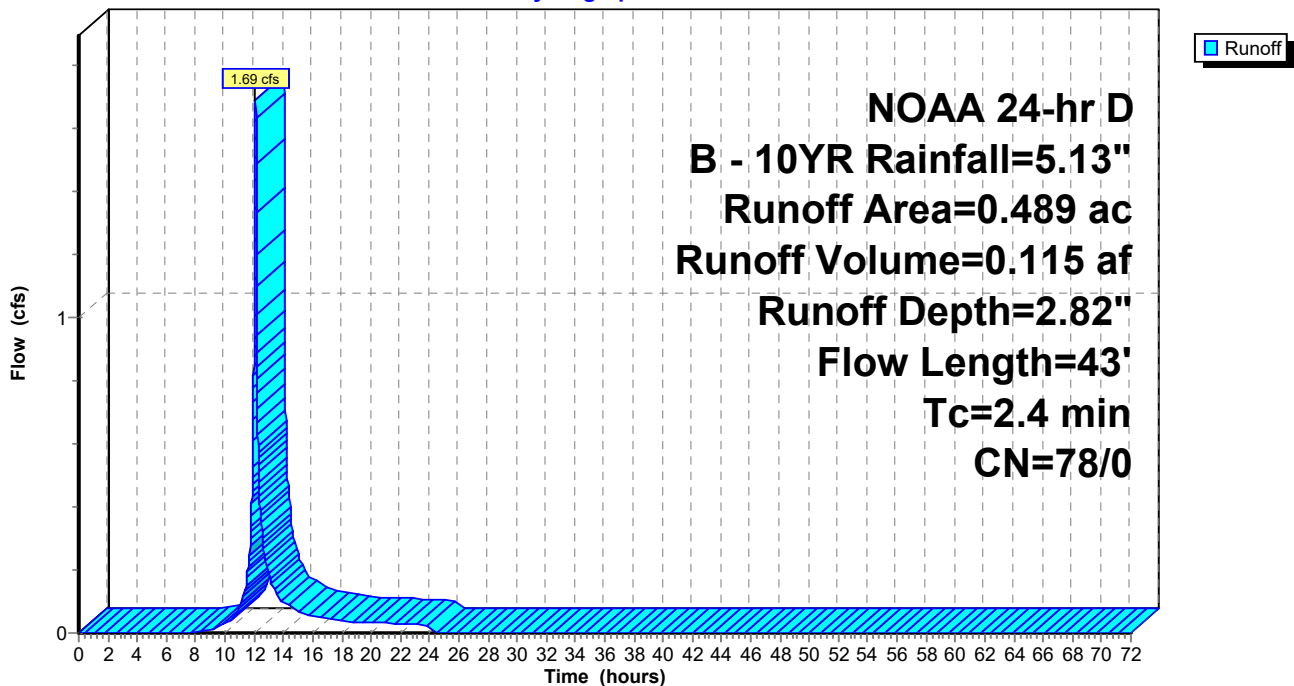
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 59

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.79 cfs @ 12.15 hrs, Volume= 0.072 af, Depth= 3.01"
 Routed to Pond B-4 : BASIN 4

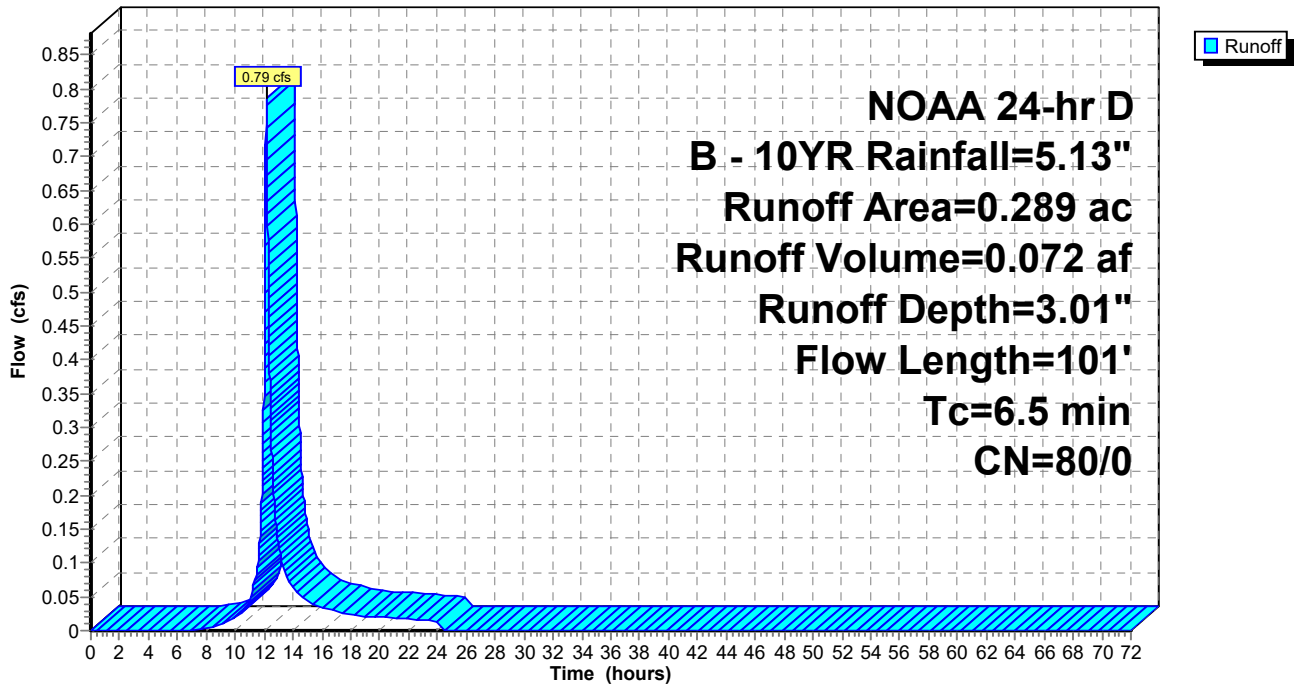
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 60

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 1.10 cfs @ 12.15 hrs, Volume= 0.102 af, Depth= 2.82"
 Routed to Pond B-5 : BASIN 5

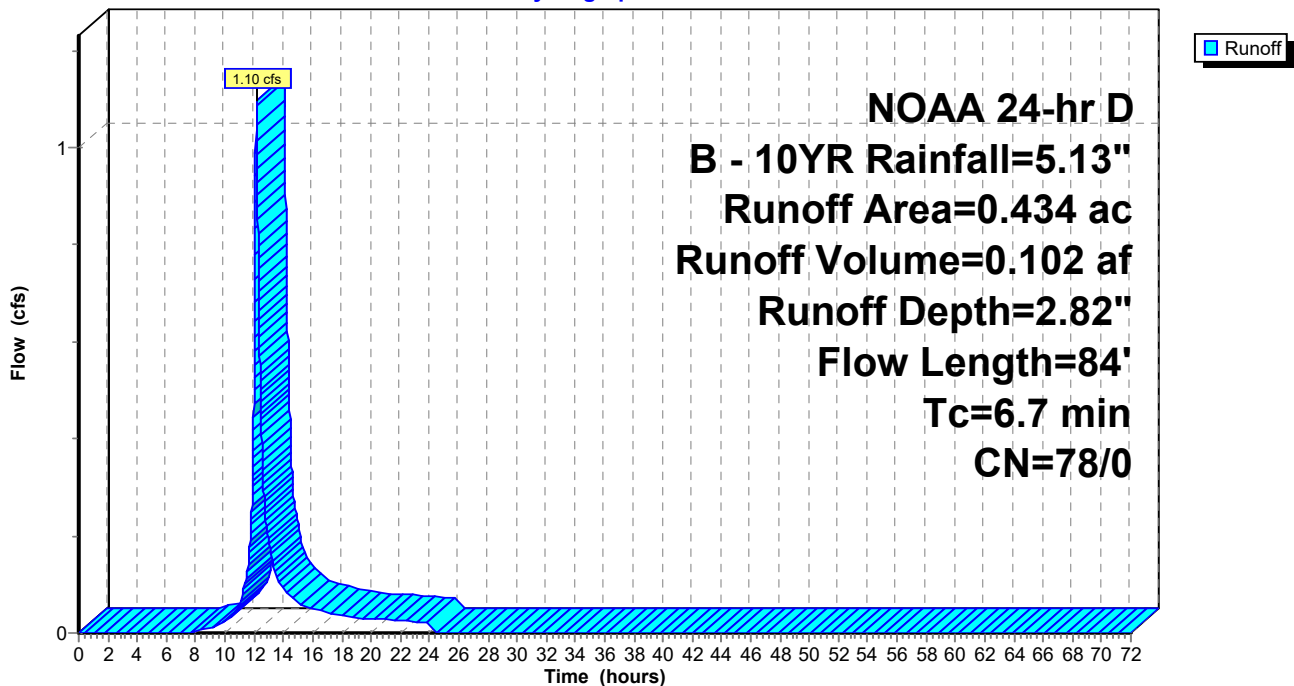
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 61

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 2.10 cfs @ 12.34 hrs, Volume= 0.384 af, Depth= 4.89"
 Routed to Link P-SR : SOUTH RIVER

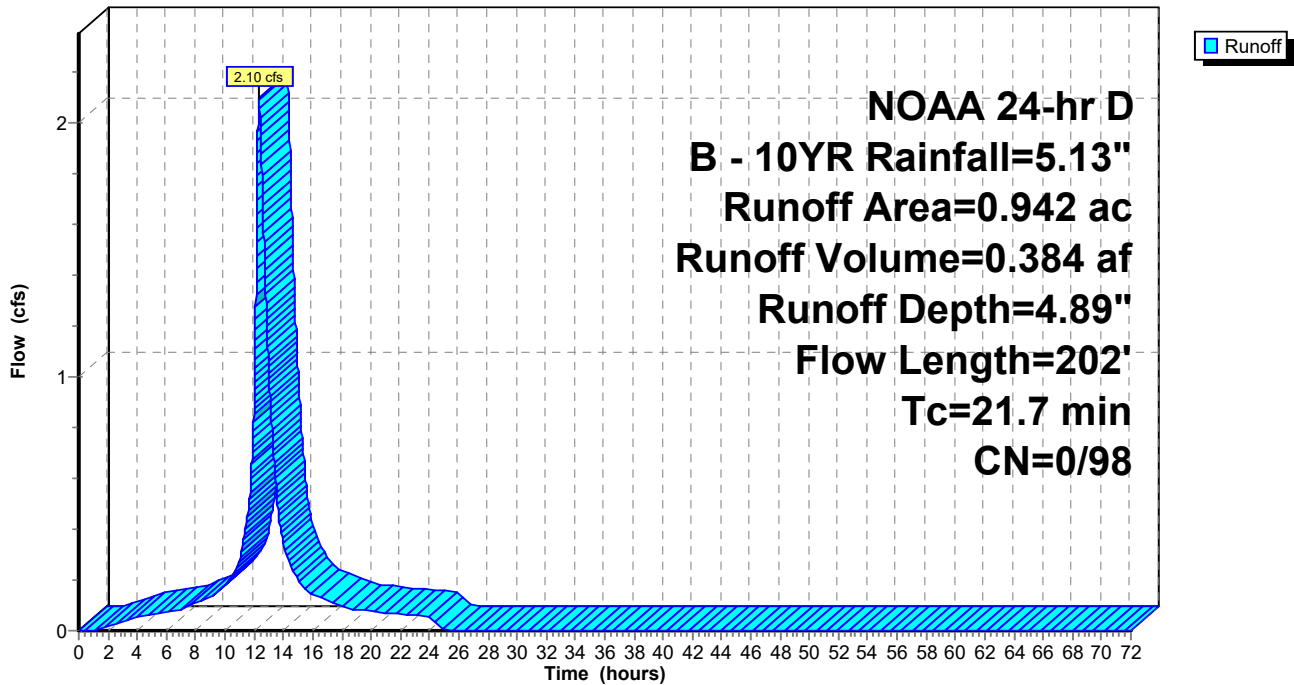
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 62

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 2.58 cfs @ 12.14 hrs, Volume= 0.259 af, Depth= 4.89"
 Routed to Link P-PC : POND CREEK

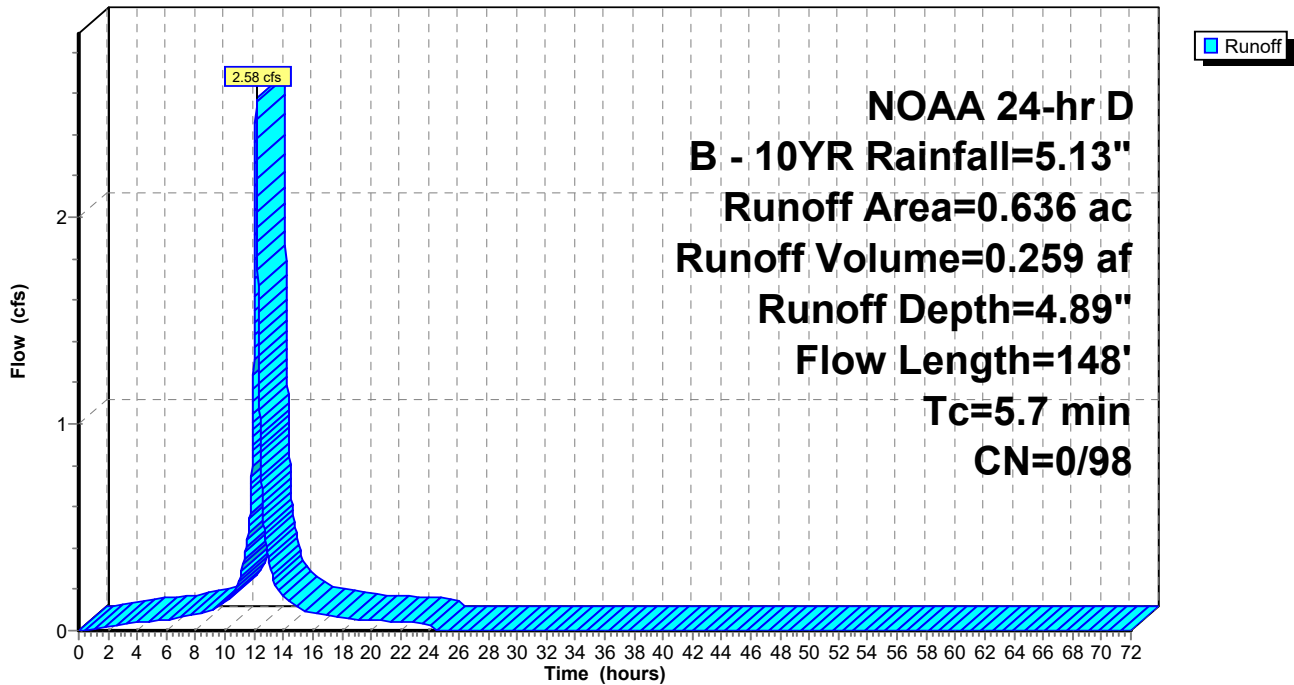
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 63

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 5.38 cfs @ 12.59 hrs, Volume= 1.218 af, Depth= 2.73"
 Routed to Link P-PC : POND CREEK

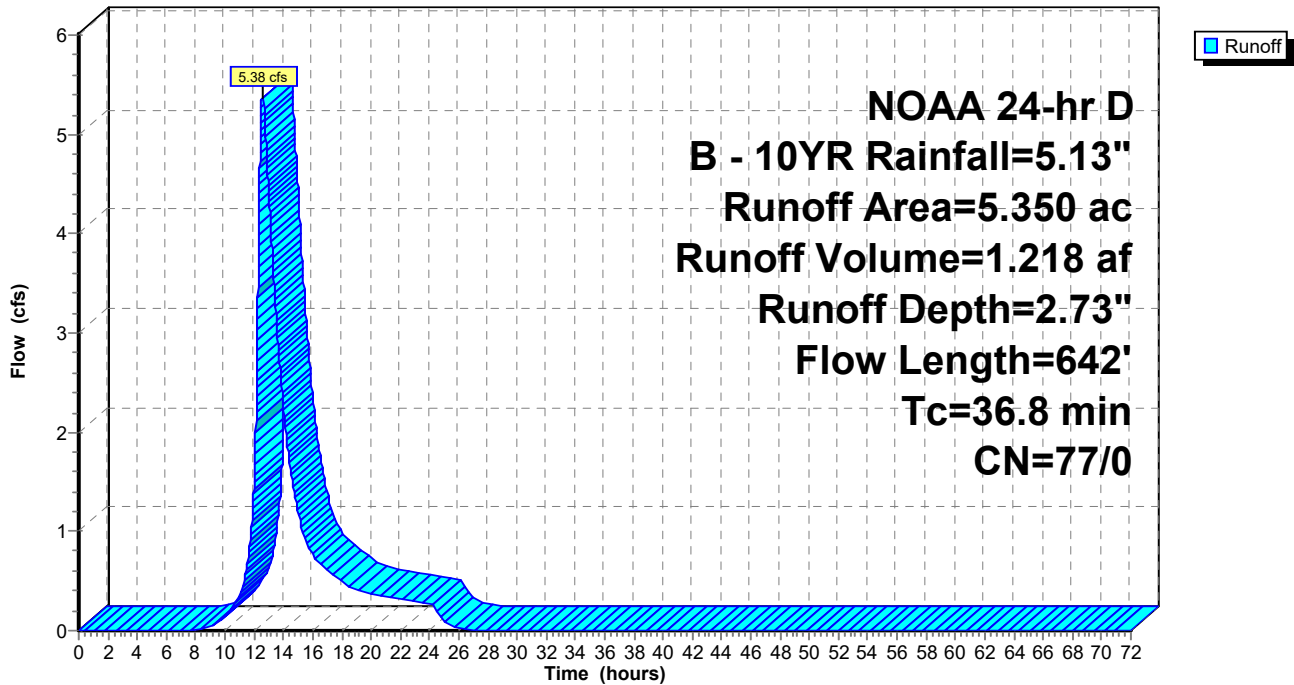
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 64

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 2.77 cfs @ 12.15 hrs, Volume= 0.287 af, Depth= 3.68"
 Routed to Link P-DC : DUCK CREEK

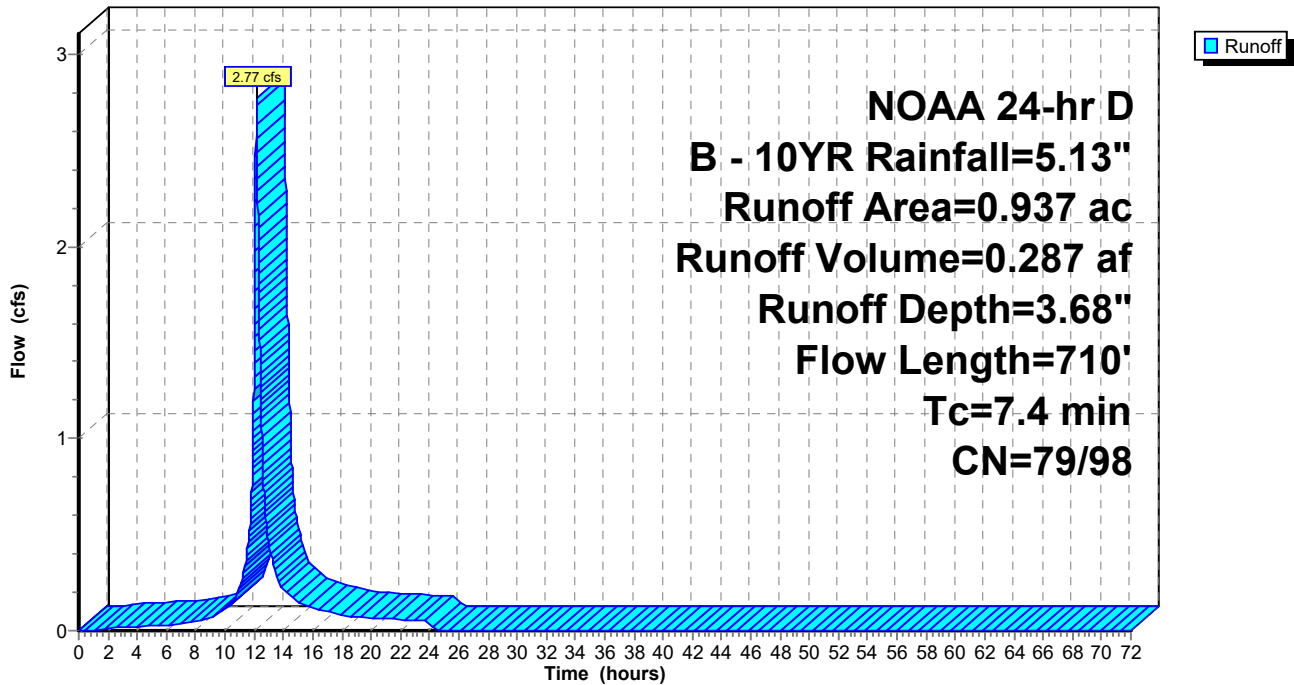
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 65

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 1.94"
 Routed to Link P-DC : DUCK CREEK

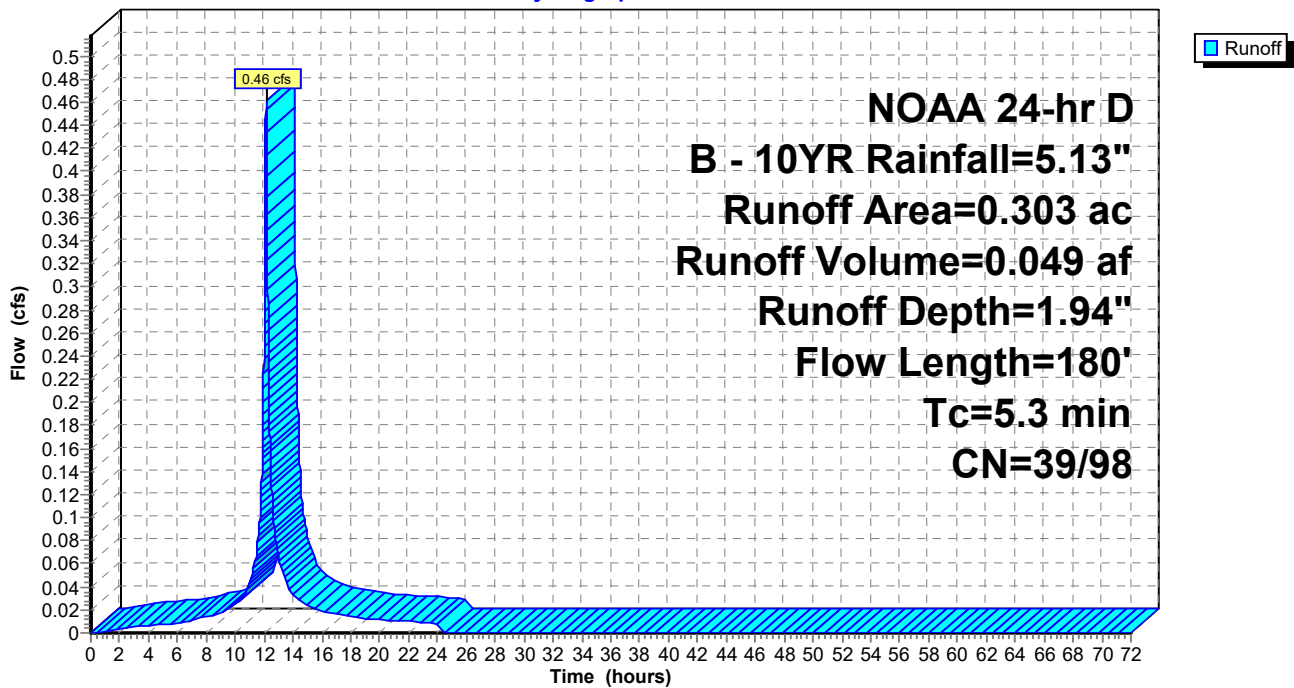
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 66

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 7.15 cfs @ 12.11 hrs, Volume= 0.610 af, Depth= 4.89"
 Routed to Pond B-2 : BASIN 2

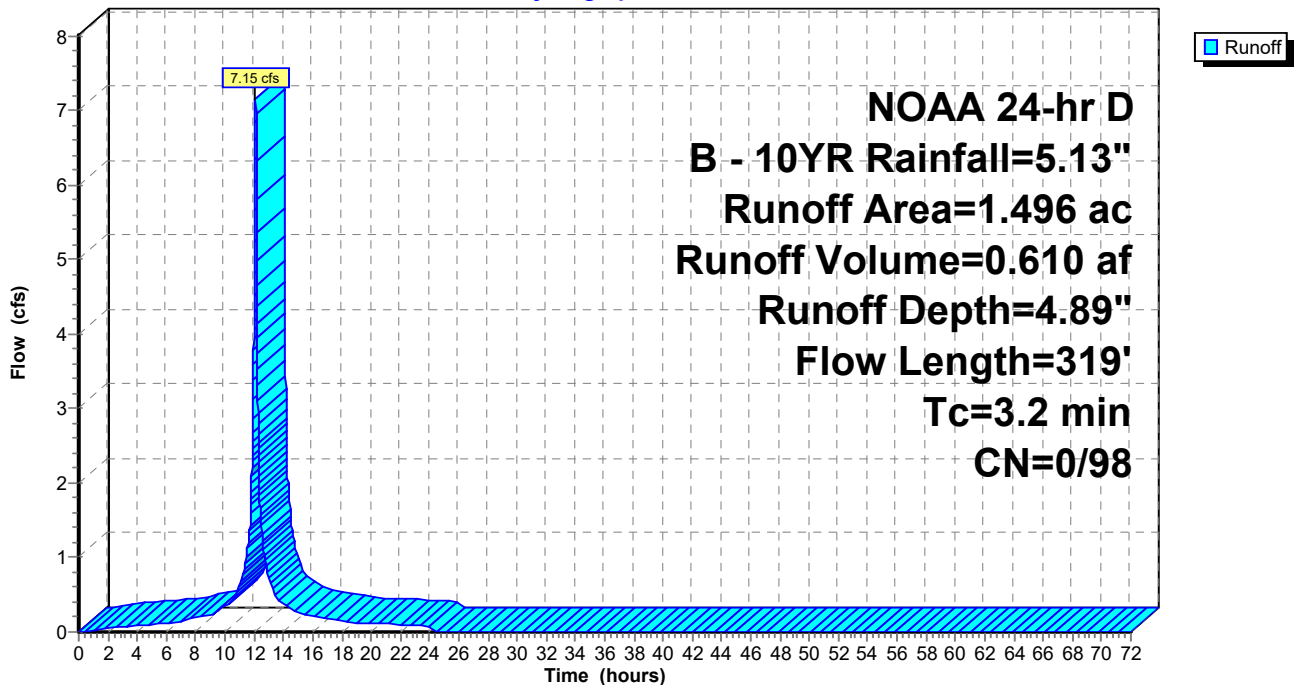
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 67

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.56 cfs @ 12.12 hrs, Volume= 0.142 af, Depth= 4.74"
 Routed to Pond B-3 : BASIN 3

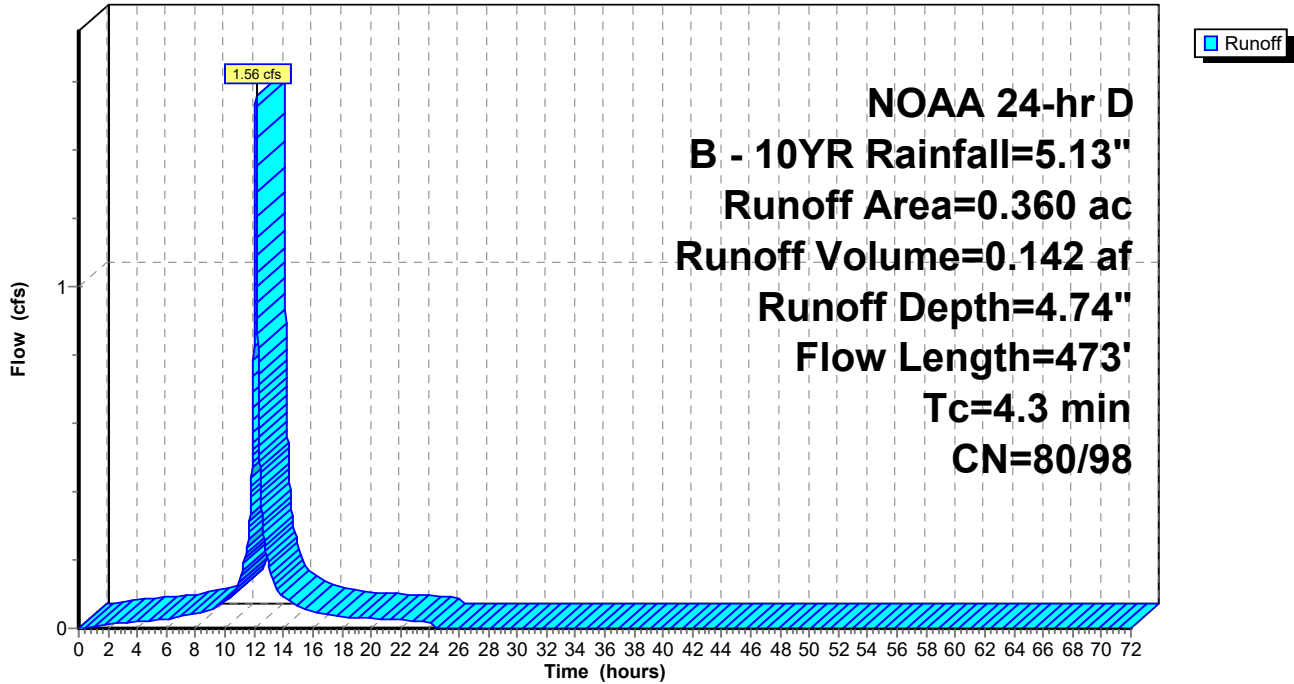
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 69

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 4.85 cfs @ 12.12 hrs, Volume= 0.433 af, Depth= 4.89"
 Routed to Pond B-3 : BASIN 3

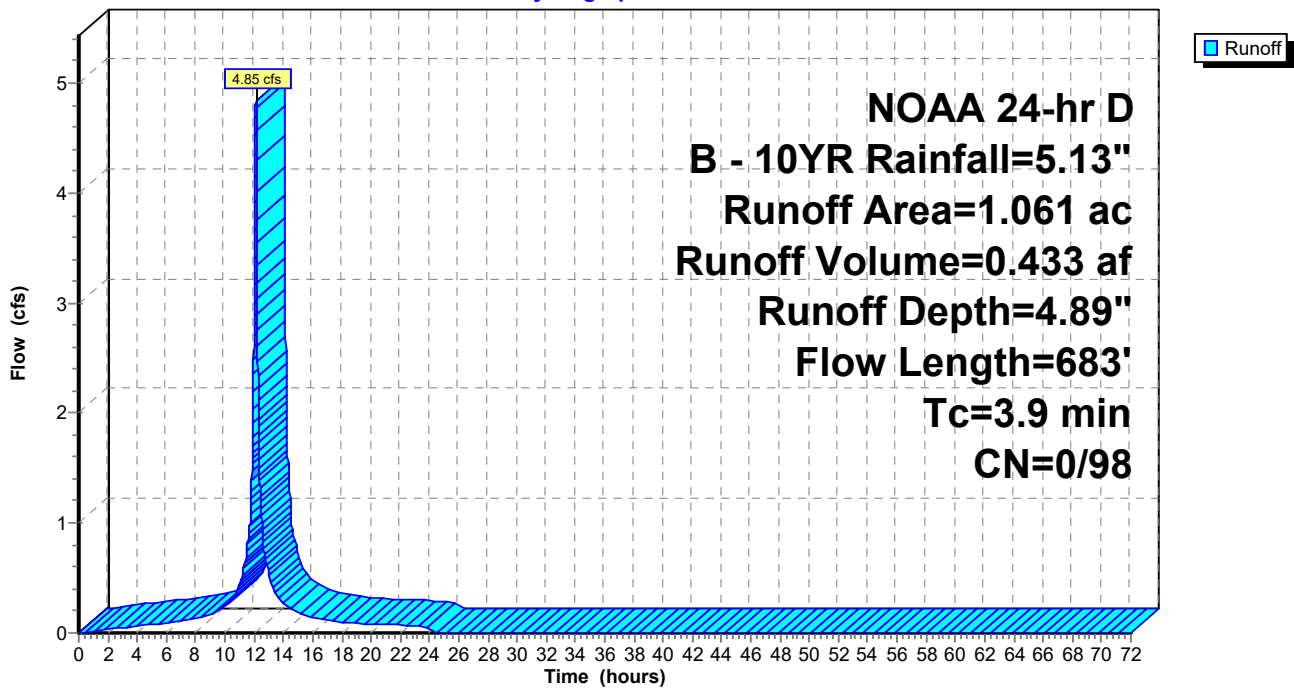
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 70

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 1.21 cfs @ 12.21 hrs, Volume= 0.147 af, Depth= 3.19"
 Routed to Pond B-4 : BASIN 4

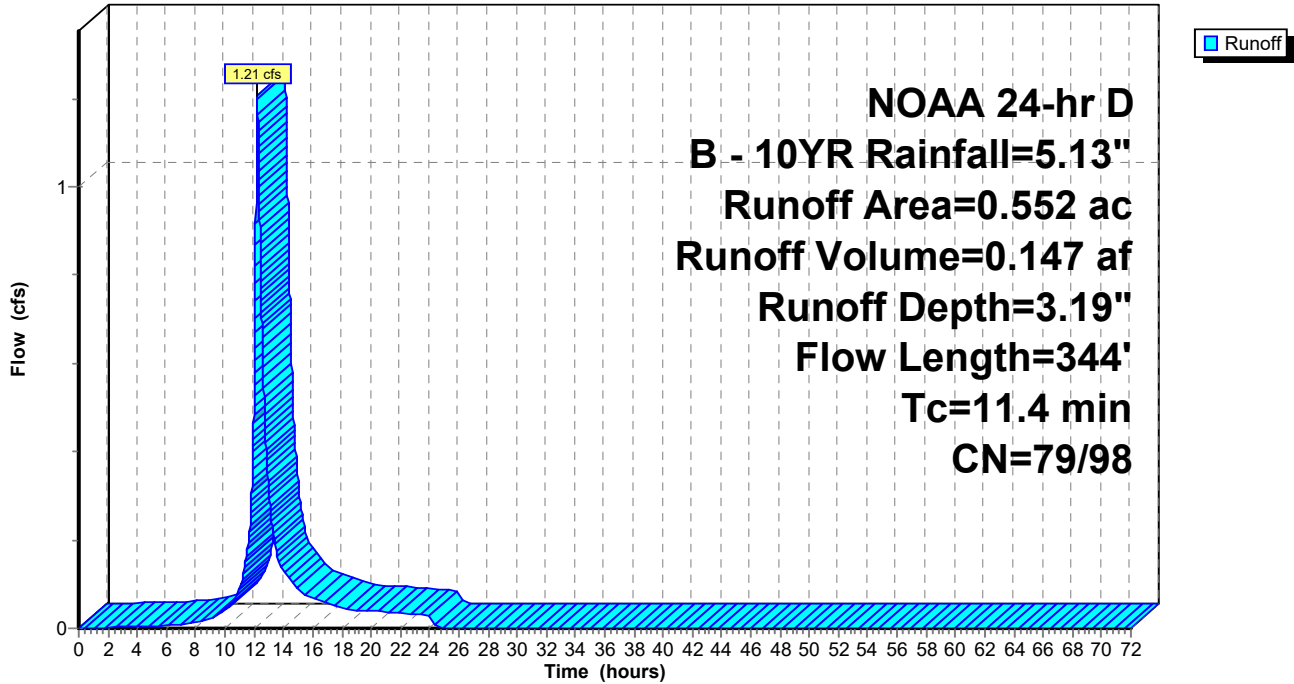
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 72

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 3.36 cfs @ 12.16 hrs, Volume= 0.376 af, Depth= 4.54"
 Routed to Pond B-4 : BASIN 4

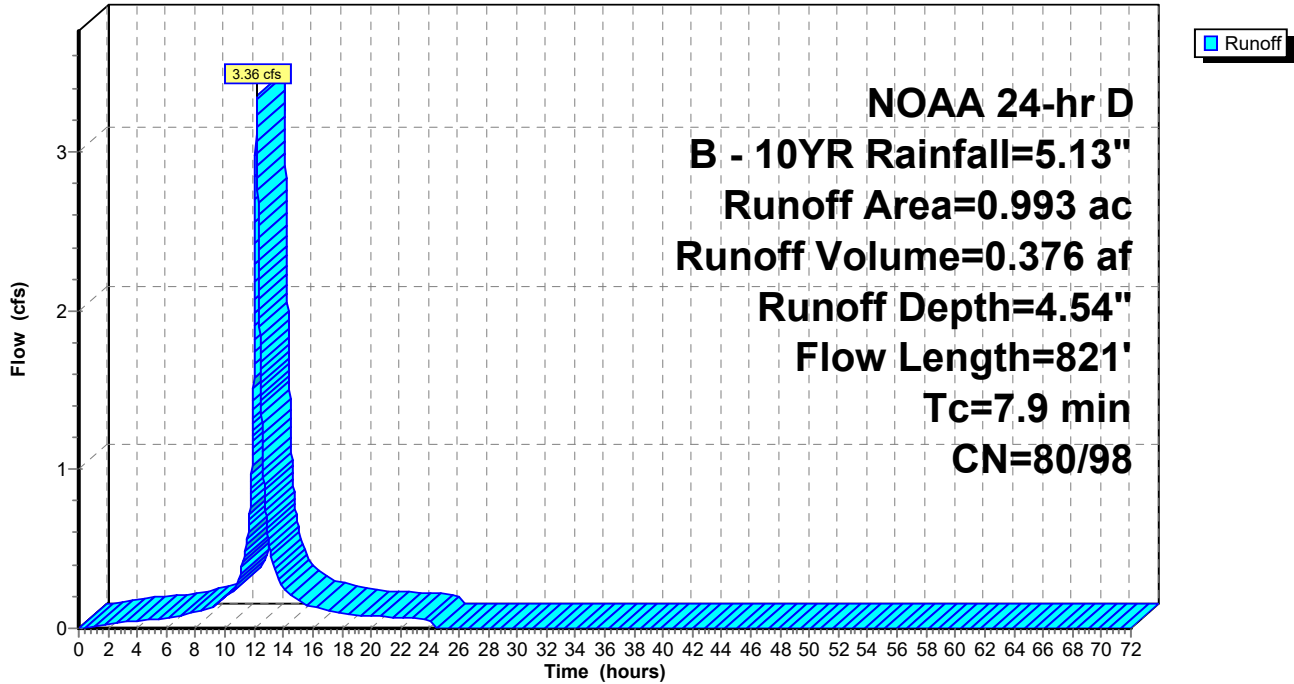
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 74

Summary for Subcatchment P-UG-1: UG-1

Runoff = 10.93 cfs @ 12.15 hrs, Volume= 1.170 af, Depth= 4.89"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

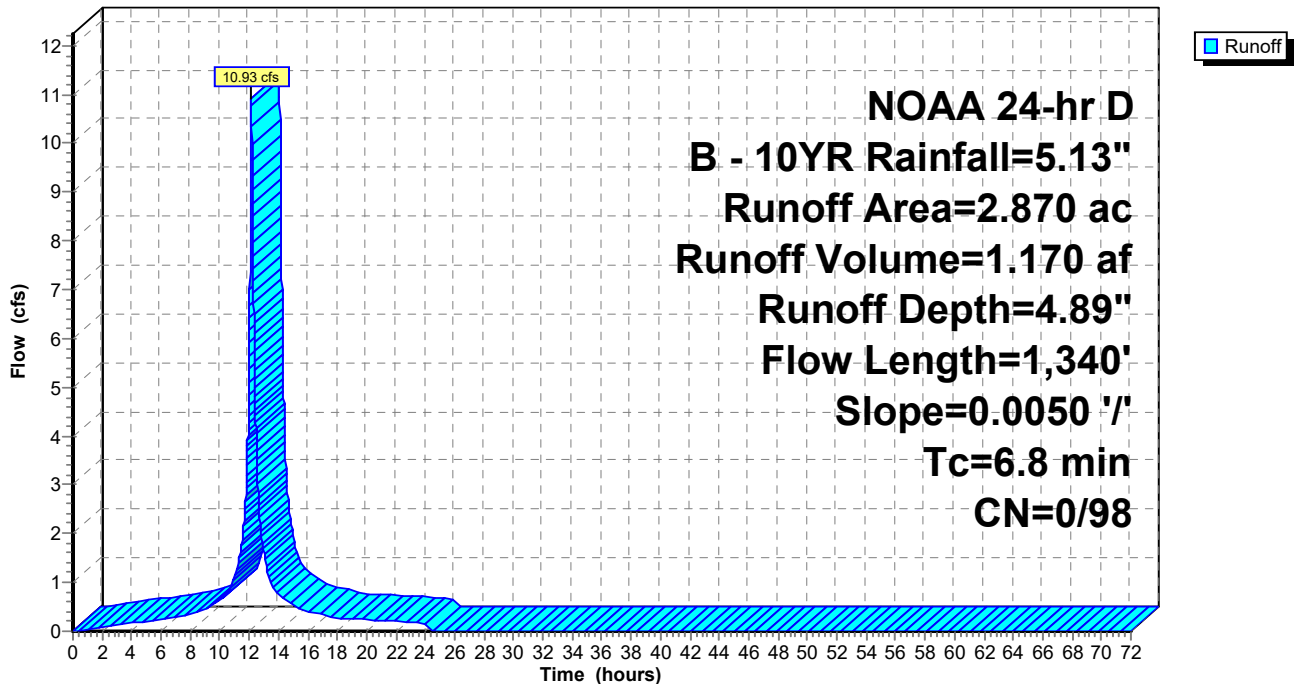
Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior

6.8 1,340 Total

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 75

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 272% of capacity of segment #3

Runoff = 12.41 cfs @ 12.13 hrs, Volume= 1.170 af, Depth= 4.89"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

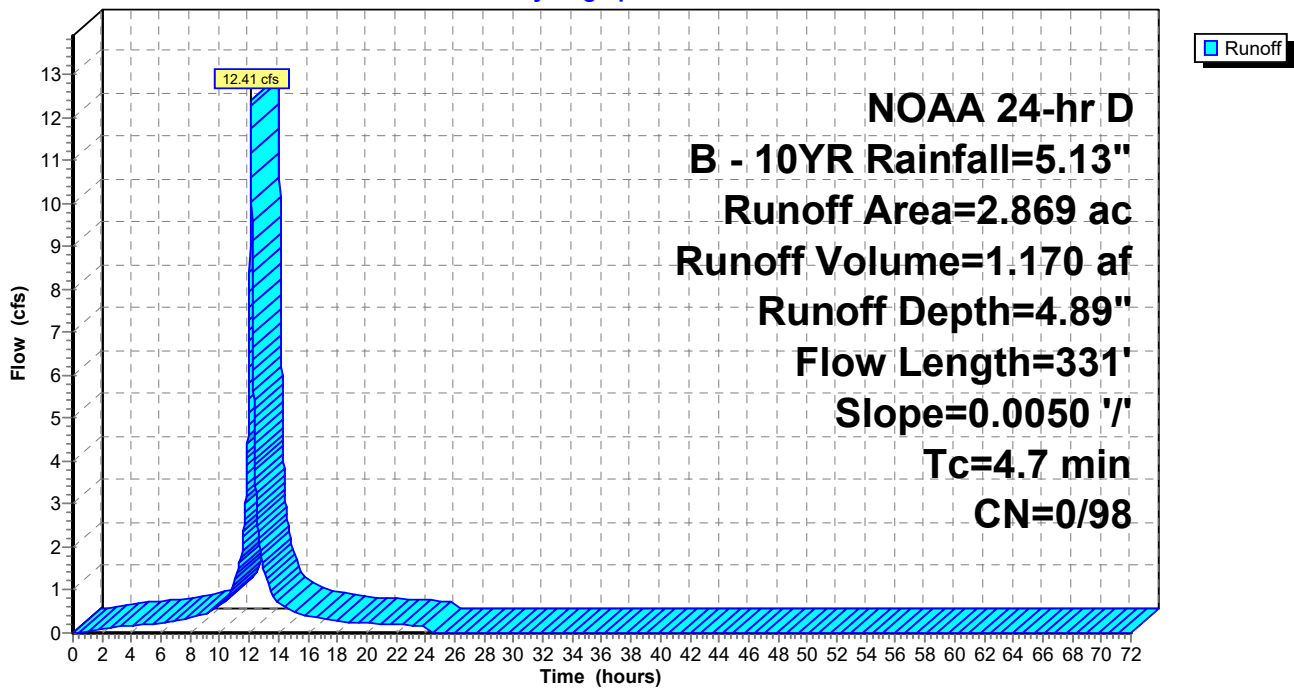
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 76

Summary for Reach 17R: E-1

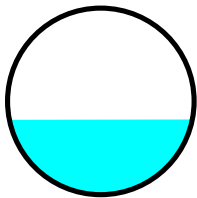
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 3.46" for B - 10YR event
Inflow = 8.57 cfs @ 12.39 hrs, Volume= 1.374 af
Outflow = 8.57 cfs @ 12.39 hrs, Volume= 1.374 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.32 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 3.7 min

Peak Storage= 384 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.94' , Surface Width= 2.29'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

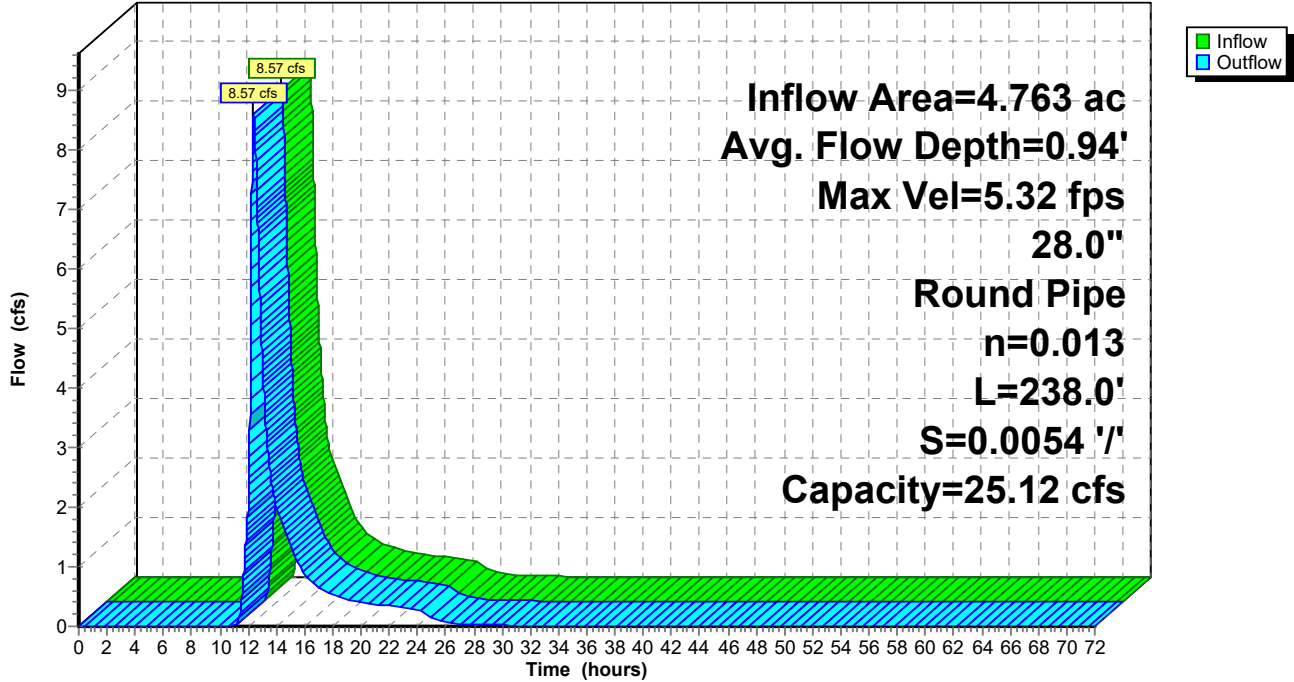
NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 77

Reach 17R: E-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 78

Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

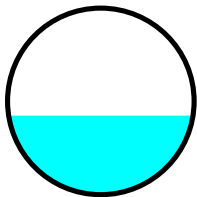
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.05' @ 12.49 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 3.46" for B - 10YR event
Inflow = 8.57 cfs @ 12.39 hrs, Volume= 1.374 af
Outflow = 8.57 cfs @ 12.40 hrs, Volume= 1.374 af, Atten= 0%, Lag= 0.6 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.98 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 3.8 min

Peak Storage= 394 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.99' , Surface Width= 2.31'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

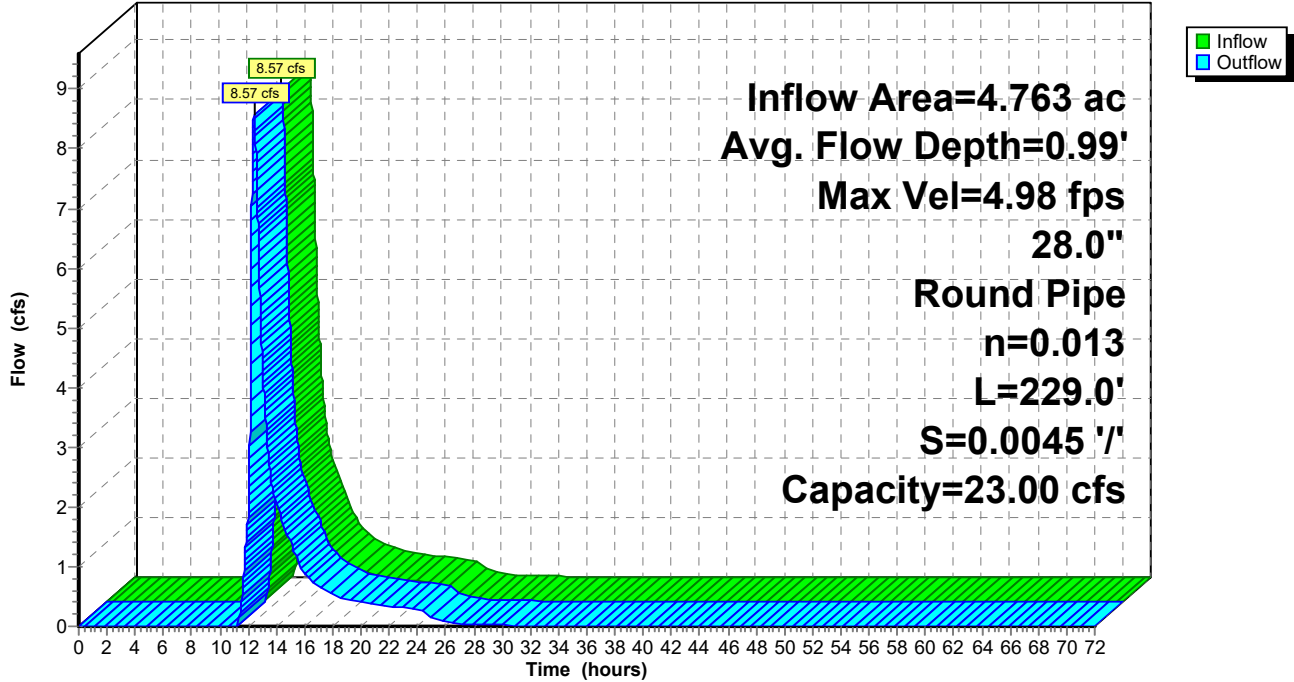
NOAA 24-hr D B - 10YR Rainfall=5.13"

Printed 2/26/2025

Page 79

Reach 18R: E-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 80

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 4.72" for B - 10YR event
 Inflow = 7.59 cfs @ 12.11 hrs, Volume= 0.643 af
 Outflow = 3.67 cfs @ 12.23 hrs, Volume= 0.549 af, Atten= 52%, Lag= 7.4 min
 Primary = 3.67 cfs @ 12.23 hrs, Volume= 0.549 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.61' @ 12.23 hrs Surf.Area= 0.133 ac Storage= 0.283 af

Plug-Flow detention time= 222.7 min calculated for 0.549 af (85% of inflow)
 Center-of-Mass det. time= 153.1 min (905.6 - 752.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

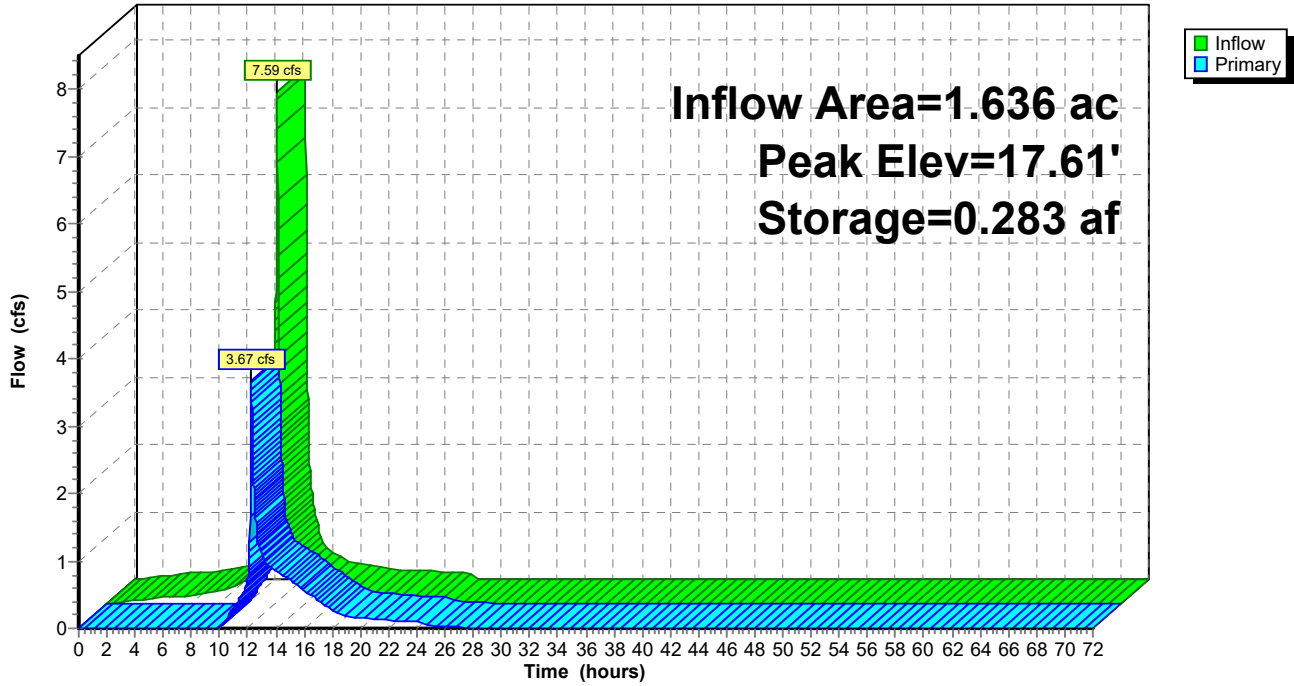
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 ' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.67 cfs @ 12.23 hrs HW=17.61' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.67 cfs of 18.55 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.01 cfs @ 5.79 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.64 cfs @ 1.68 fps)
- 4=Orifice/Grate (Weir Controls 2.02 cfs @ 1.11 fps)

Pond B-2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 82

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 4.33" for B - 10YR event
 Inflow = 8.06 cfs @ 12.12 hrs, Volume= 0.690 af
 Outflow = 2.19 cfs @ 12.39 hrs, Volume= 0.493 af, Atten= 73%, Lag= 16.5 min
 Primary = 2.19 cfs @ 12.39 hrs, Volume= 0.493 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.03' @ 12.39 hrs Surf.Area= 0.260 ac Storage= 0.377 af

Plug-Flow detention time= 402.5 min calculated for 0.493 af (71% of inflow)
 Center-of-Mass det. time= 300.1 min (1,064.4 - 764.3)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.50	0.231	569.6	0.000	0.000	0.231	
11.00	0.241	578.4	0.118	0.118	0.251	
12.00	0.259	596.0	0.250	0.368	0.291	
13.00	0.278	615.6	0.269	0.637	0.337	
13.50	0.295	633.5	0.143	0.780	0.378	

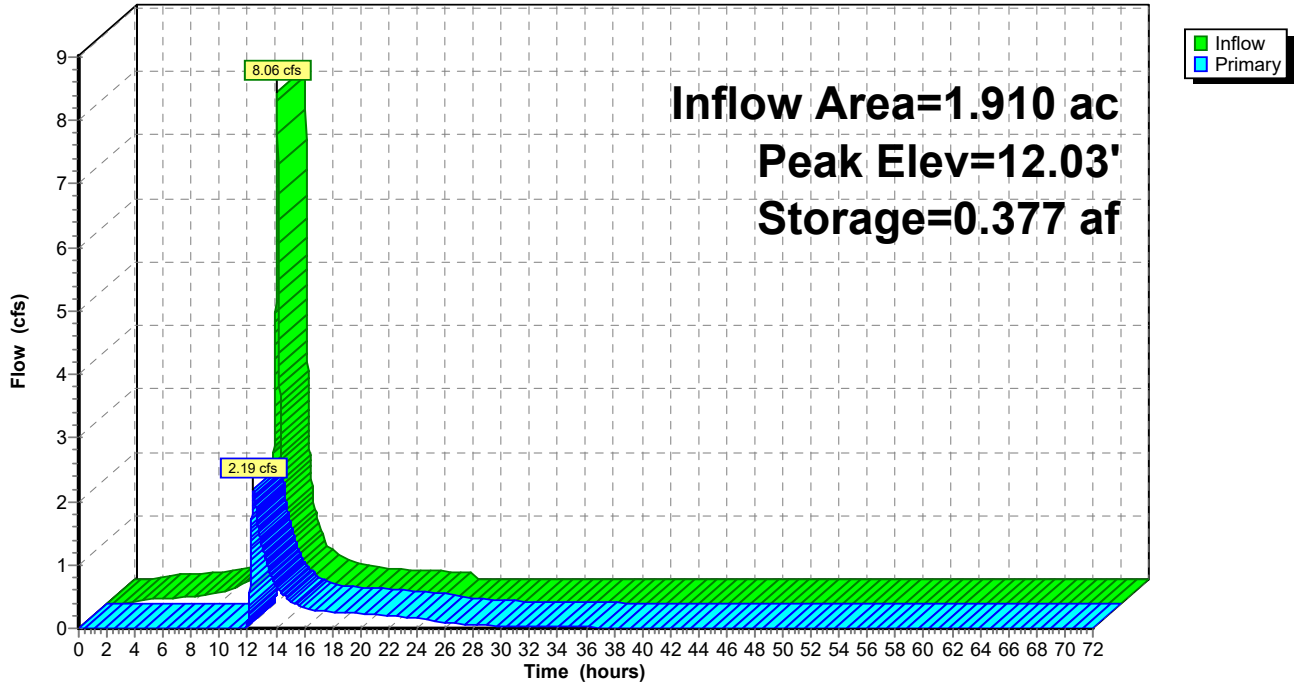
Device	Routing	Invert	Outlet Devices	
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf	
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads	

Primary OutFlow Max=2.19 cfs @ 12.39 hrs HW=12.03' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 2.19 cfs of 32.74 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.39 cfs @ 3.56 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.46 cfs @ 1.74 fps)
- 4=Orifice/Grate (Weir Controls 0.34 cfs @ 0.61 fps)

Pond B-3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 84

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 3.89" for B - 10YR event
 Inflow = 5.28 cfs @ 12.16 hrs, Volume= 0.595 af
 Outflow = 2.76 cfs @ 12.44 hrs, Volume= 0.504 af, Atten= 48%, Lag= 16.4 min
 Primary = 2.76 cfs @ 12.44 hrs, Volume= 0.504 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.87' @ 12.44 hrs Surf.Area= 4,965 sf Storage= 9,760 cf

Plug-Flow detention time= 182.0 min calculated for 0.503 af (85% of inflow)
 Center-of-Mass det. time= 110.1 min (898.9 - 788.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

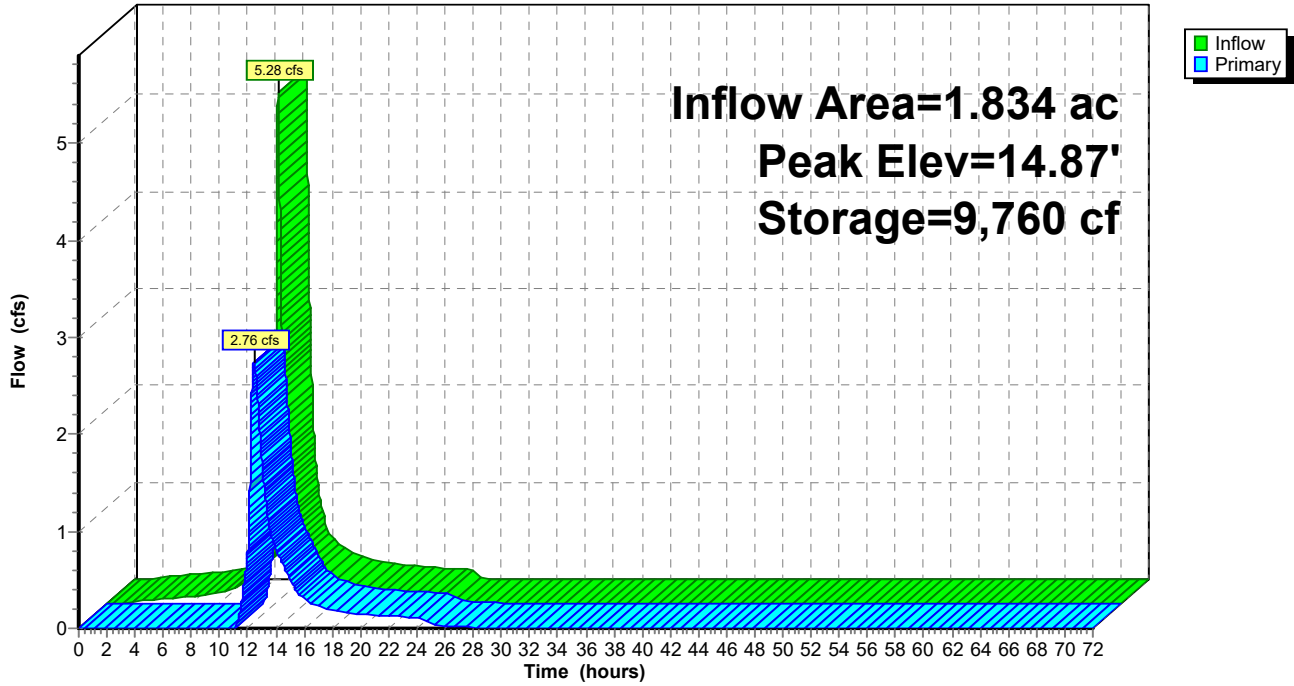
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.75 cfs @ 12.44 hrs HW=14.87' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 2.75 cfs of 12.63 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.35 cfs @ 4.96 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.40 cfs @ 2.58 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 86

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 4.51" for B - 10YR event
 Inflow = 9.64 cfs @ 12.16 hrs, Volume= 1.101 af
 Outflow = 5.86 cfs @ 12.37 hrs, Volume= 0.871 af, Atten= 39%, Lag= 12.3 min
 Primary = 5.86 cfs @ 12.37 hrs, Volume= 0.871 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.06' @ 12.37 hrs Surf.Area= 9,017 sf Storage= 19,895 cf

Plug-Flow detention time= 222.4 min calculated for 0.871 af (79% of inflow)
 Center-of-Mass det. time= 135.7 min (901.9 - 766.3)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	6,858	409.0	0	0	6,858	
13.00	7,629	429.0	2,896	2,896	8,202	
14.00	8,186	439.0	7,906	10,802	9,018	
14.10	8,239	440.0	821	11,623	9,101	
15.00	8,985	459.0	7,748	19,372	10,519	
16.00	9,537	468.1	9,260	28,631	11,335	

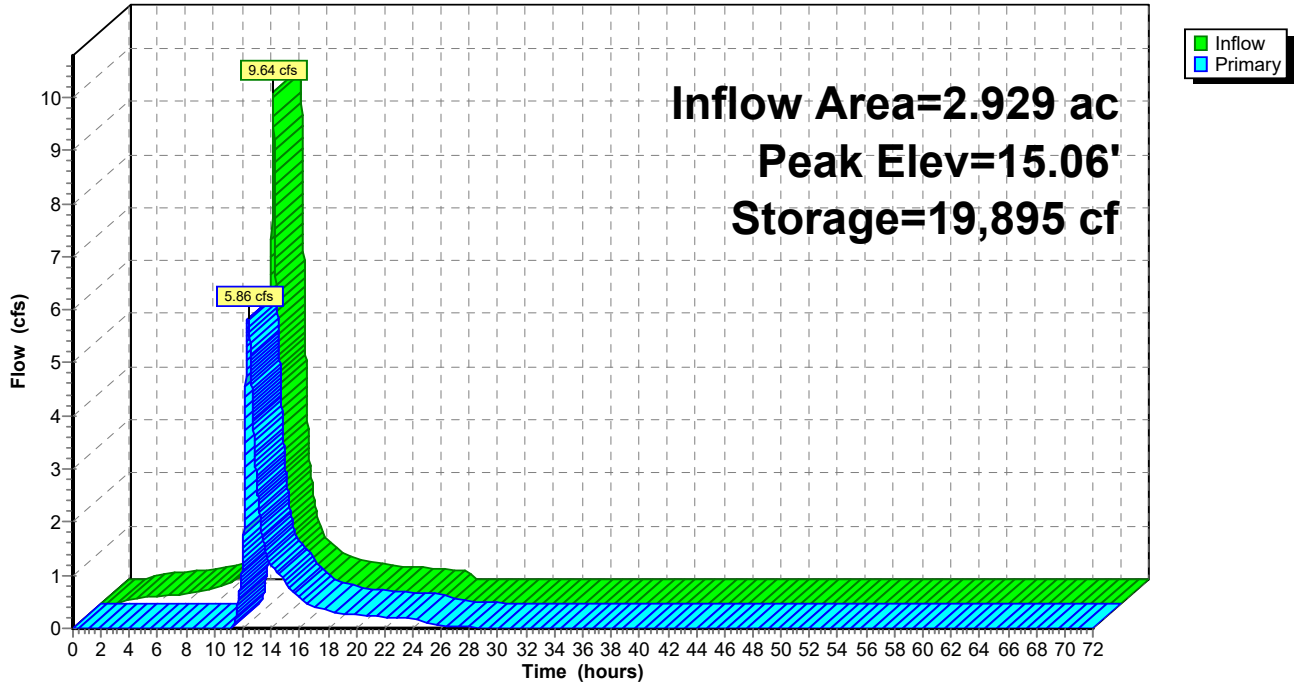
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.86 cfs @ 12.37 hrs HW=15.06' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 5.86 cfs of 13.54 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.92 cfs @ 4.69 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 3.94 cfs @ 2.44 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 88

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 4.89" for B - 10YR event
 Inflow = 23.14 cfs @ 12.13 hrs, Volume= 2.340 af
 Outflow = 1.40 cfs @ 14.16 hrs, Volume= 1.769 af, Atten= 94%, Lag= 121.3 min
 Primary = 1.40 cfs @ 14.16 hrs, Volume= 1.769 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.51' @ 14.16 hrs Surf.Area= 0.631 ac Storage= 1.666 af

Plug-Flow detention time= 845.2 min calculated for 1.769 af (76% of inflow)
 Center-of-Mass det. time= 751.0 min (1,503.1 - 752.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=1.40 cfs @ 14.16 hrs HW=13.51' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.40 cfs of 37.56 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.64 cfs @ 7.36 fps)
- 3=Orifice/Grate (Orifice Controls 0.41 cfs @ 6.00 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 0.35 cfs @ 0.78 fps)

250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 89

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"

End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

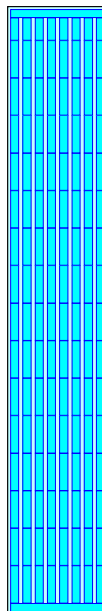
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 90

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0" End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

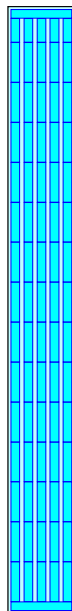
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

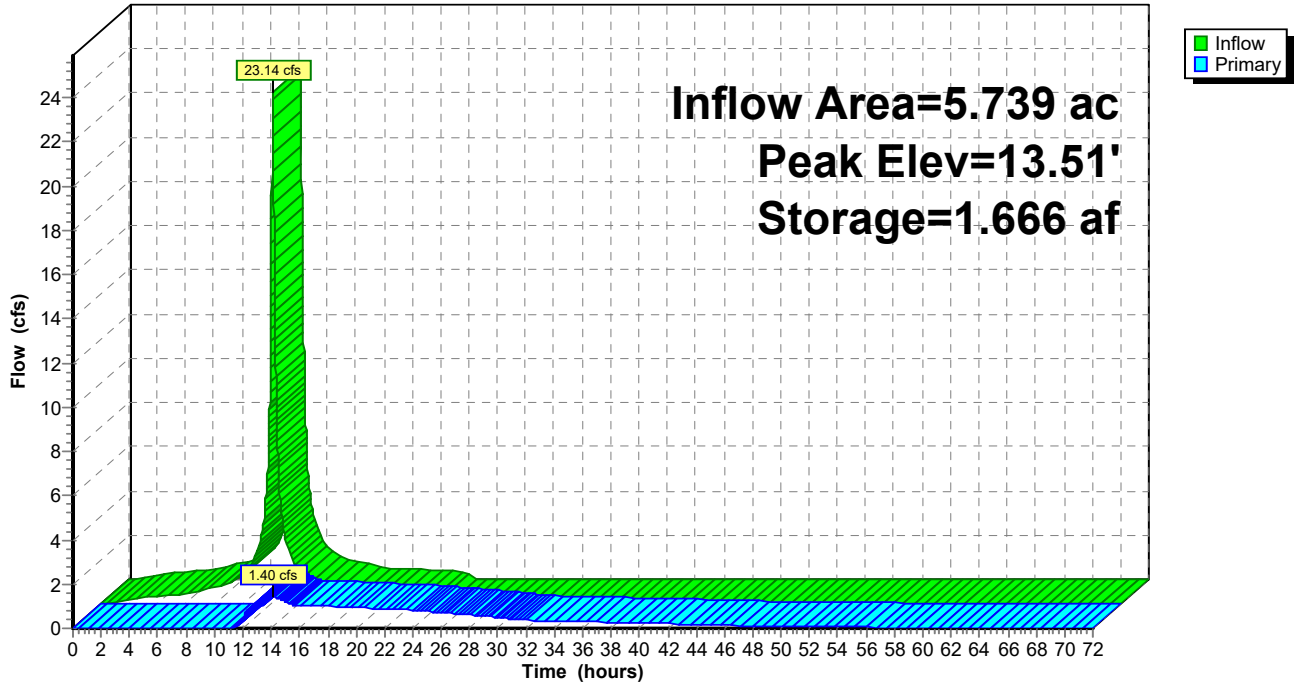
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



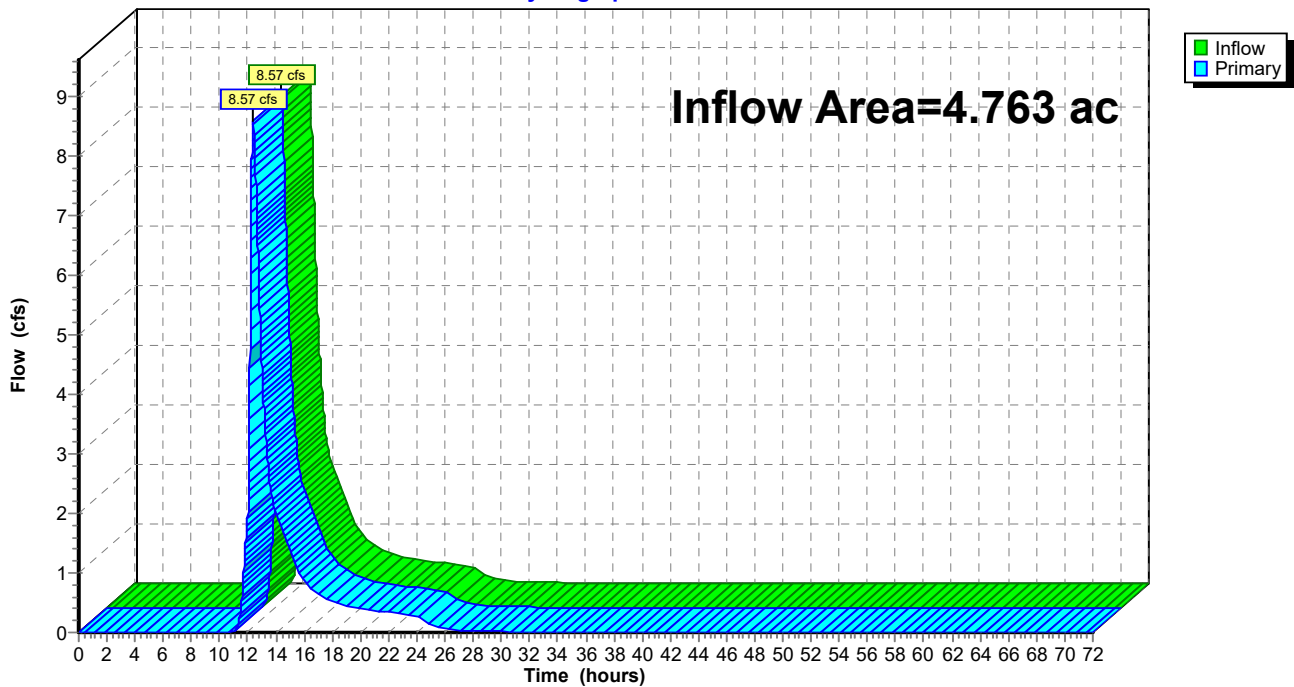
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 3.46" for B - 10YR event
Inflow = 8.57 cfs @ 12.39 hrs, Volume= 1.374 af
Primary = 8.57 cfs @ 12.39 hrs, Volume= 1.374 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



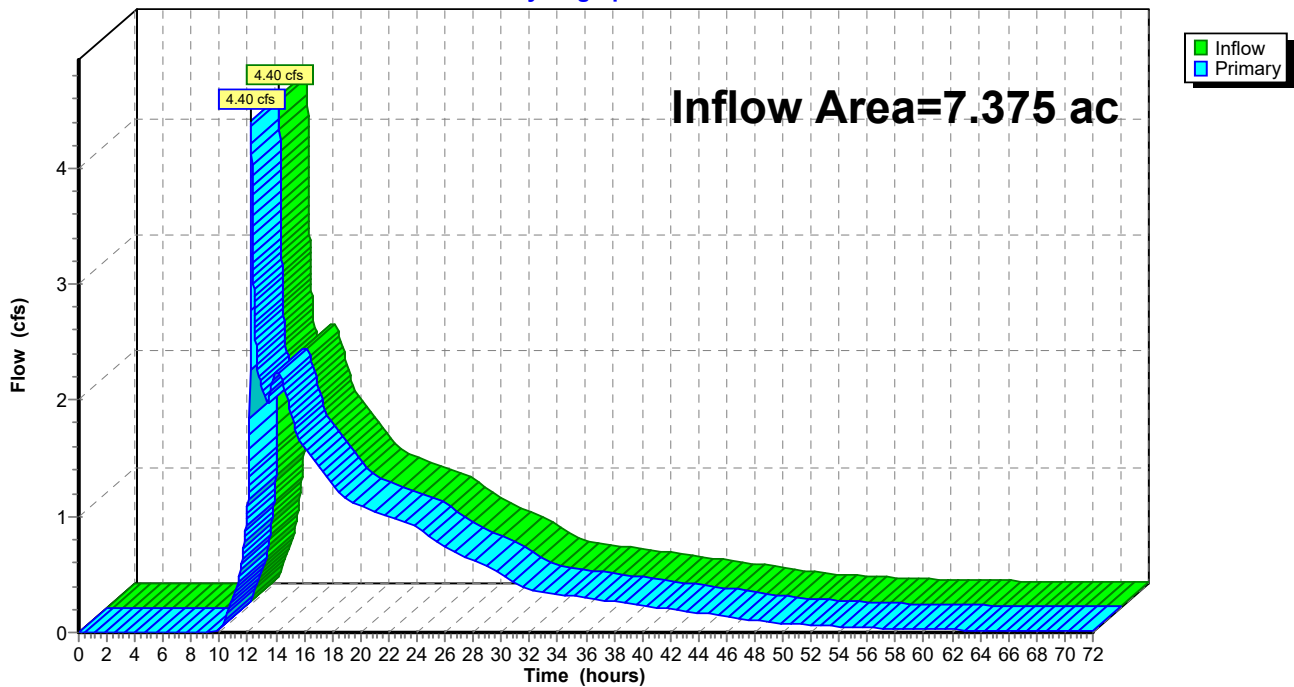
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 3.77" for B - 10YR event
Inflow = 4.40 cfs @ 12.23 hrs, Volume= 2.318 af
Primary = 4.40 cfs @ 12.23 hrs, Volume= 2.318 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



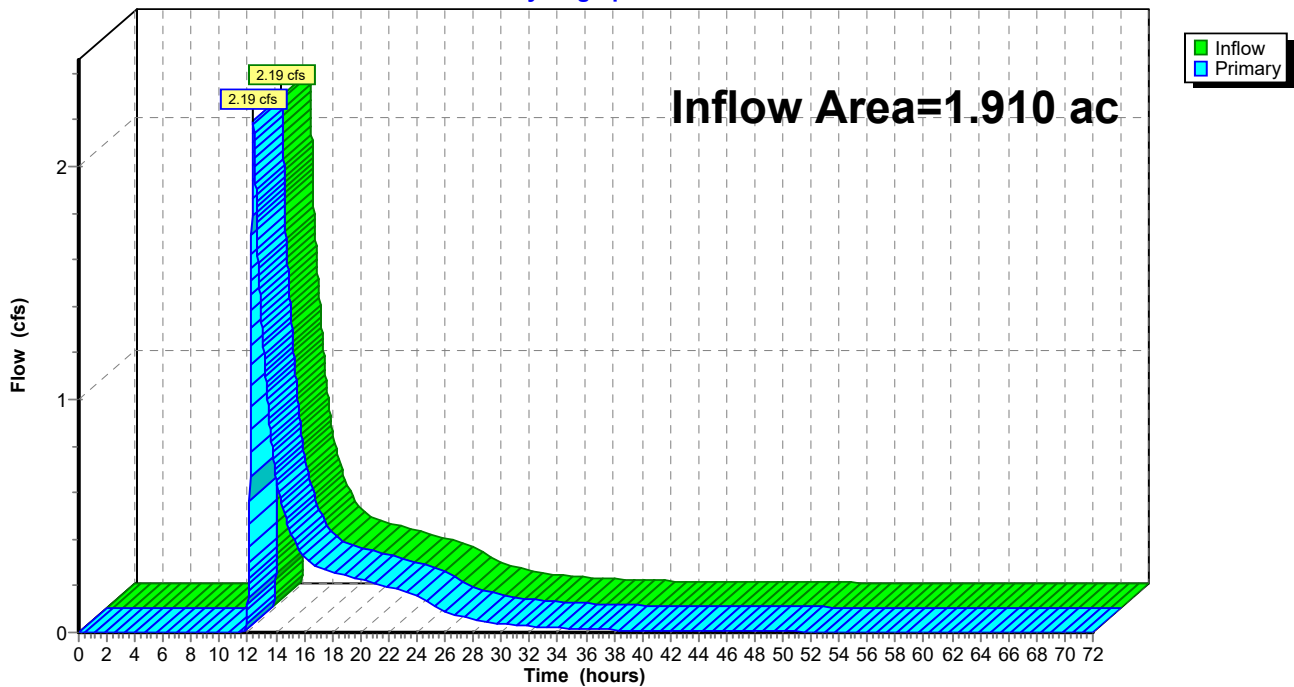
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 3.10" for B - 10YR event
Inflow = 2.19 cfs @ 12.39 hrs, Volume= 0.493 af
Primary = 2.19 cfs @ 12.39 hrs, Volume= 0.493 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



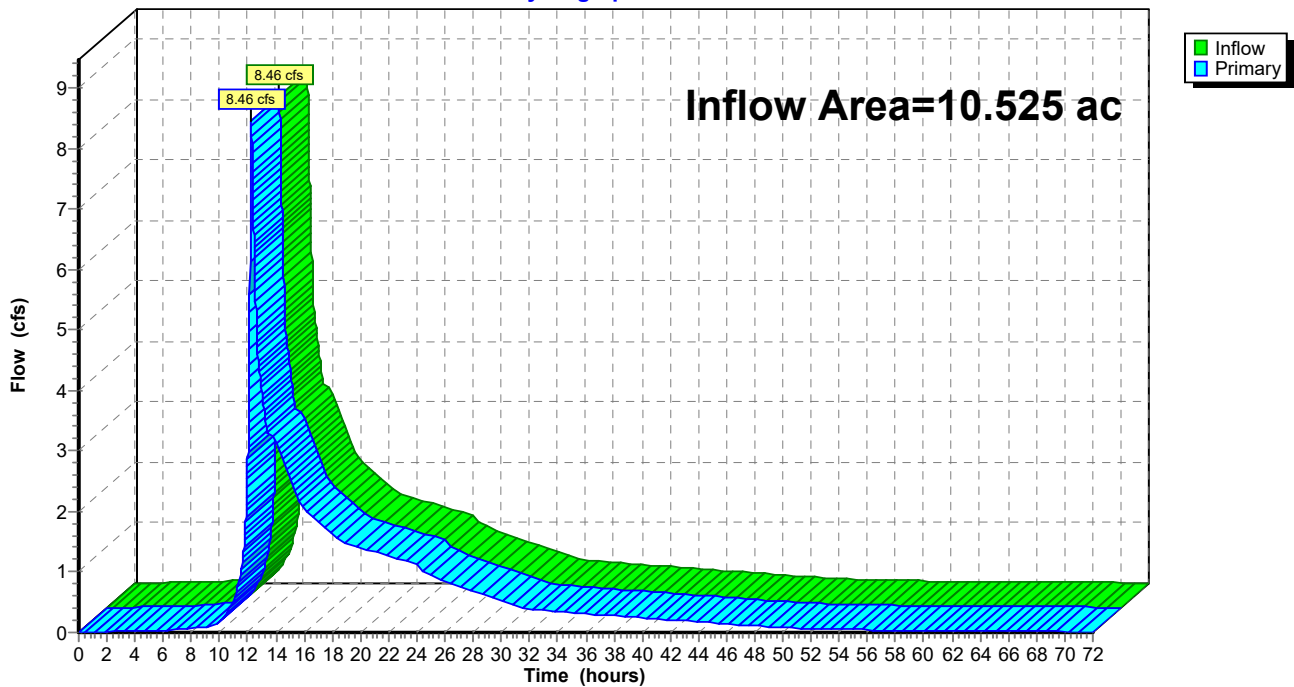
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 3.59" for B - 10YR event
Inflow = 8.46 cfs @ 12.23 hrs, Volume= 3.147 af
Primary = 8.46 cfs @ 12.23 hrs, Volume= 3.147 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



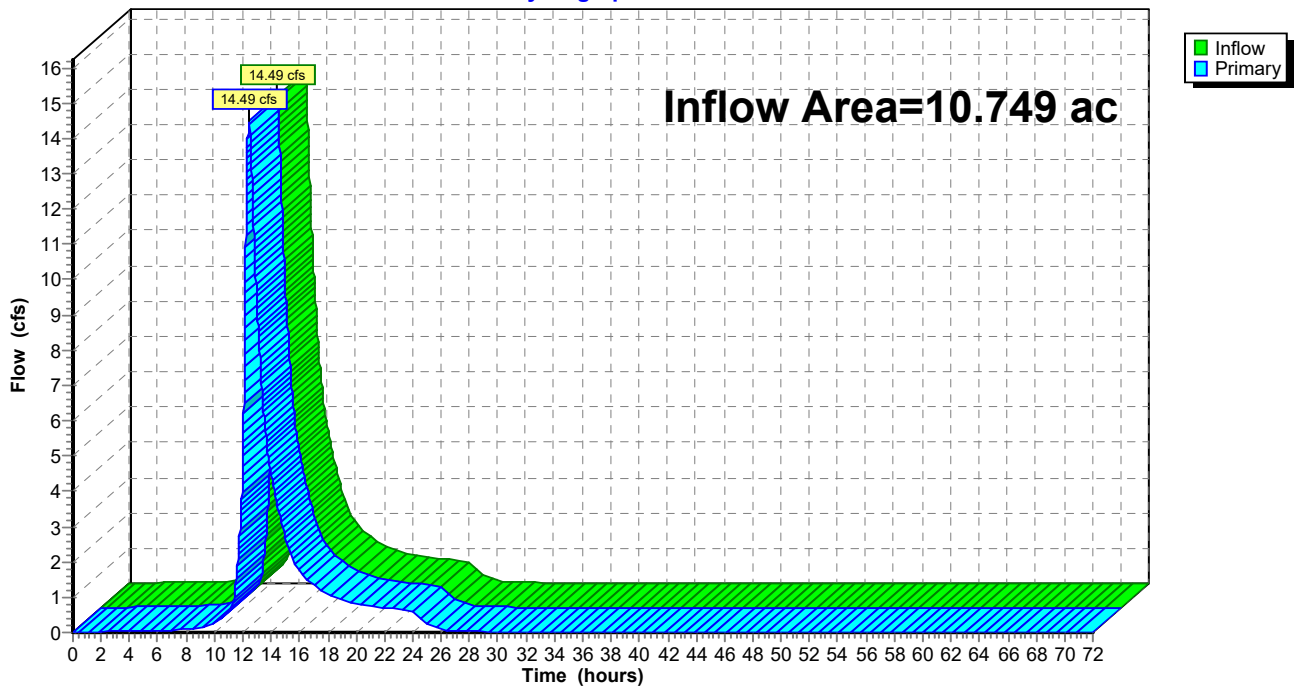
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 3.18" for B - 10YR event
Inflow = 14.49 cfs @ 12.43 hrs, Volume= 2.852 af
Primary = 14.49 cfs @ 12.43 hrs, Volume= 2.852 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D B - 10YR Rainfall=5.13"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 97

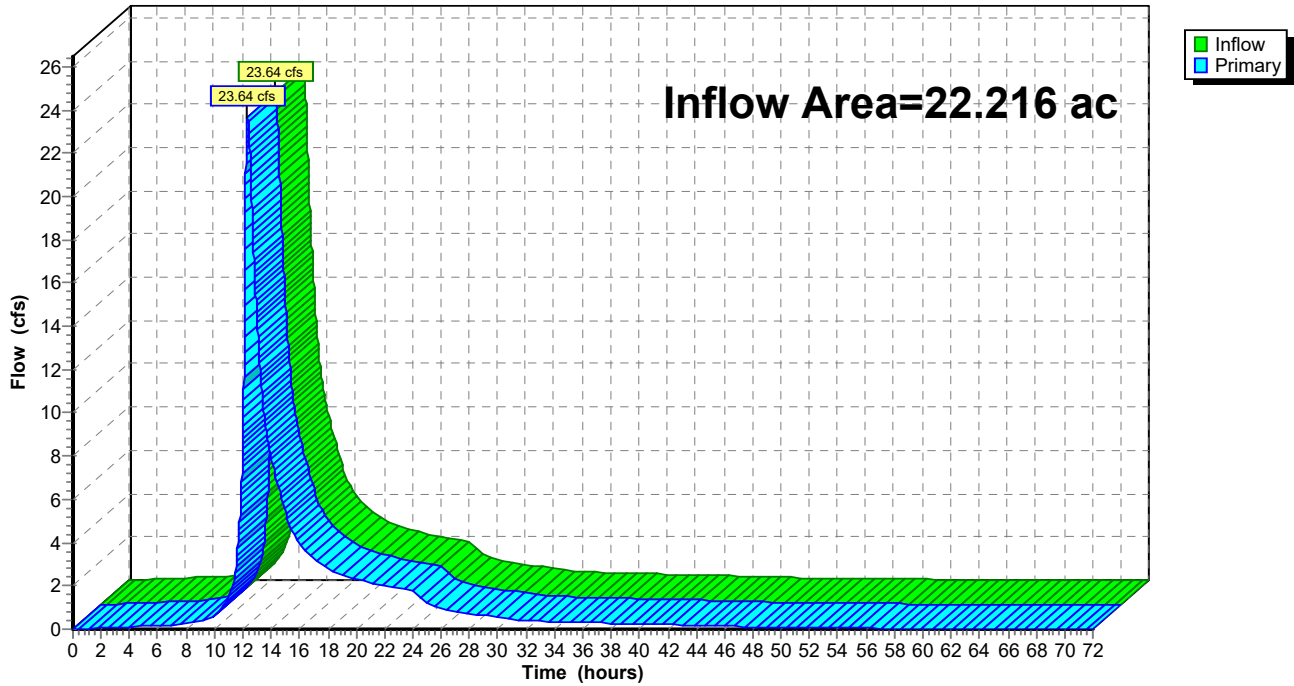
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 3.45" for B - 10YR event
Inflow = 23.64 cfs @ 12.35 hrs, Volume= 6.383 af
Primary = 23.64 cfs @ 12.35 hrs, Volume= 6.383 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 98

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=6.05" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=10.69 cfs 1.257 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.72 cfs 0.046 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=2.32 cfs 0.160 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=4.13" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=1.07 cfs 0.099 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=1.52 cfs 0.142 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=2.62 cfs 0.482 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=3.22 cfs 0.325 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=3.81" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=7.58 cfs 1.700 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=4.84" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=3.64 cfs 0.378 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=2.60" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.60 cfs 0.066 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=8.91 cfs 0.766 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=5.97" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.96 cfs 0.179 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=6.04 cfs 0.543 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=4.32" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=1.64 cfs 0.199 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=5.77" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=4.24 cfs 0.477 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=13.62 cfs 1.469 af

250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 99

SubcatchmentP-UG-2: UG-2 Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=6.14"
 Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=15.46 cfs 1.468 af

Reach 17R: E-1 Avg. Flow Depth=1.14' Max Vel=5.81 fps Inflow=12.05 cfs 1.852 af
 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=12.04 cfs 1.852 af

Reach 18R: E-2 Avg. Flow Depth=1.20' Max Vel=5.44 fps Inflow=12.04 cfs 1.852 af
 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=12.04 cfs 1.852 af

Pond B-2: BASIN 2 Peak Elev=17.72' Storage=0.297 af Inflow=9.51 cfs 0.811 af
 Outflow=7.55 cfs 0.717 af

Pond B-3: BASIN 3 Peak Elev=12.16' Storage=0.410 af Inflow=10.26 cfs 0.882 af
 Outflow=6.27 cfs 0.685 af

Pond B-4: BASIN 4 Peak Elev=15.16' Storage=11,233 cf Inflow=6.85 cfs 0.775 af
 Outflow=3.86 cfs 0.684 af

Pond B-5: BASIN 5 Peak Elev=15.26' Storage=21,715 cf Inflow=12.19 cfs 1.399 af
 Outflow=8.27 cfs 1.169 af

Pond UG-2: UG BASIN 1 & 2 (Peak Elev=13.82' Storage=1.774 af Inflow=28.84 cfs 2.937 af
 Outflow=6.82 cfs 2.365 af

Link 16L: Existing Storm Sewer Inflow=12.05 cfs 1.852 af
 Primary=12.05 cfs 1.852 af

Link D3A: POD 3A Inflow=8.74 cfs 3.082 af
 Primary=8.74 cfs 3.082 af

Link D3B: POD 3B Inflow=6.27 cfs 0.685 af
 Primary=6.27 cfs 0.685 af

Link P-DC: DUCK CREEK Inflow=18.26 cfs 4.211 af
 Primary=18.26 cfs 4.211 af

Link P-PC: POND CREEK Inflow=20.07 cfs 3.878 af
 Primary=20.07 cfs 3.878 af

Link P-SR: SOUTH RIVER Inflow=36.01 cfs 8.571 af
 Primary=36.01 cfs 8.571 af

Total Runoff Area = 22.216 ac Runoff Volume = 9.756 af Average Runoff Depth = 5.27"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 100

Summary for Subcatchment 16S: P-B5-1

Runoff = 10.69 cfs @ 12.17 hrs, Volume= 1.257 af, Depth= 6.05"
 Routed to Pond B-5 : BASIN 5

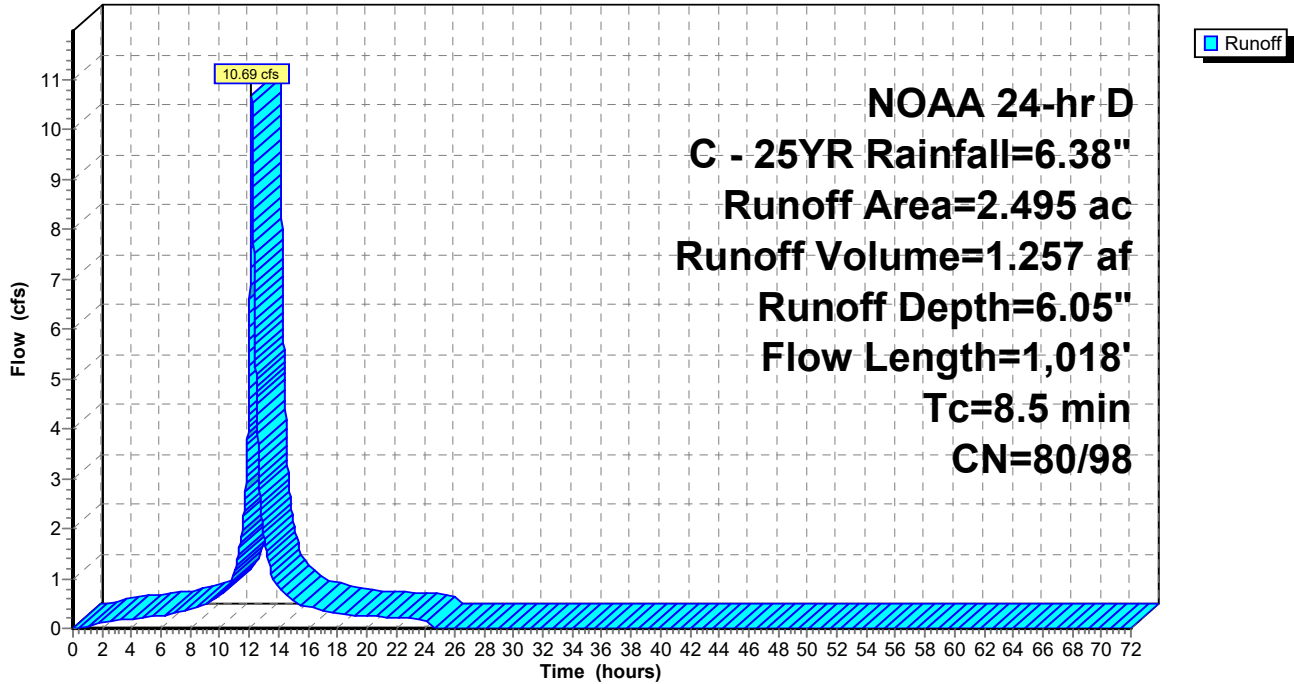
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 102

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.046 af, Depth= 3.92"
 Routed to Pond B-2 : BASIN 2

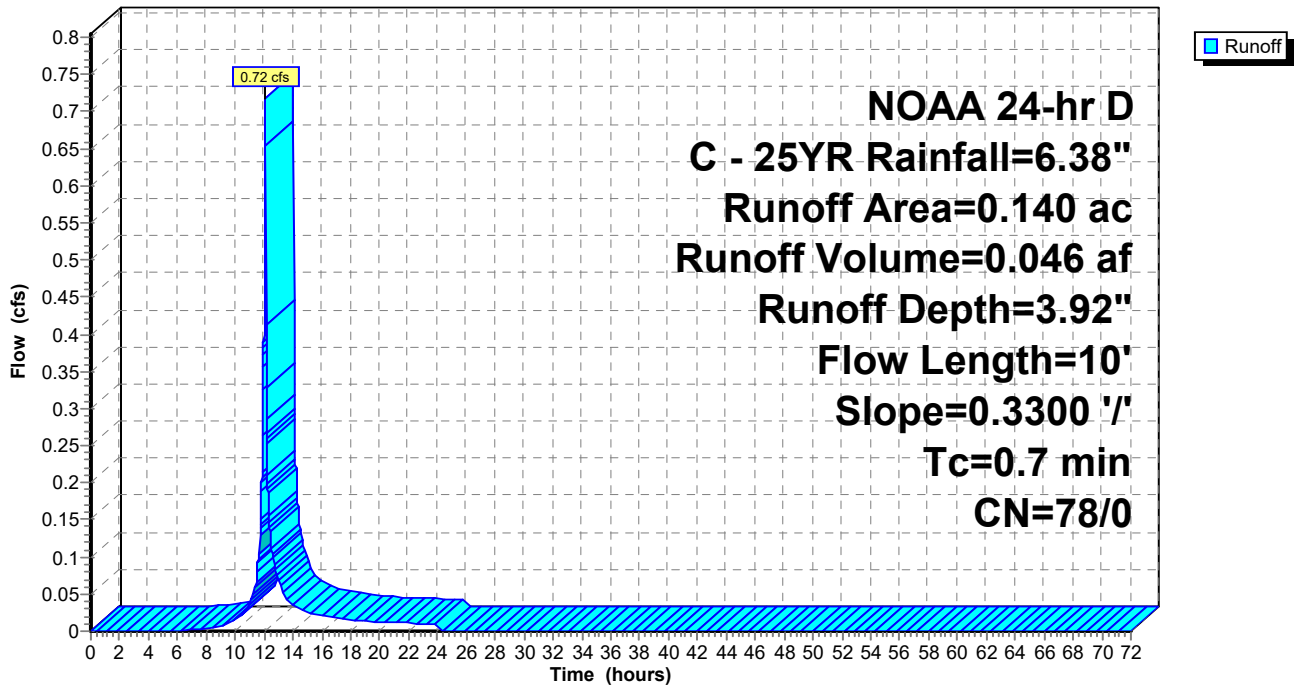
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 103

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 2.32 cfs @ 12.11 hrs, Volume= 0.160 af, Depth= 3.92"
 Routed to Pond B-3 : BASIN 3

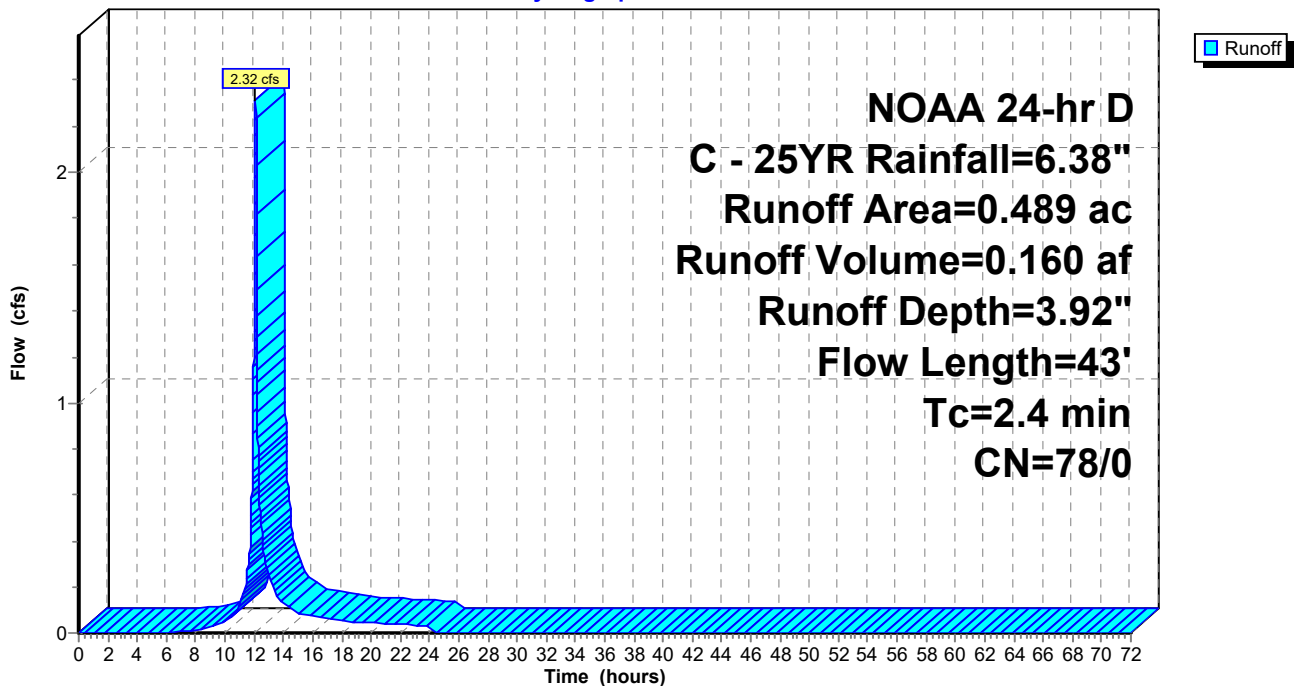
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 104

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 1.07 cfs @ 12.15 hrs, Volume= 0.099 af, Depth= 4.13"
 Routed to Pond B-4 : BASIN 4

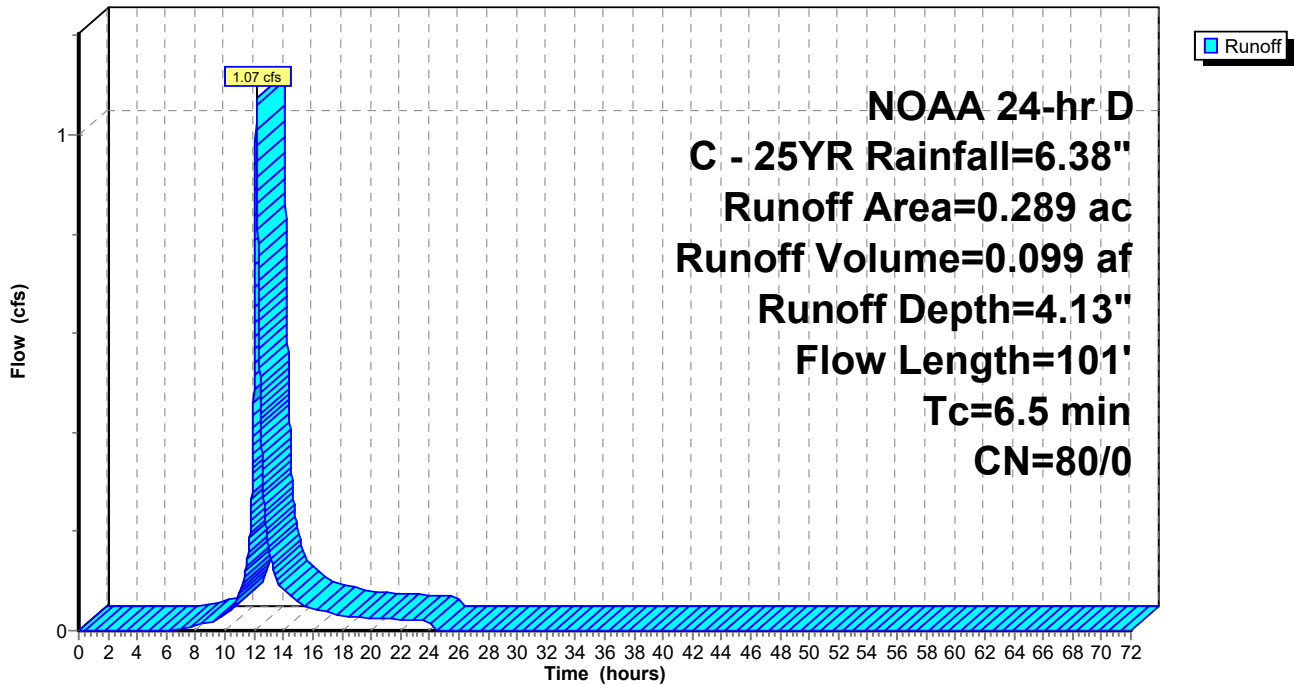
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 105

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 1.52 cfs @ 12.15 hrs, Volume= 0.142 af, Depth= 3.92"
 Routed to Pond B-5 : BASIN 5

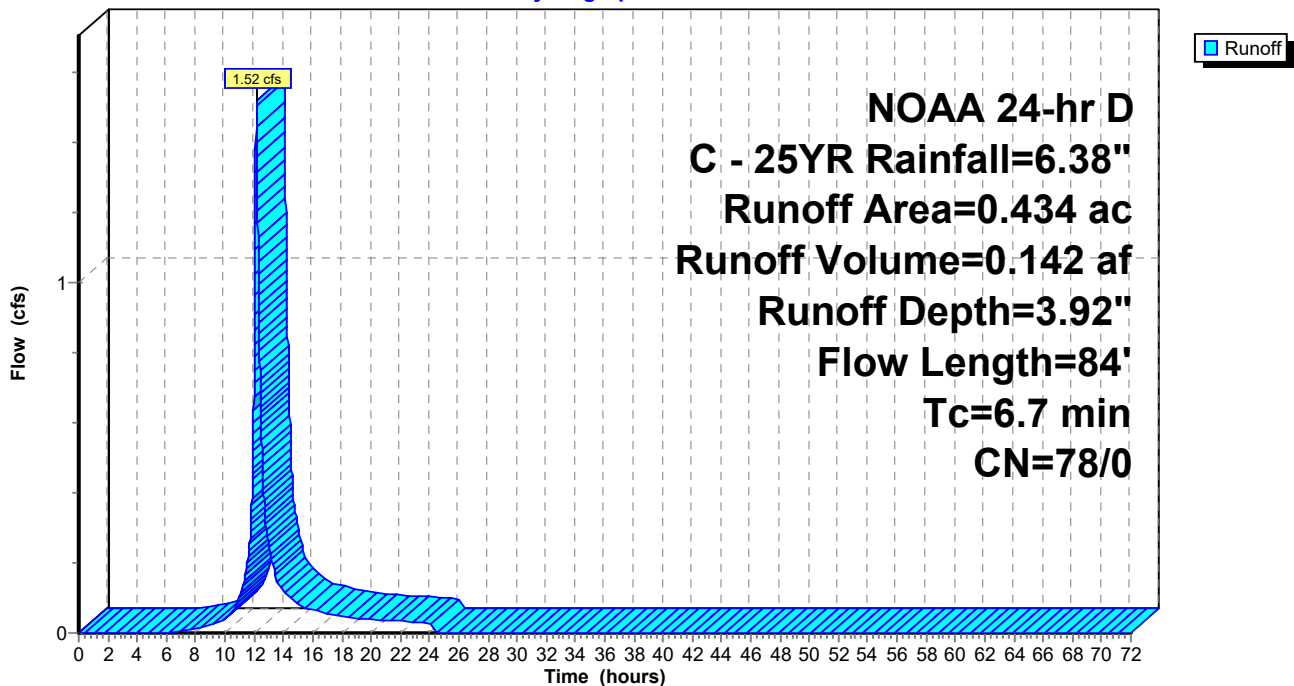
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 106

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 2.62 cfs @ 12.34 hrs, Volume= 0.482 af, Depth= 6.14"
 Routed to Link P-SR : SOUTH RIVER

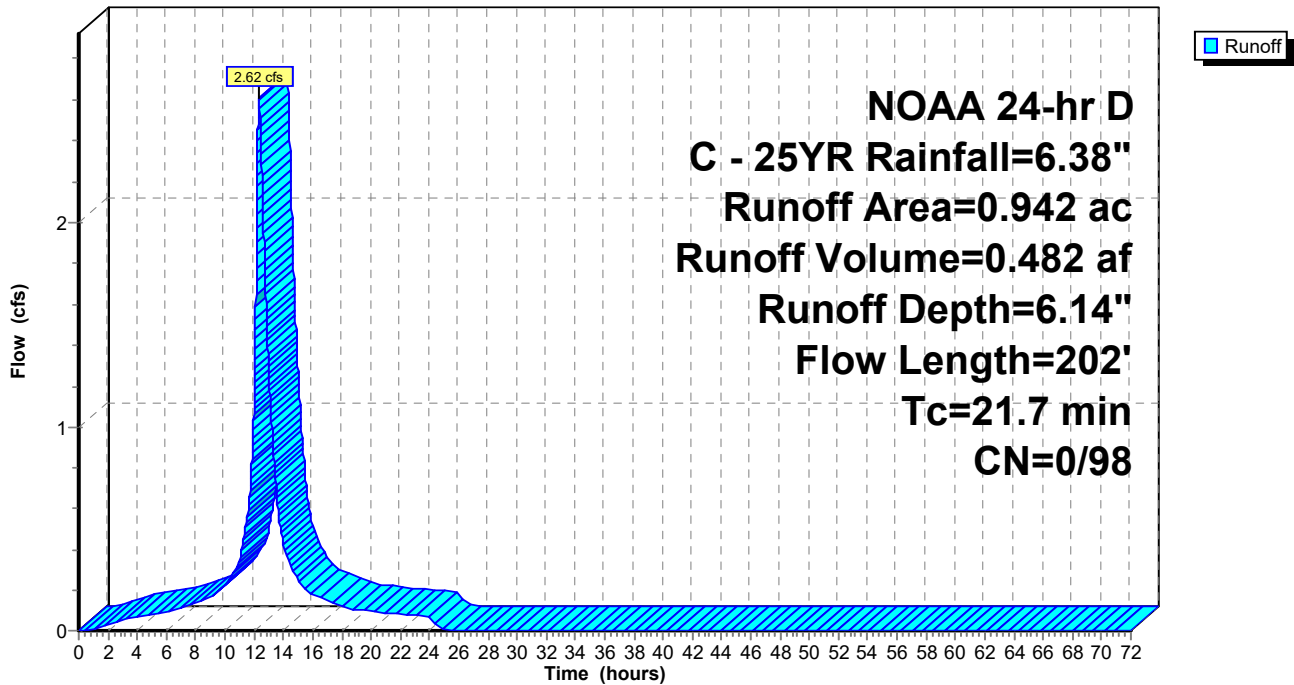
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 107

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 3.22 cfs @ 12.14 hrs, Volume= 0.325 af, Depth= 6.14"
 Routed to Link P-PC : POND CREEK

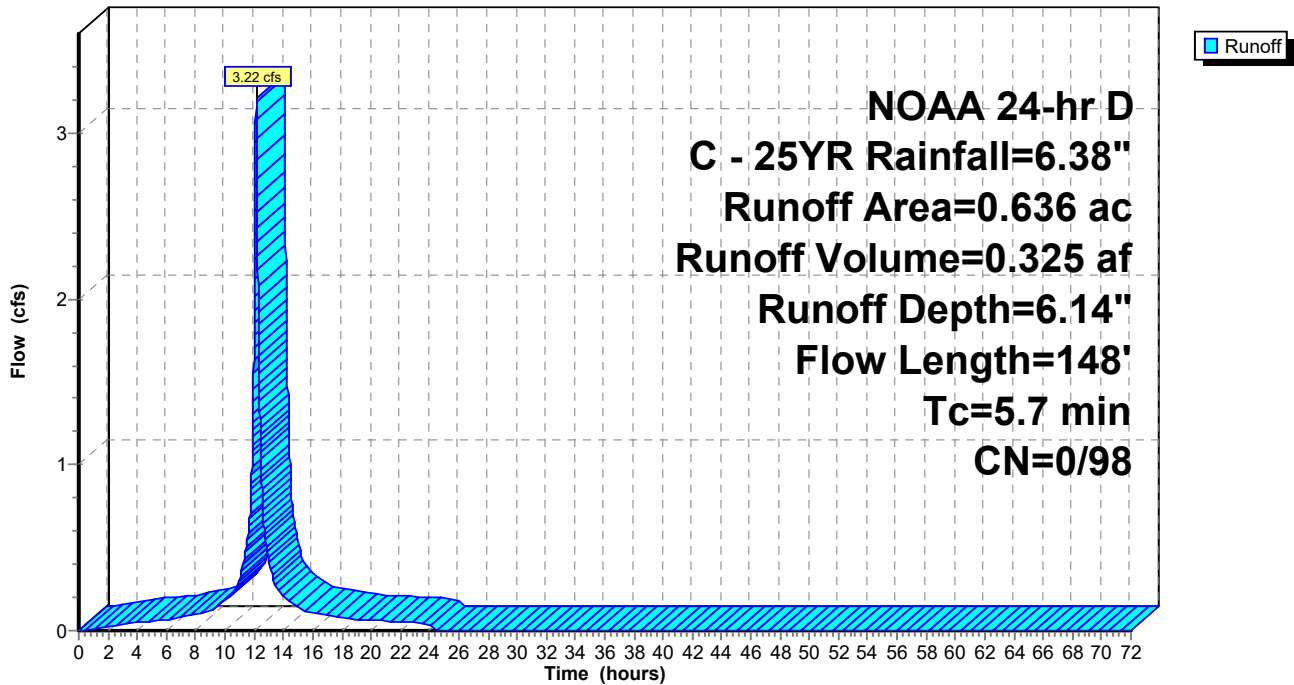
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 108

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 7.58 cfs @ 12.52 hrs, Volume= 1.700 af, Depth= 3.81"
 Routed to Link P-PC : POND CREEK

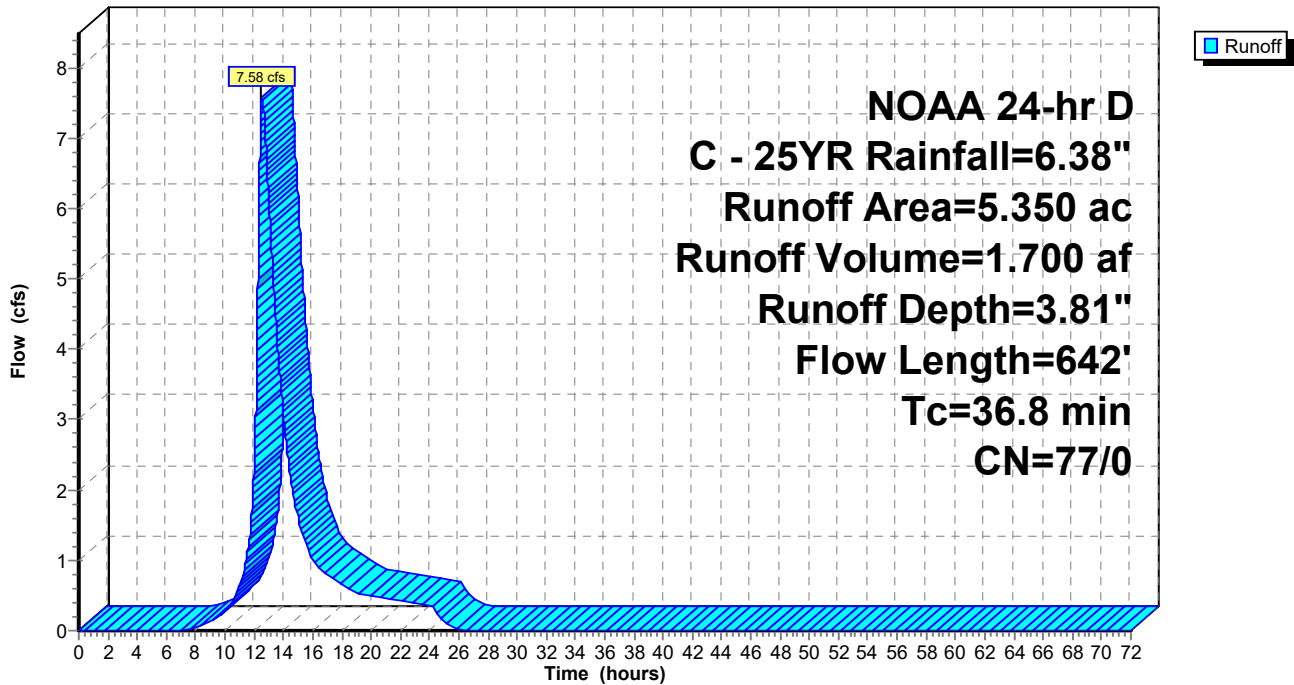
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 109

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 3.64 cfs @ 12.15 hrs, Volume= 0.378 af, Depth= 4.84"
 Routed to Link P-DC : DUCK CREEK

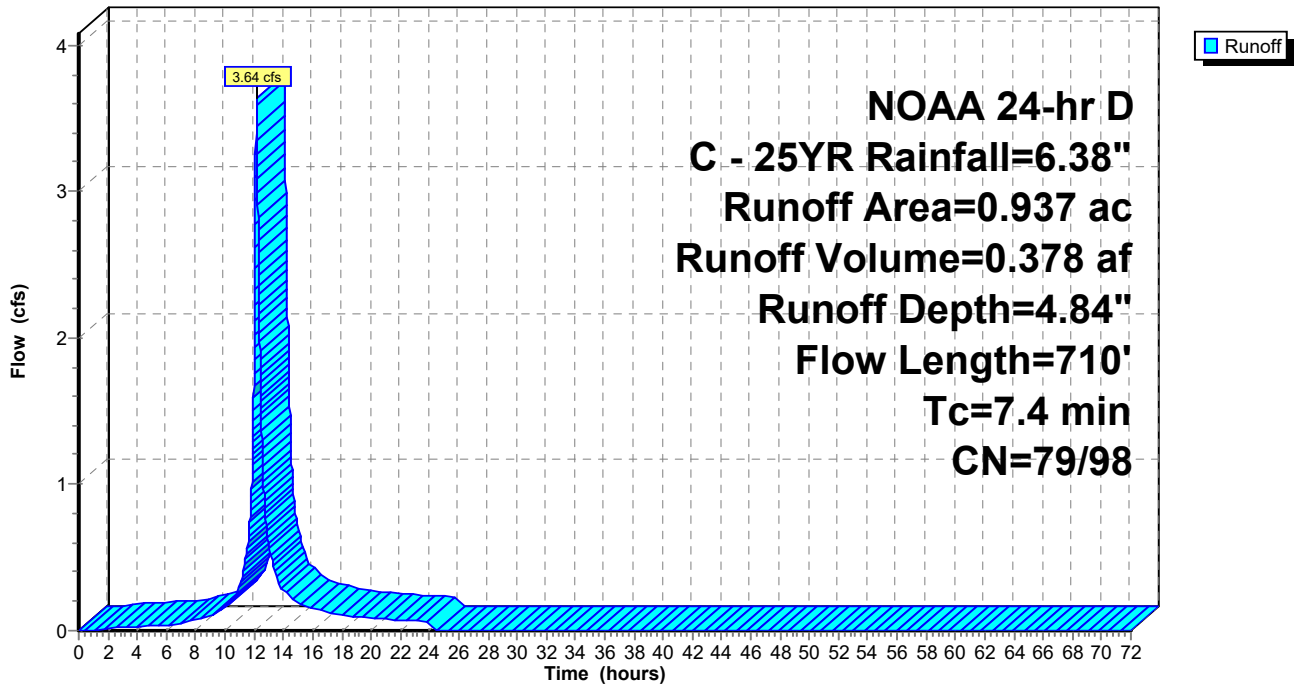
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 110

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.60 cfs @ 12.14 hrs, Volume= 0.066 af, Depth= 2.60"
 Routed to Link P-DC : DUCK CREEK

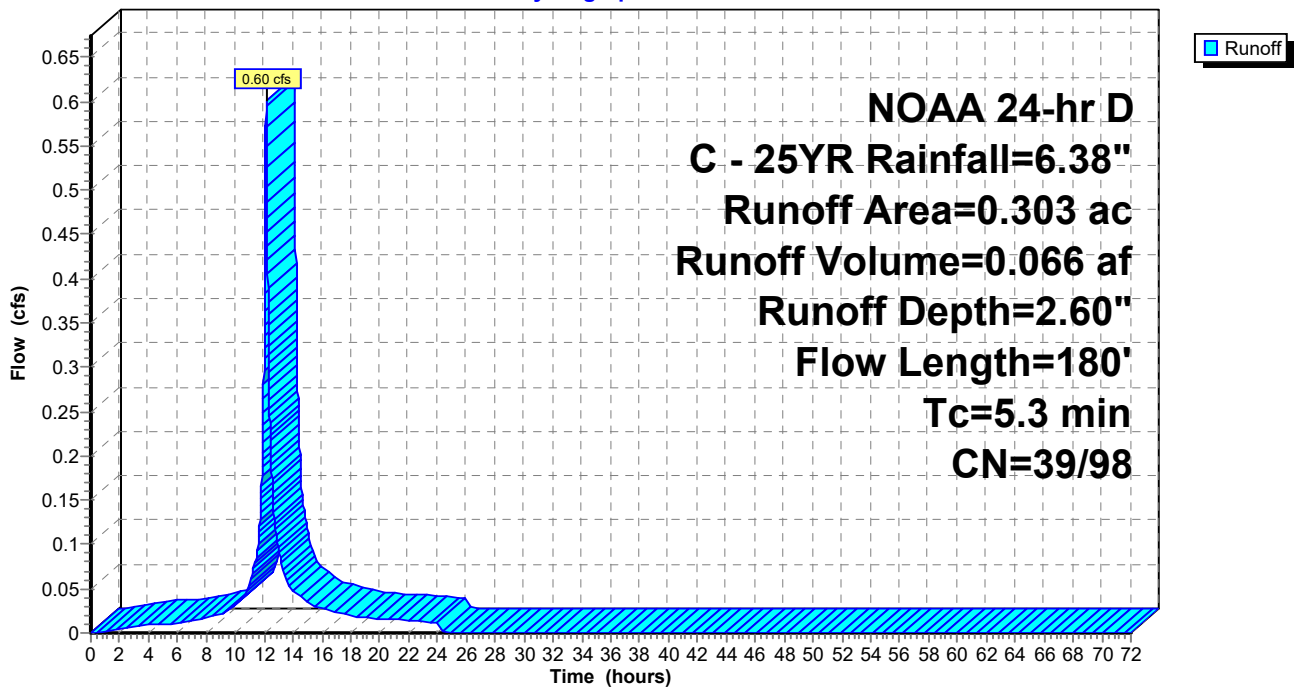
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 111

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 8.91 cfs @ 12.11 hrs, Volume= 0.766 af, Depth= 6.14"
 Routed to Pond B-2 : BASIN 2

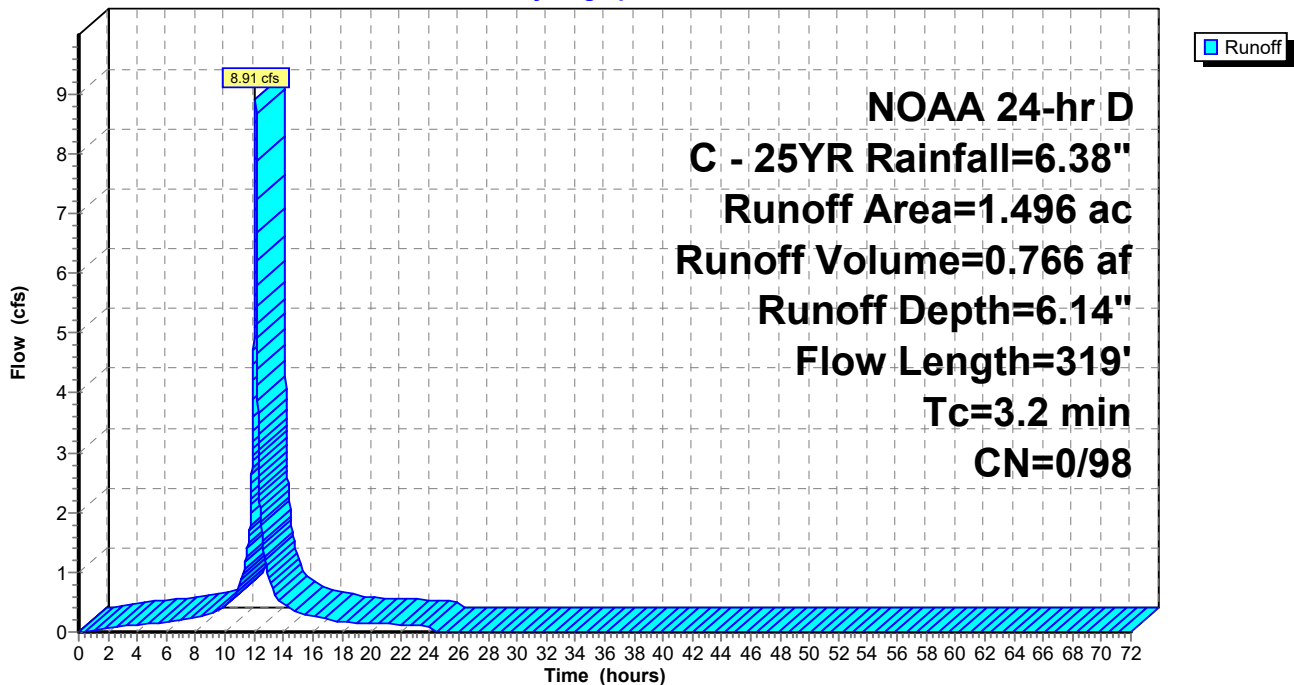
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 112

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.96 cfs @ 12.12 hrs, Volume= 0.179 af, Depth= 5.97"
 Routed to Pond B-3 : BASIN 3

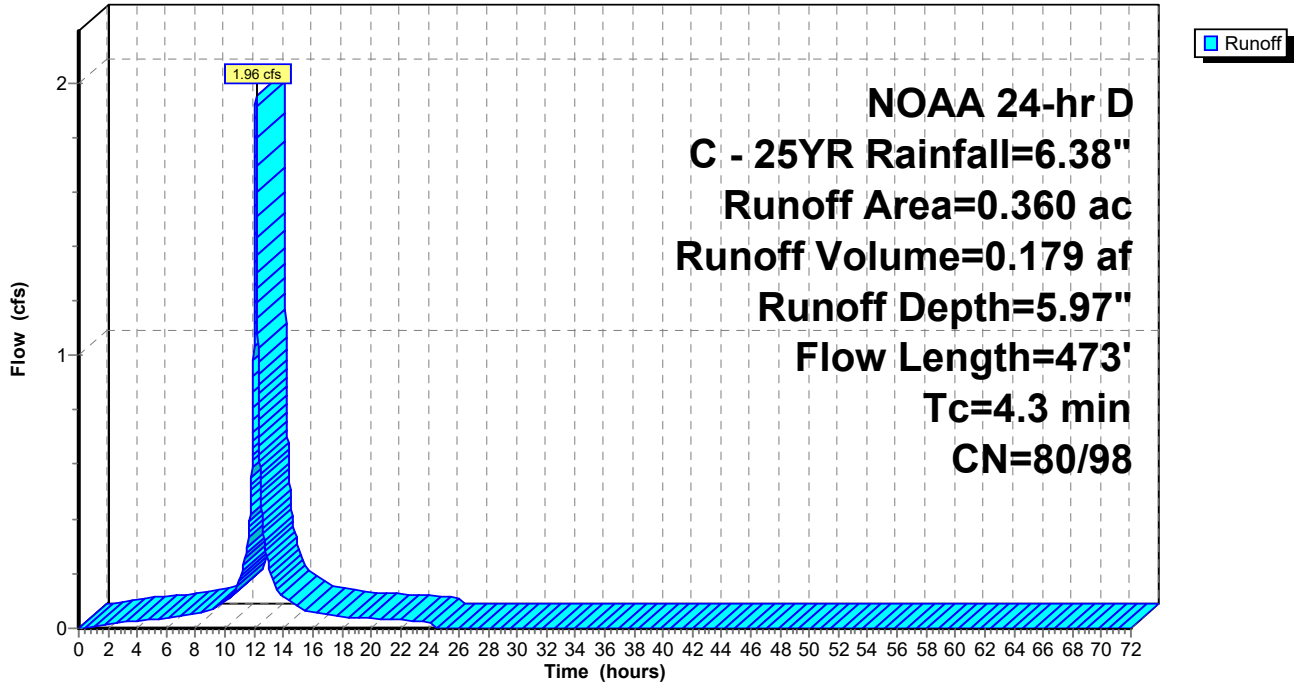
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 114

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 6.04 cfs @ 12.12 hrs, Volume= 0.543 af, Depth= 6.14"
 Routed to Pond B-3 : BASIN 3

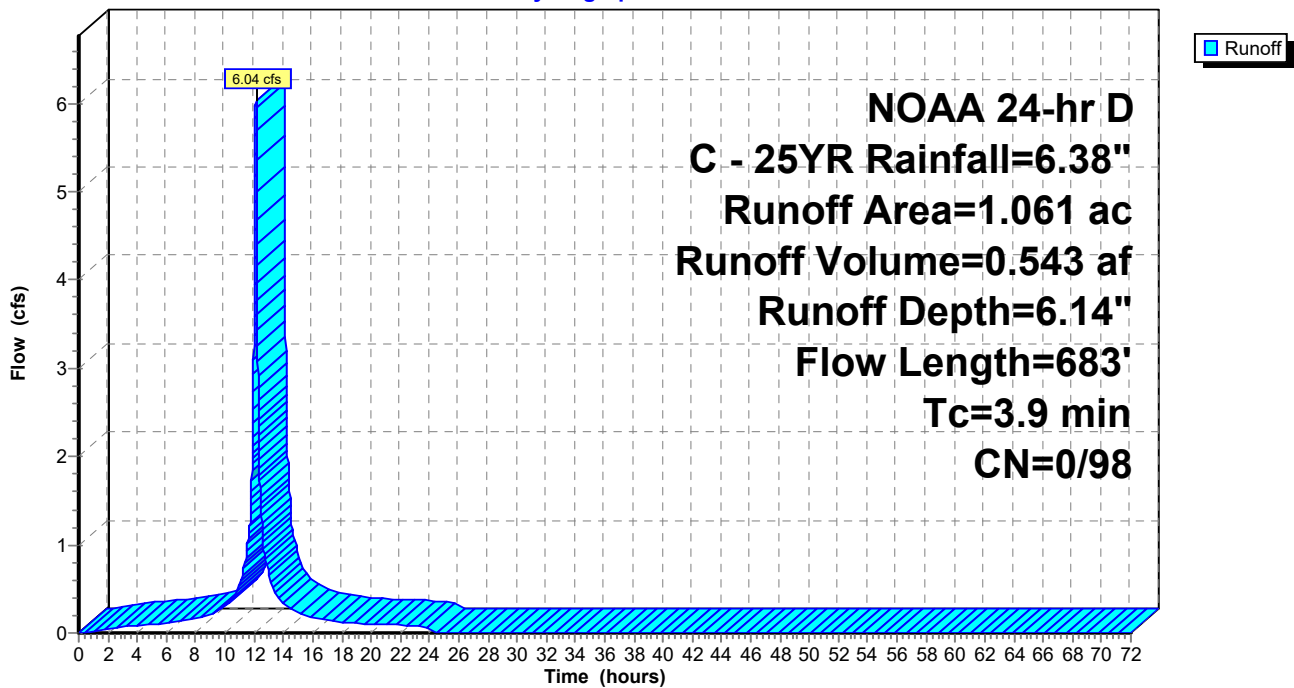
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 115

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 1.64 cfs @ 12.21 hrs, Volume= 0.199 af, Depth= 4.32"
 Routed to Pond B-4 : BASIN 4

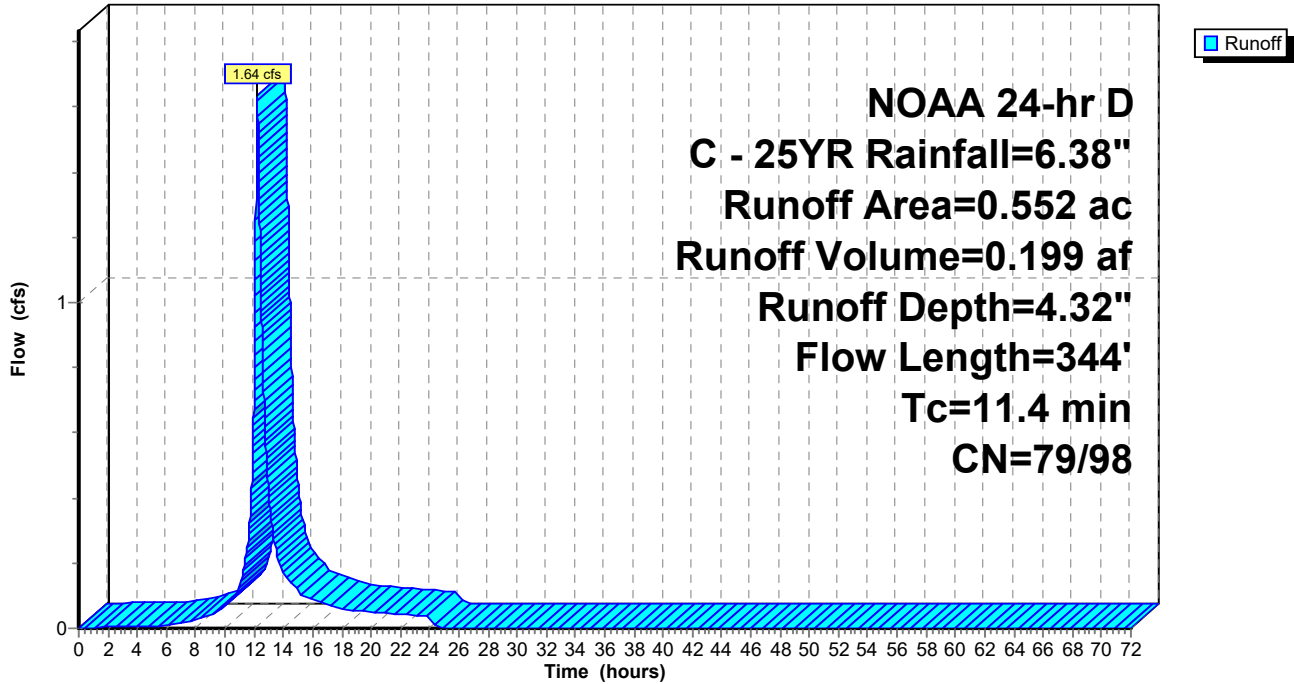
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 117

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 4.24 cfs @ 12.16 hrs, Volume= 0.477 af, Depth= 5.77"
 Routed to Pond B-4 : BASIN 4

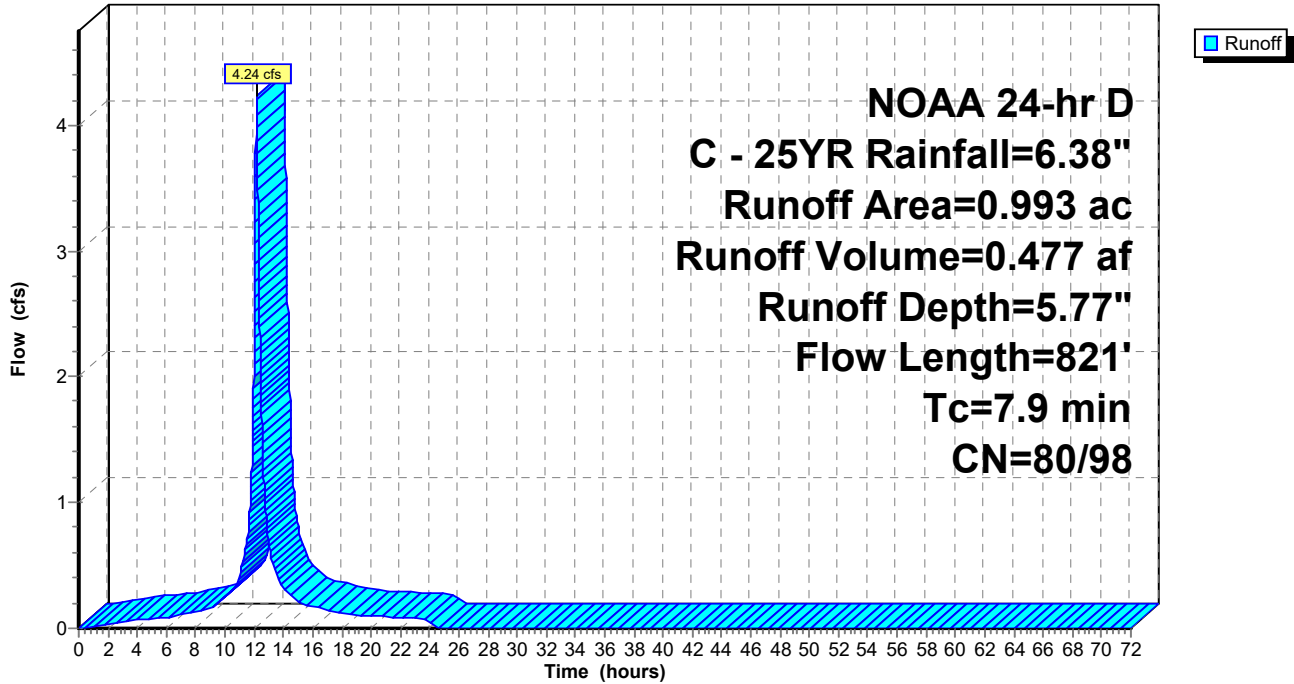
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 119

Summary for Subcatchment P-UG-1: UG-1

Runoff = 13.62 cfs @ 12.15 hrs, Volume= 1.469 af, Depth= 6.14"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

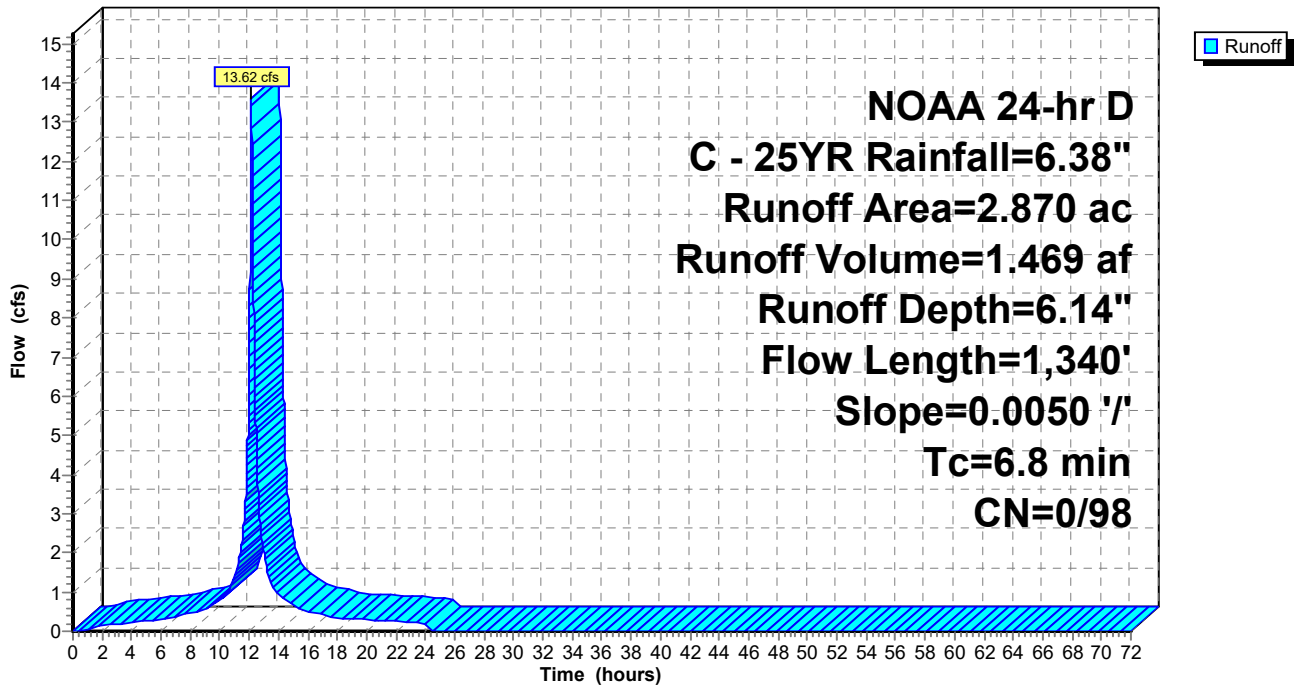
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 120

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 338% of capacity of segment #3

Runoff = 15.46 cfs @ 12.13 hrs, Volume= 1.468 af, Depth= 6.14"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

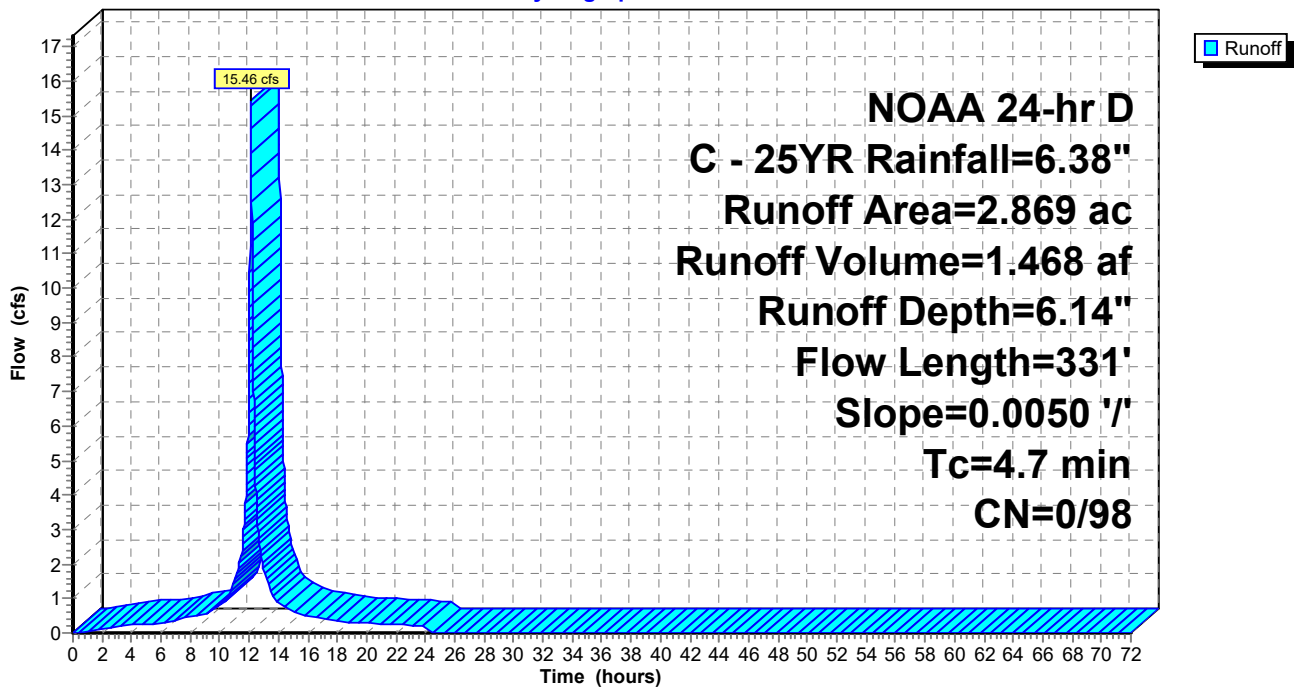
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 121

Summary for Reach 17R: E-1

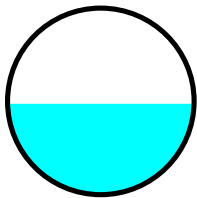
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.67" for C - 25YR event
Inflow = 12.05 cfs @ 12.35 hrs, Volume= 1.852 af
Outflow = 12.04 cfs @ 12.36 hrs, Volume= 1.852 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.81 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 3.5 min

Peak Storage= 493 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.14' , Surface Width= 2.33'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

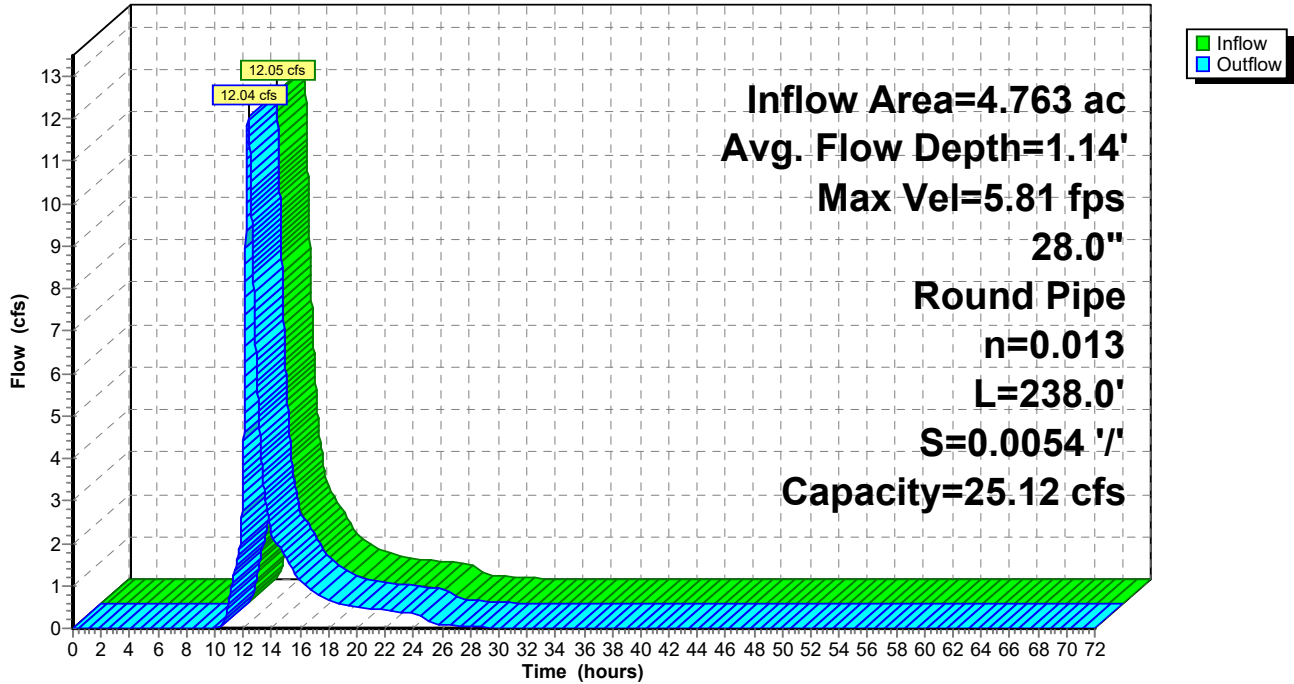
NOAA 24-hr D C - 25YR Rainfall=6.38"

Printed 2/26/2025

Page 122

Reach 17R: E-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 123

Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

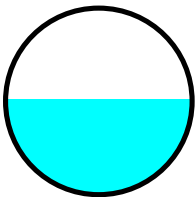
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.06' @ 12.45 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.67" for C - 25YR event
 Inflow = 12.04 cfs @ 12.36 hrs, Volume= 1.852 af
 Outflow = 12.04 cfs @ 12.37 hrs, Volume= 1.852 af, Atten= 0%, Lag= 0.5 min
 Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Max. Velocity= 5.44 fps, Min. Travel Time= 0.7 min
 Avg. Velocity = 1.06 fps, Avg. Travel Time= 3.6 min

Peak Storage= 507 cf @ 12.37 hrs
 Average Depth at Peak Storage= 1.20' , Surface Width= 2.33'
 Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
 n= 0.013
 Length= 229.0' Slope= 0.0045 '/'
 Inlet Invert= 6.64', Outlet Invert= 5.60'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

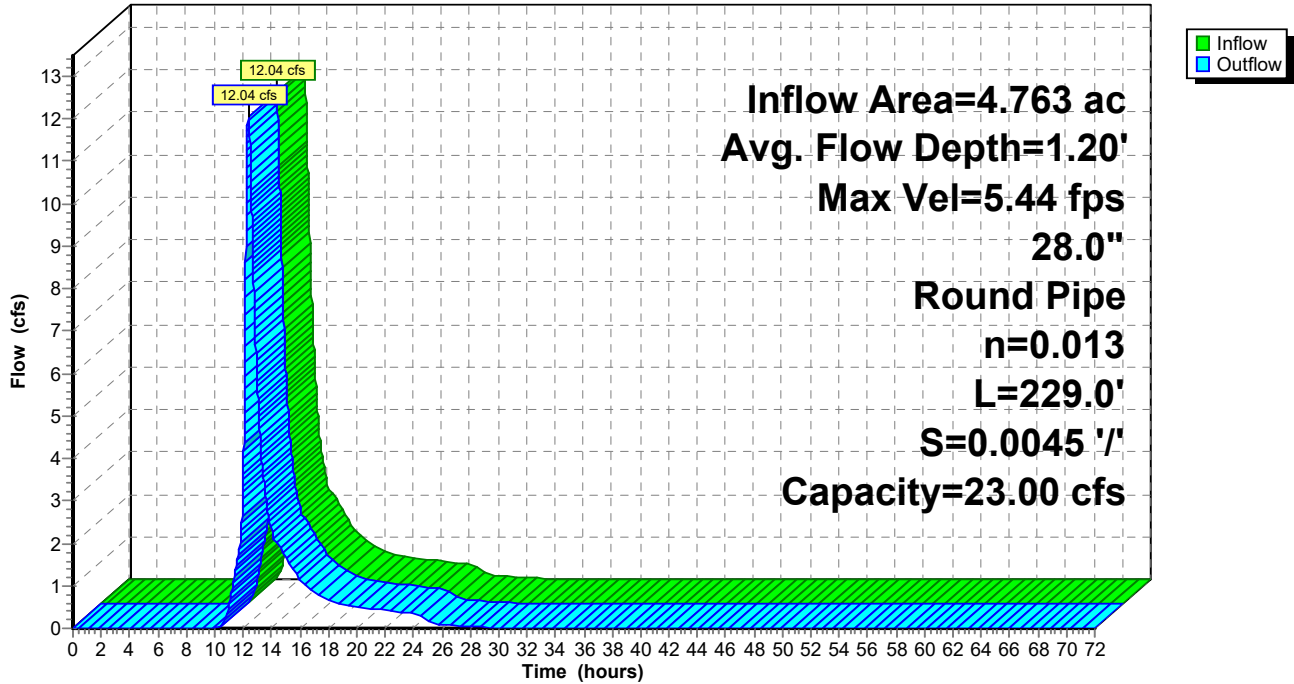
NOAA 24-hr D C - 25YR Rainfall=6.38"

Printed 2/26/2025

Page 124

Reach 18R: E-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 125

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 5.95" for C - 25YR event
 Inflow = 9.51 cfs @ 12.11 hrs, Volume= 0.811 af
 Outflow = 7.55 cfs @ 12.15 hrs, Volume= 0.717 af, Atten= 21%, Lag= 2.6 min
 Primary = 7.55 cfs @ 12.15 hrs, Volume= 0.717 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.72' @ 12.15 hrs Surf.Area= 0.135 ac Storage= 0.297 af

Plug-Flow detention time= 195.3 min calculated for 0.717 af (88% of inflow)
 Center-of-Mass det. time= 135.8 min (884.7 - 748.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

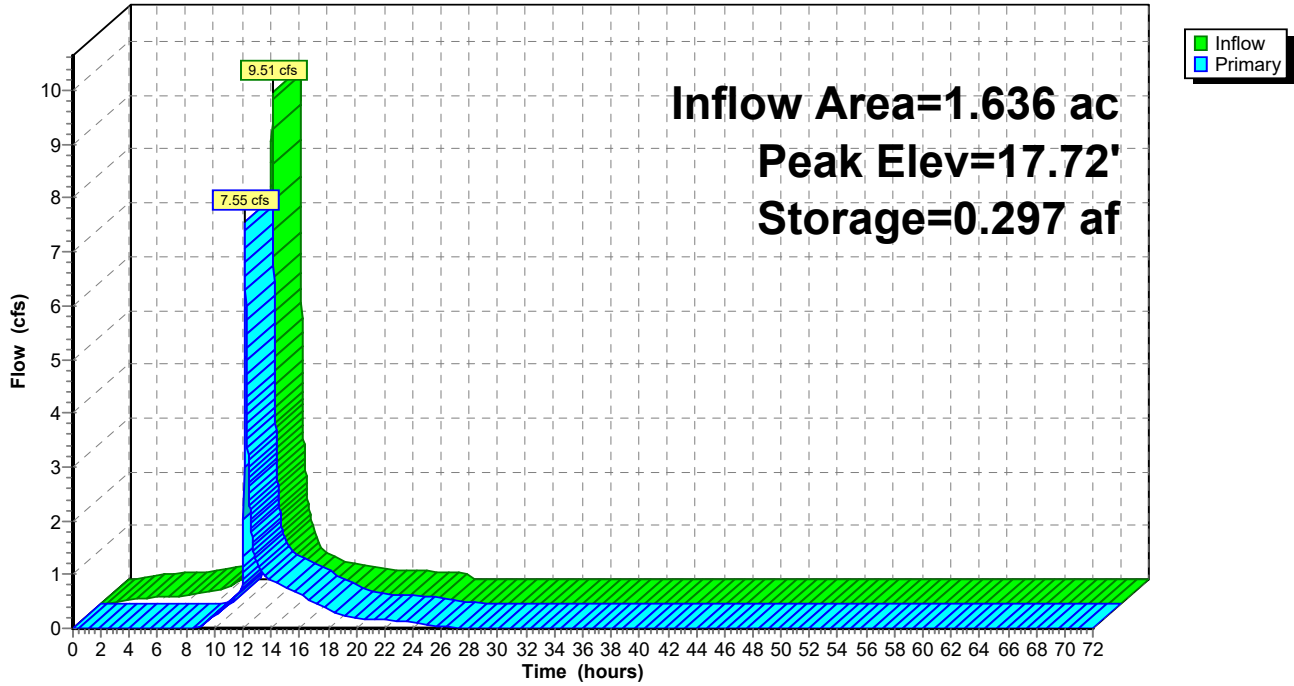
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=7.55 cfs @ 12.15 hrs HW=17.72' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 7.55 cfs of 18.85 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.05 cfs @ 6.00 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.06 cfs @ 1.99 fps)
- 4=Orifice/Grate (Weir Controls 5.45 cfs @ 1.54 fps)

Pond B-2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 127

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 5.54" for C - 25YR event
 Inflow = 10.26 cfs @ 12.12 hrs, Volume= 0.882 af
 Outflow = 6.27 cfs @ 12.21 hrs, Volume= 0.685 af, Atten= 39%, Lag= 5.5 min
 Primary = 6.27 cfs @ 12.21 hrs, Volume= 0.685 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.16' @ 12.21 hrs Surf.Area= 0.262 ac Storage= 0.410 af

Plug-Flow detention time= 336.4 min calculated for 0.685 af (78% of inflow)
 Center-of-Mass det. time= 245.9 min (1,006.6 - 760.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.50	0.231	569.6	0.000	0.000	0.231	
11.00	0.241	578.4	0.118	0.118	0.251	
12.00	0.259	596.0	0.250	0.368	0.291	
13.00	0.278	615.6	0.269	0.637	0.337	
13.50	0.295	633.5	0.143	0.780	0.378	

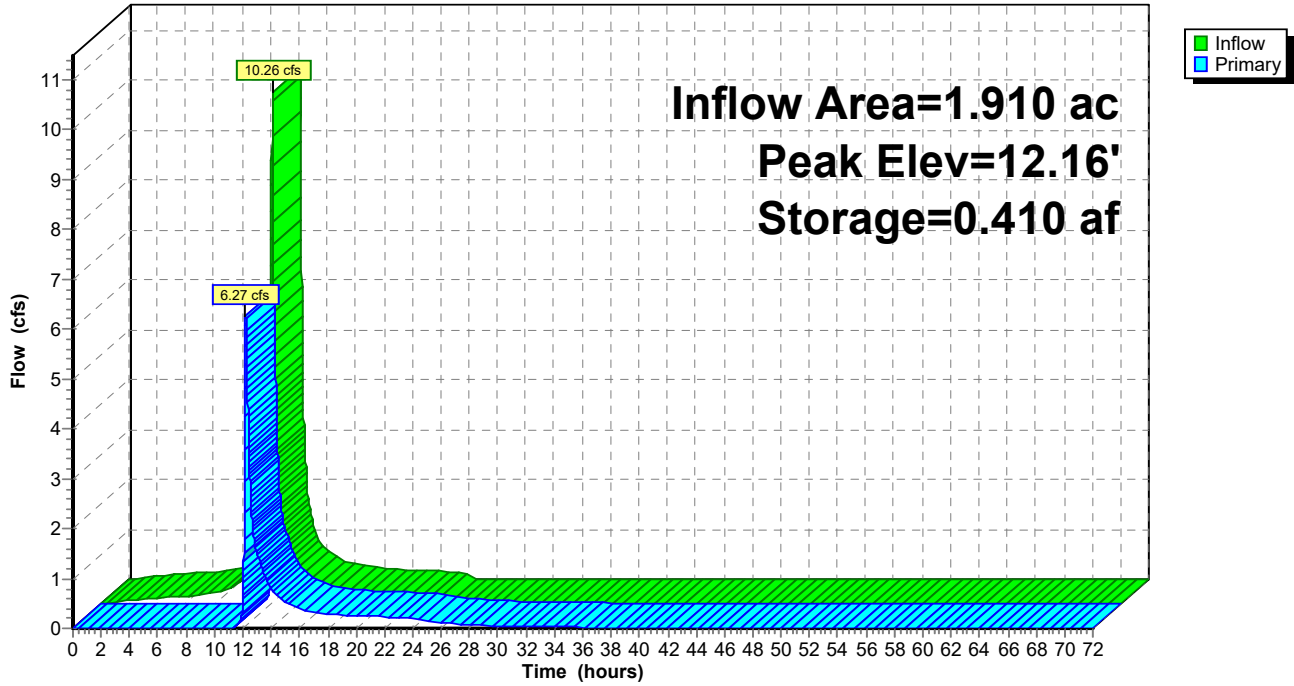
Device	Routing	Invert	Outlet Devices	
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf	
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads	

Primary OutFlow Max=6.27 cfs @ 12.21 hrs HW=12.16' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 6.27 cfs of 33.17 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.44 cfs @ 3.95 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.50 cfs @ 2.09 fps)
- 4=Orifice/Grate (Weir Controls 3.33 cfs @ 1.31 fps)

Pond B-3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 129

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 5.07" for C - 25YR event
 Inflow = 6.85 cfs @ 12.16 hrs, Volume= 0.775 af
 Outflow = 3.86 cfs @ 12.41 hrs, Volume= 0.684 af, Atten= 44%, Lag= 14.6 min
 Primary = 3.86 cfs @ 12.41 hrs, Volume= 0.684 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.16' @ 12.41 hrs Surf.Area= 5,118 sf Storage= 11,233 cf

Plug-Flow detention time= 157.2 min calculated for 0.684 af (88% of inflow)
 Center-of-Mass det. time= 97.5 min (881.9 - 784.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

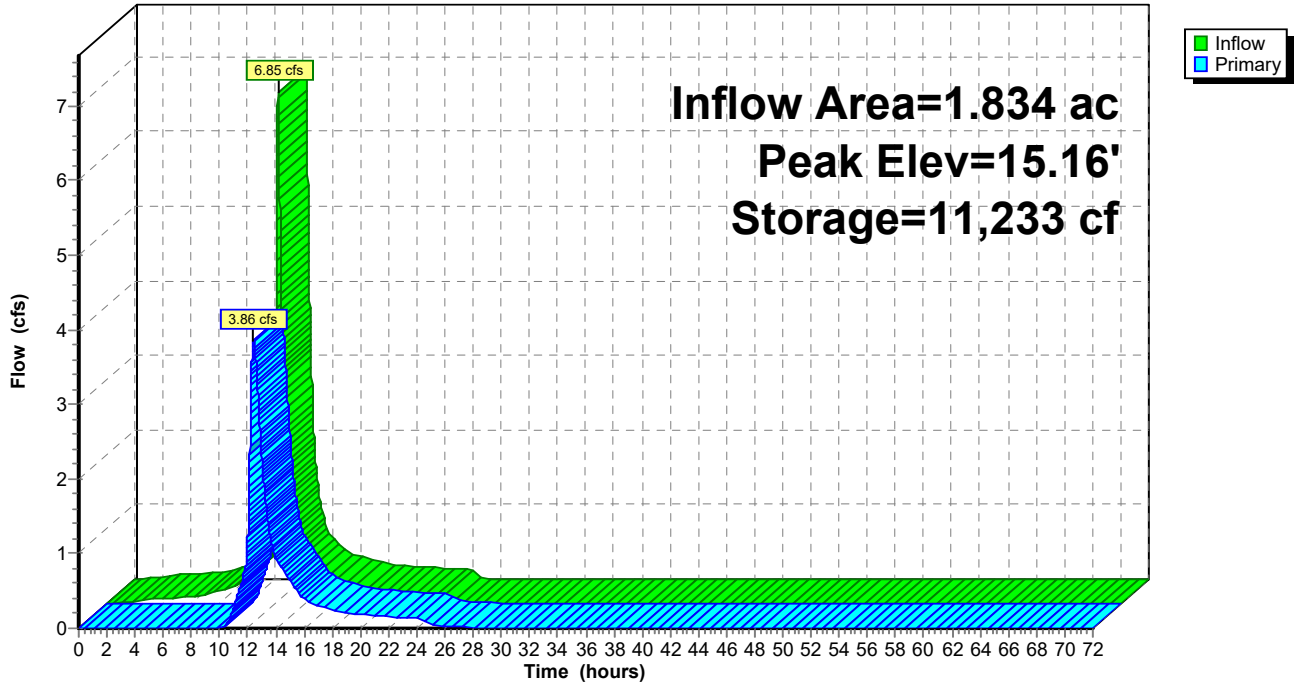
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.86 cfs @ 12.41 hrs HW=15.16' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.86 cfs of 13.02 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.53 cfs @ 5.60 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.33 cfs @ 3.12 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 131

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 5.73" for C - 25YR event
 Inflow = 12.19 cfs @ 12.16 hrs, Volume= 1.399 af
 Outflow = 8.27 cfs @ 12.33 hrs, Volume= 1.169 af, Atten= 32%, Lag= 9.9 min
 Primary = 8.27 cfs @ 12.33 hrs, Volume= 1.169 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.26' @ 12.33 hrs Surf.Area= 9,126 sf Storage= 21,715 cf

Plug-Flow detention time= 195.6 min calculated for 1.169 af (84% of inflow)
 Center-of-Mass det. time= 120.2 min (882.9 - 762.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	6,858	409.0	0	0	6,858
13.00	7,629	429.0	2,896	2,896	8,202
14.00	8,186	439.0	7,906	10,802	9,018
14.10	8,239	440.0	821	11,623	9,101
15.00	8,985	459.0	7,748	19,372	10,519
16.00	9,537	468.1	9,260	28,631	11,335

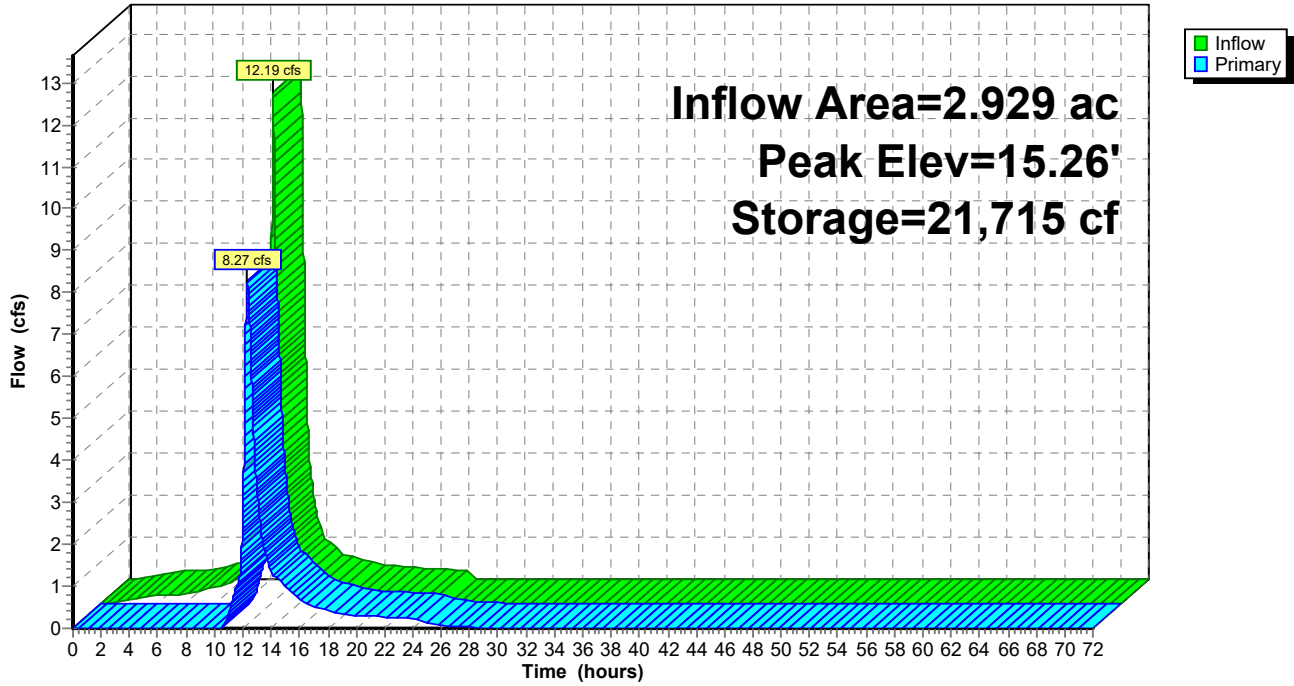
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.27 cfs @ 12.33 hrs HW=15.26' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 8.27 cfs of 13.80 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.11 cfs @ 5.16 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 6.15 cfs @ 2.85 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 133

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 6.14" for C - 25YR event
 Inflow = 28.84 cfs @ 12.13 hrs, Volume= 2.937 af
 Outflow = 6.82 cfs @ 12.59 hrs, Volume= 2.365 af, Atten= 76%, Lag= 27.2 min
 Primary = 6.82 cfs @ 12.59 hrs, Volume= 2.365 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.82' @ 12.59 hrs Surf.Area= 0.631 ac Storage= 1.774 af

Plug-Flow detention time= 699.0 min calculated for 2.365 af (81% of inflow)
 Center-of-Mass det. time= 615.8 min (1,364.3 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=6.82 cfs @ 12.59 hrs HW=13.82' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 6.82 cfs of 38.49 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.68 cfs @ 7.84 fps)
- 3=Orifice/Grate (Orifice Controls 0.45 cfs @ 6.57 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 5.68 cfs @ 1.98 fps)

250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 134

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"

End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

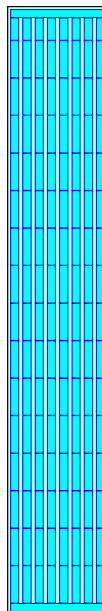
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 135

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"

End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

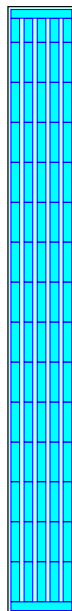
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

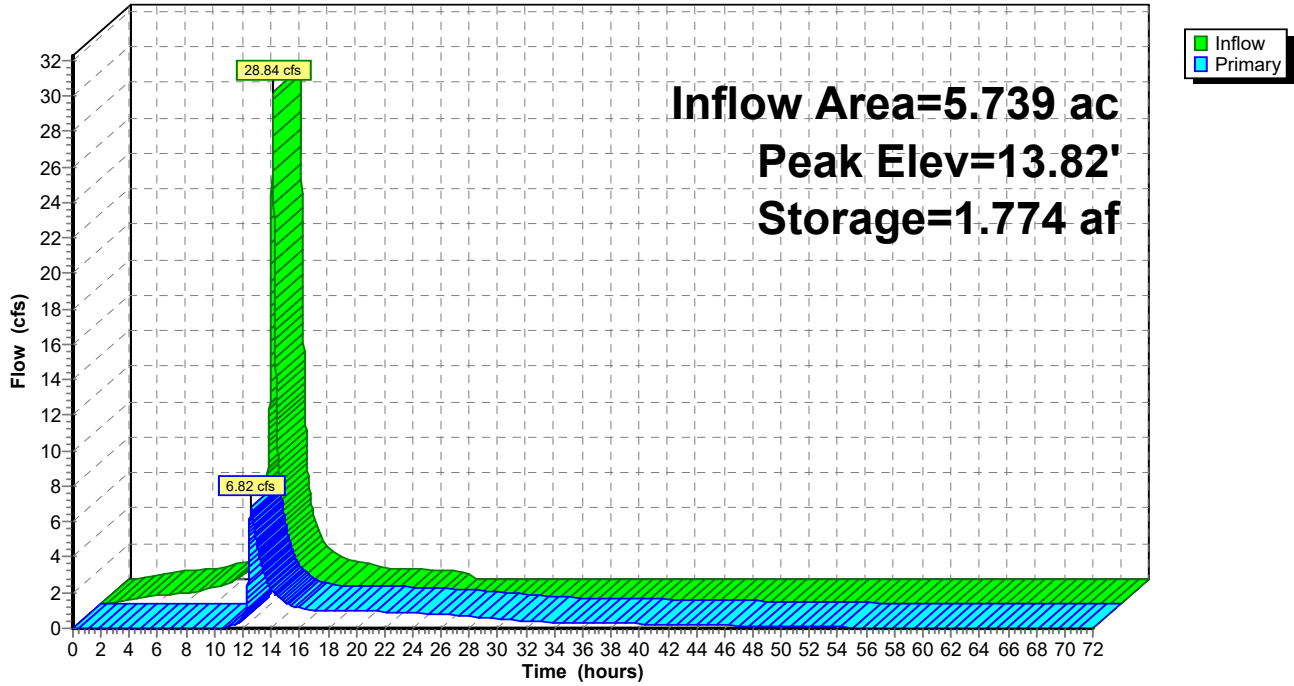
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 137

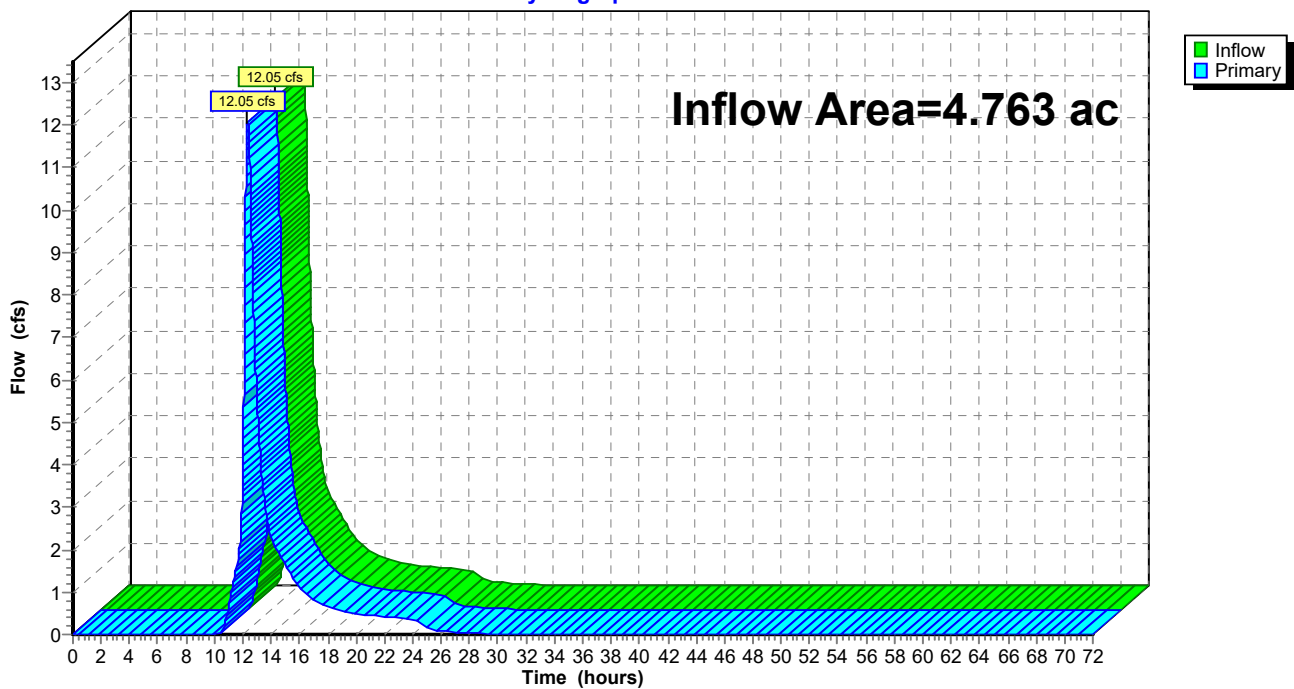
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.67" for C - 25YR event
Inflow = 12.05 cfs @ 12.35 hrs, Volume= 1.852 af
Primary = 12.05 cfs @ 12.35 hrs, Volume= 1.852 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 138

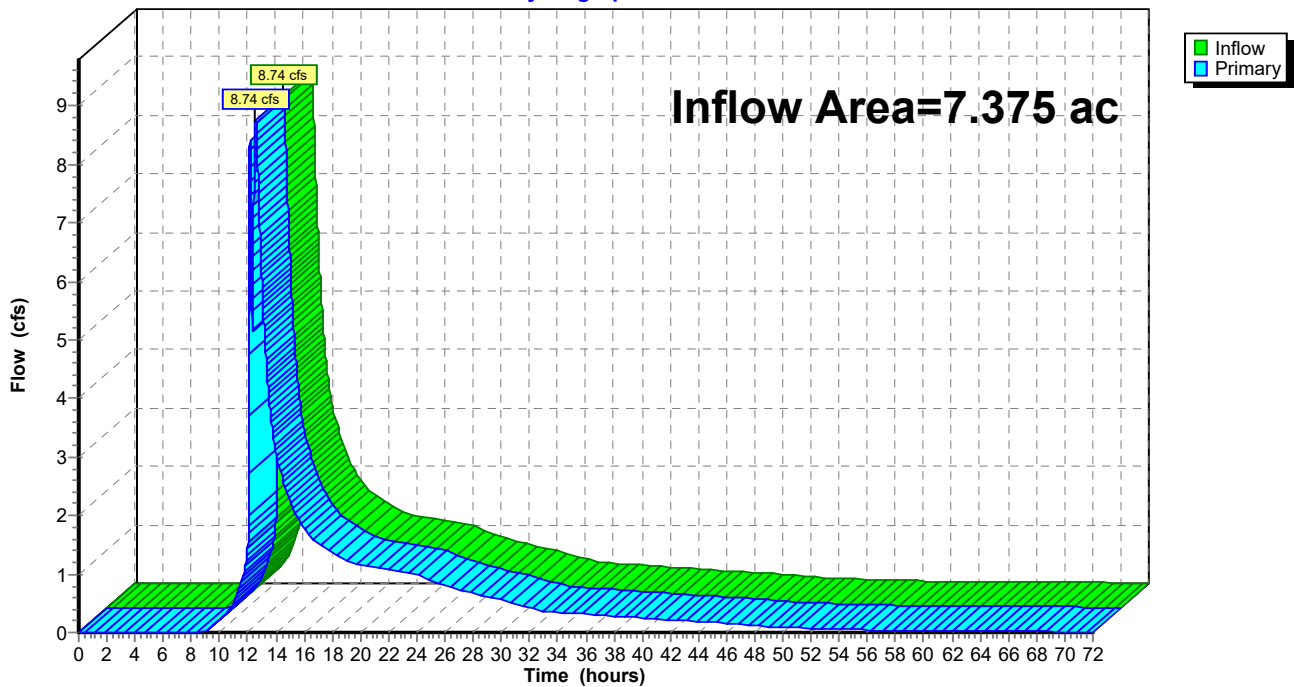
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 5.02" for C - 25YR event
Inflow = 8.74 cfs @ 12.56 hrs, Volume= 3.082 af
Primary = 8.74 cfs @ 12.56 hrs, Volume= 3.082 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 139

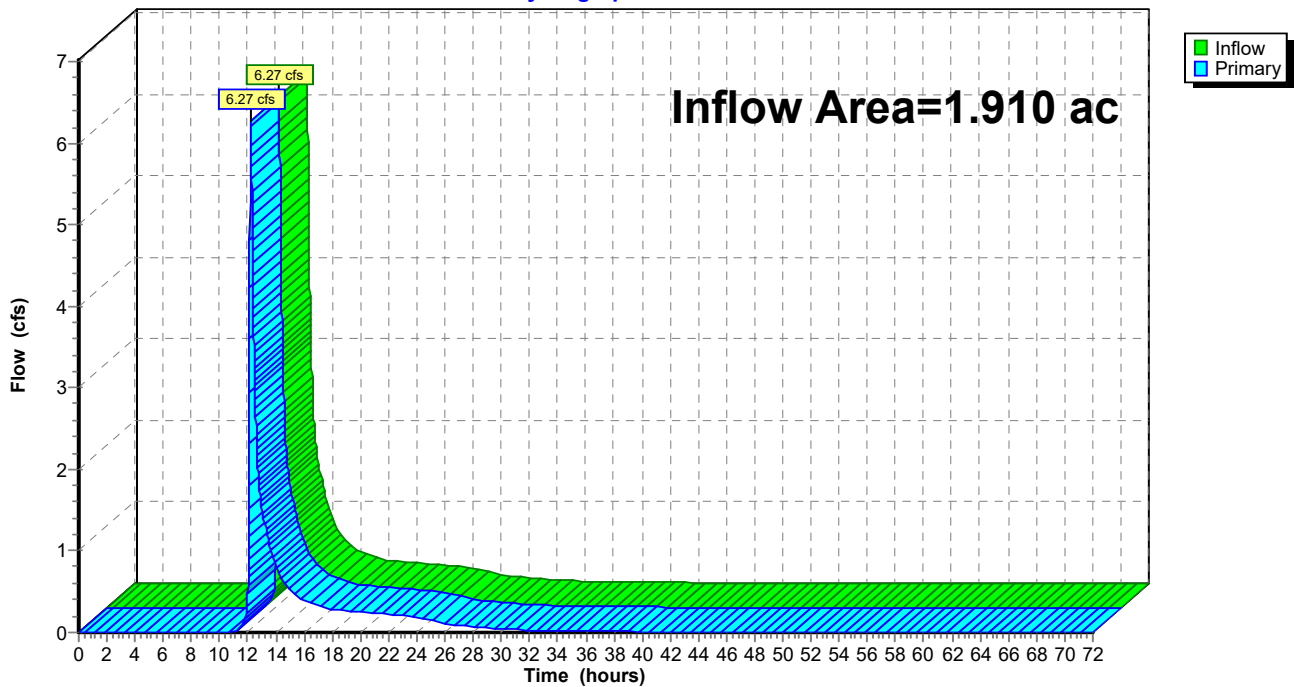
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 4.31" for C - 25YR event
Inflow = 6.27 cfs @ 12.21 hrs, Volume= 0.685 af
Primary = 6.27 cfs @ 12.21 hrs, Volume= 0.685 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D C - 25YR Rainfall=6.38"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 140

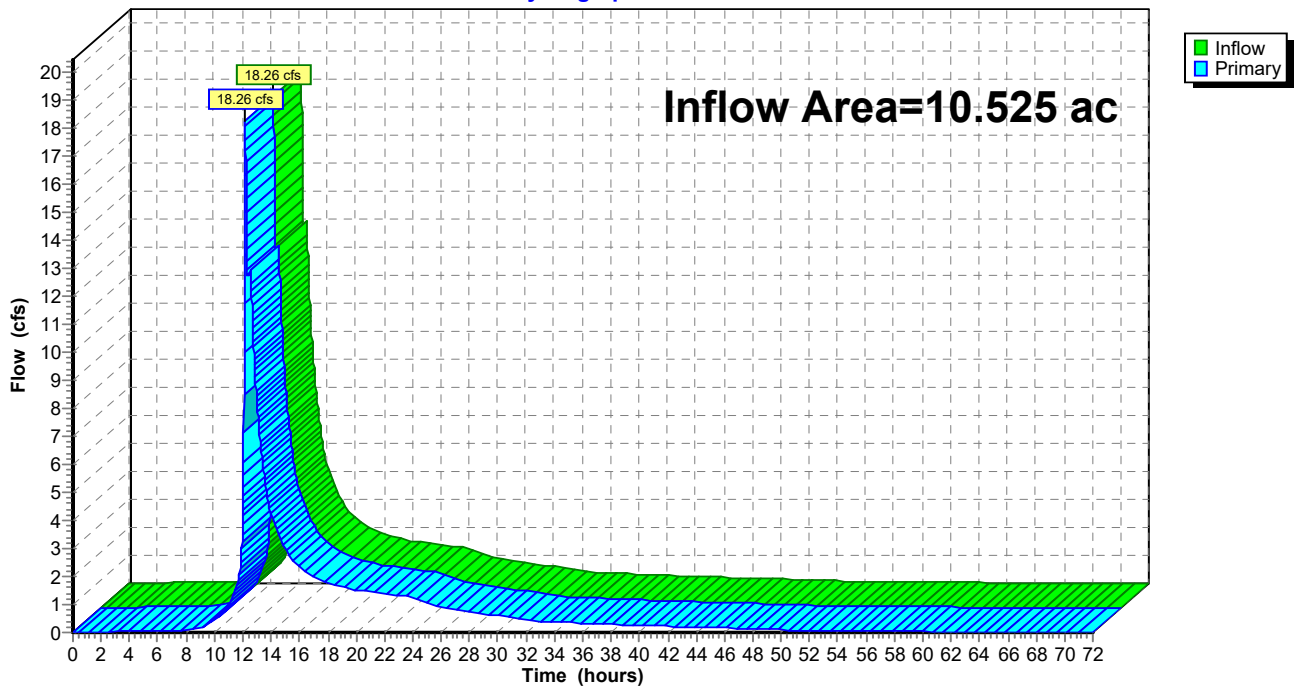
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 4.80" for C - 25YR event
Inflow = 18.26 cfs @ 12.17 hrs, Volume= 4.211 af
Primary = 18.26 cfs @ 12.17 hrs, Volume= 4.211 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



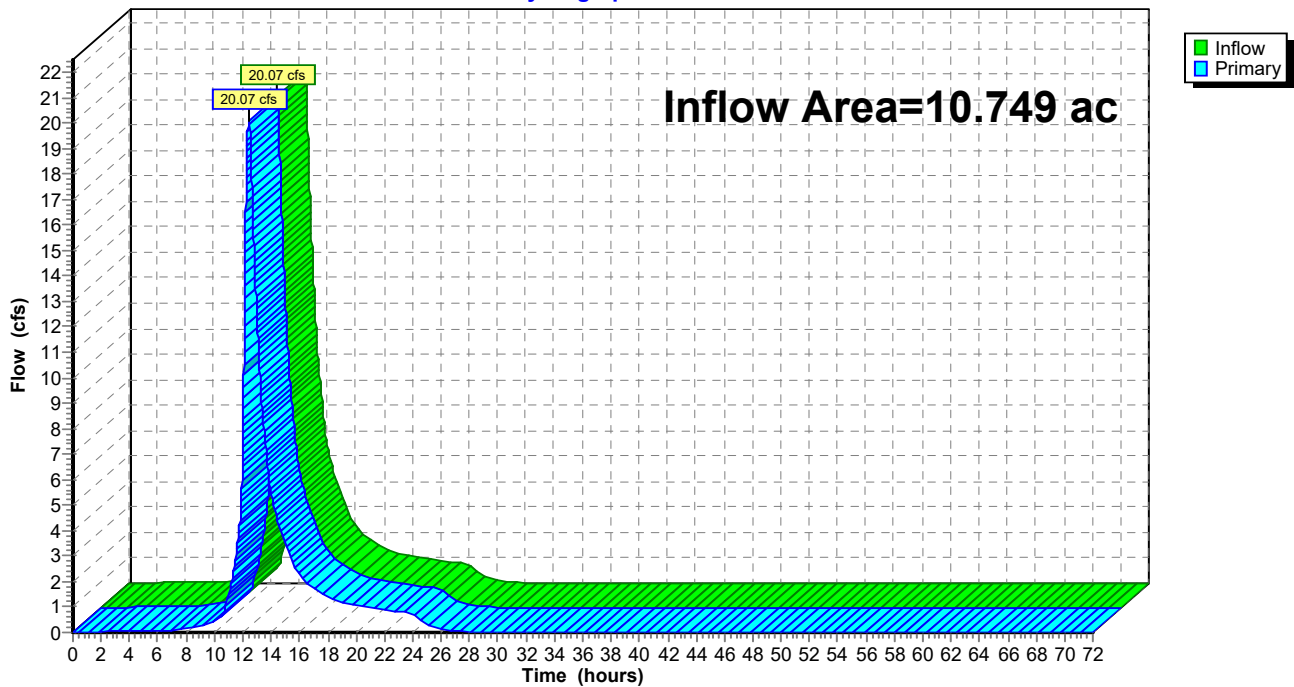
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 4.33" for C - 25YR event
Inflow = 20.07 cfs @ 12.42 hrs, Volume= 3.878 af
Primary = 20.07 cfs @ 12.42 hrs, Volume= 3.878 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



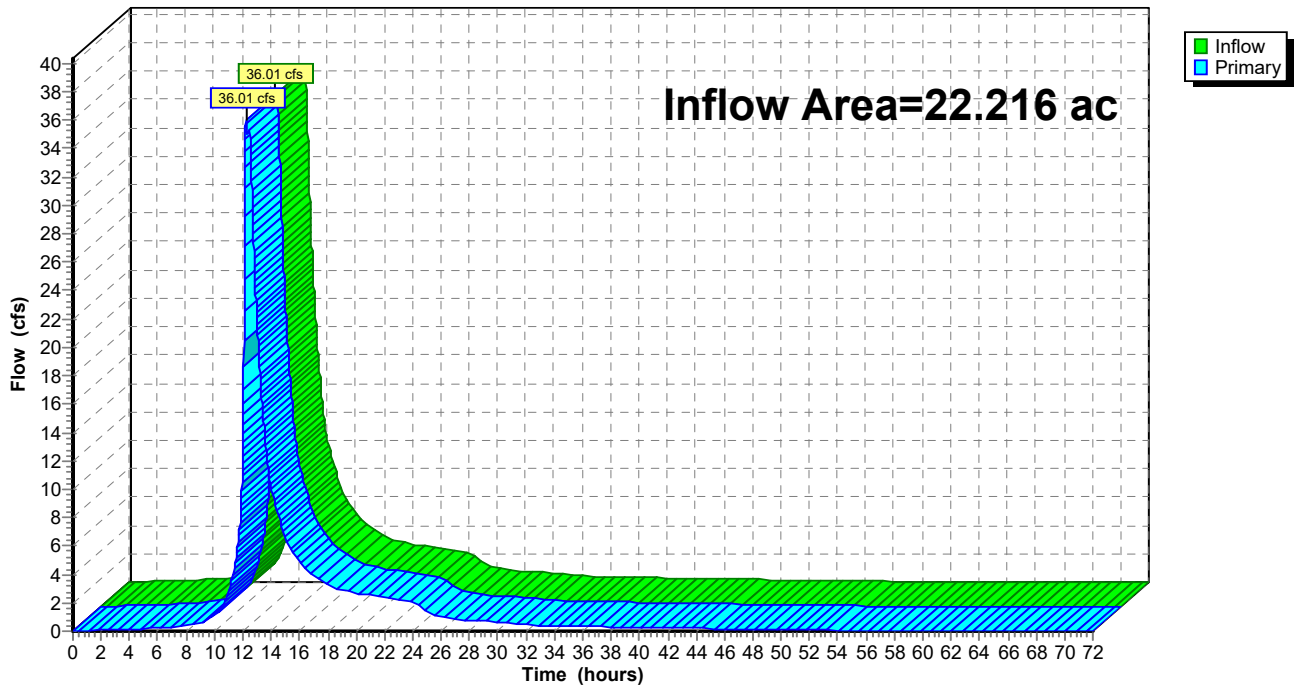
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 4.63" for C - 25YR event
Inflow = 36.01 cfs @ 12.22 hrs, Volume= 8.571 af
Primary = 36.01 cfs @ 12.22 hrs, Volume= 8.571 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 143

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=8.33" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=14.60 cfs 1.732 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=1.07 cfs 0.070 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=3.49 cfs 0.245 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=6.26" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=1.60 cfs 0.151 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=2.30 cfs 0.217 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=3.57 cfs 0.662 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=4.38 cfs 0.447 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=5.89" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=11.74 cfs 2.627 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=7.02" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=5.25 cfs 0.548 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=4.01" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.98 cfs 0.101 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=12.13 cfs 1.051 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=8.25" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=2.68 cfs 0.247 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=8.22 cfs 0.745 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=6.45" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=2.43 cfs 0.297 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=8.02" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=5.86 cfs 0.664 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=18.54 cfs 2.016 af

250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 144

SubcatchmentP-UG-2: UG-2 Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=8.43"
Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=21.04 cfs 2.015 af

Reach 17R: E-1 Avg. Flow Depth=1.66' Max Vel=6.60 fps Inflow=21.53 cfs 2.739 af
28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=21.49 cfs 2.739 af

Reach 18R: E-2 Avg. Flow Depth=1.78' Max Vel=6.11 fps Inflow=21.49 cfs 2.739 af
28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=21.45 cfs 2.739 af

Pond B-2: BASIN 2 Peak Elev=17.82' Storage=0.311 af Inflow=13.03 cfs 1.121 af
Outflow=12.08 cfs 1.027 af

Pond B-3: BASIN 3 Peak Elev=12.28' Storage=0.442 af Inflow=14.29 cfs 1.238 af
Outflow=12.02 cfs 1.041 af

Pond B-4: BASIN 4 Peak Elev=15.37' Storage=12,293 cf Inflow=9.75 cfs 1.112 af
Outflow=8.25 cfs 1.020 af

Pond B-5: BASIN 5 Peak Elev=15.51' Storage=23,979 cf Inflow=16.87 cfs 1.949 af
Outflow=13.33 cfs 1.719 af

Pond UG-2: UG BASIN 1 & 2 (Peak Elev=14.45' Storage=1.925 af Inflow=39.25 cfs 4.032 af
Outflow=25.92 cfs 3.458 af

Link 16L: Existing Storm Sewer Inflow=21.53 cfs 2.739 af
Primary=21.53 cfs 2.739 af

Link D3A: POD 3A Inflow=33.38 cfs 4.485 af
Primary=33.38 cfs 4.485 af

Link D3B: POD 3B Inflow=12.02 cfs 1.041 af
Primary=12.02 cfs 1.041 af

Link P-DC: DUCK CREEK Inflow=49.46 cfs 6.176 af
Primary=49.46 cfs 6.176 af

Link P-PC: POND CREEK Inflow=32.60 cfs 5.813 af
Primary=32.60 cfs 5.813 af

Link P-SR: SOUTH RIVER Inflow=82.02 cfs 12.650 af
Primary=82.02 cfs 12.650 af

Total Runoff Area = 22.216 ac Runoff Volume = 13.836 af Average Runoff Depth = 7.47"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 145

Summary for Subcatchment 16S: P-B5-1

Runoff = 14.60 cfs @ 12.17 hrs, Volume= 1.732 af, Depth= 8.33"
 Routed to Pond B-5 : BASIN 5

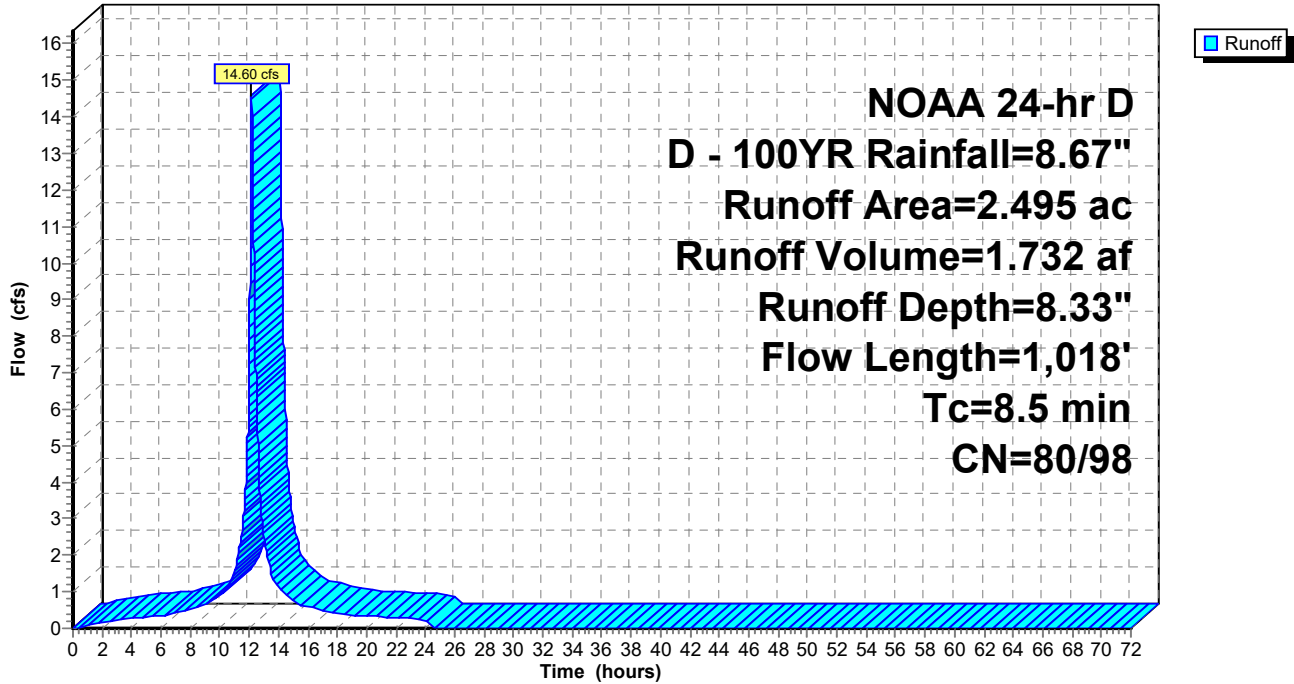
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 147

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 6.01"
Routed to Pond B-2 : BASIN 2

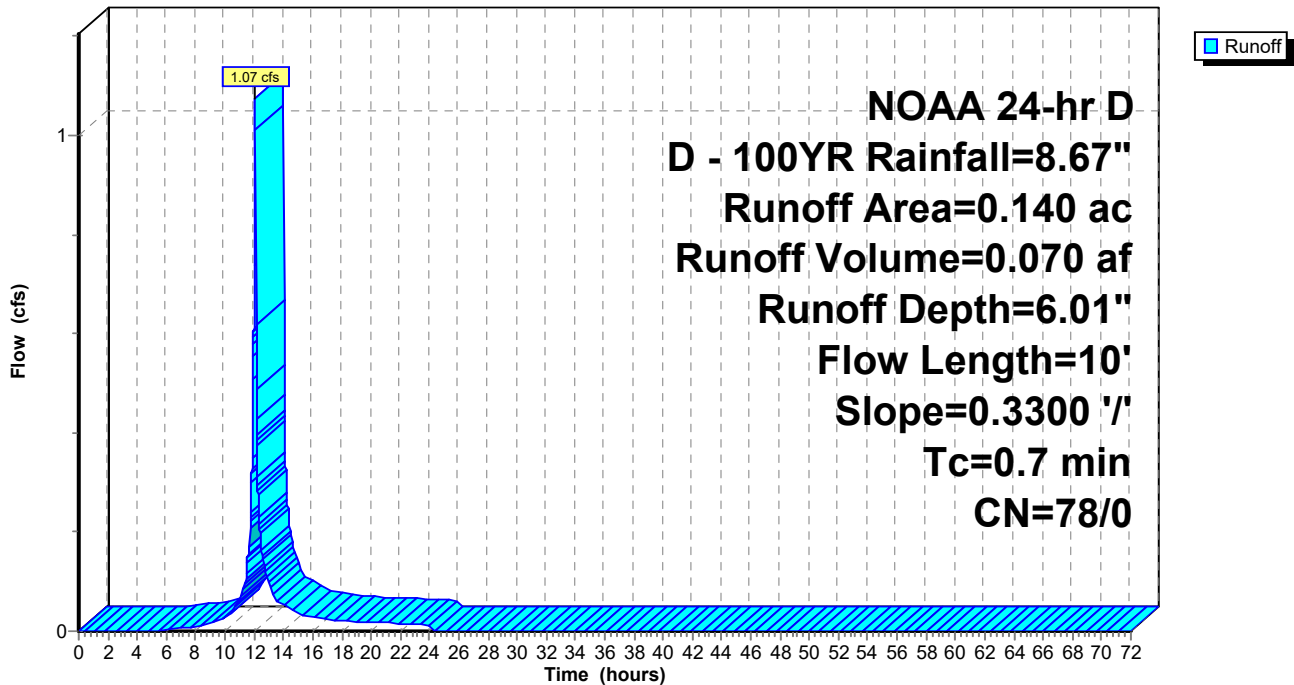
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 148

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 3.49 cfs @ 12.11 hrs, Volume= 0.245 af, Depth= 6.01"
 Routed to Pond B-3 : BASIN 3

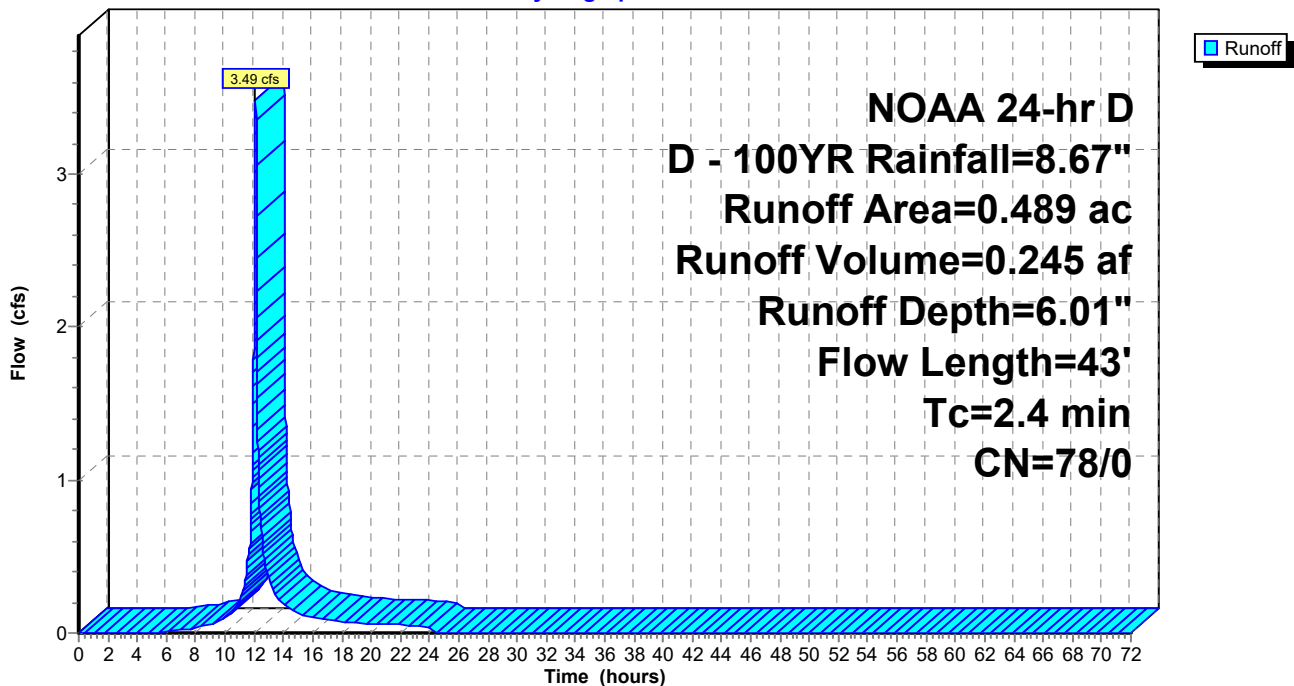
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 149

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 1.60 cfs @ 12.15 hrs, Volume= 0.151 af, Depth= 6.26"
 Routed to Pond B-4 : BASIN 4

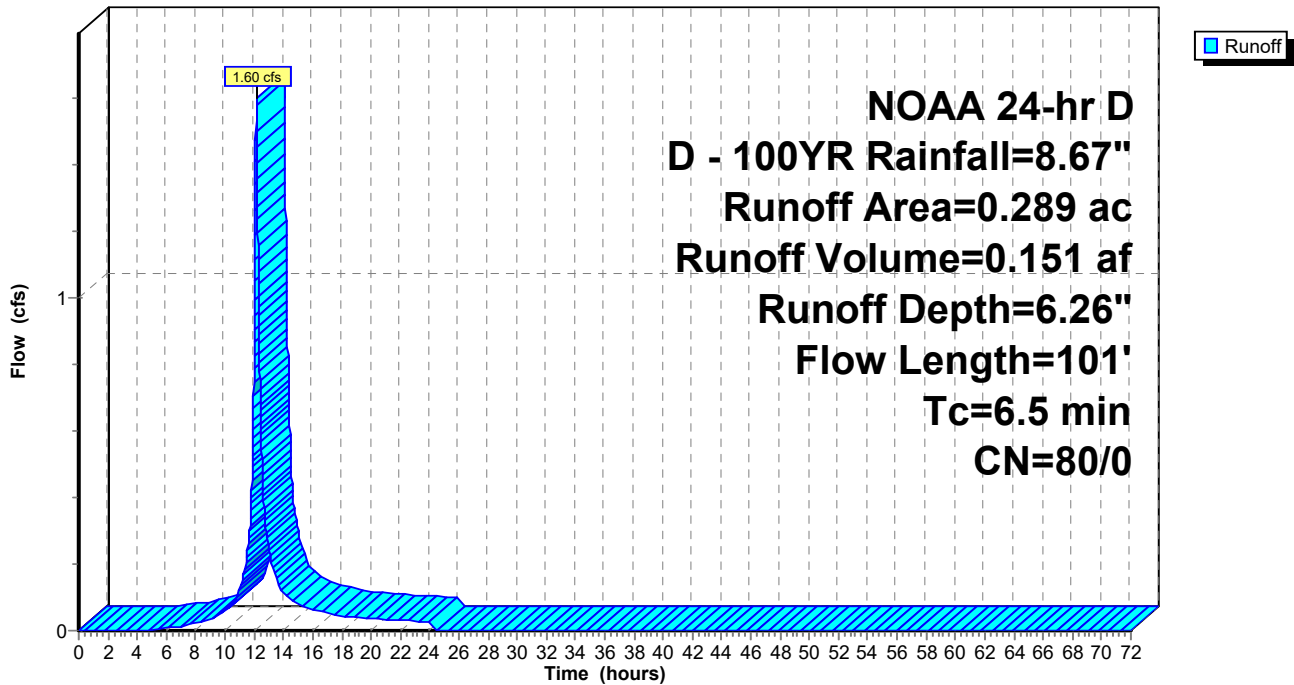
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 150

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 2.30 cfs @ 12.15 hrs, Volume= 0.217 af, Depth= 6.01"
 Routed to Pond B-5 : BASIN 5

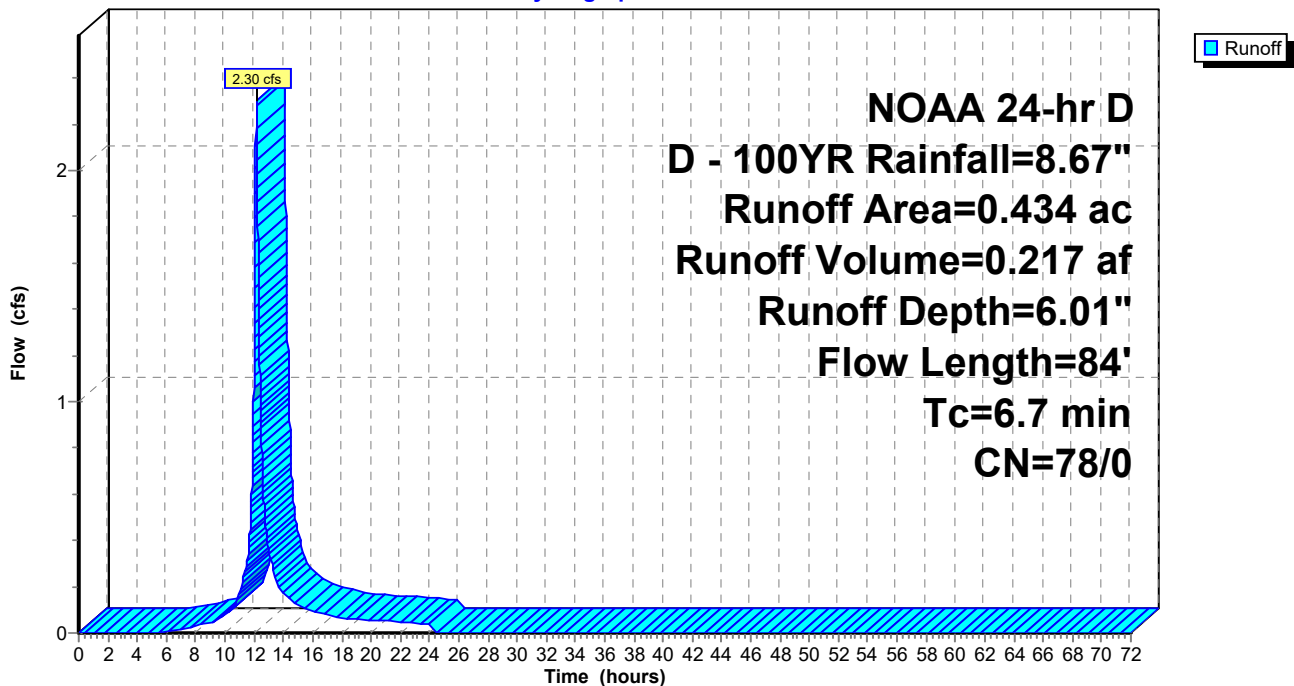
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 151

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 3.57 cfs @ 12.34 hrs, Volume= 0.662 af, Depth= 8.43"
 Routed to Link P-SR : SOUTH RIVER

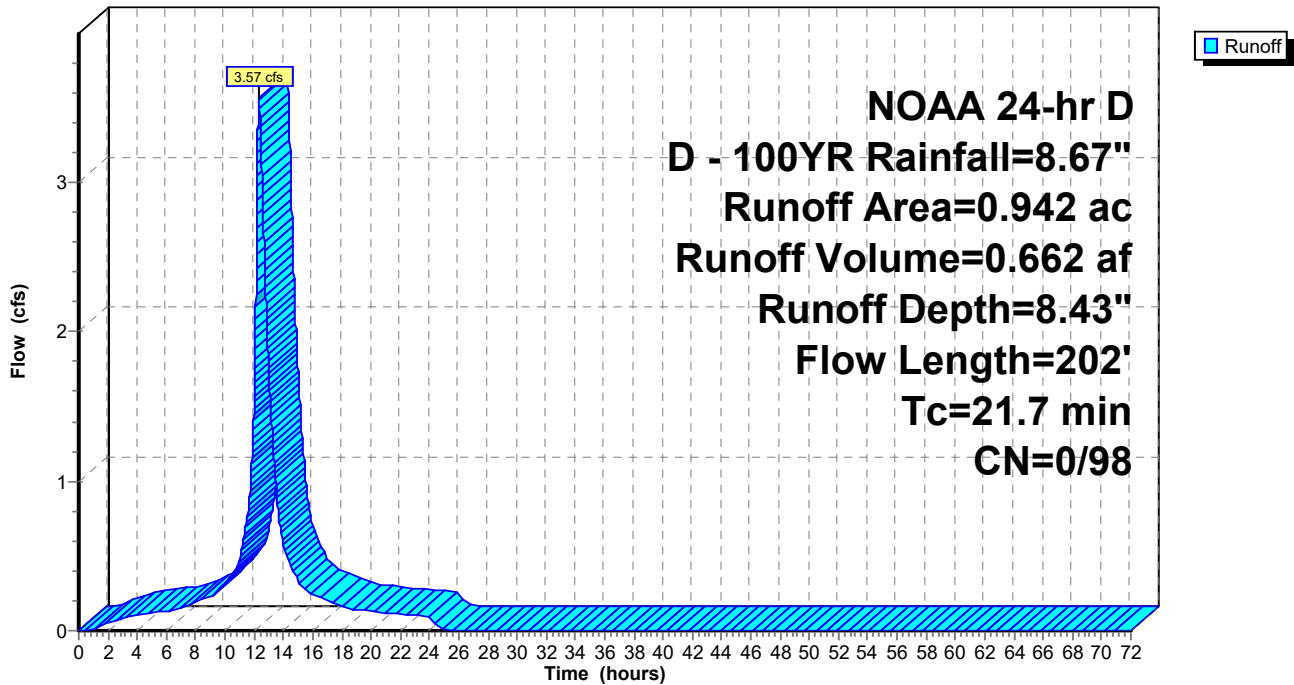
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 152

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 4.38 cfs @ 12.14 hrs, Volume= 0.447 af, Depth= 8.43"
 Routed to Link P-PC : POND CREEK

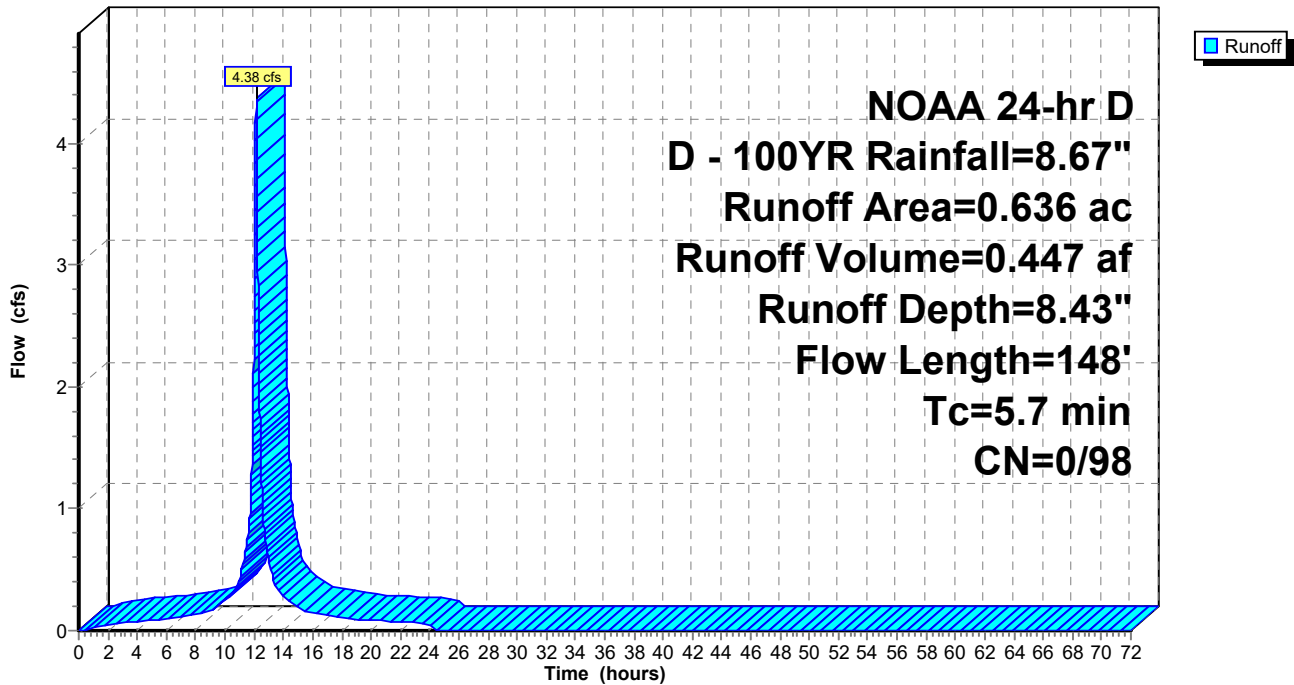
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 153

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 11.74 cfs @ 12.52 hrs, Volume= 2.627 af, Depth= 5.89"
 Routed to Link P-PC : POND CREEK

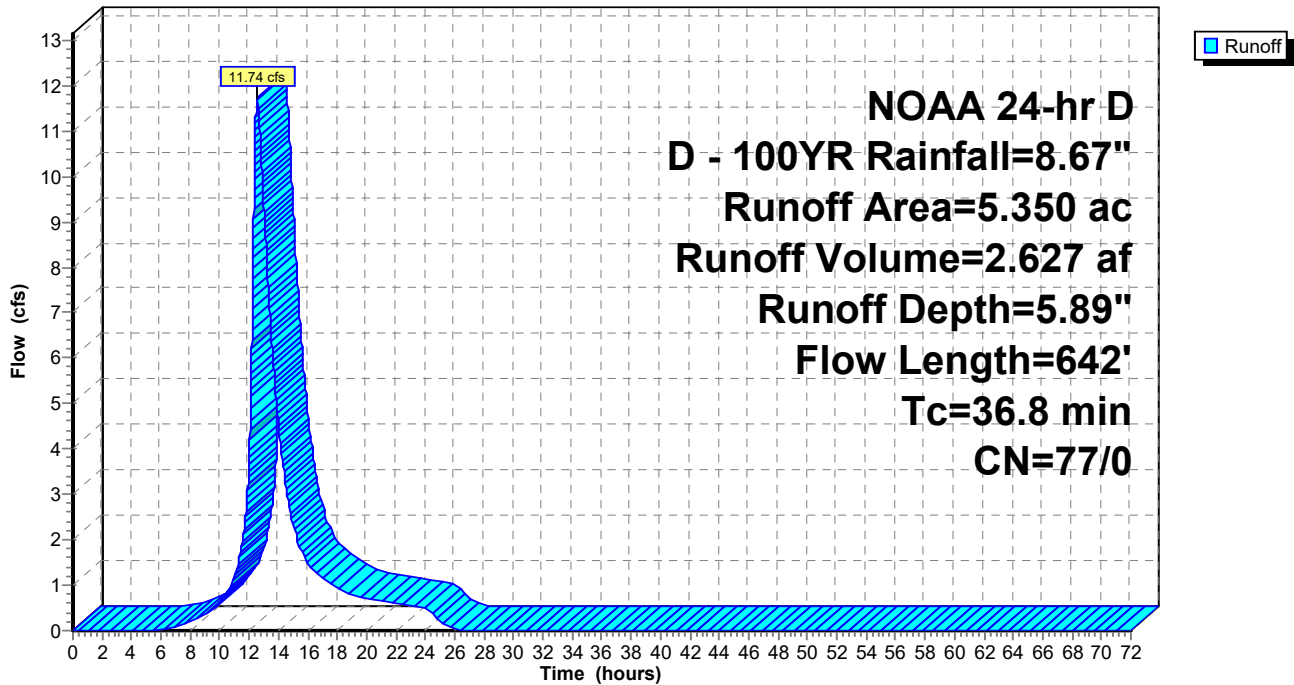
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 154

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 5.25 cfs @ 12.15 hrs, Volume= 0.548 af, Depth= 7.02"
 Routed to Link P-DC : DUCK CREEK

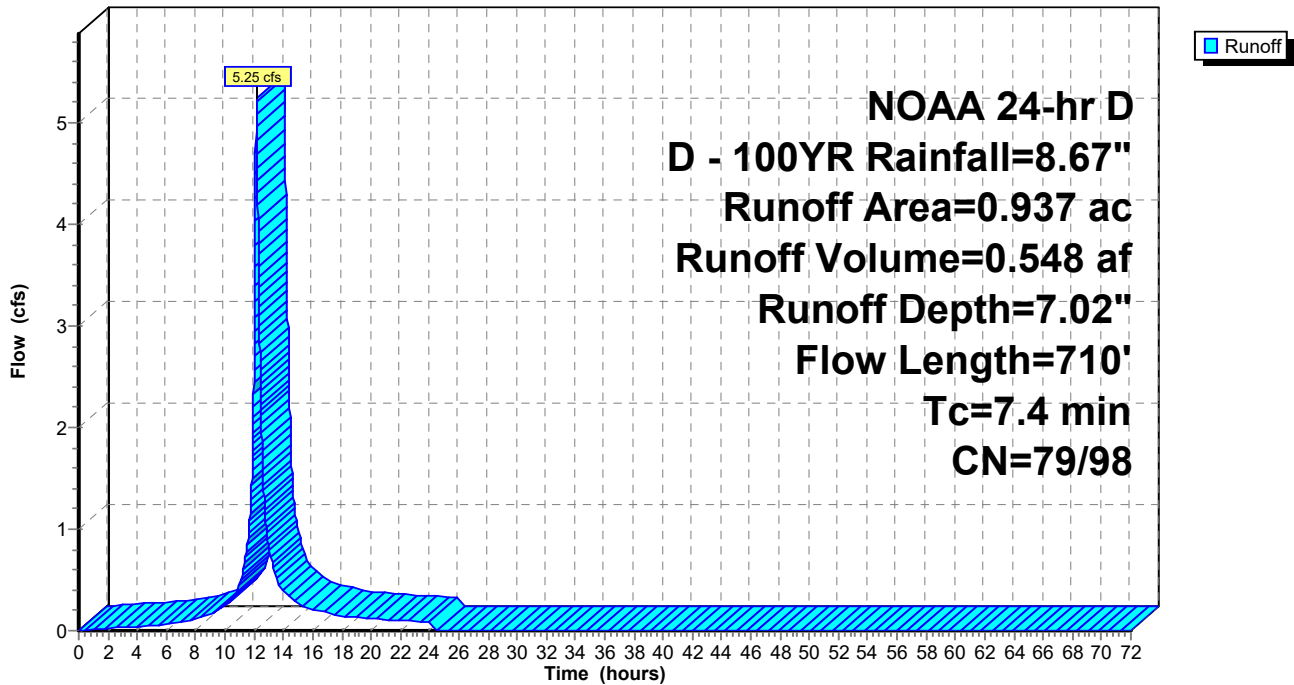
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 155

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.98 cfs @ 12.14 hrs, Volume= 0.101 af, Depth= 4.01"
 Routed to Link P-DC : DUCK CREEK

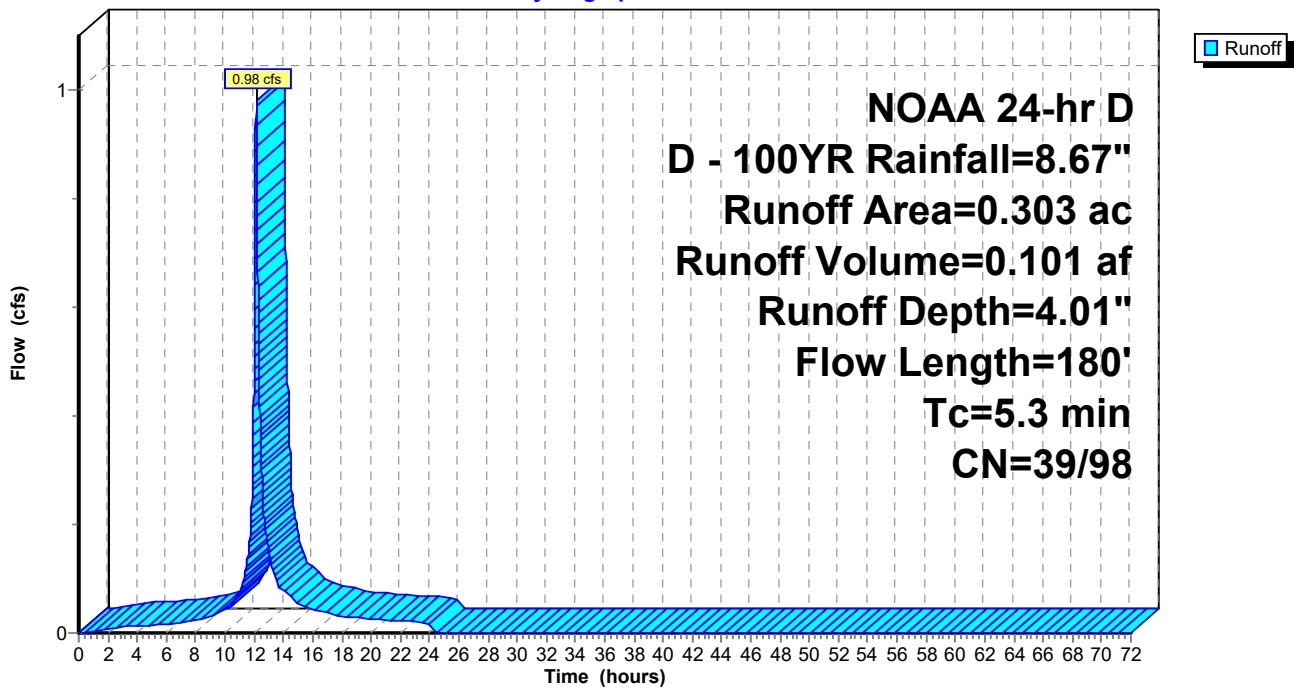
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 156

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 12.13 cfs @ 12.11 hrs, Volume= 1.051 af, Depth= 8.43"
 Routed to Pond B-2 : BASIN 2

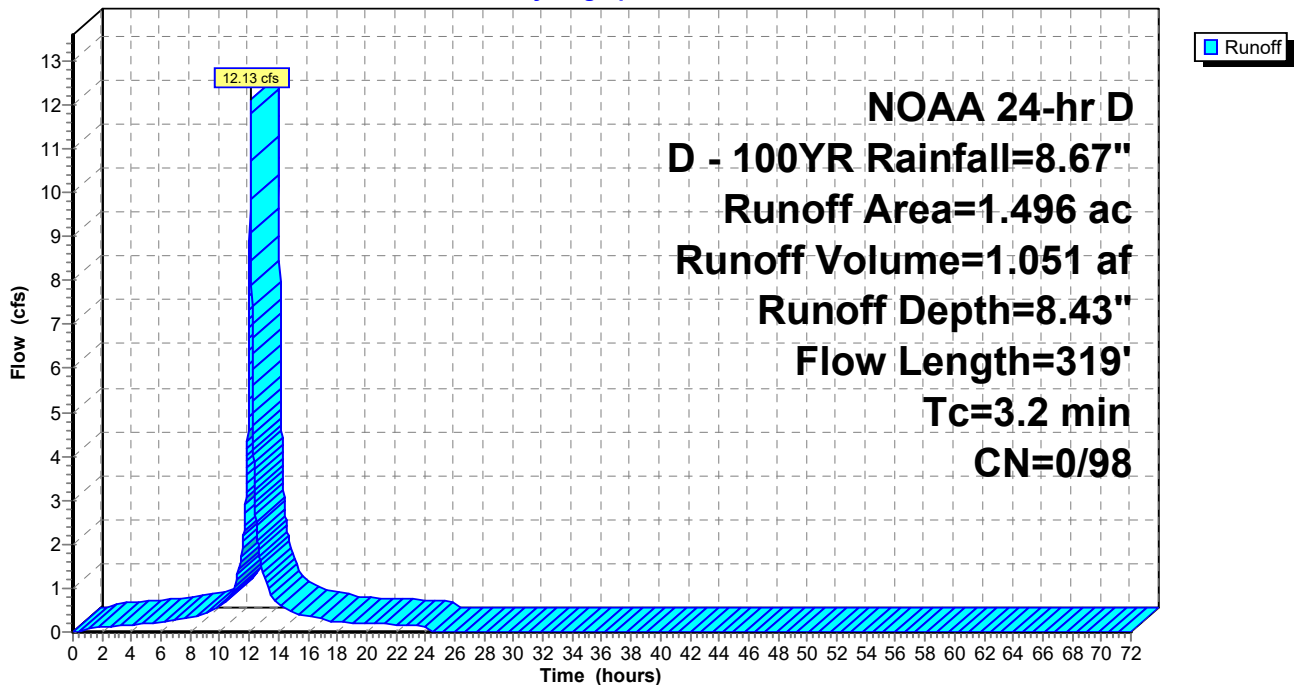
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 157

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 2.68 cfs @ 12.12 hrs, Volume= 0.247 af, Depth= 8.25"
 Routed to Pond B-3 : BASIN 3

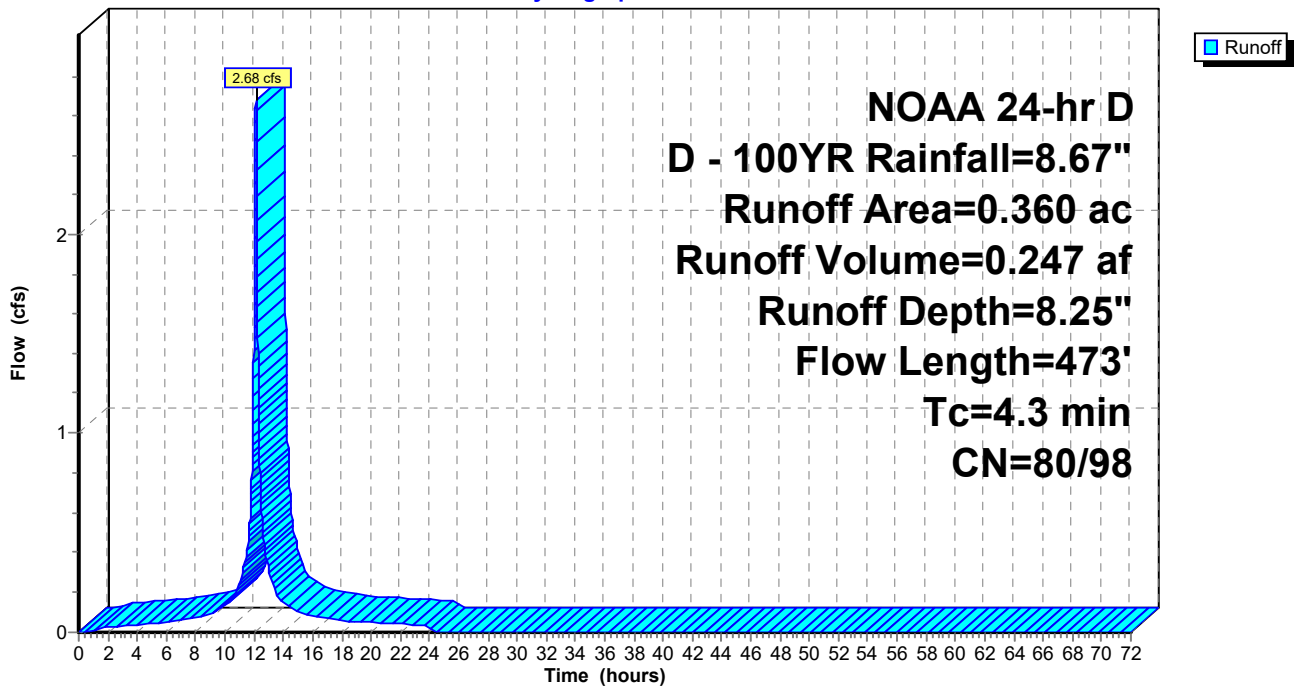
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 159

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 8.22 cfs @ 12.12 hrs, Volume= 0.745 af, Depth= 8.43"
 Routed to Pond B-3 : BASIN 3

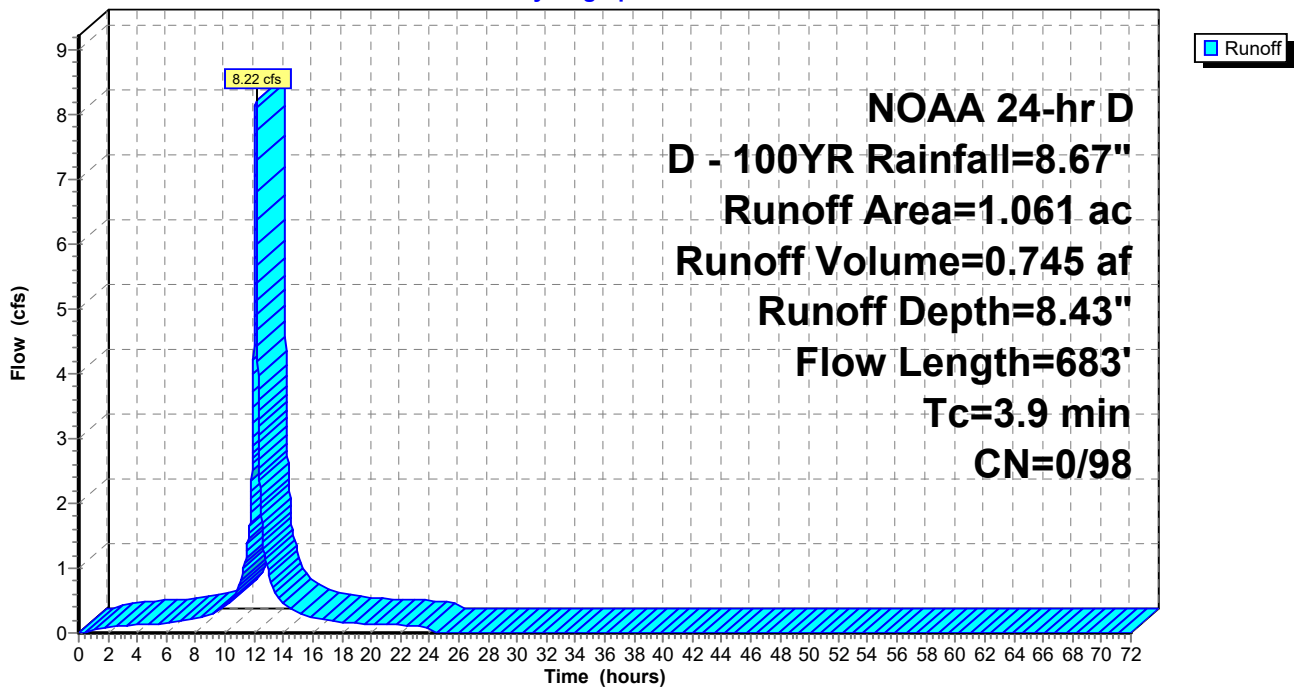
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 160

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 2.43 cfs @ 12.21 hrs, Volume= 0.297 af, Depth= 6.45"
 Routed to Pond B-4 : BASIN 4

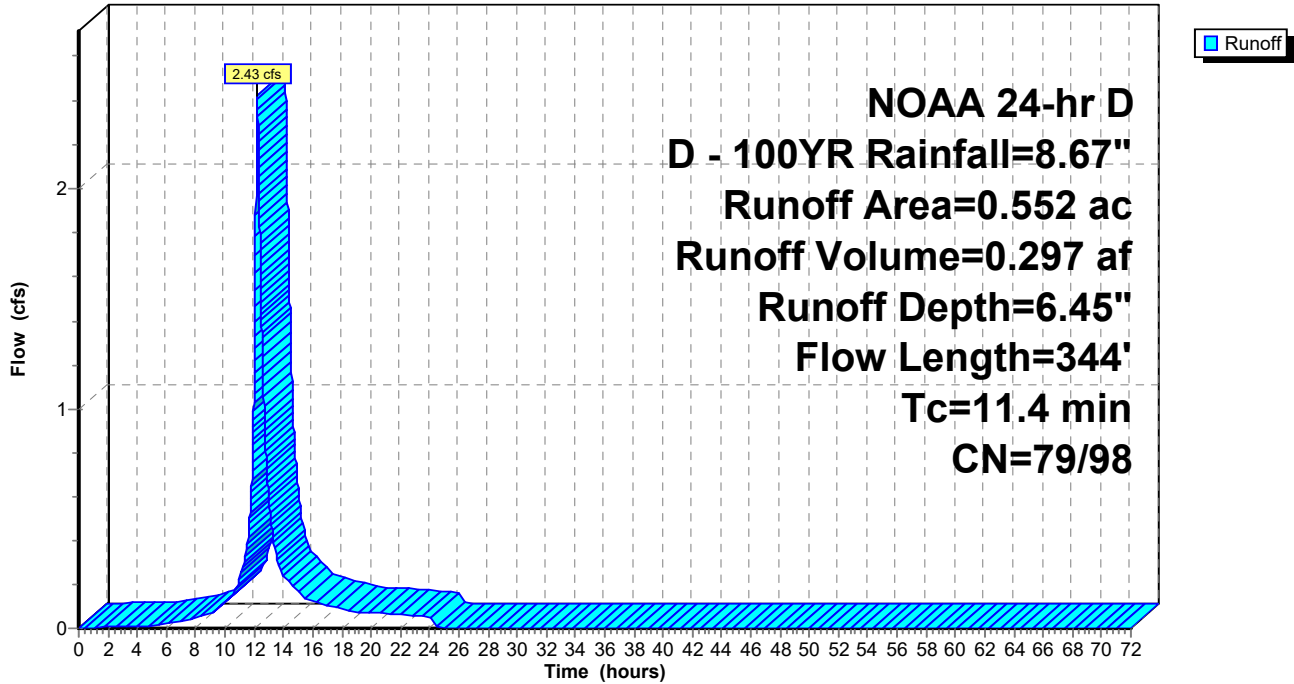
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 162

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 5.86 cfs @ 12.16 hrs, Volume= 0.664 af, Depth= 8.02"
 Routed to Pond B-4 : BASIN 4

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

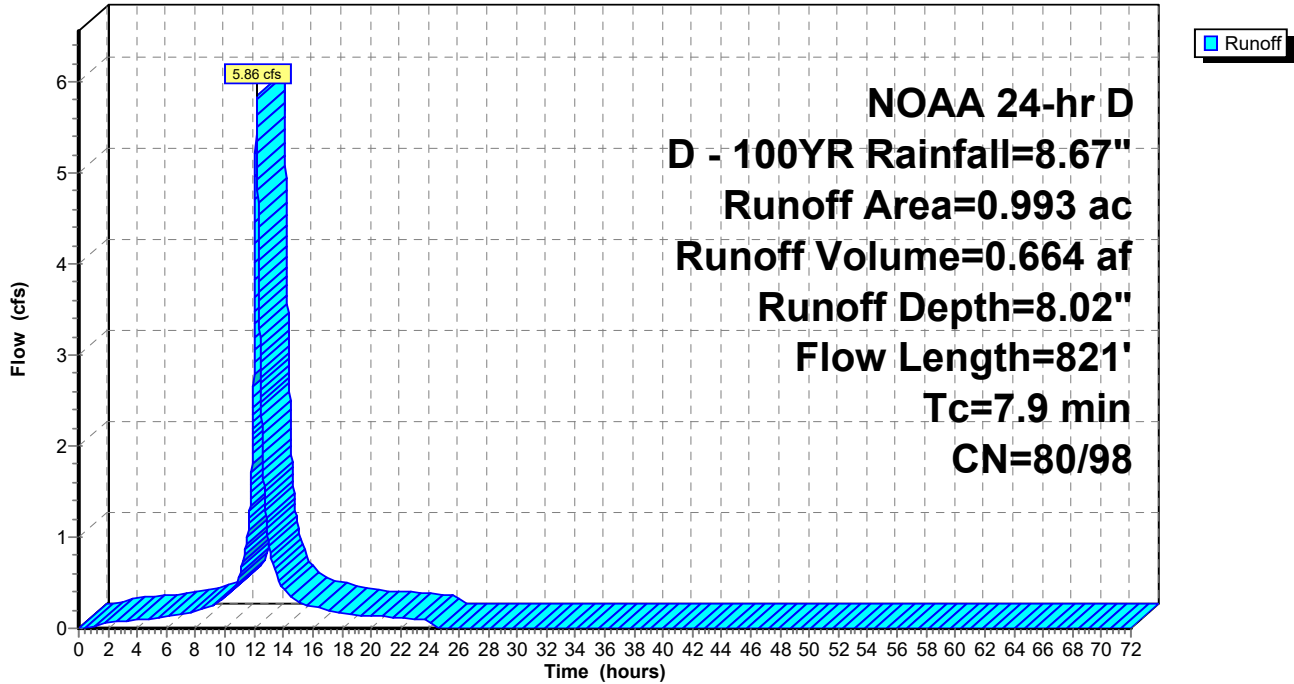
NOAA 24-hr D D - 100YR Rainfall=8.67"

Printed 2/26/2025

Page 163

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 164

Summary for Subcatchment P-UG-1: UG-1

Runoff = 18.54 cfs @ 12.15 hrs, Volume= 2.016 af, Depth= 8.43"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

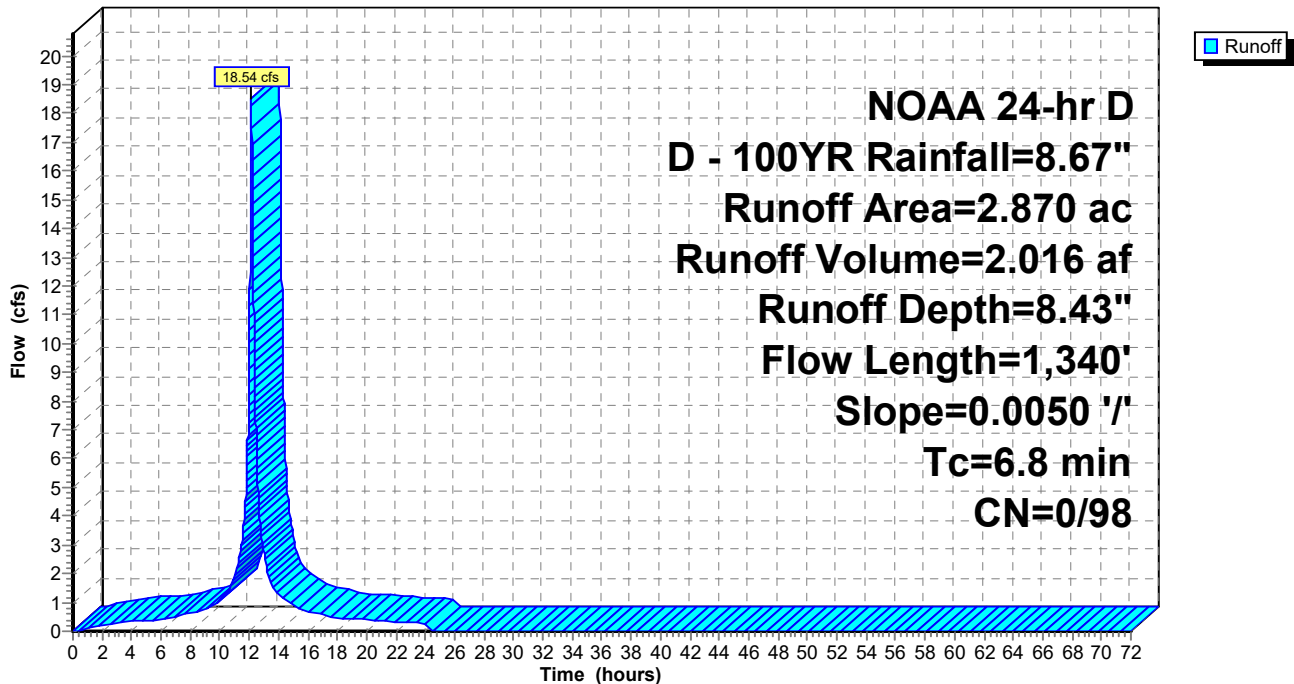
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 165

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 461% of capacity of segment #3

Runoff = 21.04 cfs @ 12.13 hrs, Volume= 2.015 af, Depth= 8.43"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

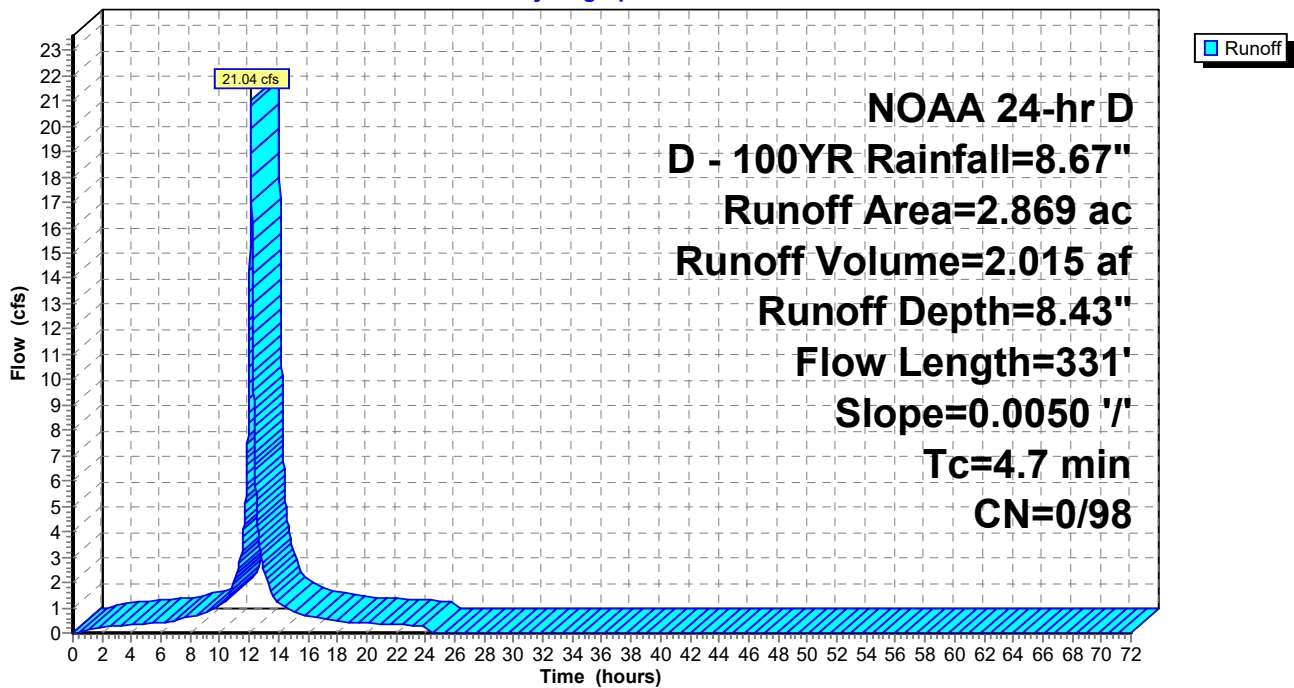
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 166

Summary for Reach 17R: E-1

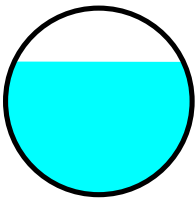
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 6.90" for D - 100YR event
Inflow = 21.53 cfs @ 12.26 hrs, Volume= 2.739 af
Outflow = 21.49 cfs @ 12.27 hrs, Volume= 2.739 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.60 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 3.2 min

Peak Storage= 775 cf @ 12.27 hrs
Average Depth at Peak Storage= 1.66' , Surface Width= 2.11'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

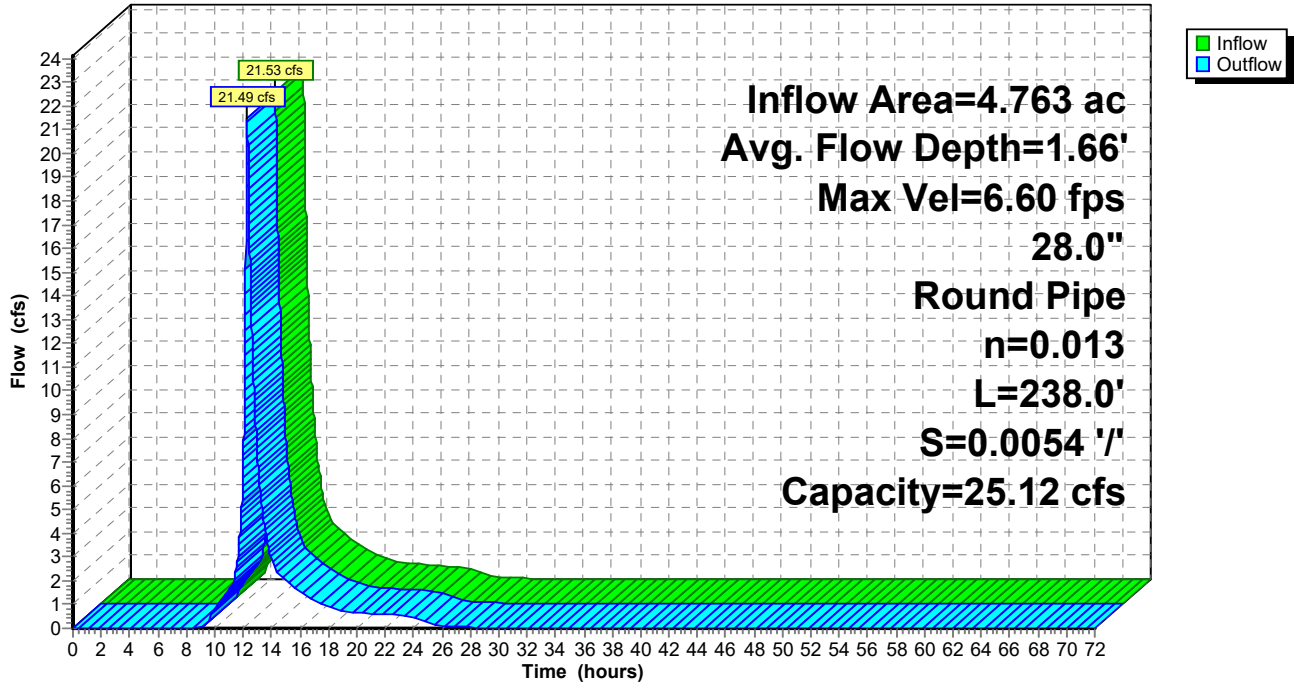
NOAA 24-hr D D - 100YR Rainfall=8.67"

Printed 2/26/2025

Page 167

Reach 17R: E-1

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 168

Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

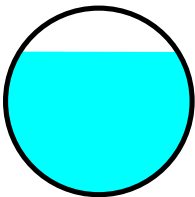
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.13' @ 12.31 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 6.90" for D - 100YR event
Inflow = 21.49 cfs @ 12.27 hrs, Volume= 2.739 af
Outflow = 21.45 cfs @ 12.28 hrs, Volume= 2.739 af, Atten= 0%, Lag= 0.6 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 3.3 min

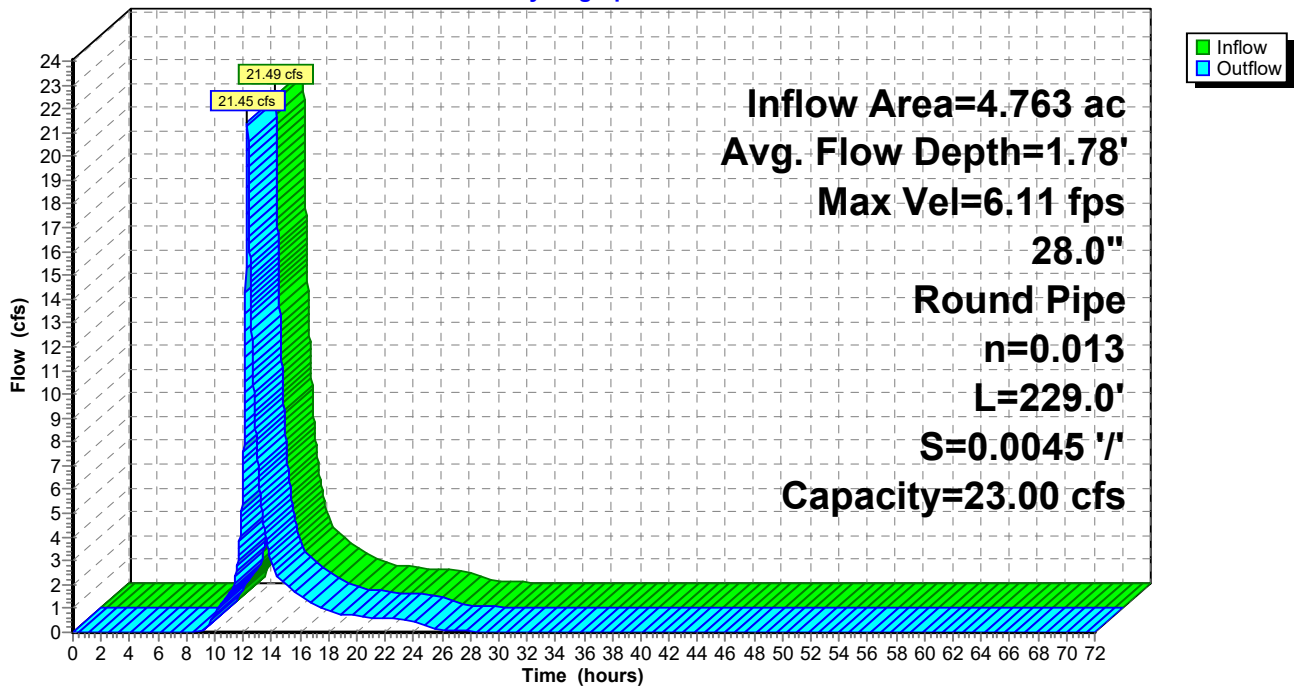
Peak Storage= 804 cf @ 12.28 hrs
Average Depth at Peak Storage= 1.78' , Surface Width= 1.98'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 170

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 8.22" for D - 100YR event
 Inflow = 13.03 cfs @ 12.11 hrs, Volume= 1.121 af
 Outflow = 12.08 cfs @ 12.13 hrs, Volume= 1.027 af, Atten= 7%, Lag= 1.4 min
 Primary = 12.08 cfs @ 12.13 hrs, Volume= 1.027 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.82' @ 12.13 hrs Surf.Area= 0.137 ac Storage= 0.311 af

Plug-Flow detention time= 162.8 min calculated for 1.027 af (92% of inflow)
 Center-of-Mass det. time= 115.6 min (860.1 - 744.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

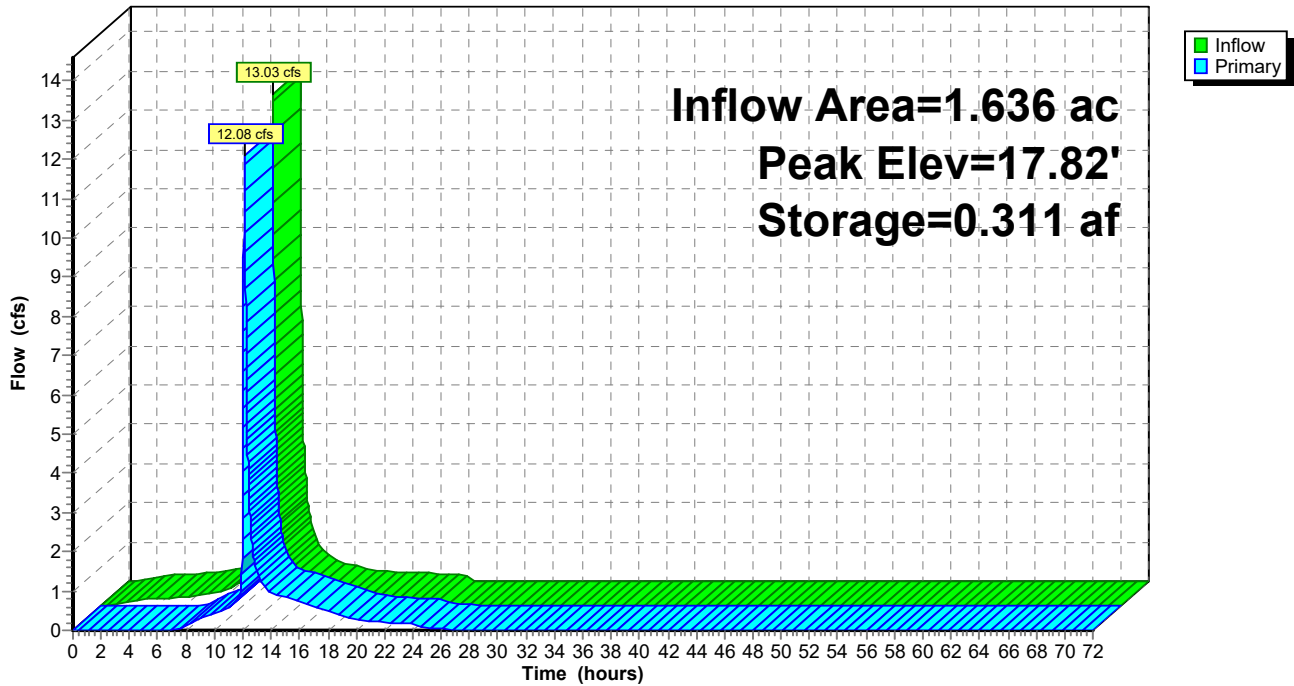
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.07 cfs @ 12.13 hrs HW=17.82' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 12.07 cfs of 19.62 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.08 cfs @ 6.19 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.49 cfs @ 2.24 fps)
- 4=Orifice/Grate (Weir Controls 9.51 cfs @ 1.85 fps)

Pond B-2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 172

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 7.78" for D - 100YR event
 Inflow = 14.29 cfs @ 12.11 hrs, Volume= 1.238 af
 Outflow = 12.02 cfs @ 12.15 hrs, Volume= 1.041 af, Atten= 16%, Lag= 2.3 min
 Primary = 12.02 cfs @ 12.15 hrs, Volume= 1.041 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.28' @ 12.15 hrs Surf.Area= 0.265 ac Storage= 0.442 af

Plug-Flow detention time= 268.4 min calculated for 1.041 af (84% of inflow)
 Center-of-Mass det. time= 194.2 min (950.1 - 755.9)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.50	0.231	569.6	0.000	0.000	0.231	
11.00	0.241	578.4	0.118	0.118	0.251	
12.00	0.259	596.0	0.250	0.368	0.291	
13.00	0.278	615.6	0.269	0.637	0.337	
13.50	0.295	633.5	0.143	0.780	0.378	

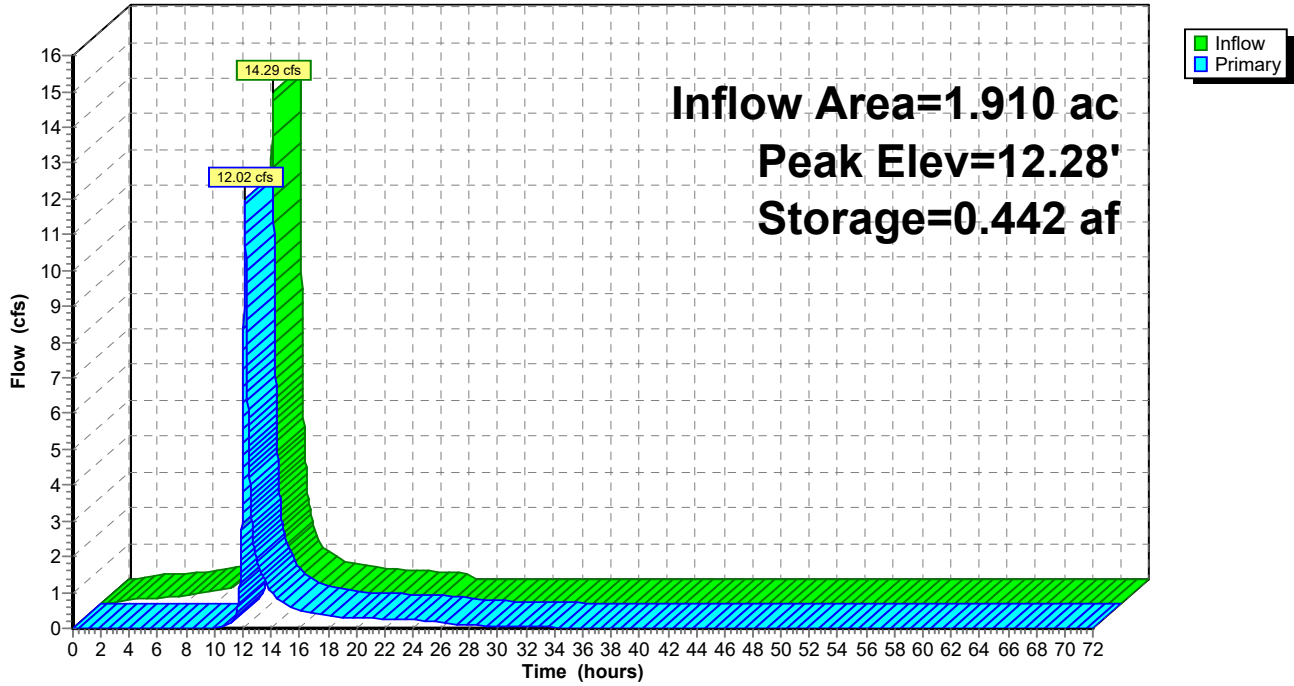
Device	Routing	Invert	Outlet Devices	
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf	
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads	
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads	

Primary OutFlow Max=12.00 cfs @ 12.15 hrs HW=12.28' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 12.00 cfs of 33.59 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.47 cfs @ 4.29 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 3.68 cfs @ 2.39 fps)
- 4=Orifice/Grate (Weir Controls 7.85 cfs @ 1.74 fps)

Pond B-3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 174

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 7.27" for D - 100YR event
 Inflow = 9.75 cfs @ 12.16 hrs, Volume= 1.112 af
 Outflow = 8.25 cfs @ 12.25 hrs, Volume= 1.020 af, Atten= 15%, Lag= 5.5 min
 Primary = 8.25 cfs @ 12.25 hrs, Volume= 1.020 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.37' @ 12.25 hrs Surf.Area= 5,198 sf Storage= 12,293 cf

Plug-Flow detention time= 127.4 min calculated for 1.020 af (92% of inflow)
 Center-of-Mass det. time= 81.8 min (859.9 - 778.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

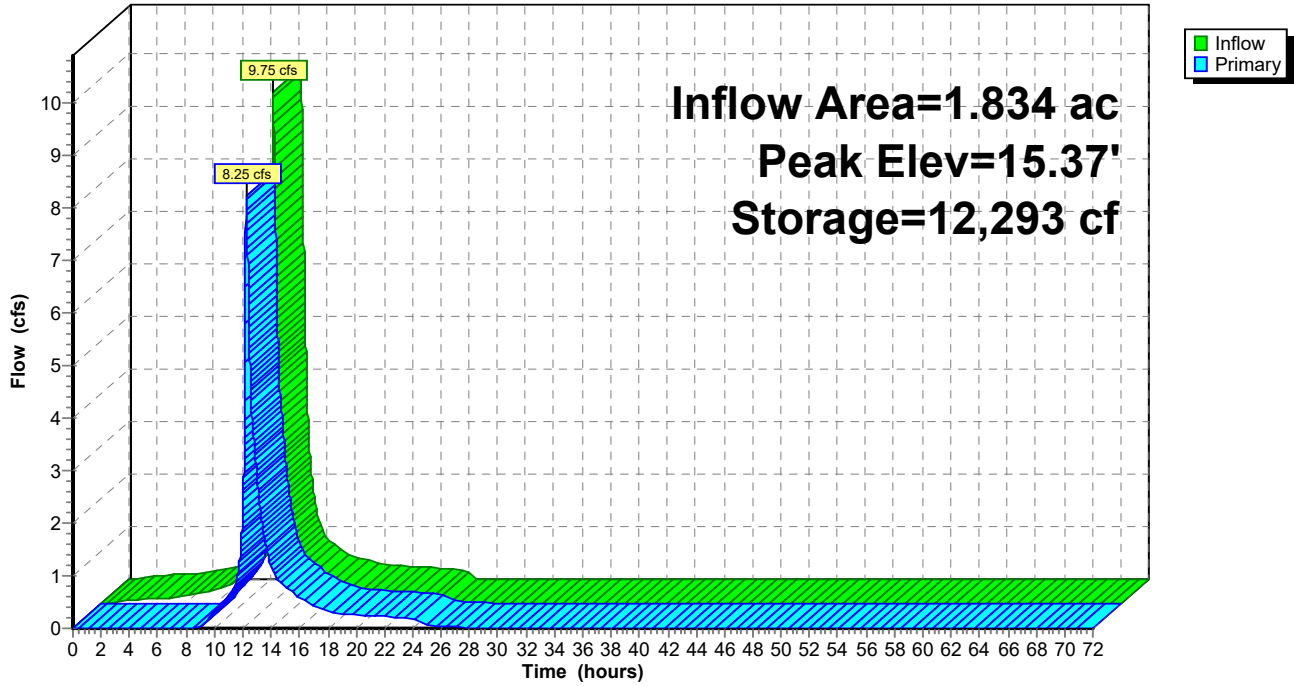
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.24 cfs @ 12.25 hrs HW=15.37' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 8.24 cfs of 13.30 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.64 cfs @ 6.01 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 3.00 cfs @ 3.46 fps)
- 4=Orifice/Grate (Weir Controls 3.60 cfs @ 1.34 fps)

Pond B-4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 176

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 7.98" for D - 100YR event
 Inflow = 16.87 cfs @ 12.16 hrs, Volume= 1.949 af
 Outflow = 13.33 cfs @ 12.27 hrs, Volume= 1.719 af, Atten= 21%, Lag= 6.6 min
 Primary = 13.33 cfs @ 12.27 hrs, Volume= 1.719 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.51' @ 12.27 hrs Surf.Area= 9,262 sf Storage= 23,979 cf

Plug-Flow detention time= 162.7 min calculated for 1.719 af (88% of inflow)
 Center-of-Mass det. time= 102.2 min (860.3 - 758.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	6,858	409.0	0	0	6,858
13.00	7,629	429.0	2,896	2,896	8,202
14.00	8,186	439.0	7,906	10,802	9,018
14.10	8,239	440.0	821	11,623	9,101
15.00	8,985	459.0	7,748	19,372	10,519
16.00	9,537	468.1	9,260	28,631	11,335

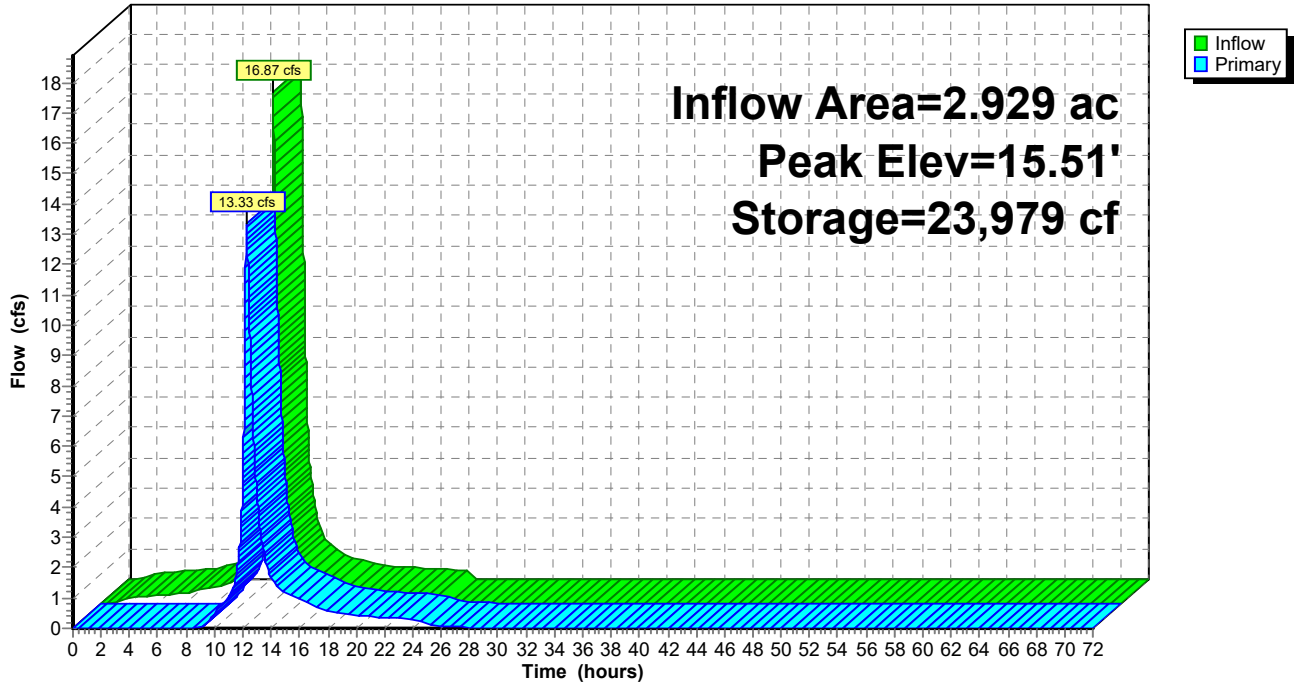
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=13.32 cfs @ 12.27 hrs HW=15.50' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 13.32 cfs of 14.11 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.33 cfs @ 5.69 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 9.22 cfs @ 3.28 fps)
- 4=Orifice/Grate (Weir Controls 1.78 cfs @ 1.06 fps)

Pond B-5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 178

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 8.43" for D - 100YR event
 Inflow = 39.25 cfs @ 12.13 hrs, Volume= 4.032 af
 Outflow = 25.92 cfs @ 12.25 hrs, Volume= 3.458 af, Atten= 34%, Lag= 7.3 min
 Primary = 25.92 cfs @ 12.25 hrs, Volume= 3.458 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.45' @ 12.25 hrs Surf.Area= 0.631 ac Storage= 1.925 af

Plug-Flow detention time= 542.6 min calculated for 3.457 af (86% of inflow)
 Center-of-Mass det. time= 473.6 min (1,217.9 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=25.90 cfs @ 12.25 hrs HW=14.45' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 25.90 cfs of 40.34 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.76 cfs @ 8.73 fps)
- 3=Orifice/Grate (Orifice Controls 0.52 cfs @ 7.61 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 24.62 cfs @ 3.27 fps)

250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 179

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0" End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 = 32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 = 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

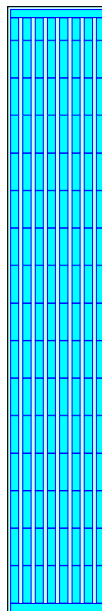
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 180

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0" End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

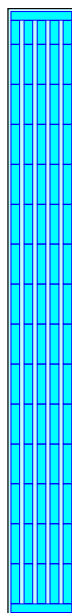
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

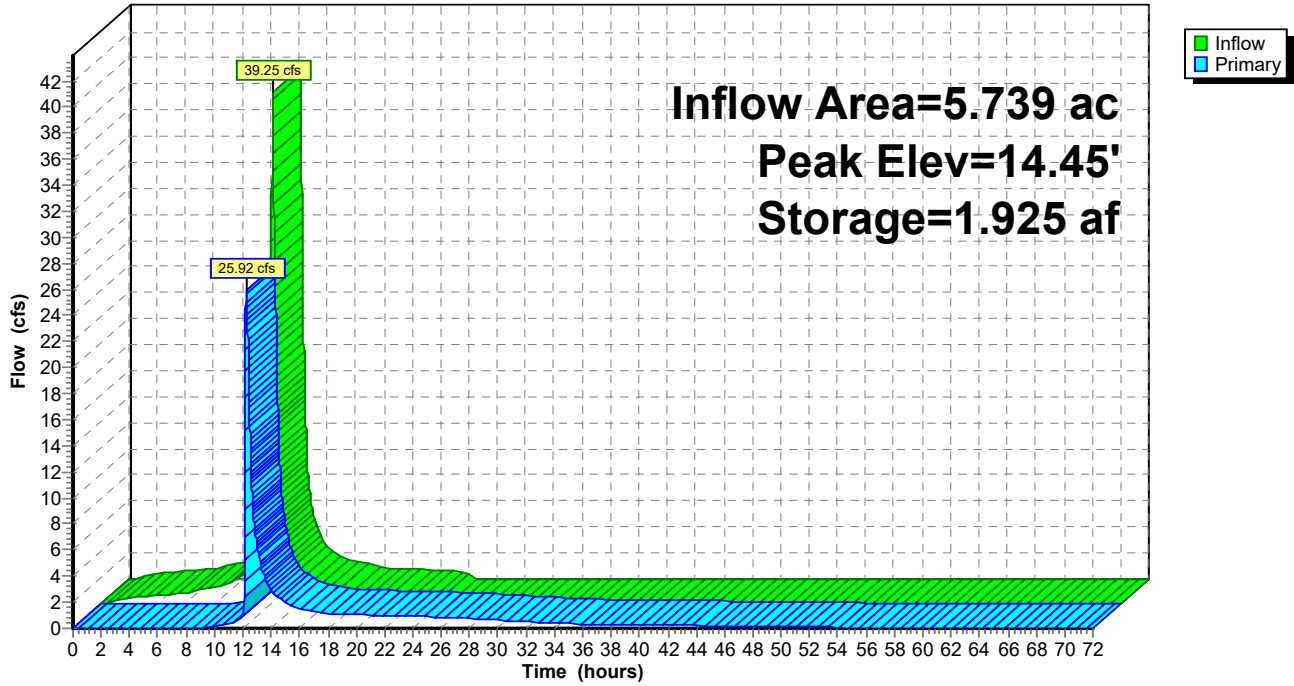
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



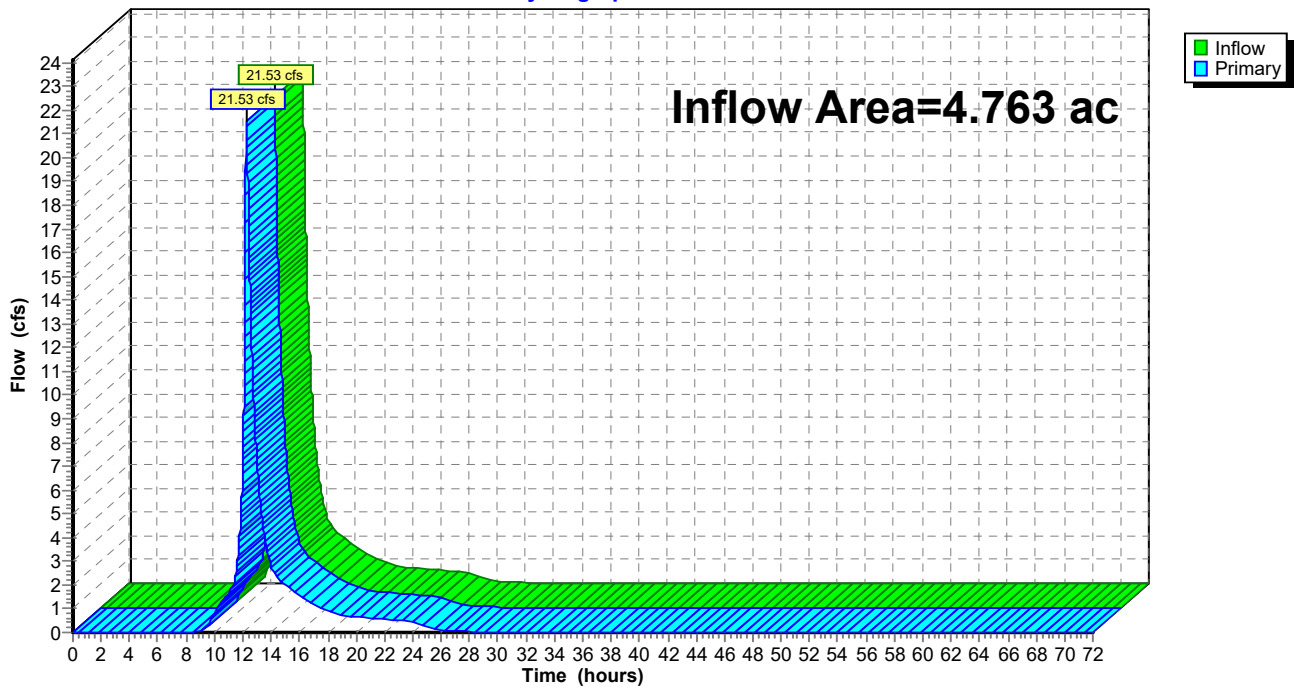
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 6.90" for D - 100YR event
Inflow = 21.53 cfs @ 12.26 hrs, Volume= 2.739 af
Primary = 21.53 cfs @ 12.26 hrs, Volume= 2.739 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 183

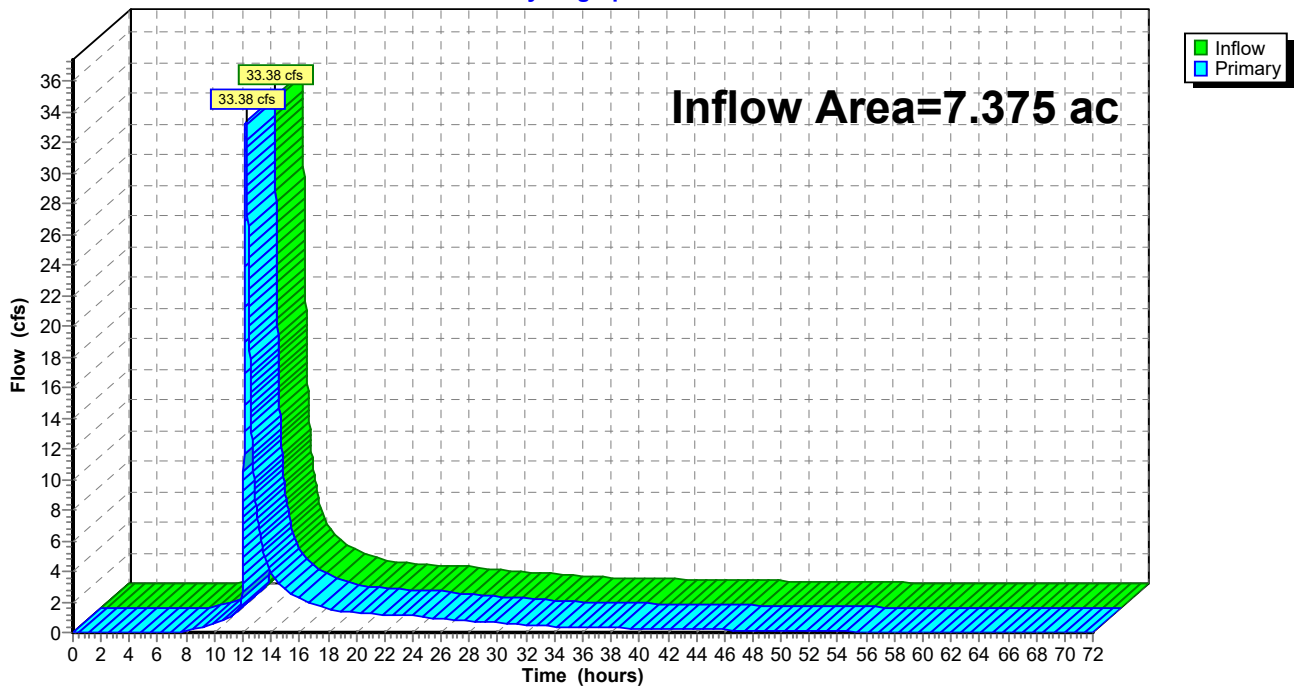
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 7.30" for D - 100YR event
Inflow = 33.38 cfs @ 12.23 hrs, Volume= 4.485 af
Primary = 33.38 cfs @ 12.23 hrs, Volume= 4.485 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



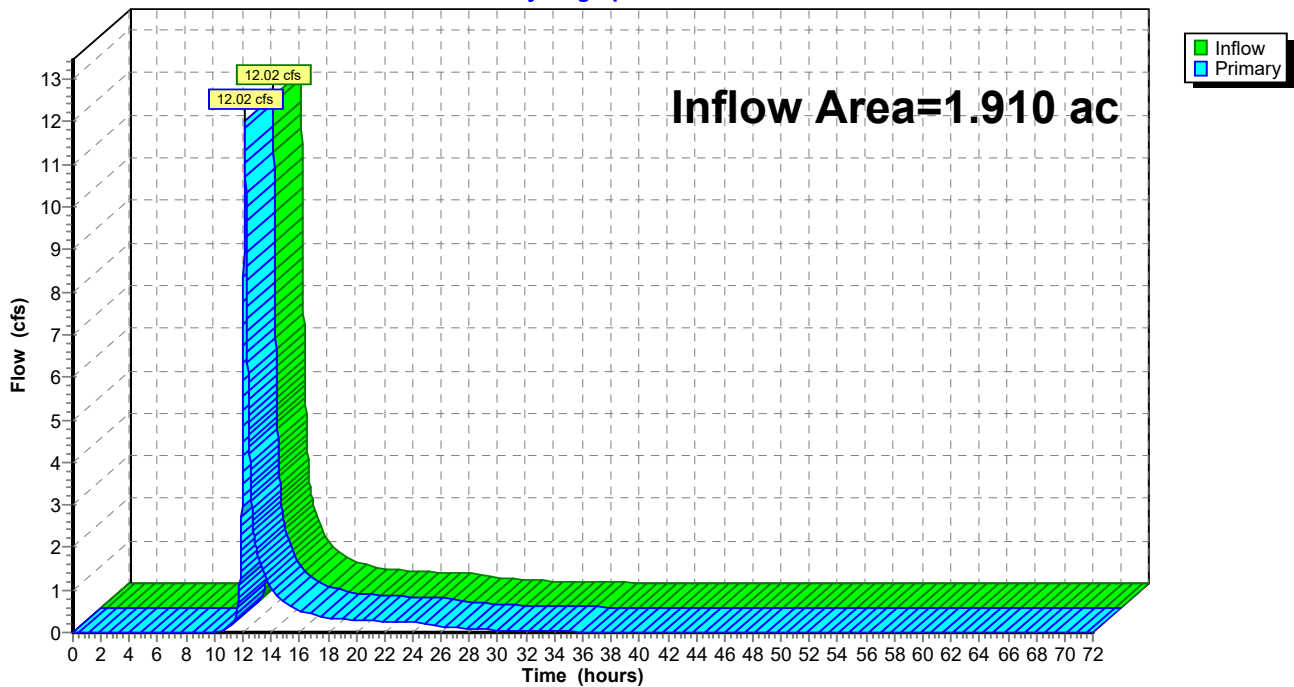
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 6.54" for D - 100YR event
Inflow = 12.02 cfs @ 12.15 hrs, Volume= 1.041 af
Primary = 12.02 cfs @ 12.15 hrs, Volume= 1.041 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



250225 - Exist & Proposed Conditions

NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 185

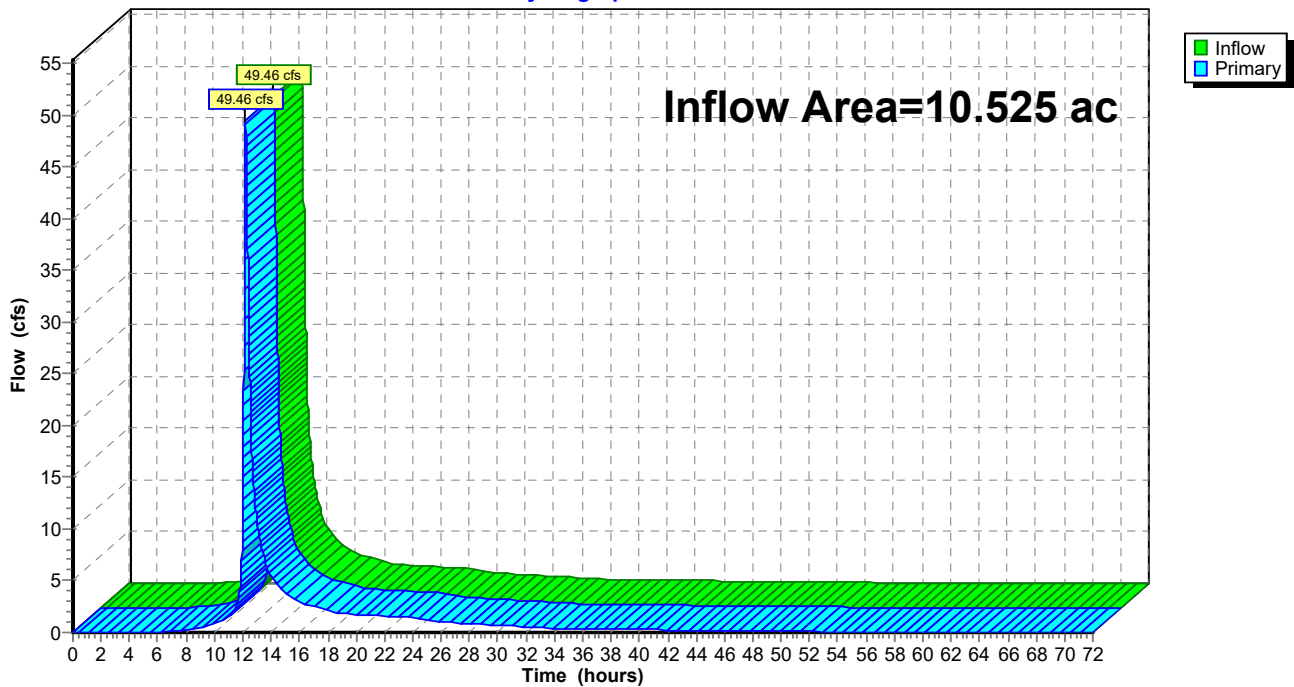
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 7.04" for D - 100YR event
Inflow = 49.46 cfs @ 12.20 hrs, Volume= 6.176 af
Primary = 49.46 cfs @ 12.20 hrs, Volume= 6.176 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



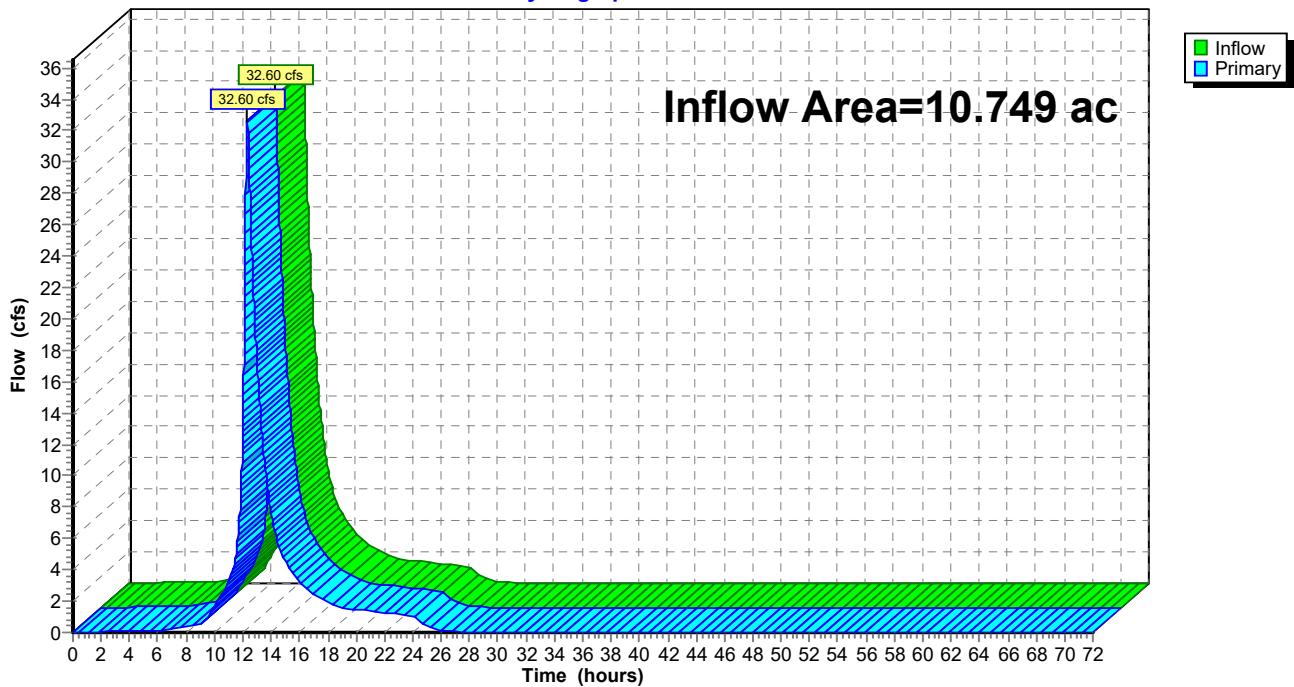
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 6.49" for D - 100YR event
Inflow = 32.60 cfs @ 12.30 hrs, Volume= 5.813 af
Primary = 32.60 cfs @ 12.30 hrs, Volume= 5.813 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



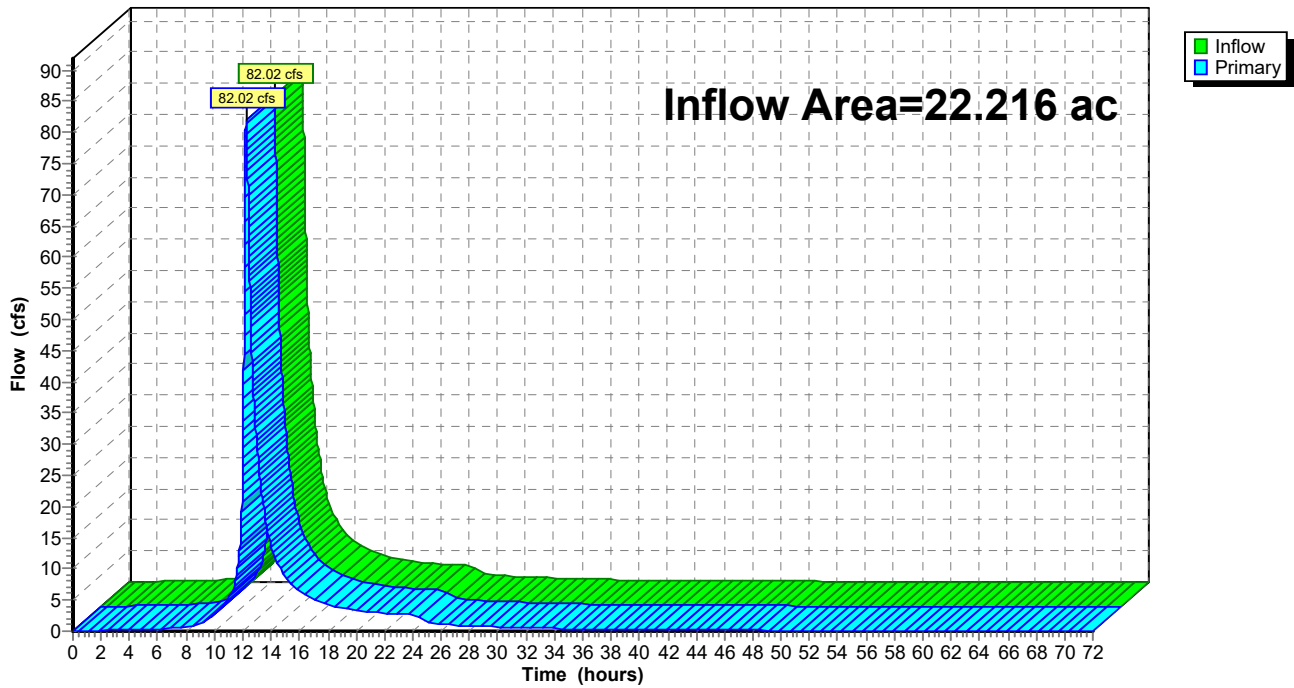
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 6.83" for D - 100YR event
Inflow = 82.02 cfs @ 12.24 hrs, Volume= 12.650 af
Primary = 82.02 cfs @ 12.24 hrs, Volume= 12.650 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 188

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=0.99" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=4.86 cfs 0.207 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.07 cfs 0.002 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=0.18 cfs 0.005 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=0.17" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.09 cfs 0.004 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=0.10 cfs 0.005 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=1.10 cfs 0.081 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=1.54 cfs 0.055 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=0.12" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=0.44 cfs 0.052 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=0.49" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=0.91 cfs 0.039 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=0.38" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.28 cfs 0.010 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=4.28 cfs 0.129 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=0.96" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=0.89 cfs 0.029 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=2.91 cfs 0.091 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=0.28" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=0.22 cfs 0.013 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=0.87" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=1.75 cfs 0.072 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=6.47 cfs 0.247 af

250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 189

SubcatchmentP-UG-2: UG-2 Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=7.45 cfs 0.247 af

Reach 17R: E-1 Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=0.00 cfs 0.000 af

Reach 18R: E-2 Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=0.00 cfs 0.000 af

Pond B-2: BASIN 2 Peak Elev=16.25' Storage=0.120 af Inflow=4.35 cfs 0.131 af
Outflow=0.24 cfs 0.037 af

Pond B-3: BASIN 3 Peak Elev=11.03' Storage=0.126 af Inflow=3.98 cfs 0.126 af
Outflow=0.00 cfs 0.000 af

Pond B-4: BASIN 4 Peak Elev=13.58' Storage=3,885 cf Inflow=2.02 cfs 0.089 af
Outflow=0.00 cfs 0.000 af

Pond B-5: BASIN 5 Peak Elev=13.80' Storage=9,215 cf Inflow=4.95 cfs 0.212 af
Outflow=0.00 cfs 0.000 af

Pond UG-2: UG BASIN 1 & 2 (Peak Elev=10.89' Storage=0.495 af Inflow=13.80 cfs 0.495 af
Outflow=0.00 cfs 0.000 af

Link 16L: Existing Storm Sewer Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link D3A: POD 3A Inflow=0.24 cfs 0.037 af
Primary=0.24 cfs 0.037 af

Link D3B: POD 3B Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link P-DC: DUCK CREEK Inflow=1.17 cfs 0.085 af
Primary=1.17 cfs 0.085 af

Link P-PC: POND CREEK Inflow=1.55 cfs 0.107 af
Primary=1.55 cfs 0.107 af

Link P-SR: SOUTH RIVER Inflow=3.34 cfs 0.273 af
Primary=3.34 cfs 0.273 af

Total Runoff Area = 22.216 ac Runoff Volume = 1.288 af Average Runoff Depth = 0.70"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 190

Summary for Subcatchment 16S: P-B5-1

Runoff = 4.86 cfs @ 1.15 hrs, Volume= 0.207 af, Depth= 0.99"
 Routed to Pond B-5 : BASIN 5

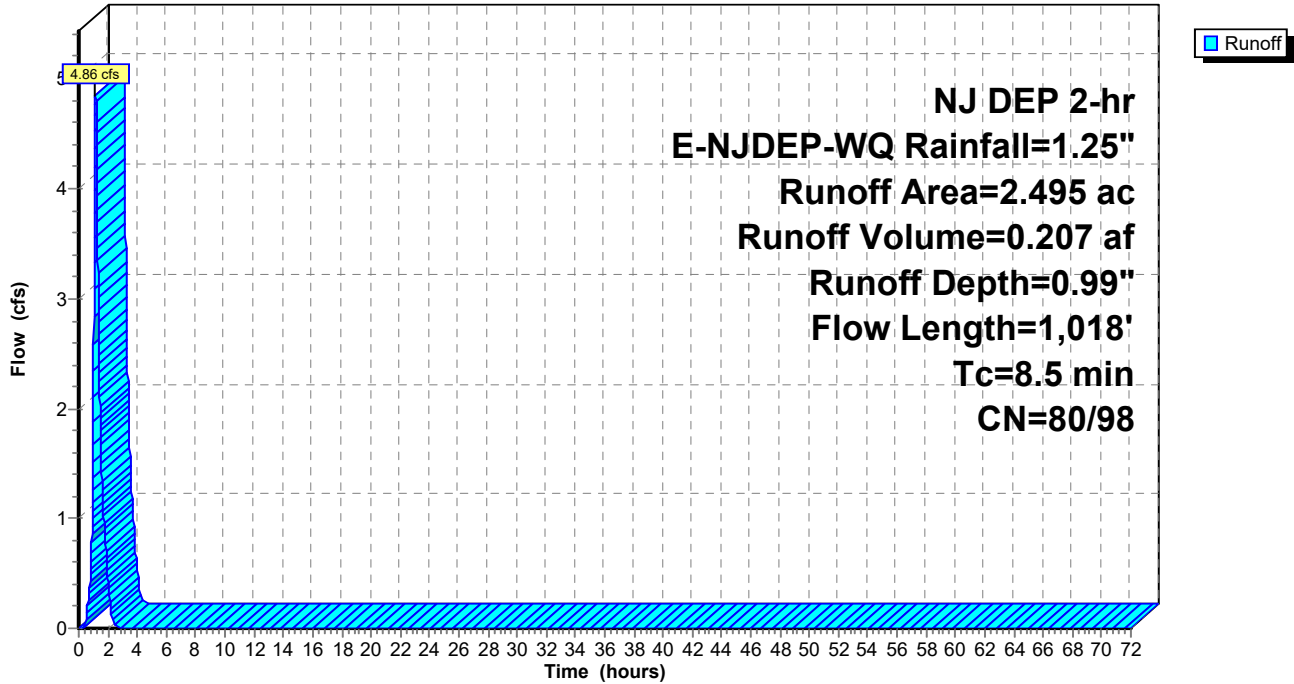
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 192

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.07 cfs @ 1.08 hrs, Volume= 0.002 af, Depth= 0.13"
 Routed to Pond B-2 : BASIN 2

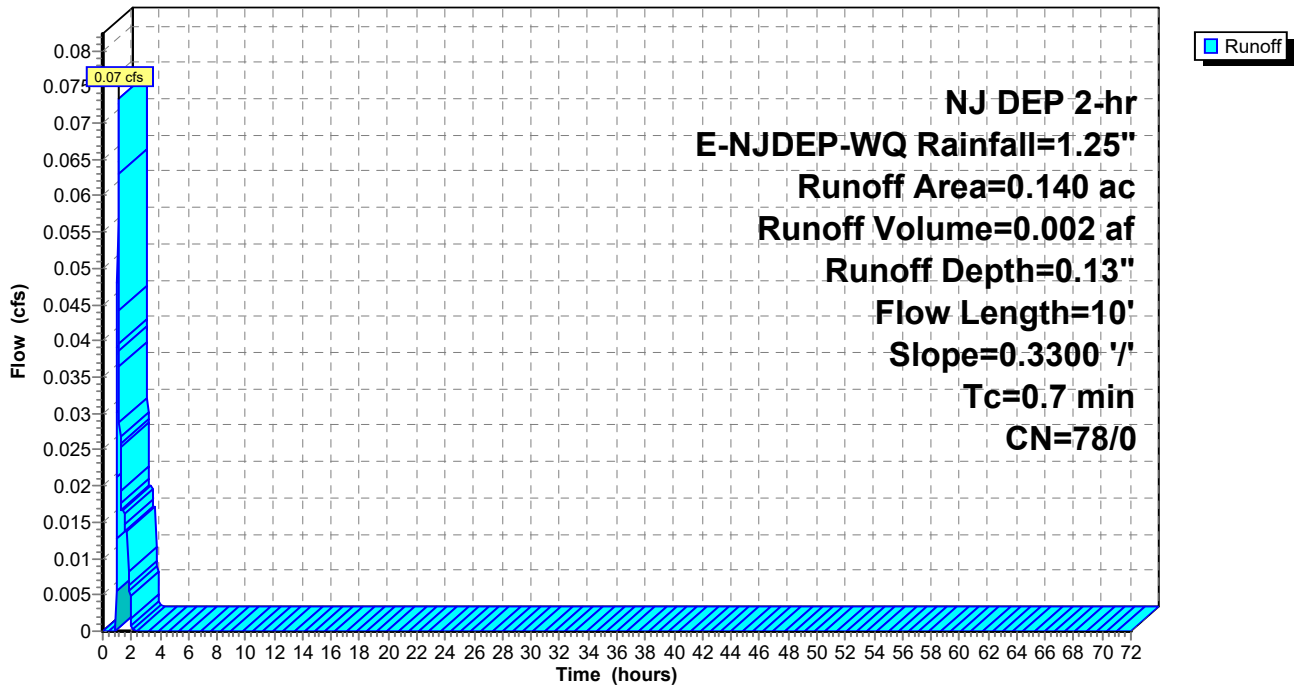
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 193

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 0.18 cfs @ 1.10 hrs, Volume= 0.005 af, Depth= 0.13"
 Routed to Pond B-3 : BASIN 3

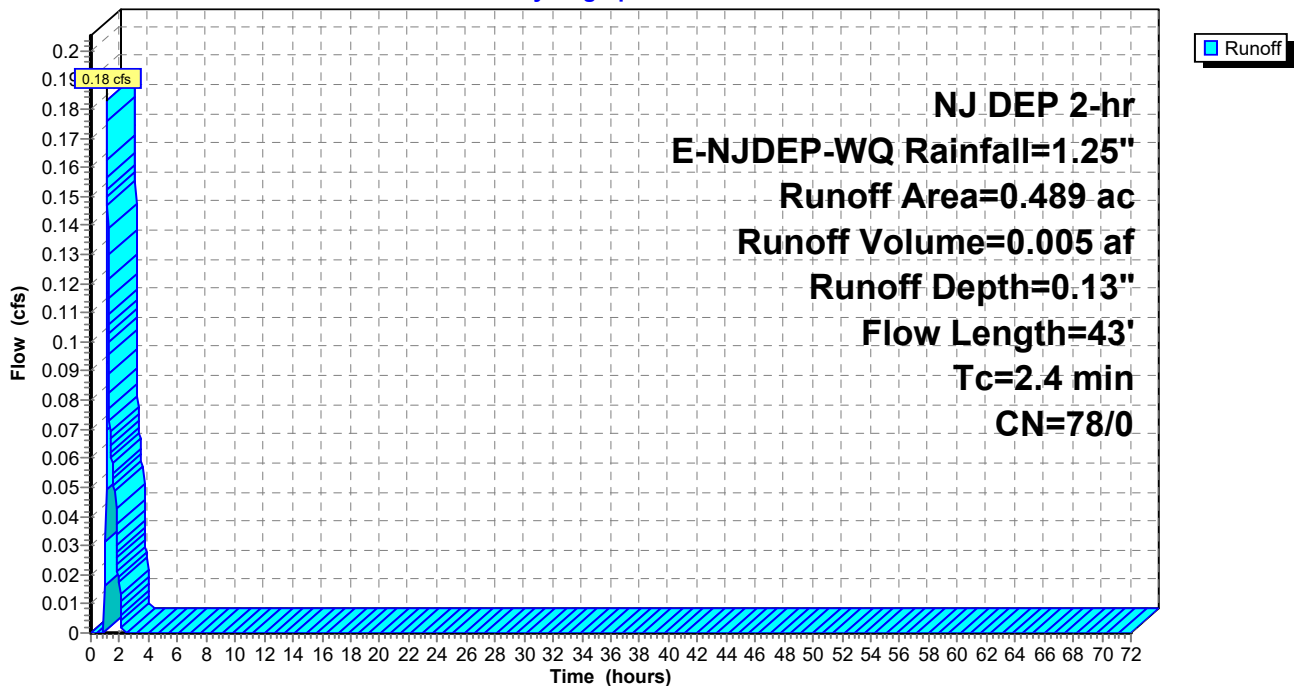
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 194

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.09 cfs @ 1.20 hrs, Volume= 0.004 af, Depth= 0.17"
 Routed to Pond B-4 : BASIN 4

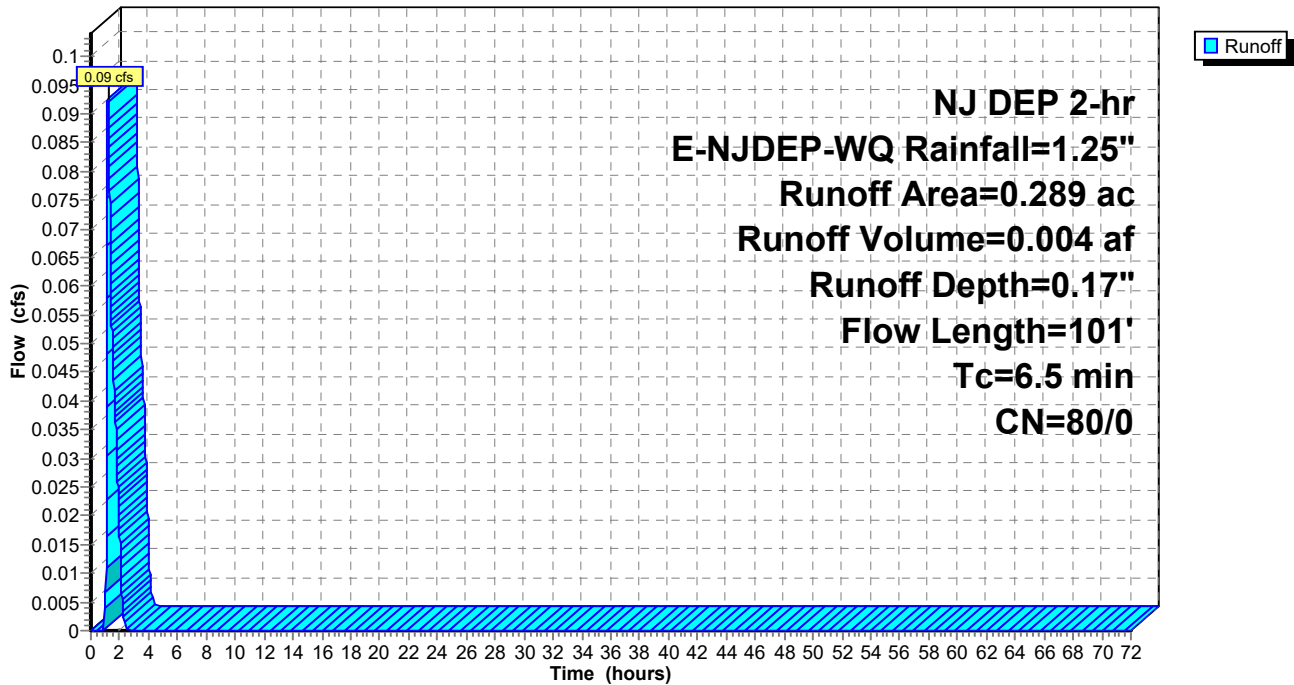
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 195

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 0.10 cfs @ 1.22 hrs, Volume= 0.005 af, Depth= 0.13"
 Routed to Pond B-5 : BASIN 5

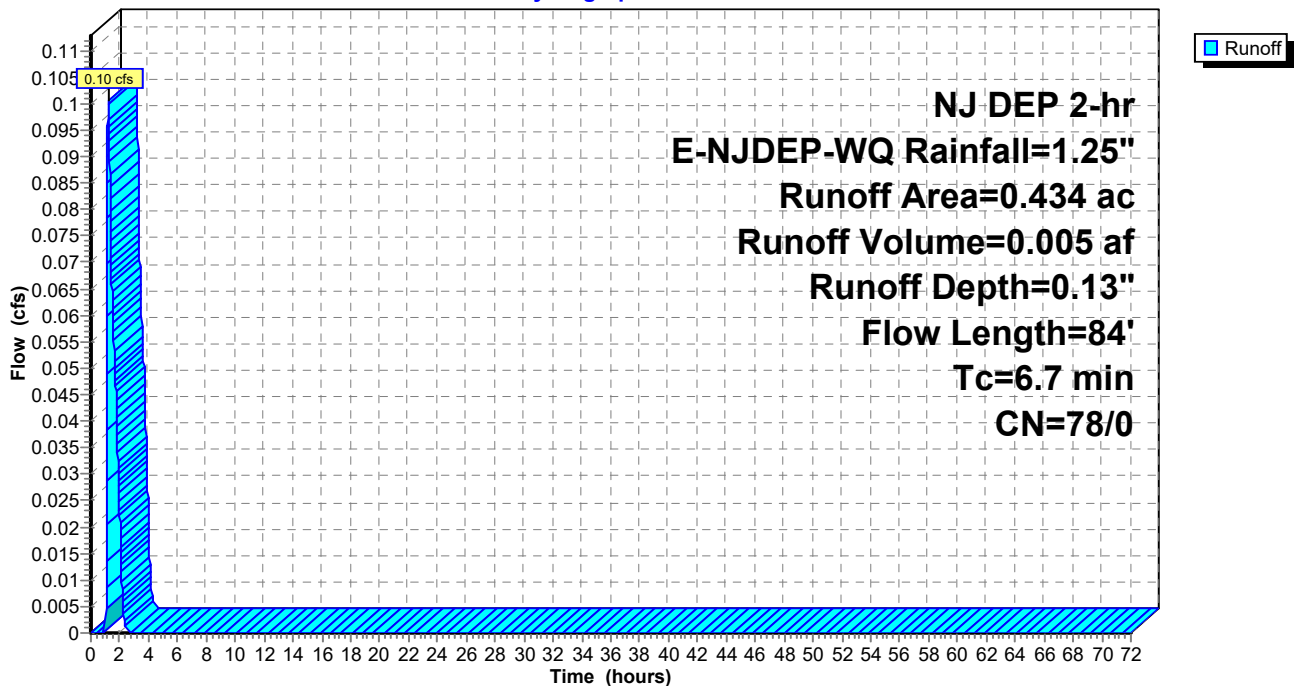
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 196

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 1.10 cfs @ 1.31 hrs, Volume= 0.081 af, Depth= 1.03"
 Routed to Link P-SR : SOUTH RIVER

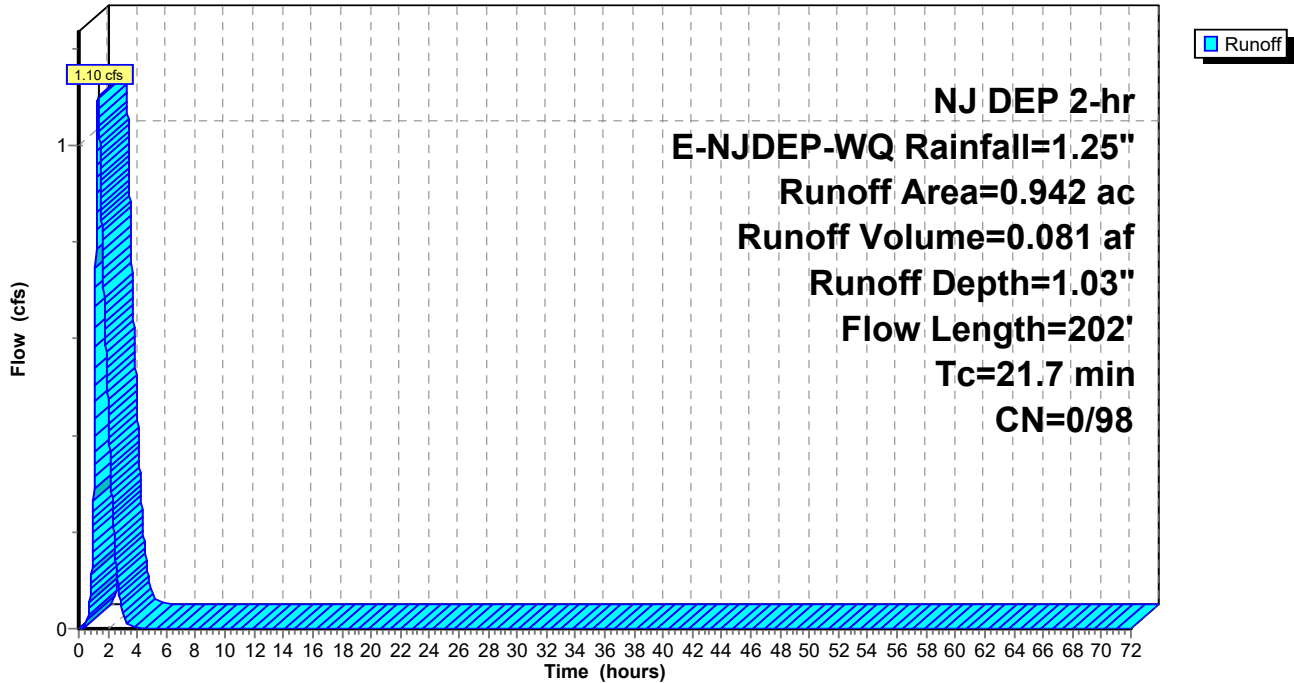
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 197

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 1.54 cfs @ 1.12 hrs, Volume= 0.055 af, Depth= 1.03"
 Routed to Link P-PC : POND CREEK

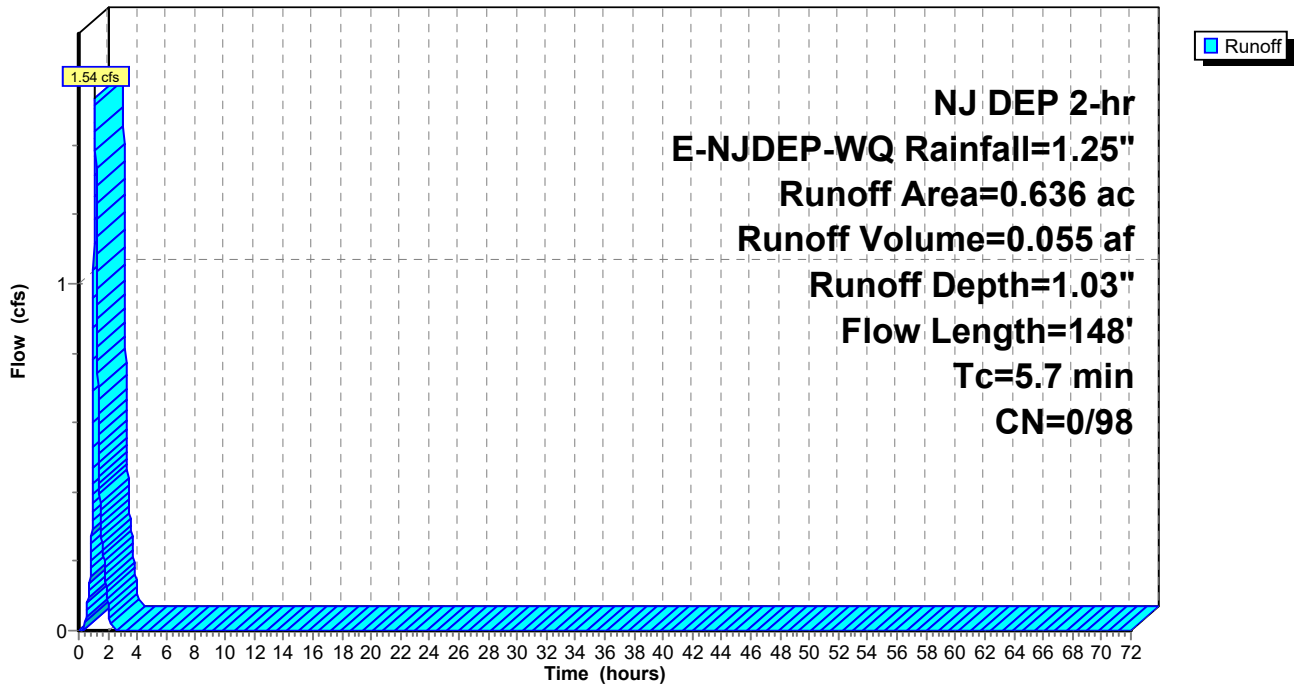
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 198

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 0.44 cfs @ 1.89 hrs, Volume= 0.052 af, Depth= 0.12"
 Routed to Link P-PC : POND CREEK

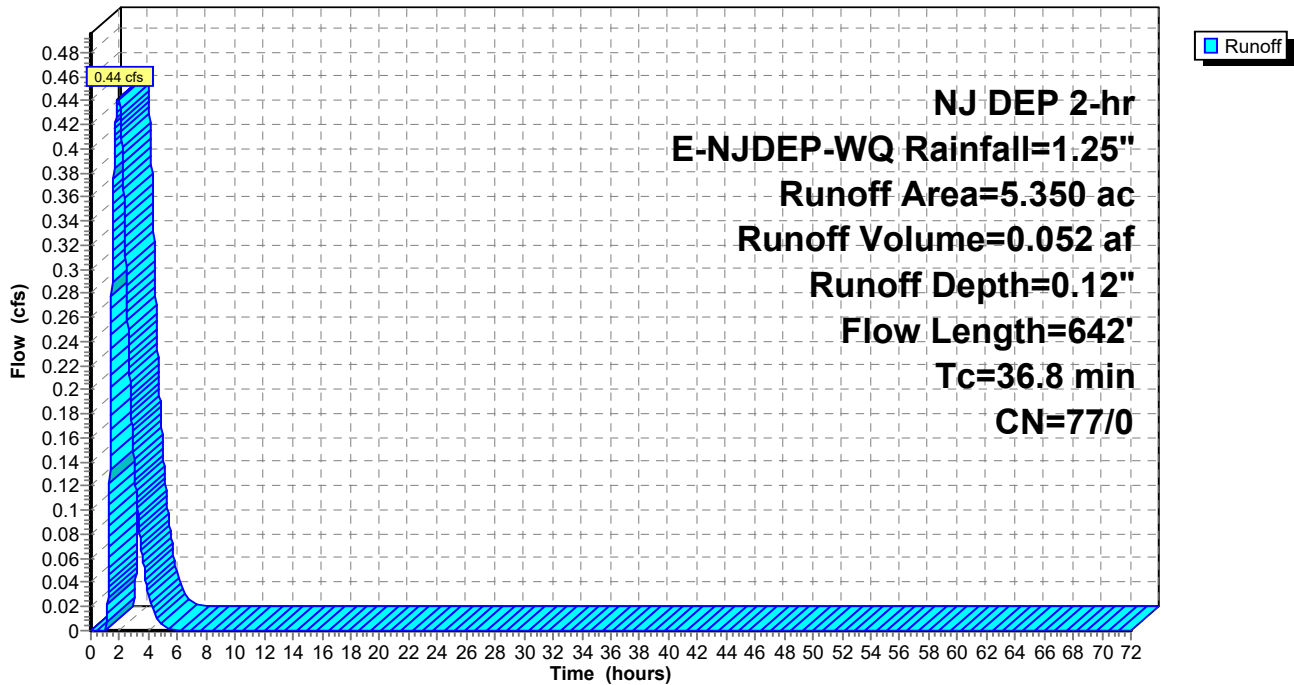
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 199

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 0.91 cfs @ 1.15 hrs, Volume= 0.039 af, Depth= 0.49"
 Routed to Link P-DC : DUCK CREEK

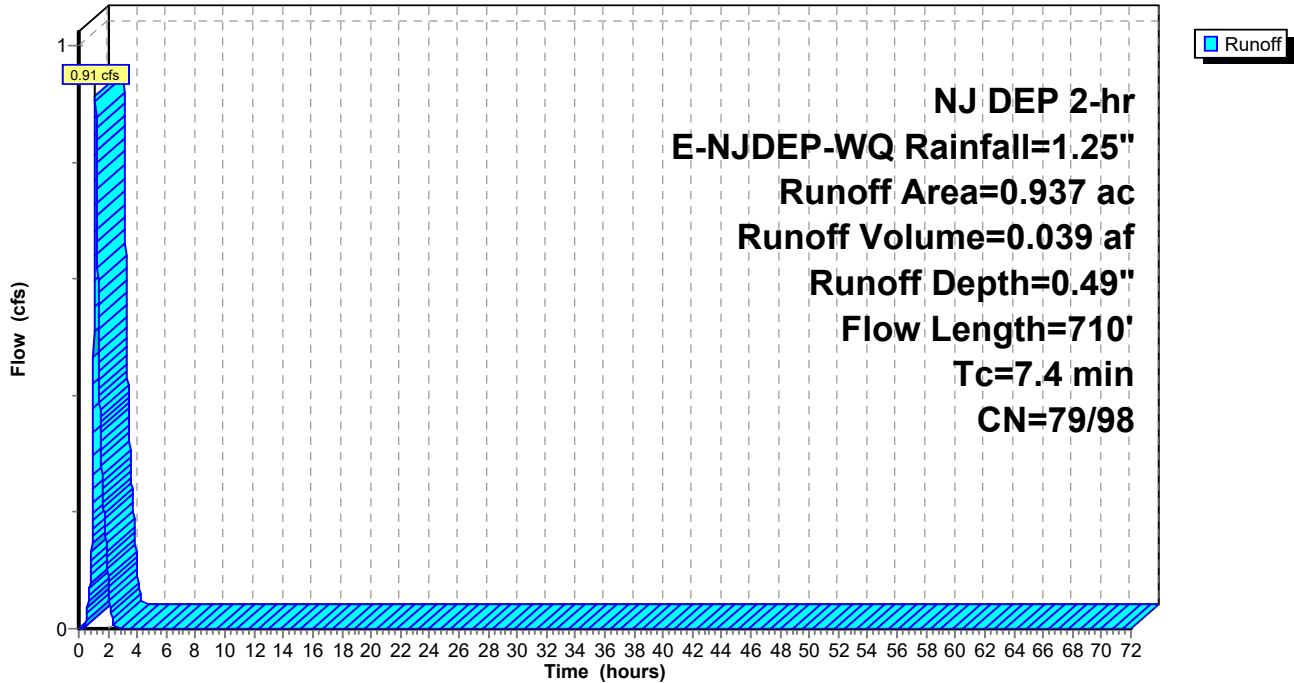
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 200

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.28 cfs @ 1.11 hrs, Volume= 0.010 af, Depth= 0.38"
 Routed to Link P-DC : DUCK CREEK

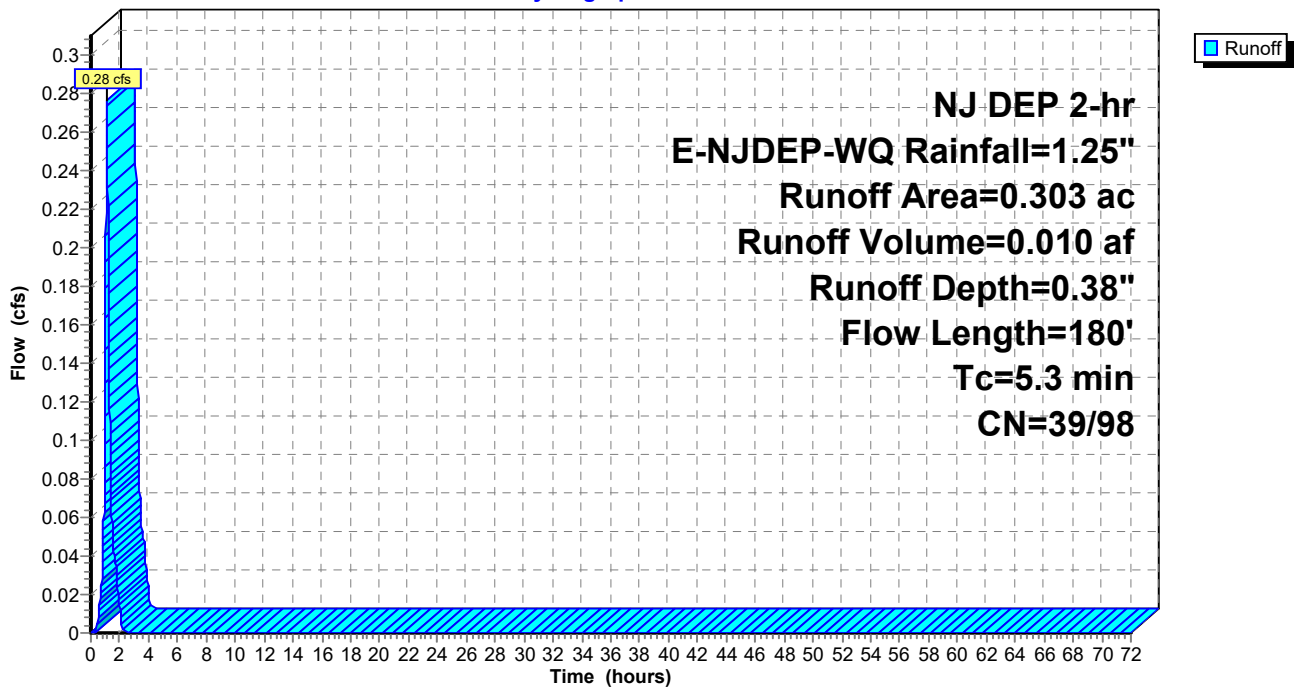
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 201

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 4.28 cfs @ 1.09 hrs, Volume= 0.129 af, Depth= 1.03"
 Routed to Pond B-2 : BASIN 2

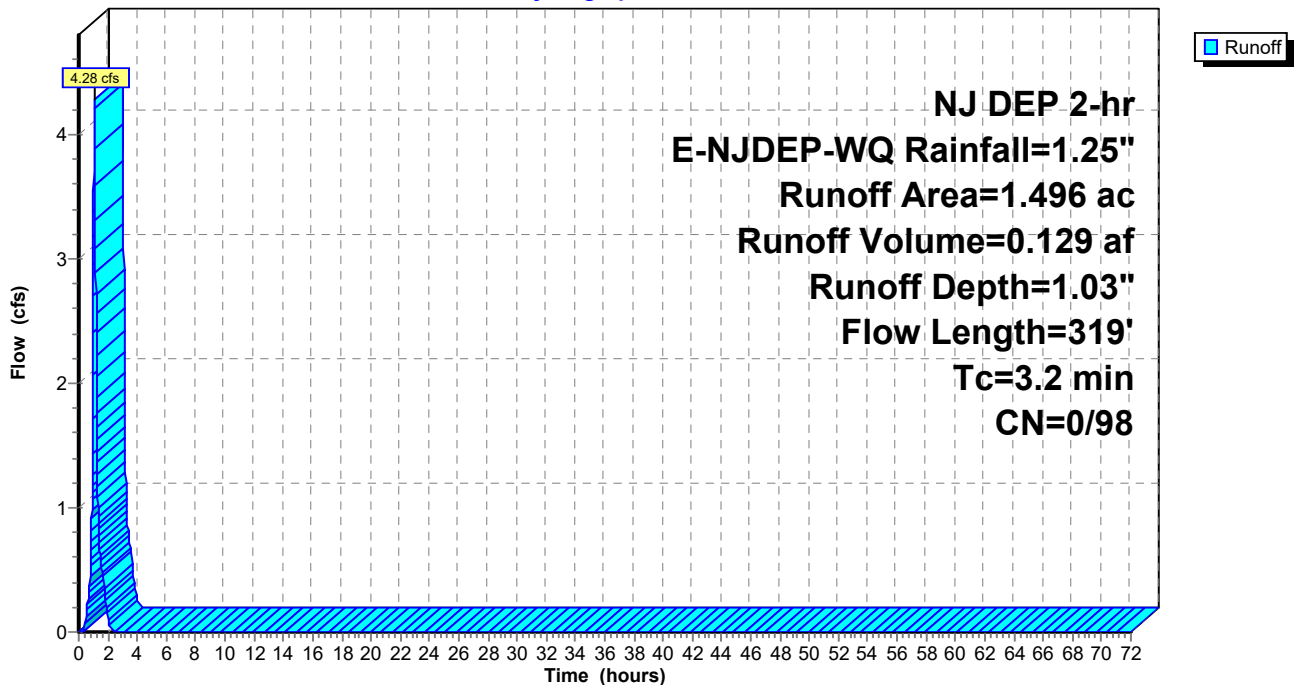
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 202

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 0.89 cfs @ 1.10 hrs, Volume= 0.029 af, Depth= 0.96"
 Routed to Pond B-3 : BASIN 3

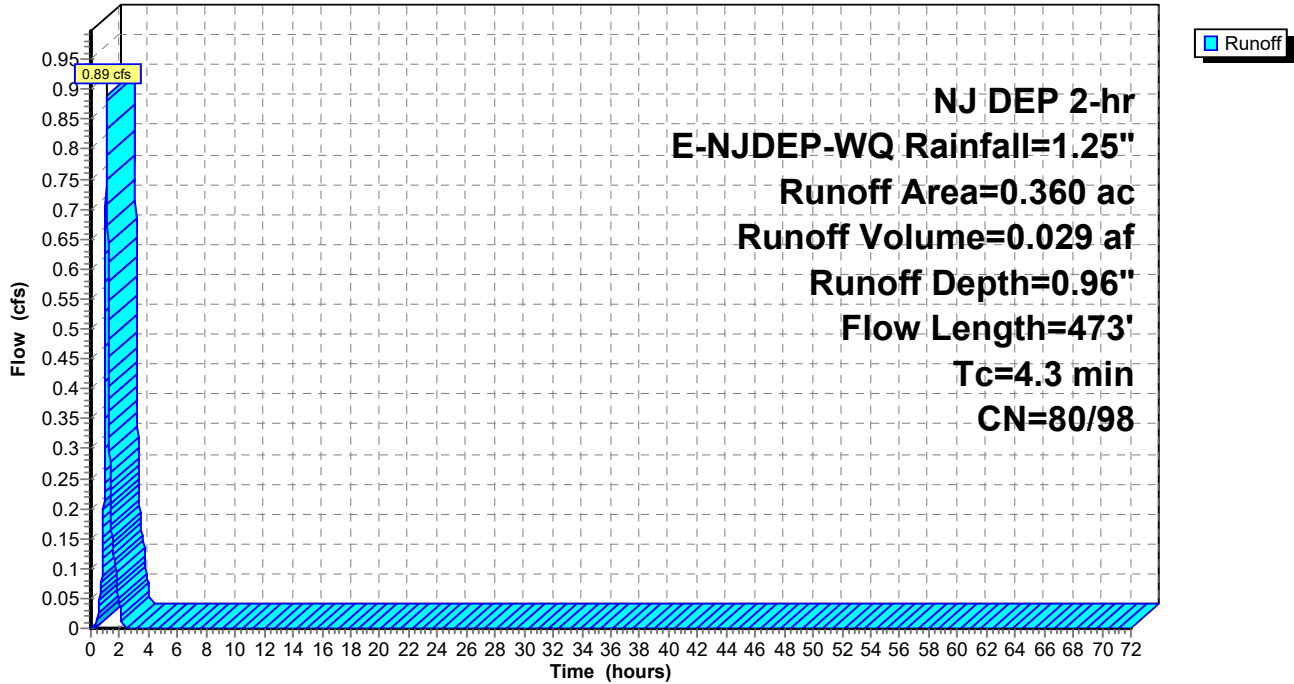
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 204

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 2.91 cfs @ 1.10 hrs, Volume= 0.091 af, Depth= 1.03"
 Routed to Pond B-3 : BASIN 3

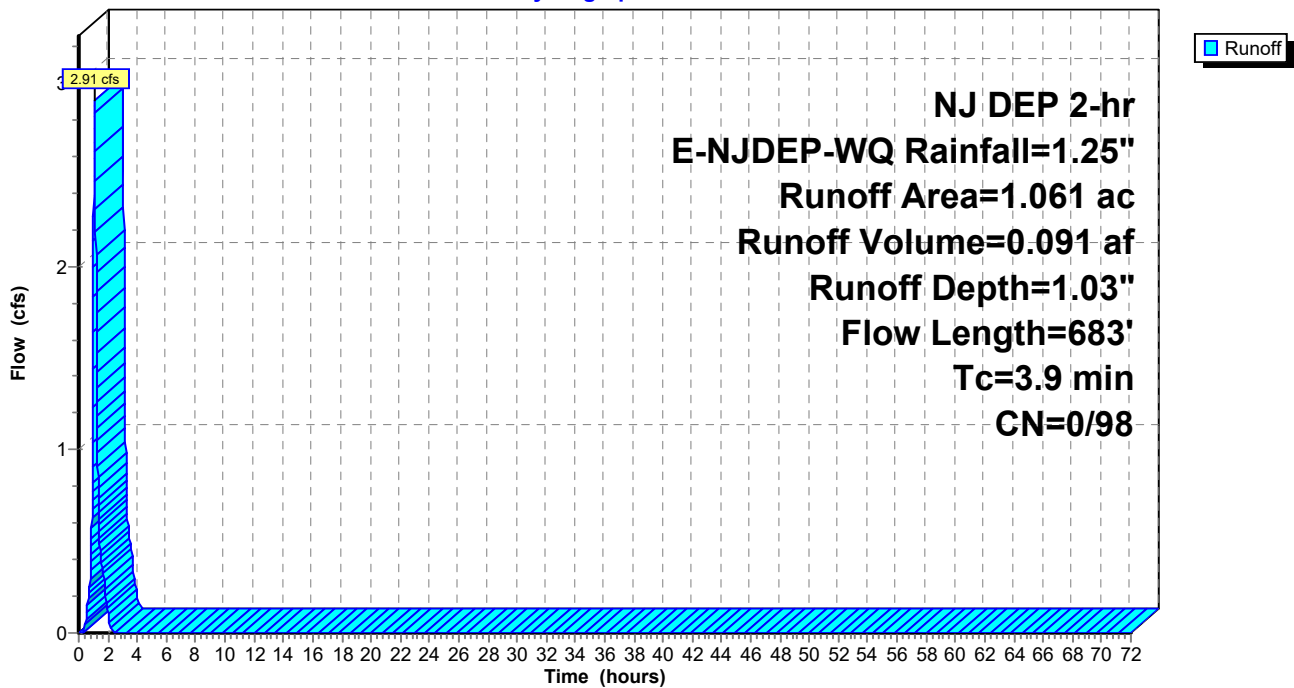
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 205

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 0.22 cfs @ 1.22 hrs, Volume= 0.013 af, Depth= 0.28"
 Routed to Pond B-4 : BASIN 4

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

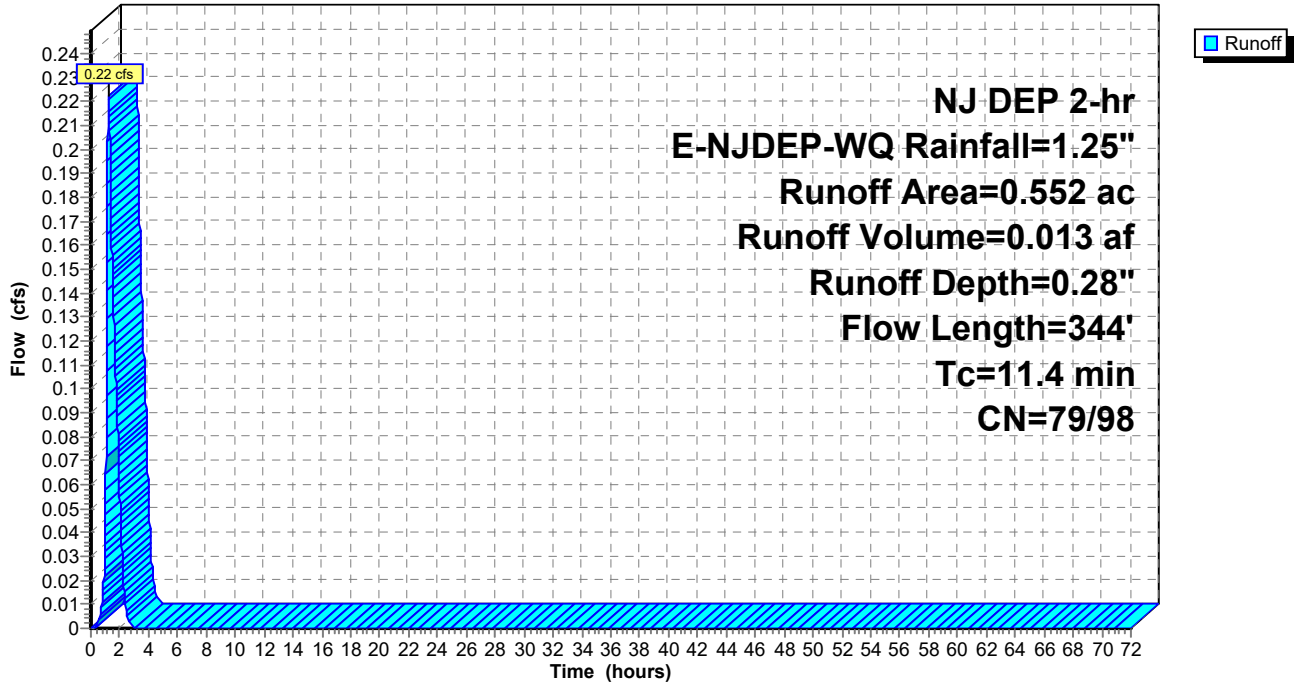
NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Printed 2/26/2025

Page 206

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 207

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 1.75 cfs @ 1.14 hrs, Volume= 0.072 af, Depth= 0.87"
 Routed to Pond B-4 : BASIN 4

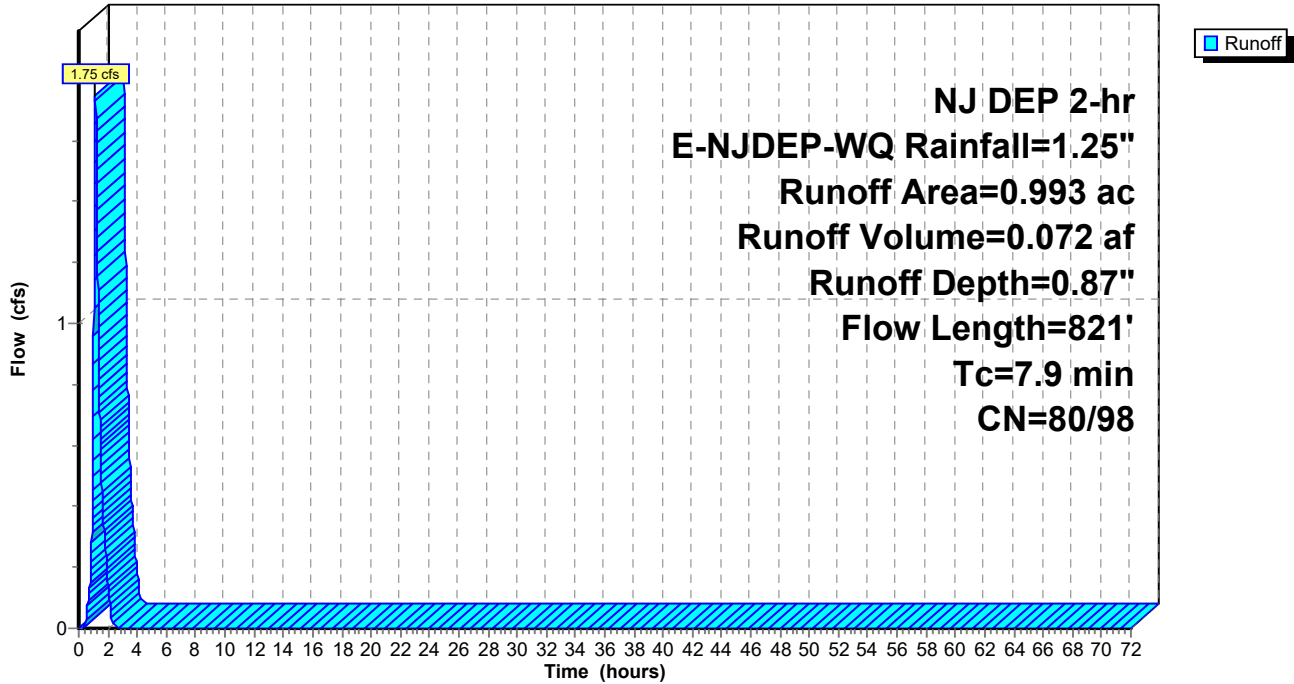
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 209

Summary for Subcatchment P-UG-1: UG-1

Runoff = 6.47 cfs @ 1.13 hrs, Volume= 0.247 af, Depth= 1.03"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

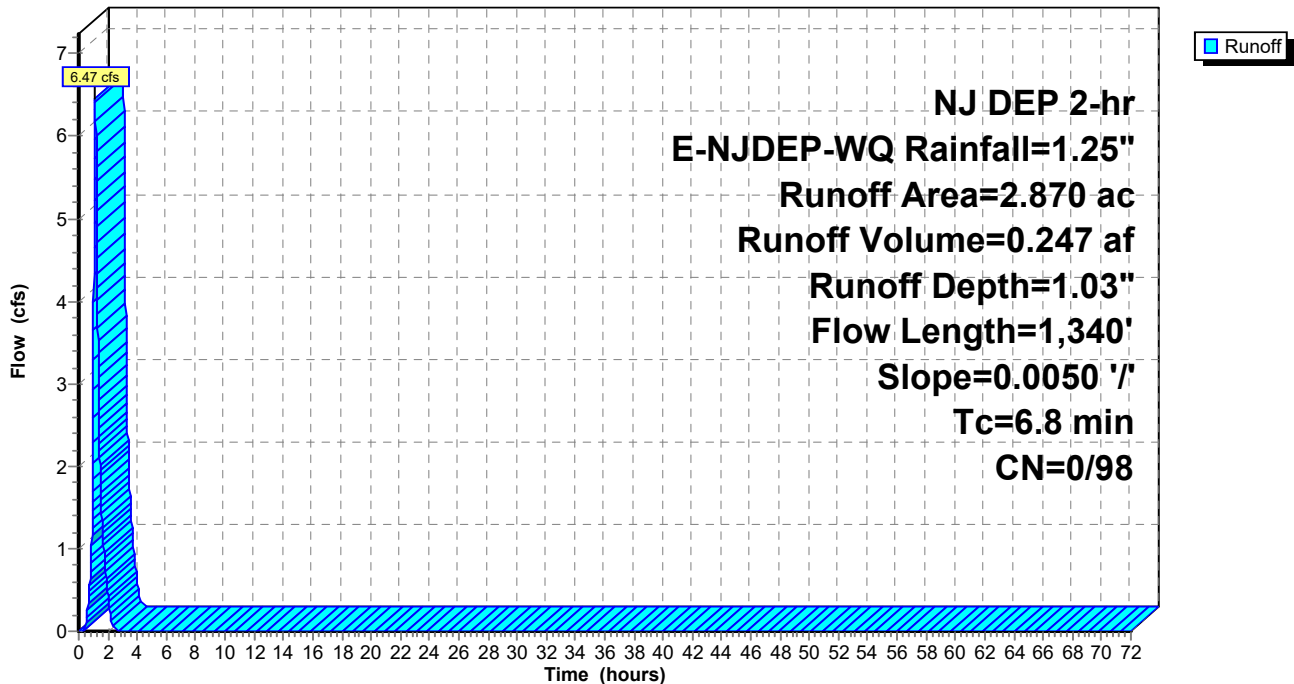
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 210

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 163% of capacity of segment #3

Runoff = 7.45 cfs @ 1.11 hrs, Volume= 0.247 af, Depth= 1.03"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

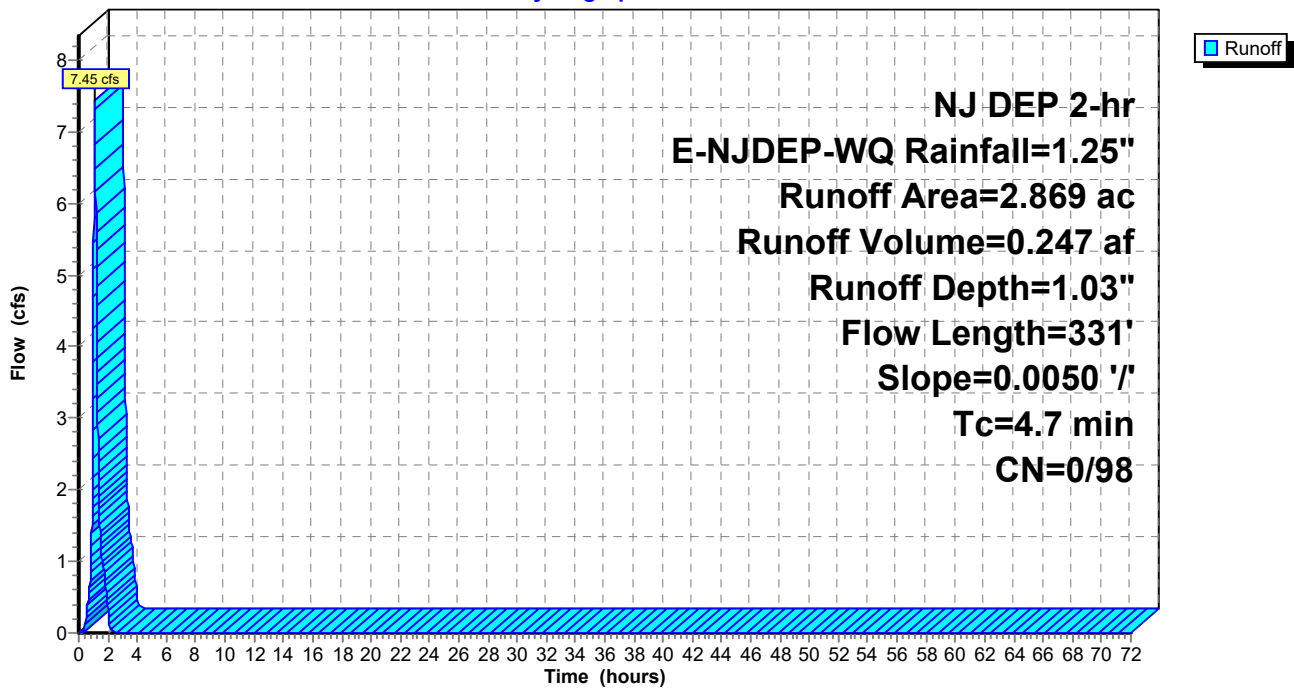
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 211

Summary for Reach 17R: E-1

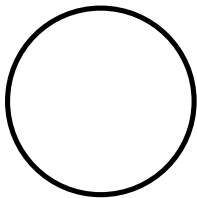
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.00" for E-NJDEP-WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

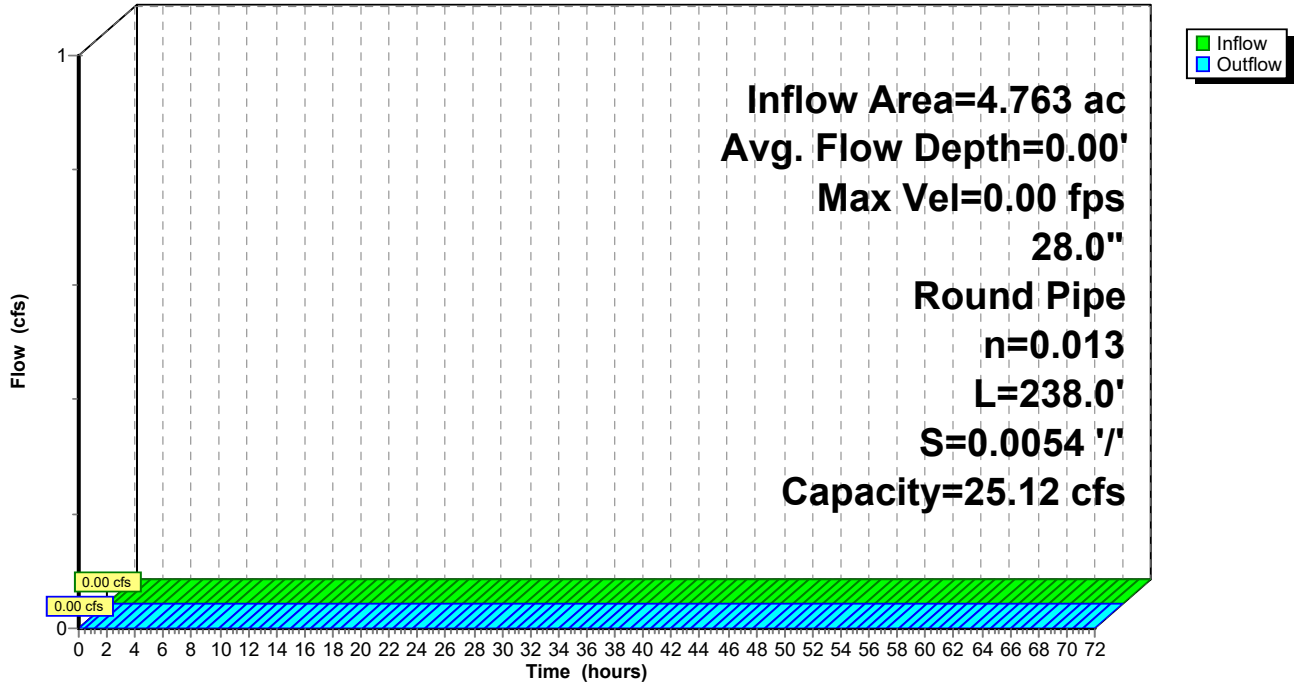
NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Printed 2/26/2025

Page 212

Reach 17R: E-1

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 213

Summary for Reach 18R: E-2

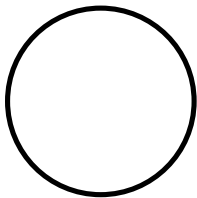
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.00" for E-NJDEP-WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



250225 - Exist & Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

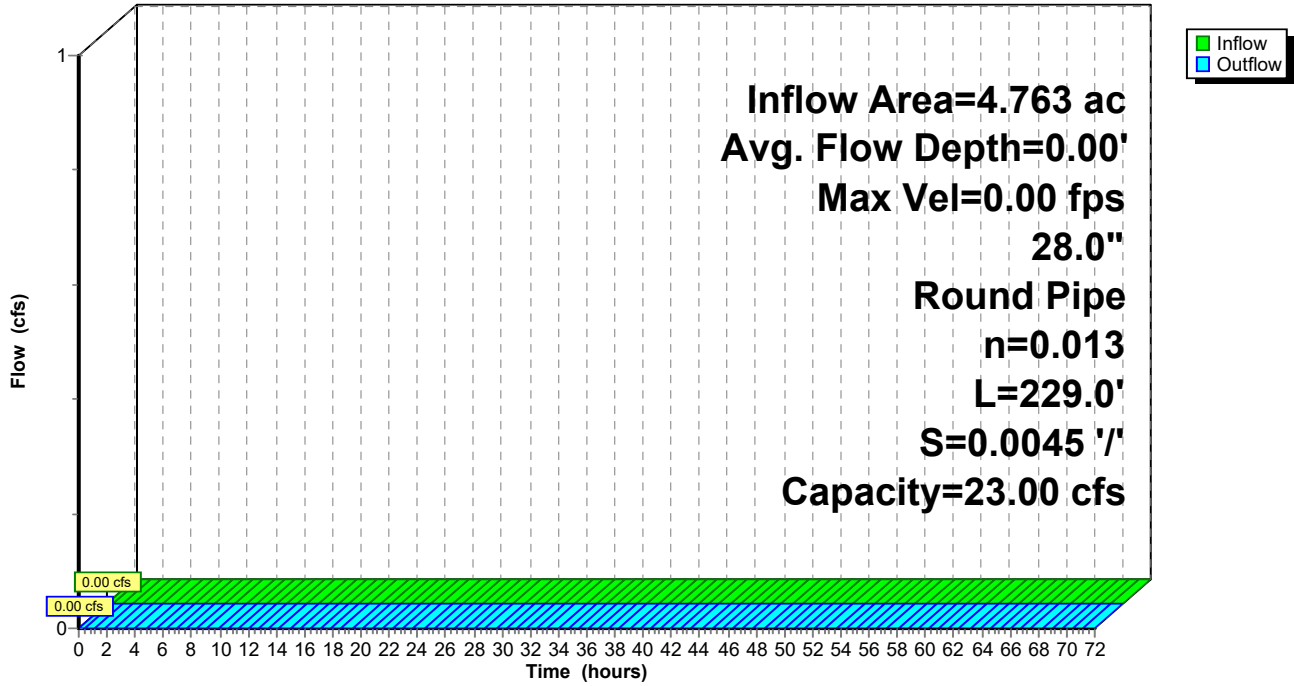
NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Printed 2/26/2025

Page 214

Reach 18R: E-2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 215

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 0.96" for E-NJDEP-WQ event
 Inflow = 4.35 cfs @ 1.09 hrs, Volume= 0.131 af
 Outflow = 0.24 cfs @ 1.85 hrs, Volume= 0.037 af, Atten= 94%, Lag= 45.3 min
 Primary = 0.24 cfs @ 1.85 hrs, Volume= 0.037 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 16.25' @ 1.85 hrs Surf.Area= 0.107 ac Storage= 0.120 af

Plug-Flow detention time= 206.9 min calculated for 0.037 af (28% of inflow)
 Center-of-Mass det. time= 190.5 min (260.2 - 69.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

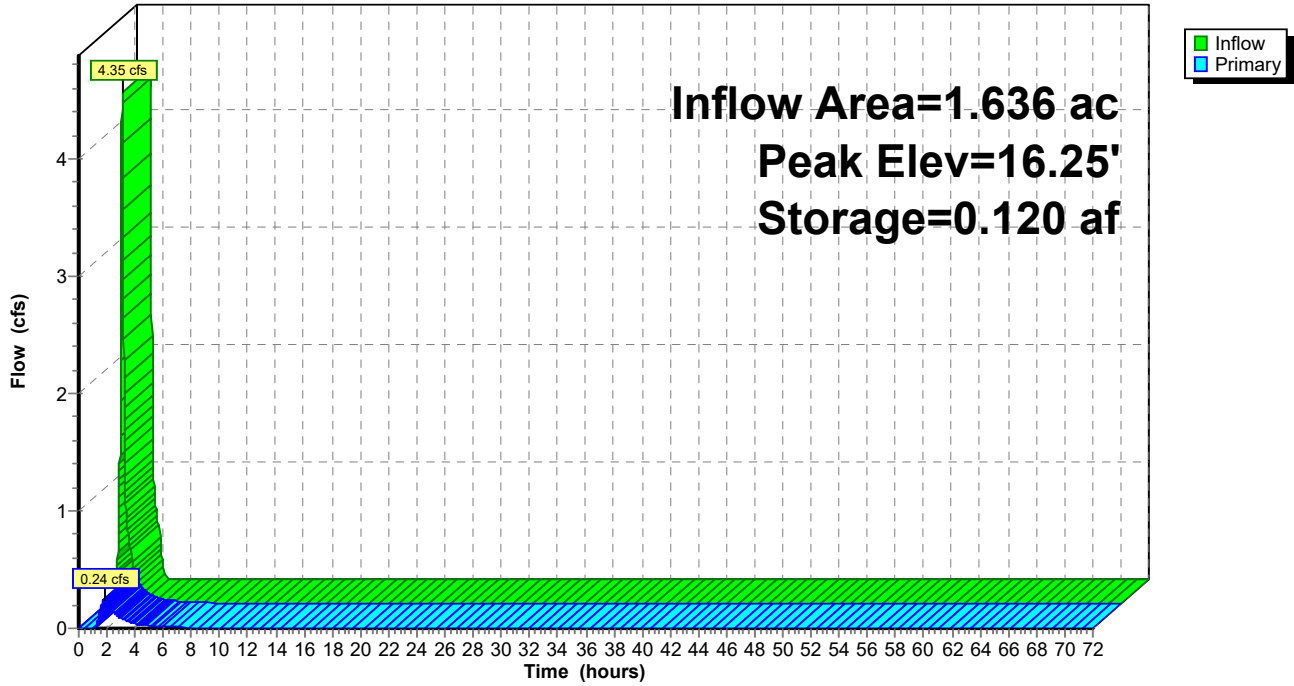
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.24 cfs @ 1.85 hrs HW=16.25' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.24 cfs of 7.01 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.24 cfs @ 1.71 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-2: BASIN 2

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 217

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 0.79" for E-NJDEP-WQ event
 Inflow = 3.98 cfs @ 1.10 hrs, Volume= 0.126 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 11.03' @ 2.48 hrs Surf.Area= 0.241 ac Storage= 0.126 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)	
10.50	0.231	569.6	0.000	0.000	0.231	
11.00	0.241	578.4	0.118	0.118	0.251	
12.00	0.259	596.0	0.250	0.368	0.291	
13.00	0.278	615.6	0.269	0.637	0.337	
13.50	0.295	633.5	0.143	0.780	0.378	

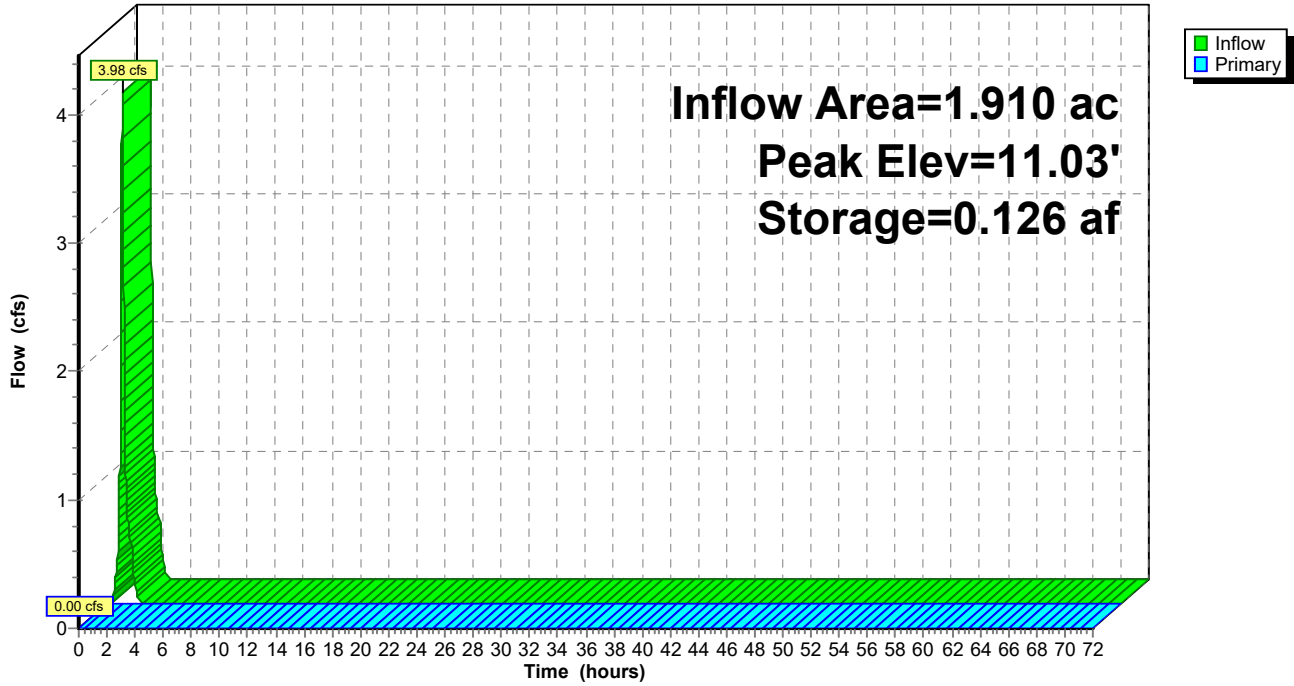
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.50' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.00 cfs of 25.88 cfs potential flow)
- 2=Orifice/Grate (Controls 0.00 cfs)
- 3=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-3: BASIN 3

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 219

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 0.58" for E-NJDEP-WQ event
 Inflow = 2.02 cfs @ 1.15 hrs, Volume= 0.089 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.58' @ 3.25 hrs Surf.Area= 4,216 sf Storage= 3,885 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

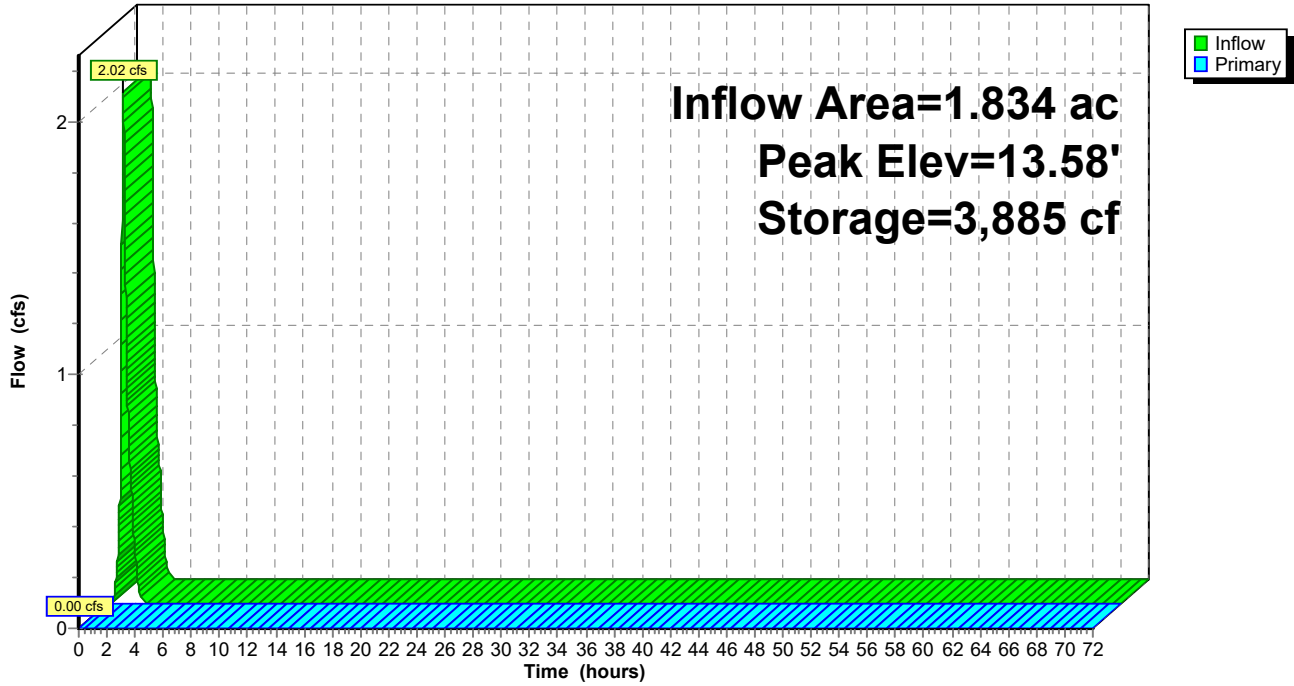
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.60' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.00 cfs of 8.95 cfs potential flow)
- 2=Orifice/Grate (Controls 0.00 cfs)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 221

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 0.87" for E-NJDEP-WQ event
 Inflow = 4.95 cfs @ 1.15 hrs, Volume= 0.212 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.80' @ 2.94 hrs Surf.Area= 8,076 sf Storage= 9,215 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	6,858	409.0	0	0	6,858	
13.00	7,629	429.0	2,896	2,896	8,202	
14.00	8,186	439.0	7,906	10,802	9,018	
14.10	8,239	440.0	821	11,623	9,101	
15.00	8,985	459.0	7,748	19,372	10,519	
16.00	9,537	468.1	9,260	28,631	11,335	

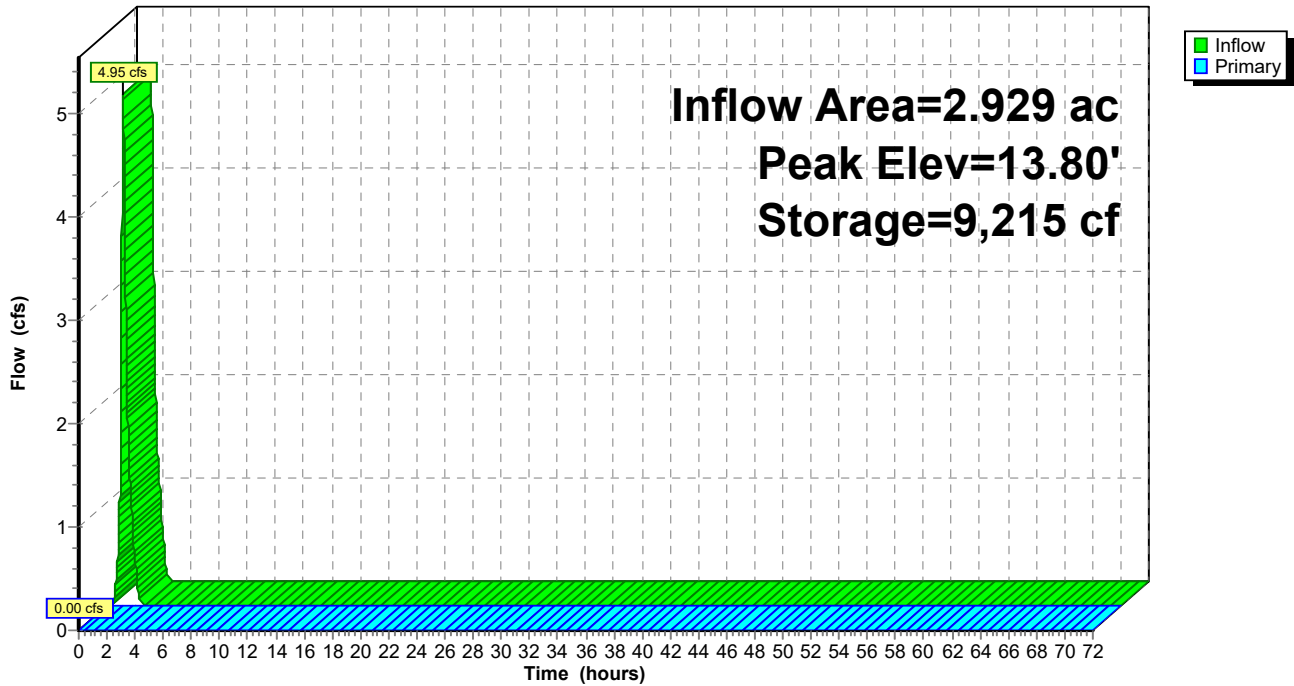
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=12.60' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.00 cfs of 9.88 cfs potential flow)
- 2=Orifice/Grate (Controls 0.00 cfs)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 223

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 1.03" for E-NJDEP-WQ event
 Inflow = 13.80 cfs @ 1.12 hrs, Volume= 0.495 af
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Peak Elev= 10.89' @ 2.76 hrs Surf.Area= 0.631 ac Storage= 0.495 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.25' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.00 cfs of 19.09 cfs potential flow)
- 2=Orifice/Grate (Controls 0.00 cfs)
- 3=Orifice/Grate (Controls 0.00 cfs)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 224

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0" End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 = 32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 = 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

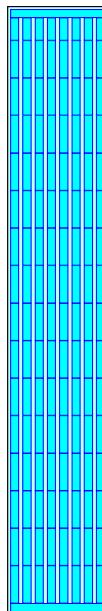
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 225

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0" End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

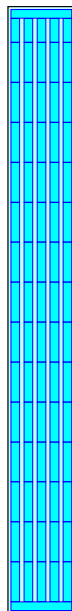
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

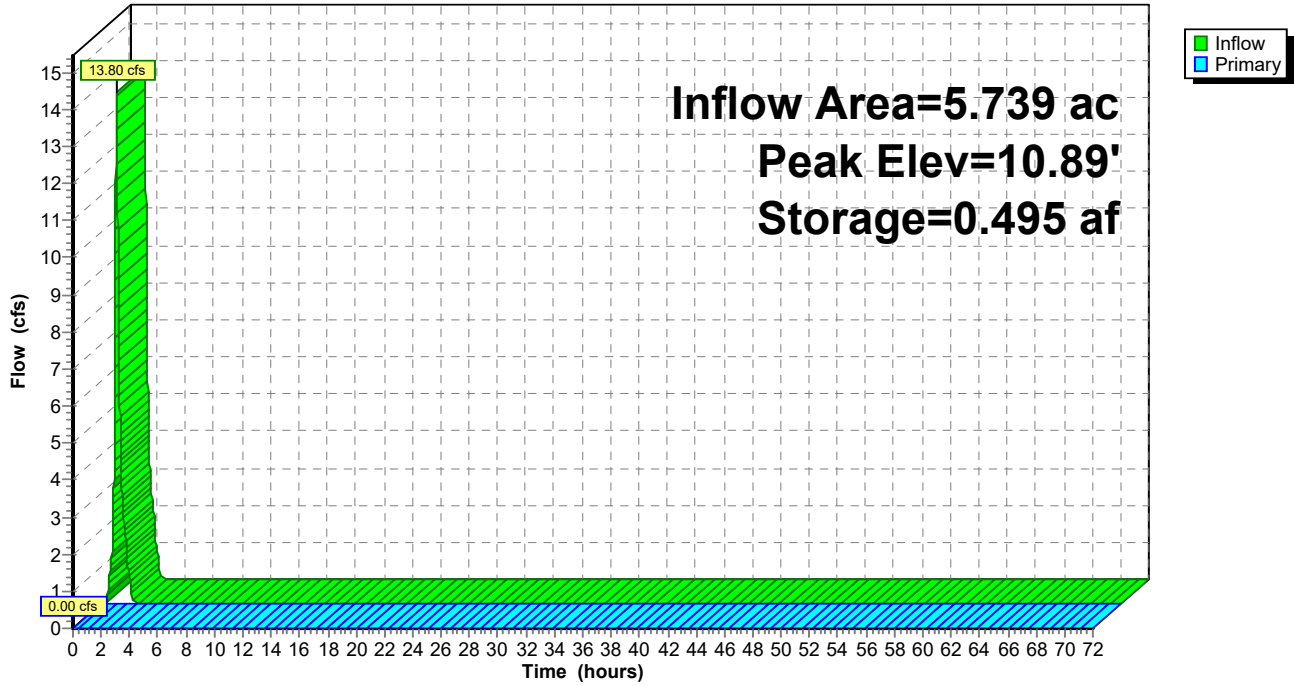
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



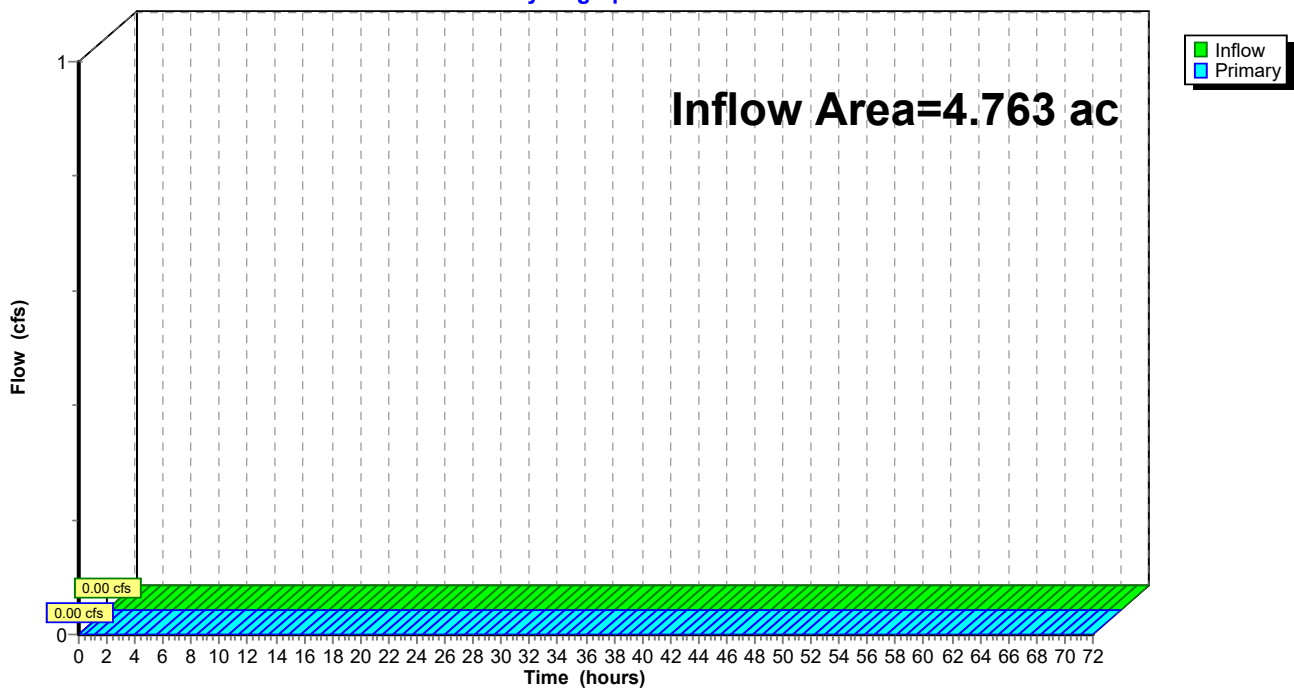
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.00" for E-NJDEP-WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 228

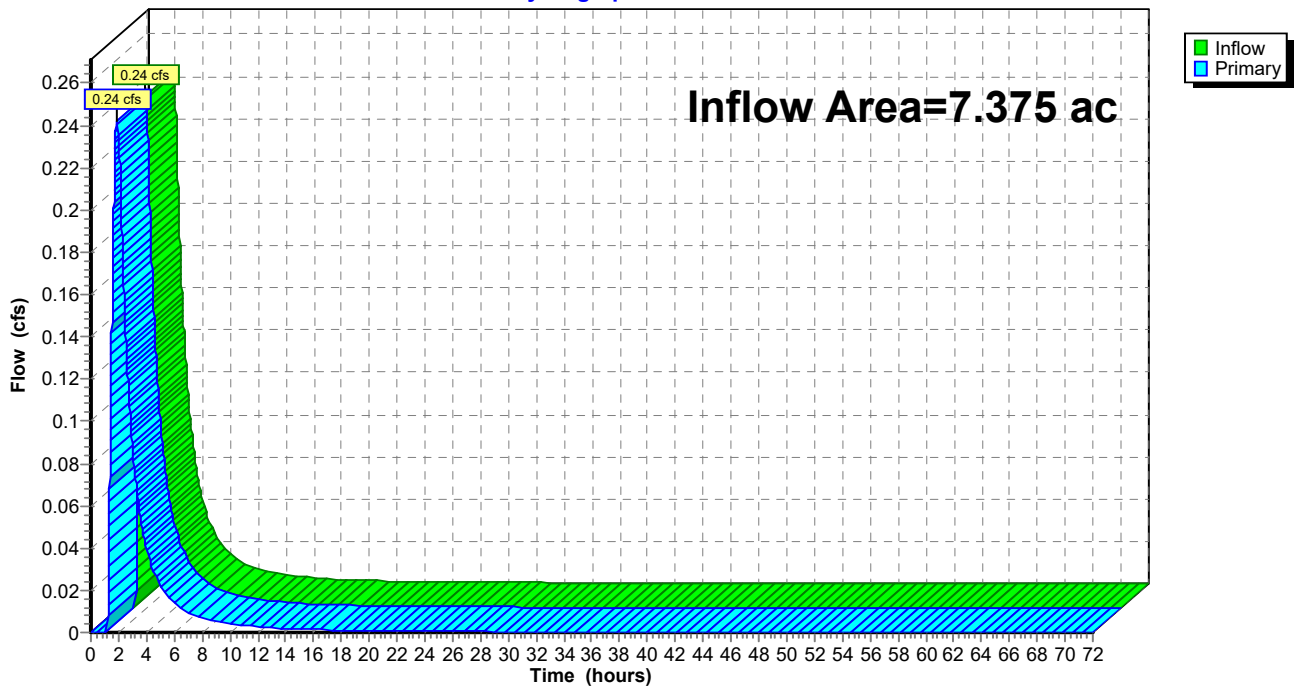
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 0.06" for E-NJDEP-WQ event
Inflow = 0.24 cfs @ 1.85 hrs, Volume= 0.037 af
Primary = 0.24 cfs @ 1.85 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



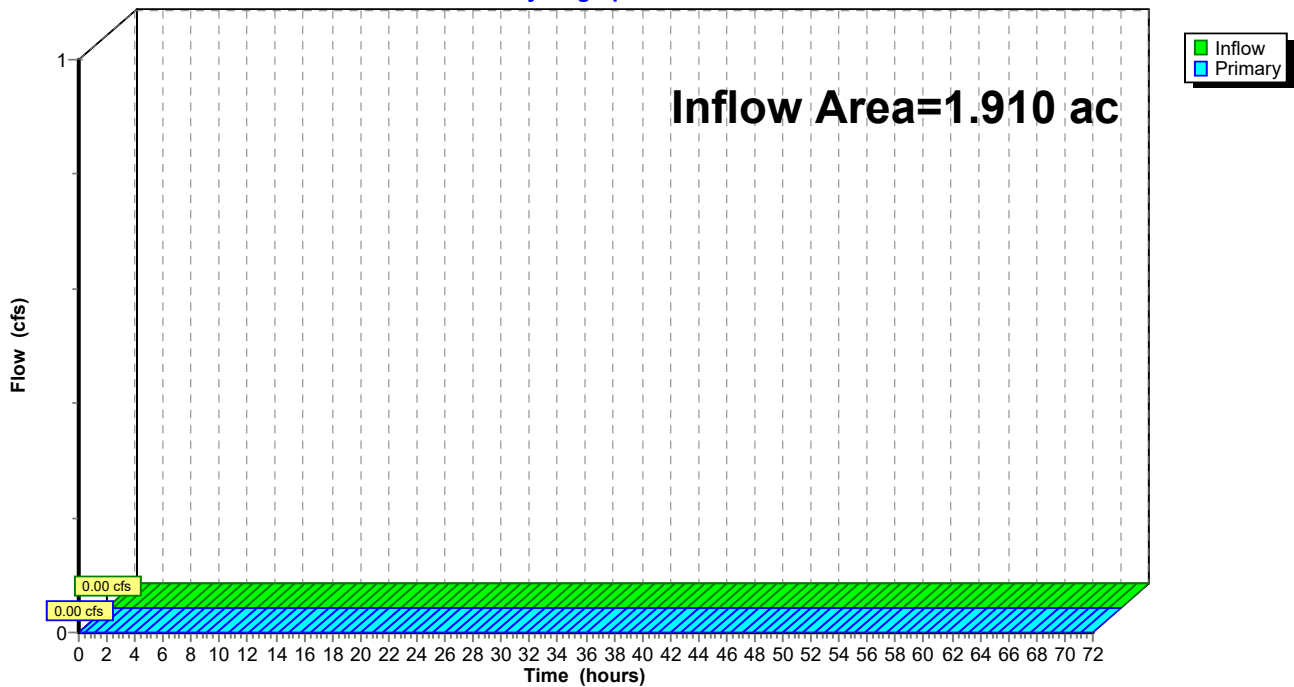
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 0.00" for E-NJDEP-WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



250225 - Exist & Proposed Conditions

NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/26/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 230

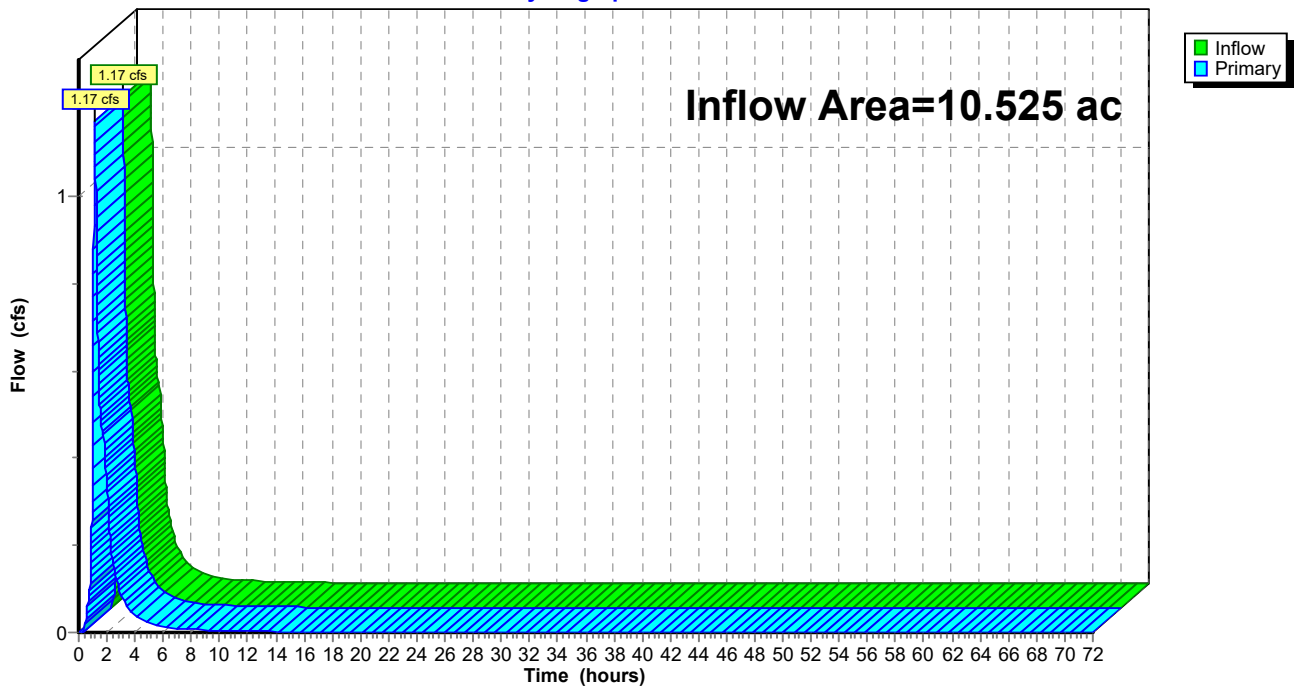
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth = 0.10" for E-NJDEP-WQ event
Inflow = 1.17 cfs @ 1.14 hrs, Volume= 0.085 af
Primary = 1.17 cfs @ 1.14 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



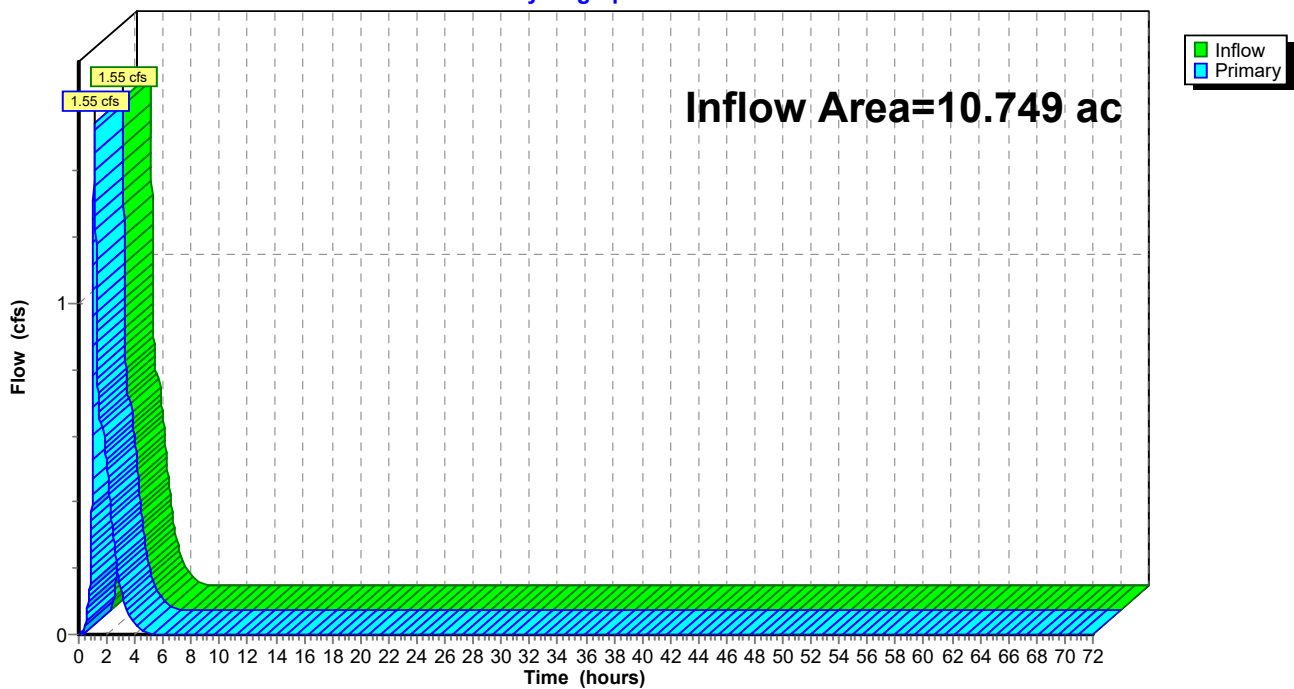
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 0.12" for E-NJDEP-WQ event
Inflow = 1.55 cfs @ 1.12 hrs, Volume= 0.107 af
Primary = 1.55 cfs @ 1.12 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



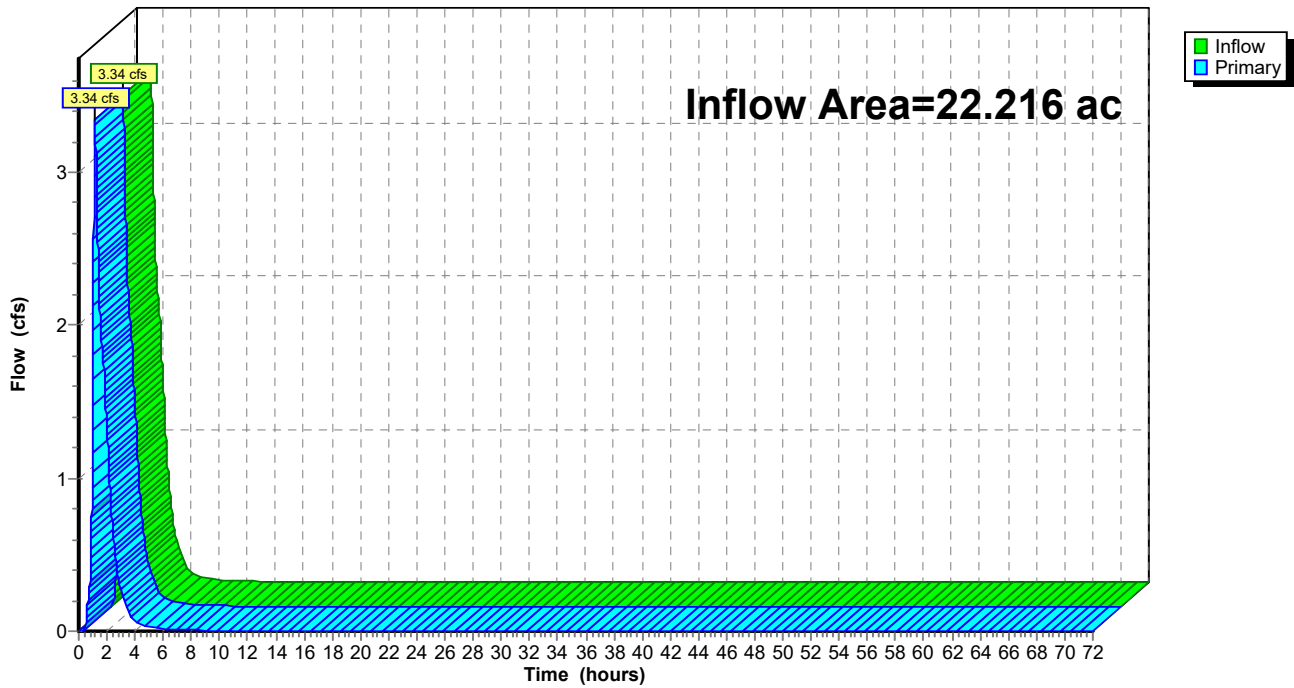
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth = 0.15" for E-NJDEP-WQ event
Inflow = 3.34 cfs @ 1.14 hrs, Volume= 0.273 af
Primary = 3.34 cfs @ 1.14 hrs, Volume= 0.273 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

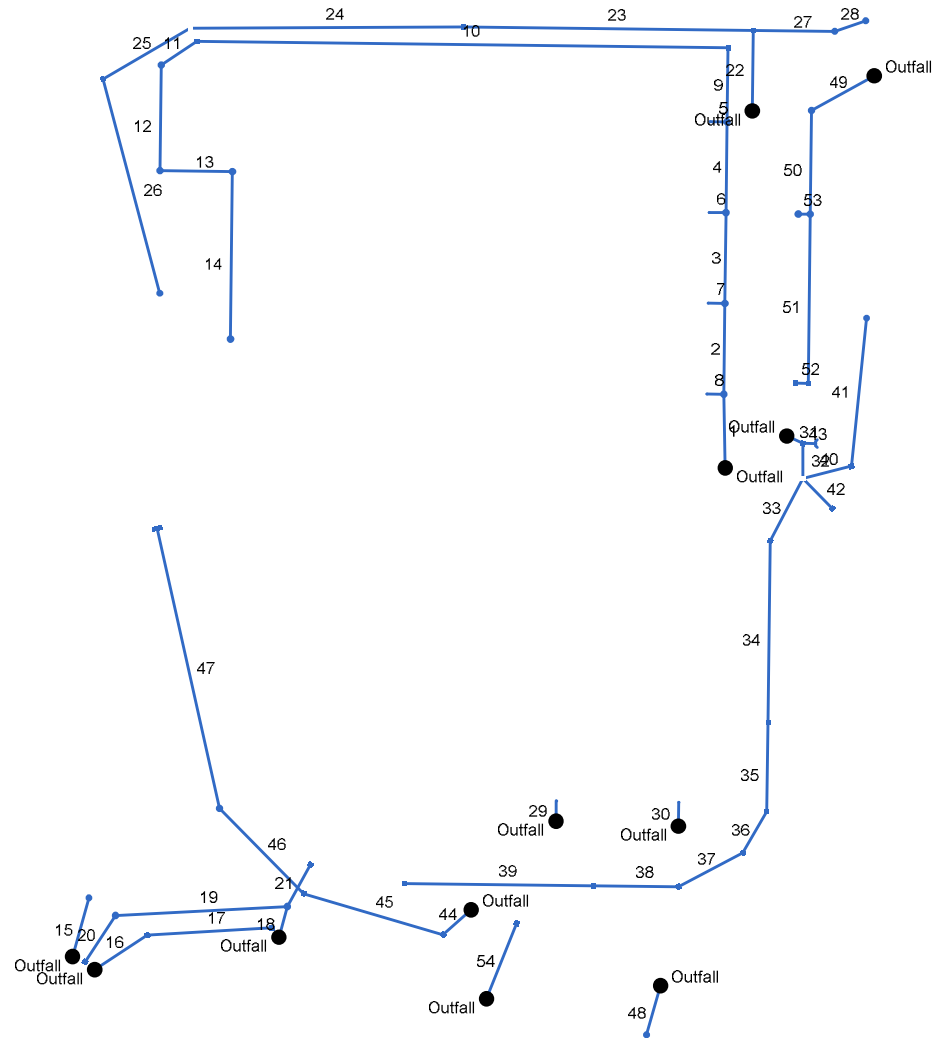
Hydrograph



APPENDIX D

Stormwater Conveyance Calculations

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Date: 2/26/2025

Calculated By: TB

Checked By: DSS

Project No.: 10000657C

Hydraflow Storm Sewers



STANDARD PIPE CAPACITY

Table with 22 columns: Line No., Line ID, Inlet ID, Drainage Area (ac), Runoff Coeff (C), Tc (min), i Sys (in/hr), QCaptured (cfs), Total Runoff (cfs), Known Q (cfs), Flow Rate (cfs), Capacity Full (cfs), Vel Ave (ft/s), Line Type, n-value Pipe, Line Size (in), Line Slope (%), Line Length (ft), Invert Up (ft), Invert Dn (ft), Struct Length (ft), Struct Width (ft). Rows 1-42 contain detailed data for various pipe segments.

Date: 2/26/2025

Calculated By: TB

Checked By: DSS

Project No.: 10000657C

Hydraflow Storm Sewers



43	P-17	S-17A	0.49	0.90	10.0	6.95	3.06	3.06	0.00	3.06	10.55	2.50	Cir	0.012	15	2.27	10.998	12.90	12.65	....	....
44	P-39B	S-39B	0.04	0.90	12.1	6.52	0.25	6.98	0.00	6.98	11.31	3.95	Cir	0.012	18	0.99	32.368	10.82	10.50	3.50	4.00
45	P-39A	S-39A	0.09	0.90	11.6	6.62	0.56	6.86	0.00	6.86	11.40	3.88	Cir	0.012	18	1.00	124.562	12.07	10.82	3.50	4.00
46	P-39	S-39	0.00	0.00	11.1	6.72	....	6.41	0.00	6.41	11.38	3.63	Cir	0.012	18	1.00	102.965	13.10	12.07	4.00	4.00
47	P-38	S-38	1.06	0.90	10.0	6.95	6.63	6.63	0.00	6.63	11.38	4.54	Cir	0.012	18	1.00	246.780	15.57	13.10	3.50	8.50
48	P-31	S-31	0.22	0.90	10.0	6.95	1.38	1.38	0.00	1.38	2.73	1.75	Cir	0.012	12	0.50	44.000	10.72	10.50	3.50	4.00
49	P-11B	S-11B	0.00	0.00	1.3	0.00	....	0.00	0.00	11.94	17.41	3.80	Cir	0.012	24	0.50	61.419	8.46	8.15	4.00	4.00
50	P-11A	S-11A	0.00	0.00	0.9	0.00	....	0.00	0.00	11.94	17.20	3.80	Cir	0.012	24	0.49	89.327	8.90	8.46	4.00	4.00
51	P-12C	S-12B	0.00	0.00	0.1	0.00	....	0.00	0.00	3.68	4.95	3.00	Cir	0.012	15	0.50	145.582	9.63	8.90	4.00	4.00
52	P-89	S-12C	0.00	0.00	0.0	0.00	3.68	0.00	3.68	3.68	4.72	3.00	Cir	0.012	15	0.45	11.000	9.68	9.63	4.00	4.00
53	P-11	S-11	0.00	0.00	0.0	0.00	8.26	0.00	8.26	8.26	17.10	2.63	Cir	0.012	24	0.49	10.270	9.18	9.13	4.00	4.00
54	P-33	S-33	0.00	0.00	0.0	0.00	2.68	0.00	2.68	2.68	8.03	1.52	Cir	0.012	18	0.50	70.272	6.35	6.00	4.00	4.00

Date: 2/26/2025

Calculated By: TB

Checked By: DSS

Project No.: 10000657C

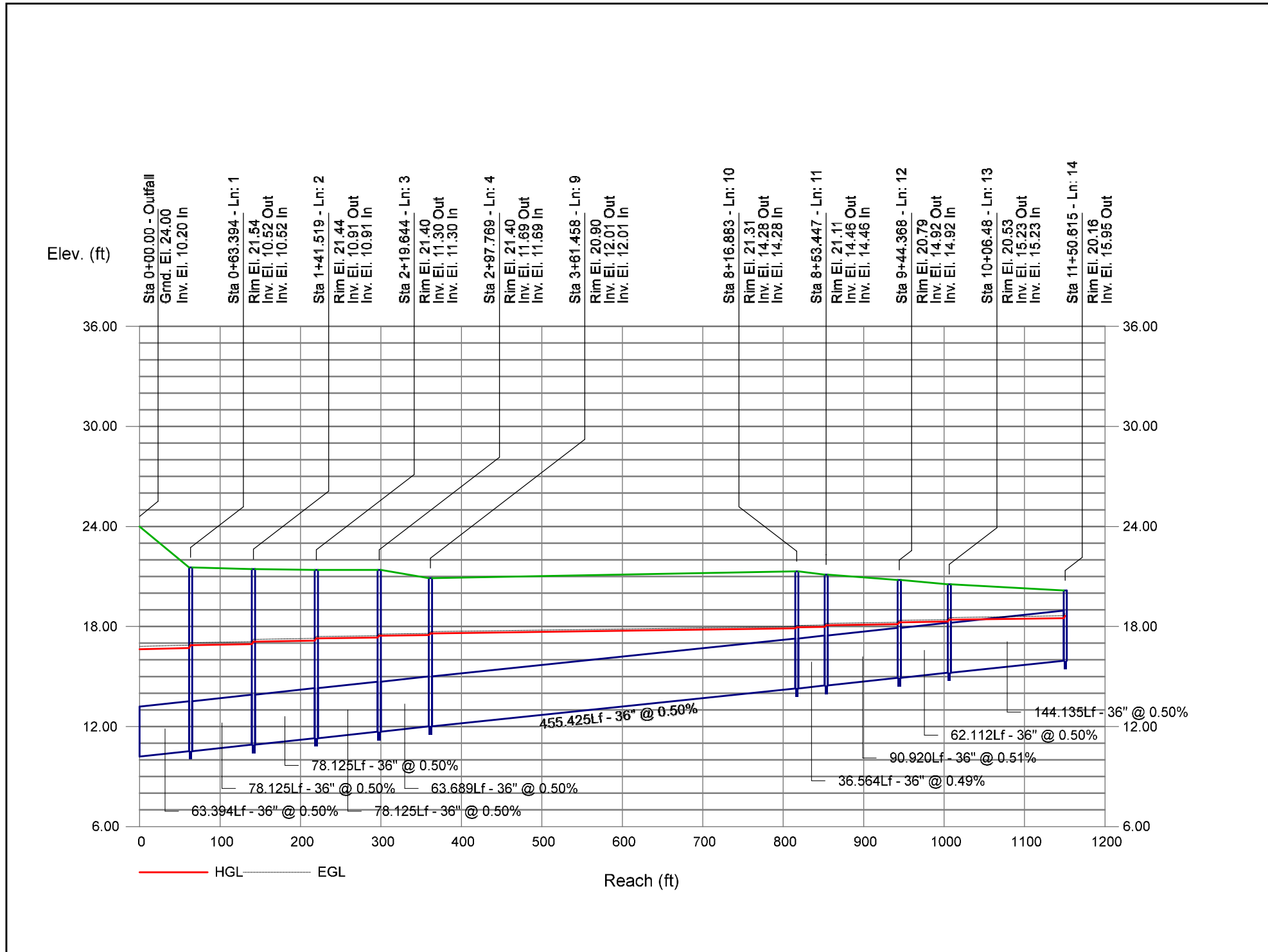
Hydraflow Storm Sewers



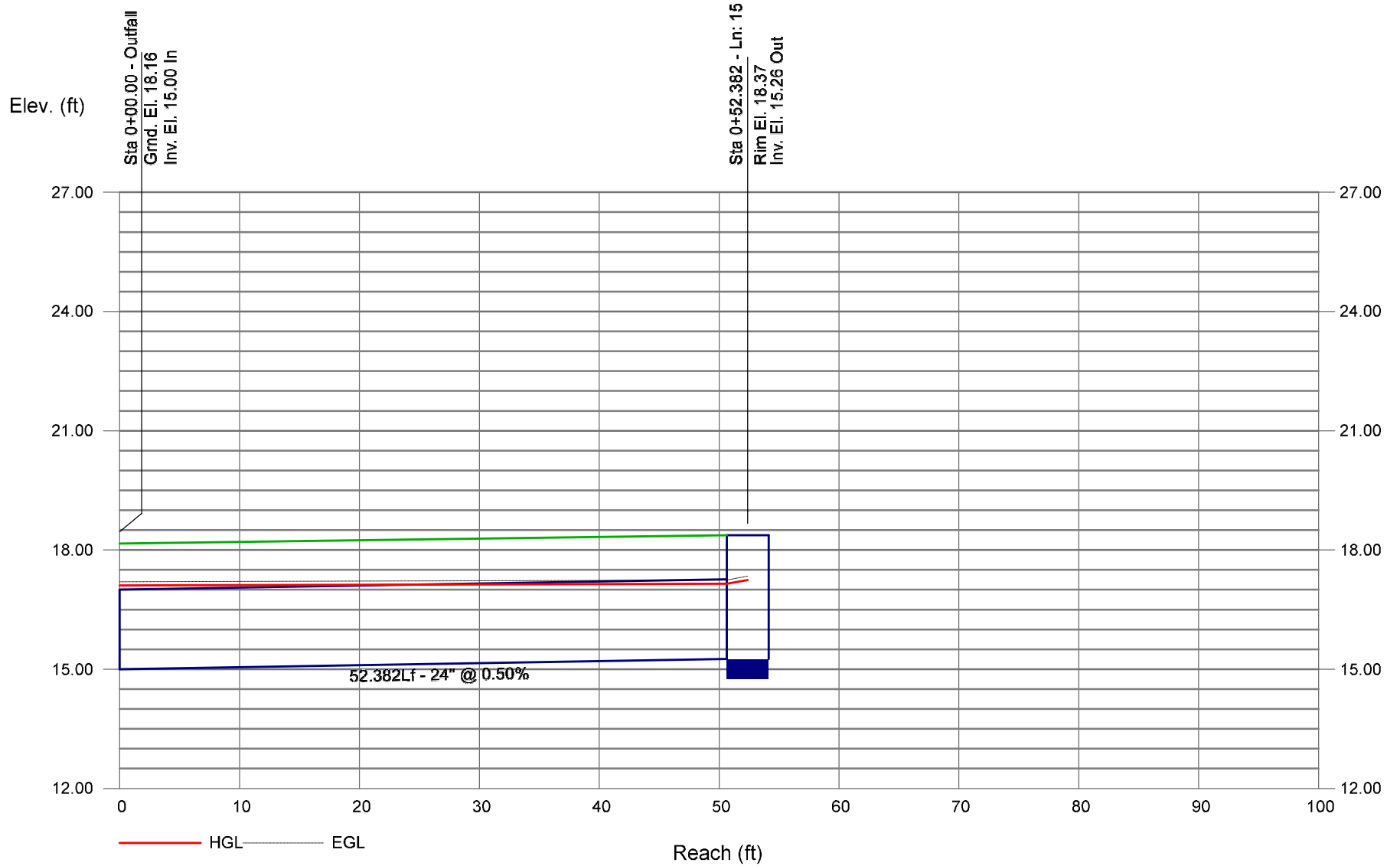
43	P-17	S-17A	0.49	0.90	10.0	6.95	3.06	3.06	0.00	3.06	17.15	3.30	Cir	0.012	18	2.27	10.998	12.90	12.65	....	....
44	P-39B	S-39B	0.04	0.90	13.8	6.23	0.25	6.67	0.00	6.67	24.36	2.12	Cir	0.012	24	0.99	32.368	10.82	10.50	3.50	4.00
45	P-39A	S-39A	0.09	0.90	12.8	6.40	0.56	6.62	0.00	6.62	24.55	2.16	Cir	0.012	24	1.00	124.562	12.07	10.82	3.50	4.00
46	P-39	S-39	0.00	0.00	12.0	6.55	....	6.25	0.00	6.25	24.51	3.36	Cir	0.012	24	1.00	102.965	13.10	12.07	4.00	4.00
47	P-38	S-38	1.06	0.90	10.0	6.95	6.63	6.63	0.00	6.63	24.51	4.85	Cir	0.012	24	1.00	246.780	15.57	13.10	3.50	8.50
48	P-31	S-31	0.22	0.90	10.0	6.95	1.38	1.38	0.00	1.38	4.95	1.12	Cir	0.012	15	0.50	44.000	10.72	10.50	3.50	4.00
49	P-11B	S-11B	0.00	0.00	1.7	0.00	....	0.00	0.00	11.94	23.83	3.00	Cir	0.012	27	0.50	61.419	8.46	8.15	4.00	4.00
50	P-11A	S-11A	0.00	0.00	1.3	0.00	....	0.00	0.00	11.94	23.54	3.00	Cir	0.012	27	0.49	89.327	8.90	8.46	4.00	4.00
51	P-12C	S-12B	0.00	0.00	0.1	0.00	....	0.00	0.00	3.68	8.06	2.08	Cir	0.012	18	0.50	145.582	9.63	8.90	4.00	4.00
52	P-89	S-12C	0.00	0.00	0.0	0.00	3.68	0.00	3.68	3.68	7.67	2.08	Cir	0.012	18	0.45	11.000	9.68	9.63	4.00	4.00
53	P-11	S-11	0.00	0.00	0.0	0.00	8.26	0.00	8.26	8.26	31.00	1.68	Cir	0.012	30	0.49	10.270	9.18	9.13	4.00	4.00
54	P-33	S-33	0.00	0.00	0.0	0.00	2.68	0.00	2.68	2.68	17.29	0.85	Cir	0.012	24	0.50	70.272	6.35	6.00	4.00	4.00

Notes: j-Line contains hyd. jump

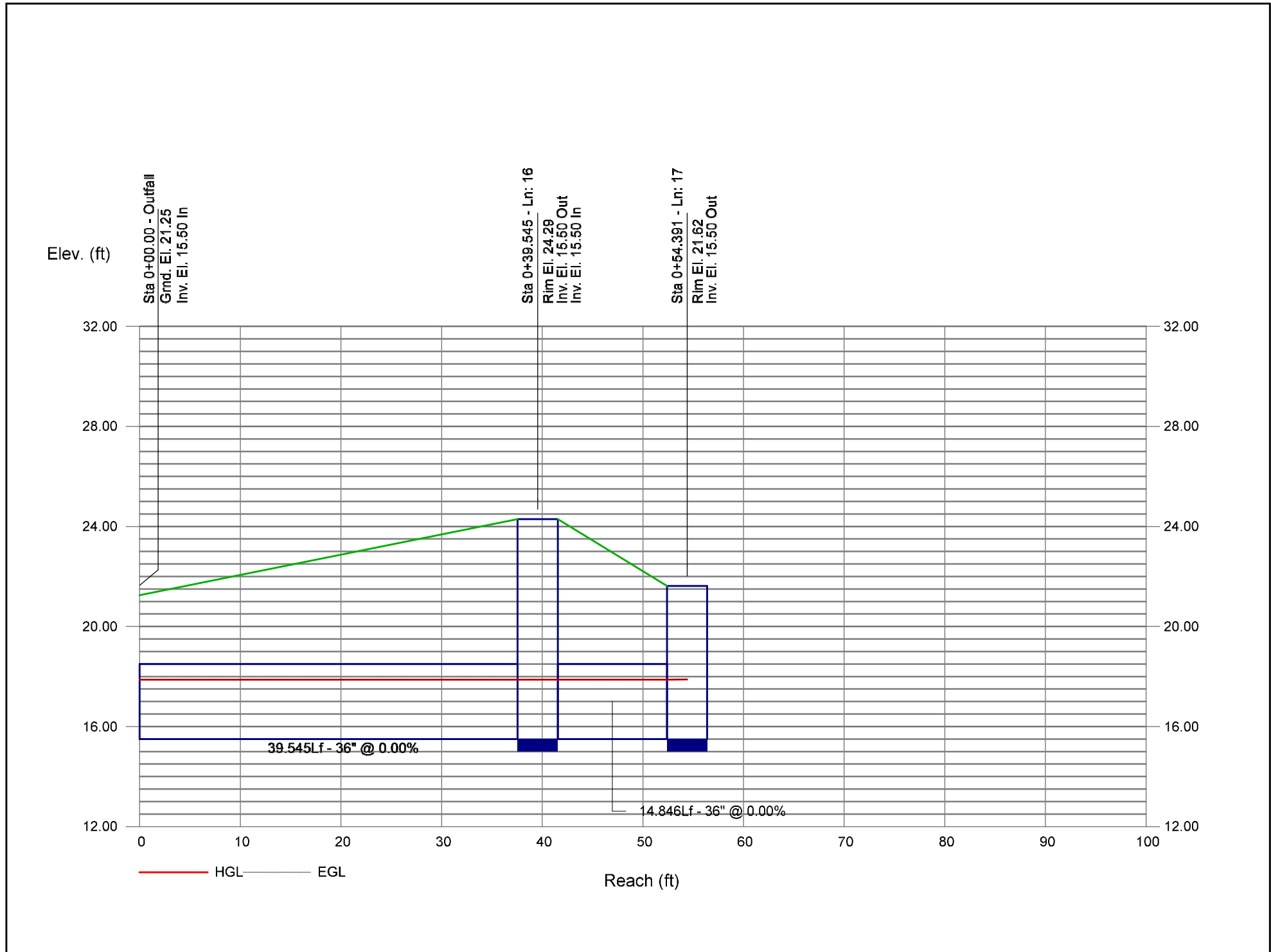
Storm Sewer Profile



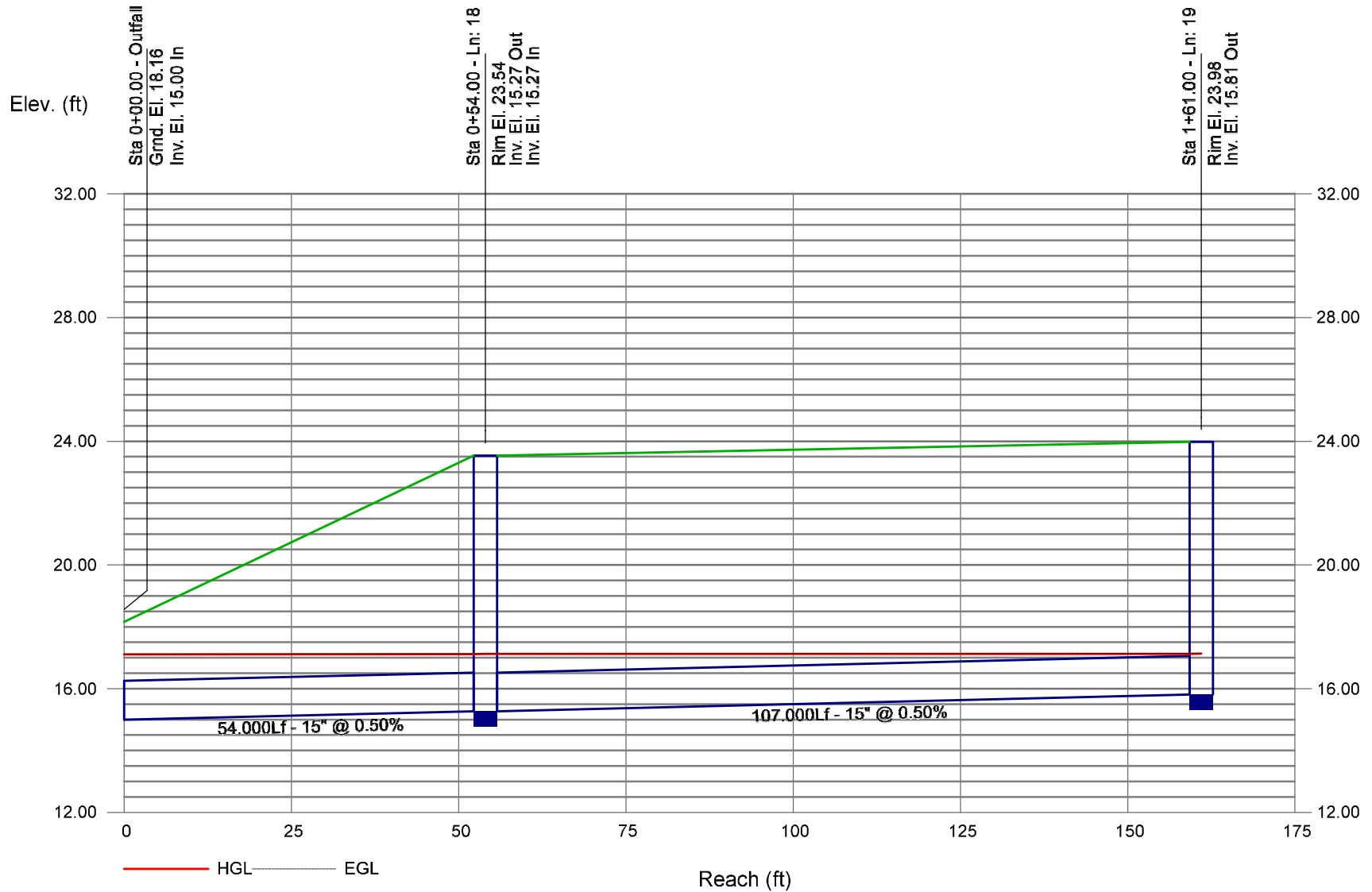
Storm Sewer Profile



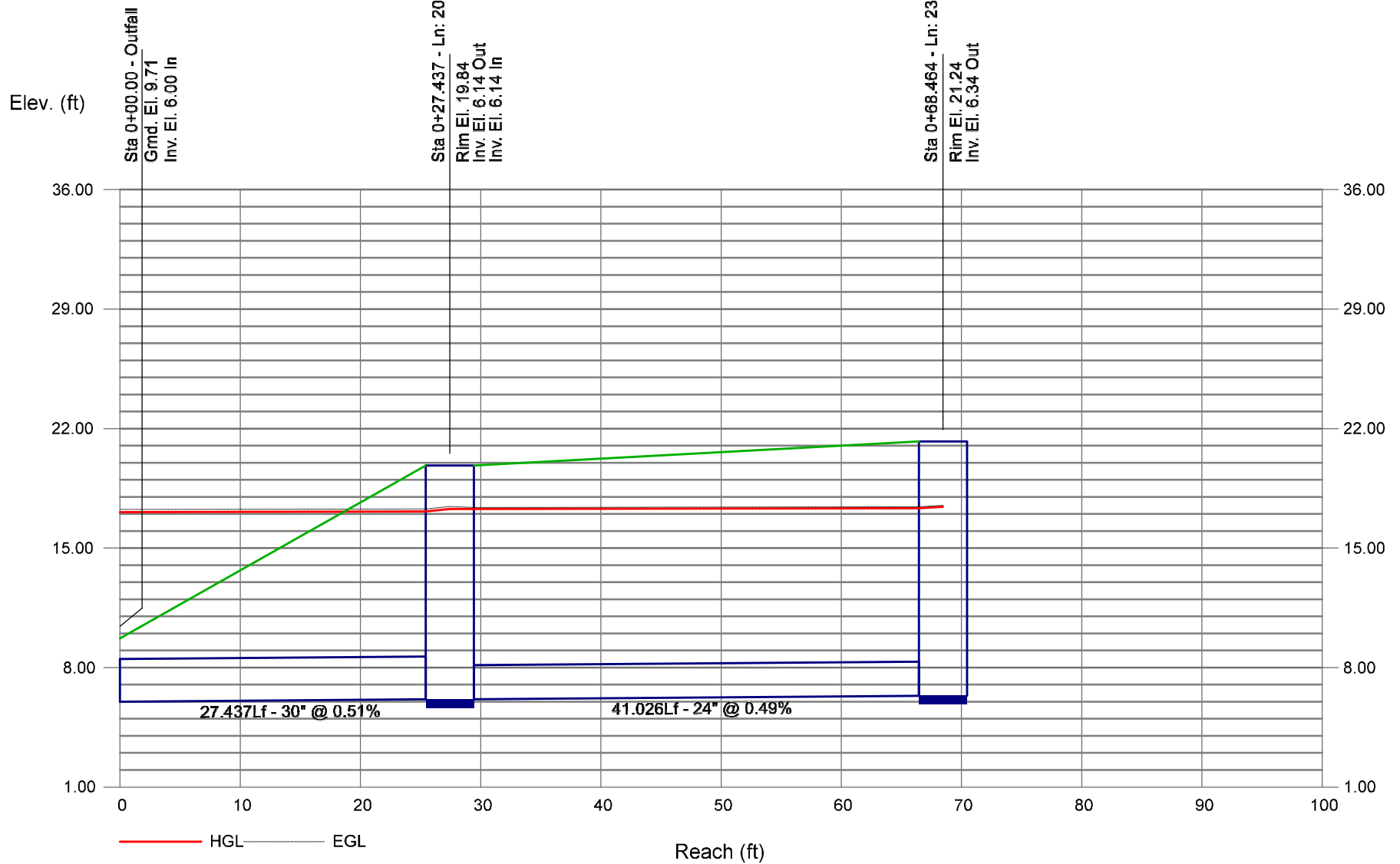
Storm Sewer Profile



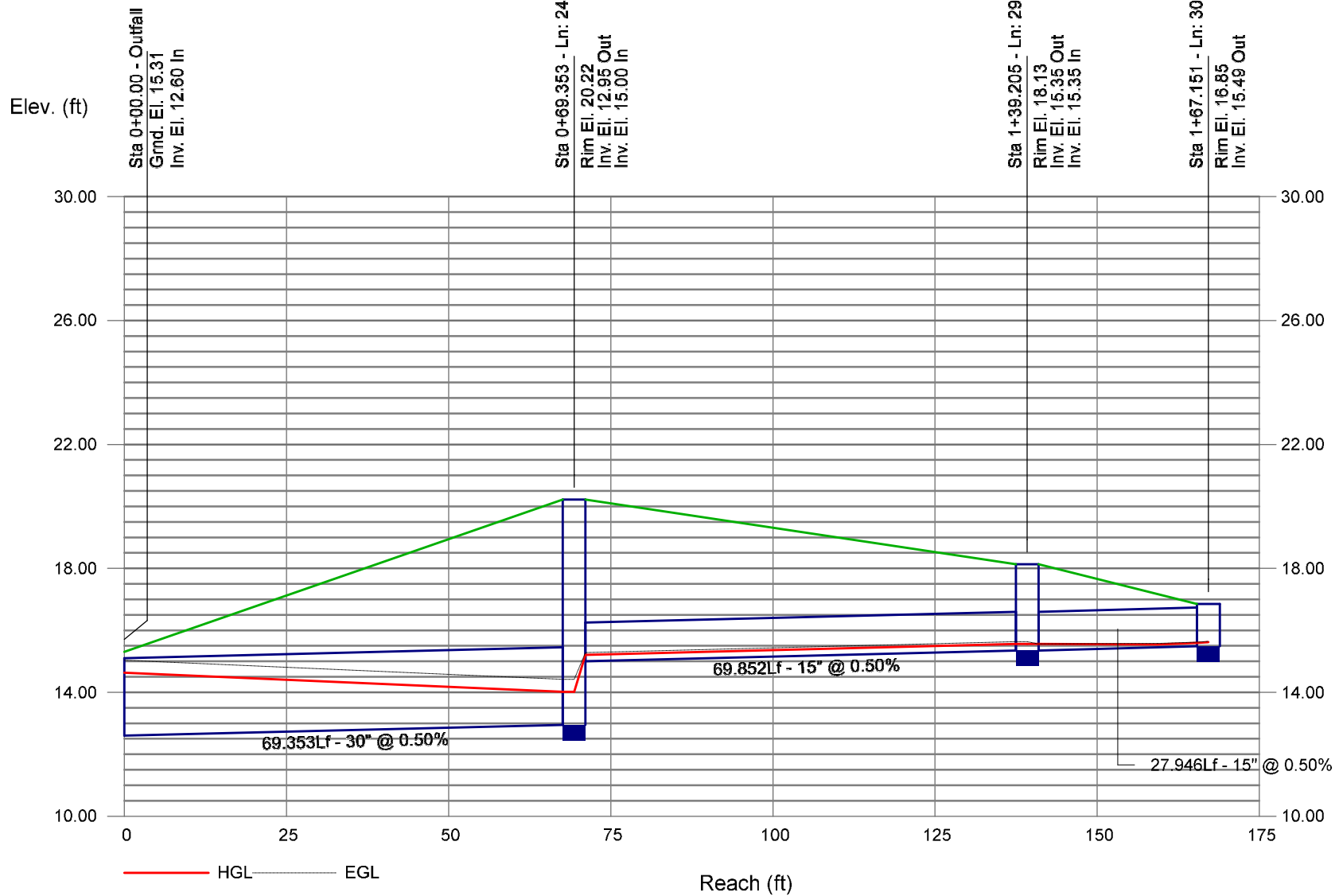
Storm Sewer Profile



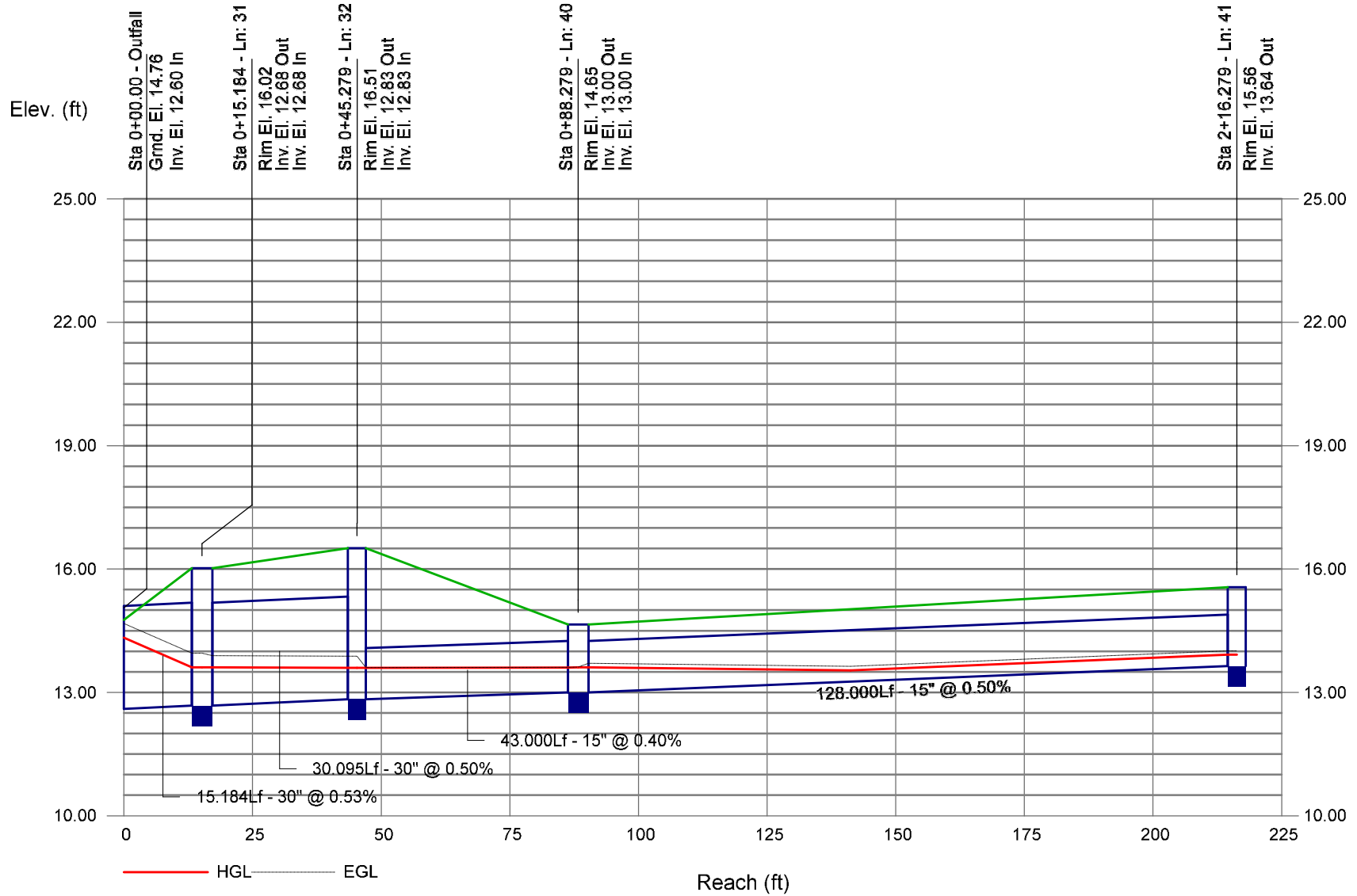
Storm Sewer Profile



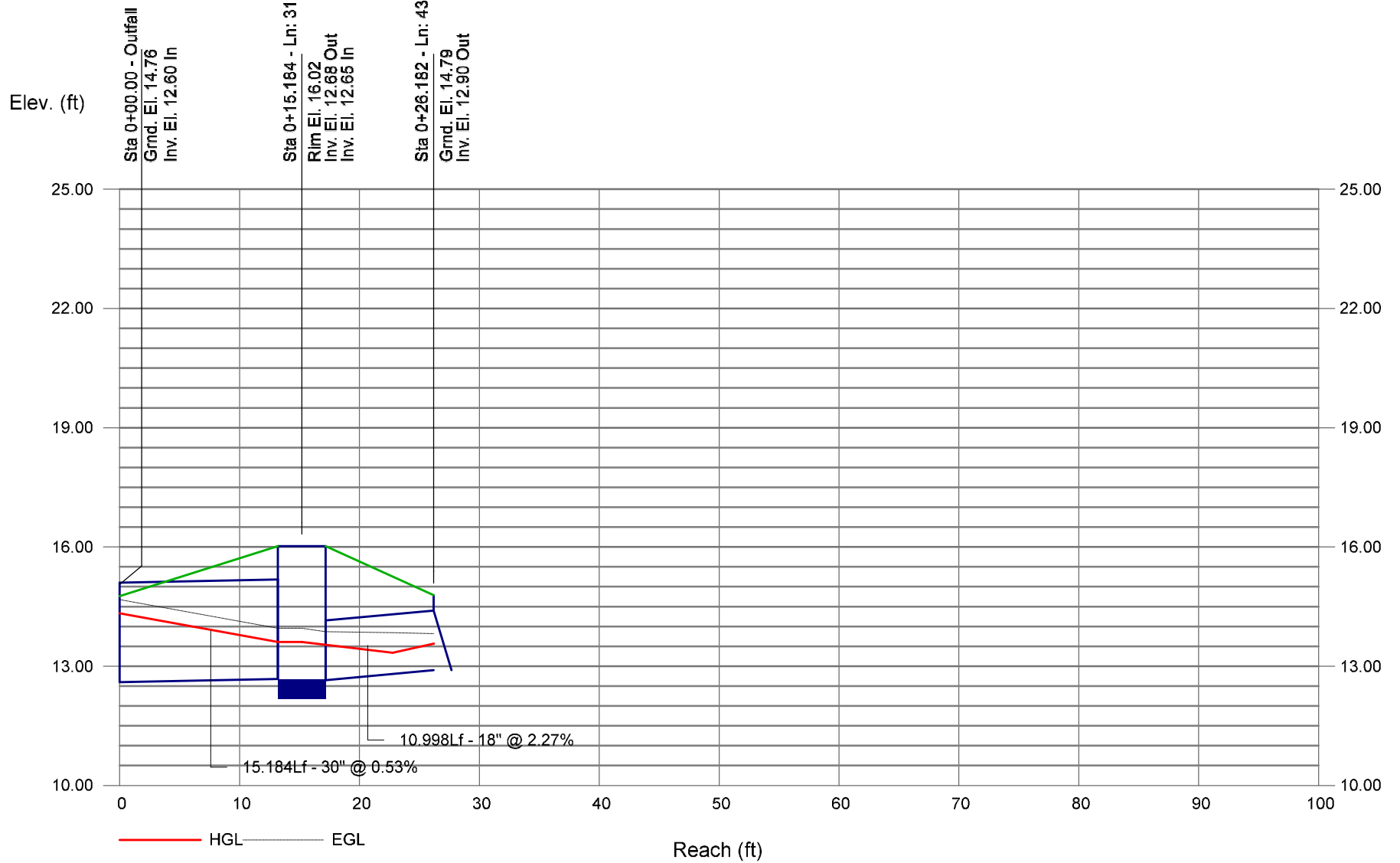
Storm Sewer Profile



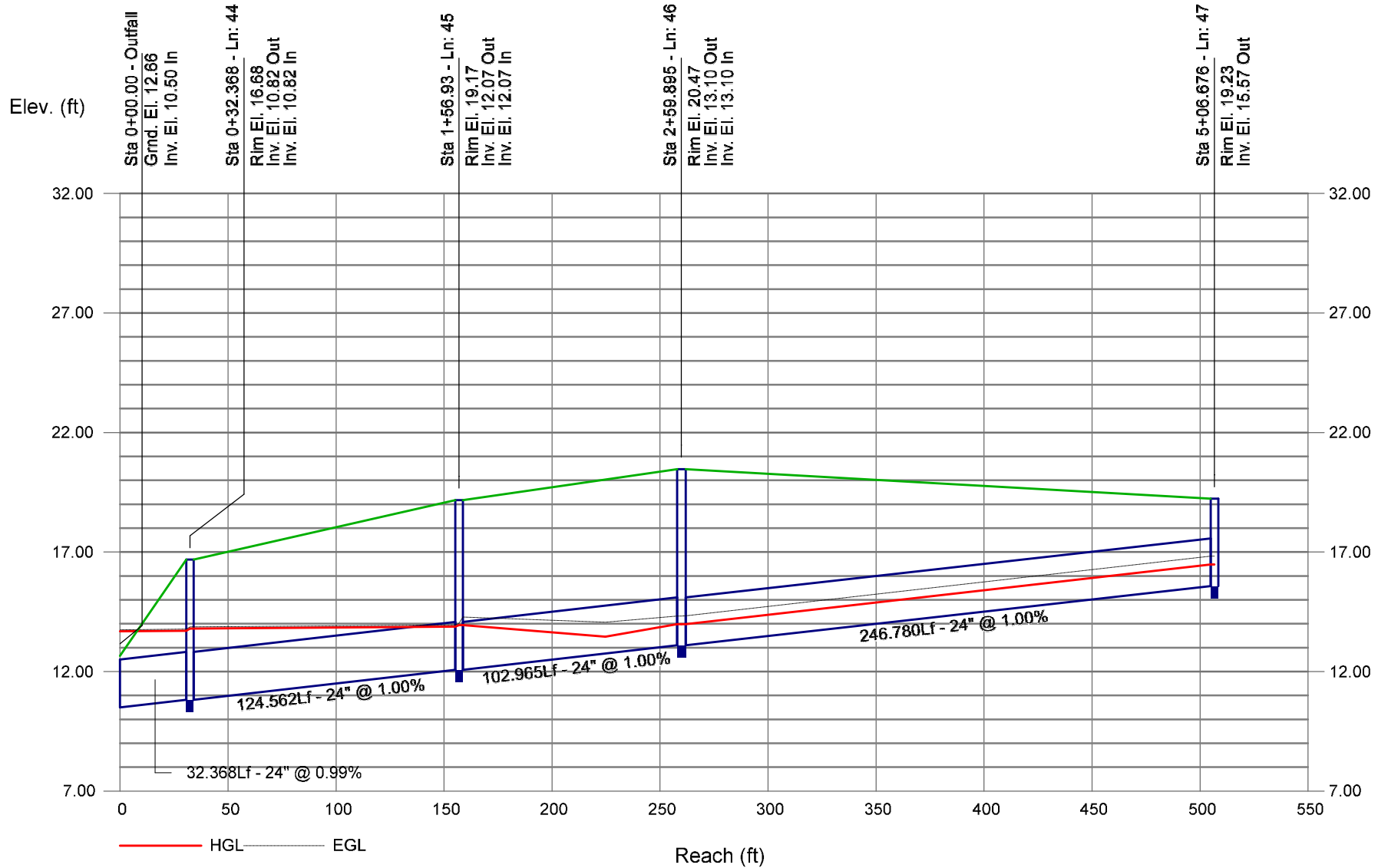
Storm Sewer Profile



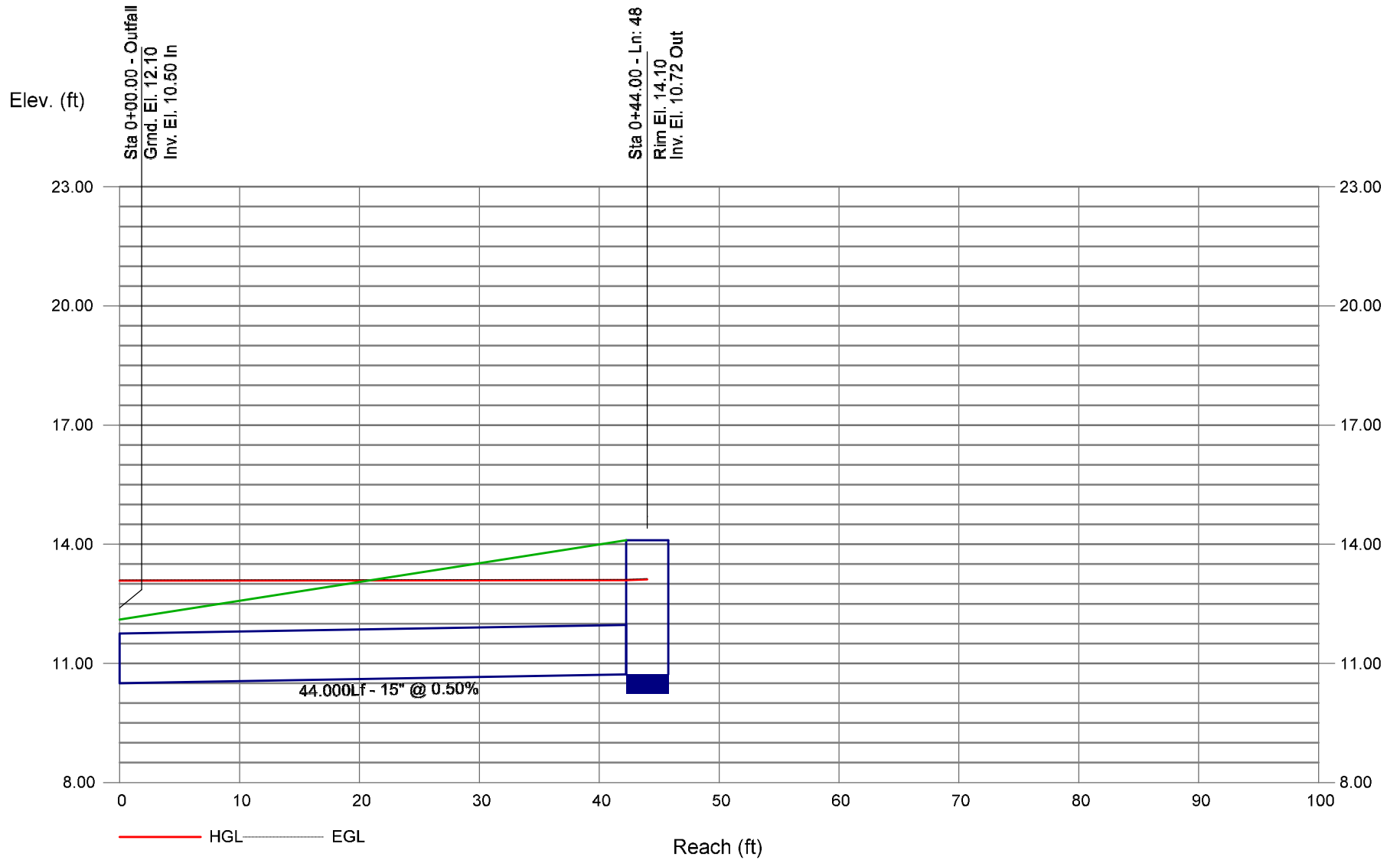
Storm Sewer Profile



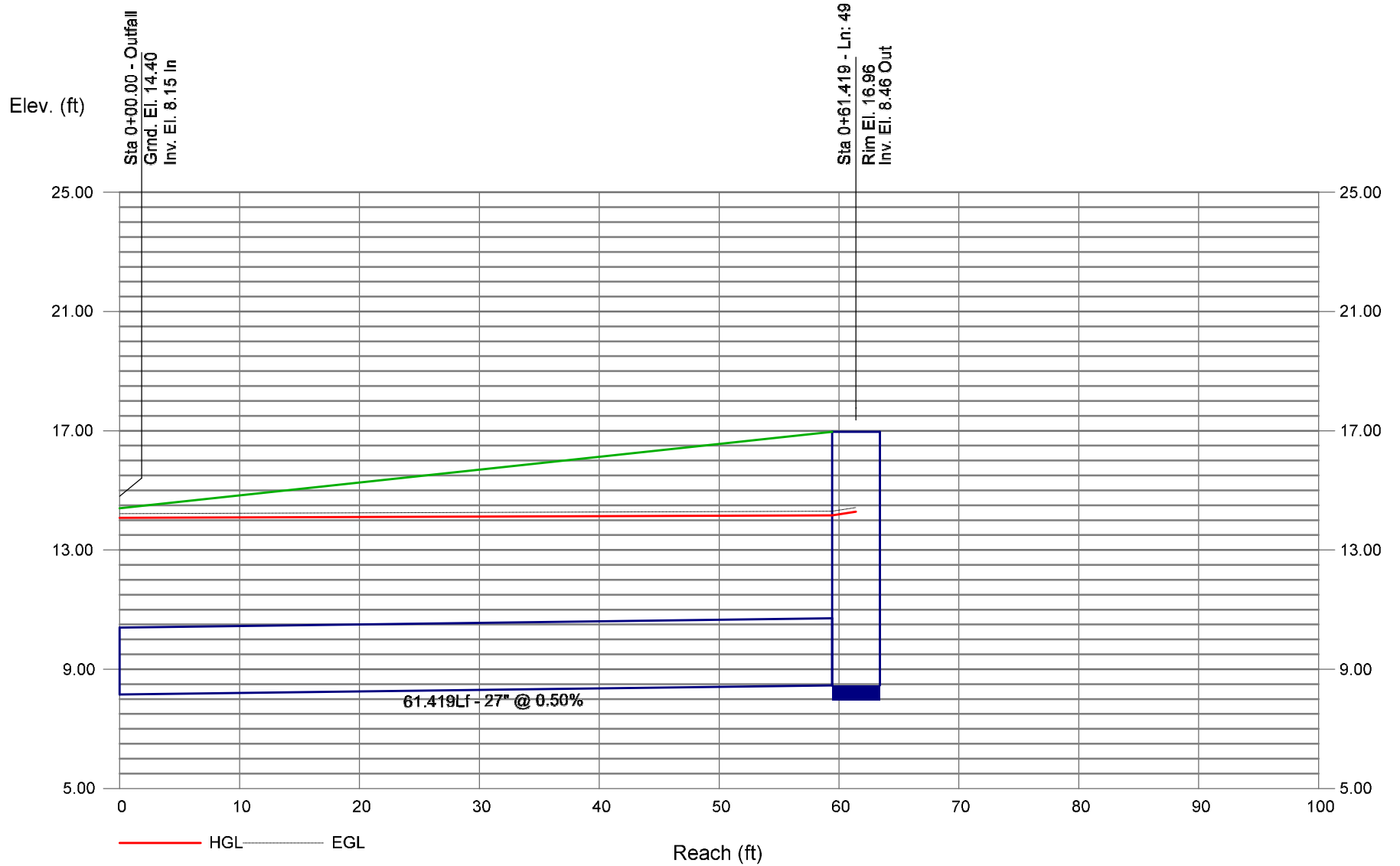
Storm Sewer Profile



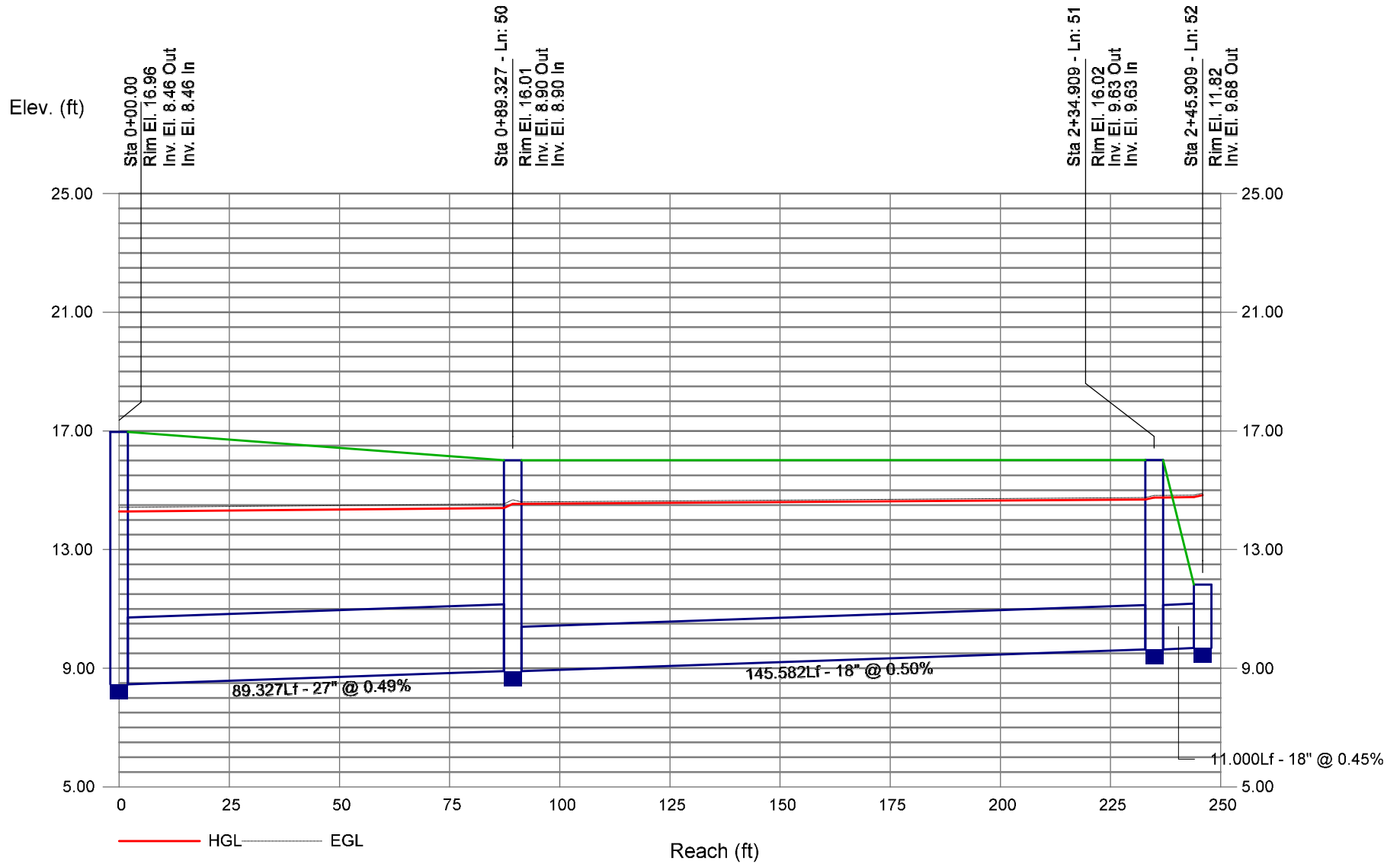
Storm Sewer Profile



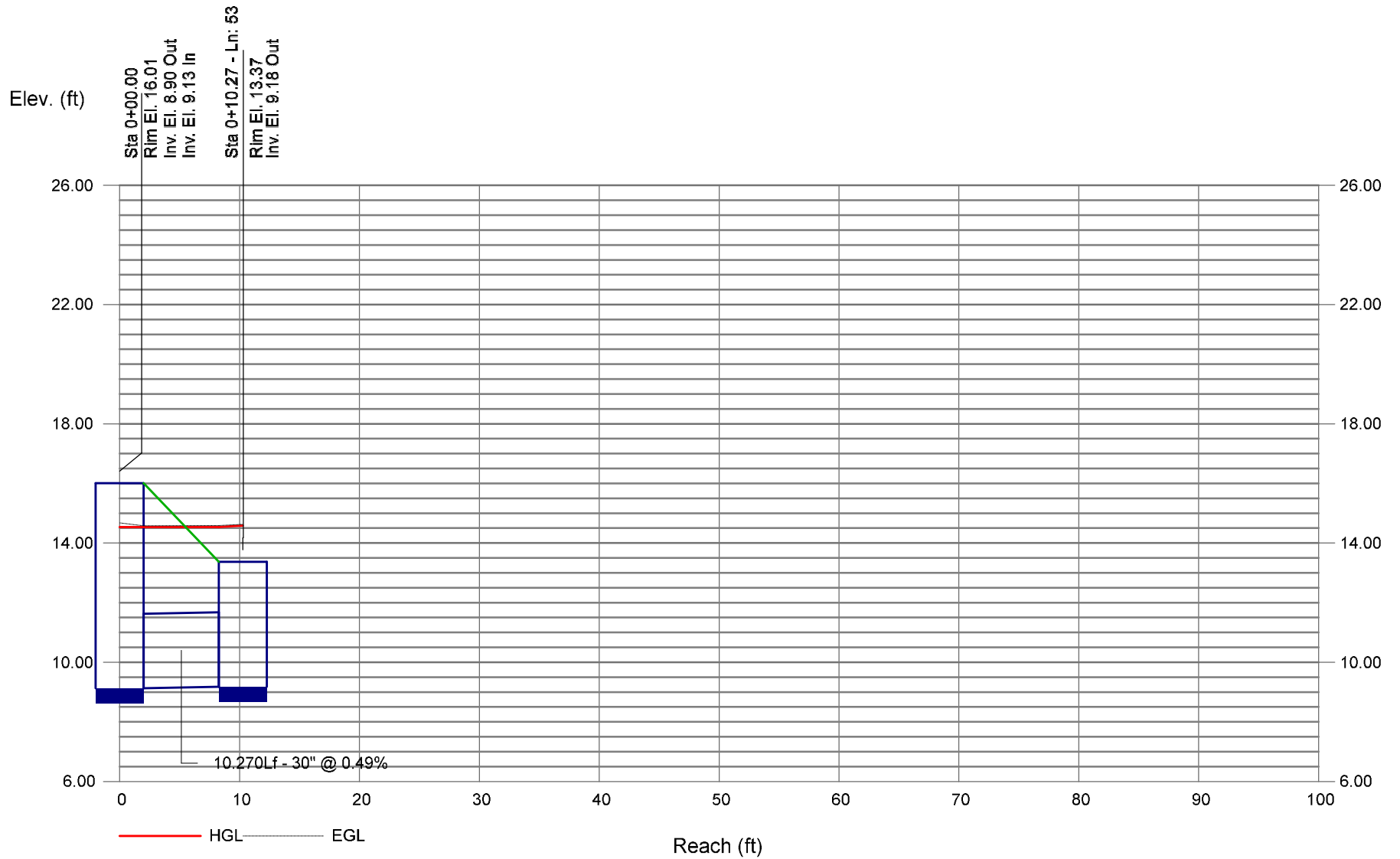
Storm Sewer Profile



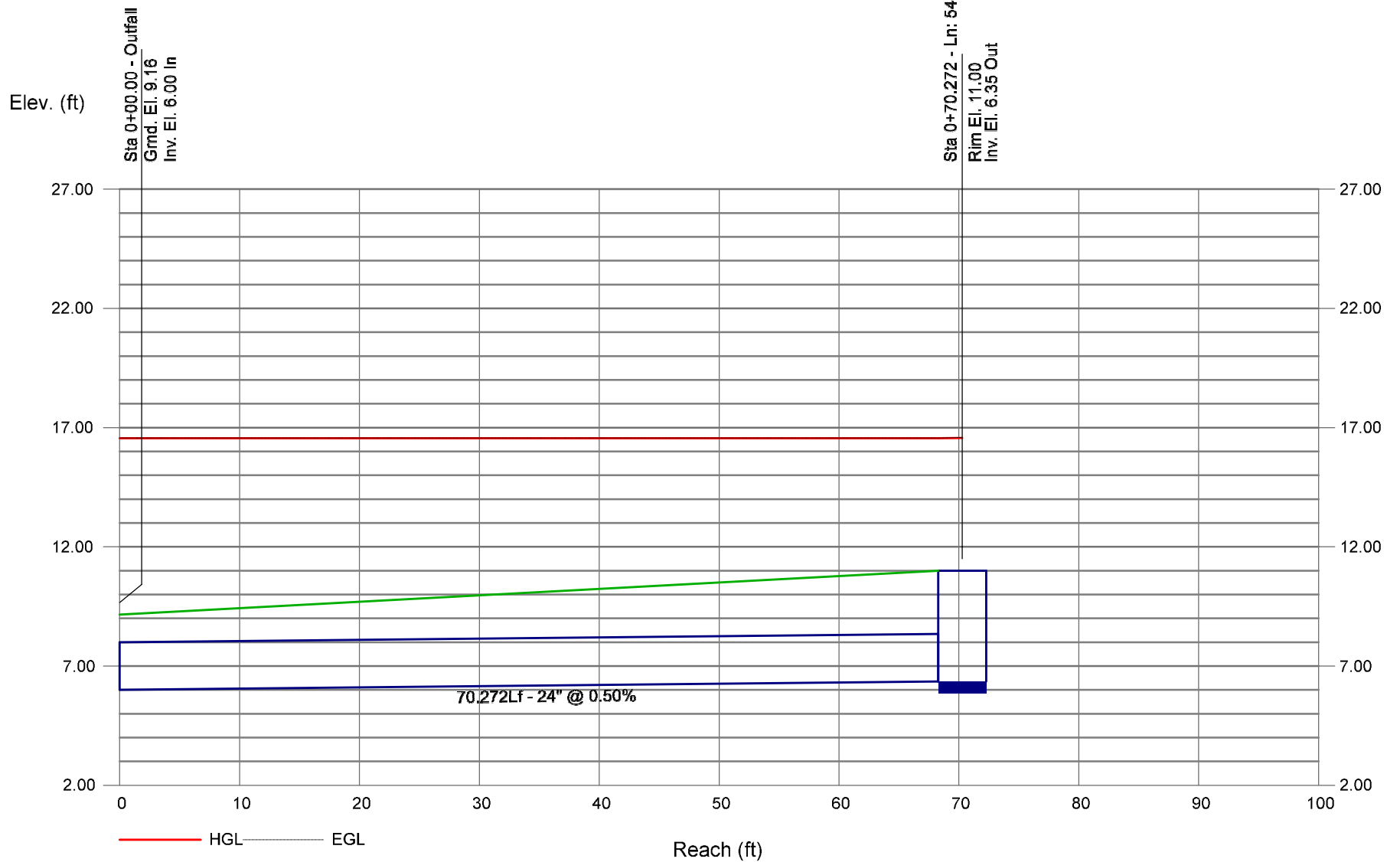
Storm Sewer Profile



Storm Sewer Profile

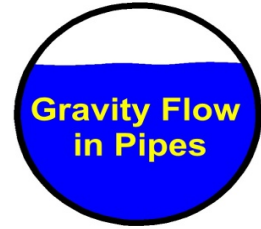


Storm Sewer Profile





Manning-Pipe



SunCam, Inc.

v 1.0.1

Fleming Island, Florida 32003

www.suncam.com

800-735-4449 or 904-215-9345

Input what you know into the "Inputs" column. No more than one entry in each of 10 color blocks.

Variable	Inputs	Solution #1	Solution #2	Units
Q Quantity of Flow		0.194381312		Cubic Foot/Sec
		87.24439291		Gallons/Minute [US]
		0.125631925		MGD (Million gal/day) [US]
		0.005504266		Cubic Meters/Sec
		19815.35718		Liters/Hour
		330.255953		Liters/Minute
		5.504265883		Liters/Second
		0.475568572		MLD (Million Liters/day)
		72.64615373		Gallons/Minute [UK]
	0.104610461		MGD (Million Gal/day) [UK]	
V Velocity of flow		2.227445764		Foot/Sec
		0.678925469		Meters/Sec
n Roughness coefficient	0.009	0.009		No Units
S Hydraulic Gradient		0.005		Feet/Foot or Meter/Meter
	0.50%	0.50%		% Slope*
R Hydraulic Radius (a/p)		0.083333333		Feet
		0.025400309		Meters
d Pipe Diameter	4	4		Inches
		101.6002032		Millimeters
% % Full	100.00%	100.00%		% Full*
h Depth of Flow		4		Inches
		101.6002032		Millimeters
a Area of Flow		0.087266463		Square Feet
		0.008107252		Square Meters
p Wetted Perimeter		1.047197551		Feet
		0.319189695		Meters

Complete Results!

Project Name	Jernee Mill Industrial
Proj. #	10000657C
By	TR
Notes	Bioretention Basins

Copyright © 2010 William C. Dunn

2:56:58 PM

NOTE: All data is for round pipe. Entrance and exit losses are ignored.

6/28/2024

APPENDIX E

Conduit Outlet Protection Calculations Emergency Spillway Analysis

Conduit Outlet Protection Calculations
 Scour Hole # HW S-41

Design Parameters:

Design Storm Flow for 100 Year, Q	25.92 cfs
Vertical Dimension of Outlet Pipe, D_o	30 in
Horizontal Dimension of Outlet Pipe, W_o	30 in
Tailwater Depth, TW^1	0.50 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	15 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 5.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 7.50$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 12.50$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 15.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o = 10.37$ cfs per foot

• **Case I: $y = 1/2 D_o$**

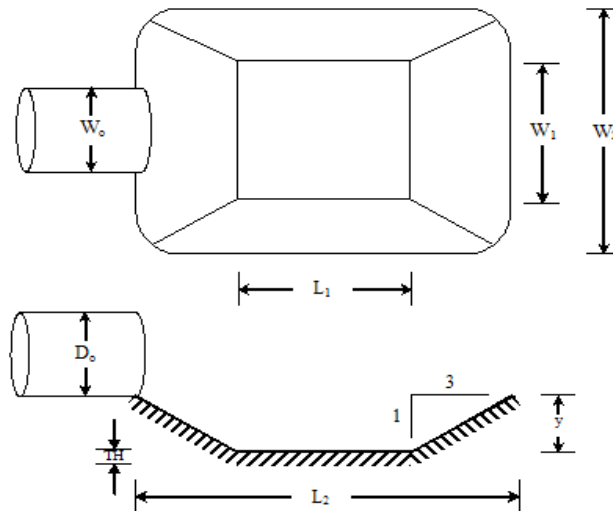
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 6.73$ in Therefore, use $d_{50} = 7$ in

Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric $TH = 14$ 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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # HW S-34

Design Parameters:

Design Storm Flow for 100 Year, Q	9.75 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW^1	0.40 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	12 in

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, $q = Q/D_o =$ 4.88 cfs per foot

• **Case I: $y = 1/2 D_o$**

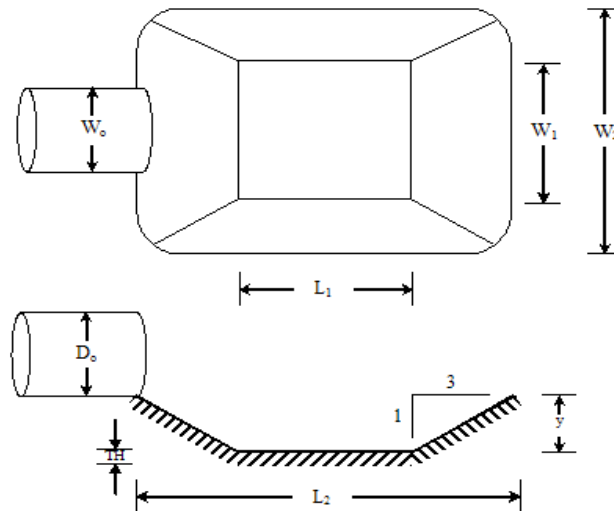
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 3.08$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-3B

Design Parameters:

Design Storm Flow for 25 Year, Q	10.14 cfs
Vertical Dimension of Outlet Pipe, D_o	30 in
Horizontal Dimension of Outlet Pipe, W_o	30 in
Tailwater Depth, TW^1	2.66 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	15 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 5.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 7.50$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 12.50$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 15.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 4.06 cfs per foot

• **Case I: $y = 1/2 D_o$**

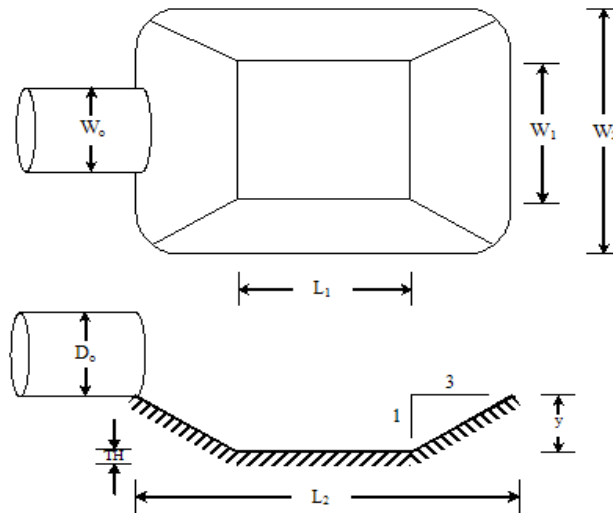
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.36$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-17

Design Parameters:

Design Storm Flow for 25 Year, Q	7.86 cfs
Vertical Dimension of Outlet Pipe, D_o	30 in
Horizontal Dimension of Outlet Pipe, W_o	30 in
Tailwater Depth, TW^1	2.64 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	15 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 5.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 7.50$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 12.50$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 15.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 3.14 cfs per foot

• **Case I: $y = 1/2 D_o$**

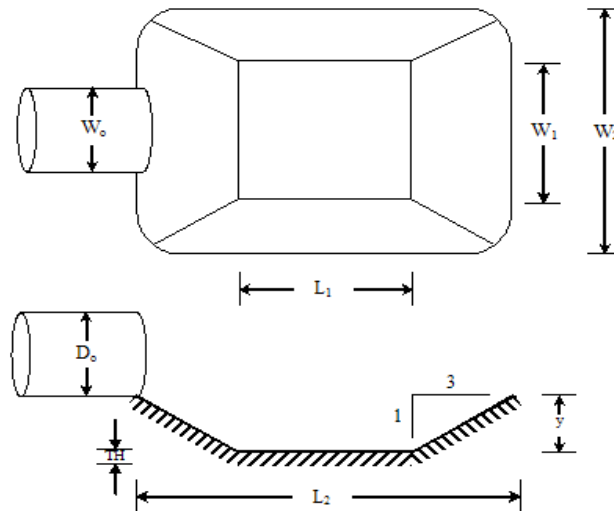
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.26$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-39C

Design Parameters:

Design Storm Flow for 25 Year, Q	6.69 cfs
Vertical Dimension of Outlet Pipe, D_o	24 in
Horizontal Dimension of Outlet Pipe, W_o	24 in
Tailwater Depth, TW^1	1.90 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	12 in

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, $q = Q/D_o = 3.35$ cfs per foot

• **Case I: $y = 1/2 D_o$**

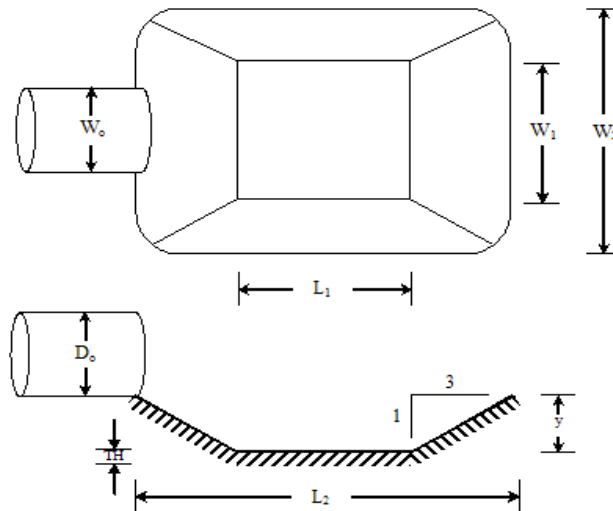
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.39$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-50

Design Parameters:

Design Storm Flow for 25 Year, Q	0.76 cfs
Vertical Dimension of Outlet Pipe, D_o	15 in
Horizontal Dimension of Outlet Pipe, W_o	15 in
Tailwater Depth, TW^1	2.11 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	8 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 2.50$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 3.75$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 6.25$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 7.50$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 0.61 cfs per foot

• **Case I: $y = 1/2 D_o$**

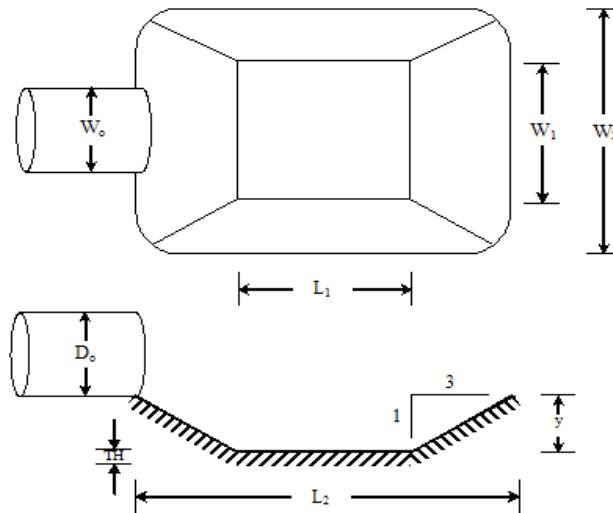
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.04$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-46

Design Parameters:

Design Storm Flow for 25 Year, Q	7.54 cfs
Vertical Dimension of Outlet Pipe, D_o	30 in
Horizontal Dimension of Outlet Pipe, W_o	30 in
Tailwater Depth, TW^1	2.11 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	15 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 5.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 7.50$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 12.50$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 15.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 3.02 cfs per foot

• **Case I: $y = 1/2 D_o$**

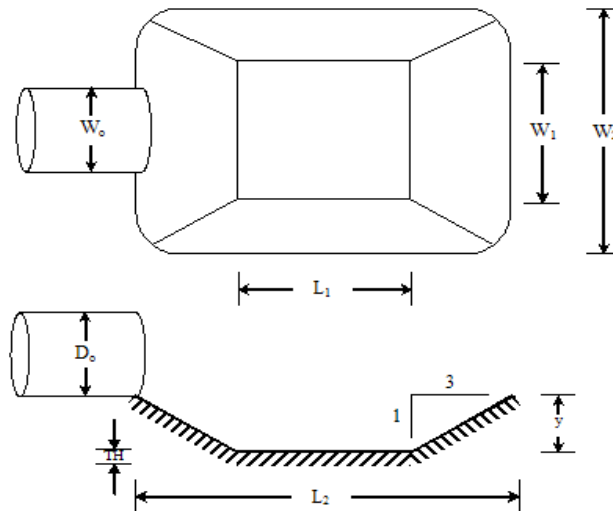
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.31$ in Therefore, use $d_{50} = 4$ in

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 $TW = 0.2D_o$.

Conduit Outlet Protection Calculations
 Scour Hole # FES S-32

Design Parameters:

Design Storm Flow for 25 Year, Q	1.38 cfs
Vertical Dimension of Outlet Pipe, D_o	18 in
Horizontal Dimension of Outlet Pipe, W_o	18 in
Tailwater Depth, TW^1	1.90 ft
Scour Hole Depth, y ($1/2 D_o$ or D_o)	9 in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	$W_1 = 3.00$ ft
Minimum Bottom Length, $L_1 = 3D_o$	$L_1 = 4.50$ ft
Minimum Top Width (max side slope of 3:1), W_2	$W_2 = 7.50$ ft
Minimum Top Length (max side slope of 3:1), L_2	$L_2 = 9.00$ ft

Rip Rap Stone Size Calculations:

Unit Discharge, $q = Q/D_o =$ 0.92 cfs per foot

• **Case I: $y = 1/2 D_o$**

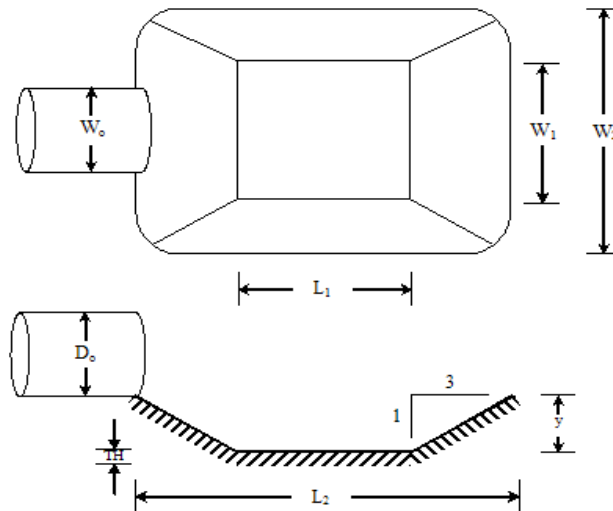
Median Stone, $d_{50} = \frac{0.0125 q^{1.33}}{TW} = 0.07$ in Therefore, use $d_{50} = 4$ in

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.

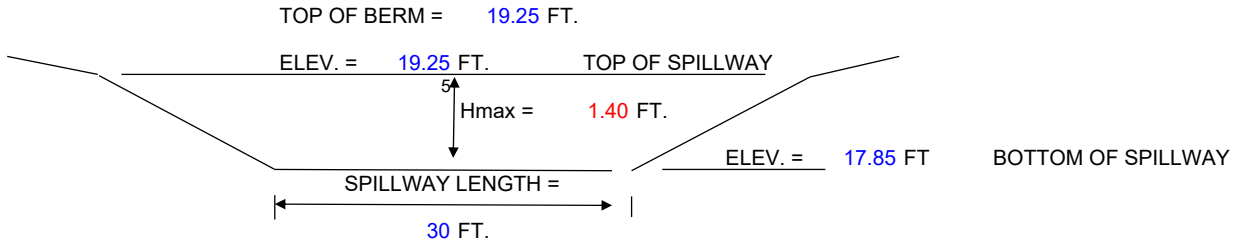
Footnote:

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



EMERGENCY SPILLWAY CALCULATIONS

Basin 2



o Spillway Capacity:

Spillway calculation based on weir equation: $Q = CLH^{3/2}$

'C' = weir coefficient: Use 2.61

Qmax through spillway = 129.7

Spillway designed to pass 100 year flow

100 year flow = 12.08 CFS HEADWATER DEPTH = 0.29 FT.

100 year flow + 50 % = 18.1 CFS HEADWATER DEPTH = 0.38 FT.

ALLOWABLE HEADWATER DEPTH = 1.40 FT. WHICH IS GREATER THAN REQUIRED THEREFORE WEIR HAS CAPACITY

FREEBOARD 100-YR = 1.11 FT. SINCE GREATER THAN OR EQUALS
FREEBOARD 100-YR+50% = 1.02 FT. 1.0-FOOT FREEBOARD, IS OK

STABILITY:

$Q=AV$ OR $V=Q/A$

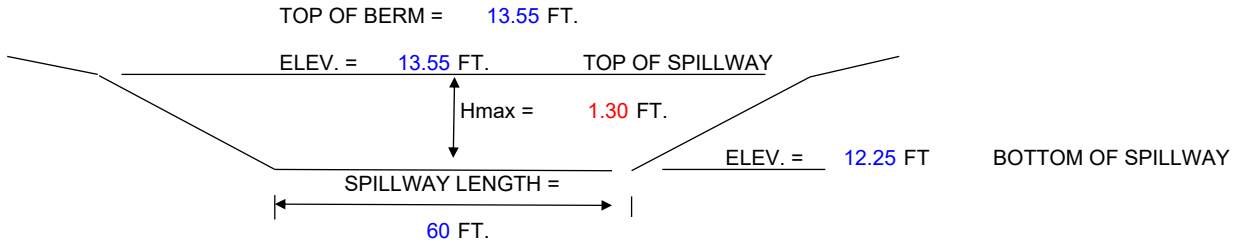
Q	(FLOW, CFS)	12.1
A	(AREA, SF)	42
V	(VELOCITY, FPS)	0.29

WHICH IS LESS THEN 1.8 FPS AS REQUIRED BY SCD CHAPTER 18-1, TABLE 18-1 FOR SAND



EMERGENCY SPILLWAY CALCULATIONS

Basin 3



o Spillway Capacity:

Spillway calculation based on weir equation: $Q = CLH^{3/2}$

'C' = weir coefficient: Use 2.61

Qmax through spillway = 232.1

Spillway designed to pass 100 year flow

100 year flow = 9.75 CFS HEADWATER DEPTH = 0.16 FT.

100 year flow + 50 % = 14.6 CFS HEADWATER DEPTH = 0.21 FT.

ALLOWABLE HEADWATER DEPTH = 1.30 FT. WHICH IS GREATER THAN REQUIRED THEREFORE WEIR HAS CAPACITY

FREEBOARD 100-YR = 1.14 FT. SINCE GREATER THAN OR EQUALS
FREEBOARD 100-YR+50% = 1.09 FT. 1.0-FOOT FREEBOARD, IS OK

STABILITY:

$Q=AV$ OR $V=Q/A$

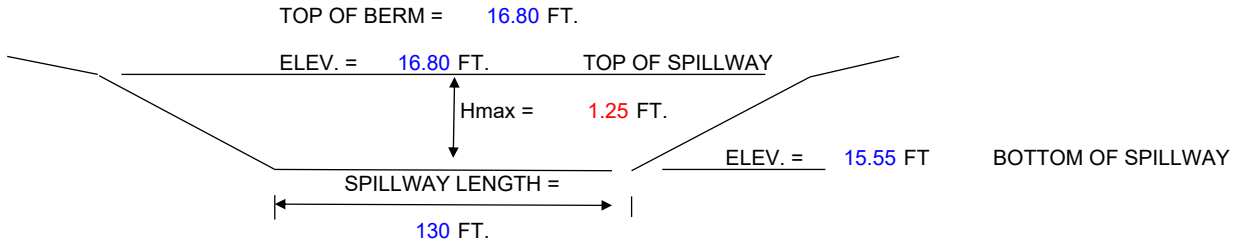
Q	(FLOW, CFS)	9.8
A	(AREA, SF)	78
V	(VELOCITY, FPS)	0.13

WHICH IS LESS THEN 1.8 FPS AS REQUIRED BY SCD CHAPTER 18-1, TABLE 18-1 FOR SAND



EMERGENCY SPILLWAY CALCULATIONS

Basin 4 / 5



o Spillway Capacity:

Spillway calculation based on weir equation: $Q = CLH^{3/2}$

'C' = weir coefficient: Use **2.61**

Qmax through spillway = **474.2**

Spillway designed to pass 100 year flow

100 year flow = **21.08 CFS** HEADWATER DEPTH = **0.16 FT.**

100 year flow + 50 % = **31.6 CFS** HEADWATER DEPTH = **0.21 FT.**

ALLOWABLE HEADWATER DEPTH = **1.25 FT.** WHICH IS GREATER THAN REQUIRED THEREFORE WEIR HAS CAPACITY

FREEBOARD 100-YR = **1.09 FT.** SINCE GREATER THAN OR EQUALS
 FREEBOARD 100-YR+50% = **1.04 FT.** 1.0-FOOT FREEBOARD, IS OK

STABILITY:

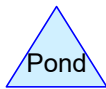
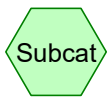
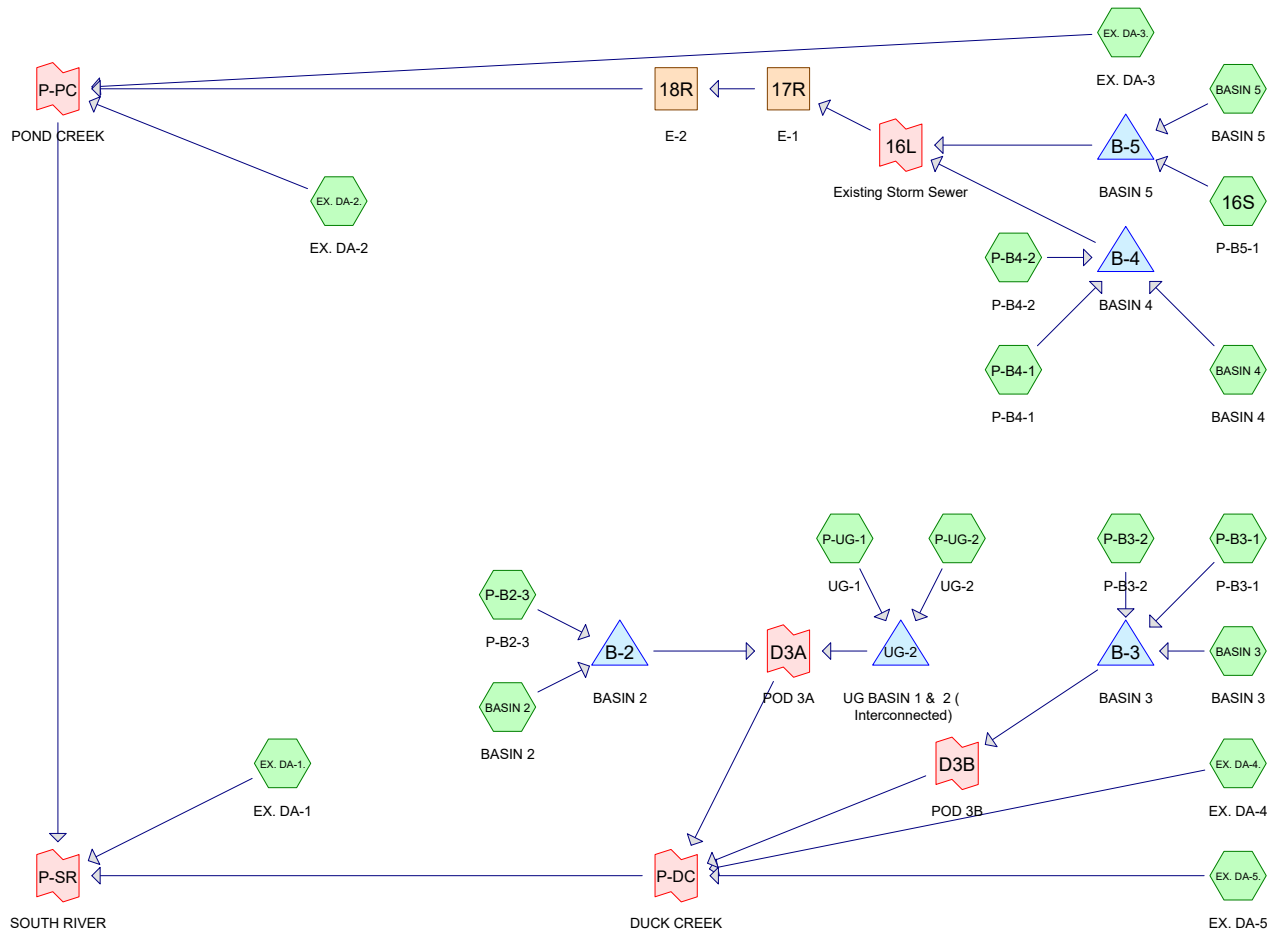
$Q=AV$ OR $V=Q/A$

Q	(FLOW, CFS)	21.1
A	(AREA, SF)	162.5
V	(VELOCITY, FPS)	0.13

WHICH IS LESS THEN 1.8 FPS AS REQUIRED BY SCD CHAPTER 18-1, TABLE 18-1 FOR SAND

APPENDIX F

Failure Analysis



Routing Diagram for 250225 - (Failure Analysis) Proposed Conditions
 Prepared by Colliers Engineering & Design, Printed 2/25/2025
 HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	A - 2YR	NOAA 24-hr	D	Default	24.00	1	3.35	2
2	B - 10YR	NOAA 24-hr	D	Default	24.00	1	5.13	2
3	C - 25YR	NOAA 24-hr	D	Default	24.00	1	6.38	2
4	D - 100YR	NOAA 24-hr	D	Default	24.00	1	8.67	2
5	E-NJDEP-WQ	NJ DEP 2-hr		Default	2.00	1	1.25	2

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 3

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.192	39	>75% Grass cover, Good, HSG A (EX. DA-5.)
1.164	80	>75% Grass cover, Good, HSG D (16S, BASIN 4, EX. DA-4., P-B3-1, P-B4-1, P-B4-2)
0.899	98	>75% Grass cover, Good, HSG D (16S, P-B2-3, P-B3-1, P-B3-2)
0.090	98	Concrete, HSG D (16S, EX. DA-1., P-B3-1, P-B4-2)
2.723	98	DA - Paved parking, HSG D (16S, P-B4-1, P-B4-2)
1.568	98	Grass, HSG D (EX. DA-1., EX. DA-2.)
1.063	78	Meadow, non-grazed, HSG D (BASIN 2, BASIN 3, BASIN 5)
0.111	98	Paved parking, HSG A (EX. DA-5.)
2.811	98	Paved parking, HSG D (EX. DA-4., P-B2-3, P-B3-1, P-B3-2)
5.739	98	Roof, HSG D (P-UG-1, P-UG-2)
5.856	77	Woods, Good, HSG D (EX. DA-3., EX. DA-4., P-B4-1)
22.216	90	TOTAL AREA

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 4

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.303	HSG A	EX. DA-5.
0.000	HSG B	
0.000	HSG C	
21.913	HSG D	16S, BASIN 2, BASIN 3, BASIN 4, BASIN 5, EX. DA-1., EX. DA-2., EX. DA-3., EX. DA-4., P-B2-3, P-B3-1, P-B3-2, P-B4-1, P-B4-2, P-UG-1, P-UG-2
0.000	Other	
22.216		TOTAL AREA

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 5

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.192	0.000	0.000	2.063	0.000	2.255	>75% Grass cover, Good	16S, BASIN 4, EX. DA-4., EX. DA-5., P-B2-3, P-B3-1, P-B3-2, P-B4-1, P-B4-2
0.000	0.000	0.000	0.090	0.000	0.090	Concrete	16S, EX. DA-1., P-B3-1, P-B4-2
0.000	0.000	0.000	2.723	0.000	2.723	DA - Paved parking	16S, P-B4-1, P-B4-2
0.000	0.000	0.000	1.568	0.000	1.568	Grass	EX. DA-1., EX. DA-2.
0.000	0.000	0.000	1.063	0.000	1.063	Meadow, non-grazed	BASIN 2, BASIN 3, BASIN 5
0.111	0.000	0.000	2.811	0.000	2.922	Paved parking	EX. DA-4., EX. DA-5., P-B2-3, P-B3-1, P-B3-2
0.000	0.000	0.000	5.739	0.000	5.739	Roof	P-UG-1, P-UG-2
0.000	0.000	0.000	5.856	0.000	5.856	Woods, Good	EX. DA-3., EX. DA-4., P-B4-1

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 6

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.303	0.000	0.000	21.913	0.000	22.216	TOTAL AREA	

250225 - (Failure Analysis) Proposed Conditions

Prepared by Colliers Engineering & Design

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Printed 2/25/2025

Page 7

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	16S	0.00	0.00	840.0	0.0045	0.012	0.0	30.0	0.0	
2	P-B2-3	0.00	0.00	49.0	0.0050	0.013	0.0	24.0	0.0	
3	P-B3-1	0.00	0.00	50.0	0.0050	0.013	0.0	15.0	0.0	
4	P-B3-2	0.00	0.00	500.0	0.0100	0.013	0.0	24.0	0.0	
5	P-B4-1	0.00	0.00	33.0	0.0050	0.012	0.0	15.0	0.0	
6	P-B4-2	0.00	0.00	677.0	0.0050	0.012	0.0	18.0	0.0	
7	P-UG-1	0.00	0.00	1,140.0	0.0050	0.013	0.0	30.0	0.0	
8	P-UG-2	0.00	0.00	18.0	0.0050	0.013	0.0	15.0	0.0	
9	17R	7.93	6.64	238.0	0.0054	0.013	0.0	28.0	0.0	
10	18R	6.64	5.60	229.0	0.0045	0.013	0.0	28.0	0.0	
11	B-2	15.00	14.52	52.0	0.0092	0.013	0.0	24.0	0.0	
12	B-3	6.35	6.00	70.0	0.0050	0.013	0.0	24.0	0.0	
13	B-4	9.68	9.63	11.0	0.0045	0.013	0.0	15.0	0.0	
14	B-5	9.18	9.13	10.0	0.0050	0.013	0.0	15.0	0.0	
15	UG-2	6.34	6.14	41.0	0.0049	0.012	0.0	24.0	0.0	

250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 8

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=3.04" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=5.50 cfs 0.632 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.27 cfs 0.016 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=0.83 cfs 0.056 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=1.52" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.40 cfs 0.037 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=1.38" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=0.53 cfs 0.050 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=1.36 cfs 0.245 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=1.67 cfs 0.165 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=1.32" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=2.49 cfs 0.589 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=2.10" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=1.57 cfs 0.164 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=1.14" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.30 cfs 0.029 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=4.64 cfs 0.389 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=2.98" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.00 cfs 0.090 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=3.15 cfs 0.276 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=1.68" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=0.63 cfs 0.077 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=2.82" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=2.11 cfs 0.233 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=7.09 cfs 0.745 af

250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 9

SubcatchmentP-UG-2: UG-2	Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=3.12" Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=8.05 cfs 0.745 af
Reach 17R: E-1	Avg. Flow Depth=0.68' Max Vel=4.48 fps Inflow=4.62 cfs 1.028 af 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=4.62 cfs 1.028 af
Reach 18R: E-2	Avg. Flow Depth=0.71' Max Vel=4.20 fps Inflow=4.62 cfs 1.028 af 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=4.61 cfs 1.028 af
Pond B-2: BASIN 2	Peak Elev=17.24' Storage=0.235 af Inflow=4.86 cfs 0.405 af Outflow=0.87 cfs 0.404 af
Pond B-3: BASIN 3	Peak Elev=12.00' Storage=0.369 af Inflow=4.96 cfs 0.422 af Outflow=1.63 cfs 0.416 af
Pond B-4: BASIN 4	Peak Elev=14.47' Storage=7,842 cf Inflow=3.09 cfs 0.347 af Outflow=1.40 cfs 0.347 af
Pond B-5: BASIN 5	Peak Elev=14.80' Storage=17,612 cf Inflow=6.03 cfs 0.683 af Outflow=3.24 cfs 0.682 af
Pond UG-2: UG BASIN 1 & 2 (	Peak Elev=13.05' Storage=1.480 af Inflow=15.01 cfs 1.491 af Outflow=0.92 cfs 1.464 af
Link 16L: Existing Storm Sewer	Inflow=4.62 cfs 1.028 af Primary=4.62 cfs 1.028 af
Link D3A: POD 3A	Inflow=1.74 cfs 1.868 af Primary=1.74 cfs 1.868 af
Link D3B: POD 3B	Inflow=1.63 cfs 0.416 af Primary=1.63 cfs 0.416 af
Link P-DC: DUCK CREEK	Inflow=4.57 cfs 2.477 af Primary=4.57 cfs 2.477 af
Link P-PC: POND CREEK	Inflow=7.49 cfs 1.782 af Primary=7.49 cfs 1.782 af
Link P-SR: SOUTH RIVER	Inflow=12.86 cfs 4.504 af Primary=12.86 cfs 4.504 af

Total Runoff Area = 22.216 ac Runoff Volume = 4.538 af Average Runoff Depth = 2.45"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 10

Summary for Subcatchment 16S: P-B5-1

Runoff = 5.50 cfs @ 12.17 hrs, Volume= 0.632 af, Depth= 3.04"
 Routed to Pond B-5 : BASIN 5

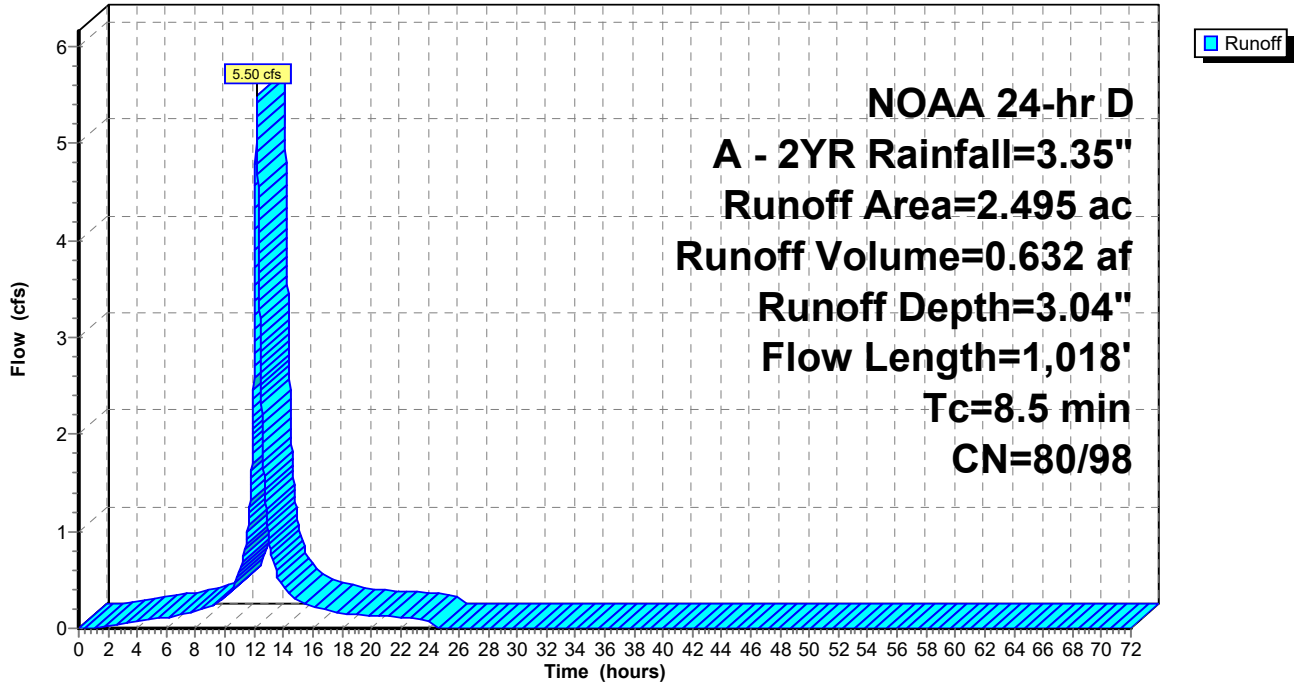
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 12

Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 1.38"
 Routed to Pond B-2 : BASIN 2

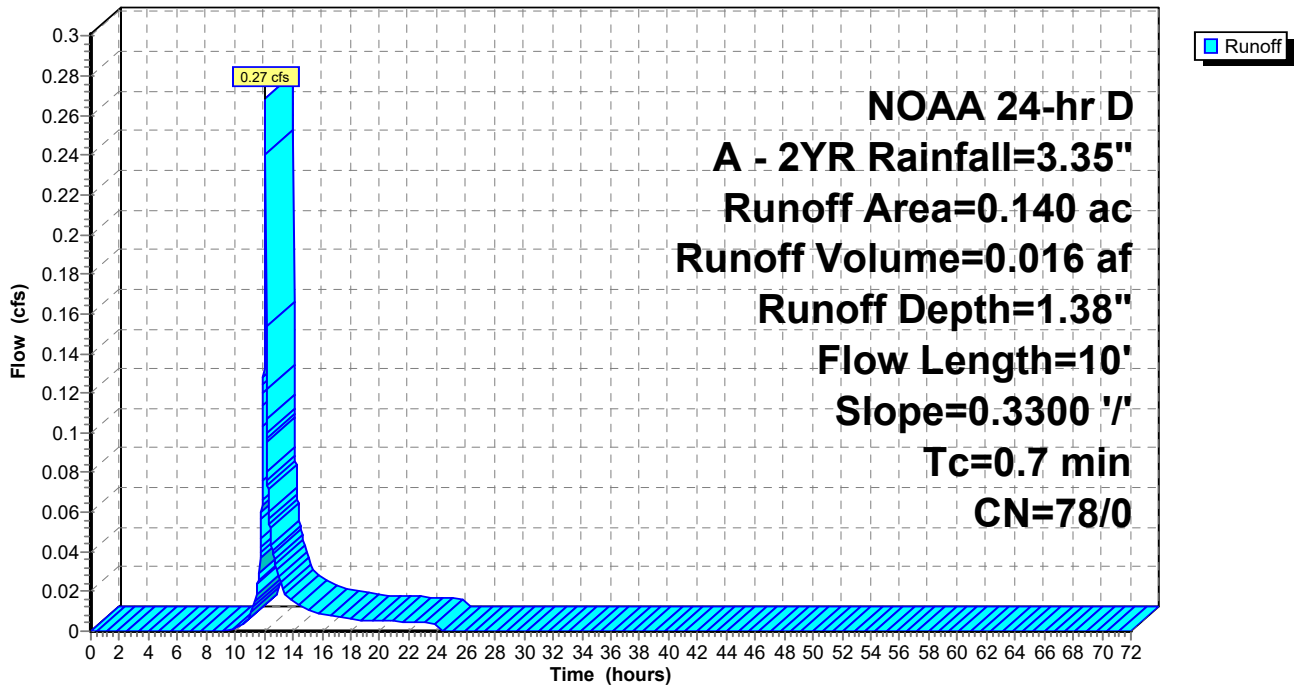
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 13

Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 0.83 cfs @ 12.11 hrs, Volume= 0.056 af, Depth= 1.38"
 Routed to Pond B-3 : BASIN 3

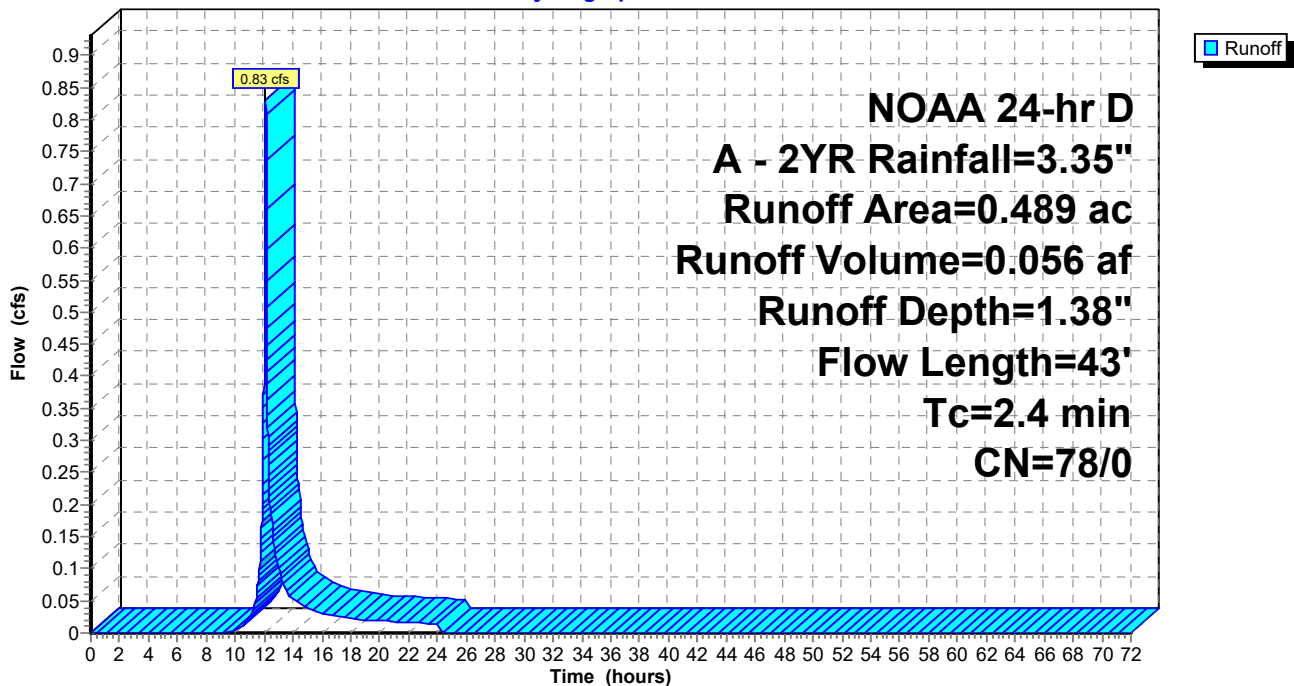
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 14

Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.40 cfs @ 12.15 hrs, Volume= 0.037 af, Depth= 1.52"
 Routed to Pond B-4 : BASIN 4

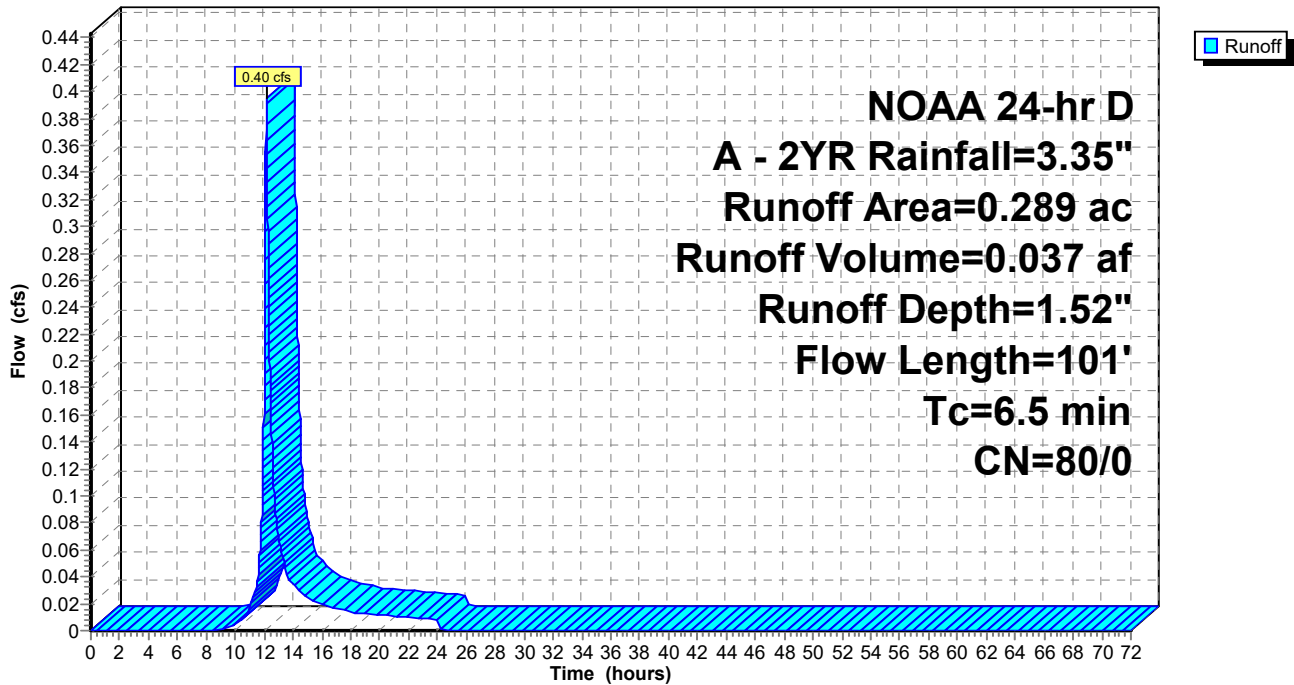
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 15

Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 0.53 cfs @ 12.15 hrs, Volume= 0.050 af, Depth= 1.38"
 Routed to Pond B-5 : BASIN 5

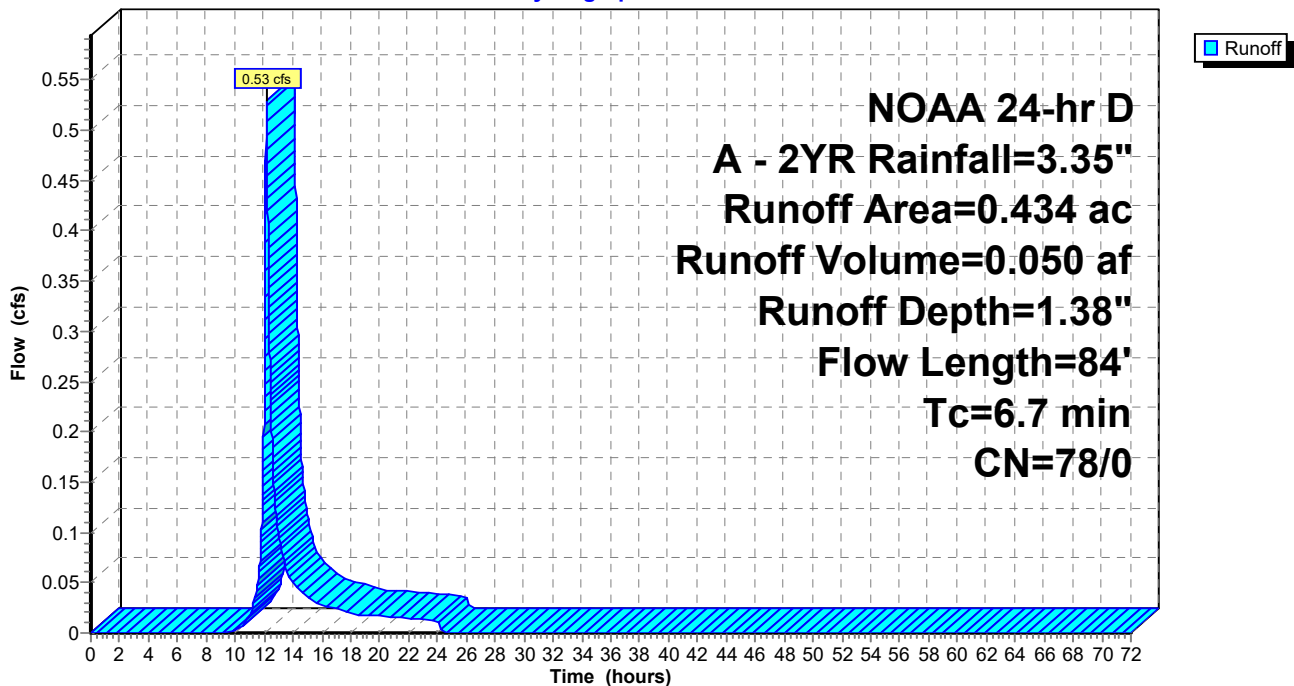
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 16

Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 1.36 cfs @ 12.34 hrs, Volume= 0.245 af, Depth= 3.12"
 Routed to Link P-SR : SOUTH RIVER

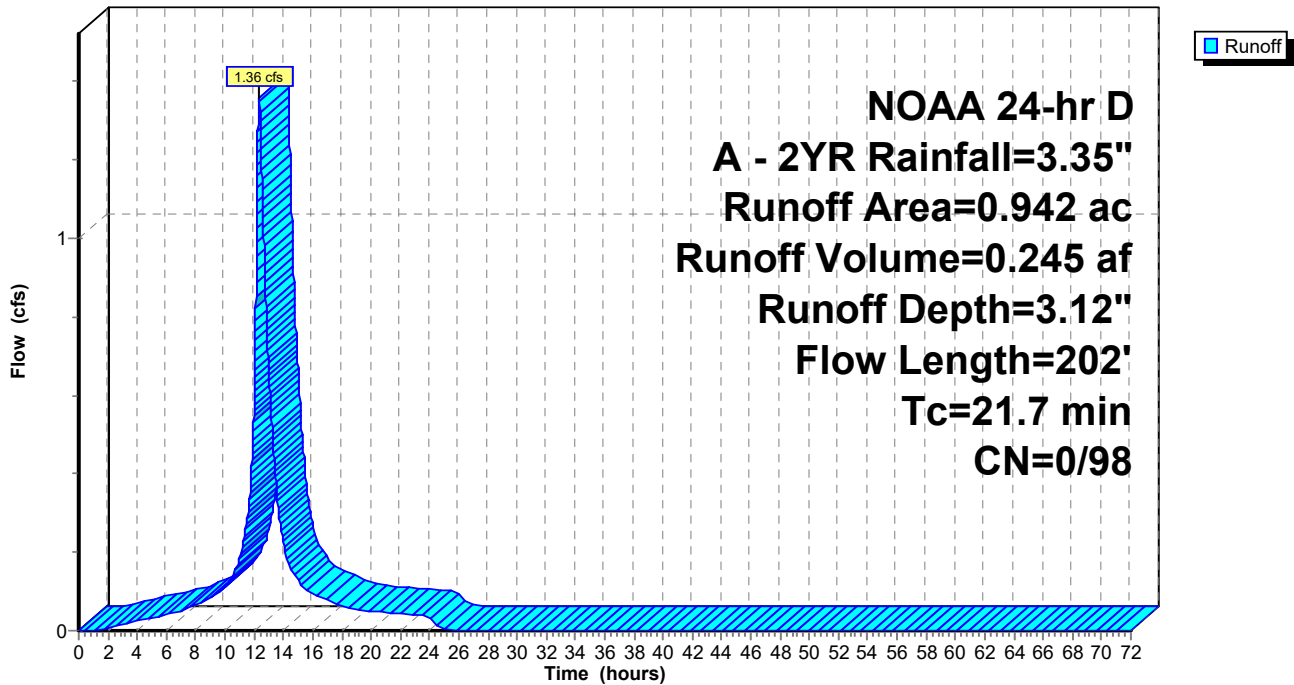
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 17

Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 1.67 cfs @ 12.14 hrs, Volume= 0.165 af, Depth= 3.12"
 Routed to Link P-PC : POND CREEK

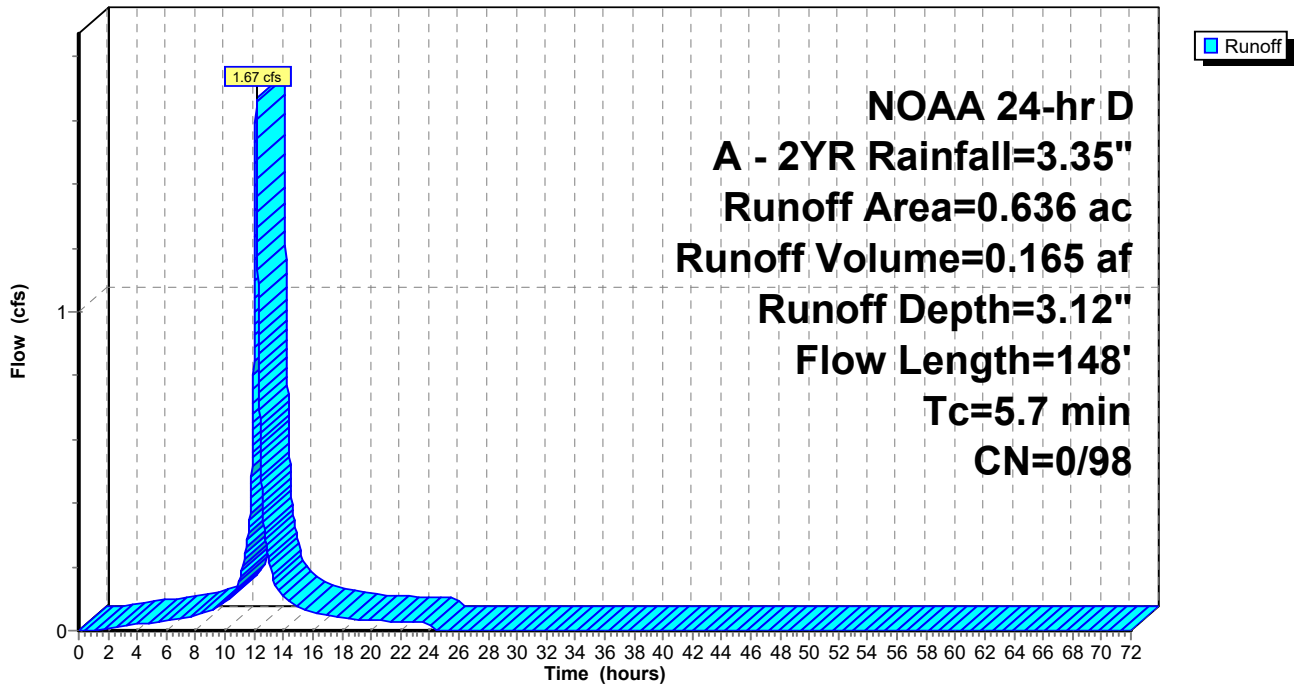
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 18

Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 2.49 cfs @ 12.59 hrs, Volume= 0.589 af, Depth= 1.32"
 Routed to Link P-PC : POND CREEK

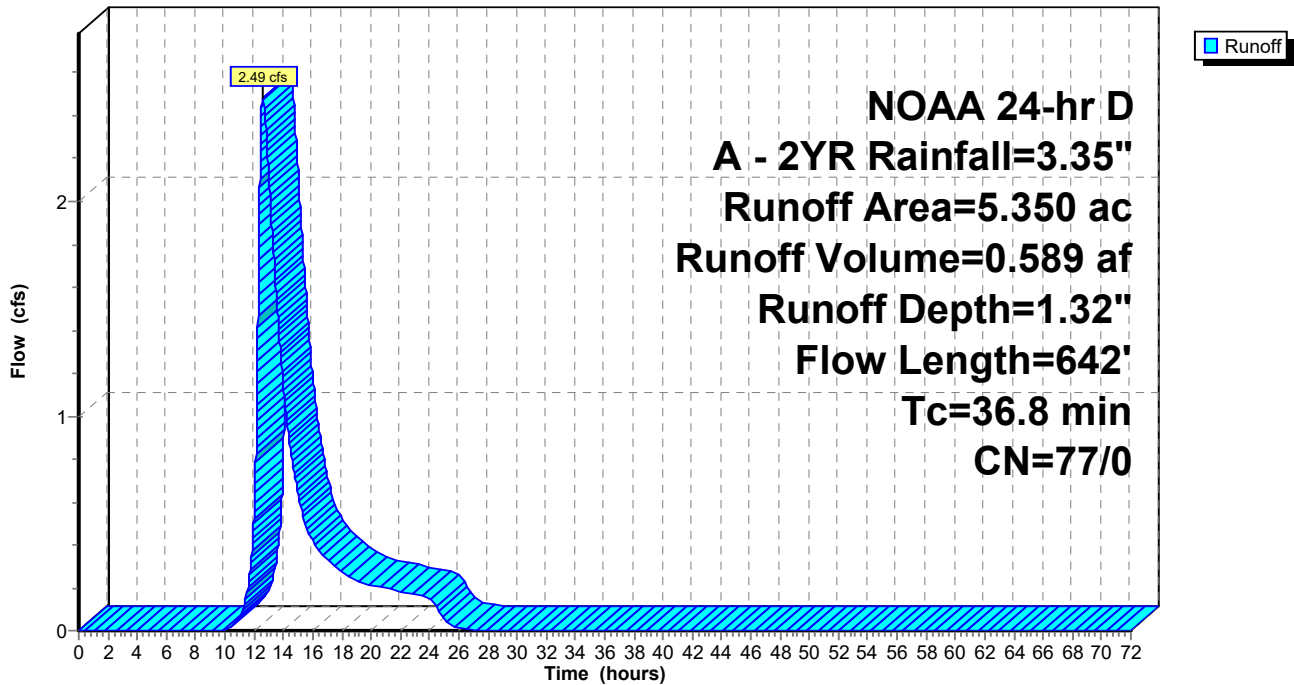
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 19

Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 1.57 cfs @ 12.16 hrs, Volume= 0.164 af, Depth= 2.10"
 Routed to Link P-DC : DUCK CREEK

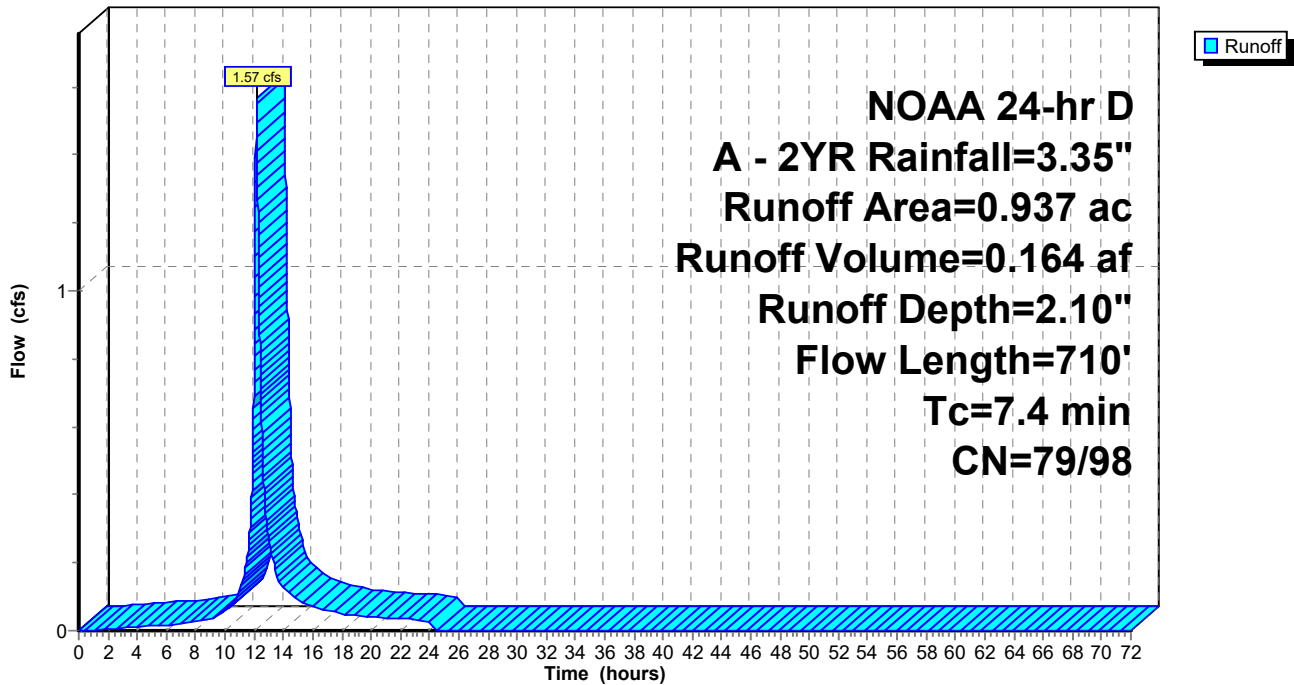
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 20

Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.30 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 1.14"
 Routed to Link P-DC : DUCK CREEK

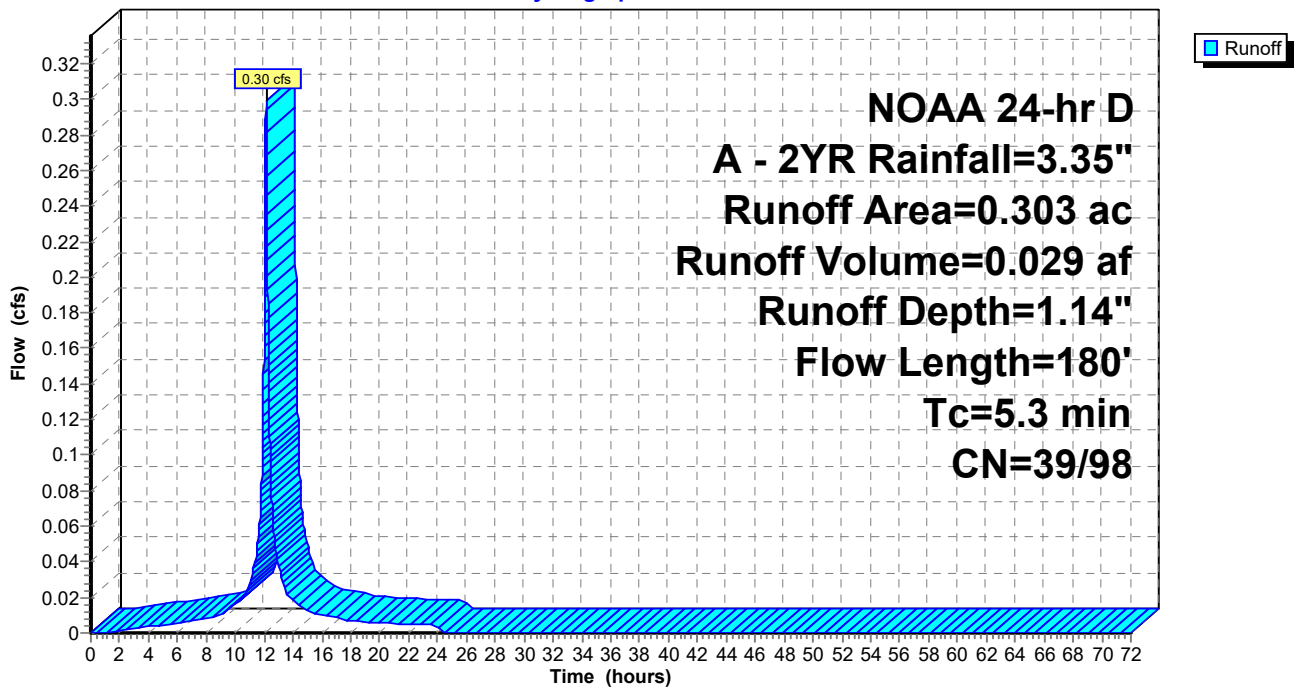
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 21

Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 4.64 cfs @ 12.11 hrs, Volume= 0.389 af, Depth= 3.12"
 Routed to Pond B-2 : BASIN 2

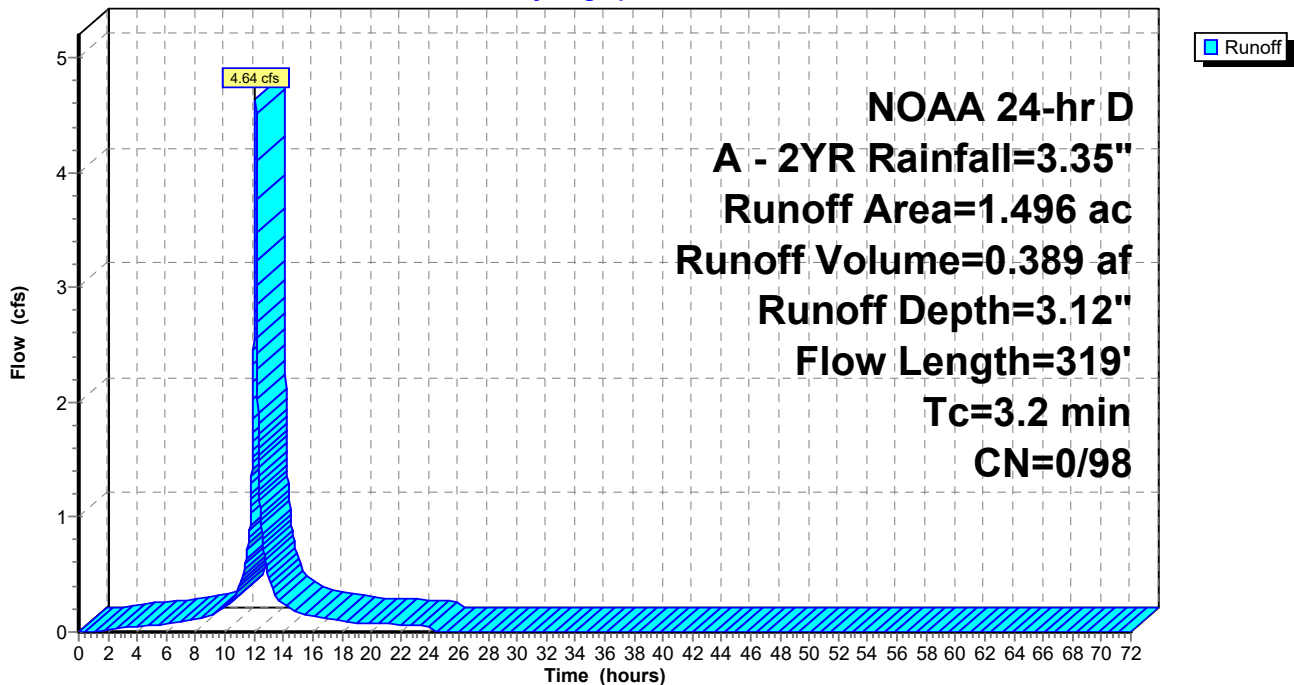
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 22

Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.00 cfs @ 12.12 hrs, Volume= 0.090 af, Depth= 2.98"
 Routed to Pond B-3 : BASIN 3

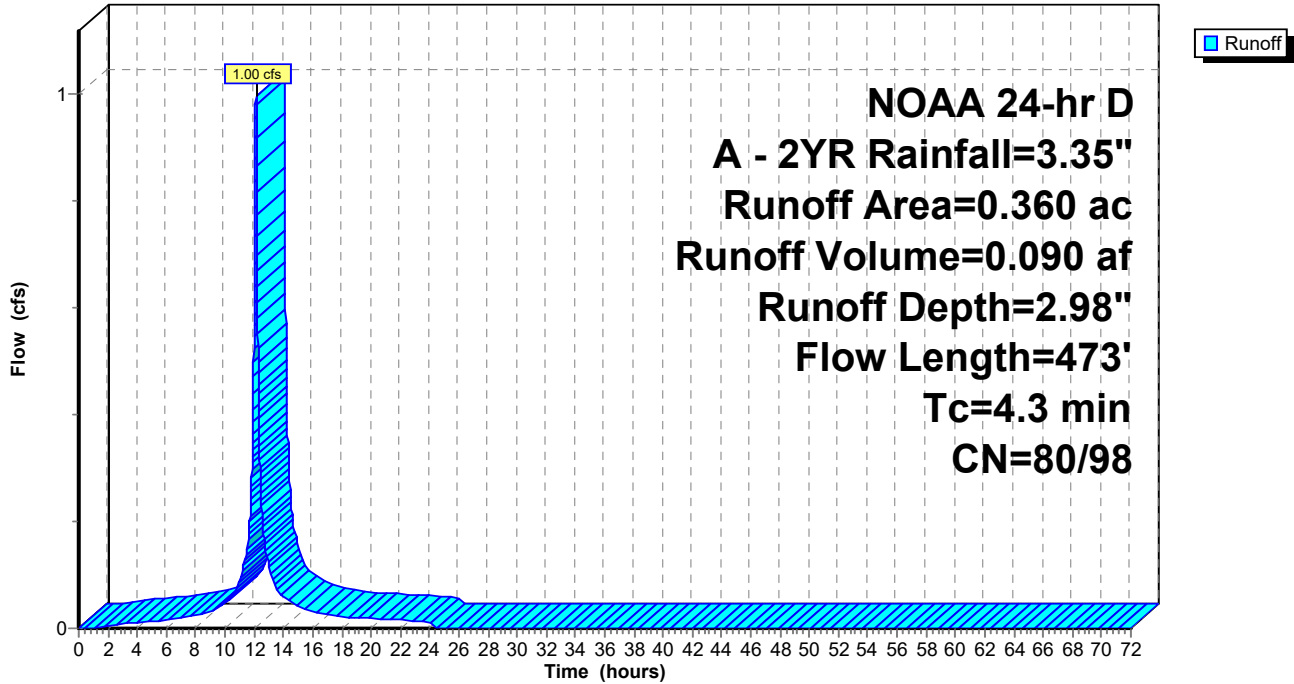
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 24

Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 3.15 cfs @ 12.12 hrs, Volume= 0.276 af, Depth= 3.12"
 Routed to Pond B-3 : BASIN 3

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

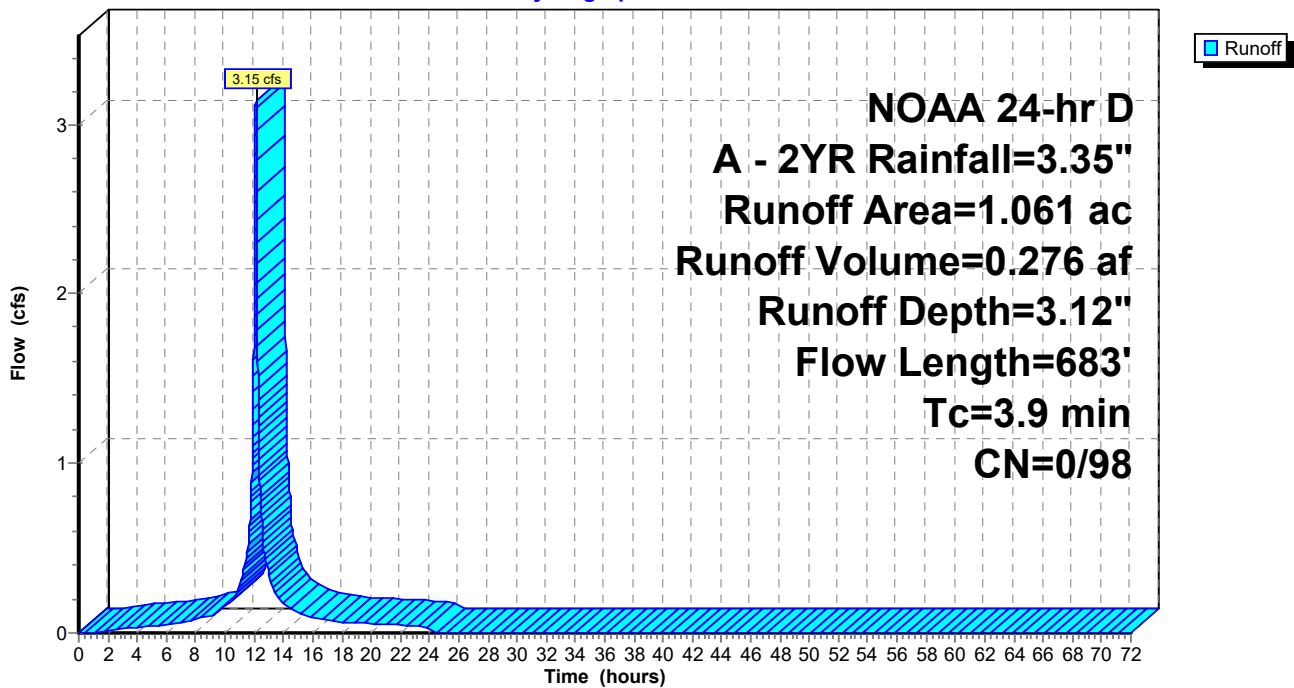
Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior

3.9 683 Total

Subcatchment P-B3-2: P-B3-2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 25

Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 0.63 cfs @ 12.21 hrs, Volume= 0.077 af, Depth= 1.68"
 Routed to Pond B-4 : BASIN 4

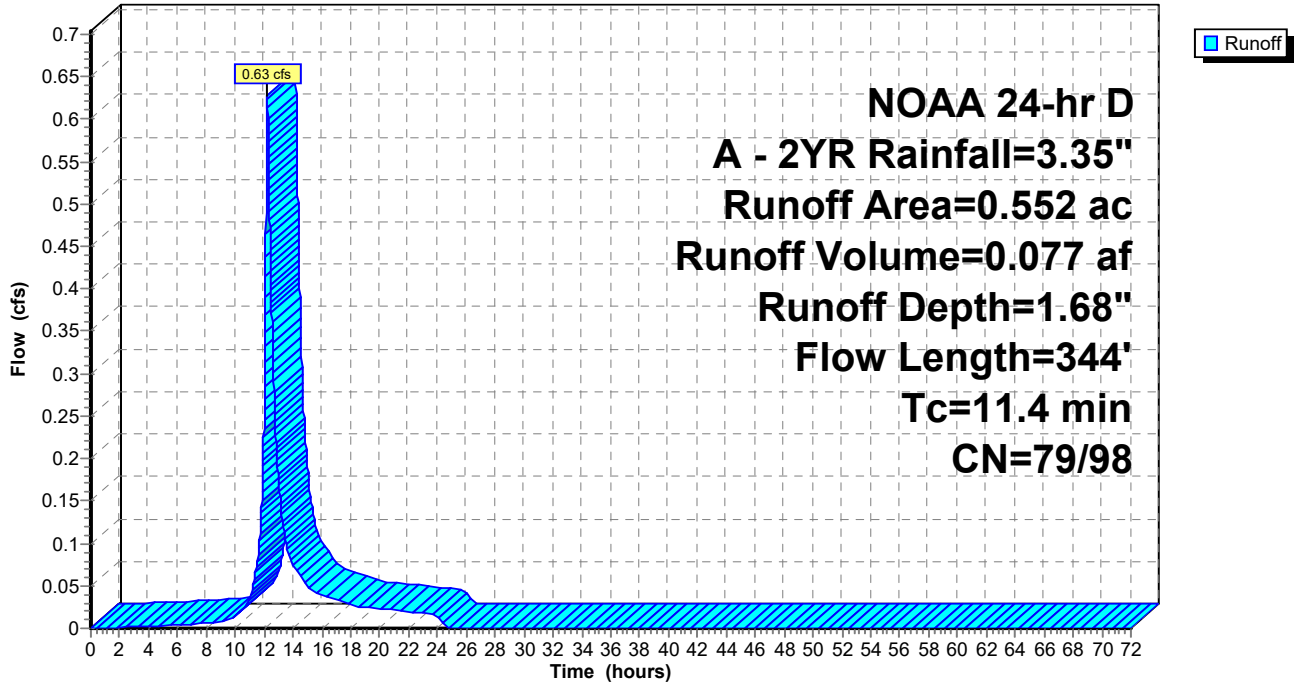
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 27

Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 2.11 cfs @ 12.16 hrs, Volume= 0.233 af, Depth= 2.82"
 Routed to Pond B-4 : BASIN 4

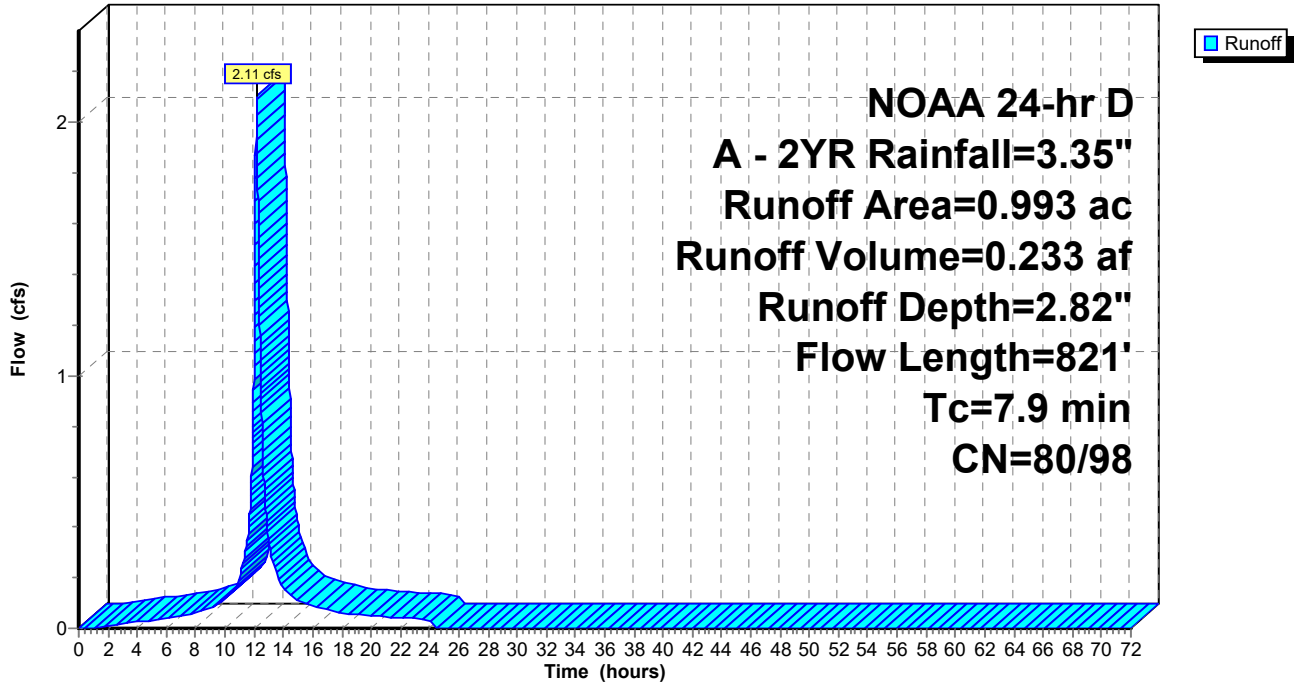
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 29

Summary for Subcatchment P-UG-1: UG-1

Runoff = 7.09 cfs @ 12.15 hrs, Volume= 0.745 af, Depth= 3.12"

Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

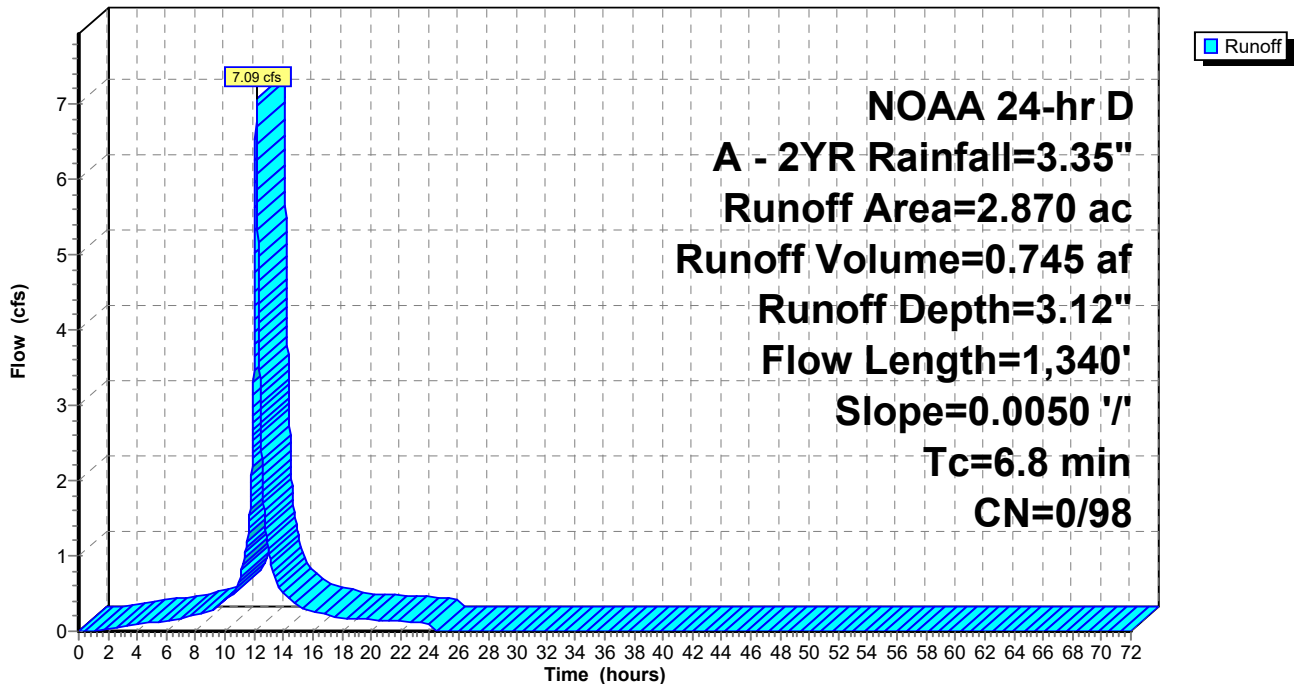
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 30

Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 176% of capacity of segment #3

Runoff = 8.05 cfs @ 12.13 hrs, Volume= 0.745 af, Depth= 3.12"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

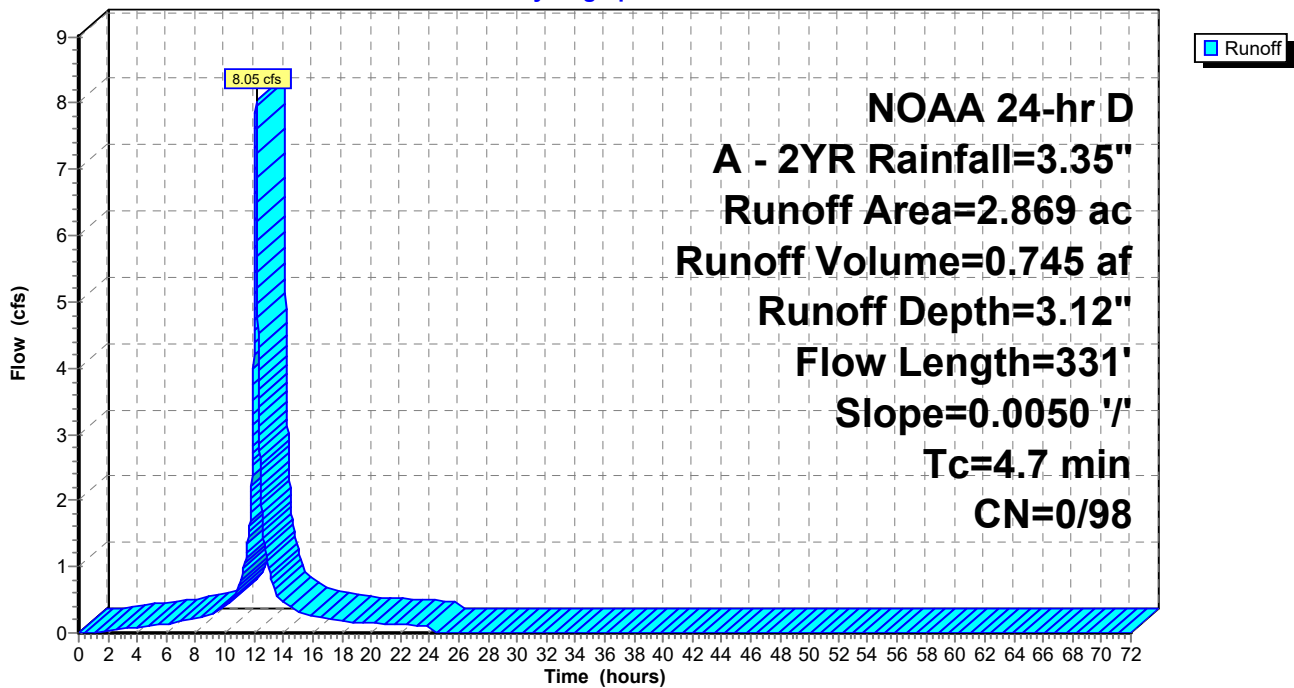
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D A - 2YR Rainfall=3.35"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 31

Summary for Reach 17R: E-1

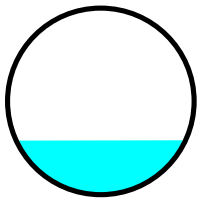
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 2.59" for A - 2YR event
Inflow = 4.62 cfs @ 12.43 hrs, Volume= 1.028 af
Outflow = 4.62 cfs @ 12.44 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.7 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.48 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.06 fps, Avg. Travel Time= 3.8 min

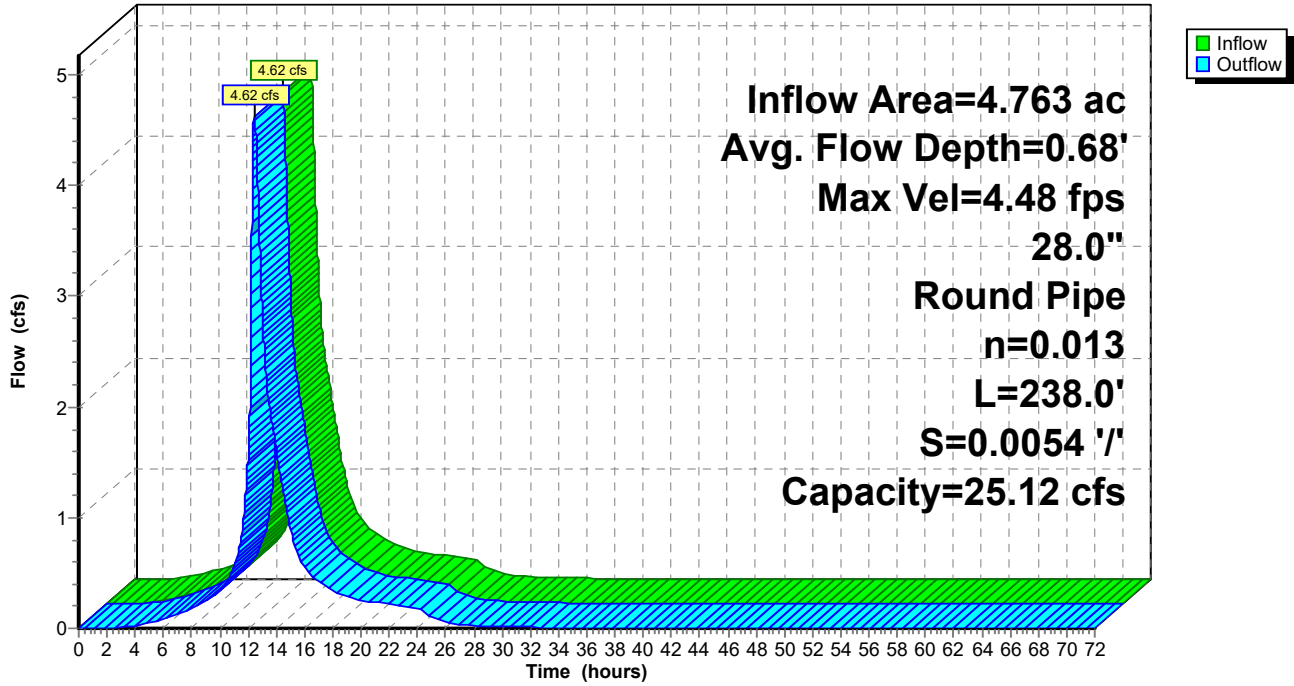
Peak Storage= 245 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.68' , Surface Width= 2.12'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



Reach 17R: E-1

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 33

Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

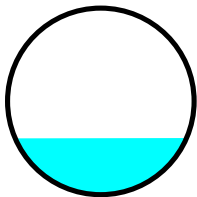
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.03' @ 12.57 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 2.59" for A - 2YR event
Inflow = 4.62 cfs @ 12.44 hrs, Volume= 1.028 af
Outflow = 4.61 cfs @ 12.46 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.7 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.20 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 3.9 min

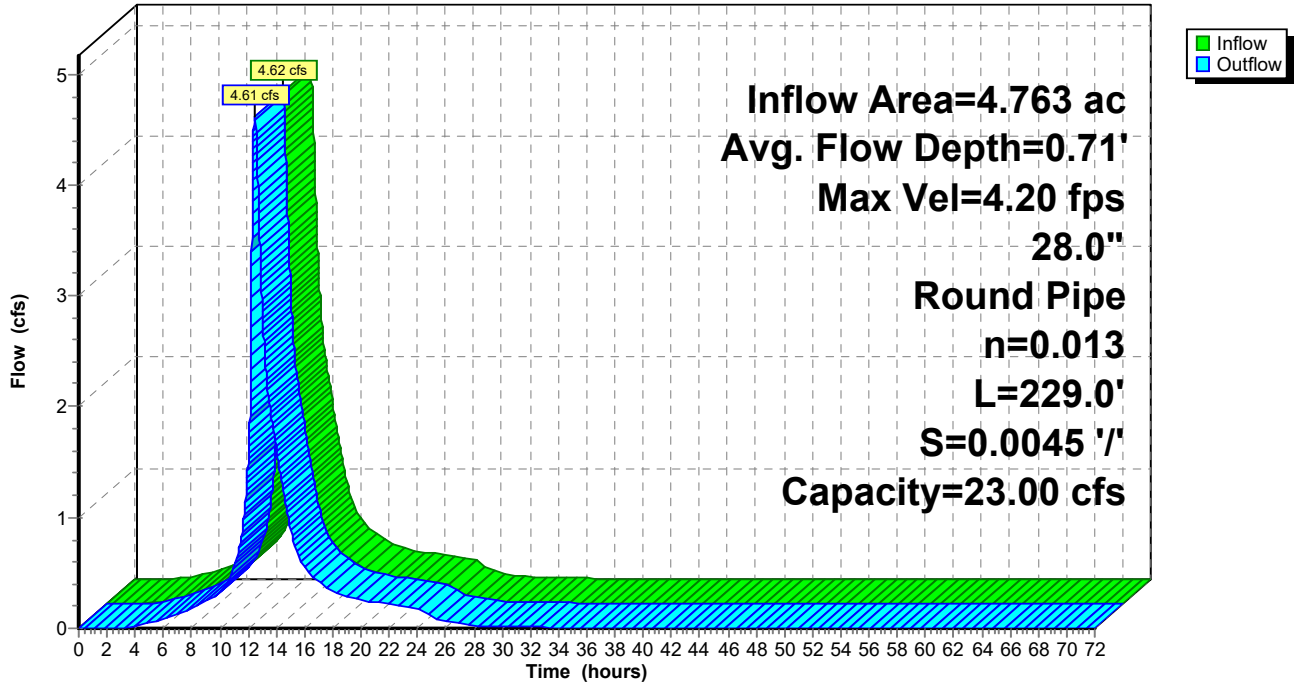
Peak Storage= 251 cf @ 12.46 hrs
Average Depth at Peak Storage= 0.71' , Surface Width= 2.15'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 35

Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 2.97" for A - 2YR event
 Inflow = 4.86 cfs @ 12.11 hrs, Volume= 0.405 af
 Outflow = 0.87 cfs @ 12.55 hrs, Volume= 0.404 af, Atten= 82%, Lag= 26.7 min
 Primary = 0.87 cfs @ 12.55 hrs, Volume= 0.404 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 16.00' Surf.Area= 0.102 ac Storage= 0.093 af
 Peak Elev= 17.24' @ 12.55 hrs Surf.Area= 0.126 ac Storage= 0.235 af (0.141 af above start)

Plug-Flow detention time= 277.4 min calculated for 0.311 af (77% of inflow)
 Center-of-Mass det. time= 105.8 min (866.3 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

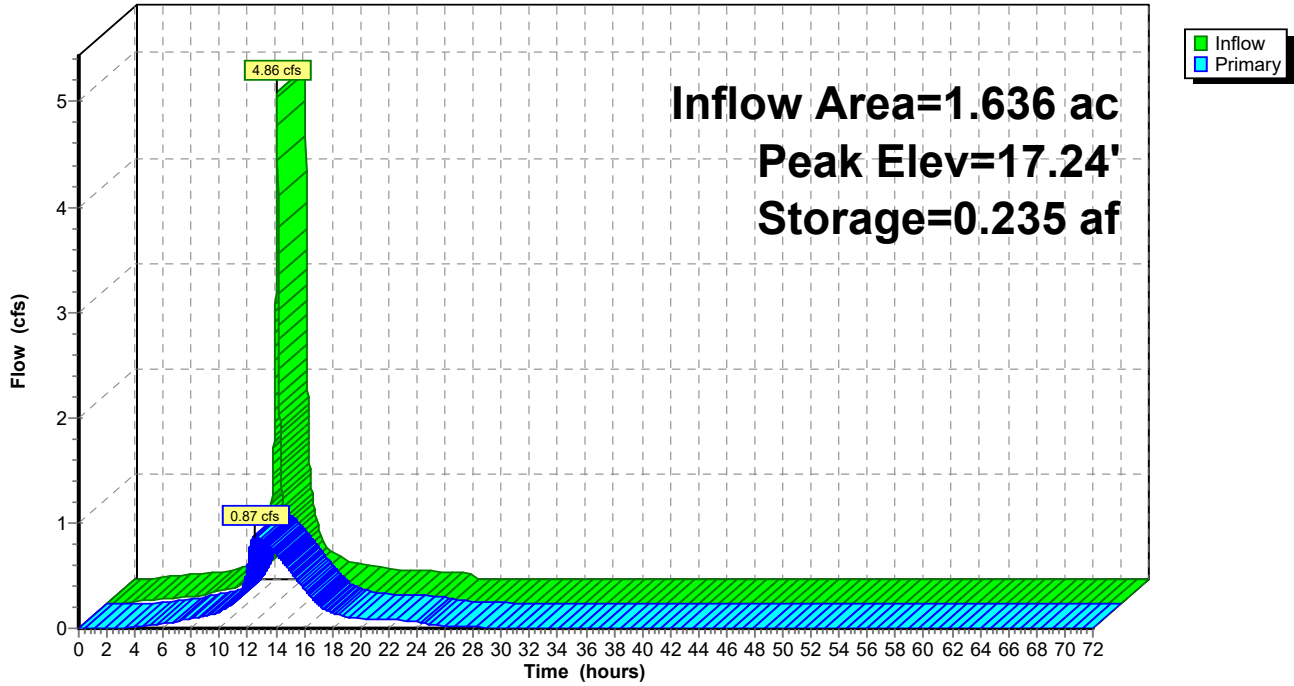
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.87 cfs @ 12.55 hrs HW=17.24' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.87 cfs of 16.30 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.87 cfs @ 4.99 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-2: BASIN 2

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 37

Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 2.65" for A - 2YR event
 Inflow = 4.96 cfs @ 12.12 hrs, Volume= 0.422 af
 Outflow = 1.63 cfs @ 12.35 hrs, Volume= 0.416 af, Atten= 67%, Lag= 13.8 min
 Primary = 1.63 cfs @ 12.35 hrs, Volume= 0.416 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.30' Surf.Area= 0.246 ac Storage= 0.191 af
 Peak Elev= 12.00' @ 12.35 hrs Surf.Area= 0.260 ac Storage= 0.369 af (0.178 af above start)

Plug-Flow detention time= 631.3 min calculated for 0.225 af (53% of inflow)
 Center-of-Mass det. time= 257.0 min (1,028.9 - 771.9)

Volume	Invert	Avail.Storage	Storage Description		
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
10.50	0.231	569.6	0.000	0.000	0.231
11.00	0.241	578.4	0.118	0.118	0.251
12.00	0.259	596.0	0.250	0.368	0.291
13.00	0.278	615.6	0.269	0.637	0.337
13.50	0.295	633.5	0.143	0.780	0.378

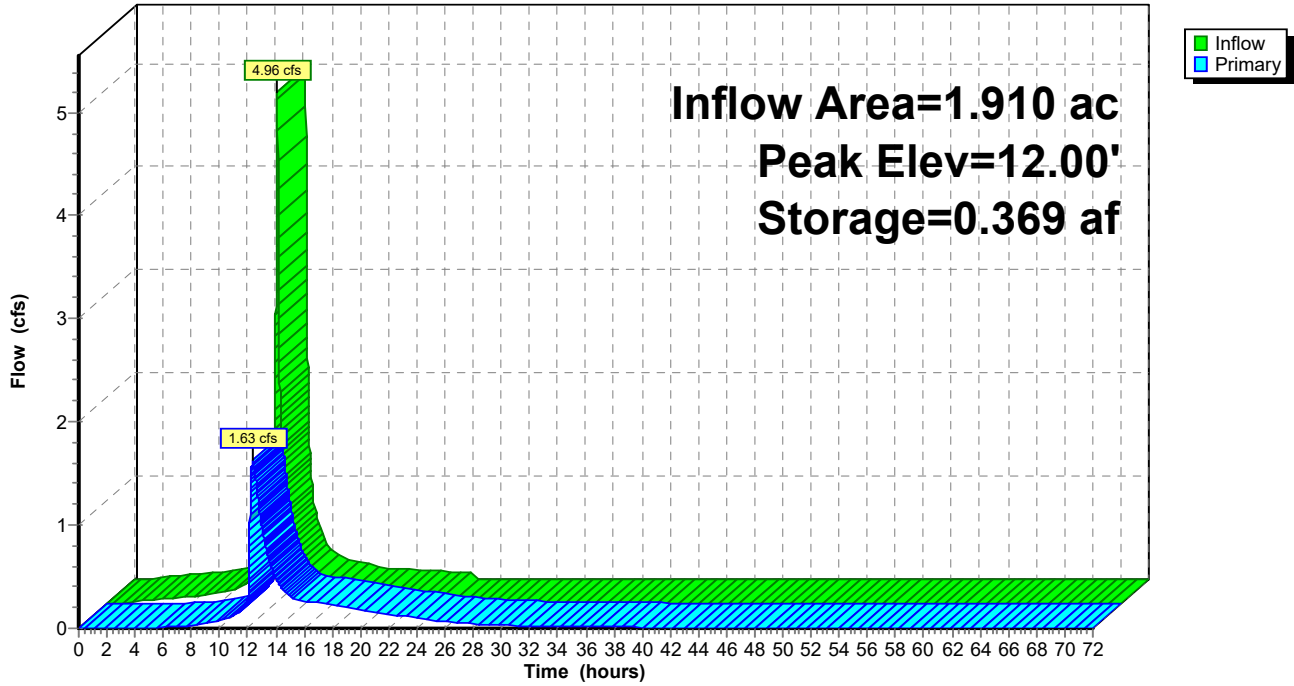
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.63 cfs @ 12.35 hrs HW=12.00' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.63 cfs of 32.63 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.38 cfs @ 3.46 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.24 cfs @ 1.65 fps)
- 4=Orifice/Grate (Weir Controls 0.02 cfs @ 0.22 fps)

Pond B-3: BASIN 3

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 39

Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 2.27" for A - 2YR event
 Inflow = 3.09 cfs @ 12.16 hrs, Volume= 0.347 af
 Outflow = 1.40 cfs @ 12.50 hrs, Volume= 0.347 af, Atten= 55%, Lag= 20.1 min
 Primary = 1.40 cfs @ 12.50 hrs, Volume= 0.347 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.60' Surf.Area= 4,225 sf Storage= 3,964 cf
 Peak Elev= 14.47' @ 12.50 hrs Surf.Area= 4,695 sf Storage= 7,842 cf (3,878 cf above start)

Plug-Flow detention time= 251.1 min calculated for 0.256 af (74% of inflow)
 Center-of-Mass det. time= 74.3 min (871.6 - 797.2)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	3,598	261.0	0	0	3,598
13.00	3,956	273.0	1,510	1,510	4,119
14.00	4,409	283.0	4,180	5,691	4,642
14.10	4,447	284.0	443	6,133	4,695
15.00	5,055	304.0	4,273	10,406	5,667
16.00	5,447	312.0	5,250	15,656	6,166

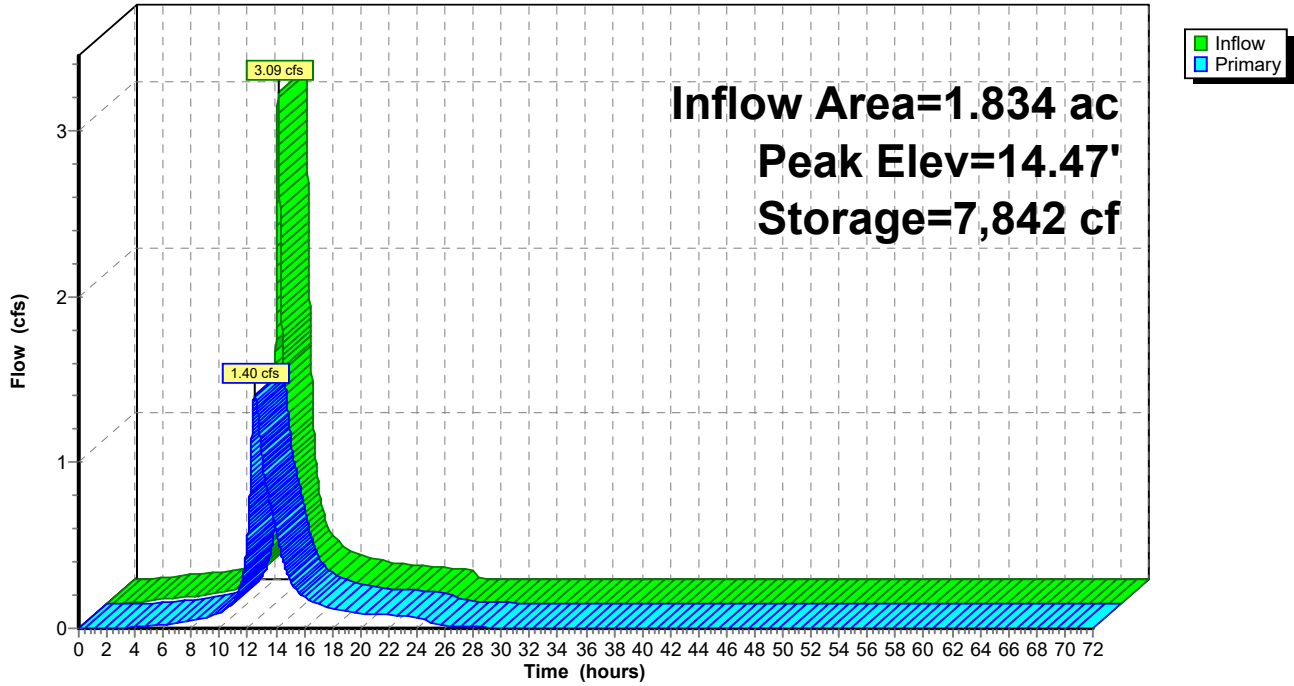
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.40 cfs @ 12.50 hrs HW=14.47' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.40 cfs of 12.06 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.07 cfs @ 3.93 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.33 cfs @ 1.55 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 41

Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 2.80" for A - 2YR event
 Inflow = 6.03 cfs @ 12.16 hrs, Volume= 0.683 af
 Outflow = 3.24 cfs @ 12.41 hrs, Volume= 0.682 af, Atten= 46%, Lag= 15.0 min
 Primary = 3.24 cfs @ 12.41 hrs, Volume= 0.682 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.90' Surf.Area= 8,129 sf Storage= 9,986 cf
 Peak Elev= 14.80' @ 12.41 hrs Surf.Area= 8,818 sf Storage= 17,612 cf (7,626 cf above start)

Plug-Flow detention time= 296.4 min calculated for 0.452 af (66% of inflow)
 Center-of-Mass det. time= 83.2 min (857.3 - 774.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	6,858	409.0	0	0	6,858
13.00	7,629	429.0	2,896	2,896	8,202
14.00	8,186	439.0	7,906	10,802	9,018
14.10	8,239	440.0	821	11,623	9,101
15.00	8,985	459.0	7,748	19,372	10,519
16.00	9,537	468.1	9,260	28,631	11,335

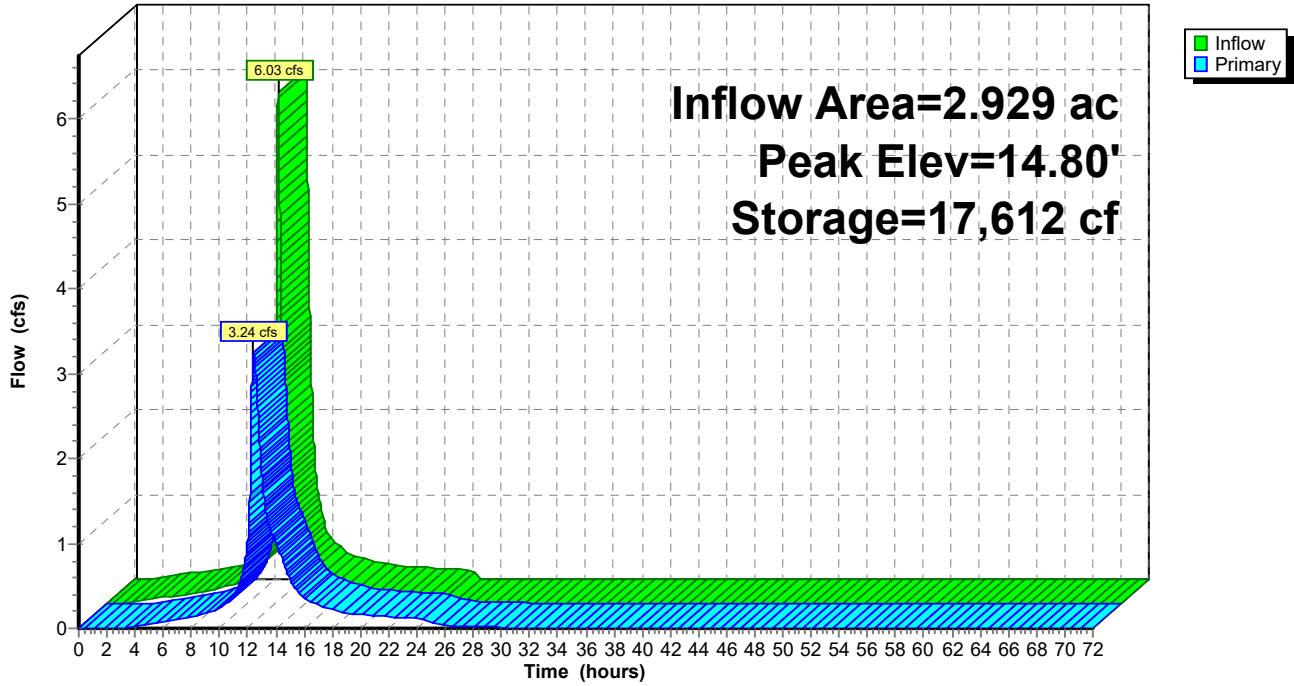
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.24 cfs @ 12.41 hrs HW=14.80' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.24 cfs of 13.21 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.64 cfs @ 4.01 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.60 cfs @ 1.80 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 43

Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 3.12" for A - 2YR event
 Inflow = 15.01 cfs @ 12.13 hrs, Volume= 1.491 af
 Outflow = 0.92 cfs @ 14.14 hrs, Volume= 1.464 af, Atten= 94%, Lag= 120.1 min
 Primary = 0.92 cfs @ 14.14 hrs, Volume= 1.464 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.00' Surf.Area= 0.631 ac Storage= 0.542 af
 Peak Elev= 13.05' @ 14.14 hrs Surf.Area= 0.631 ac Storage= 1.480 af (0.938 af above start)

Plug-Flow detention time= 1,119.5 min calculated for 0.922 af (62% of inflow)
 Center-of-Mass det. time= 668.5 min (1,429.1 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=0.92 cfs @ 14.14 hrs HW=13.05' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.92 cfs of 36.15 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.58 cfs @ 6.61 fps)
- 3=Orifice/Grate (Orifice Controls 0.34 cfs @ 5.04 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 44

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"

End Stone x 2 = 324.00' Base Length

8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 = 32,197.7 cf Chamber Storage

128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 = 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af

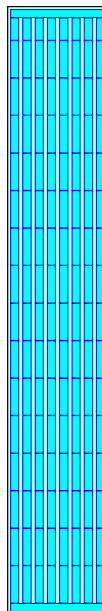
Overall Storage Efficiency = 57.7%

Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers

3,517.4 cy Field

2,088.7 cy Stone



250225 - (Failure Analysis) Proposed Conditions

NOAA 24-hr D A - 2YR Rainfall=3.35"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 45

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf

Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf

Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"

End Stone x 2 = 304.00' Base Length

5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width

6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 = 18,864.5 cf Chamber Storage

75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 = 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af

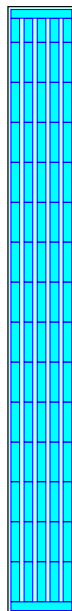
Overall Storage Efficiency = 57.5%

Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers

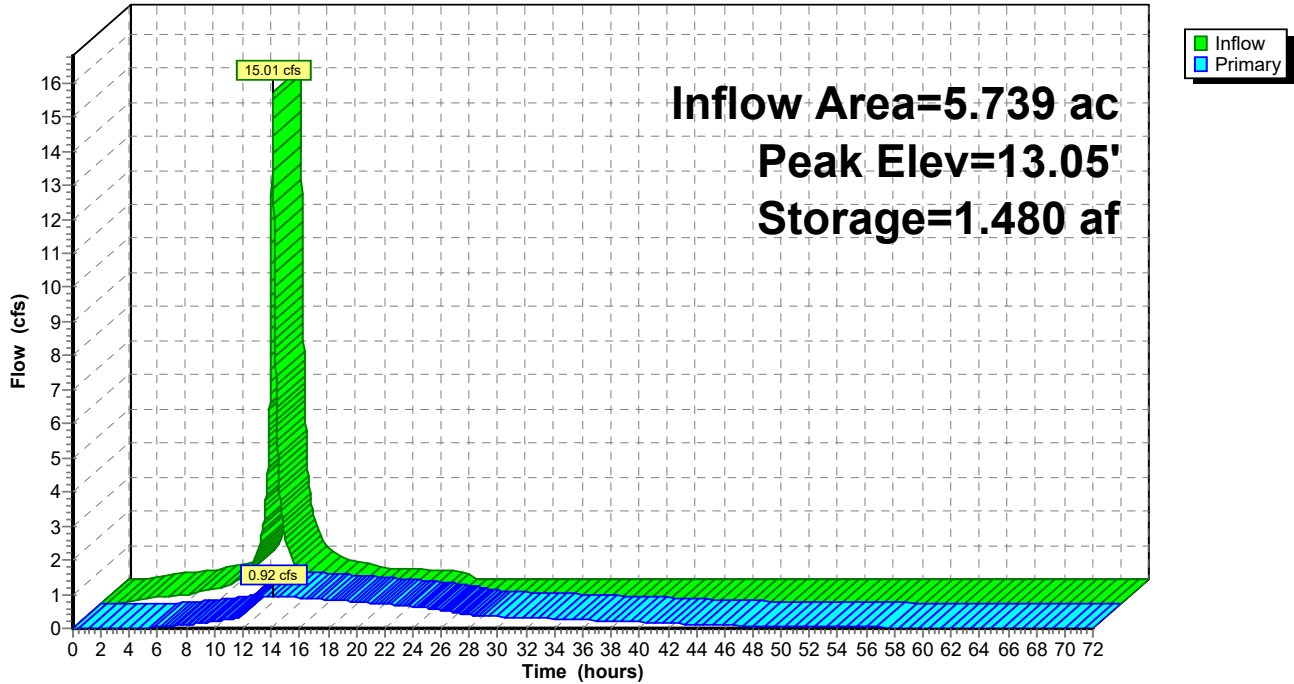
2,084.9 cy Field

1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



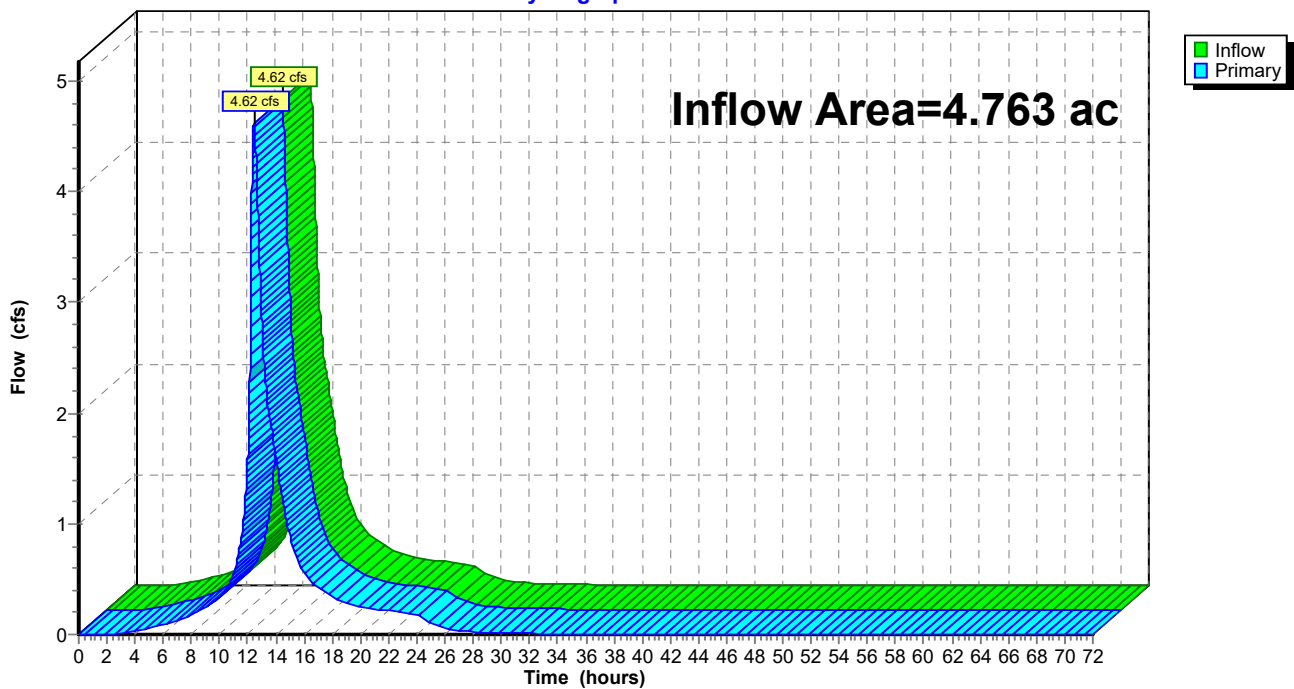
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 2.59" for A - 2YR event
Inflow = 4.62 cfs @ 12.43 hrs, Volume= 1.028 af
Primary = 4.62 cfs @ 12.43 hrs, Volume= 1.028 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



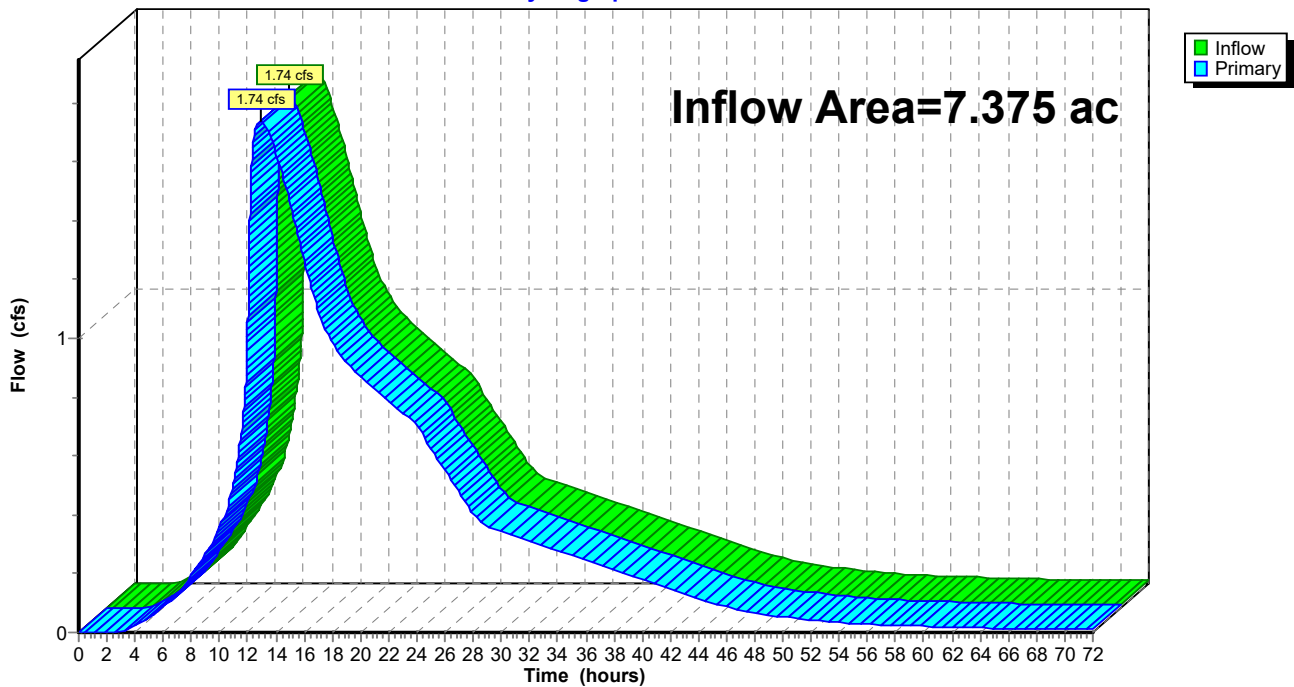
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 3.04" for A - 2YR event
Inflow = 1.74 cfs @ 12.91 hrs, Volume= 1.868 af
Primary = 1.74 cfs @ 12.91 hrs, Volume= 1.868 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



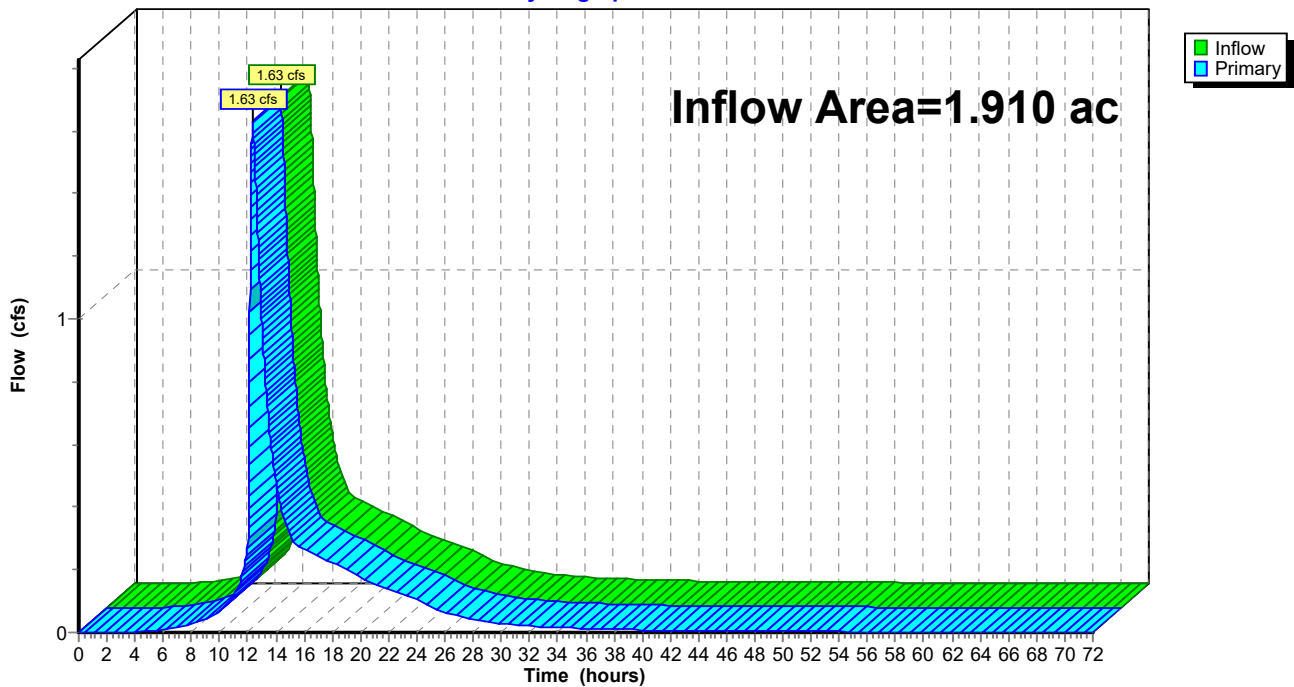
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 2.62" for A - 2YR event
Inflow = 1.63 cfs @ 12.35 hrs, Volume= 0.416 af
Primary = 1.63 cfs @ 12.35 hrs, Volume= 0.416 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



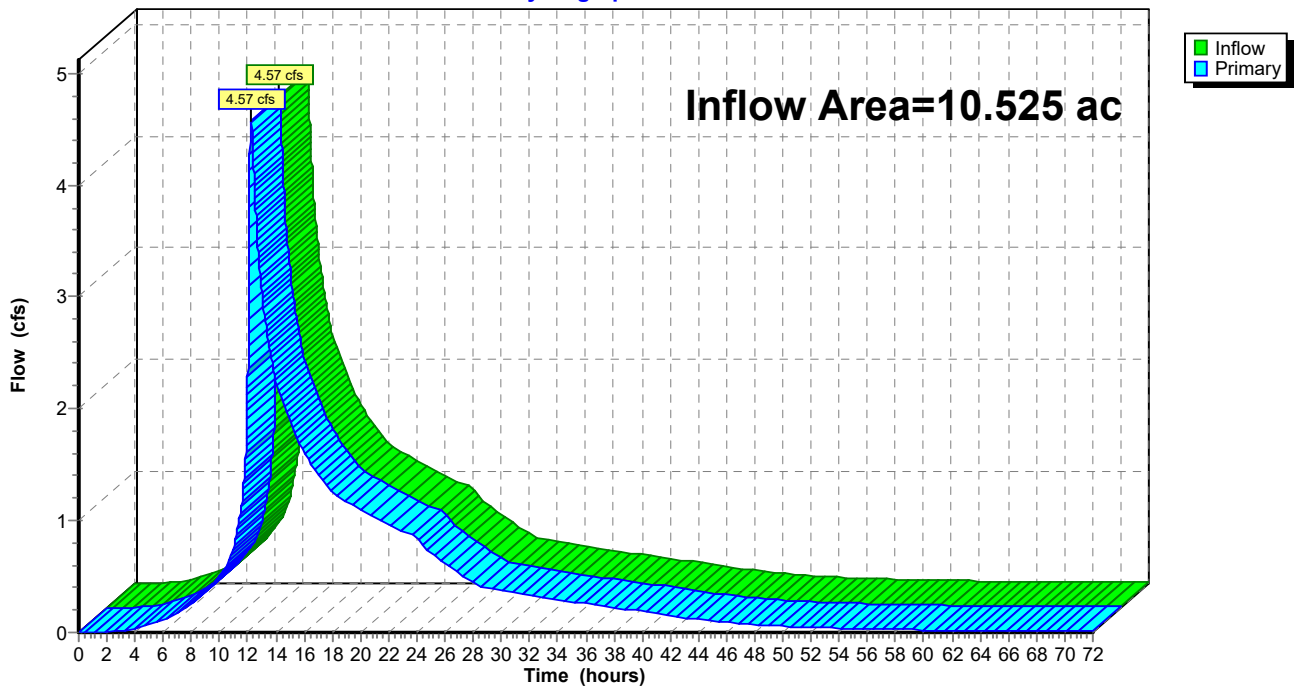
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 2.82" for A - 2YR event
Inflow = 4.57 cfs @ 12.22 hrs, Volume= 2.477 af
Primary = 4.57 cfs @ 12.22 hrs, Volume= 2.477 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



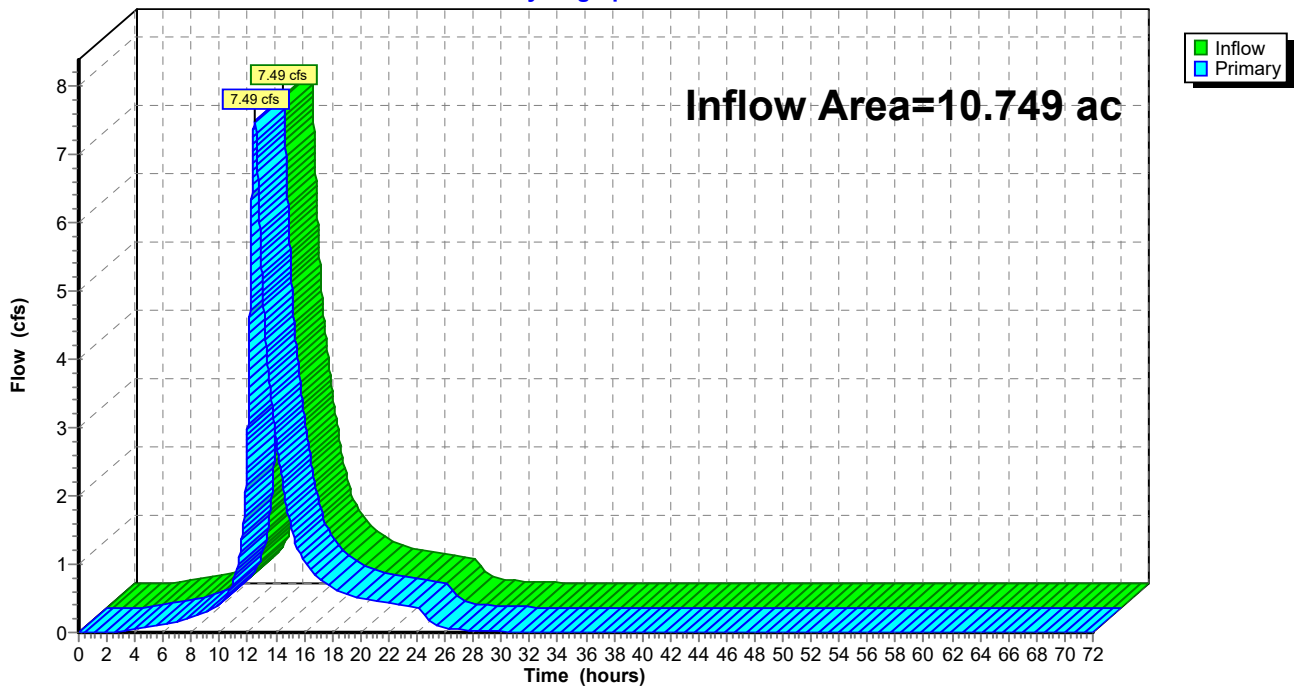
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 1.99" for A - 2YR event
Inflow = 7.49 cfs @ 12.49 hrs, Volume= 1.782 af
Primary = 7.49 cfs @ 12.49 hrs, Volume= 1.782 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



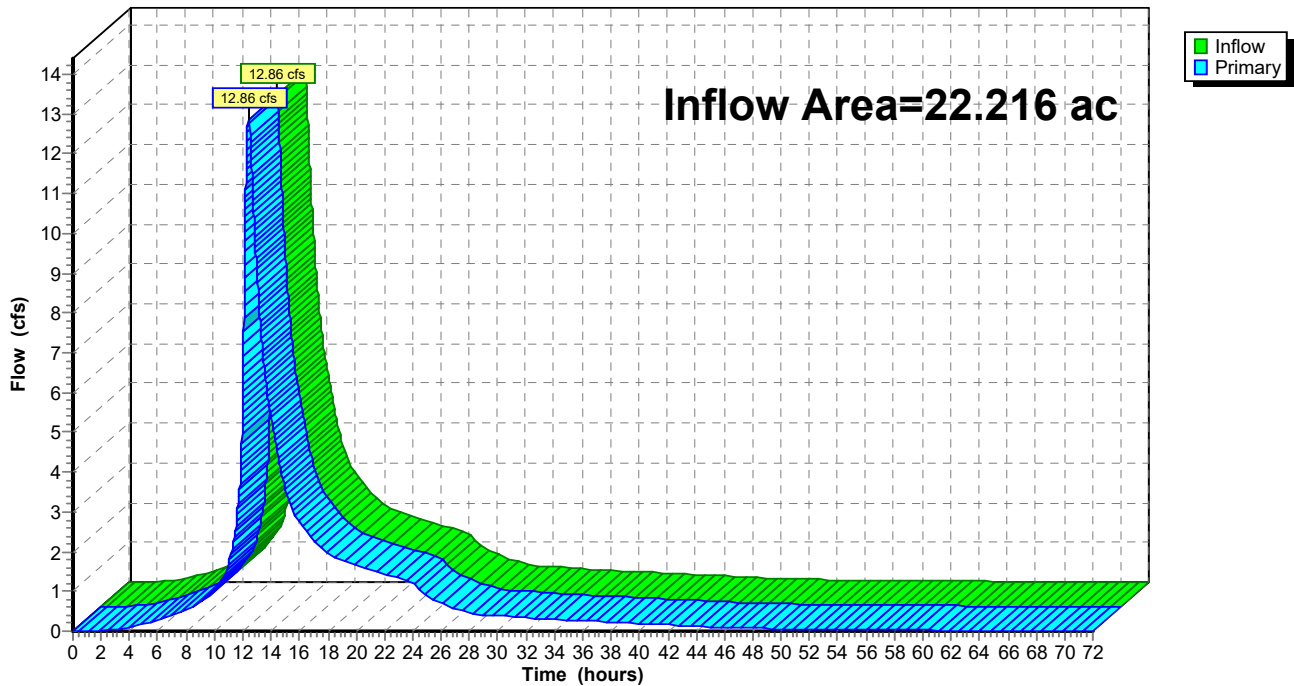
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 2.43" for A - 2YR event
Inflow = 12.86 cfs @ 12.40 hrs, Volume= 4.504 af
Primary = 12.86 cfs @ 12.40 hrs, Volume= 4.504 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=4.80" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=8.55 cfs 0.999 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.53 cfs 0.033 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=1.69 cfs 0.115 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=3.01" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.79 cfs 0.072 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=2.82" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=1.10 cfs 0.102 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=2.10 cfs 0.384 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=2.58 cfs 0.259 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=2.73" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=5.38 cfs 1.218 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=3.68" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=2.77 cfs 0.287 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=1.94" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.46 cfs 0.049 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=7.15 cfs 0.610 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=4.74" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.56 cfs 0.142 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=4.85 cfs 0.433 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=3.19" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=1.21 cfs 0.147 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=4.54" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=3.36 cfs 0.376 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=10.93 cfs 1.170 af

SubcatchmentP-UG-2: UG-2	Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=4.89" Flow Length=331' Slope=0.0050 '/ Tc=4.7 min CN=0/98 Runoff=12.41 cfs 1.170 af
Reach 17R: E-1	Avg. Flow Depth=0.97' Max Vel=5.40 fps Inflow=9.06 cfs 1.695 af 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/ Capacity=25.12 cfs Outflow=9.06 cfs 1.695 af
Reach 18R: E-2	Avg. Flow Depth=1.02' Max Vel=5.06 fps Inflow=9.06 cfs 1.695 af 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/ Capacity=23.00 cfs Outflow=9.05 cfs 1.695 af
Pond B-2: BASIN 2	Peak Elev=17.62' Storage=0.284 af Inflow=7.59 cfs 0.643 af Outflow=3.92 cfs 0.642 af
Pond B-3: BASIN 3	Peak Elev=12.15' Storage=0.407 af Inflow=8.06 cfs 0.690 af Outflow=5.87 cfs 0.684 af
Pond B-4: BASIN 4	Peak Elev=14.90' Storage=9,883 cf Inflow=5.28 cfs 0.595 af Outflow=2.85 cfs 0.595 af
Pond B-5: BASIN 5	Peak Elev=15.09' Storage=20,220 cf Inflow=9.64 cfs 1.101 af Outflow=6.27 cfs 1.100 af
Pond UG-2: UG BASIN 1 & 2 (	Peak Elev=13.80' Storage=1.768 af Inflow=23.14 cfs 2.340 af Outflow=6.44 cfs 2.310 af
Link 16L: Existing Storm Sewer	Inflow=9.06 cfs 1.695 af Primary=9.06 cfs 1.695 af
Link D3A: POD 3A	Inflow=8.21 cfs 2.953 af Primary=8.21 cfs 2.953 af
Link D3B: POD 3B	Inflow=5.87 cfs 0.684 af Primary=5.87 cfs 0.684 af
Link P-DC: DUCK CREEK	Inflow=13.52 cfs 3.973 af Primary=13.52 cfs 3.973 af
Link P-PC: POND CREEK	Inflow=14.90 cfs 3.172 af Primary=14.90 cfs 3.172 af
Link P-SR: SOUTH RIVER	Inflow=29.47 cfs 7.529 af Primary=29.47 cfs 7.529 af

Total Runoff Area = 22.216 ac Runoff Volume = 7.566 af Average Runoff Depth = 4.09"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

Summary for Subcatchment 16S: P-B5-1

Runoff = 8.55 cfs @ 12.17 hrs, Volume= 0.999 af, Depth= 4.80"
 Routed to Pond B-5 : BASIN 5

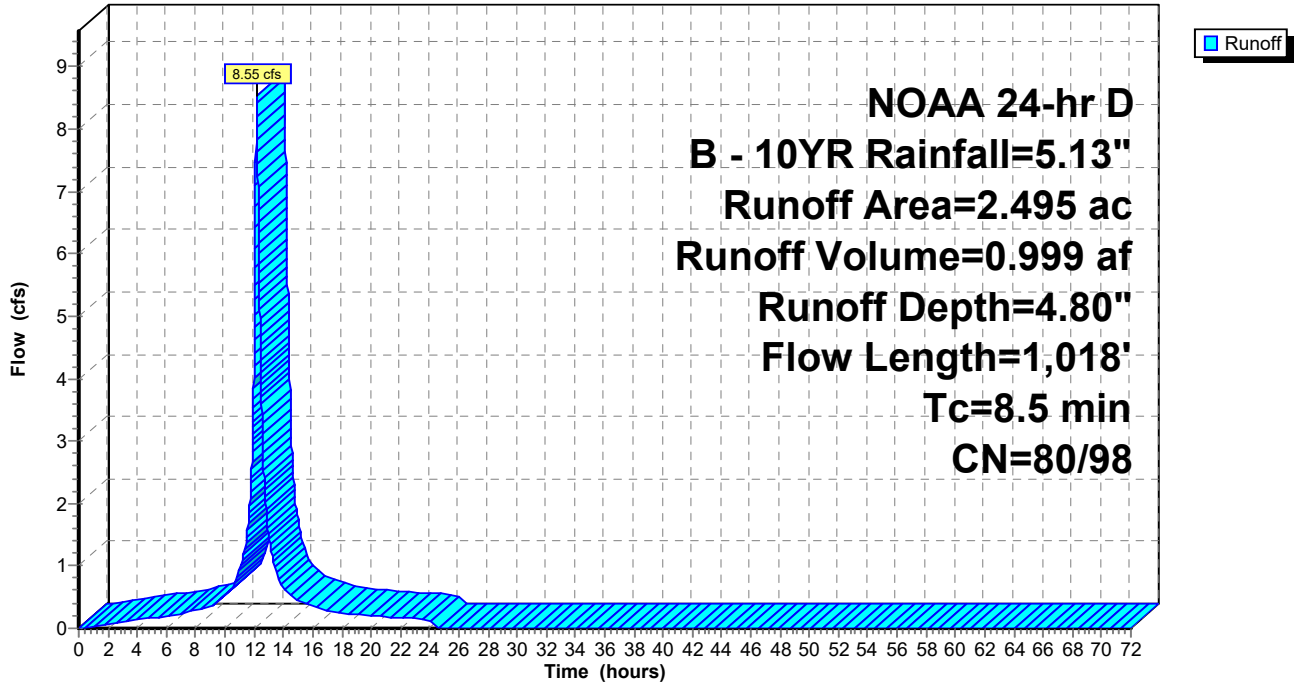
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.53 cfs @ 12.10 hrs, Volume= 0.033 af, Depth= 2.82"
 Routed to Pond B-2 : BASIN 2

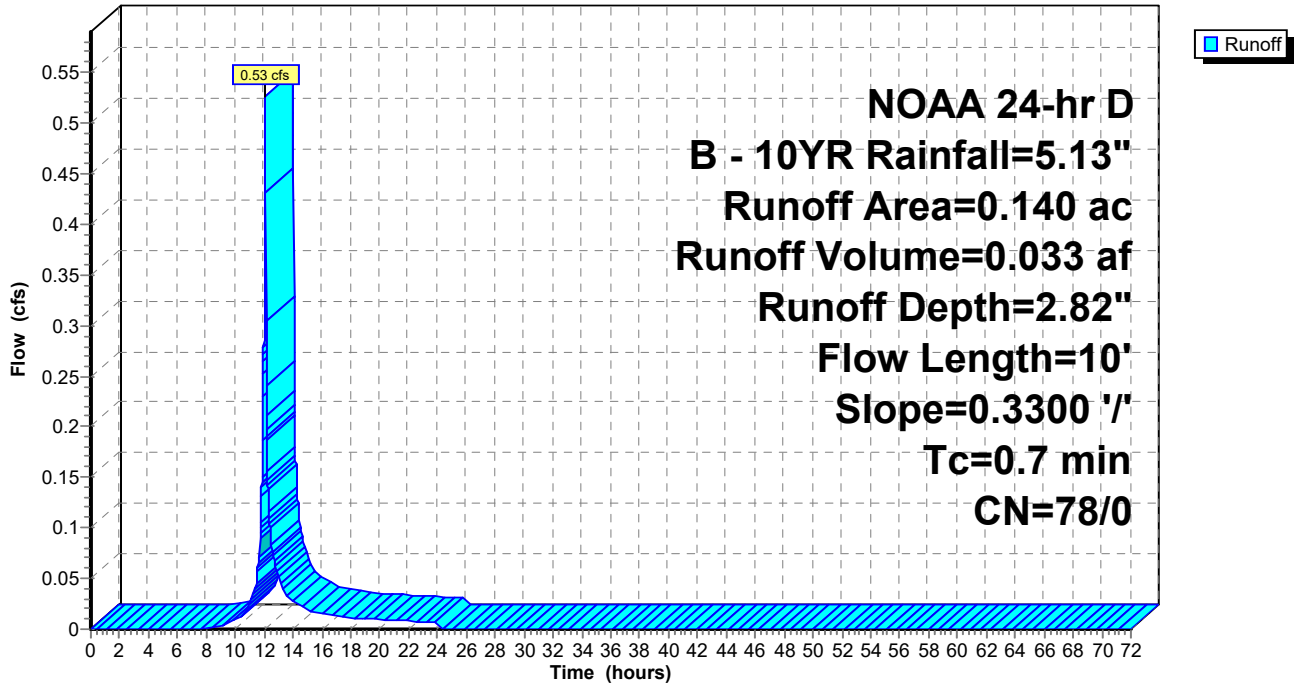
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 1.69 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 2.82"
 Routed to Pond B-3 : BASIN 3

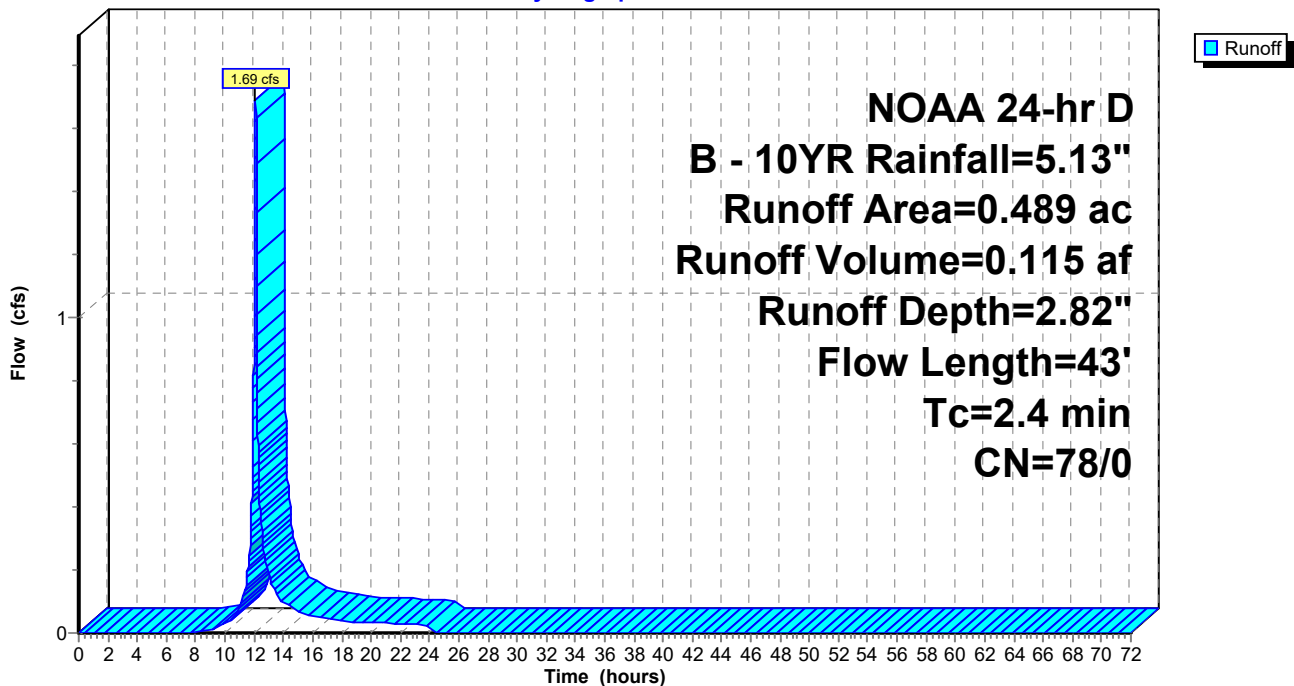
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.79 cfs @ 12.15 hrs, Volume= 0.072 af, Depth= 3.01"
 Routed to Pond B-4 : BASIN 4

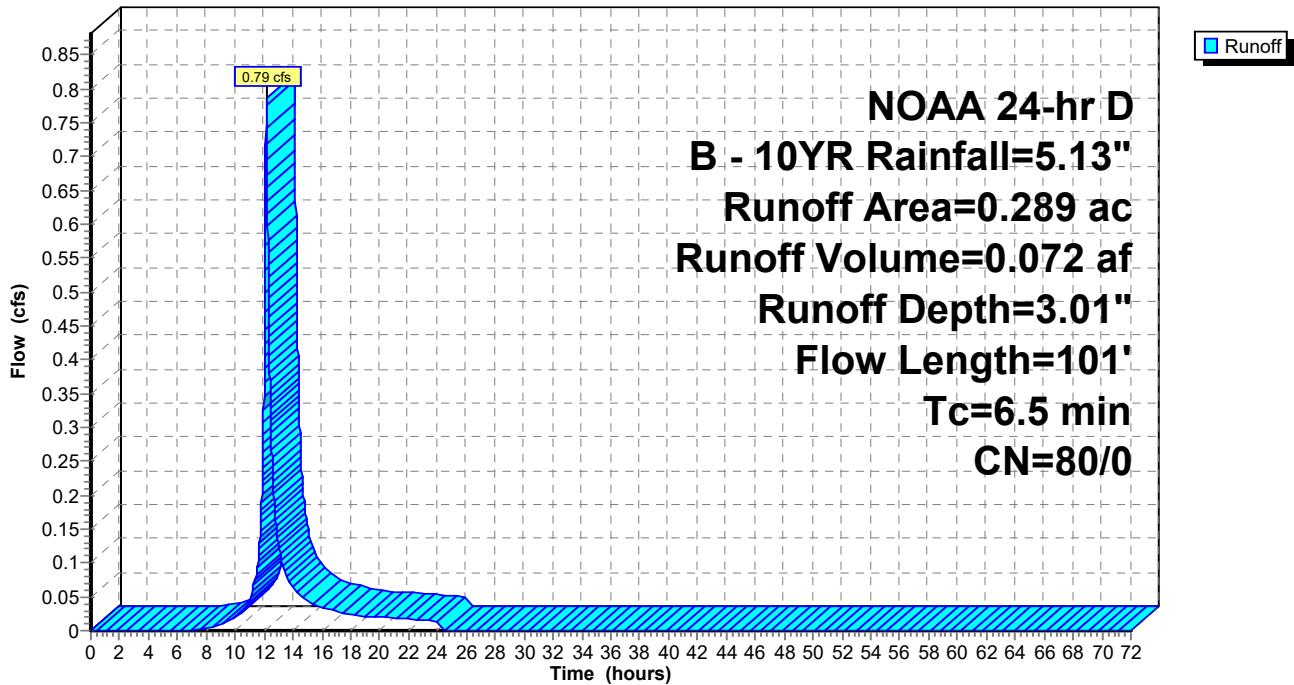
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 1.10 cfs @ 12.15 hrs, Volume= 0.102 af, Depth= 2.82"
 Routed to Pond B-5 : BASIN 5

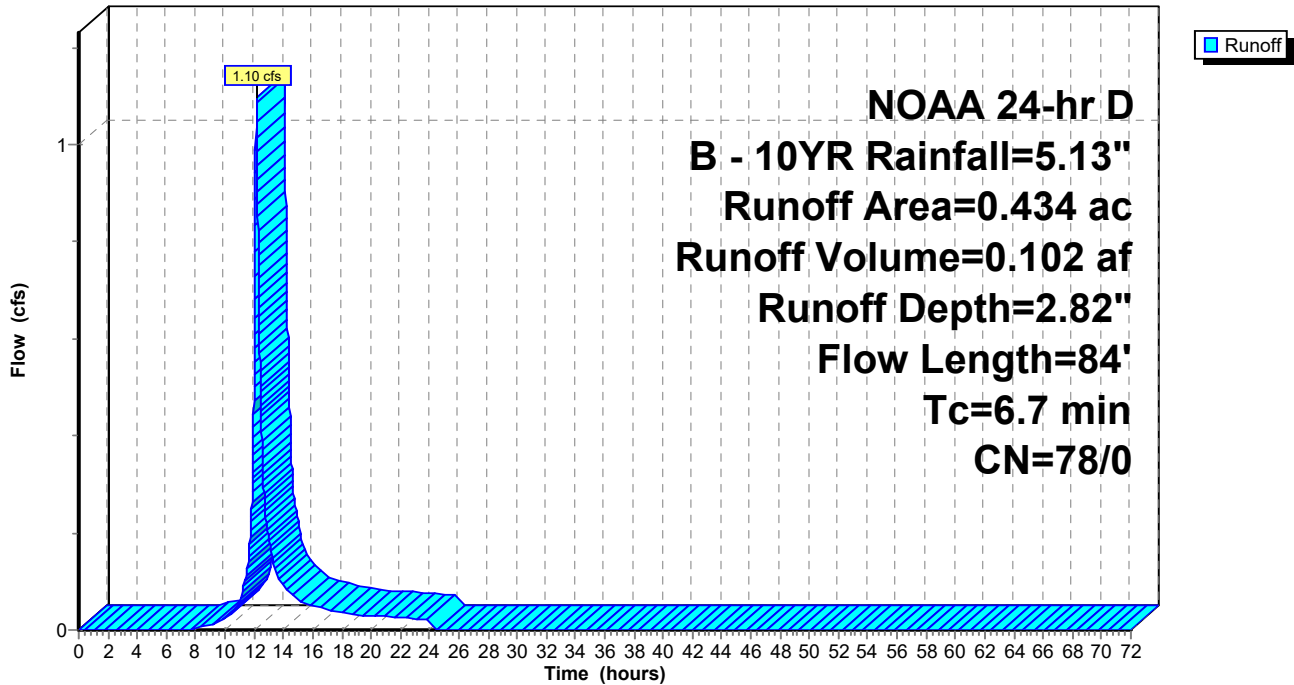
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 2.10 cfs @ 12.34 hrs, Volume= 0.384 af, Depth= 4.89"
 Routed to Link P-SR : SOUTH RIVER

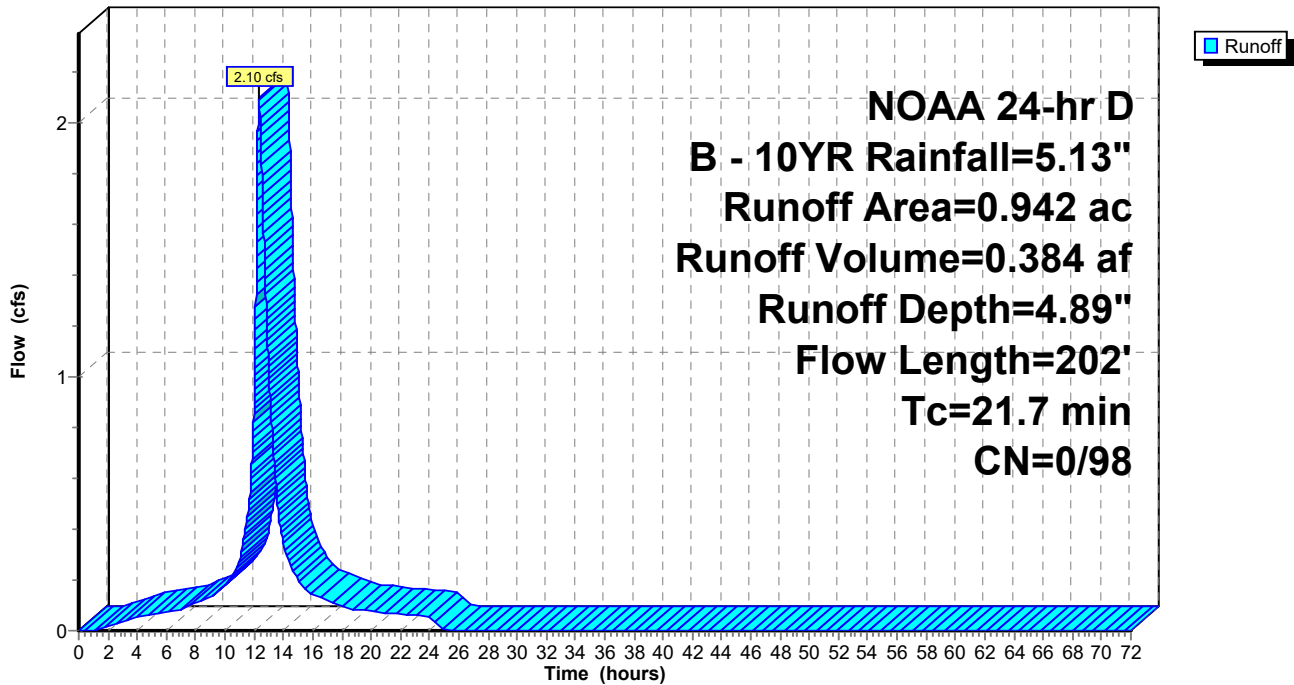
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 2.58 cfs @ 12.14 hrs, Volume= 0.259 af, Depth= 4.89"
 Routed to Link P-PC : POND CREEK

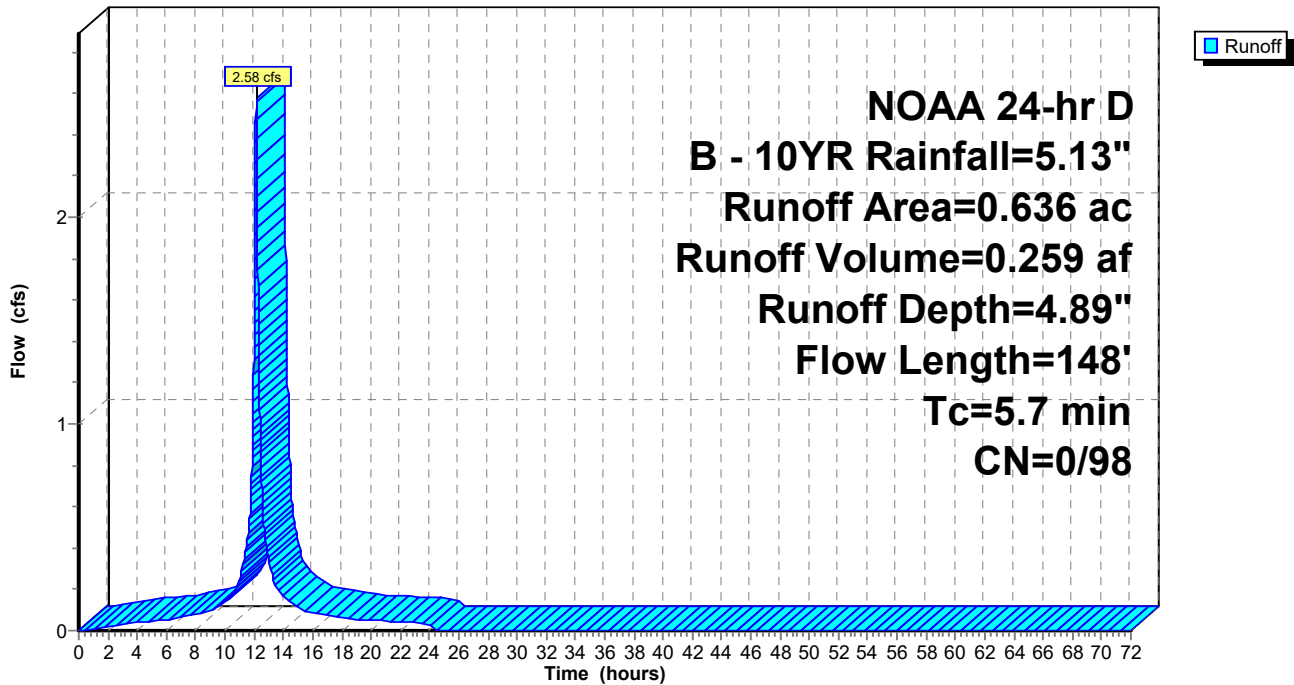
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 5.38 cfs @ 12.59 hrs, Volume= 1.218 af, Depth= 2.73"
 Routed to Link P-PC : POND CREEK

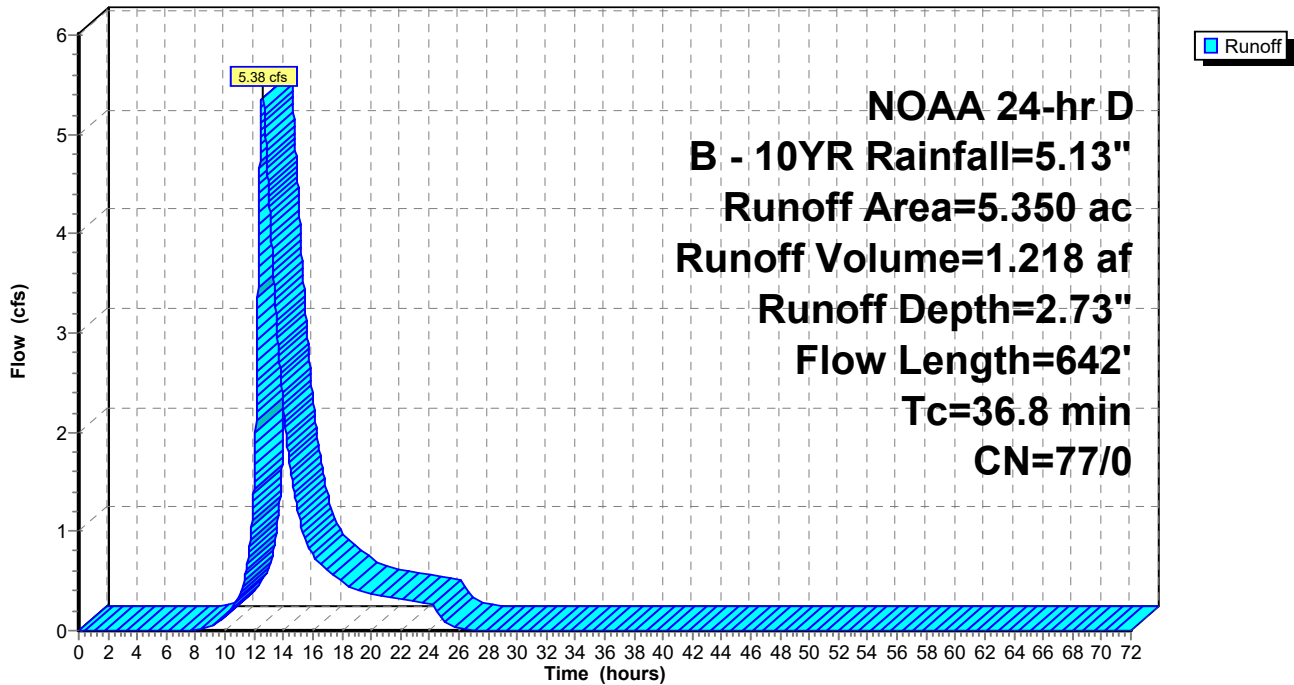
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 2.77 cfs @ 12.15 hrs, Volume= 0.287 af, Depth= 3.68"
 Routed to Link P-DC : DUCK CREEK

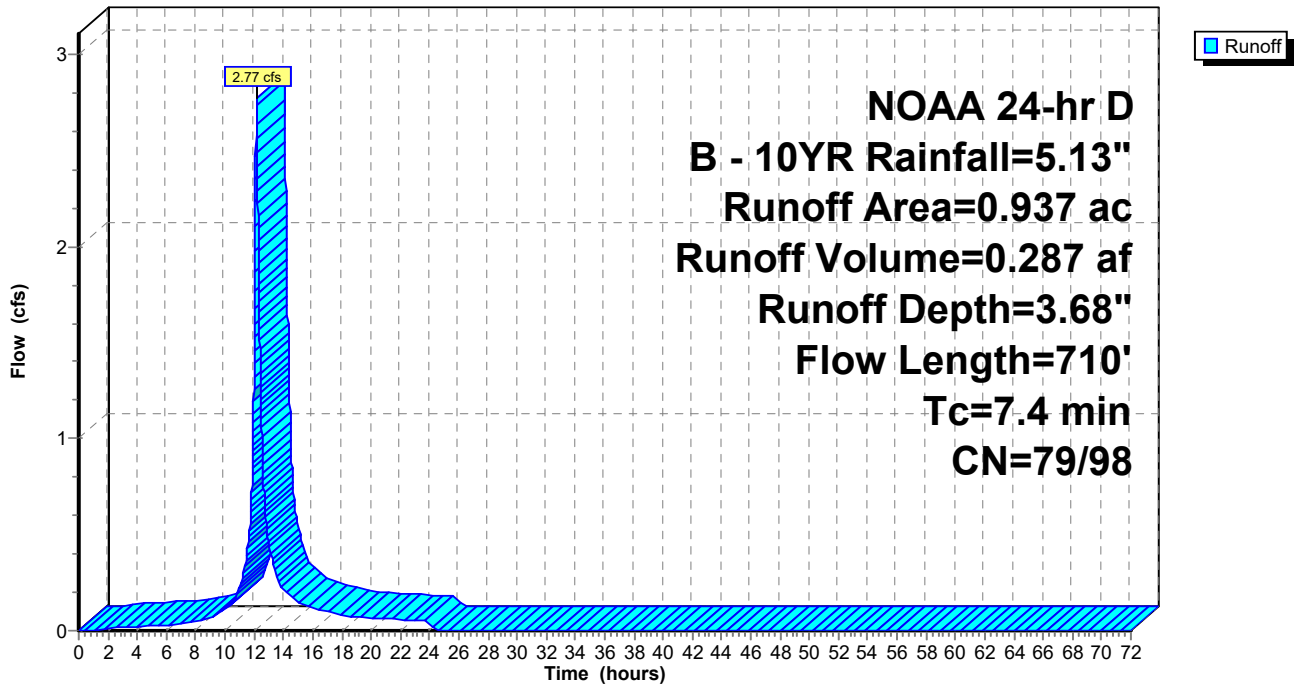
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.46 cfs @ 12.13 hrs, Volume= 0.049 af, Depth= 1.94"
 Routed to Link P-DC : DUCK CREEK

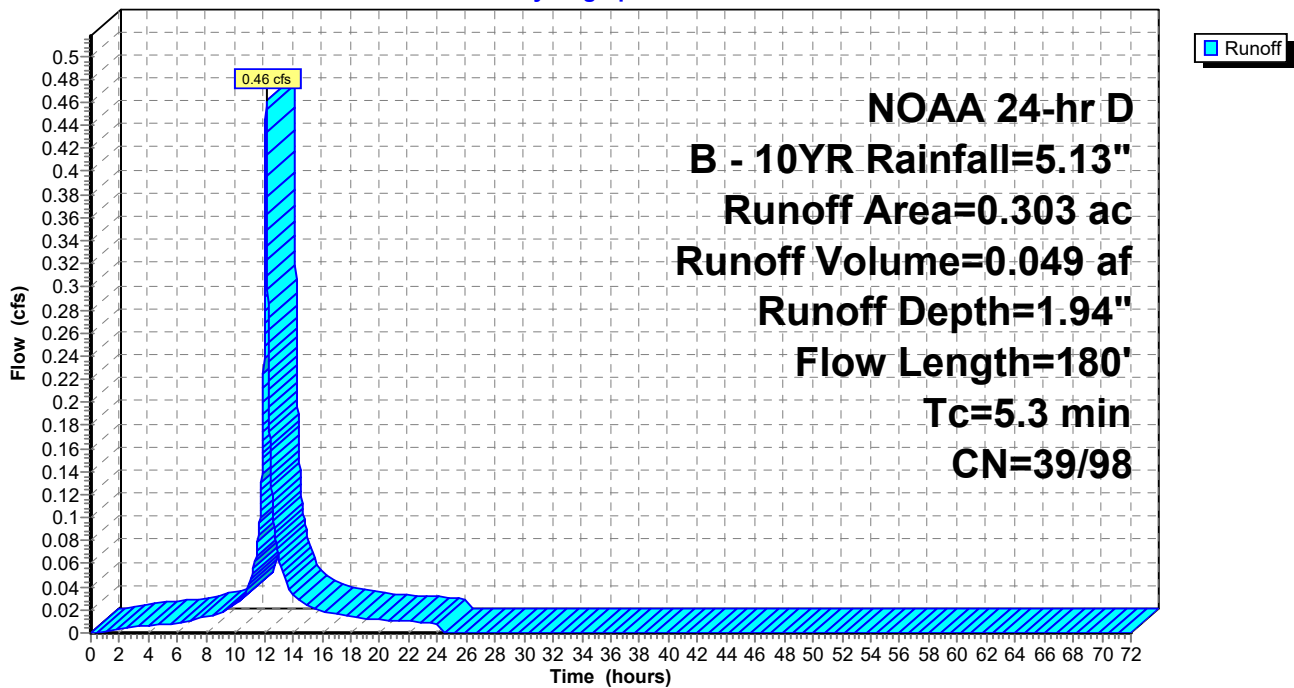
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 7.15 cfs @ 12.11 hrs, Volume= 0.610 af, Depth= 4.89"
 Routed to Pond B-2 : BASIN 2

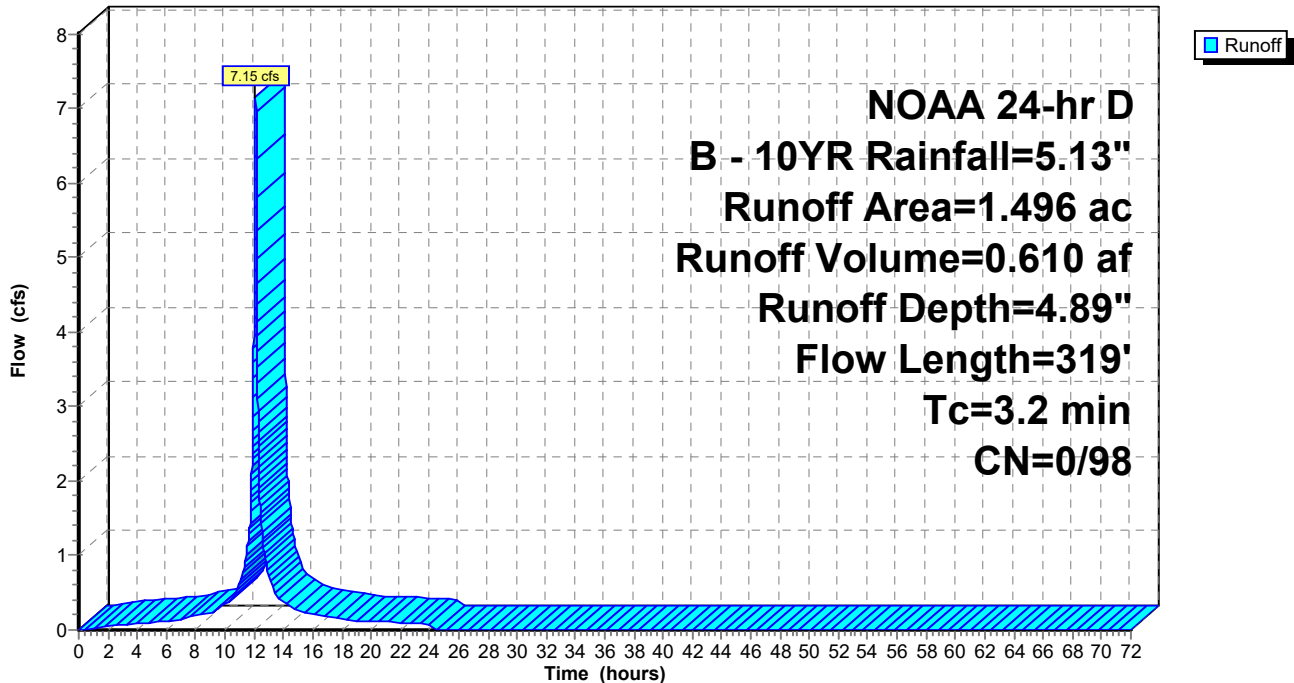
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.56 cfs @ 12.12 hrs, Volume= 0.142 af, Depth= 4.74"
 Routed to Pond B-3 : BASIN 3

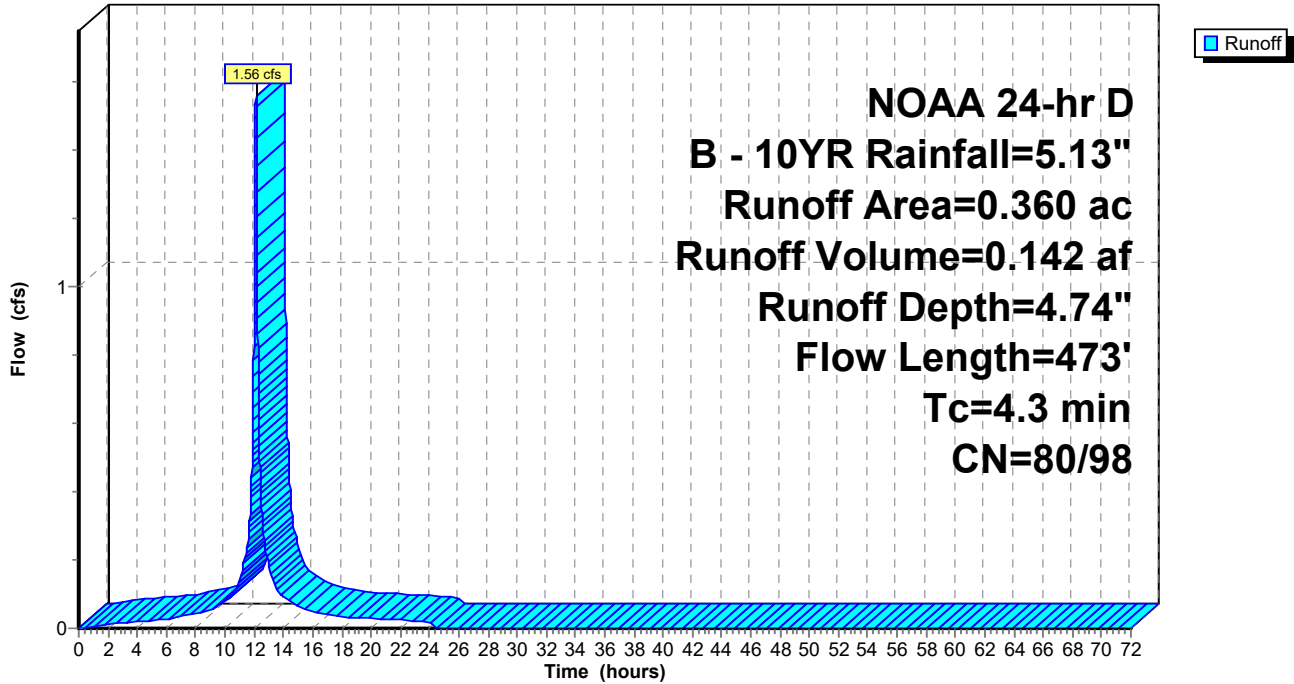
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 4.85 cfs @ 12.12 hrs, Volume= 0.433 af, Depth= 4.89"
 Routed to Pond B-3 : BASIN 3

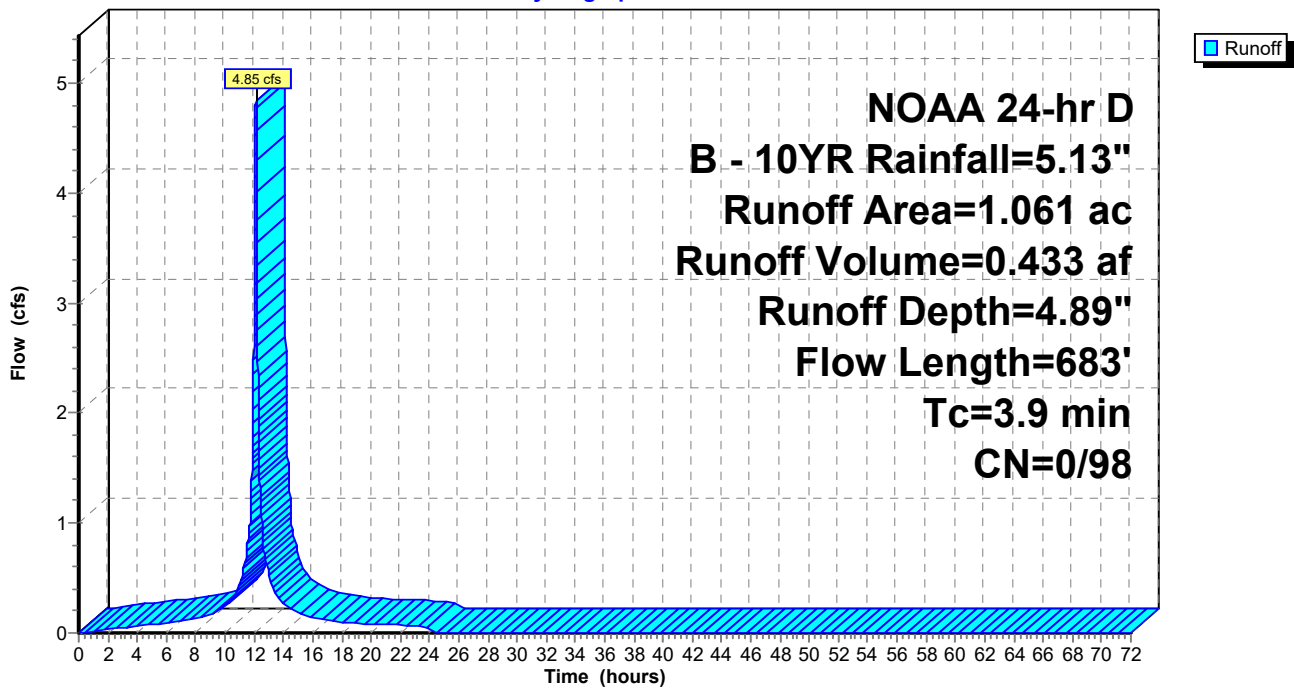
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 1.21 cfs @ 12.21 hrs, Volume= 0.147 af, Depth= 3.19"
 Routed to Pond B-4 : BASIN 4

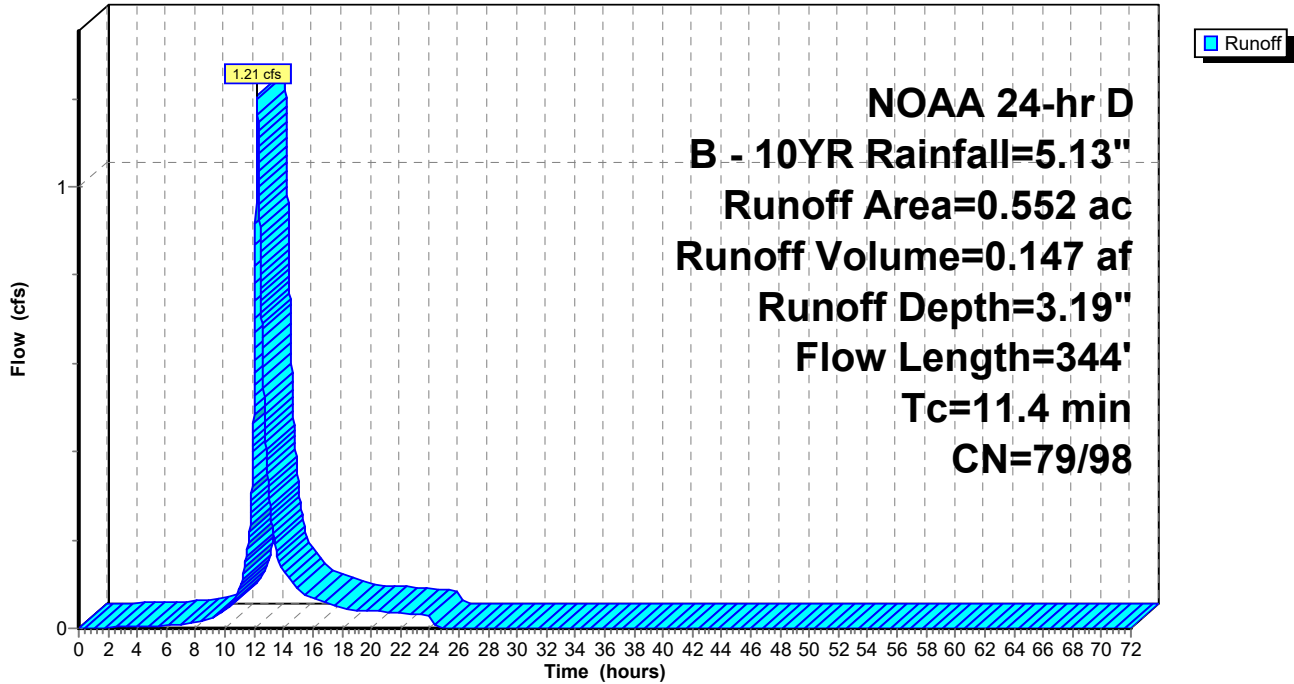
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 3.36 cfs @ 12.16 hrs, Volume= 0.376 af, Depth= 4.54"
 Routed to Pond B-4 : BASIN 4

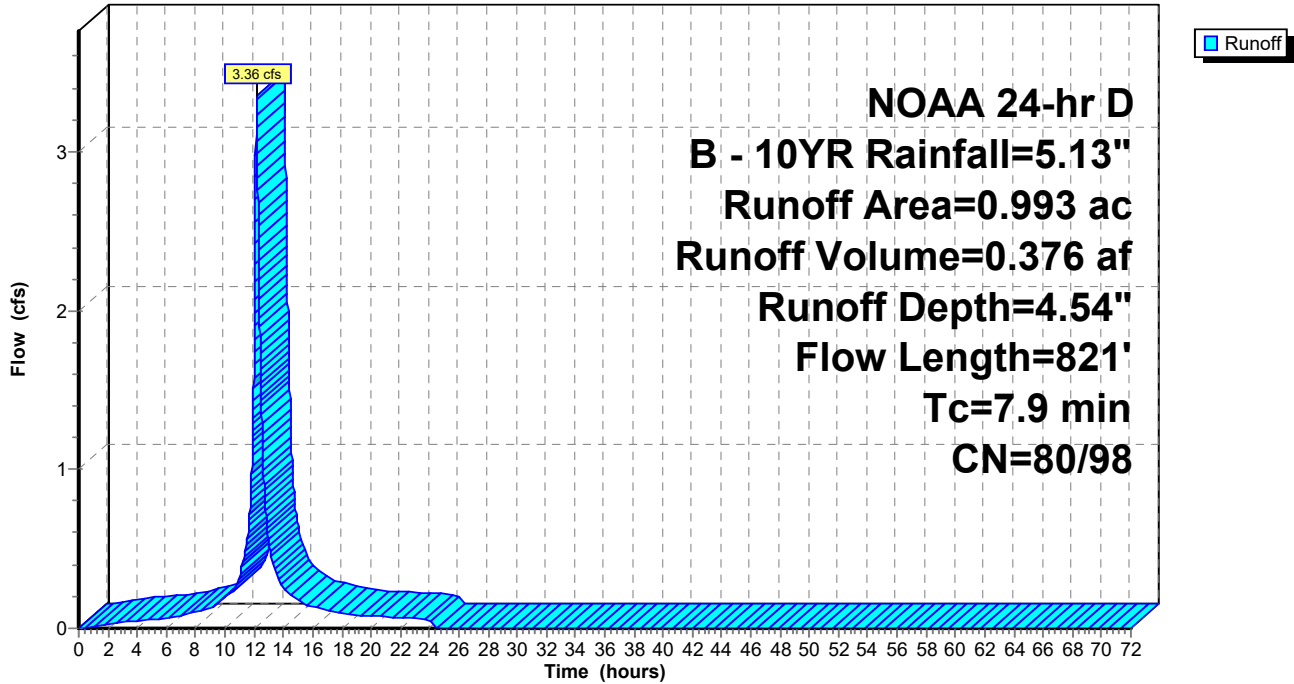
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



Summary for Subcatchment P-UG-1: UG-1

Runoff = 10.93 cfs @ 12.15 hrs, Volume= 1.170 af, Depth= 4.89"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

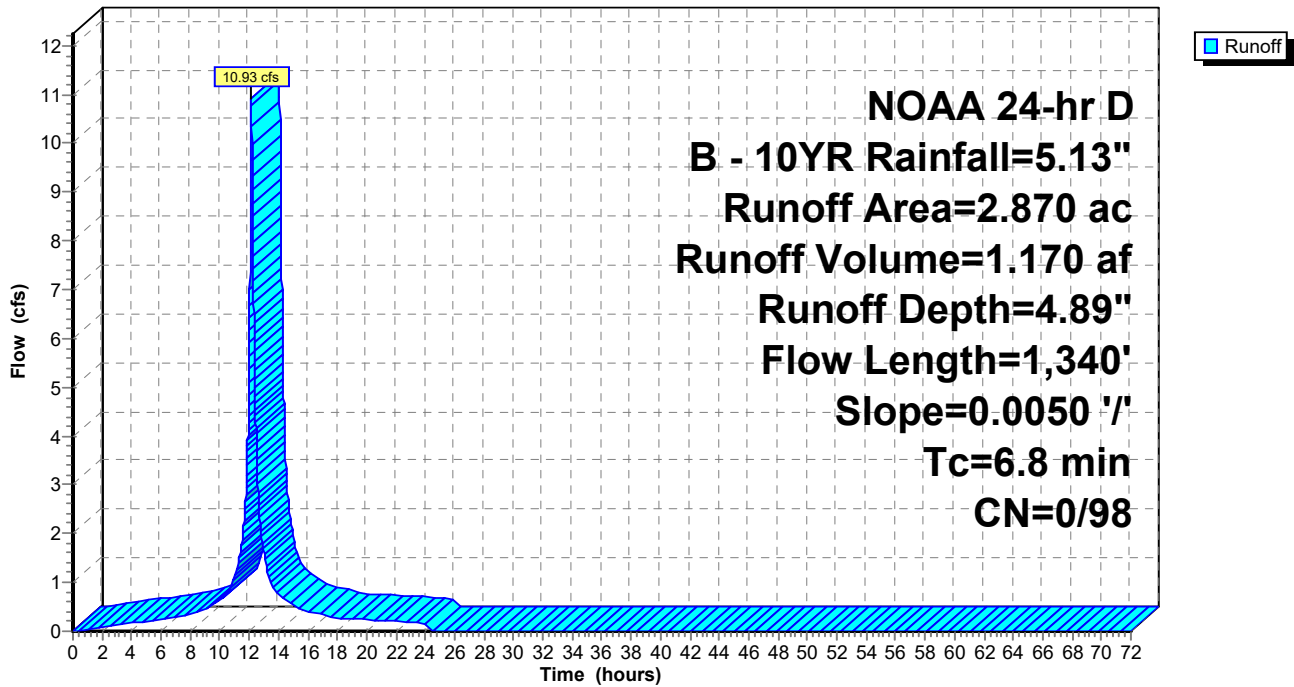
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 272% of capacity of segment #3

Runoff = 12.41 cfs @ 12.13 hrs, Volume= 1.170 af, Depth= 4.89"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

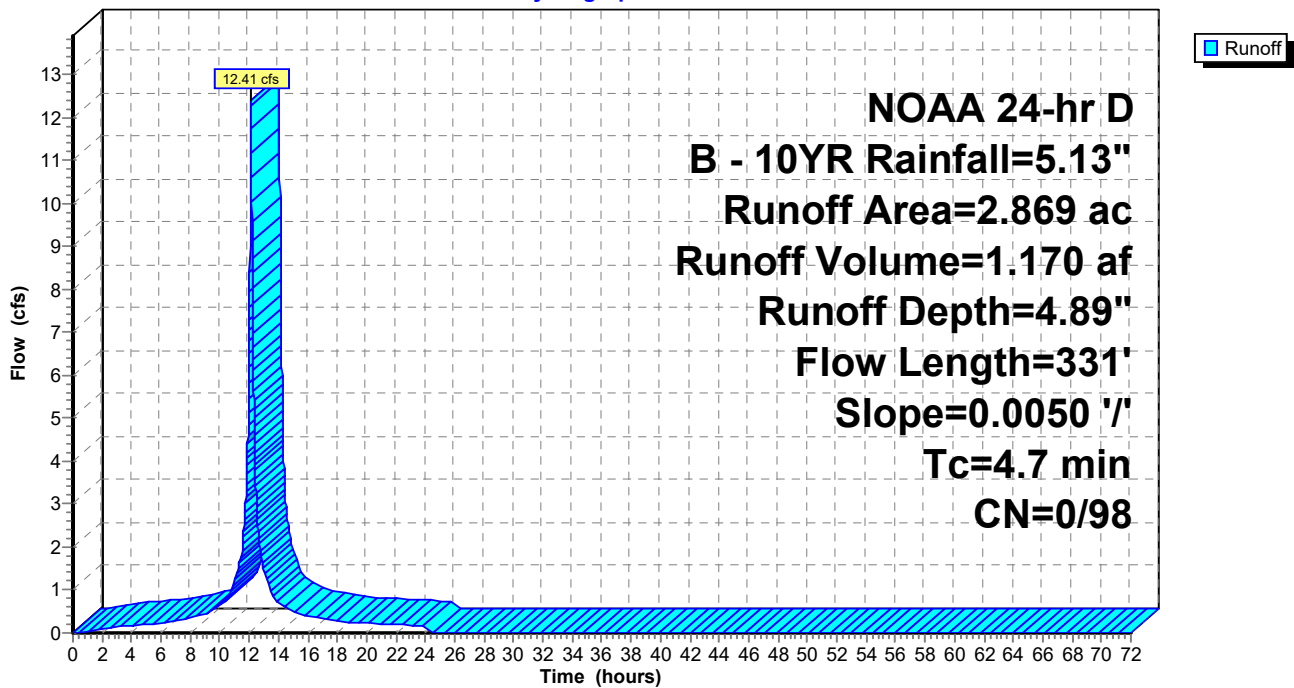
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D B - 10YR Rainfall=5.13"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



Summary for Reach 17R: E-1

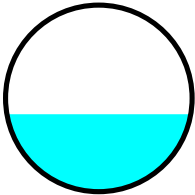
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.27" for B - 10YR event
Inflow = 9.06 cfs @ 12.36 hrs, Volume= 1.695 af
Outflow = 9.06 cfs @ 12.37 hrs, Volume= 1.695 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.40 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 3.4 min

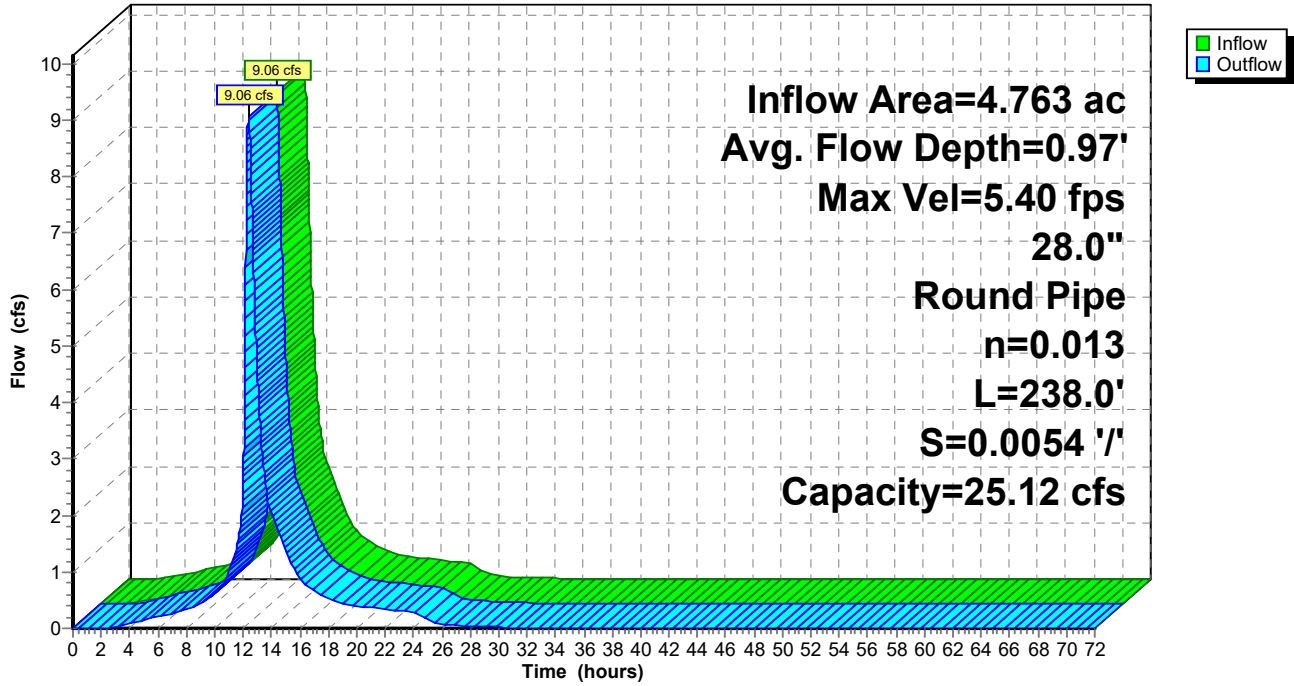
Peak Storage= 399 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.97' , Surface Width= 2.30'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



Reach 17R: E-1

Hydrograph



Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

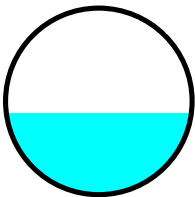
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.05' @ 12.47 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.27" for B - 10YR event
Inflow = 9.06 cfs @ 12.37 hrs, Volume= 1.695 af
Outflow = 9.05 cfs @ 12.38 hrs, Volume= 1.695 af, Atten= 0%, Lag= 0.6 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.06 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 3.5 min

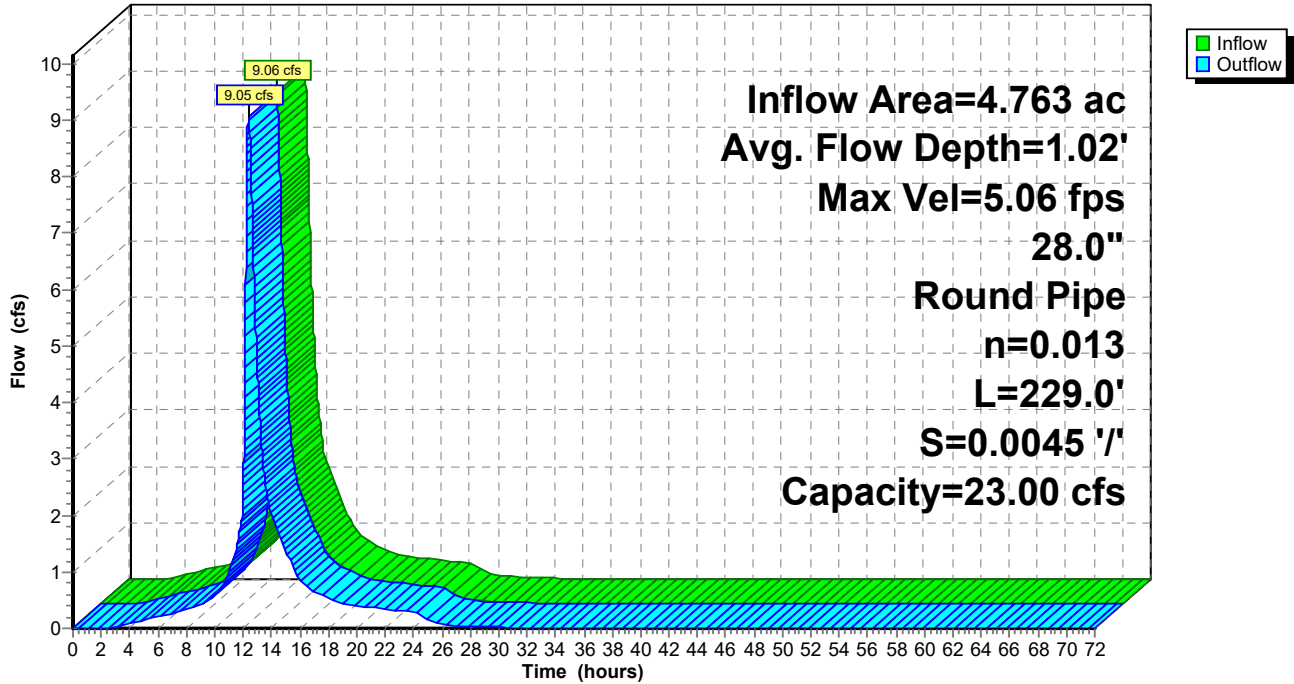
Peak Storage= 410 cf @ 12.38 hrs
Average Depth at Peak Storage= 1.02' , Surface Width= 2.31'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 4.72" for B - 10YR event
 Inflow = 7.59 cfs @ 12.11 hrs, Volume= 0.643 af
 Outflow = 3.92 cfs @ 12.22 hrs, Volume= 0.642 af, Atten= 48%, Lag= 6.8 min
 Primary = 3.92 cfs @ 12.22 hrs, Volume= 0.642 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 16.00' Surf.Area= 0.102 ac Storage= 0.093 af
 Peak Elev= 17.62' @ 12.22 hrs Surf.Area= 0.133 ac Storage= 0.284 af (0.190 af above start)

Plug-Flow detention time= 224.0 min calculated for 0.549 af (85% of inflow)
 Center-of-Mass det. time= 94.0 min (846.4 - 752.4)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

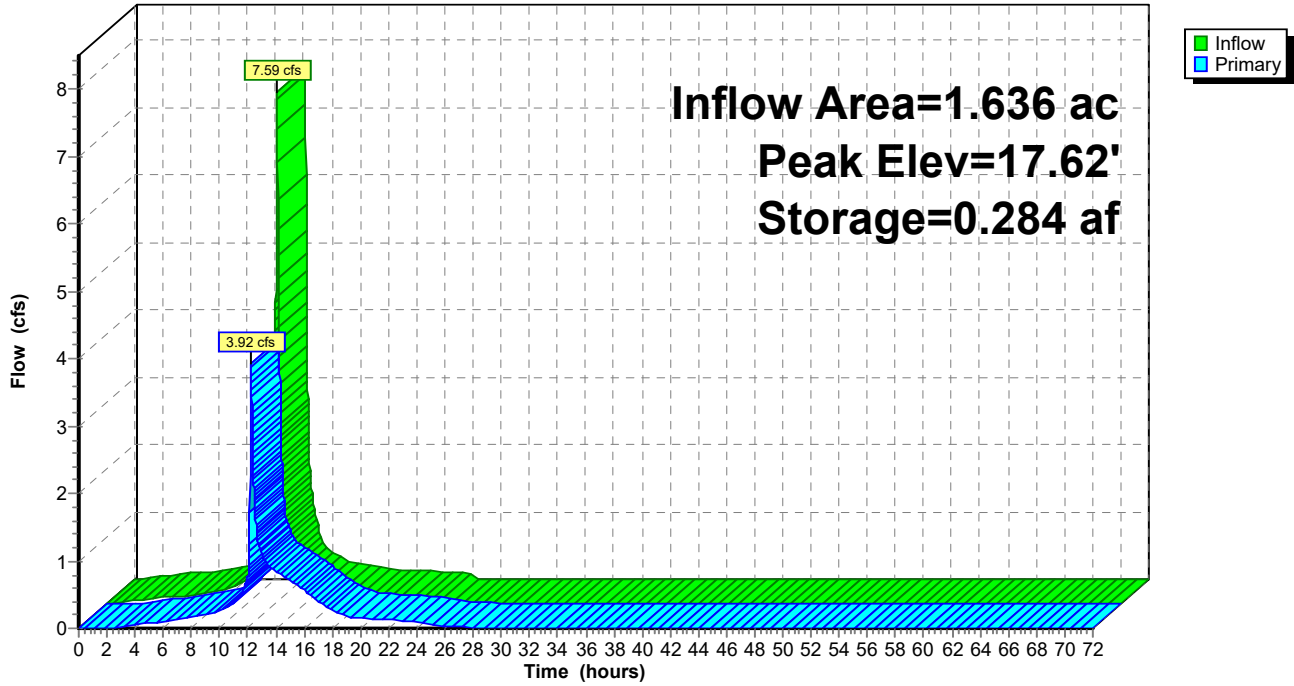
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.92 cfs @ 12.22 hrs HW=17.62' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.92 cfs of 18.56 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.01 cfs @ 5.81 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.67 cfs @ 1.71 fps)
- 4=Orifice/Grate (Weir Controls 2.23 cfs @ 1.14 fps)

Pond B-2: BASIN 2

Hydrograph



Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 4.33" for B - 10YR event
 Inflow = 8.06 cfs @ 12.12 hrs, Volume= 0.690 af
 Outflow = 5.87 cfs @ 12.18 hrs, Volume= 0.684 af, Atten= 27%, Lag= 3.6 min
 Primary = 5.87 cfs @ 12.18 hrs, Volume= 0.684 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.30' Surf.Area= 0.246 ac Storage= 0.191 af
 Peak Elev= 12.15' @ 12.18 hrs Surf.Area= 0.262 ac Storage= 0.407 af (0.216 af above start)

Plug-Flow detention time= 403.7 min calculated for 0.493 af (72% of inflow)
 Center-of-Mass det. time= 193.6 min (958.0 - 764.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
10.50	0.231	569.6	0.000	0.000	0.231
11.00	0.241	578.4	0.118	0.118	0.251
12.00	0.259	596.0	0.250	0.368	0.291
13.00	0.278	615.6	0.269	0.637	0.337
13.50	0.295	633.5	0.143	0.780	0.378

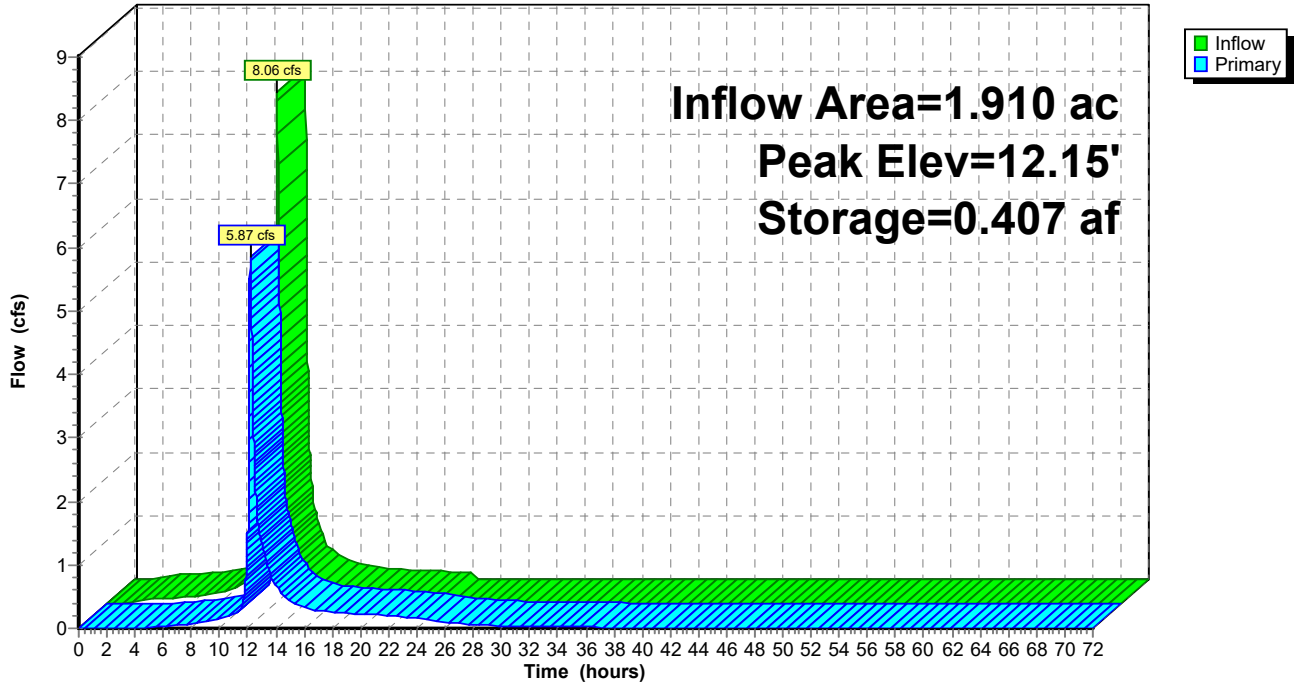
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=5.86 cfs @ 12.18 hrs HW=12.15' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 5.86 cfs of 33.14 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.43 cfs @ 3.92 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.41 cfs @ 2.07 fps)
- 4=Orifice/Grate (Weir Controls 3.02 cfs @ 1.26 fps)

Pond B-3: BASIN 3

Hydrograph



Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 3.89" for B - 10YR event
 Inflow = 5.28 cfs @ 12.16 hrs, Volume= 0.595 af
 Outflow = 2.85 cfs @ 12.42 hrs, Volume= 0.595 af, Atten= 46%, Lag= 15.7 min
 Primary = 2.85 cfs @ 12.42 hrs, Volume= 0.595 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.60' Surf.Area= 4,225 sf Storage= 3,964 cf
 Peak Elev= 14.90' @ 12.42 hrs Surf.Area= 4,982 sf Storage= 9,883 cf (5,918 cf above start)

Plug-Flow detention time= 183.3 min calculated for 0.504 af (85% of inflow)
 Center-of-Mass det. time= 60.4 min (849.3 - 788.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

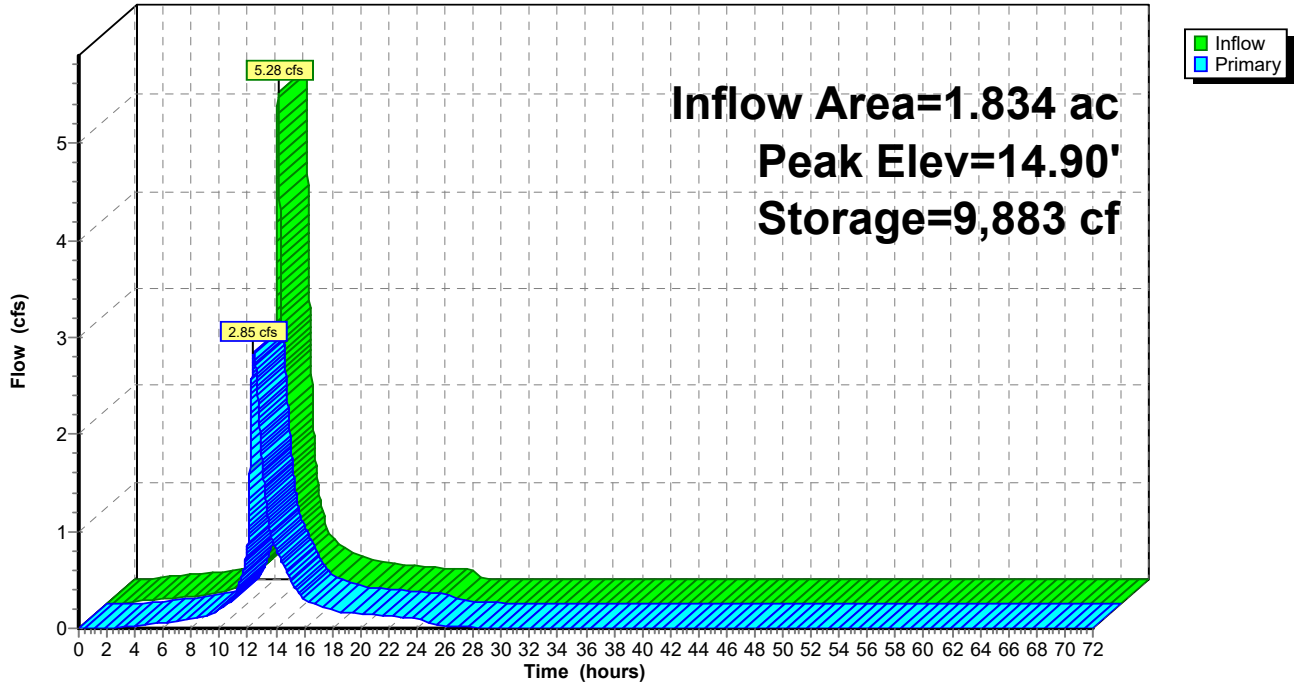
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=2.85 cfs @ 12.42 hrs HW=14.90' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 2.85 cfs of 12.66 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.37 cfs @ 5.02 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.48 cfs @ 2.63 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 4.51" for B - 10YR event
 Inflow = 9.64 cfs @ 12.16 hrs, Volume= 1.101 af
 Outflow = 6.27 cfs @ 12.34 hrs, Volume= 1.100 af, Atten= 35%, Lag= 10.9 min
 Primary = 6.27 cfs @ 12.34 hrs, Volume= 1.100 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.90' Surf.Area= 8,129 sf Storage= 9,986 cf
 Peak Elev= 15.09' @ 12.34 hrs Surf.Area= 9,036 sf Storage= 20,220 cf (10,234 cf above start)

Plug-Flow detention time= 223.9 min calculated for 0.871 af (79% of inflow)
 Center-of-Mass det. time= 67.4 min (833.7 - 766.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	6,858	409.0	0	0	6,858
13.00	7,629	429.0	2,896	2,896	8,202
14.00	8,186	439.0	7,906	10,802	9,018
14.10	8,239	440.0	821	11,623	9,101
15.00	8,985	459.0	7,748	19,372	10,519
16.00	9,537	468.1	9,260	28,631	11,335

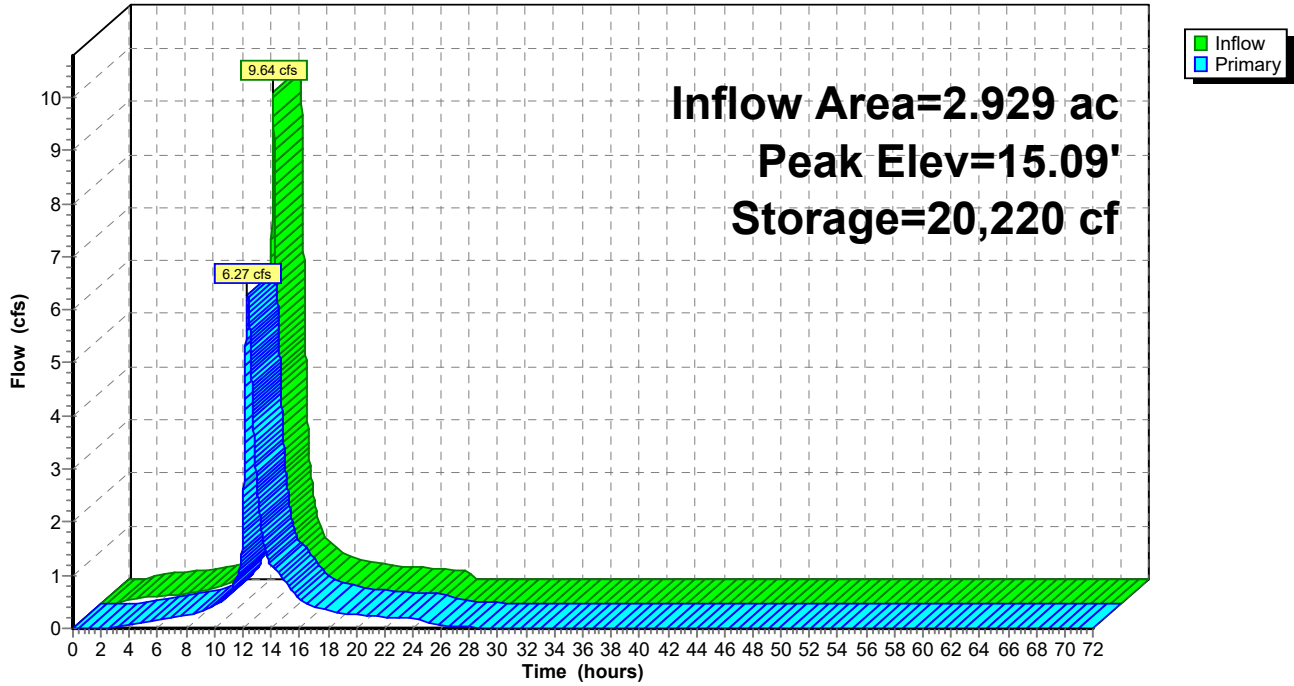
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=6.27 cfs @ 12.34 hrs HW=15.09' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 6.27 cfs of 13.59 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.96 cfs @ 4.78 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 4.31 cfs @ 2.52 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 4.89" for B - 10YR event
 Inflow = 23.14 cfs @ 12.13 hrs, Volume= 2.340 af
 Outflow = 6.44 cfs @ 12.53 hrs, Volume= 2.310 af, Atten= 72%, Lag= 23.5 min
 Primary = 6.44 cfs @ 12.53 hrs, Volume= 2.310 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.00' Surf.Area= 0.631 ac Storage= 0.542 af
 Peak Elev= 13.80' @ 12.53 hrs Surf.Area= 0.631 ac Storage= 1.768 af (1.227 af above start)

Plug-Flow detention time= 848.6 min calculated for 1.769 af (76% of inflow)
 Center-of-Mass det. time= 566.8 min (1,318.9 - 752.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=6.44 cfs @ 12.53 hrs HW=13.80' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 6.44 cfs of 38.44 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.68 cfs @ 7.81 fps)
- 3=Orifice/Grate (Orifice Controls 0.45 cfs @ 6.54 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 5.31 cfs @ 1.93 fps)

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
 Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
 Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

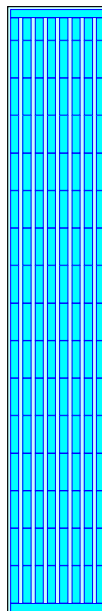
16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"
 End Stone x 2 = 324.00' Base Length
 8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width
 6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
 32,197.7 cf Chamber Storage
 128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af
 Overall Storage Efficiency = 57.7%
 Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers
 3,517.4 cy Field
 2,088.7 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

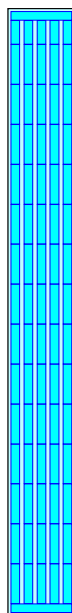
15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"
End Stone x 2 = 304.00' Base Length
5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 =
18,864.5 cf Chamber Storage
75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 =
22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

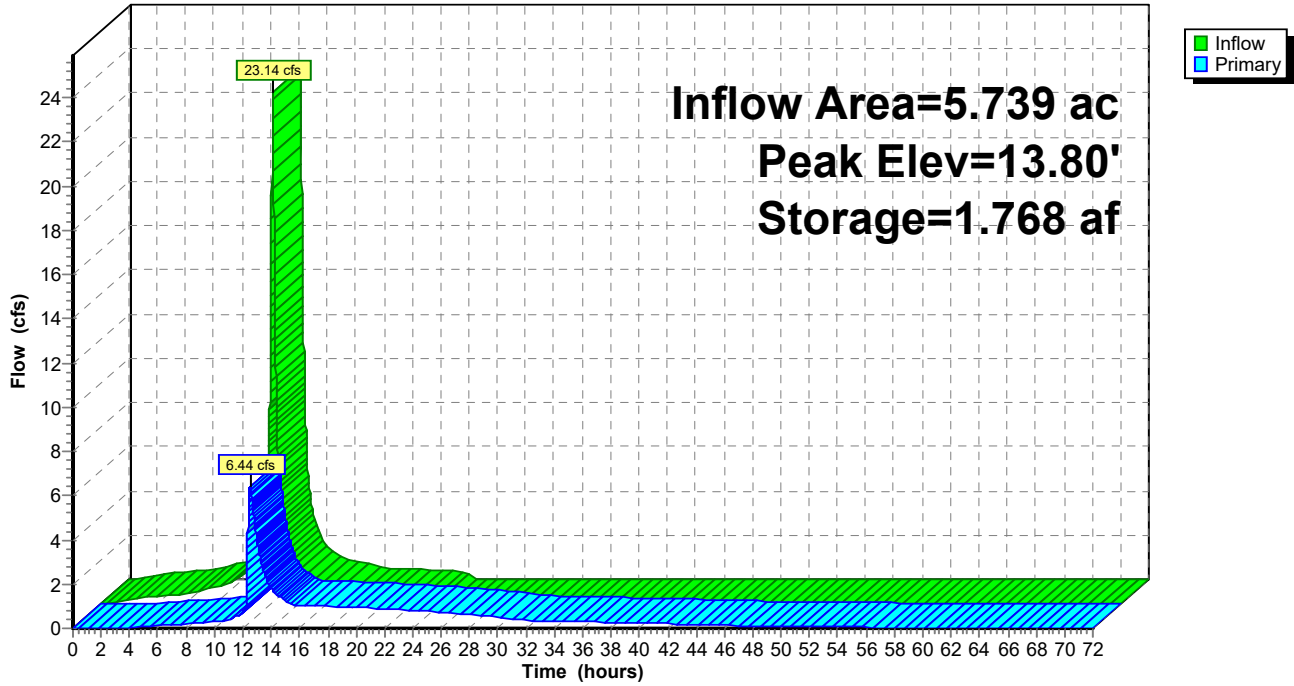
Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af
Overall Storage Efficiency = 57.5%
Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers
2,084.9 cy Field
1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



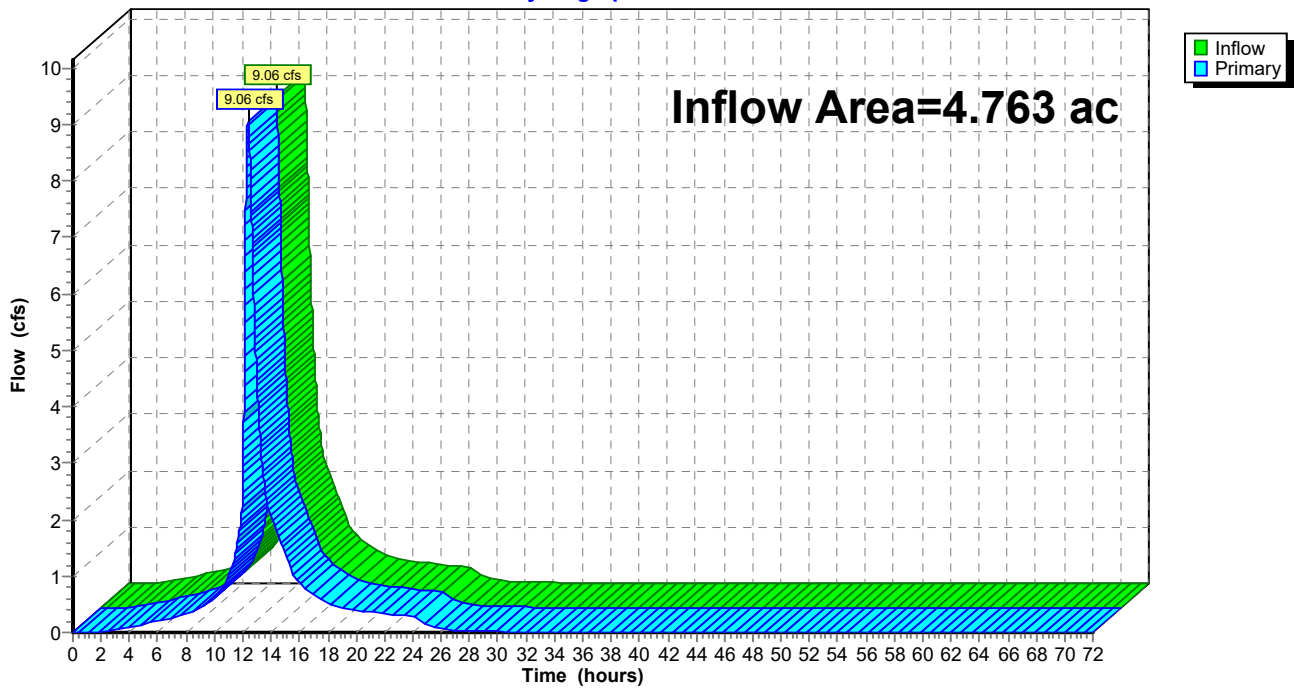
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 4.27" for B - 10YR event
Inflow = 9.06 cfs @ 12.36 hrs, Volume= 1.695 af
Primary = 9.06 cfs @ 12.36 hrs, Volume= 1.695 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



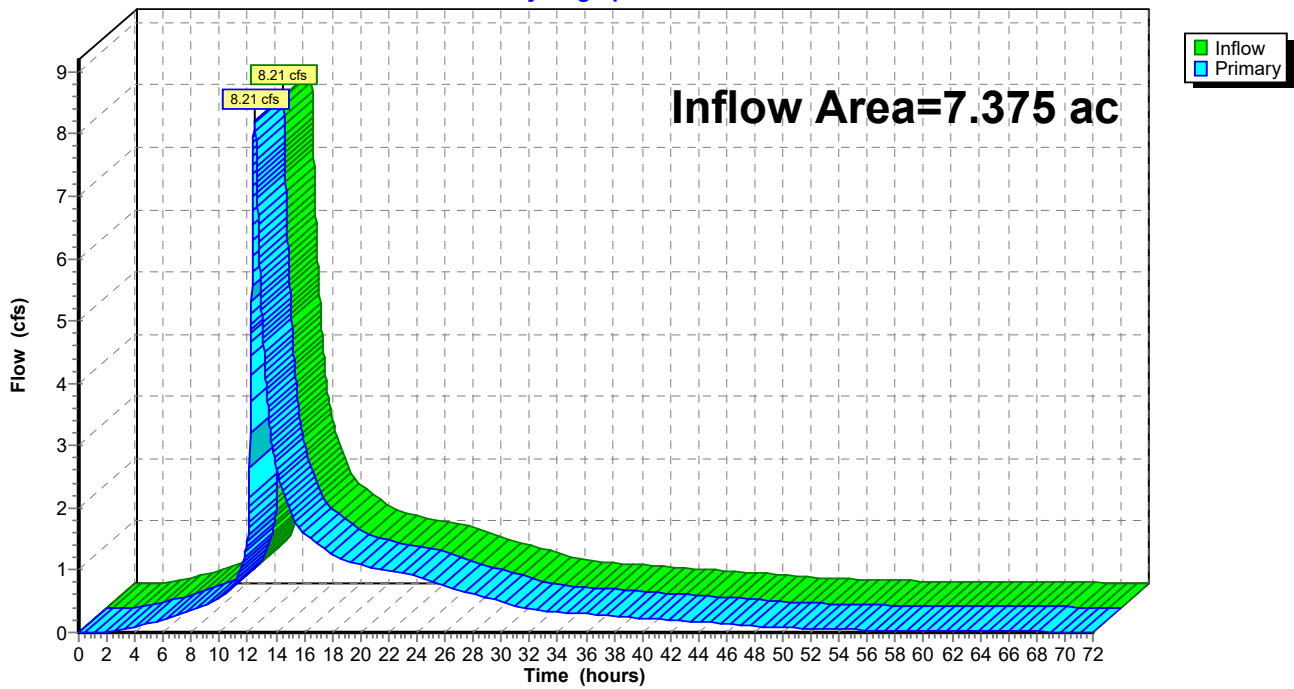
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 4.80" for B - 10YR event
 Inflow = 8.21 cfs @ 12.49 hrs, Volume= 2.953 af
 Primary = 8.21 cfs @ 12.49 hrs, Volume= 2.953 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



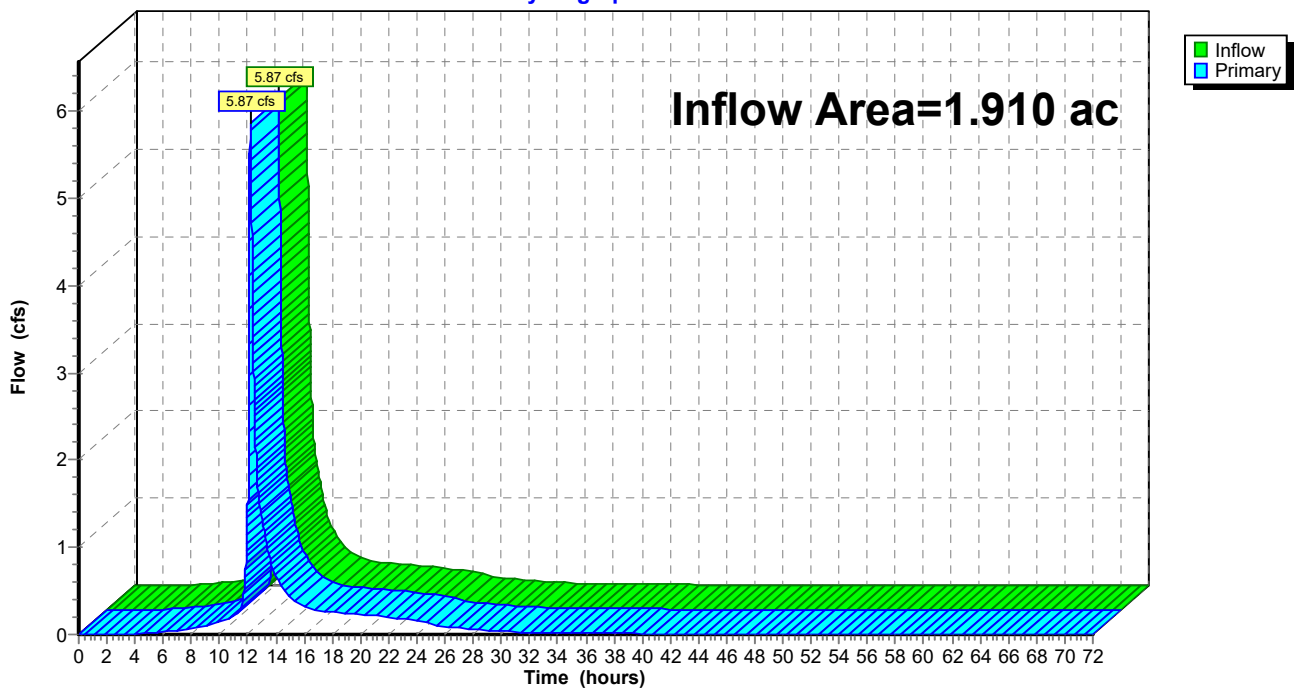
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 4.30" for B - 10YR event
 Inflow = 5.87 cfs @ 12.18 hrs, Volume= 0.684 af
 Primary = 5.87 cfs @ 12.18 hrs, Volume= 0.684 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



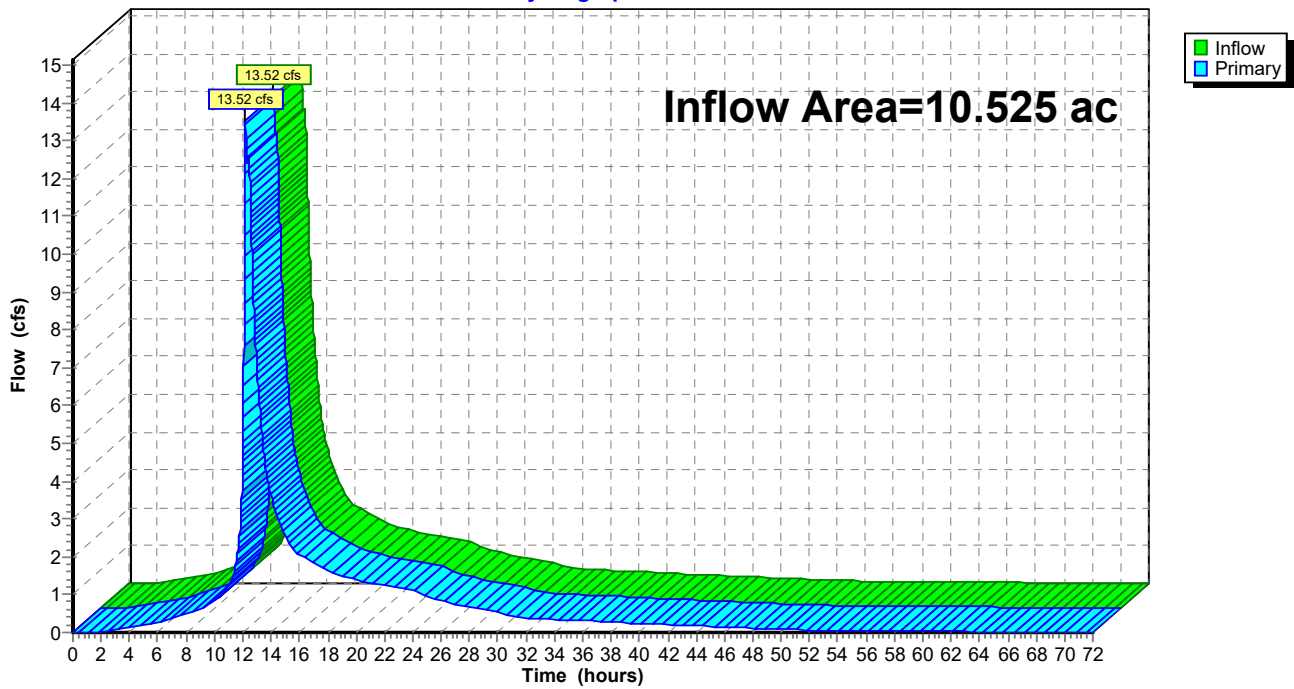
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 4.53" for B - 10YR event
Inflow = 13.52 cfs @ 12.19 hrs, Volume= 3.973 af
Primary = 13.52 cfs @ 12.19 hrs, Volume= 3.973 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



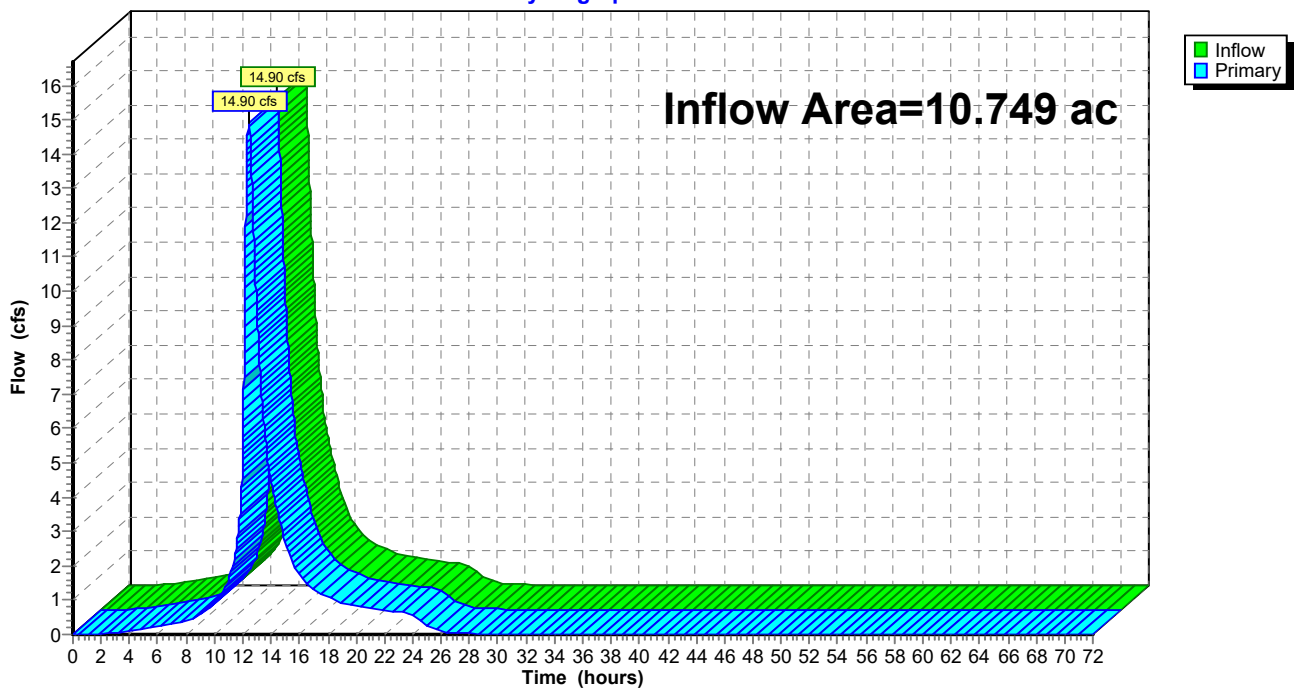
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 3.54" for B - 10YR event
 Inflow = 14.90 cfs @ 12.43 hrs, Volume= 3.172 af
 Primary = 14.90 cfs @ 12.43 hrs, Volume= 3.172 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



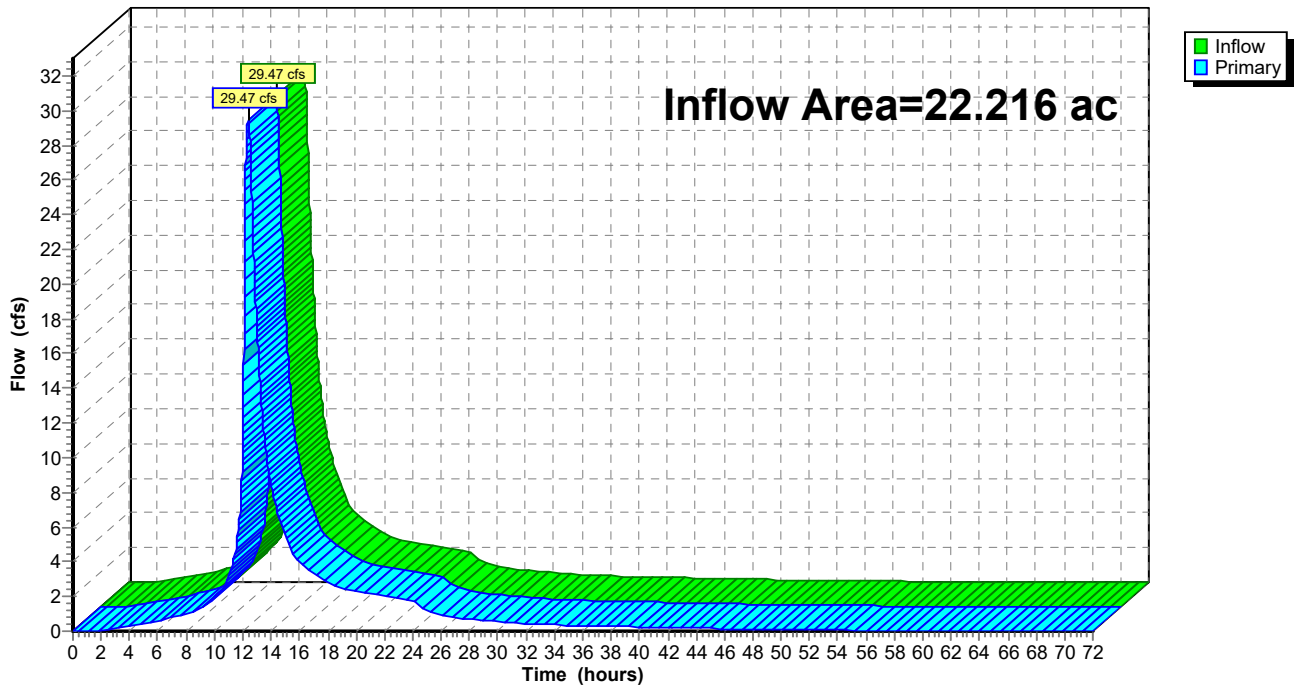
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 4.07" for B - 10YR event
Inflow = 29.47 cfs @ 12.39 hrs, Volume= 7.529 af
Primary = 29.47 cfs @ 12.39 hrs, Volume= 7.529 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=6.05" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=10.69 cfs 1.257 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.72 cfs 0.046 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=2.32 cfs 0.160 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=4.13" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=1.07 cfs 0.099 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=3.92" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=1.52 cfs 0.142 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=2.62 cfs 0.482 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=3.22 cfs 0.325 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=3.81" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=7.58 cfs 1.700 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=4.84" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=3.64 cfs 0.378 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=2.60" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.60 cfs 0.066 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=8.91 cfs 0.766 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=5.97" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=1.96 cfs 0.179 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=6.04 cfs 0.543 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=4.32" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=1.64 cfs 0.199 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=5.77" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=4.24 cfs 0.477 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=13.62 cfs 1.469 af

SubcatchmentP-UG-2: UG-2	Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=6.14" Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=15.46 cfs 1.468 af
Reach 17R: E-1	Avg. Flow Depth=1.15' Max Vel=5.83 fps Inflow=12.18 cfs 2.173 af 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=12.18 cfs 2.173 af
Reach 18R: E-2	Avg. Flow Depth=1.21' Max Vel=5.45 fps Inflow=12.18 cfs 2.173 af 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=12.17 cfs 2.173 af
Pond B-2: BASIN 2	Peak Elev=17.72' Storage=0.298 af Inflow=9.51 cfs 0.811 af Outflow=7.65 cfs 0.811 af
Pond B-3: BASIN 3	Peak Elev=12.21' Storage=0.422 af Inflow=10.26 cfs 0.882 af Outflow=8.30 cfs 0.876 af
Pond B-4: BASIN 4	Peak Elev=15.17' Storage=11,266 cf Inflow=6.85 cfs 0.775 af Outflow=3.88 cfs 0.775 af
Pond B-5: BASIN 5	Peak Elev=15.27' Storage=21,798 cf Inflow=12.19 cfs 1.399 af Outflow=8.38 cfs 1.398 af
Pond UG-2: UG BASIN 1 & 2 (	Peak Elev=14.17' Storage=1.855 af Inflow=28.84 cfs 2.937 af Outflow=16.54 cfs 2.907 af
Link 16L: Existing Storm Sewer	Inflow=12.18 cfs 2.173 af Primary=12.18 cfs 2.173 af
Link D3A: POD 3A	Inflow=21.11 cfs 3.717 af Primary=21.11 cfs 3.717 af
Link D3B: POD 3B	Inflow=8.30 cfs 0.876 af Primary=8.30 cfs 0.876 af
Link P-DC: DUCK CREEK	Inflow=31.11 cfs 5.038 af Primary=31.11 cfs 5.038 af
Link P-PC: POND CREEK	Inflow=20.18 cfs 4.198 af Primary=20.18 cfs 4.198 af
Link P-SR: SOUTH RIVER	Inflow=51.71 cfs 9.718 af Primary=51.71 cfs 9.718 af

Total Runoff Area = 22.216 ac Runoff Volume = 9.756 af Average Runoff Depth = 5.27"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

Summary for Subcatchment 16S: P-B5-1

Runoff = 10.69 cfs @ 12.17 hrs, Volume= 1.257 af, Depth= 6.05"
 Routed to Pond B-5 : BASIN 5

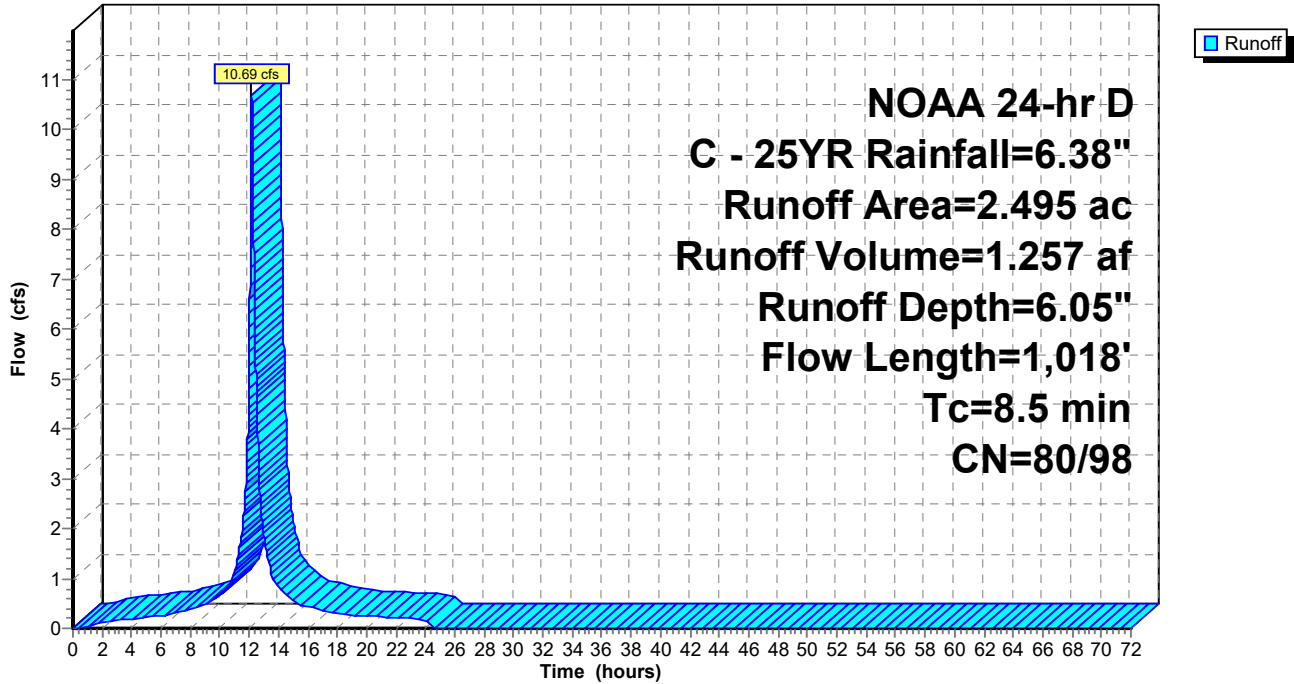
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.72 cfs @ 12.10 hrs, Volume= 0.046 af, Depth= 3.92"
 Routed to Pond B-2 : BASIN 2

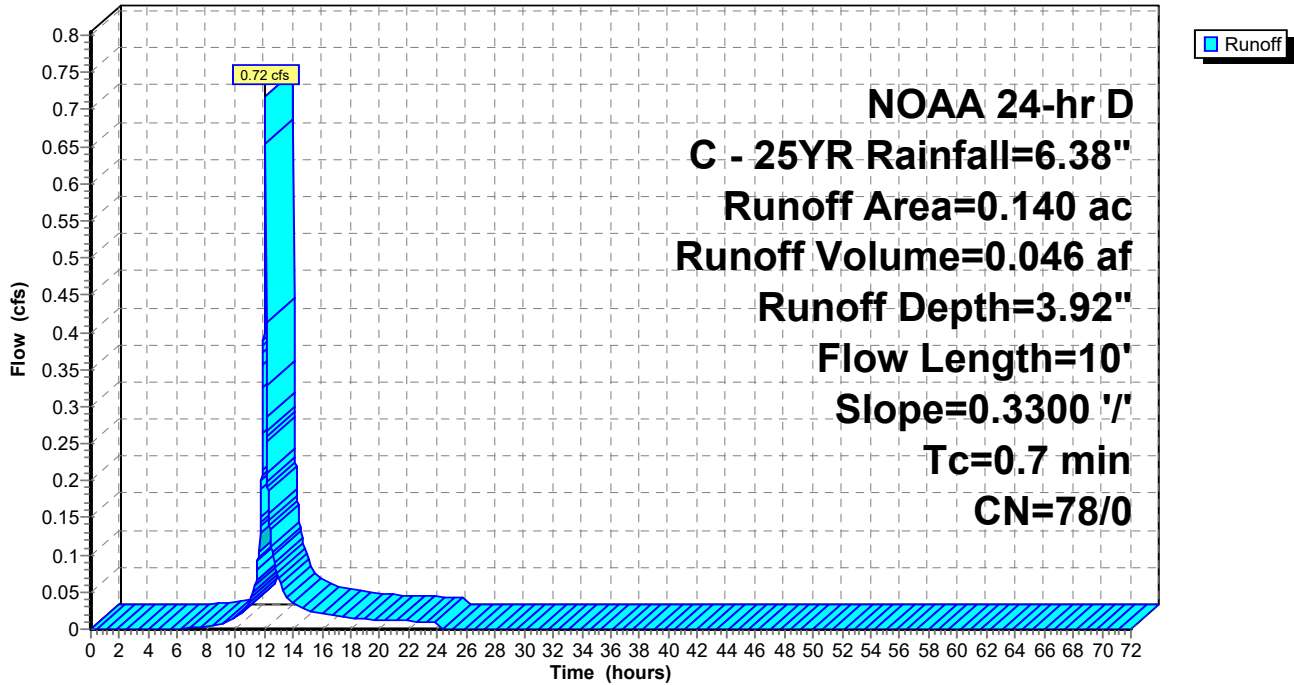
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 2.32 cfs @ 12.11 hrs, Volume= 0.160 af, Depth= 3.92"
 Routed to Pond B-3 : BASIN 3

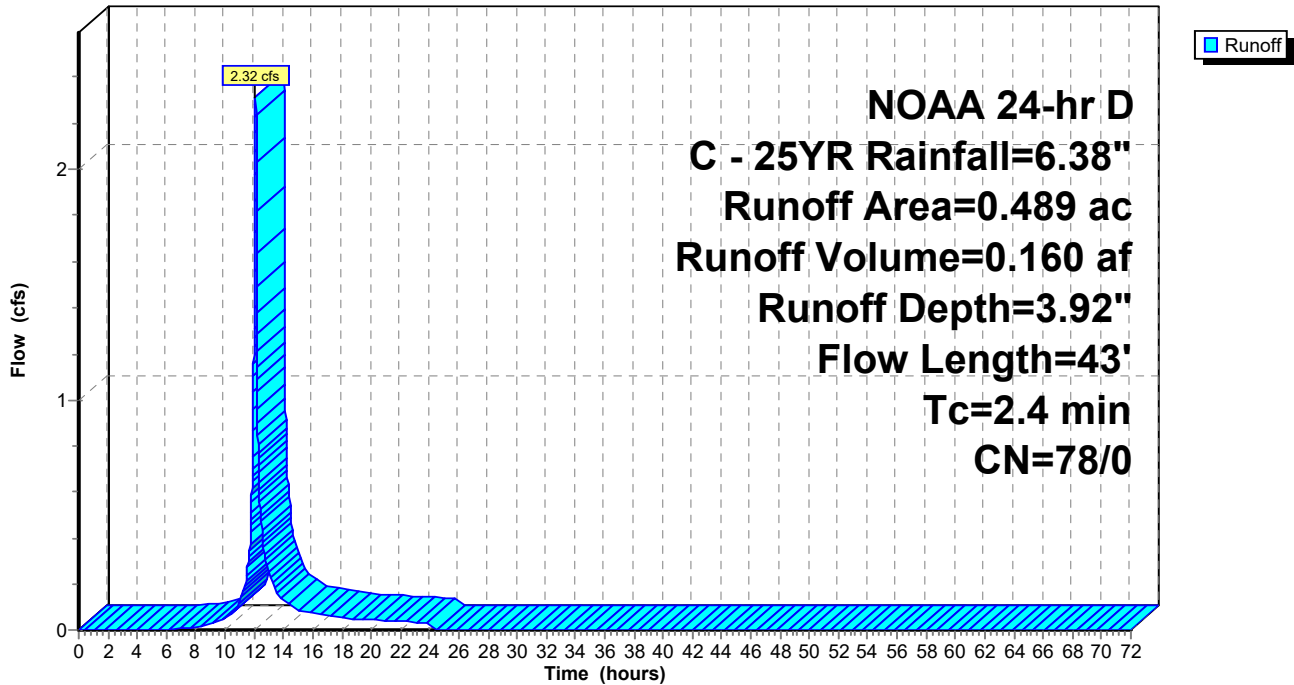
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 1.07 cfs @ 12.15 hrs, Volume= 0.099 af, Depth= 4.13"
 Routed to Pond B-4 : BASIN 4

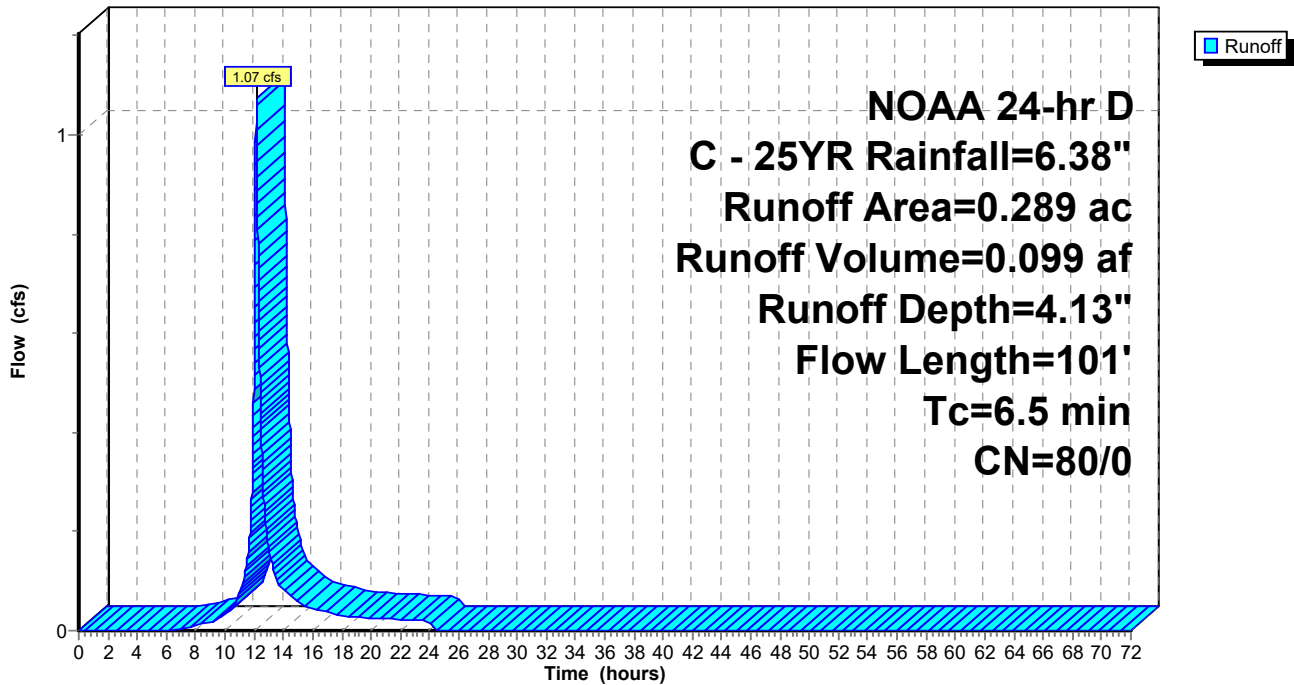
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 1.52 cfs @ 12.15 hrs, Volume= 0.142 af, Depth= 3.92"
 Routed to Pond B-5 : BASIN 5

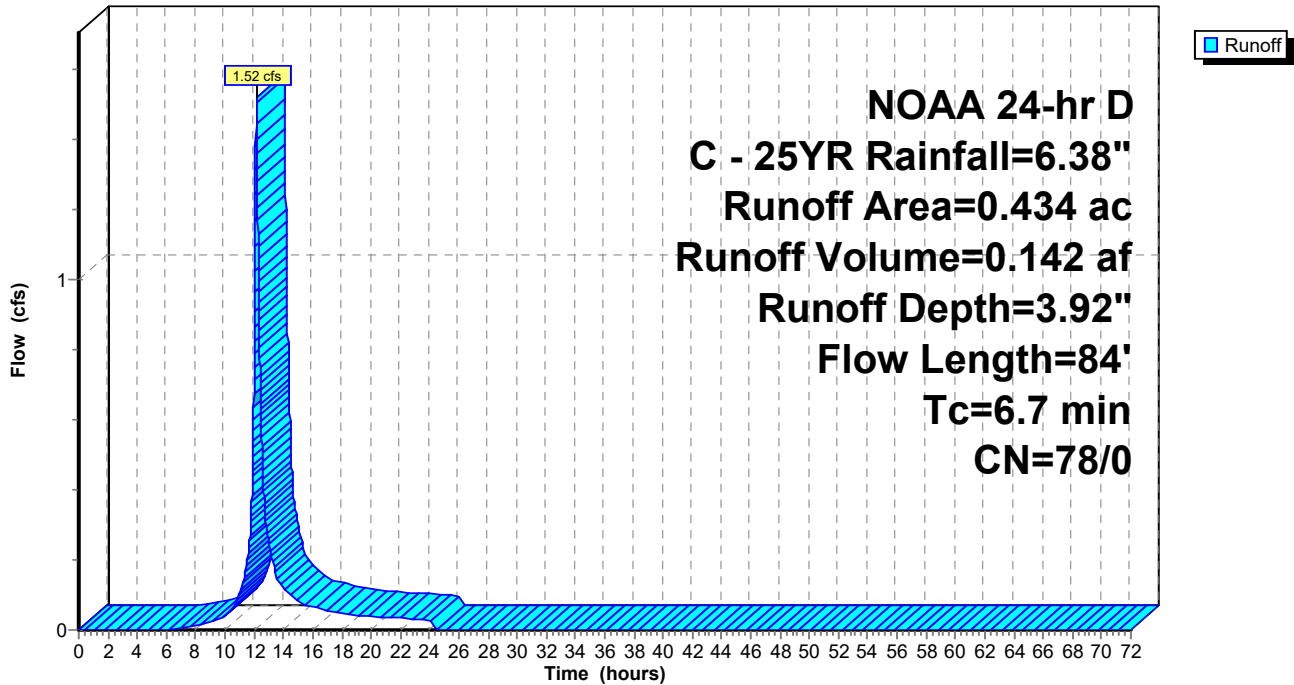
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 2.62 cfs @ 12.34 hrs, Volume= 0.482 af, Depth= 6.14"
 Routed to Link P-SR : SOUTH RIVER

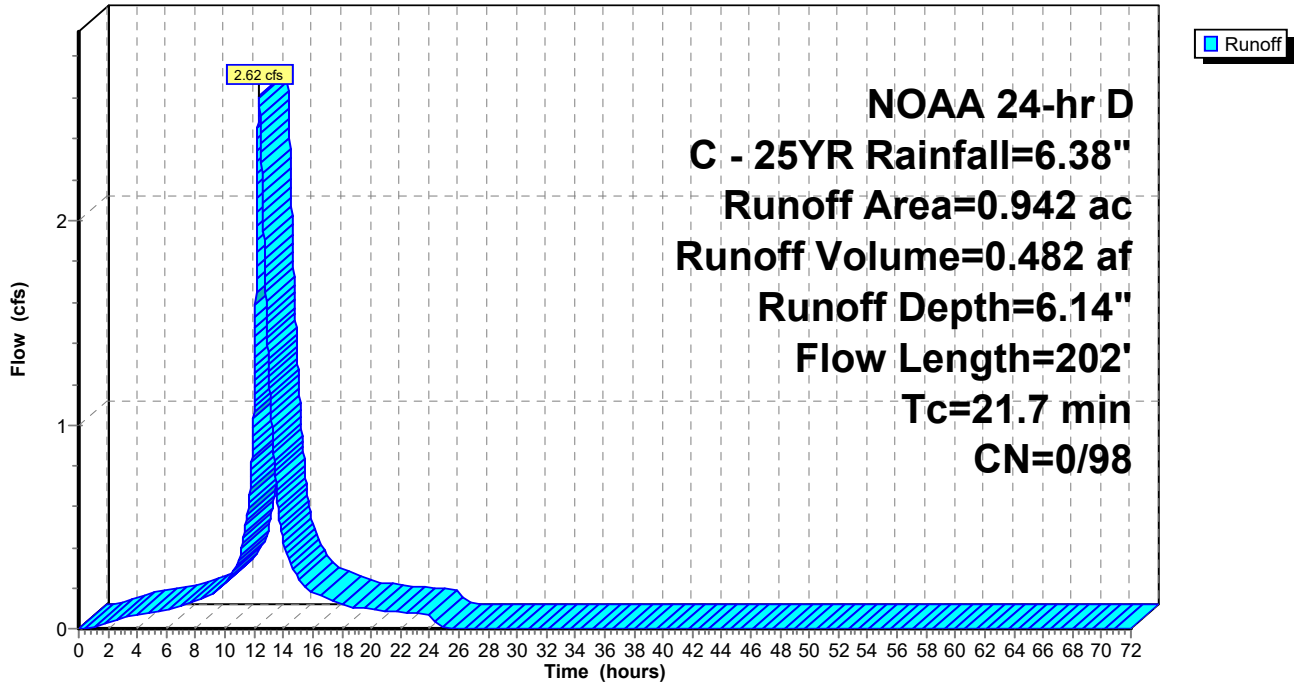
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 3.22 cfs @ 12.14 hrs, Volume= 0.325 af, Depth= 6.14"
 Routed to Link P-PC : POND CREEK

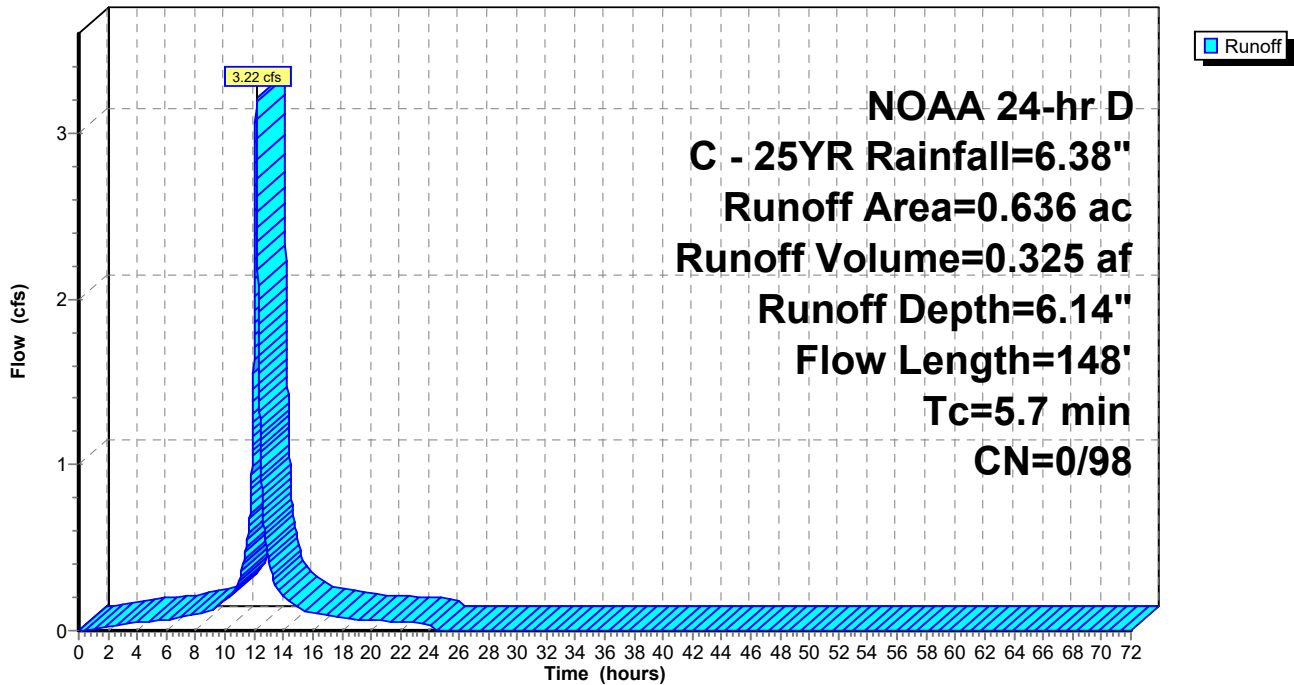
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 7.58 cfs @ 12.52 hrs, Volume= 1.700 af, Depth= 3.81"
 Routed to Link P-PC : POND CREEK

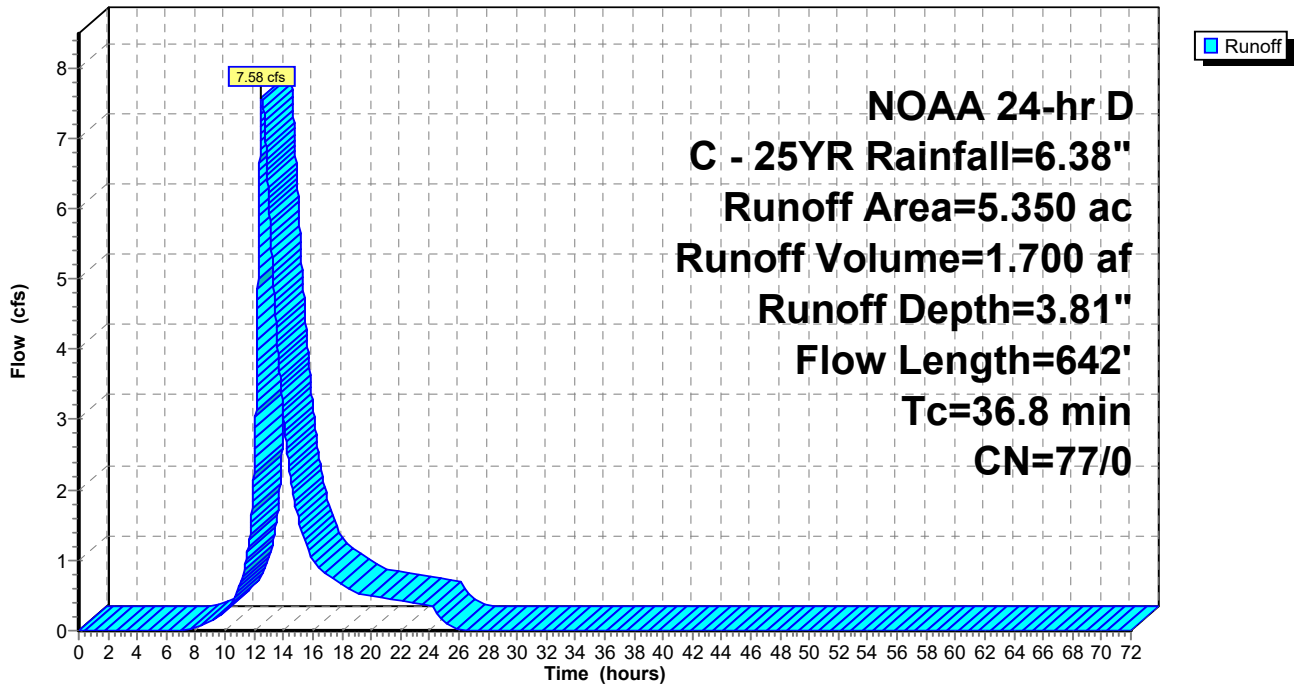
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 3.64 cfs @ 12.15 hrs, Volume= 0.378 af, Depth= 4.84"
 Routed to Link P-DC : DUCK CREEK

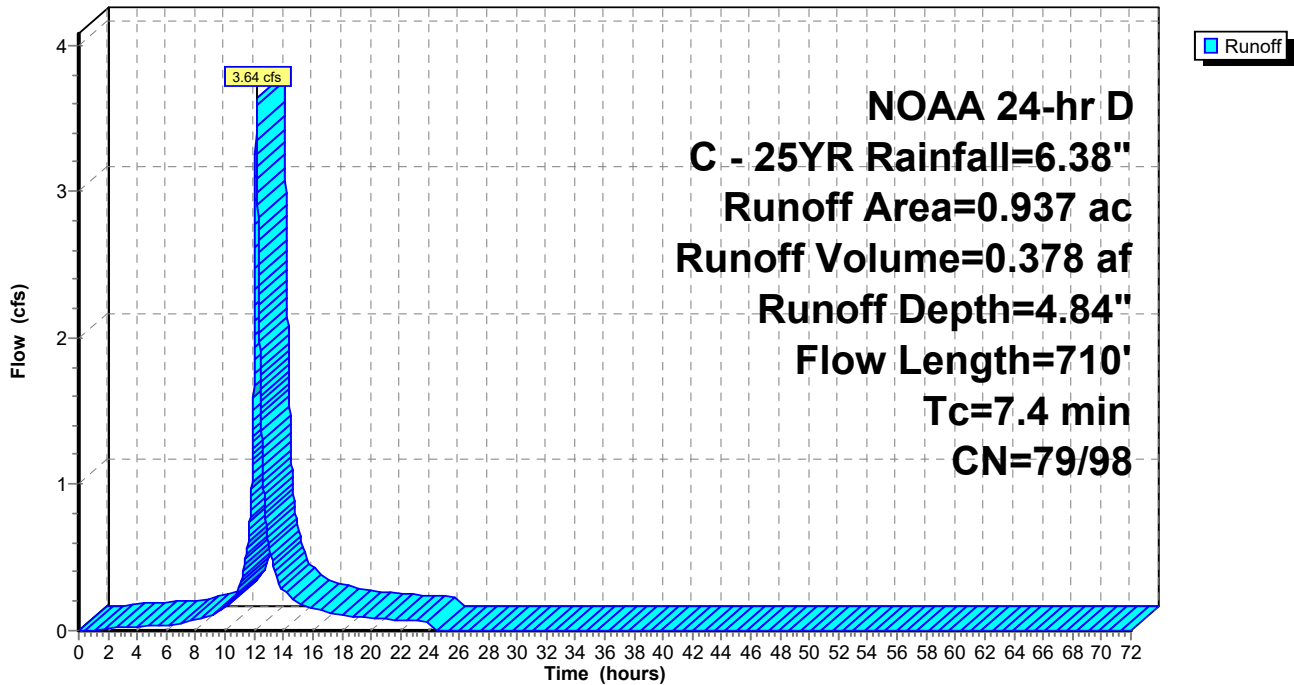
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.60 cfs @ 12.14 hrs, Volume= 0.066 af, Depth= 2.60"
 Routed to Link P-DC : DUCK CREEK

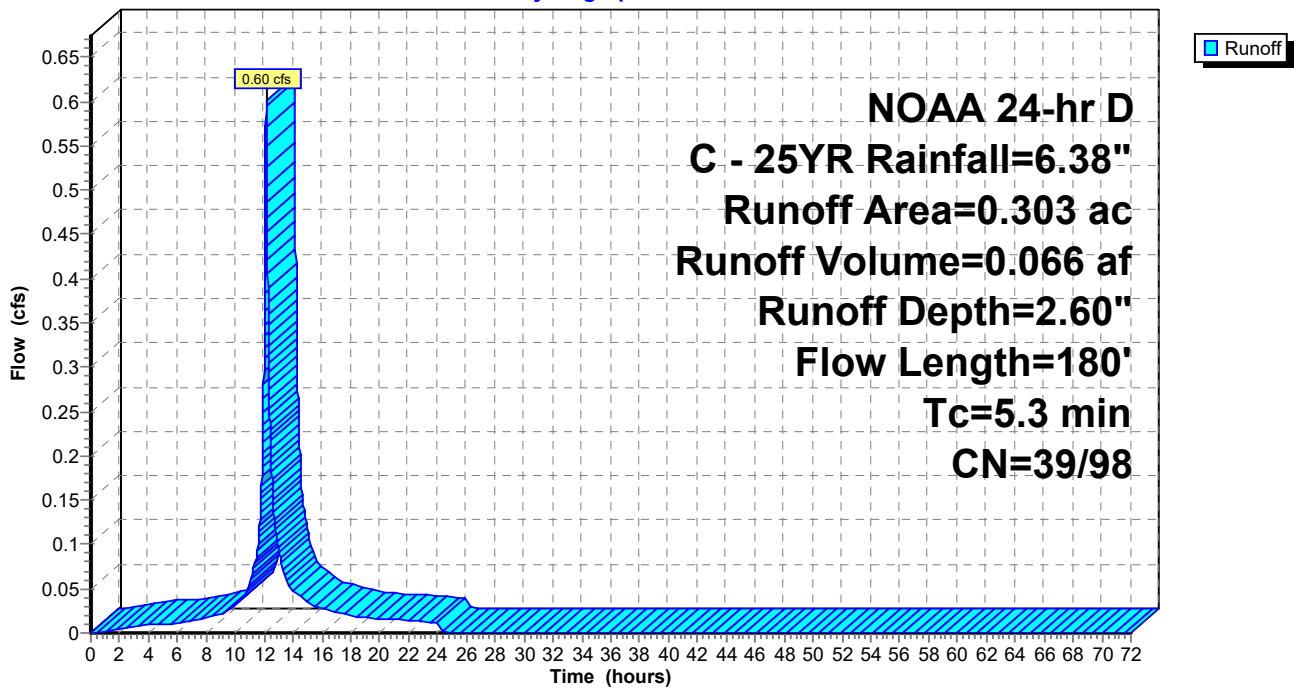
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 8.91 cfs @ 12.11 hrs, Volume= 0.766 af, Depth= 6.14"
 Routed to Pond B-2 : BASIN 2

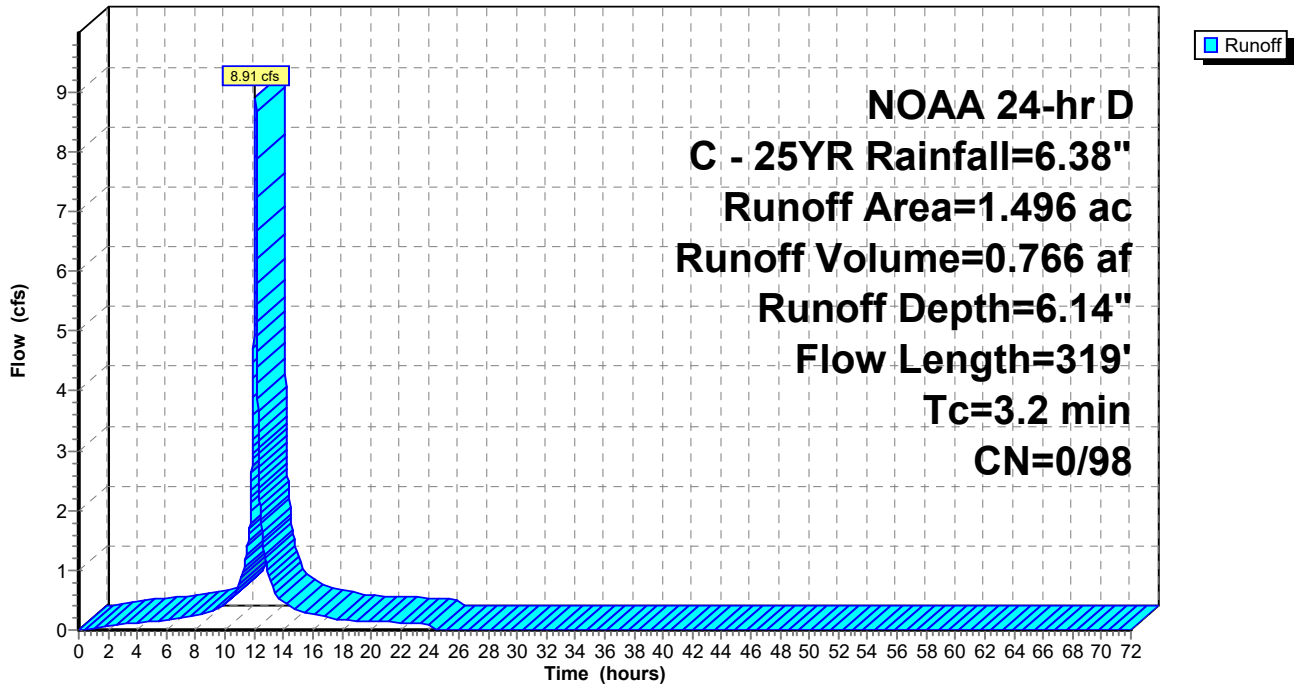
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 1.96 cfs @ 12.12 hrs, Volume= 0.179 af, Depth= 5.97"
 Routed to Pond B-3 : BASIN 3

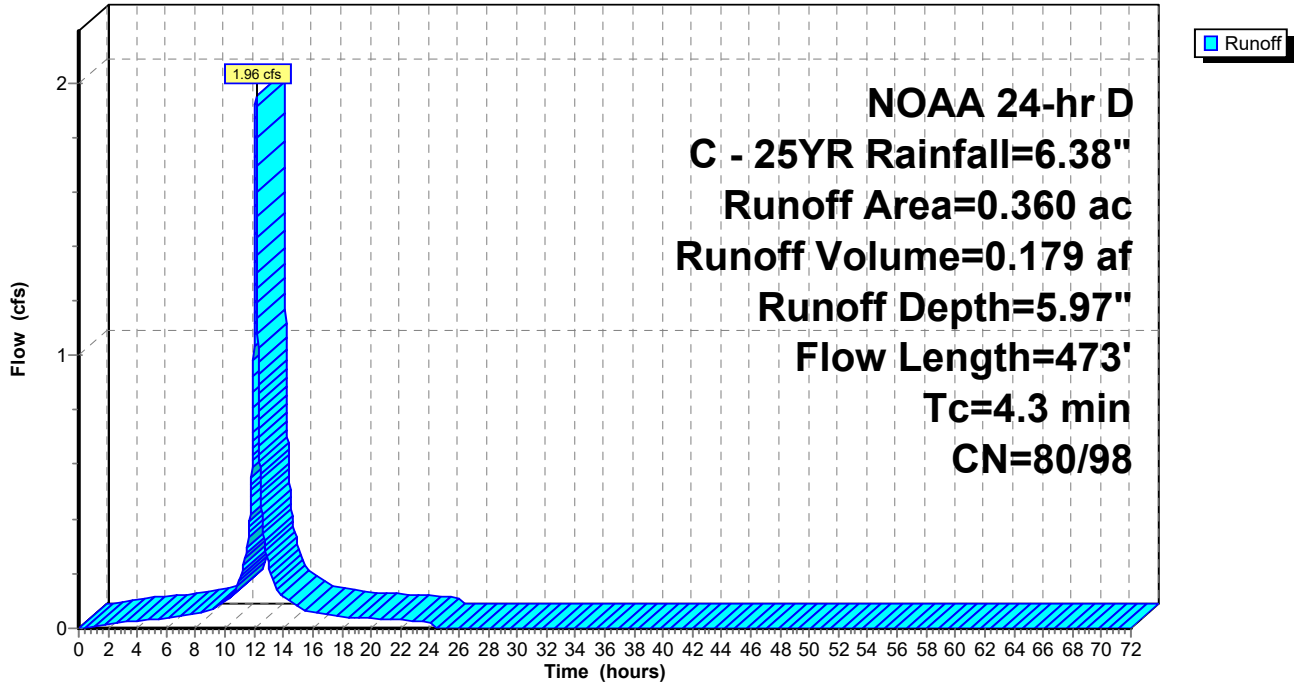
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 6.04 cfs @ 12.12 hrs, Volume= 0.543 af, Depth= 6.14"
 Routed to Pond B-3 : BASIN 3

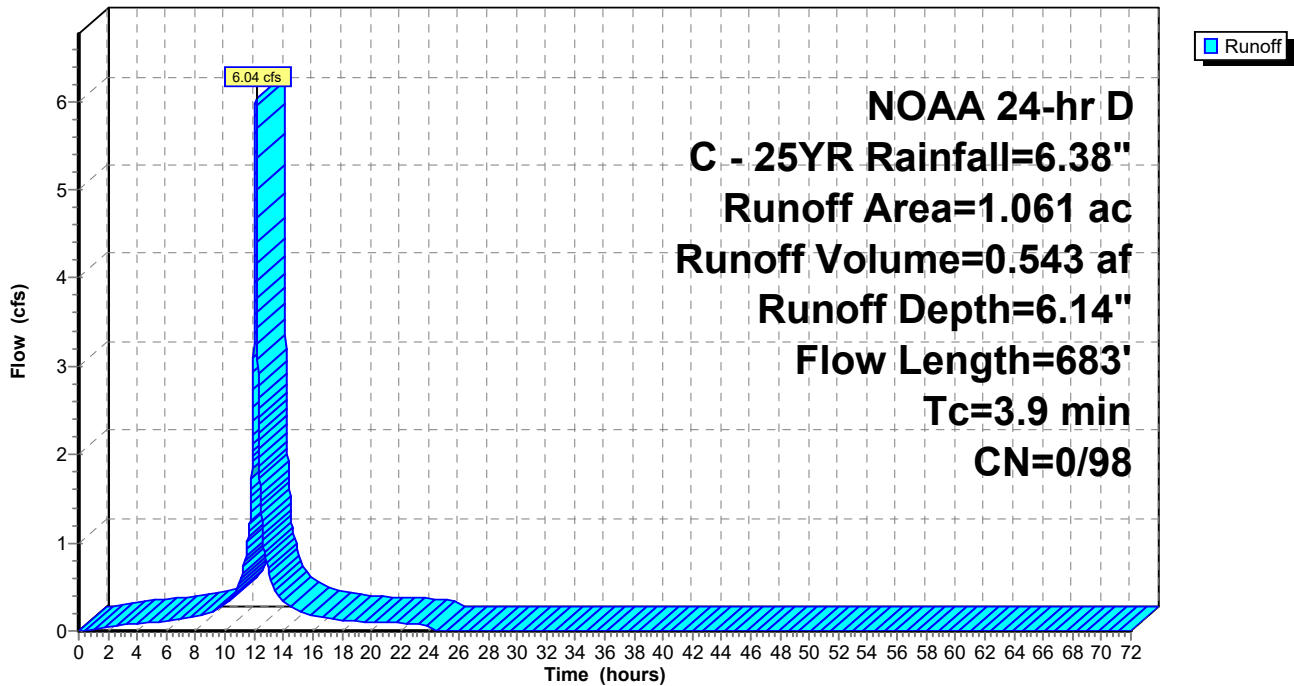
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 1.64 cfs @ 12.21 hrs, Volume= 0.199 af, Depth= 4.32"
 Routed to Pond B-4 : BASIN 4

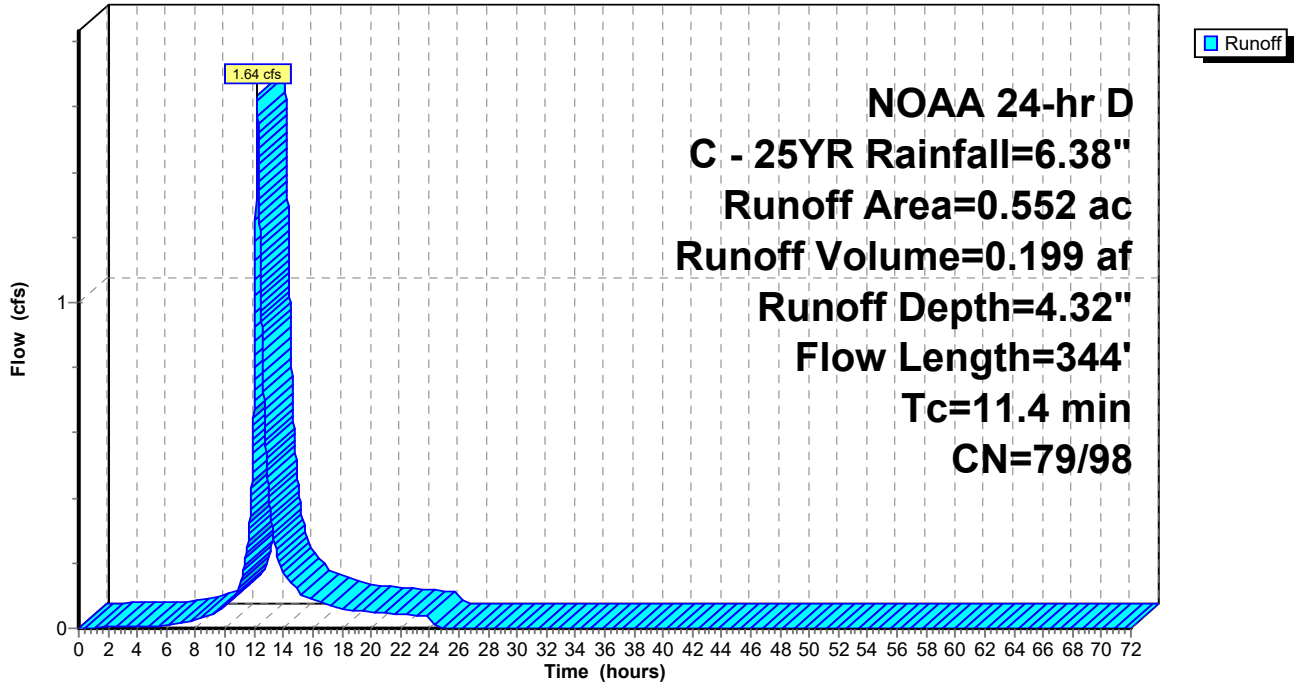
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 4.24 cfs @ 12.16 hrs, Volume= 0.477 af, Depth= 5.77"
 Routed to Pond B-4 : BASIN 4

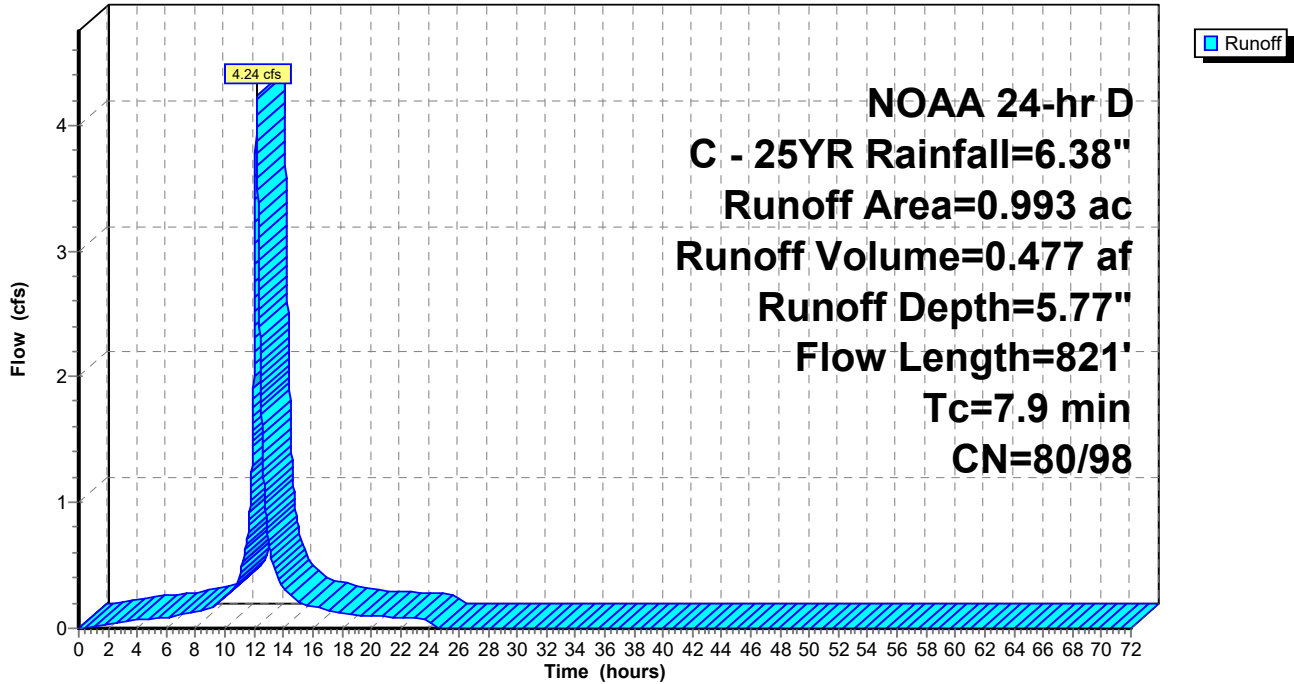
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



Summary for Subcatchment P-UG-1: UG-1

Runoff = 13.62 cfs @ 12.15 hrs, Volume= 1.469 af, Depth= 6.14"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

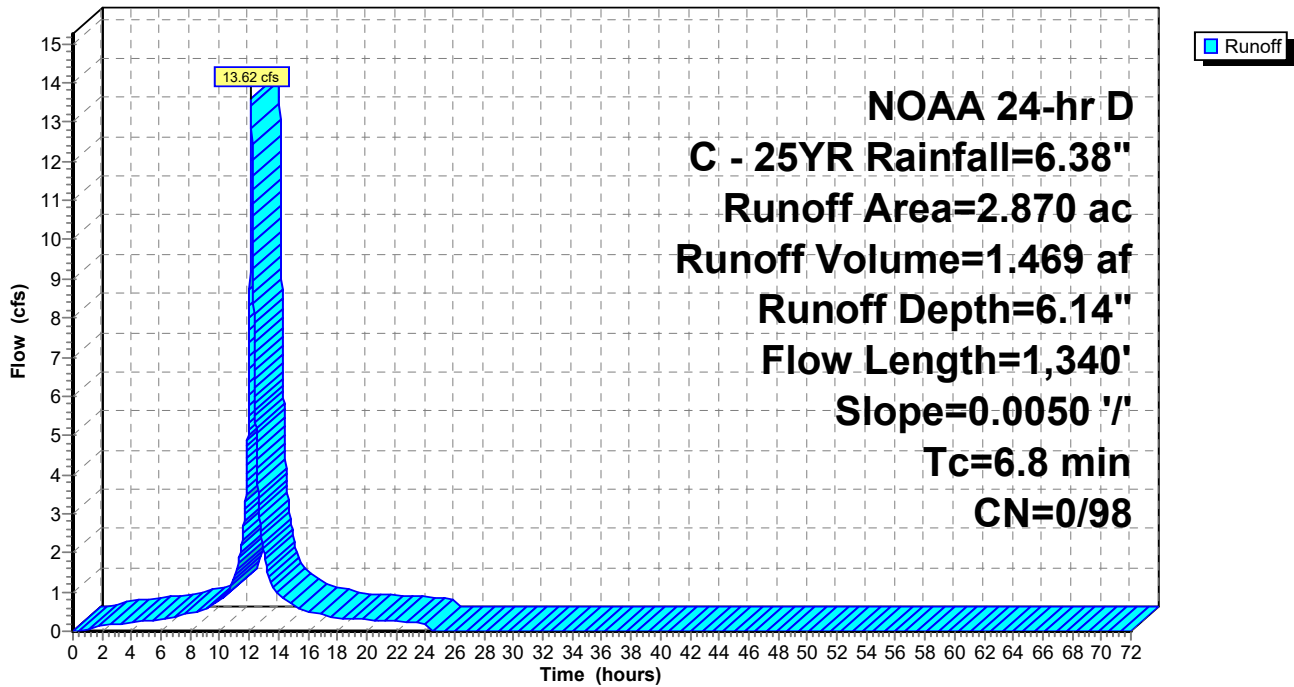
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 338% of capacity of segment #3

Runoff = 15.46 cfs @ 12.13 hrs, Volume= 1.468 af, Depth= 6.14"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

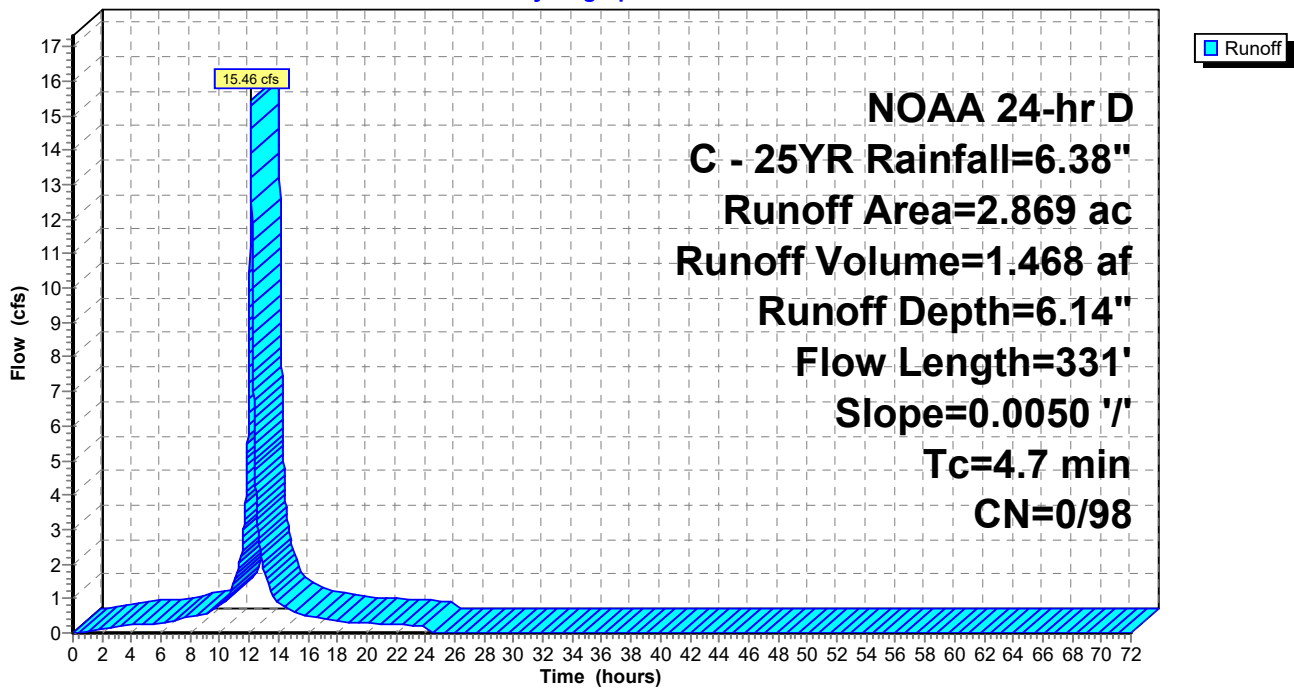
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D C - 25YR Rainfall=6.38"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



Summary for Reach 17R: E-1

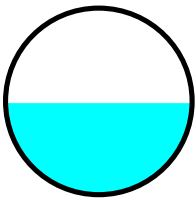
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 5.47" for C - 25YR event
Inflow = 12.18 cfs @ 12.34 hrs, Volume= 2.173 af
Outflow = 12.18 cfs @ 12.35 hrs, Volume= 2.173 af, Atten= 0%, Lag= 0.5 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.83 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 3.2 min

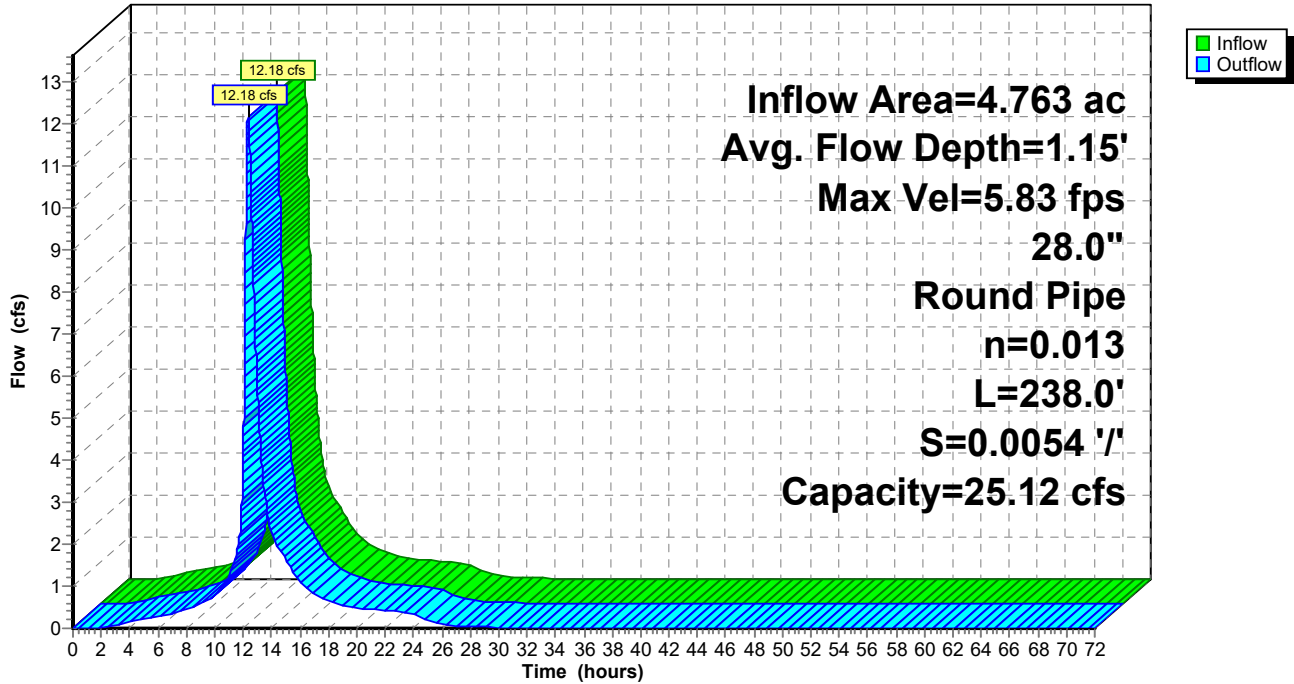
Peak Storage= 497 cf @ 12.35 hrs
Average Depth at Peak Storage= 1.15' , Surface Width= 2.33'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



Reach 17R: E-1

Hydrograph



Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

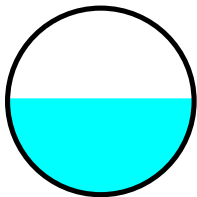
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.06' @ 12.44 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 5.47" for C - 25YR event
Inflow = 12.18 cfs @ 12.35 hrs, Volume= 2.173 af
Outflow = 12.17 cfs @ 12.36 hrs, Volume= 2.173 af, Atten= 0%, Lag= 0.5 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.45 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 3.3 min

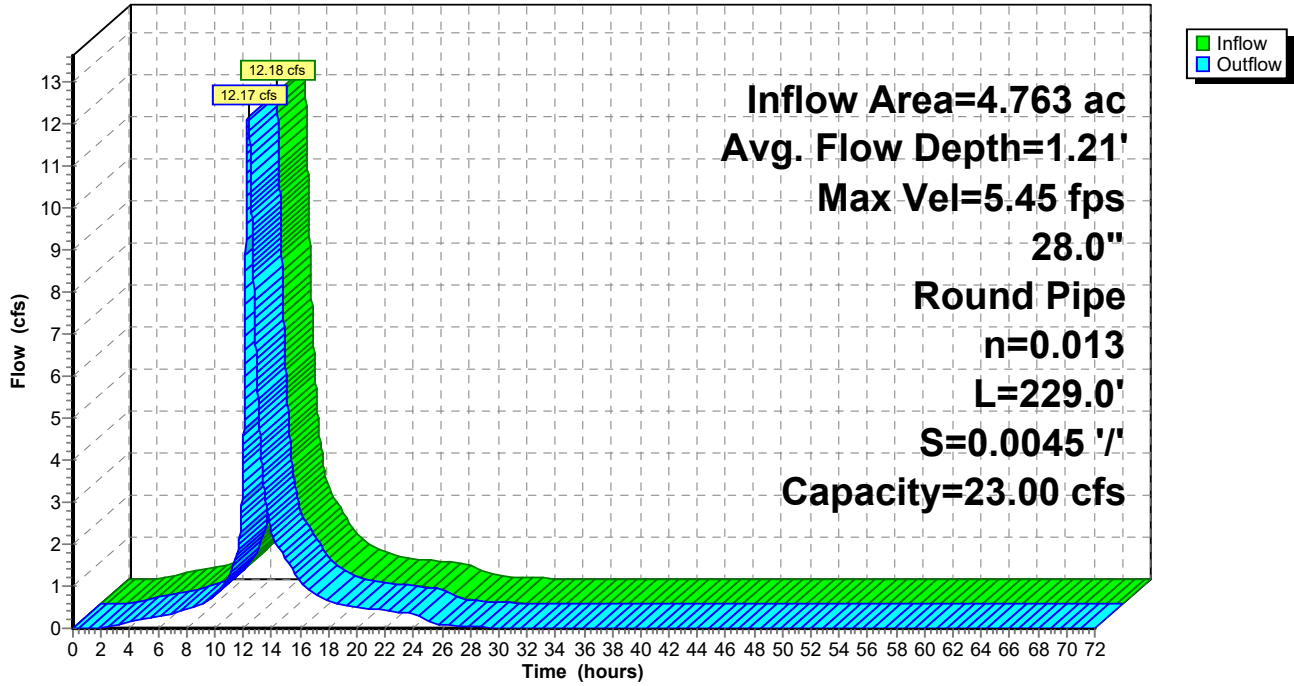
Peak Storage= 511 cf @ 12.36 hrs
Average Depth at Peak Storage= 1.21' , Surface Width= 2.33'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 5.95" for C - 25YR event
 Inflow = 9.51 cfs @ 12.11 hrs, Volume= 0.811 af
 Outflow = 7.65 cfs @ 12.15 hrs, Volume= 0.811 af, Atten= 20%, Lag= 2.5 min
 Primary = 7.65 cfs @ 12.15 hrs, Volume= 0.811 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 16.00' Surf.Area= 0.102 ac Storage= 0.093 af
 Peak Elev= 17.72' @ 12.15 hrs Surf.Area= 0.135 ac Storage= 0.298 af (0.204 af above start)

Plug-Flow detention time= 196.7 min calculated for 0.717 af (88% of inflow)
 Center-of-Mass det. time= 84.8 min (833.6 - 748.9)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

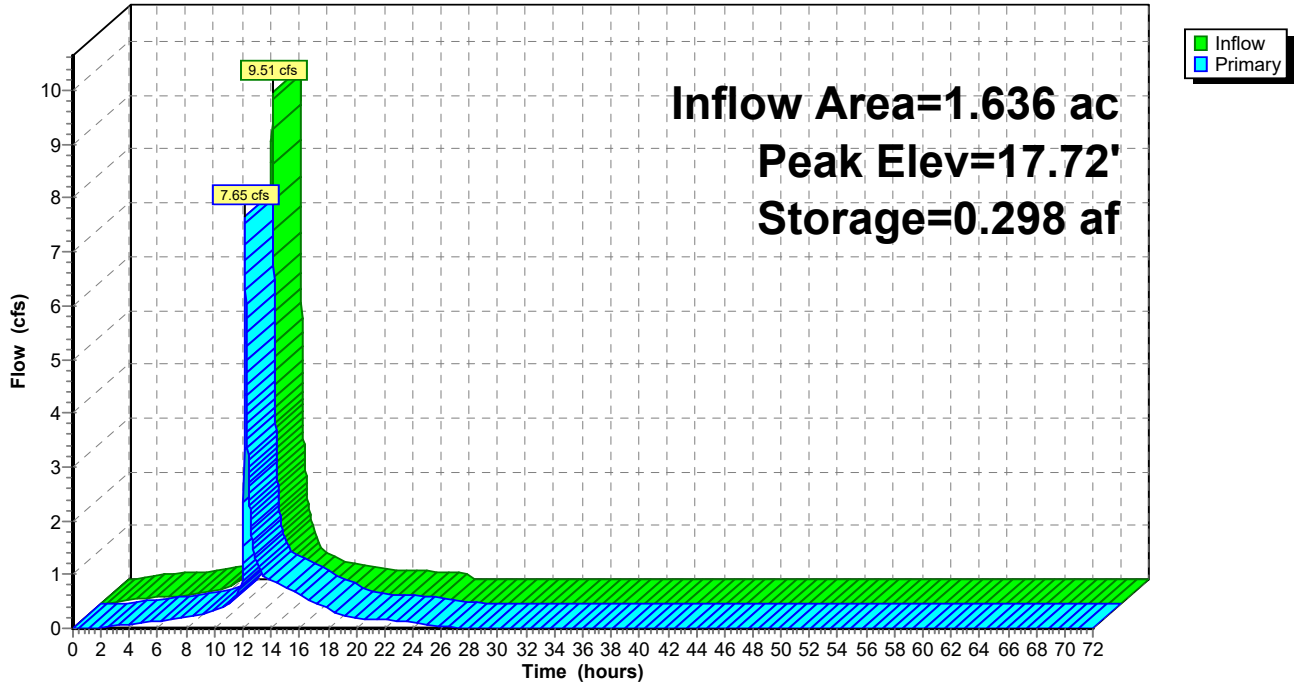
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=7.64 cfs @ 12.15 hrs HW=17.72' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 7.64 cfs of 18.87 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.05 cfs @ 6.01 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.06 cfs @ 2.00 fps)
- 4=Orifice/Grate (Weir Controls 5.53 cfs @ 1.55 fps)

Pond B-2: BASIN 2

Hydrograph



Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 5.54" for C - 25YR event
 Inflow = 10.26 cfs @ 12.12 hrs, Volume= 0.882 af
 Outflow = 8.30 cfs @ 12.16 hrs, Volume= 0.876 af, Atten= 19%, Lag= 2.6 min
 Primary = 8.30 cfs @ 12.16 hrs, Volume= 0.876 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.30' Surf.Area= 0.246 ac Storage= 0.191 af
 Peak Elev= 12.21' @ 12.16 hrs Surf.Area= 0.263 ac Storage= 0.422 af (0.231 af above start)

Plug-Flow detention time= 336.4 min calculated for 0.685 af (78% of inflow)
 Center-of-Mass det. time= 168.8 min (929.5 - 760.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
10.50	0.231	569.6	0.000	0.000	0.231
11.00	0.241	578.4	0.118	0.118	0.251
12.00	0.259	596.0	0.250	0.368	0.291
13.00	0.278	615.6	0.269	0.637	0.337
13.50	0.295	633.5	0.143	0.780	0.378

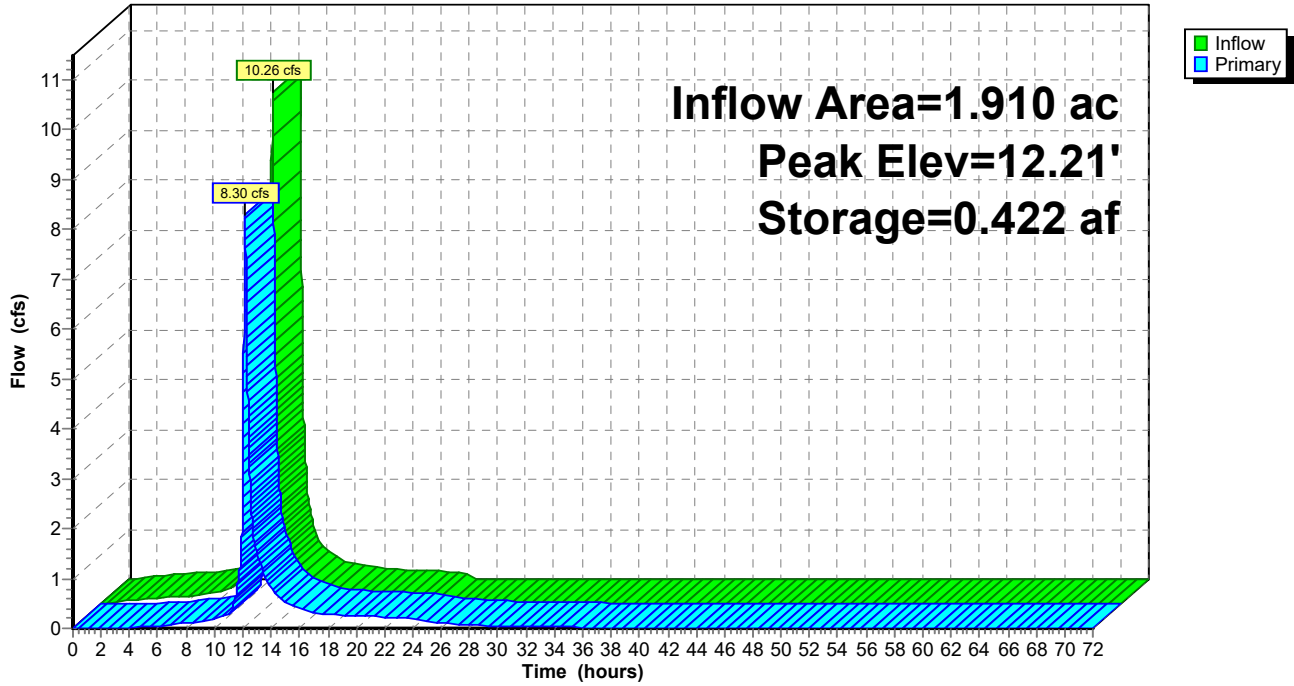
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.29 cfs @ 12.16 hrs HW=12.21' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 8.29 cfs of 33.34 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.45 cfs @ 4.08 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.93 cfs @ 2.21 fps)
- 4=Orifice/Grate (Weir Controls 4.91 cfs @ 1.49 fps)

Pond B-3: BASIN 3

Hydrograph



Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 5.07" for C - 25YR event
 Inflow = 6.85 cfs @ 12.16 hrs, Volume= 0.775 af
 Outflow = 3.88 cfs @ 12.41 hrs, Volume= 0.775 af, Atten= 43%, Lag= 14.5 min
 Primary = 3.88 cfs @ 12.41 hrs, Volume= 0.775 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.60' Surf.Area= 4,225 sf Storage= 3,964 cf
 Peak Elev= 15.17' @ 12.41 hrs Surf.Area= 5,120 sf Storage= 11,266 cf (7,302 cf above start)

Plug-Flow detention time= 157.8 min calculated for 0.684 af (88% of inflow)
 Center-of-Mass det. time= 54.9 min (839.3 - 784.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

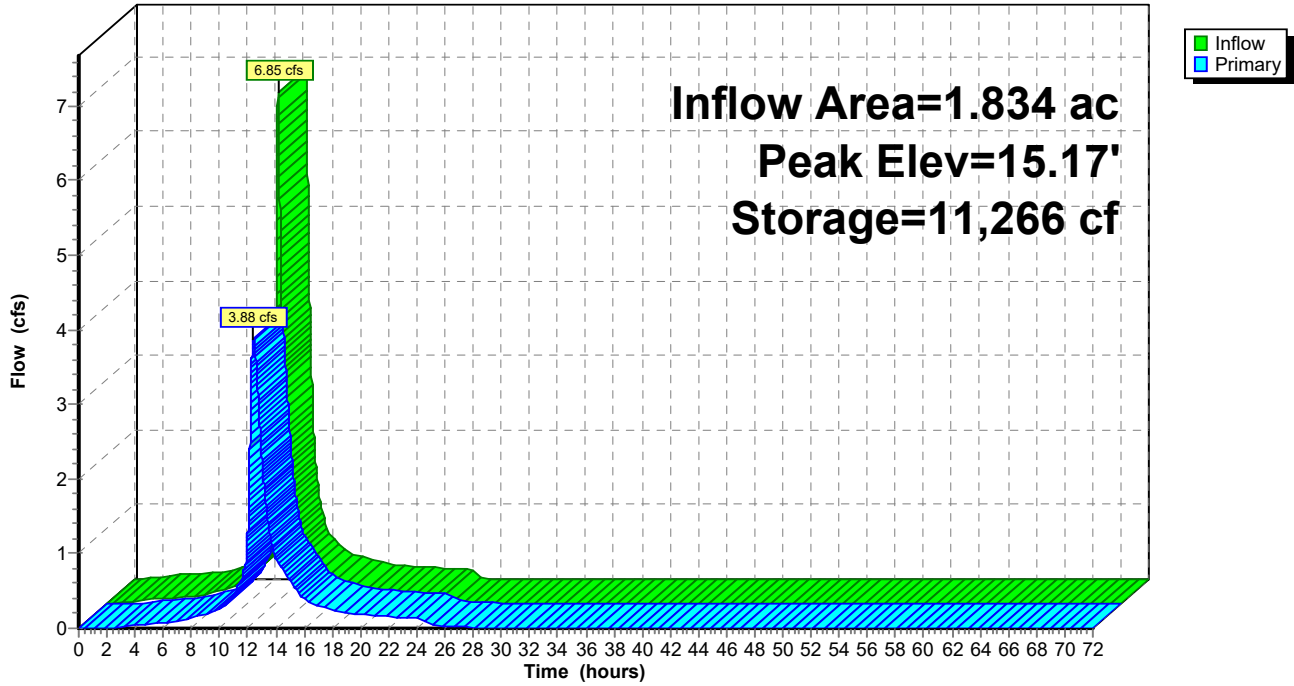
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=3.88 cfs @ 12.41 hrs HW=15.17' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 3.88 cfs of 13.03 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.53 cfs @ 5.62 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 2.35 cfs @ 3.13 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 5.73" for C - 25YR event
 Inflow = 12.19 cfs @ 12.16 hrs, Volume= 1.399 af
 Outflow = 8.38 cfs @ 12.32 hrs, Volume= 1.398 af, Atten= 31%, Lag= 9.6 min
 Primary = 8.38 cfs @ 12.32 hrs, Volume= 1.398 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.90' Surf.Area= 8,129 sf Storage= 9,986 cf
 Peak Elev= 15.27' @ 12.32 hrs Surf.Area= 9,131 sf Storage= 21,798 cf (11,812 cf above start)

Plug-Flow detention time= 196.9 min calculated for 1.169 af (84% of inflow)
 Center-of-Mass det. time= 60.9 min (823.6 - 762.7)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	6,858	409.0	0	0	6,858	
13.00	7,629	429.0	2,896	2,896	8,202	
14.00	8,186	439.0	7,906	10,802	9,018	
14.10	8,239	440.0	821	11,623	9,101	
15.00	8,985	459.0	7,748	19,372	10,519	
16.00	9,537	468.1	9,260	28,631	11,335	

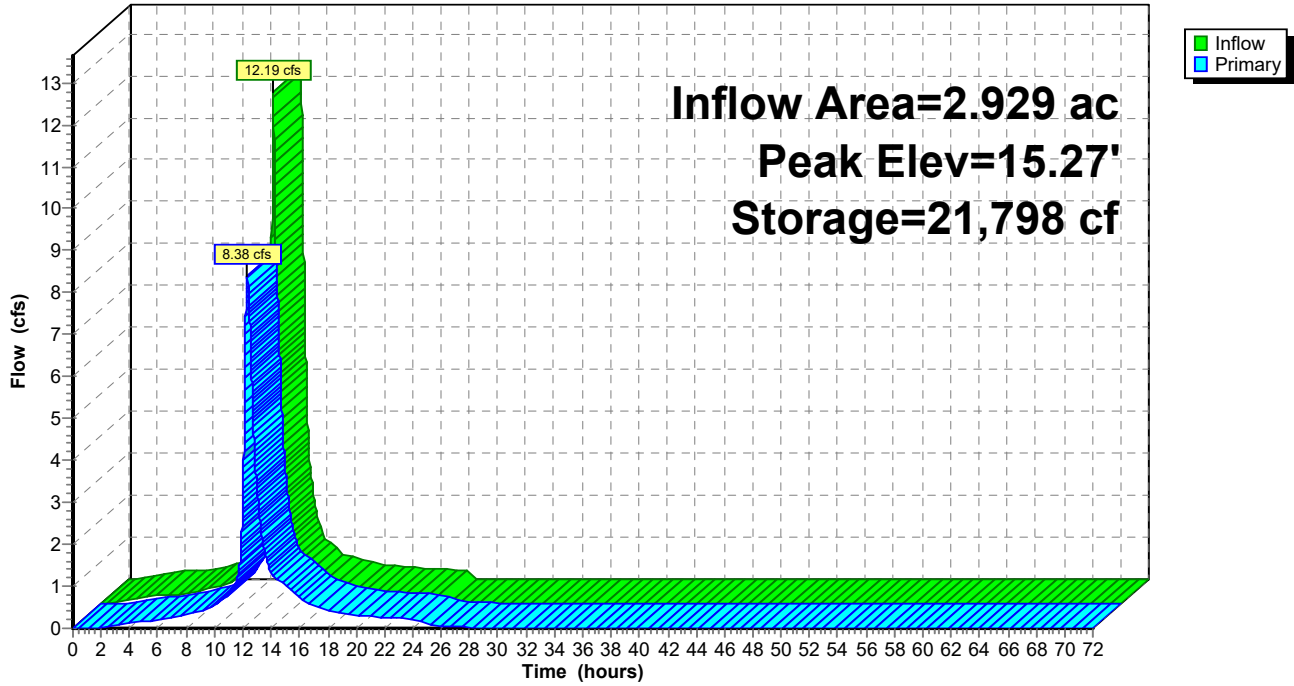
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.38 cfs @ 12.32 hrs HW=15.27' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 8.38 cfs of 13.81 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.12 cfs @ 5.18 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 6.26 cfs @ 2.87 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 6.14" for C - 25YR event
 Inflow = 28.84 cfs @ 12.13 hrs, Volume= 2.937 af
 Outflow = 16.54 cfs @ 12.29 hrs, Volume= 2.907 af, Atten= 43%, Lag= 9.4 min
 Primary = 16.54 cfs @ 12.29 hrs, Volume= 2.907 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.00' Surf.Area= 0.631 ac Storage= 0.542 af
 Peak Elev= 14.17' @ 12.29 hrs Surf.Area= 0.631 ac Storage= 1.855 af (1.314 af above start)

Plug-Flow detention time= 700.5 min calculated for 2.365 af (81% of inflow)
 Center-of-Mass det. time= 487.3 min (1,235.8 - 748.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=16.53 cfs @ 12.29 hrs HW=14.17' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 16.53 cfs of 39.53 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.73 cfs @ 8.34 fps)
- 3=Orifice/Grate (Orifice Controls 0.49 cfs @ 7.17 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 15.32 cfs @ 2.77 fps)

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

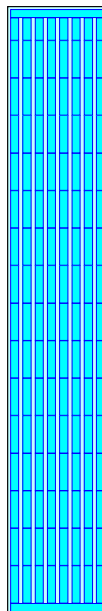
16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"
End Stone x 2 = 324.00' Base Length
8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
32,197.7 cf Chamber Storage
128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af
Overall Storage Efficiency = 57.7%
Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers
3,517.4 cy Field
2,088.7 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

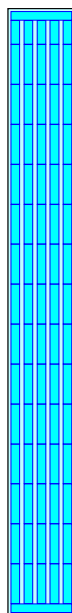
15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"
End Stone x 2 = 304.00' Base Length
5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 =
18,864.5 cf Chamber Storage
75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 =
22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

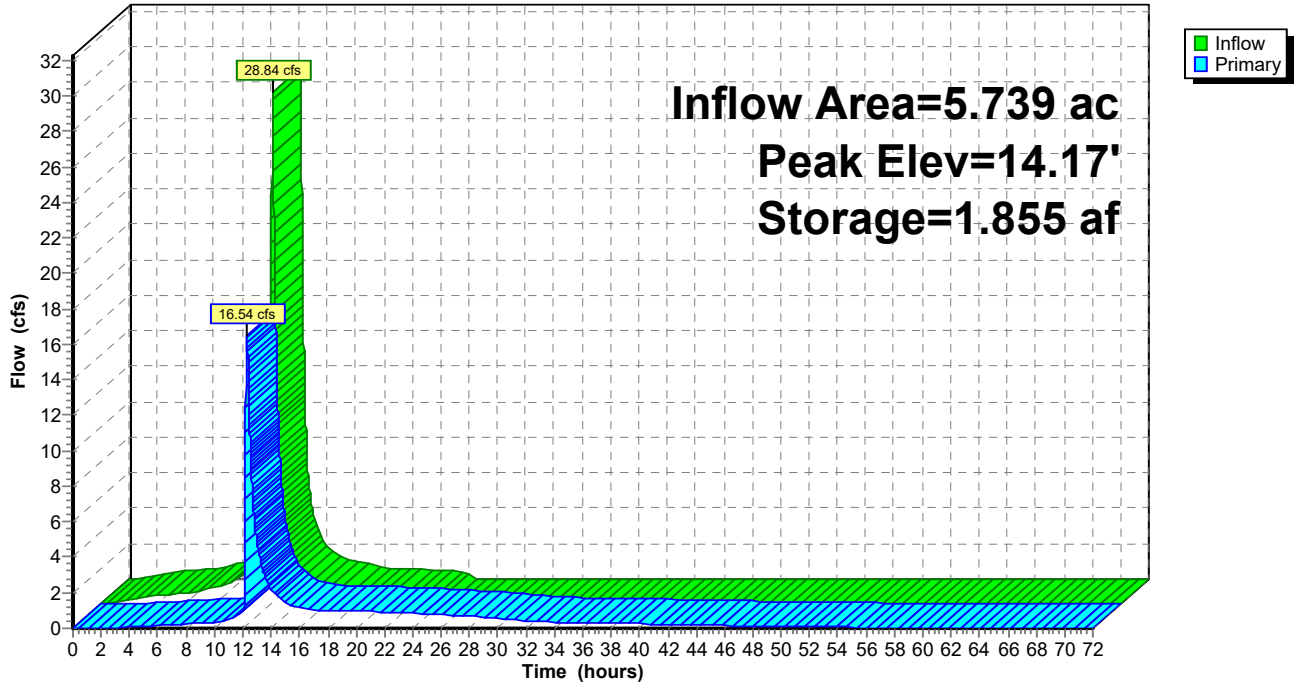
Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af
Overall Storage Efficiency = 57.5%
Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers
2,084.9 cy Field
1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



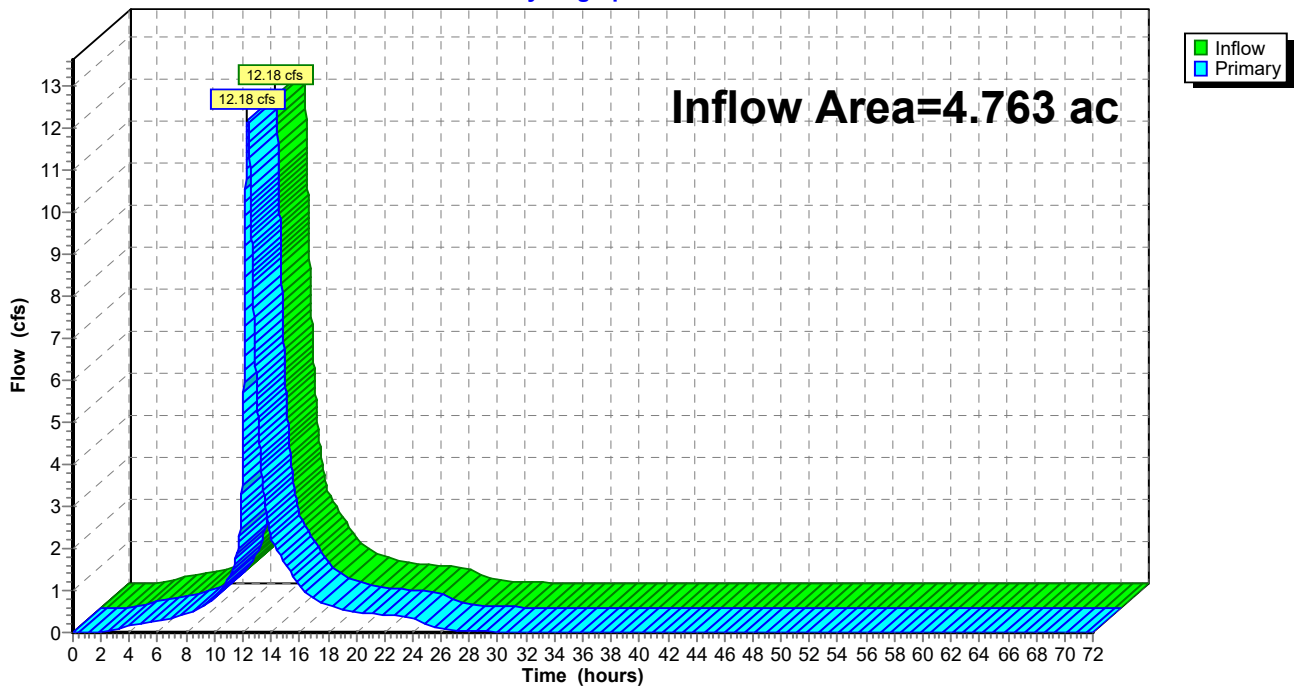
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 5.47" for C - 25YR event
Inflow = 12.18 cfs @ 12.34 hrs, Volume= 2.173 af
Primary = 12.18 cfs @ 12.34 hrs, Volume= 2.173 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



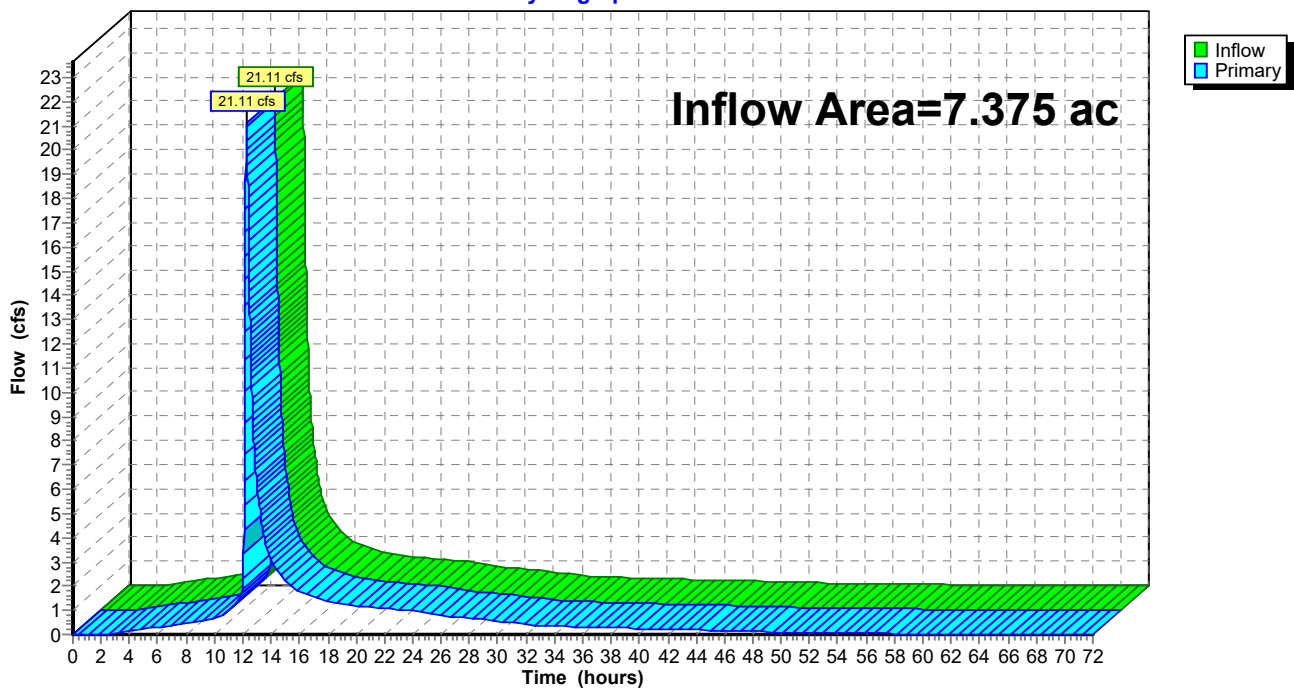
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 6.05" for C - 25YR event
 Inflow = 21.11 cfs @ 12.27 hrs, Volume= 3.717 af
 Primary = 21.11 cfs @ 12.27 hrs, Volume= 3.717 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



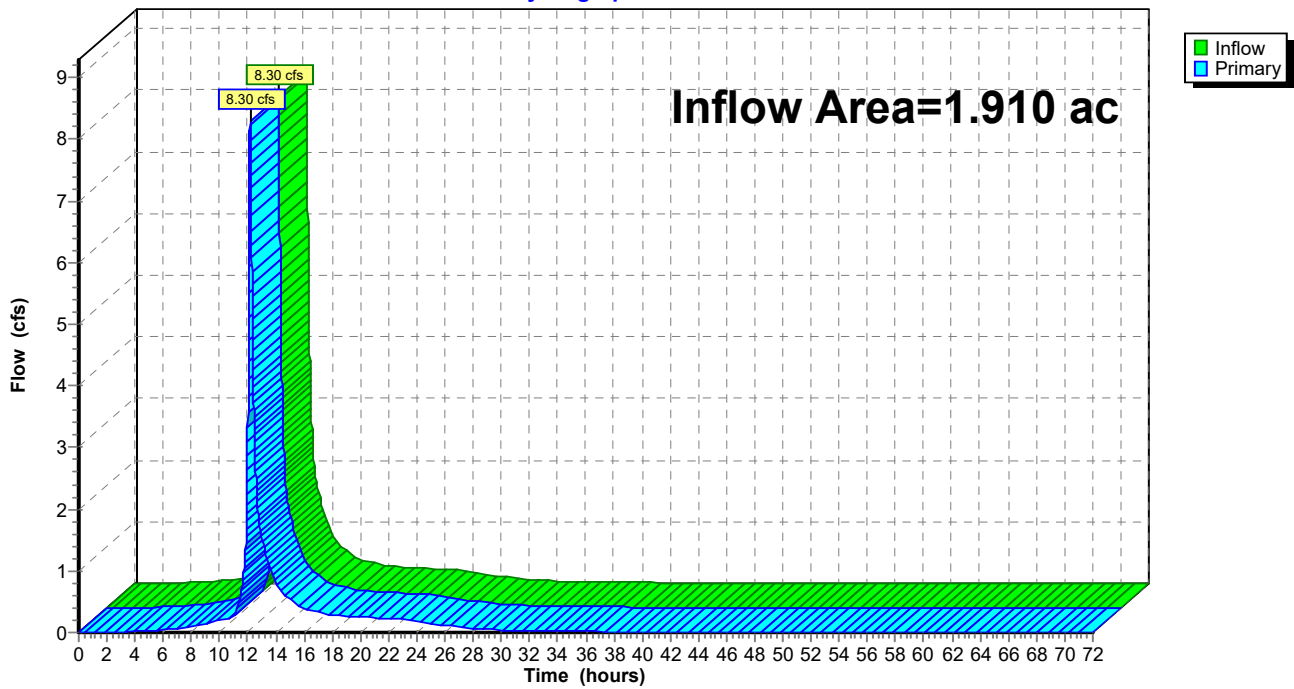
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 5.51" for C - 25YR event
Inflow = 8.30 cfs @ 12.16 hrs, Volume= 0.876 af
Primary = 8.30 cfs @ 12.16 hrs, Volume= 0.876 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



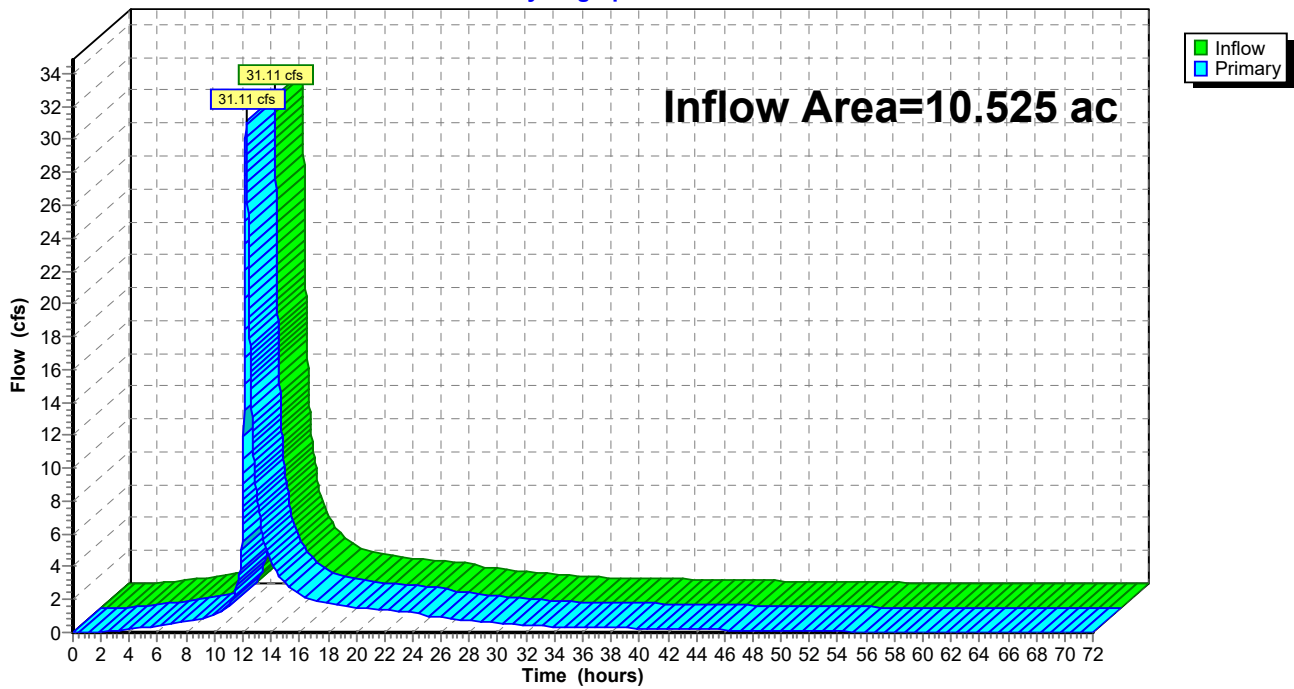
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 5.74" for C - 25YR event
Inflow = 31.11 cfs @ 12.24 hrs, Volume= 5.038 af
Primary = 31.11 cfs @ 12.24 hrs, Volume= 5.038 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



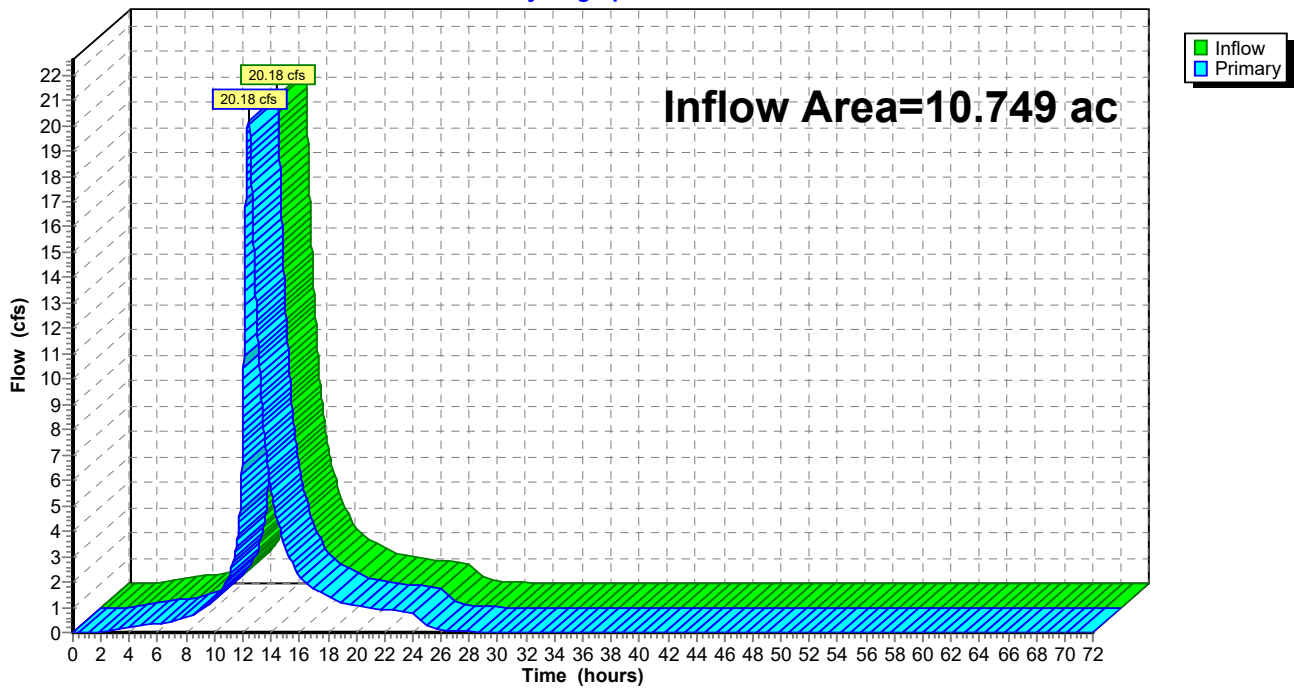
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 4.69" for C - 25YR event
Inflow = 20.18 cfs @ 12.42 hrs, Volume= 4.198 af
Primary = 20.18 cfs @ 12.42 hrs, Volume= 4.198 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



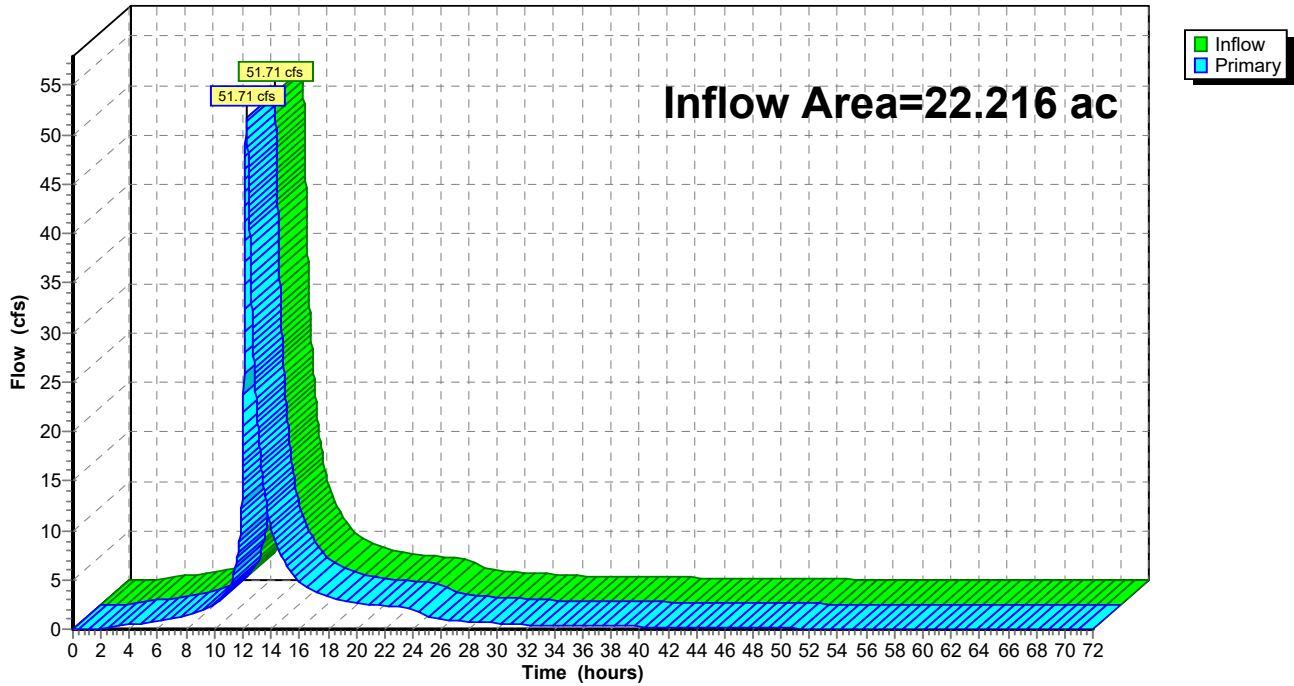
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 5.25" for C - 25YR event
Inflow = 51.71 cfs @ 12.26 hrs, Volume= 9.718 af
Primary = 51.71 cfs @ 12.26 hrs, Volume= 9.718 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - (Failure Analysis) Proposed Conditions NOAA 24-hr D D - 100YR Rainfall=8.67"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 143

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=8.33" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=14.60 cfs 1.732 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=1.07 cfs 0.070 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=3.49 cfs 0.245 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=6.26" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=1.60 cfs 0.151 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=6.01" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=2.30 cfs 0.217 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=3.57 cfs 0.662 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=4.38 cfs 0.447 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=5.89" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=11.74 cfs 2.627 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=7.02" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=5.25 cfs 0.548 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=4.01" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.98 cfs 0.101 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=12.13 cfs 1.051 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=8.25" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=2.68 cfs 0.247 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=8.22 cfs 0.745 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=6.45" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=2.43 cfs 0.297 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=8.02" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=5.86 cfs 0.664 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=18.54 cfs 2.016 af

SubcatchmentP-UG-2: UG-2	Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=8.43" Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=21.04 cfs 2.015 af
Reach 17R: E-1	Avg. Flow Depth=1.66' Max Vel=6.60 fps Inflow=21.56 cfs 3.059 af 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=21.52 cfs 3.059 af
Reach 18R: E-2	Avg. Flow Depth=1.79' Max Vel=6.11 fps Inflow=21.52 cfs 3.059 af 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=21.47 cfs 3.059 af
Pond B-2: BASIN 2	Peak Elev=17.82' Storage=0.311 af Inflow=13.03 cfs 1.121 af Outflow=12.08 cfs 1.121 af
Pond B-3: BASIN 3	Peak Elev=12.28' Storage=0.443 af Inflow=14.29 cfs 1.238 af Outflow=12.11 cfs 1.232 af
Pond B-4: BASIN 4	Peak Elev=15.37' Storage=12,294 cf Inflow=9.75 cfs 1.112 af Outflow=8.25 cfs 1.111 af
Pond B-5: BASIN 5	Peak Elev=15.51' Storage=23,982 cf Inflow=16.87 cfs 1.949 af Outflow=13.35 cfs 1.948 af
Pond UG-2: UG BASIN 1 & 2 (	Peak Elev=14.62' Storage=1.968 af Inflow=39.25 cfs 4.032 af Outflow=32.08 cfs 4.000 af
Link 16L: Existing Storm Sewer	Inflow=21.56 cfs 3.059 af Primary=21.56 cfs 3.059 af
Link D3A: POD 3A	Inflow=42.02 cfs 5.120 af Primary=42.02 cfs 5.120 af
Link D3B: POD 3B	Inflow=12.11 cfs 1.232 af Primary=12.11 cfs 1.232 af
Link P-DC: DUCK CREEK	Inflow=60.11 cfs 7.002 af Primary=60.11 cfs 7.002 af
Link P-PC: POND CREEK	Inflow=32.62 cfs 6.133 af Primary=32.62 cfs 6.133 af
Link P-SR: SOUTH RIVER	Inflow=87.93 cfs 13.797 af Primary=87.93 cfs 13.797 af

Total Runoff Area = 22.216 ac Runoff Volume = 13.836 af Average Runoff Depth = 7.47"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

Summary for Subcatchment 16S: P-B5-1

Runoff = 14.60 cfs @ 12.17 hrs, Volume= 1.732 af, Depth= 8.33"
 Routed to Pond B-5 : BASIN 5

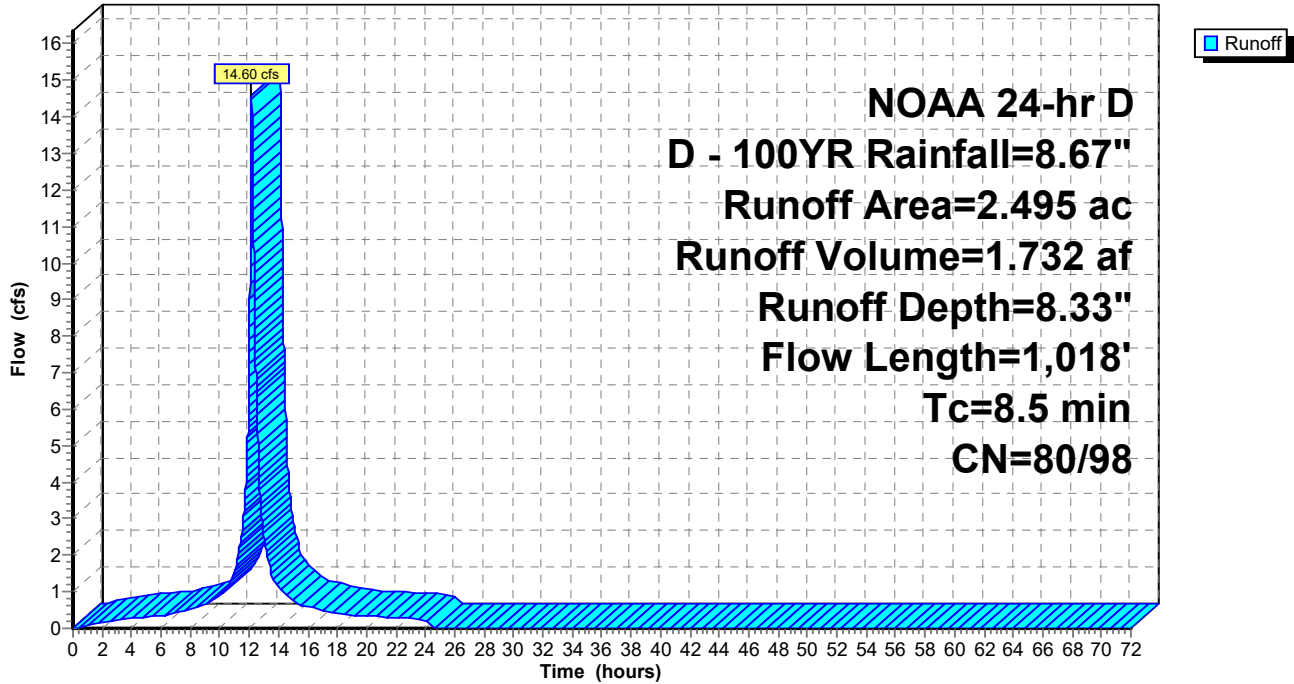
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 6.01"
 Routed to Pond B-2 : BASIN 2

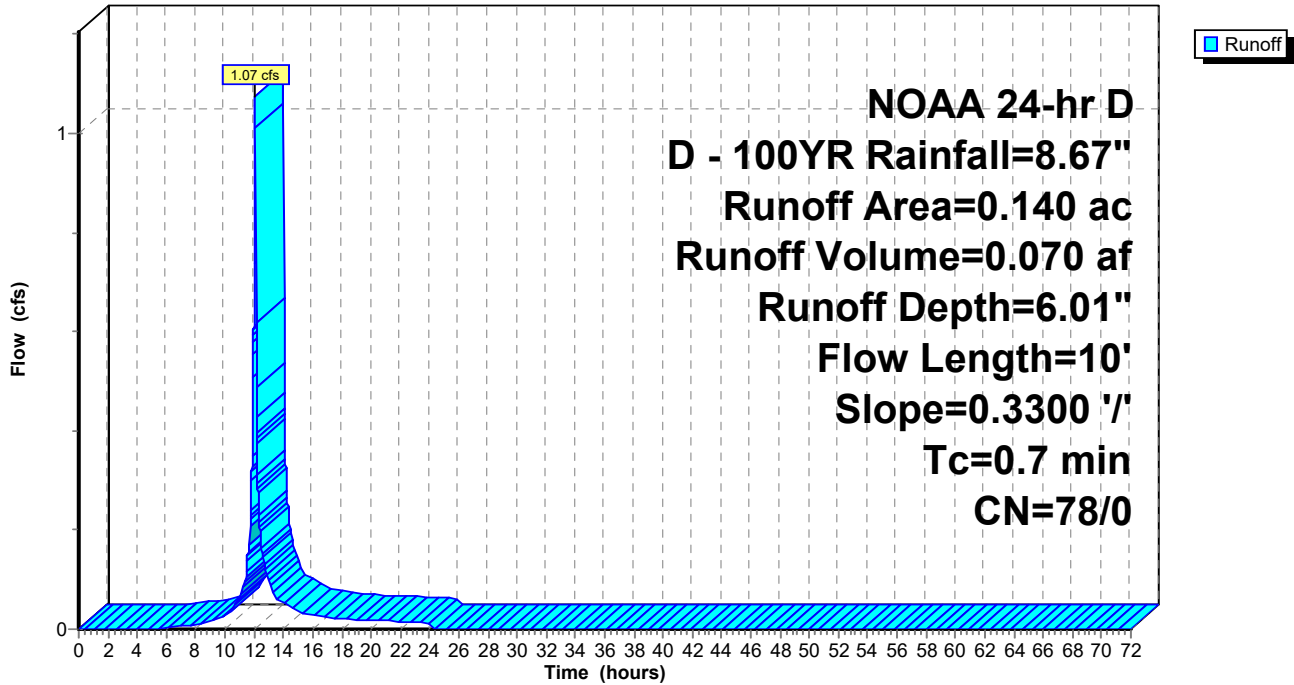
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 3.49 cfs @ 12.11 hrs, Volume= 0.245 af, Depth= 6.01"
 Routed to Pond B-3 : BASIN 3

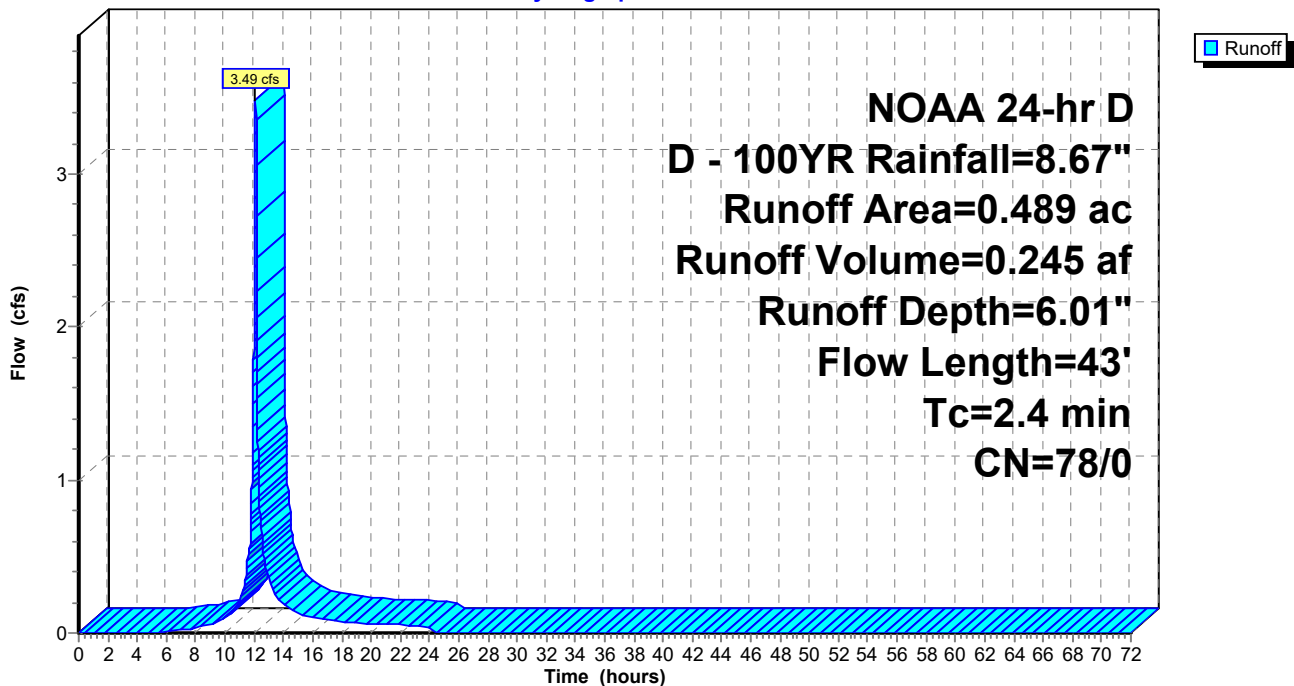
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 1.60 cfs @ 12.15 hrs, Volume= 0.151 af, Depth= 6.26"
 Routed to Pond B-4 : BASIN 4

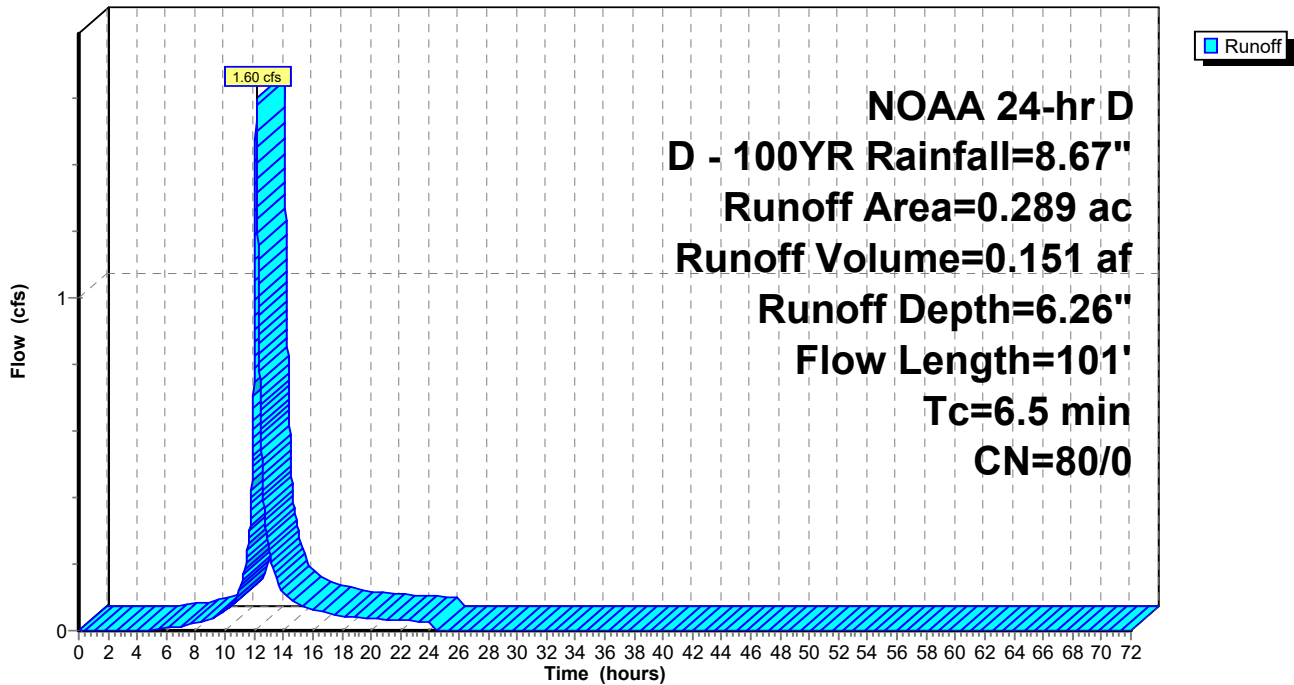
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 2.30 cfs @ 12.15 hrs, Volume= 0.217 af, Depth= 6.01"
 Routed to Pond B-5 : BASIN 5

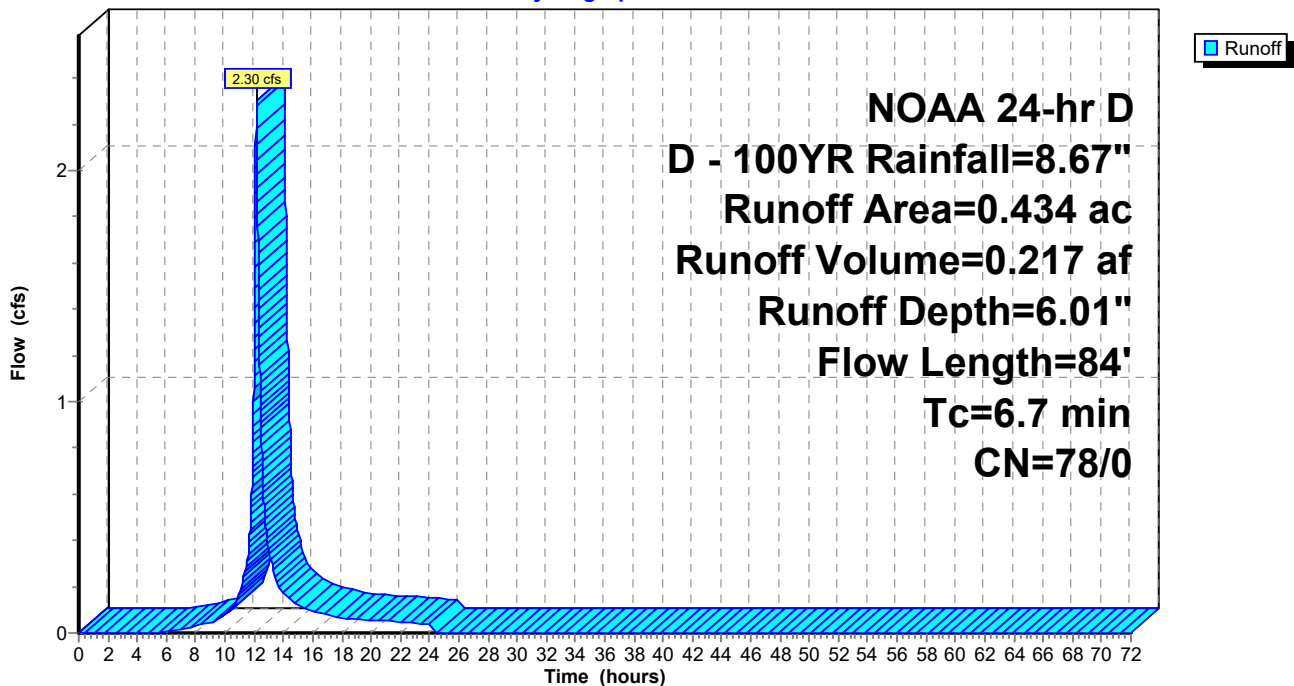
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 3.57 cfs @ 12.34 hrs, Volume= 0.662 af, Depth= 8.43"
 Routed to Link P-SR : SOUTH RIVER

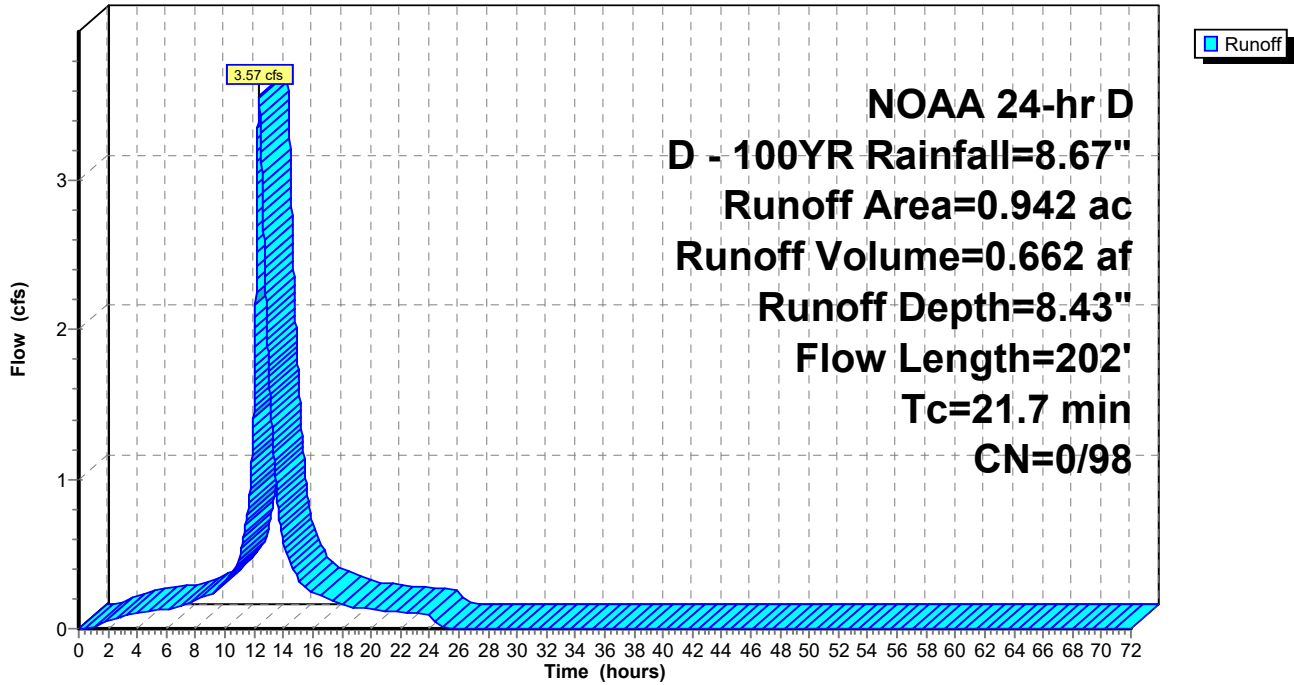
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



Summary for Subcatchment EX. DA-2.: EX. DA-2

Runoff = 4.38 cfs @ 12.14 hrs, Volume= 0.447 af, Depth= 8.43"
 Routed to Link P-PC : POND CREEK

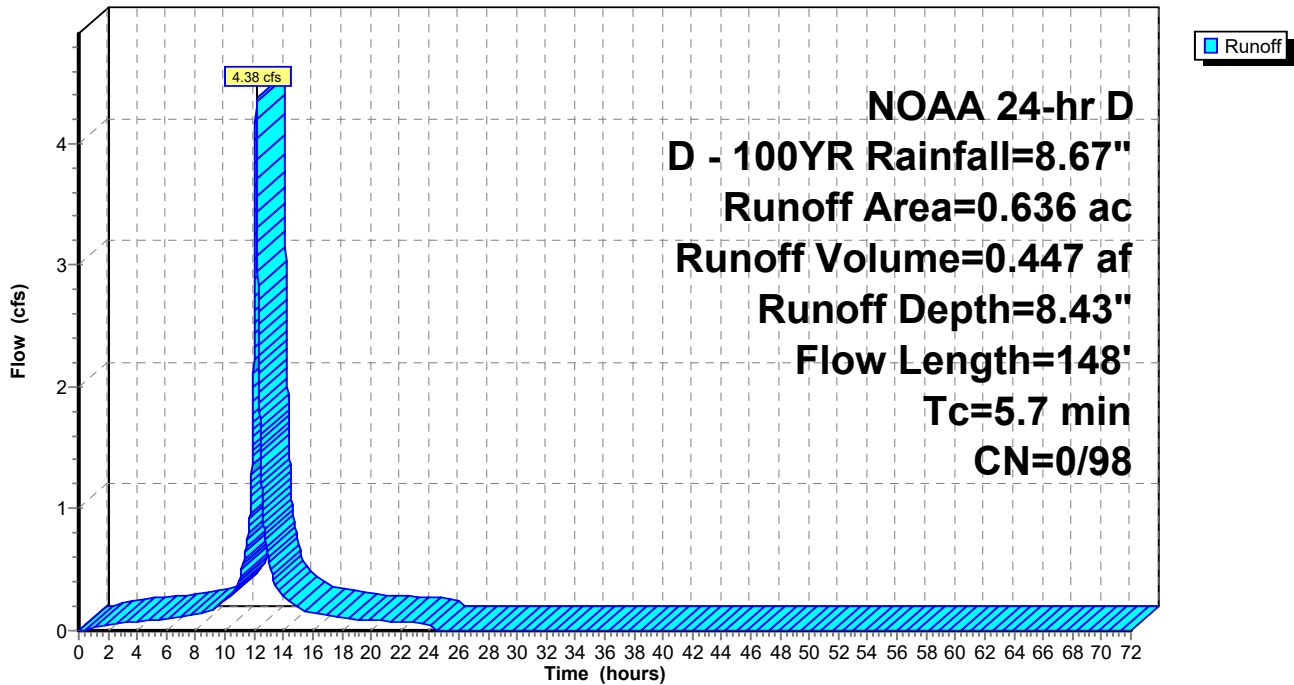
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2

Hydrograph



Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 11.74 cfs @ 12.52 hrs, Volume= 2.627 af, Depth= 5.89"
 Routed to Link P-PC : POND CREEK

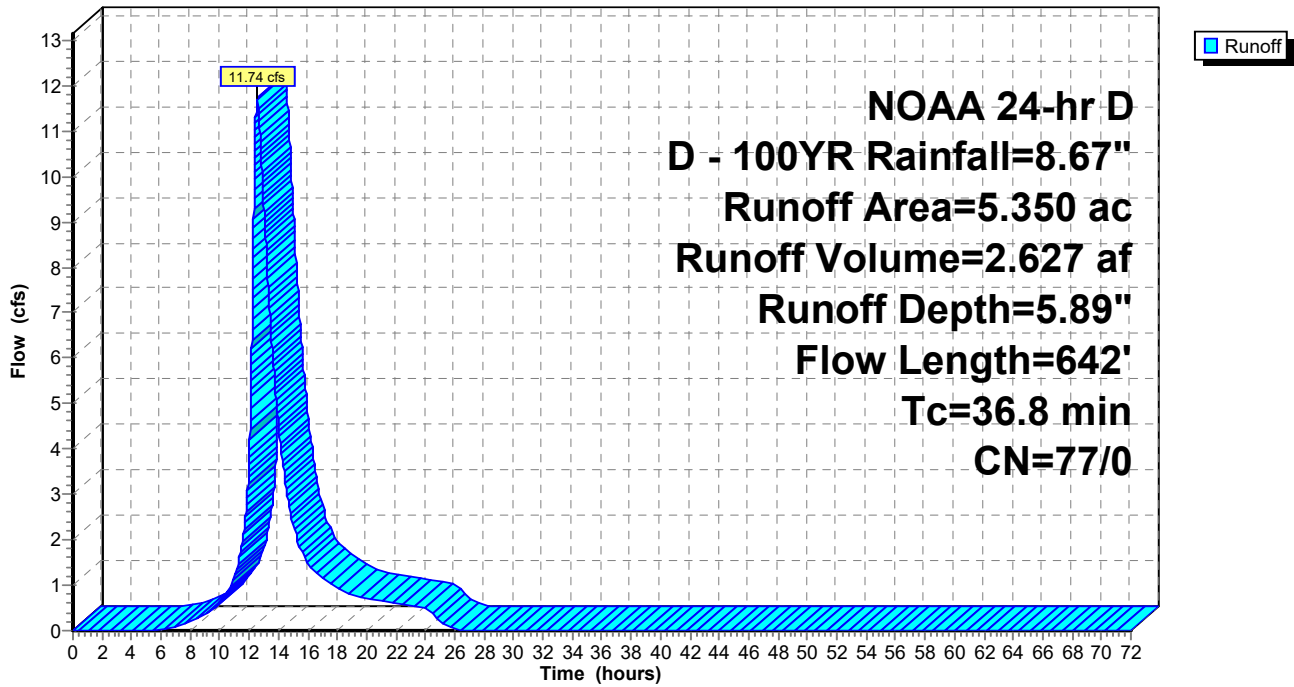
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 5.25 cfs @ 12.15 hrs, Volume= 0.548 af, Depth= 7.02"
 Routed to Link P-DC : DUCK CREEK

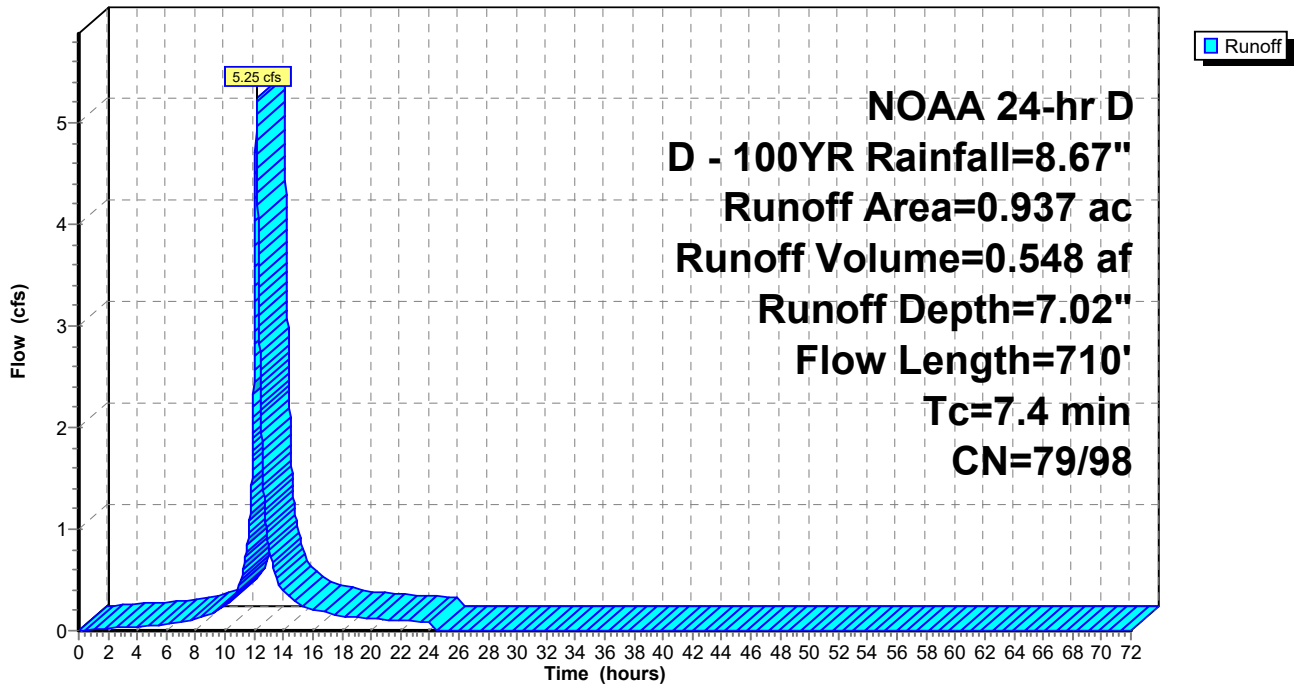
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.98 cfs @ 12.14 hrs, Volume= 0.101 af, Depth= 4.01"
 Routed to Link P-DC : DUCK CREEK

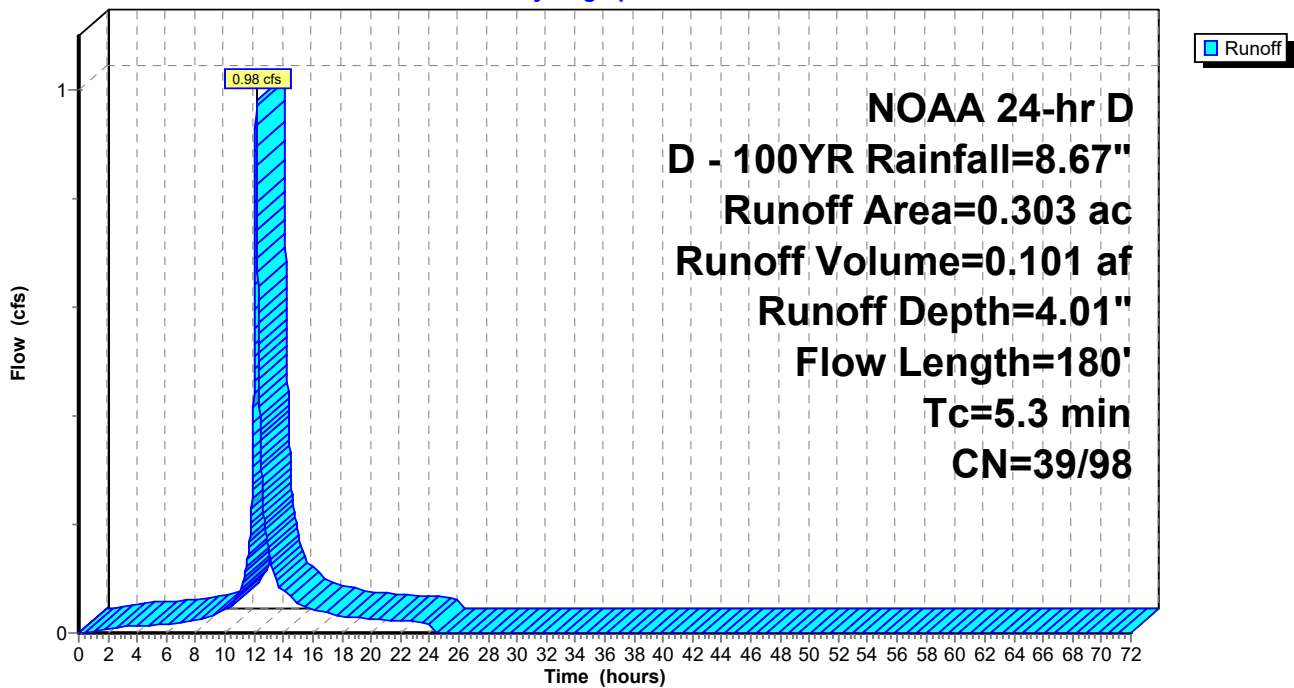
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 12.13 cfs @ 12.11 hrs, Volume= 1.051 af, Depth= 8.43"
 Routed to Pond B-2 : BASIN 2

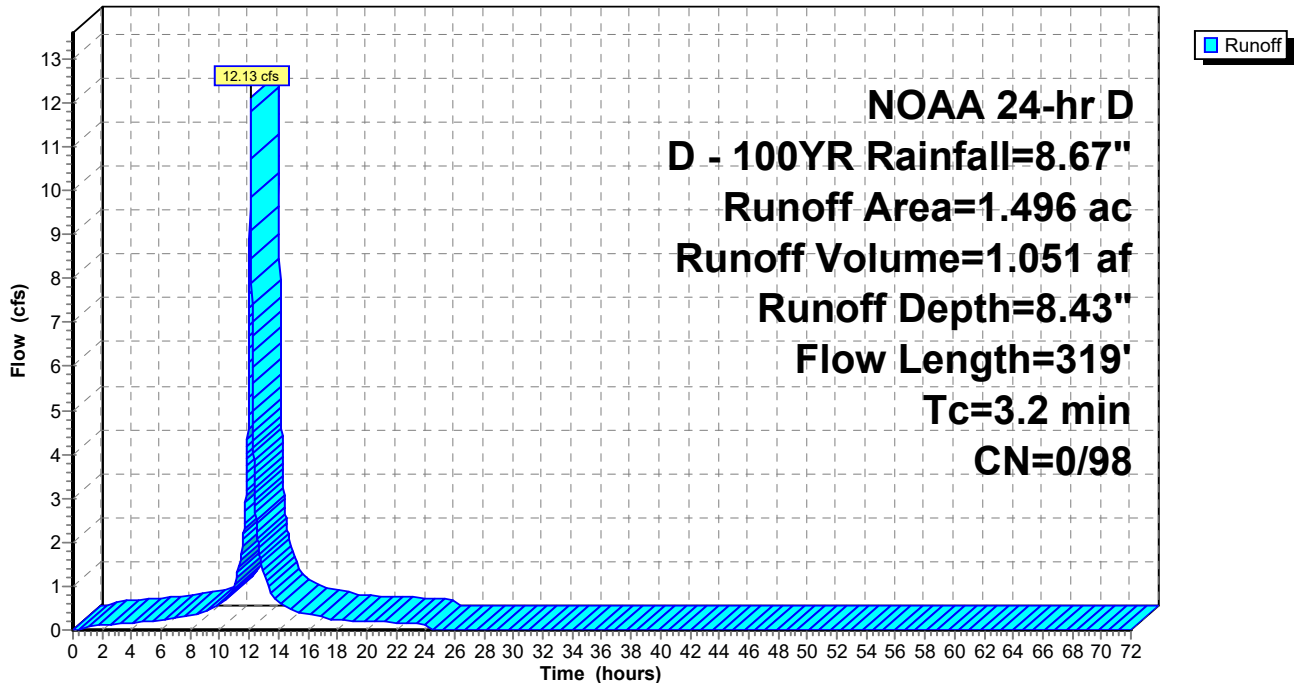
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 2.68 cfs @ 12.12 hrs, Volume= 0.247 af, Depth= 8.25"
 Routed to Pond B-3 : BASIN 3

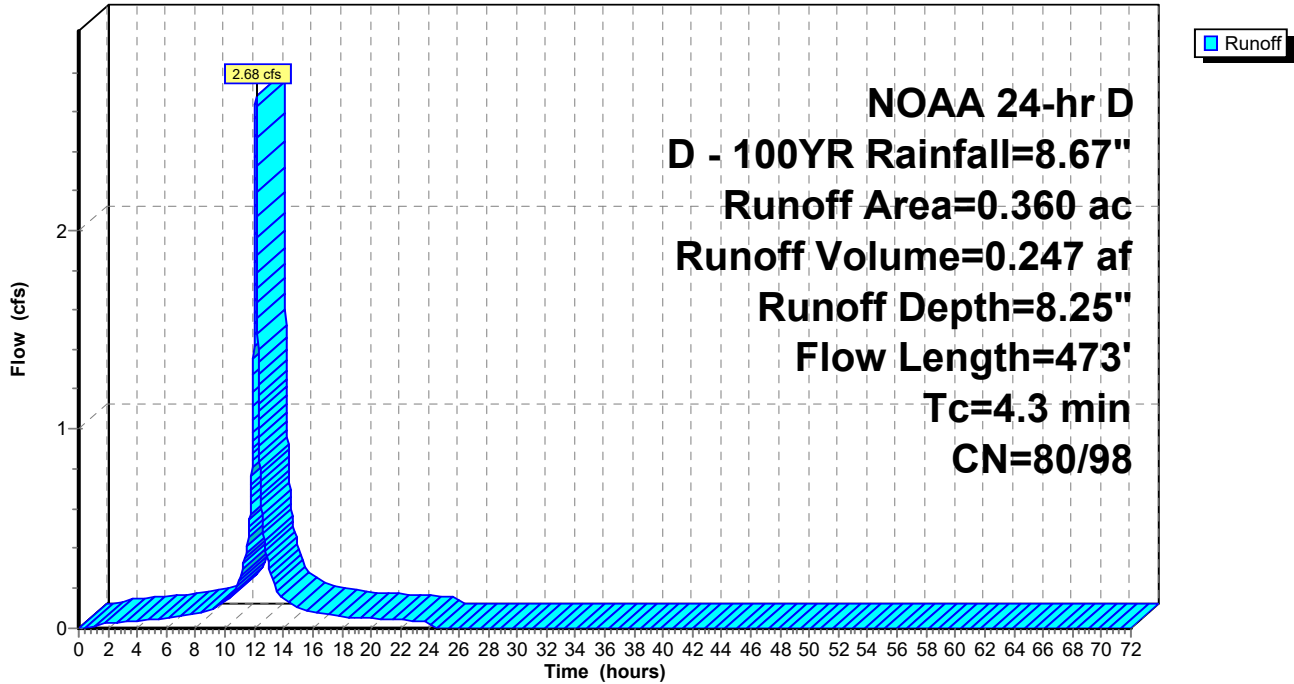
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 8.22 cfs @ 12.12 hrs, Volume= 0.745 af, Depth= 8.43"
 Routed to Pond B-3 : BASIN 3

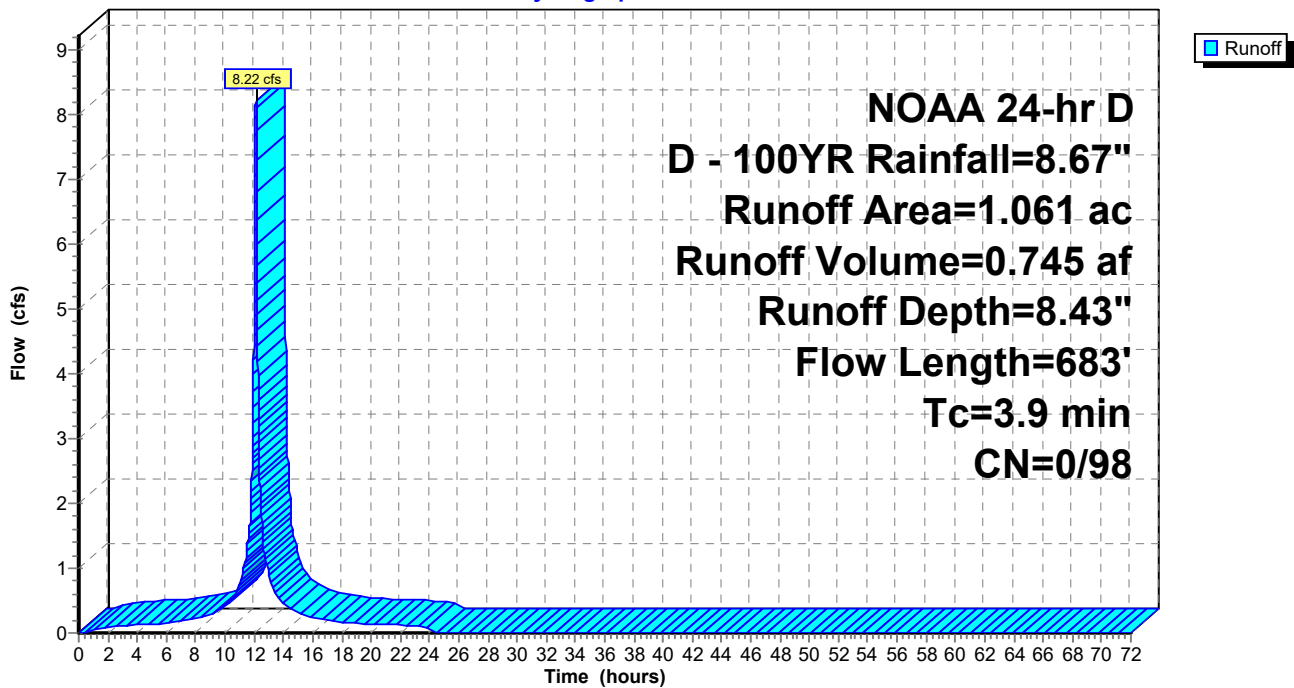
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 2.43 cfs @ 12.21 hrs, Volume= 0.297 af, Depth= 6.45"
 Routed to Pond B-4 : BASIN 4

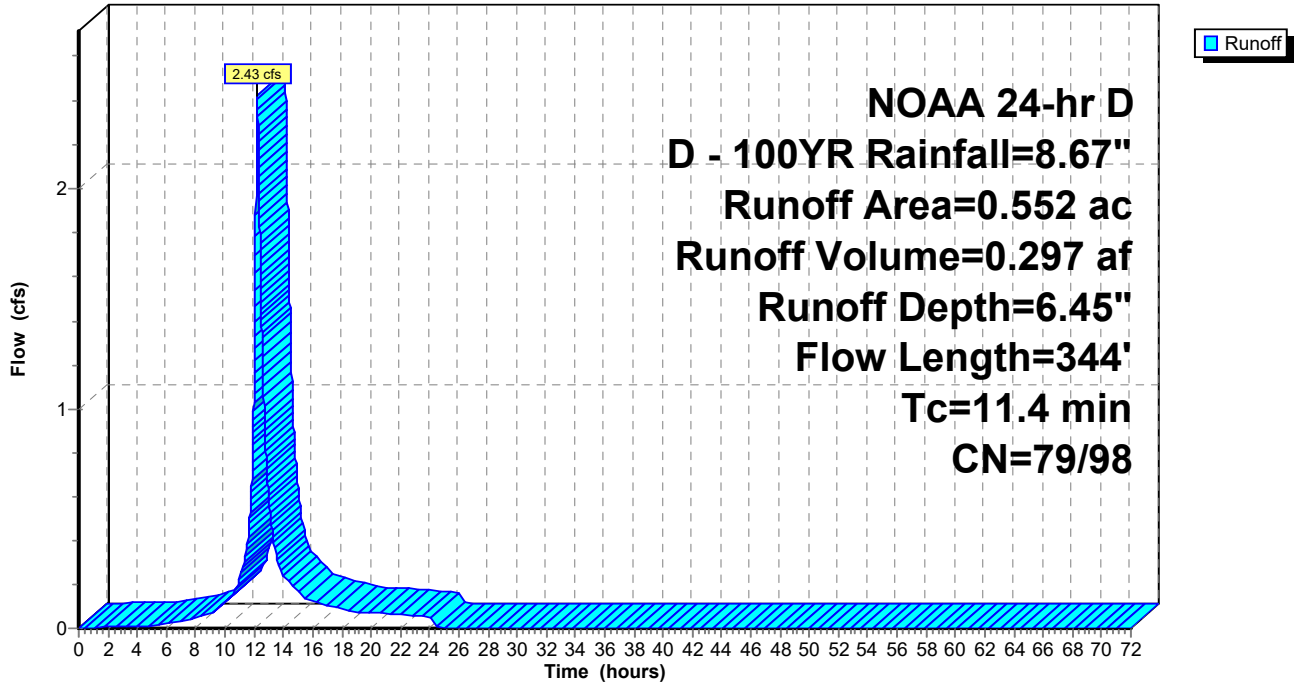
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 5.86 cfs @ 12.16 hrs, Volume= 0.664 af, Depth= 8.02"
 Routed to Pond B-4 : BASIN 4

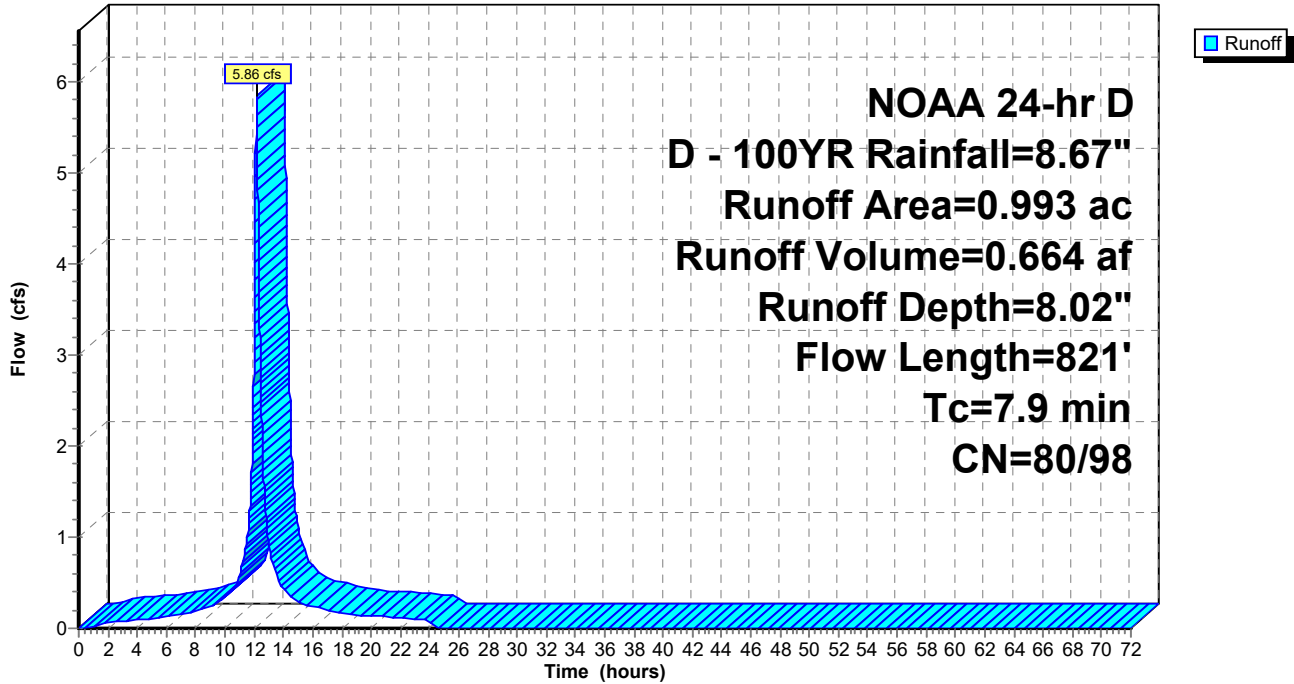
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



Summary for Subcatchment P-UG-1: UG-1

Runoff = 18.54 cfs @ 12.15 hrs, Volume= 2.016 af, Depth= 8.43"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

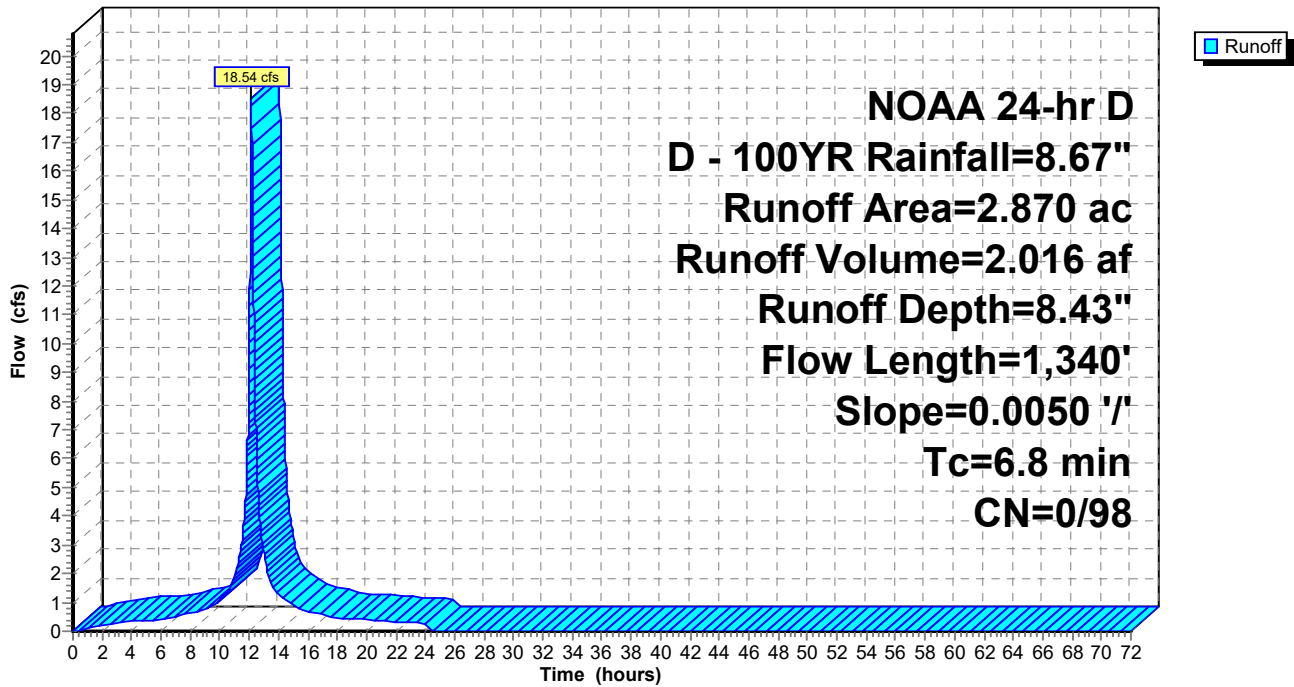
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 461% of capacity of segment #3

Runoff = 21.04 cfs @ 12.13 hrs, Volume= 2.015 af, Depth= 8.43"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

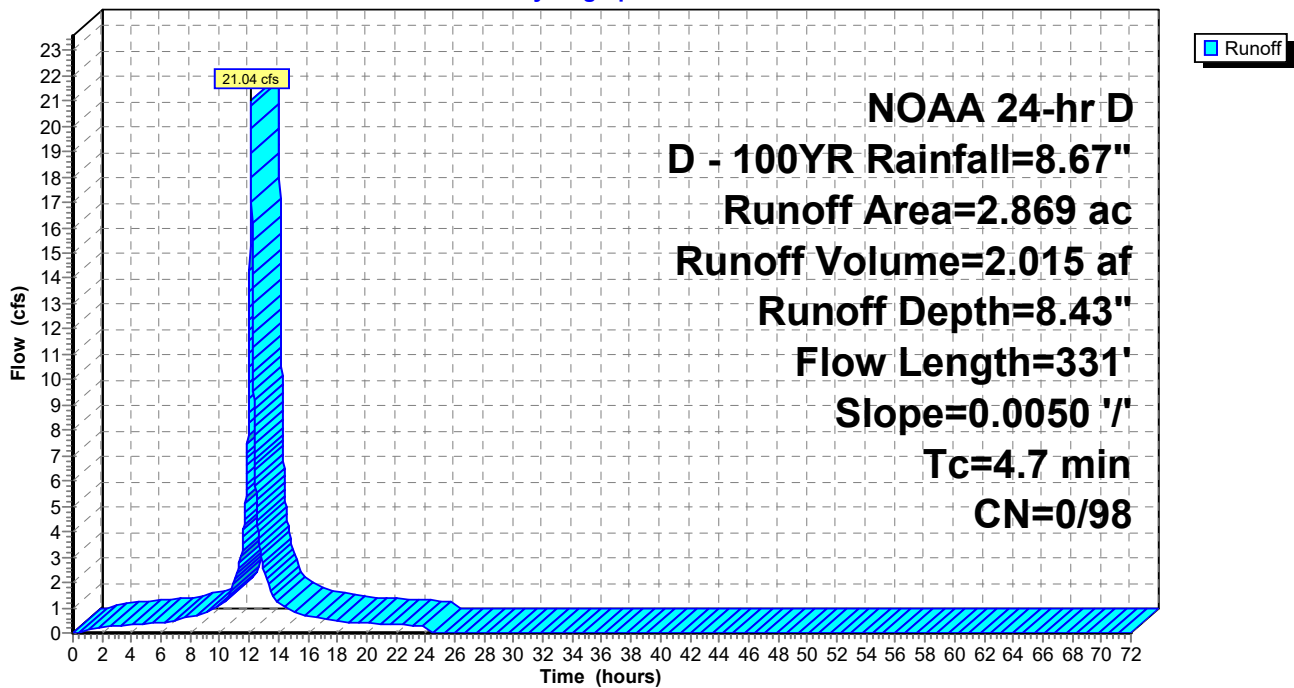
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NOAA 24-hr D D - 100YR Rainfall=8.67"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



Summary for Reach 17R: E-1

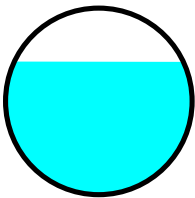
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 7.71" for D - 100YR event
Inflow = 21.56 cfs @ 12.26 hrs, Volume= 3.059 af
Outflow = 21.52 cfs @ 12.27 hrs, Volume= 3.059 af, Atten= 0%, Lag= 0.6 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.60 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 3.0 min

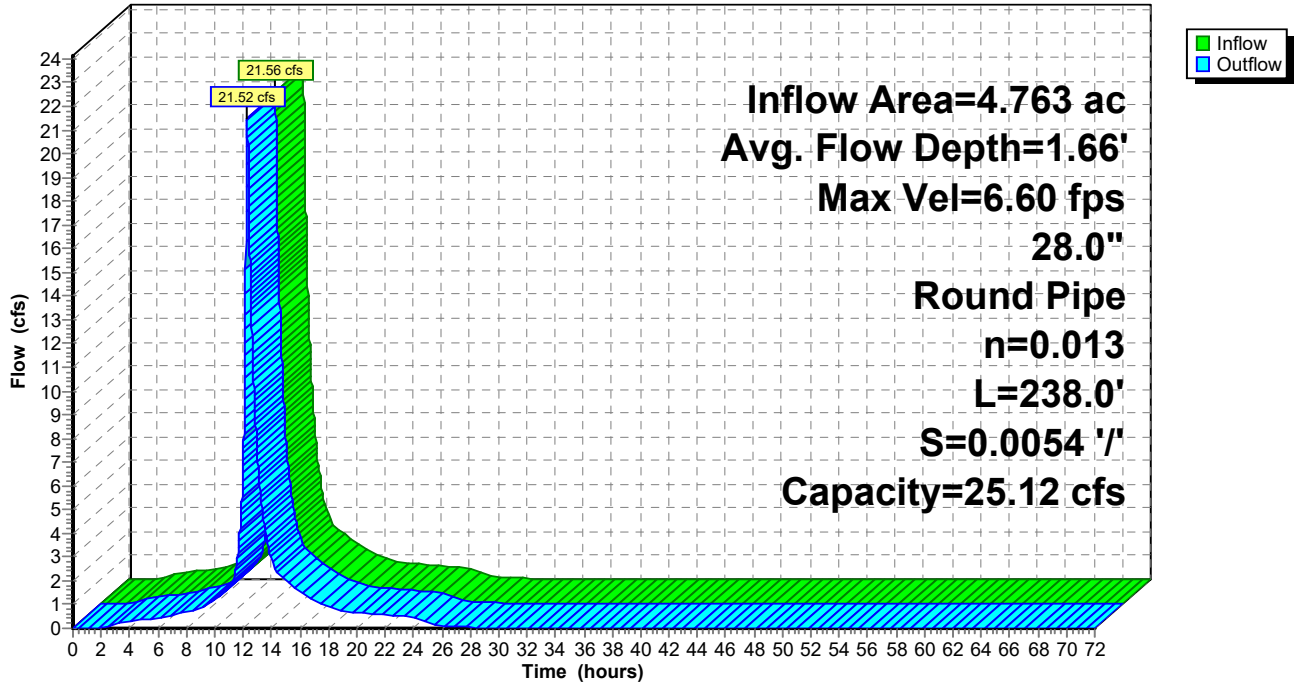
Peak Storage= 776 cf @ 12.27 hrs
Average Depth at Peak Storage= 1.66' , Surface Width= 2.11'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



Reach 17R: E-1

Hydrograph



Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

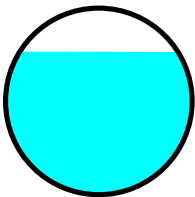
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.13' @ 12.31 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 7.71" for D - 100YR event
Inflow = 21.52 cfs @ 12.27 hrs, Volume= 3.059 af
Outflow = 21.47 cfs @ 12.28 hrs, Volume= 3.059 af, Atten= 0%, Lag= 0.6 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 3.1 min

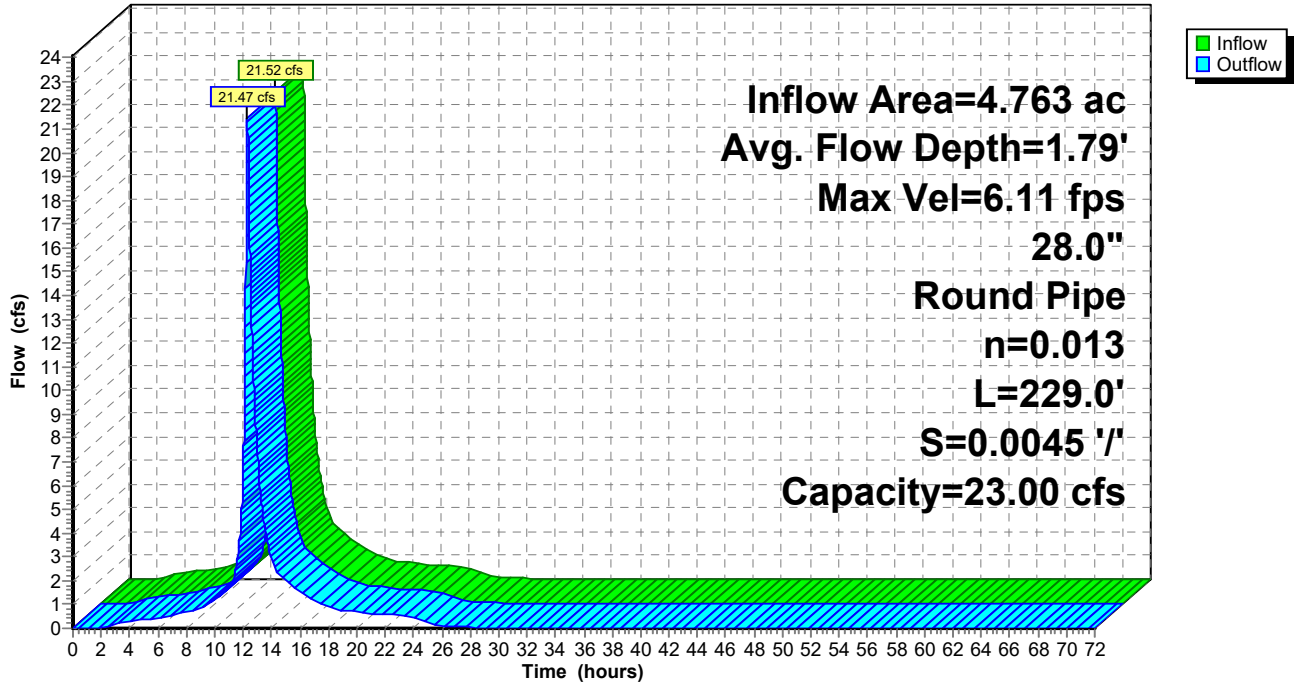
Peak Storage= 804 cf @ 12.28 hrs
Average Depth at Peak Storage= 1.79' , Surface Width= 1.98'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 8.22" for D - 100YR event
 Inflow = 13.03 cfs @ 12.11 hrs, Volume= 1.121 af
 Outflow = 12.08 cfs @ 12.13 hrs, Volume= 1.121 af, Atten= 7%, Lag= 1.4 min
 Primary = 12.08 cfs @ 12.13 hrs, Volume= 1.121 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 16.00' Surf.Area= 0.102 ac Storage= 0.093 af
 Peak Elev= 17.82' @ 12.13 hrs Surf.Area= 0.137 ac Storage= 0.311 af (0.217 af above start)

Plug-Flow detention time= 163.6 min calculated for 1.027 af (92% of inflow)
 Center-of-Mass det. time= 74.4 min (818.9 - 744.5)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

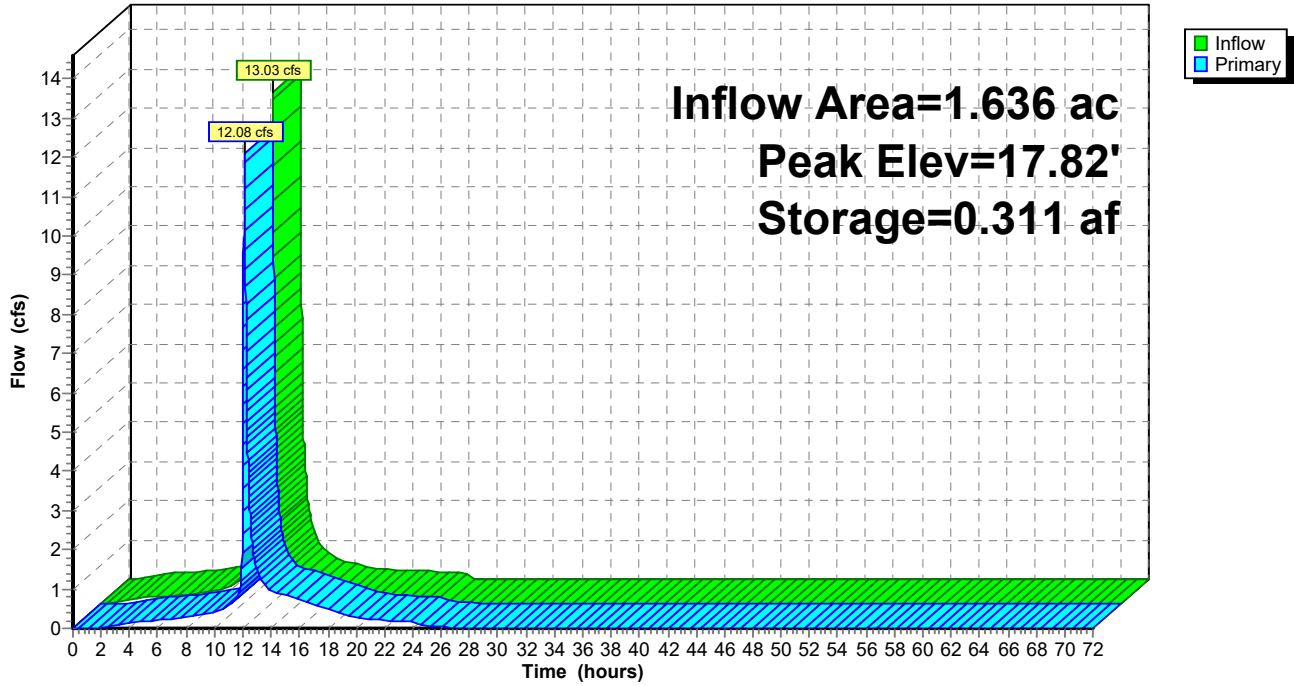
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.08 cfs @ 12.13 hrs HW=17.82' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 12.08 cfs of 19.62 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.08 cfs @ 6.19 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 1.49 cfs @ 2.24 fps)
- 4=Orifice/Grate (Weir Controls 9.51 cfs @ 1.85 fps)

Pond B-2: BASIN 2

Hydrograph



Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 7.78" for D - 100YR event
 Inflow = 14.29 cfs @ 12.11 hrs, Volume= 1.238 af
 Outflow = 12.11 cfs @ 12.15 hrs, Volume= 1.232 af, Atten= 15%, Lag= 2.2 min
 Primary = 12.11 cfs @ 12.15 hrs, Volume= 1.232 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.30' Surf.Area= 0.246 ac Storage= 0.191 af
 Peak Elev= 12.28' @ 12.15 hrs Surf.Area= 0.265 ac Storage= 0.443 af (0.252 af above start)

Plug-Flow detention time= 268.7 min calculated for 1.041 af (84% of inflow)
 Center-of-Mass det. time= 139.7 min (895.6 - 755.9)

Volume	Invert	Avail.Storage	Storage Description		
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
10.50	0.231	569.6	0.000	0.000	0.231
11.00	0.241	578.4	0.118	0.118	0.251
12.00	0.259	596.0	0.250	0.368	0.291
13.00	0.278	615.6	0.269	0.637	0.337
13.50	0.295	633.5	0.143	0.780	0.378

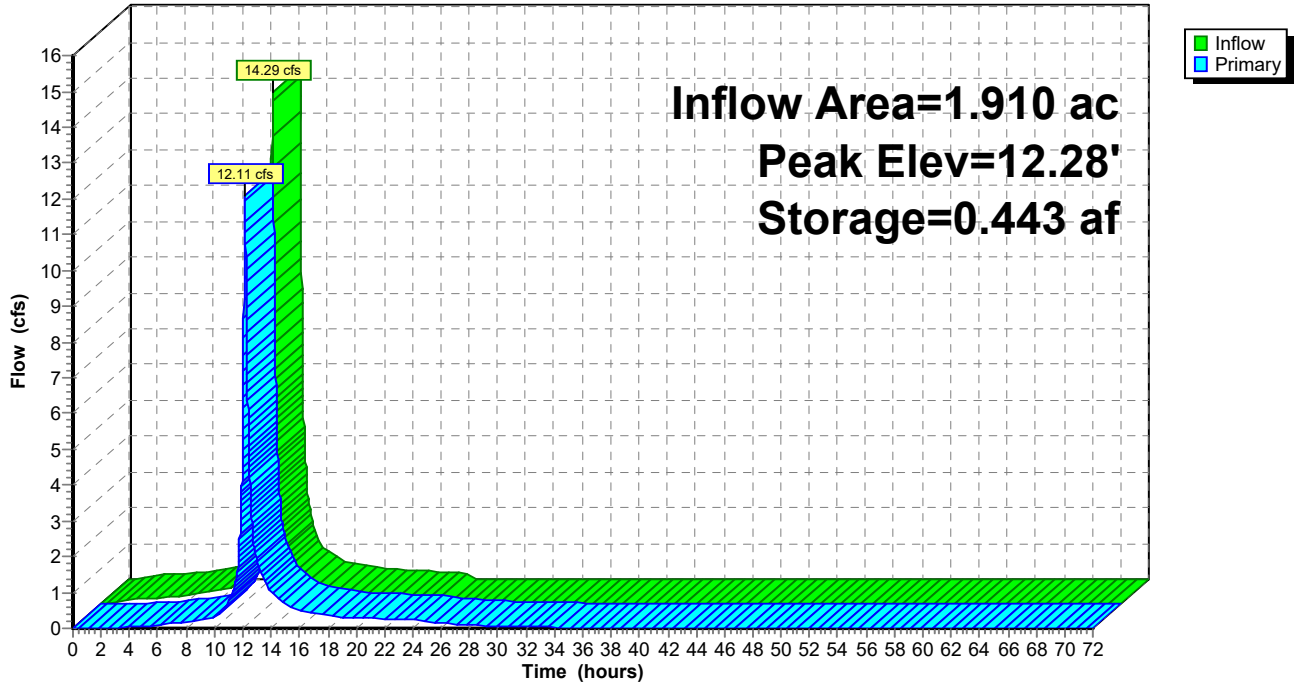
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=12.11 cfs @ 12.15 hrs HW=12.28' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 12.11 cfs of 33.60 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.47 cfs @ 4.30 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 3.70 cfs @ 2.39 fps)
- 4=Orifice/Grate (Weir Controls 7.93 cfs @ 1.74 fps)

Pond B-3: BASIN 3

Hydrograph



Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 7.27" for D - 100YR event
 Inflow = 9.75 cfs @ 12.16 hrs, Volume= 1.112 af
 Outflow = 8.25 cfs @ 12.25 hrs, Volume= 1.111 af, Atten= 15%, Lag= 5.4 min
 Primary = 8.25 cfs @ 12.25 hrs, Volume= 1.111 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.60' Surf.Area= 4,225 sf Storage= 3,964 cf
 Peak Elev= 15.37' @ 12.25 hrs Surf.Area= 5,198 sf Storage= 12,294 cf (8,330 cf above start)

Plug-Flow detention time= 127.4 min calculated for 1.020 af (92% of inflow)
 Center-of-Mass det. time= 47.2 min (825.4 - 778.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

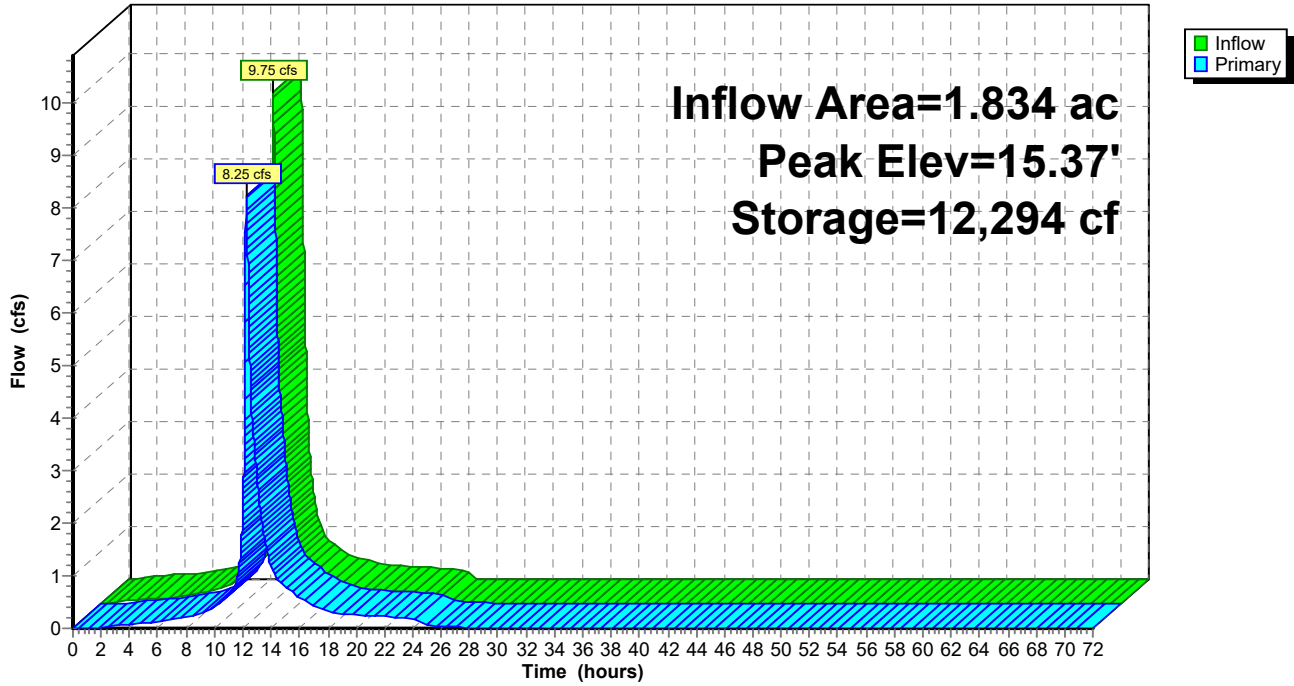
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=8.25 cfs @ 12.25 hrs HW=15.37' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 8.25 cfs of 13.30 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.64 cfs @ 6.01 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 3.00 cfs @ 3.46 fps)
- 4=Orifice/Grate (Weir Controls 3.60 cfs @ 1.34 fps)

Pond B-4: BASIN 4

Hydrograph



Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 7.98" for D - 100YR event
 Inflow = 16.87 cfs @ 12.16 hrs, Volume= 1.949 af
 Outflow = 13.35 cfs @ 12.27 hrs, Volume= 1.948 af, Atten= 21%, Lag= 6.6 min
 Primary = 13.35 cfs @ 12.27 hrs, Volume= 1.948 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.90' Surf.Area= 8,129 sf Storage= 9,986 cf
 Peak Elev= 15.51' @ 12.27 hrs Surf.Area= 9,262 sf Storage= 23,982 cf (13,996 cf above start)

Plug-Flow detention time= 163.4 min calculated for 1.719 af (88% of inflow)
 Center-of-Mass det. time= 53.0 min (811.1 - 758.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	6,858	409.0	0	0	6,858	
13.00	7,629	429.0	2,896	2,896	8,202	
14.00	8,186	439.0	7,906	10,802	9,018	
14.10	8,239	440.0	821	11,623	9,101	
15.00	8,985	459.0	7,748	19,372	10,519	
16.00	9,537	468.1	9,260	28,631	11,335	

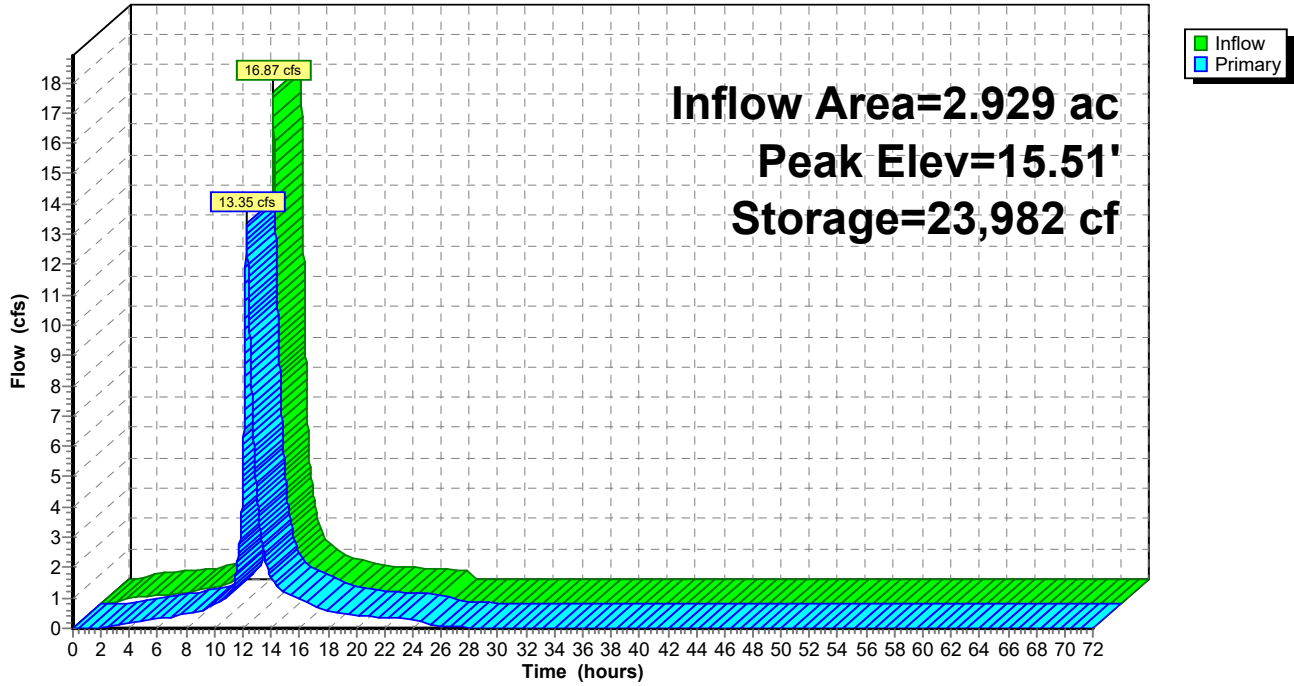
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=13.34 cfs @ 12.27 hrs HW=15.51' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 13.34 cfs of 14.11 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 2.33 cfs @ 5.69 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 9.23 cfs @ 3.28 fps)
- 4=Orifice/Grate (Weir Controls 1.79 cfs @ 1.06 fps)

Pond B-5: BASIN 5

Hydrograph



Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 8.43" for D - 100YR event
 Inflow = 39.25 cfs @ 12.13 hrs, Volume= 4.032 af
 Outflow = 32.08 cfs @ 12.20 hrs, Volume= 4.000 af, Atten= 18%, Lag= 3.9 min
 Primary = 32.08 cfs @ 12.20 hrs, Volume= 4.000 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.00' Surf.Area= 0.631 ac Storage= 0.542 af
 Peak Elev= 14.62' @ 12.20 hrs Surf.Area= 0.631 ac Storage= 1.968 af (1.426 af above start)

Plug-Flow detention time= 544.1 min calculated for 3.457 af (86% of inflow)
 Center-of-Mass det. time= 395.2 min (1,139.5 - 744.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 ' / Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	2.5" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=32.07 cfs @ 12.20 hrs HW=14.62' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 32.07 cfs of 40.82 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.78 cfs @ 8.95 fps)
- 3=Orifice/Grate (Orifice Controls 0.54 cfs @ 7.87 fps)
- 4=Sharp-Crested Rectangular Weir (Weir Controls 30.75 cfs @ 3.54 fps)

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
 Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
 Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

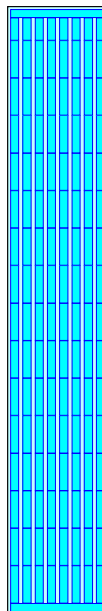
16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"
 End Stone x 2 = 324.00' Base Length
 8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width
 6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
 32,197.7 cf Chamber Storage
 128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af
 Overall Storage Efficiency = 57.7%
 Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers
 3,517.4 cy Field
 2,088.7 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
 Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
 Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

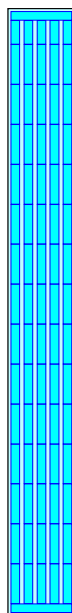
15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"
 End Stone x 2 = 304.00' Base Length
 5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width
 6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 =
 18,864.5 cf Chamber Storage
 75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 =
 22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

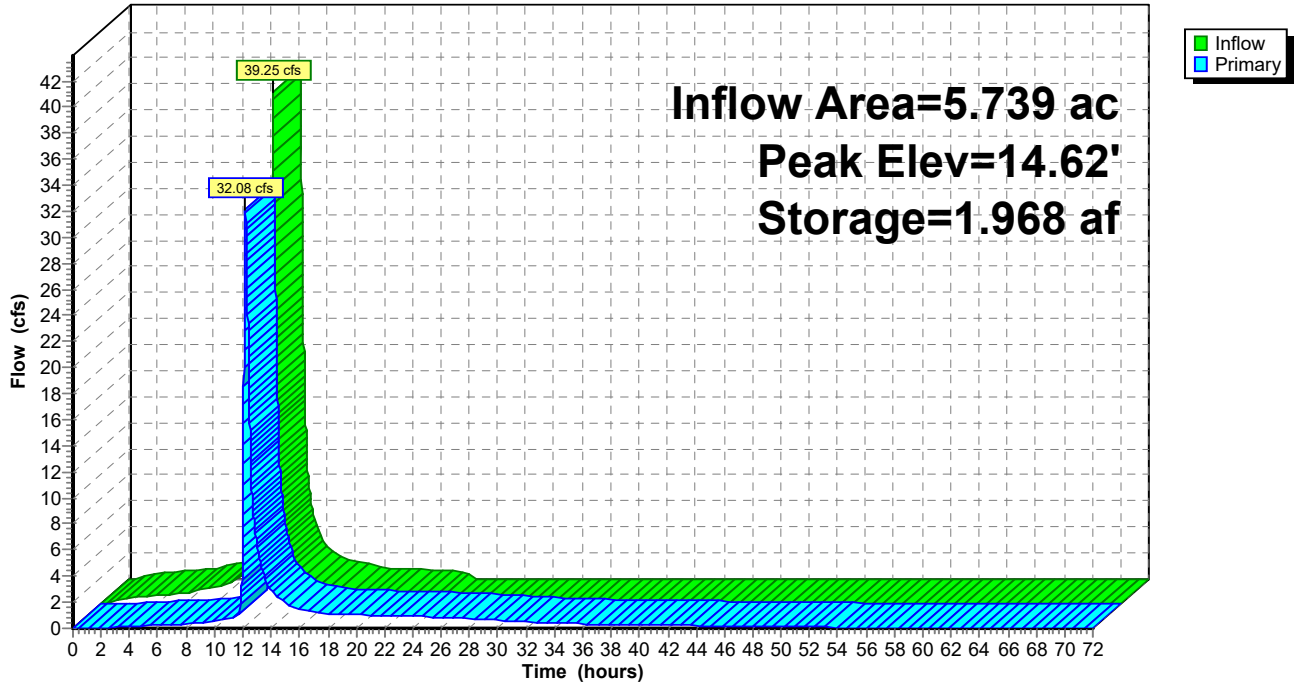
Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af
 Overall Storage Efficiency = 57.5%
 Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers
 2,084.9 cy Field
 1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



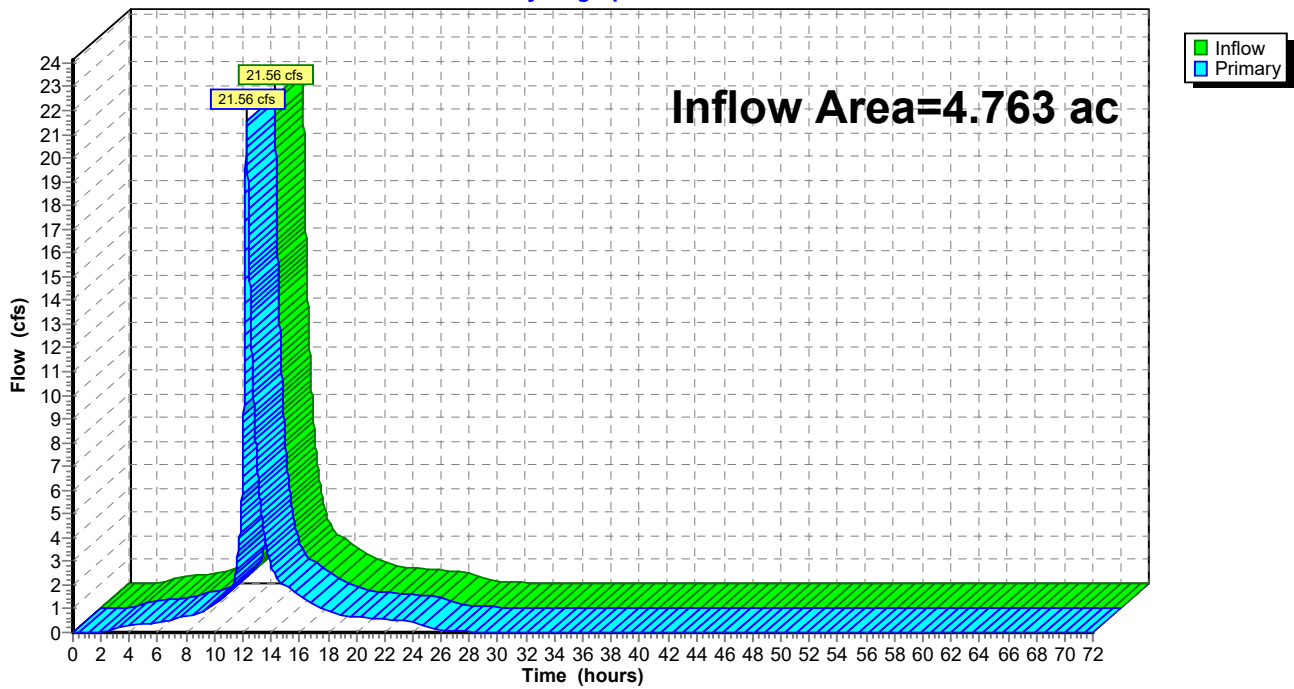
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 7.71" for D - 100YR event
Inflow = 21.56 cfs @ 12.26 hrs, Volume= 3.059 af
Primary = 21.56 cfs @ 12.26 hrs, Volume= 3.059 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



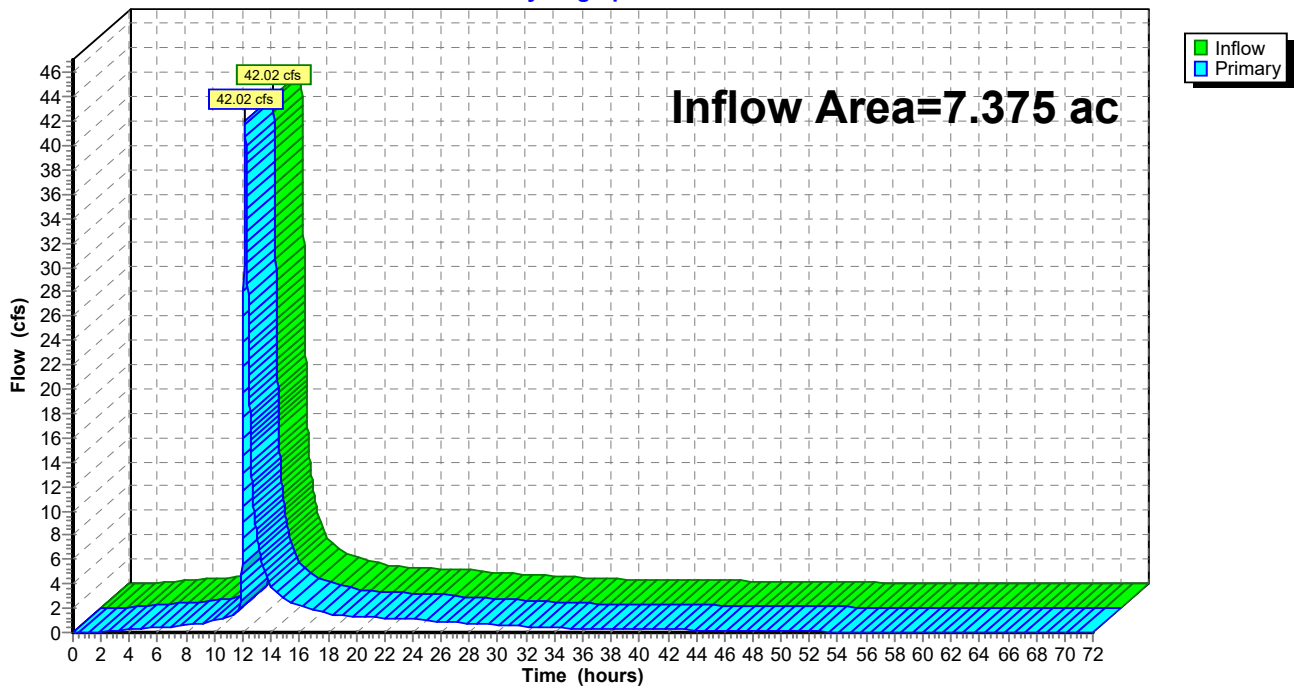
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 8.33" for D - 100YR event
Inflow = 42.02 cfs @ 12.17 hrs, Volume= 5.120 af
Primary = 42.02 cfs @ 12.17 hrs, Volume= 5.120 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



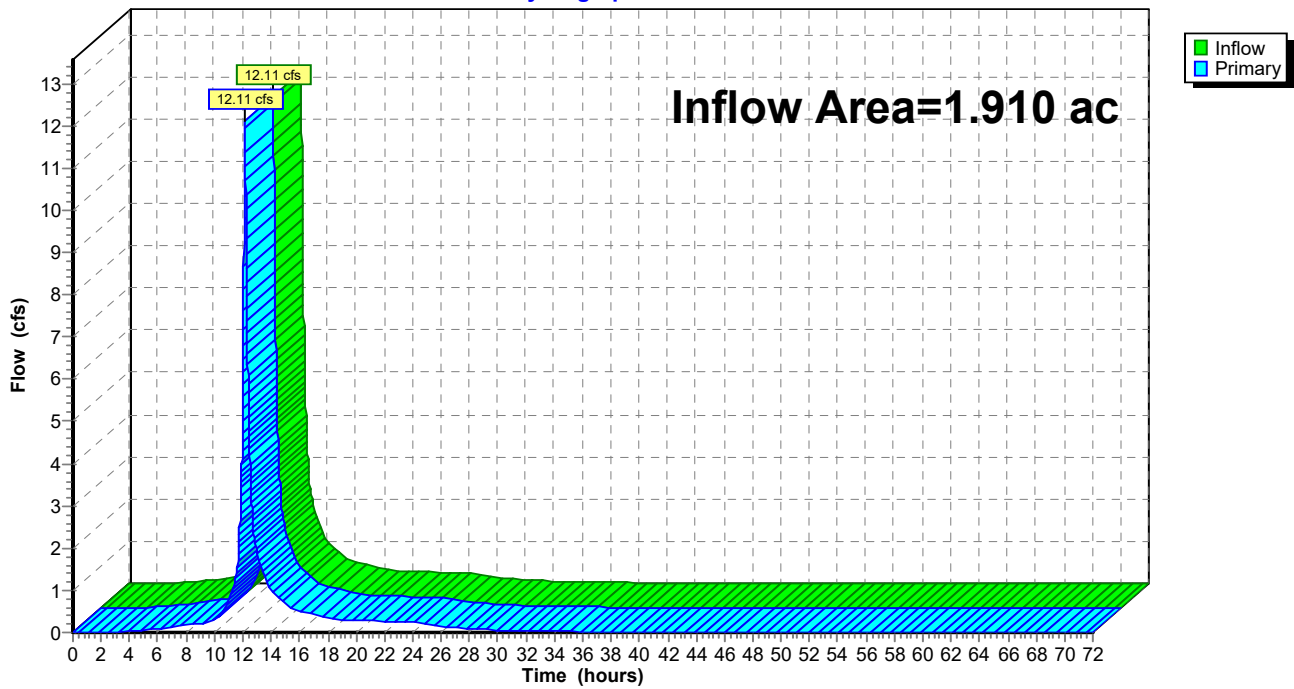
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 7.74" for D - 100YR event
Inflow = 12.11 cfs @ 12.15 hrs, Volume= 1.232 af
Primary = 12.11 cfs @ 12.15 hrs, Volume= 1.232 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



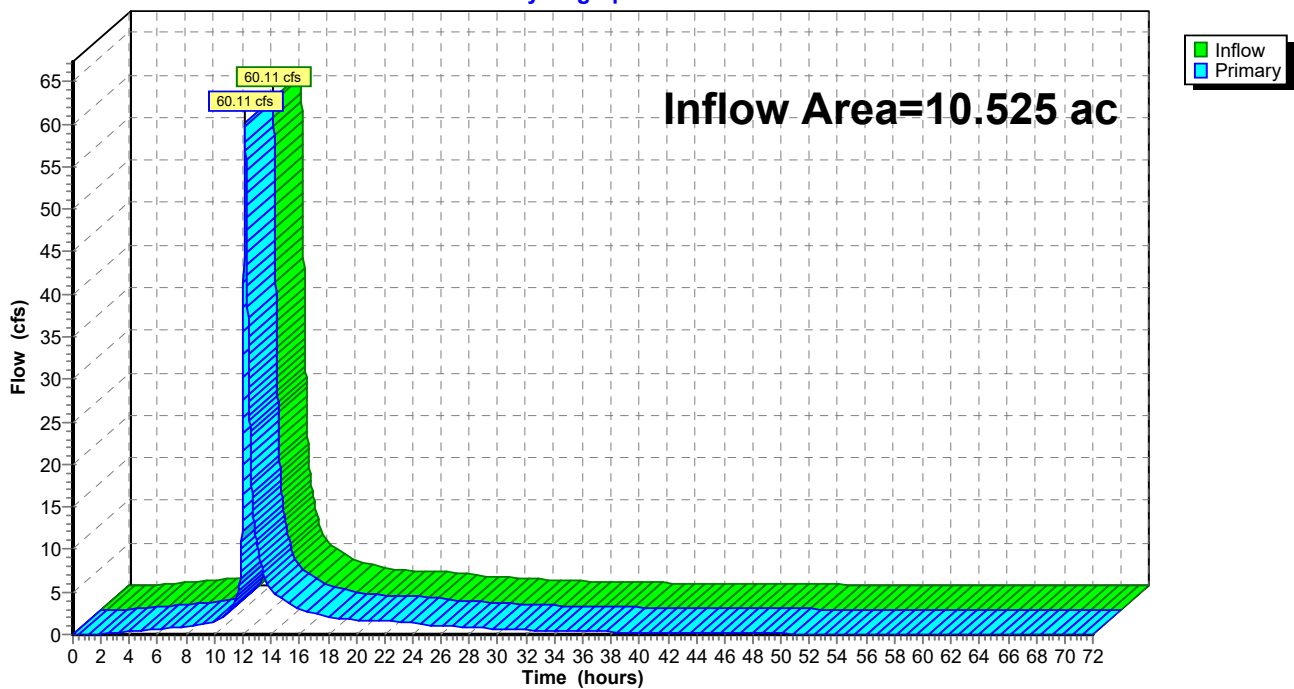
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 7.98" for D - 100YR event
Inflow = 60.11 cfs @ 12.16 hrs, Volume= 7.002 af
Primary = 60.11 cfs @ 12.16 hrs, Volume= 7.002 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



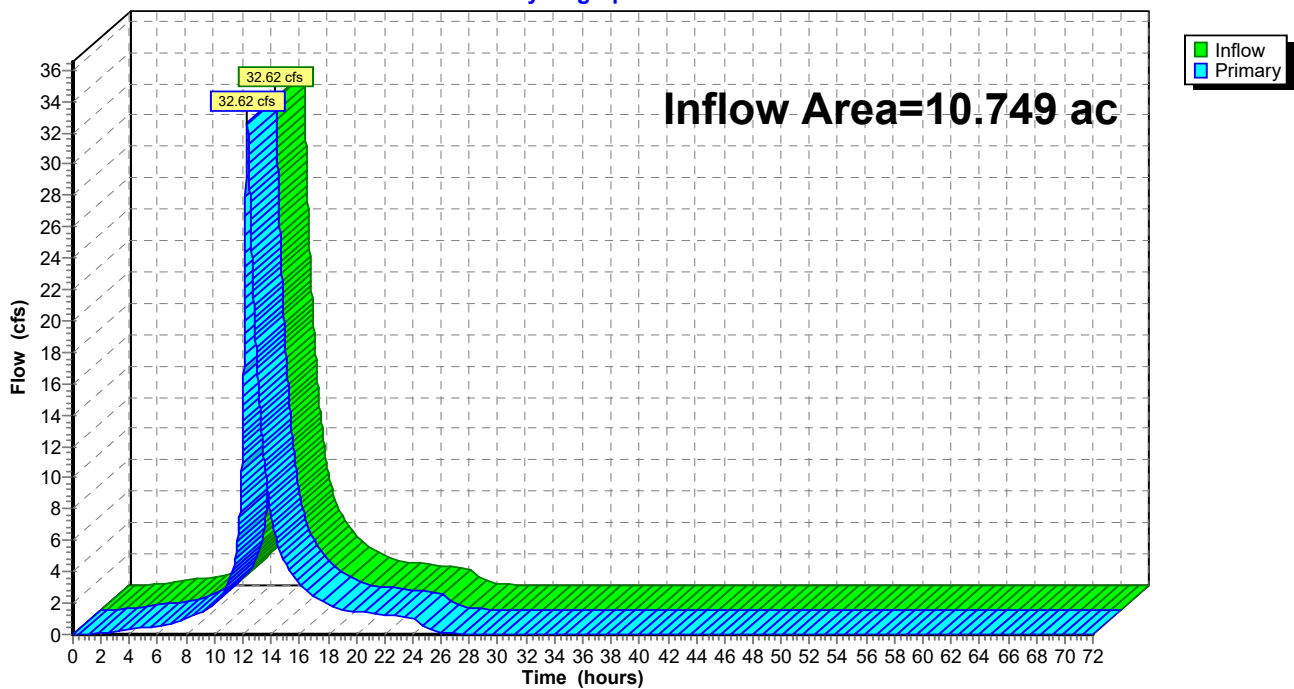
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 6.85" for D - 100YR event
Inflow = 32.62 cfs @ 12.30 hrs, Volume= 6.133 af
Primary = 32.62 cfs @ 12.30 hrs, Volume= 6.133 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



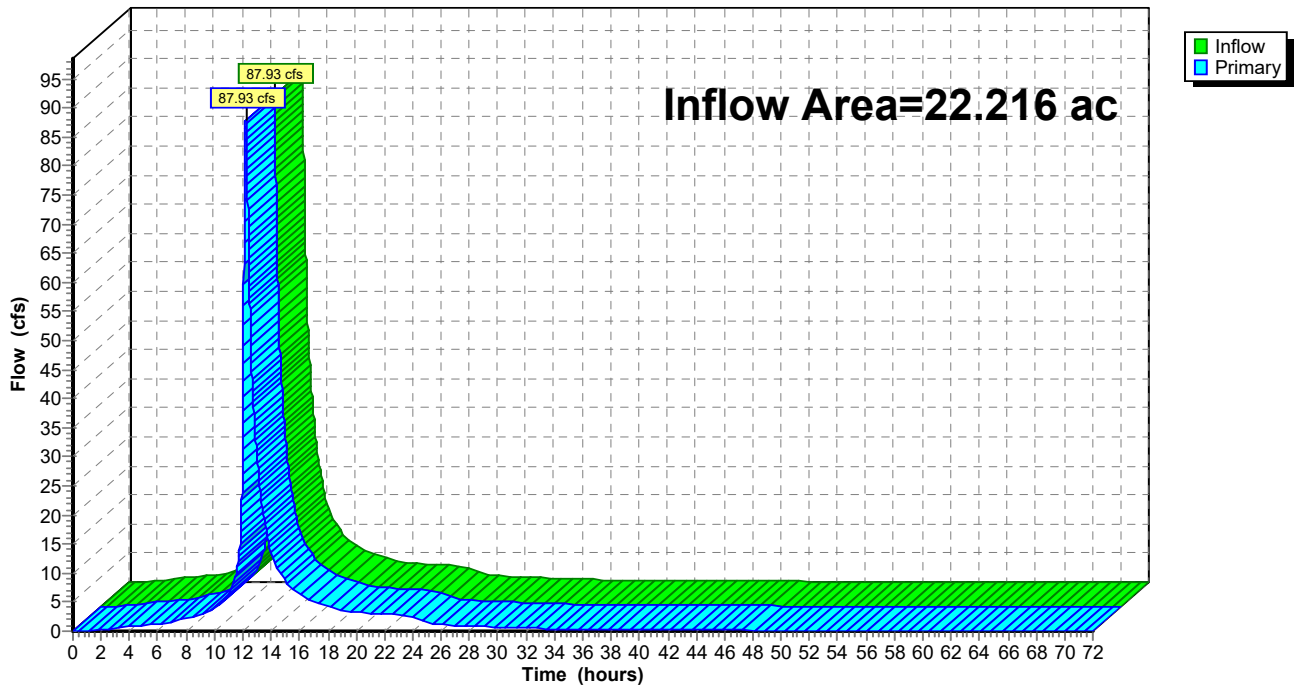
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 7.45" for D - 100YR event
Inflow = 87.93 cfs @ 12.22 hrs, Volume= 13.797 af
Primary = 87.93 cfs @ 12.22 hrs, Volume= 13.797 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-SR: SOUTH RIVER

Hydrograph



250225 - (Failure Analysis) Proposed Conditions NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 188

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment16S: P-B5-1	Runoff Area=2.495 ac 95.31% Impervious Runoff Depth=0.99" Flow Length=1,018' Tc=8.5 min CN=80/98 Runoff=4.86 cfs 0.207 af
SubcatchmentBASIN 2: BASIN 2	Runoff Area=0.140 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=10' Slope=0.3300 '/ Tc=0.7 min CN=78/0 Runoff=0.07 cfs 0.002 af
SubcatchmentBASIN 3: BASIN 3	Runoff Area=0.489 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=43' Tc=2.4 min CN=78/0 Runoff=0.18 cfs 0.005 af
SubcatchmentBASIN 4: BASIN 4	Runoff Area=0.289 ac 0.00% Impervious Runoff Depth=0.17" Flow Length=101' Tc=6.5 min CN=80/0 Runoff=0.09 cfs 0.004 af
SubcatchmentBASIN 5: BASIN 5	Runoff Area=0.434 ac 0.00% Impervious Runoff Depth=0.13" Flow Length=84' Tc=6.7 min CN=78/0 Runoff=0.10 cfs 0.005 af
SubcatchmentEX. DA-1.: EX. DA-1	Runoff Area=0.942 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=202' Tc=21.7 min CN=0/98 Runoff=1.10 cfs 0.081 af
SubcatchmentEX. DA-2.: EX. DA-2	Runoff Area=0.636 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=148' Tc=5.7 min CN=0/98 Runoff=1.54 cfs 0.055 af
SubcatchmentEX. DA-3.: EX. DA-3	Runoff Area=5.350 ac 0.00% Impervious Runoff Depth=0.12" Flow Length=642' Tc=36.8 min CN=77/0 Runoff=0.44 cfs 0.052 af
SubcatchmentEX. DA-4.: EX. DA-4	Runoff Area=0.937 ac 38.74% Impervious Runoff Depth=0.49" Flow Length=710' Tc=7.4 min CN=79/98 Runoff=0.91 cfs 0.039 af
SubcatchmentEX. DA-5.: EX. DA-5	Runoff Area=0.303 ac 36.63% Impervious Runoff Depth=0.38" Flow Length=180' Tc=5.3 min CN=39/98 Runoff=0.28 cfs 0.010 af
SubcatchmentP-B2-3: P-B2-3	Runoff Area=1.496 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=319' Tc=3.2 min CN=0/98 Runoff=4.28 cfs 0.129 af
SubcatchmentP-B3-1: P-B3-1	Runoff Area=0.360 ac 91.67% Impervious Runoff Depth=0.96" Flow Length=473' Tc=4.3 min CN=80/98 Runoff=0.89 cfs 0.029 af
SubcatchmentP-B3-2: P-B3-2	Runoff Area=1.061 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=683' Tc=3.9 min CN=0/98 Runoff=2.91 cfs 0.091 af
SubcatchmentP-B4-1: P-B4-1	Runoff Area=0.552 ac 13.95% Impervious Runoff Depth=0.28" Flow Length=344' Tc=11.4 min CN=79/98 Runoff=0.22 cfs 0.013 af
SubcatchmentP-B4-2: P-B4-2	Runoff Area=0.993 ac 81.37% Impervious Runoff Depth=0.87" Flow Length=821' Tc=7.9 min CN=80/98 Runoff=1.75 cfs 0.072 af
SubcatchmentP-UG-1: UG-1	Runoff Area=2.870 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=1,340' Slope=0.0050 '/ Tc=6.8 min CN=0/98 Runoff=6.47 cfs 0.247 af

250225 - (Failure Analysis) Proposed Conditions NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Prepared by Colliers Engineering & Design

Printed 2/25/2025

HydroCAD® 10.20-5c s/n 04431 © 2023 HydroCAD Software Solutions LLC

Page 189

Subcatchment P-UG-2: UG-2	Runoff Area=2.869 ac 100.00% Impervious Runoff Depth=1.03" Flow Length=331' Slope=0.0050 '/' Tc=4.7 min CN=0/98 Runoff=7.45 cfs 0.247 af
Reach 17R: E-1	Avg. Flow Depth=0.46' Max Vel=3.59 fps Inflow=2.15 cfs 0.300 af 28.0" Round Pipe n=0.013 L=238.0' S=0.0054 '/' Capacity=25.12 cfs Outflow=2.14 cfs 0.300 af
Reach 18R: E-2	Avg. Flow Depth=0.48' Max Vel=3.37 fps Inflow=2.14 cfs 0.300 af 28.0" Round Pipe n=0.013 L=229.0' S=0.0045 '/' Capacity=23.00 cfs Outflow=2.14 cfs 0.300 af
Pond B-2: BASIN 2	Peak Elev=16.80' Storage=0.182 af Inflow=4.35 cfs 0.131 af Outflow=0.67 cfs 0.130 af
Pond B-3: BASIN 3	Peak Elev=11.73' Storage=0.298 af Inflow=3.98 cfs 0.126 af Outflow=0.26 cfs 0.122 af
Pond B-4: BASIN 4	Peak Elev=14.08' Storage=6,064 cf Inflow=2.02 cfs 0.089 af Outflow=0.69 cfs 0.089 af
Pond B-5: BASIN 5	Peak Elev=14.56' Storage=15,480 cf Inflow=4.95 cfs 0.212 af Outflow=1.46 cfs 0.211 af
Pond UG-2: UG BASIN 1 & 2 (	Peak Elev=12.00' Storage=1.000 af Inflow=13.80 cfs 0.495 af Outflow=0.45 cfs 0.479 af
Link 16L: Existing Storm Sewer	Inflow=2.15 cfs 0.300 af Primary=2.15 cfs 0.300 af
Link D3A: POD 3A	Inflow=1.08 cfs 0.609 af Primary=1.08 cfs 0.609 af
Link D3B: POD 3B	Inflow=0.26 cfs 0.122 af Primary=0.26 cfs 0.122 af
Link P-DC: DUCK CREEK	Inflow=2.15 cfs 0.780 af Primary=2.15 cfs 0.780 af
Link P-PC: POND CREEK	Inflow=2.78 cfs 0.407 af Primary=2.78 cfs 0.407 af
Link P-SR: SOUTH RIVER	Inflow=5.59 cfs 1.268 af Primary=5.59 cfs 1.268 af

Total Runoff Area = 22.216 ac Runoff Volume = 1.288 af Average Runoff Depth = 0.70"
37.25% Pervious = 8.275 ac 62.75% Impervious = 13.941 ac

Summary for Subcatchment 16S: P-B5-1

Runoff = 4.86 cfs @ 1.15 hrs, Volume= 0.207 af, Depth= 0.99"
 Routed to Pond B-5 : BASIN 5

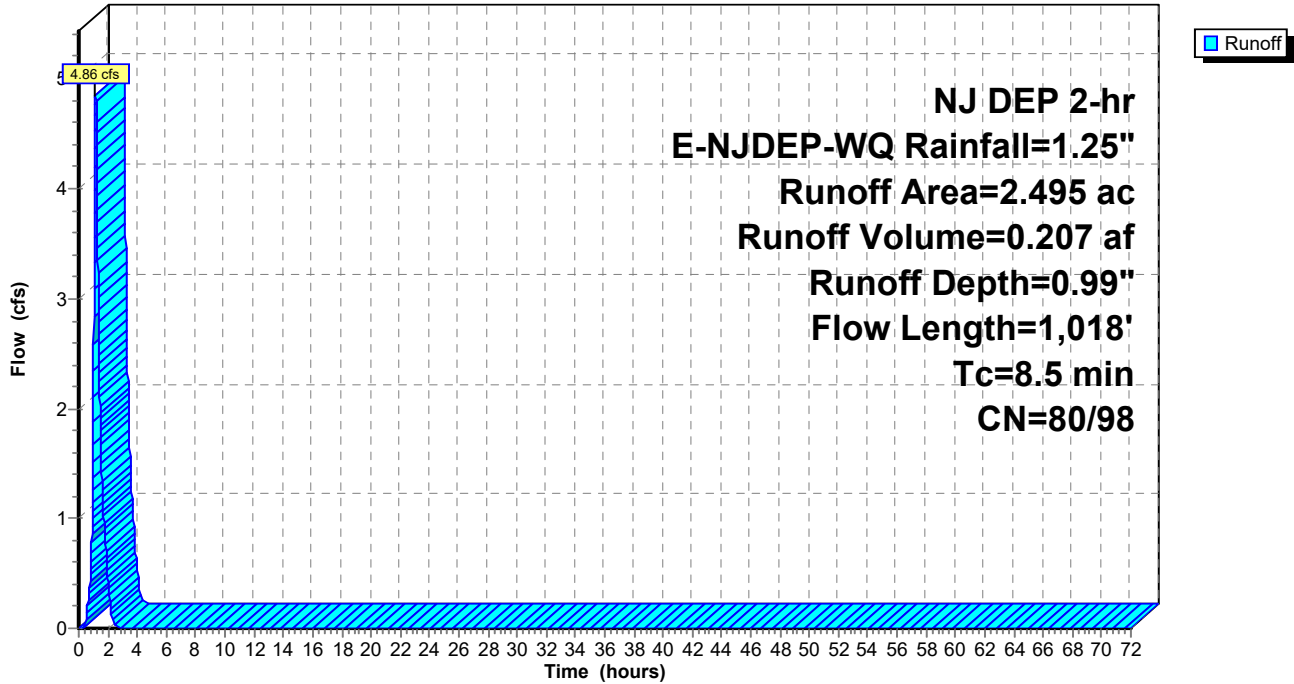
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 1.889	98	DA - Paved parking, HSG D
0.117	80	>75% Grass cover, Good, HSG D
* 0.477	98	>75% Grass cover, Good, HSG D
* 0.012	98	Concrete, HSG D
2.495	97	Weighted Average
0.117	80	4.69% Pervious Area
2.378	98	95.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	33	0.0100	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.0	145	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.3	840	0.0045	6.07	29.81	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
8.5	1,018	Total			

Subcatchment 16S: P-B5-1

Hydrograph



Summary for Subcatchment BASIN 2: BASIN 2

[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.07 cfs @ 1.08 hrs, Volume= 0.002 af, Depth= 0.13"
 Routed to Pond B-2 : BASIN 2

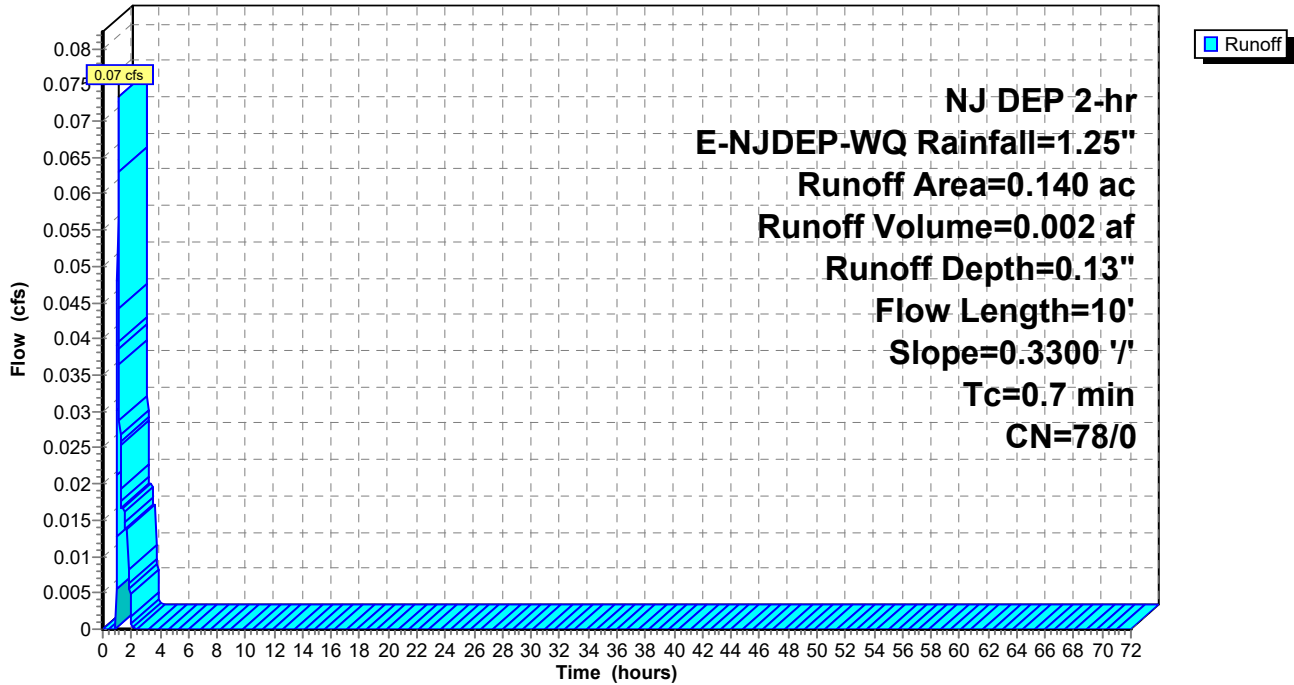
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.140	78	Meadow, non-grazed, HSG D
0.140	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.3300	0.23		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"

Subcatchment BASIN 2: BASIN 2

Hydrograph



Summary for Subcatchment BASIN 3: BASIN 3

Runoff = 0.18 cfs @ 1.10 hrs, Volume= 0.005 af, Depth= 0.13"
 Routed to Pond B-3 : BASIN 3

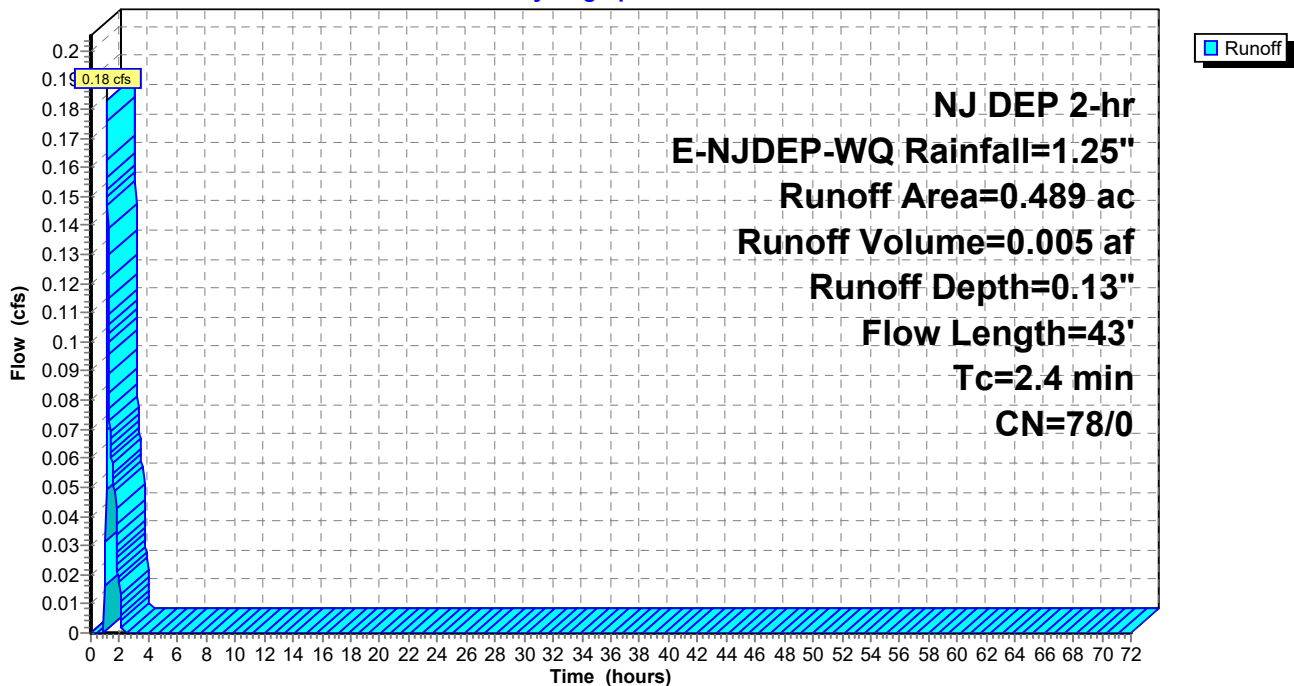
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.489	78	Meadow, non-grazed, HSG D
0.489	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.0670	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	13	0.3330	4.04		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.4	43	Total			

Subcatchment BASIN 3: BASIN 3

Hydrograph



Summary for Subcatchment BASIN 4: BASIN 4

Runoff = 0.09 cfs @ 1.20 hrs, Volume= 0.004 af, Depth= 0.17"
 Routed to Pond B-4 : BASIN 4

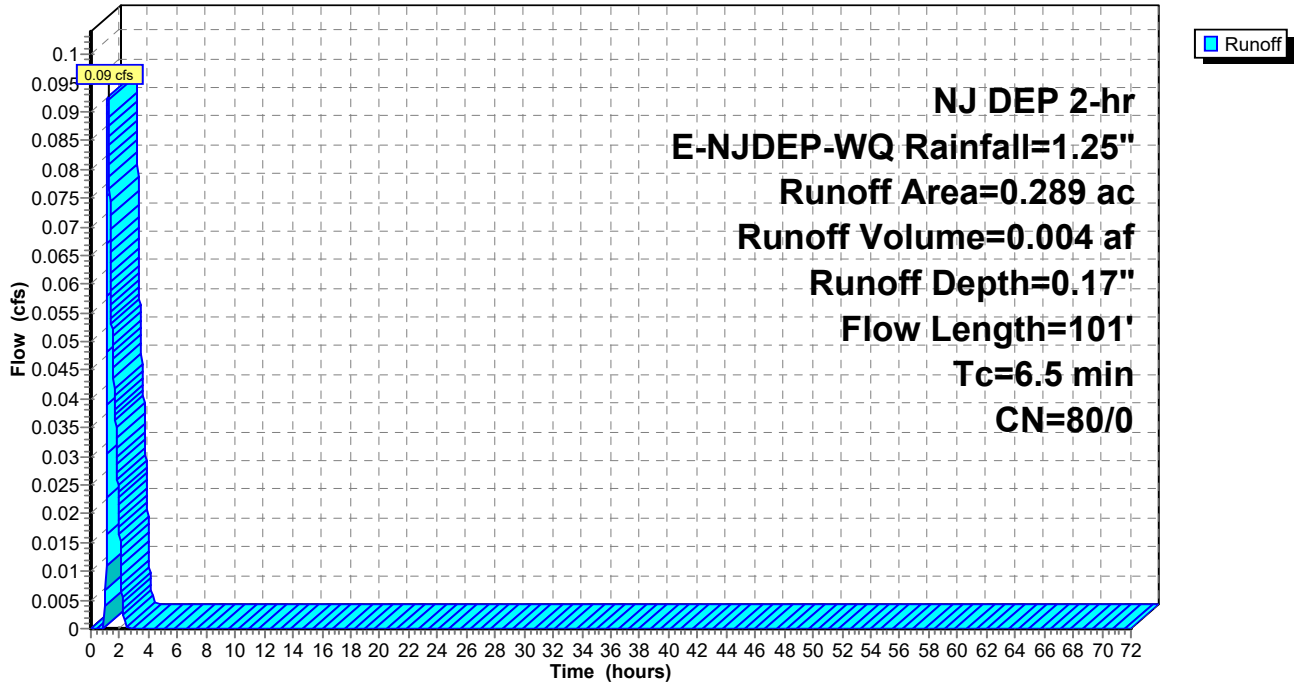
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.289	80	>75% Grass cover, Good, HSG D
0.289	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	62	0.0480	0.22		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.8	25	0.0790	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.1	14	0.3300	4.02		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.5	101	Total			

Subcatchment BASIN 4: BASIN 4

Hydrograph



Summary for Subcatchment BASIN 5: BASIN 5

Runoff = 0.10 cfs @ 1.22 hrs, Volume= 0.005 af, Depth= 0.13"
 Routed to Pond B-5 : BASIN 5

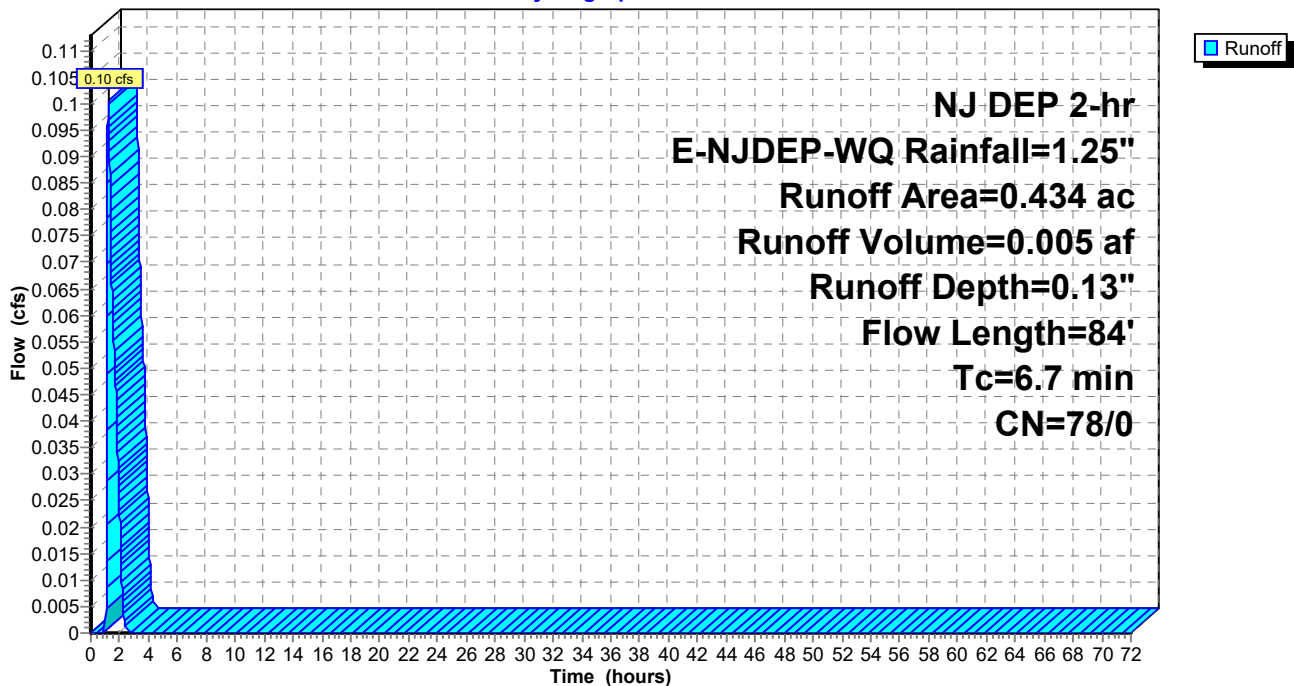
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.434	78	Meadow, non-grazed, HSG D
0.434	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.5	45	0.0108	0.12		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.2350	3.39		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.7	84	Total			

Subcatchment BASIN 5: BASIN 5

Hydrograph



Summary for Subcatchment EX. DA-1.: EX. DA-1

Runoff = 1.10 cfs @ 1.31 hrs, Volume= 0.081 af, Depth= 1.03"
 Routed to Link P-SR : SOUTH RIVER

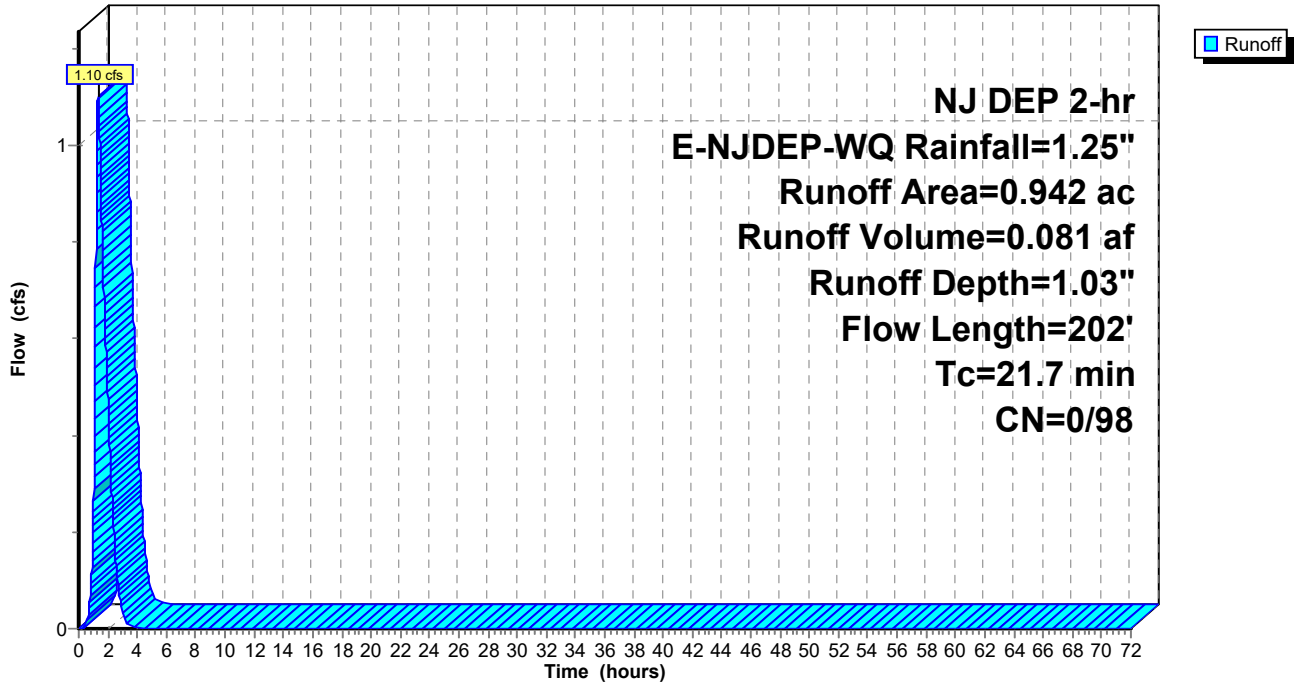
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.932	98	Grass, HSG D
* 0.010	98	Concrete, HSG D
0.942	98	Weighted Average
0.942	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	67	0.0100	0.05		Sheet Flow, Grass: Bermuda n= 0.410 P2= 3.35"
0.4	90	0.3000	3.83		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.8	45	0.0200	0.99		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
21.7	202	Total			

Subcatchment EX. DA-1.: EX. DA-1

Hydrograph



Summary for Subcatchment EX. DA-2.: EX. DA-2

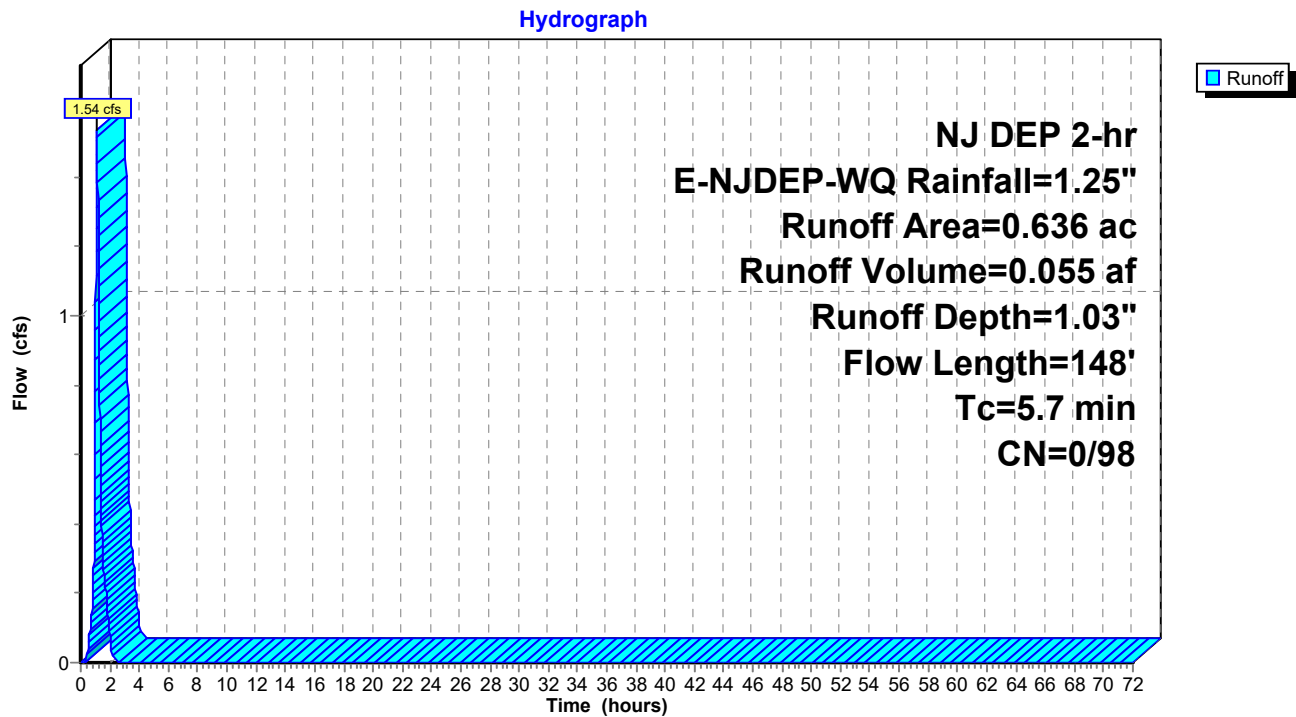
Runoff = 1.54 cfs @ 1.12 hrs, Volume= 0.055 af, Depth= 1.03"
 Routed to Link P-PC : POND CREEK

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.636	98	Grass, HSG D
0.636	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	14	0.0200	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.8	29	0.2800	0.27		Sheet Flow, Grass: Dense n= 0.240 P2= 3.35"
1.0	105	0.0635	1.76		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
5.7	148	Total			

Subcatchment EX. DA-2.: EX. DA-2



Summary for Subcatchment EX. DA-3.: EX. DA-3

Runoff = 0.44 cfs @ 1.89 hrs, Volume= 0.052 af, Depth= 0.12"
 Routed to Link P-PC : POND CREEK

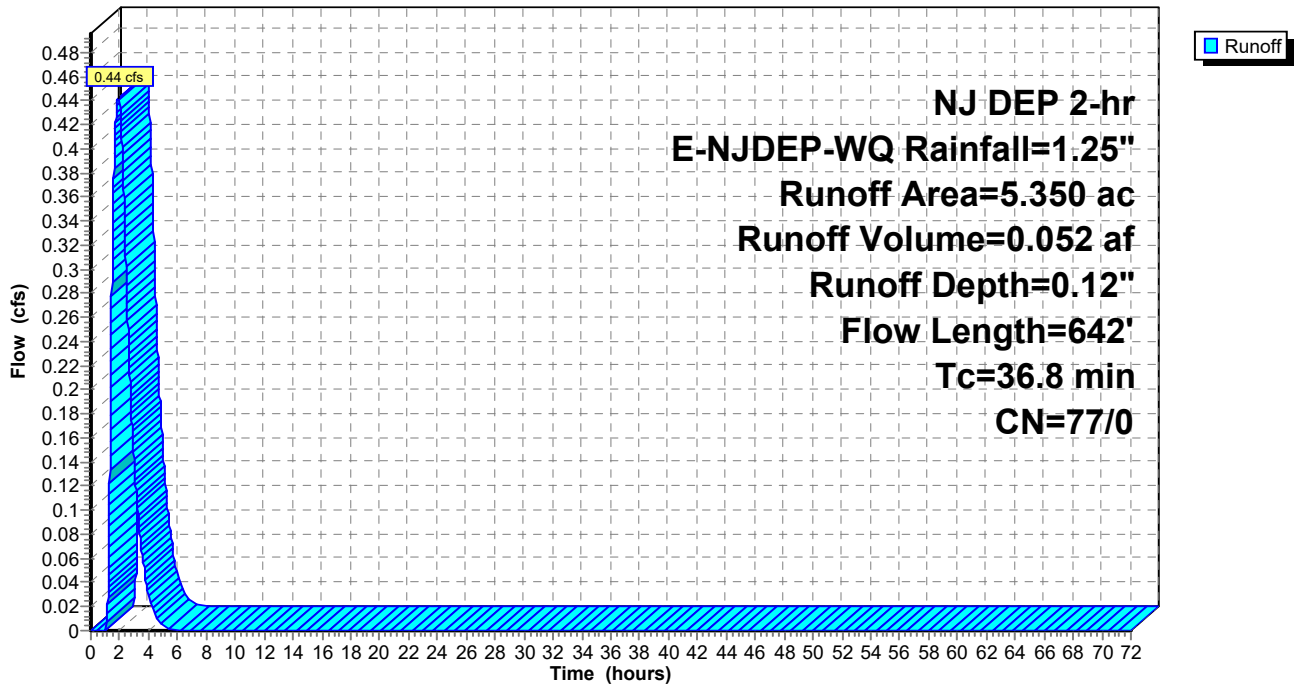
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
5.350	77	Woods, Good, HSG D
5.350	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6	80	0.0095	0.06		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
5.0	232	0.0240	0.77		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
8.2	330	0.0180	0.67		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
36.8	642	Total			

Subcatchment EX. DA-3.: EX. DA-3

Hydrograph



Summary for Subcatchment EX. DA-4.: EX. DA-4

Runoff = 0.91 cfs @ 1.15 hrs, Volume= 0.039 af, Depth= 0.49"
 Routed to Link P-DC : DUCK CREEK

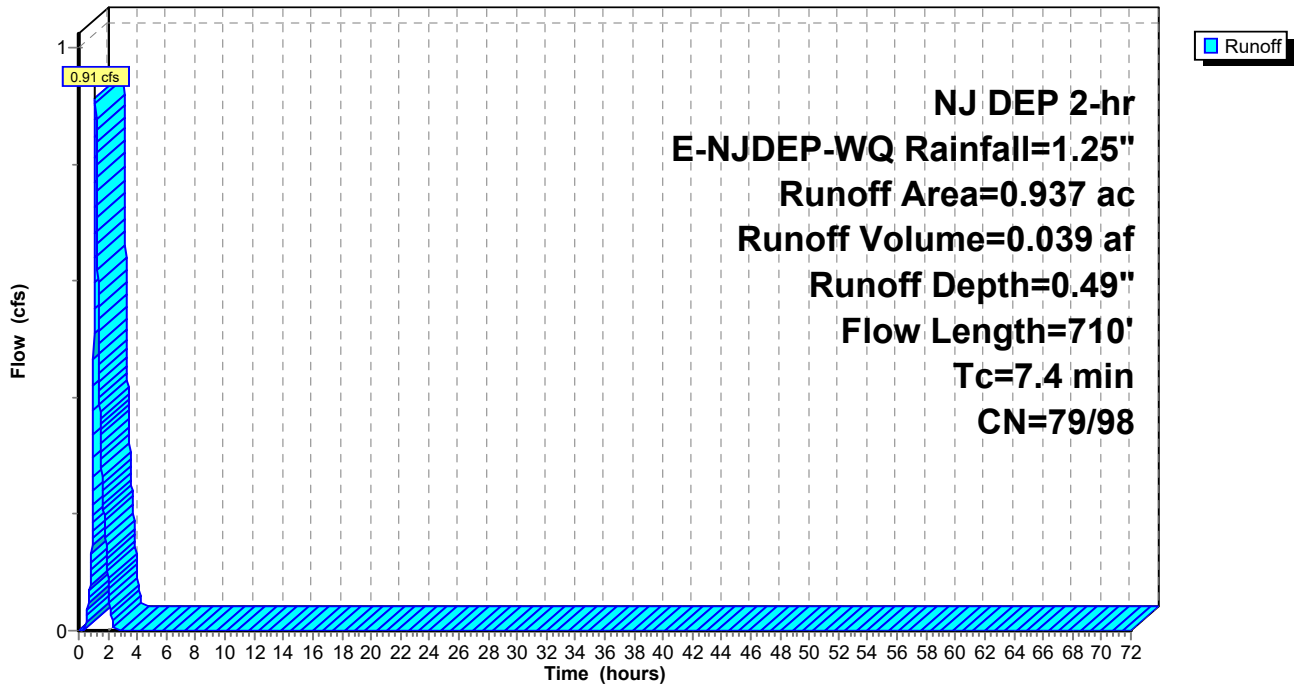
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.363	98	Paved parking, HSG D
0.296	80	>75% Grass cover, Good, HSG D
0.278	77	Woods, Good, HSG D
0.937	86	Weighted Average
0.574	79	61.26% Pervious Area
0.363	98	38.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
5.3	610	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
7.4	710	Total			

Subcatchment EX. DA-4.: EX. DA-4

Hydrograph



Summary for Subcatchment EX. DA-5.: EX. DA-5

Runoff = 0.28 cfs @ 1.11 hrs, Volume= 0.010 af, Depth= 0.38"
 Routed to Link P-DC : DUCK CREEK

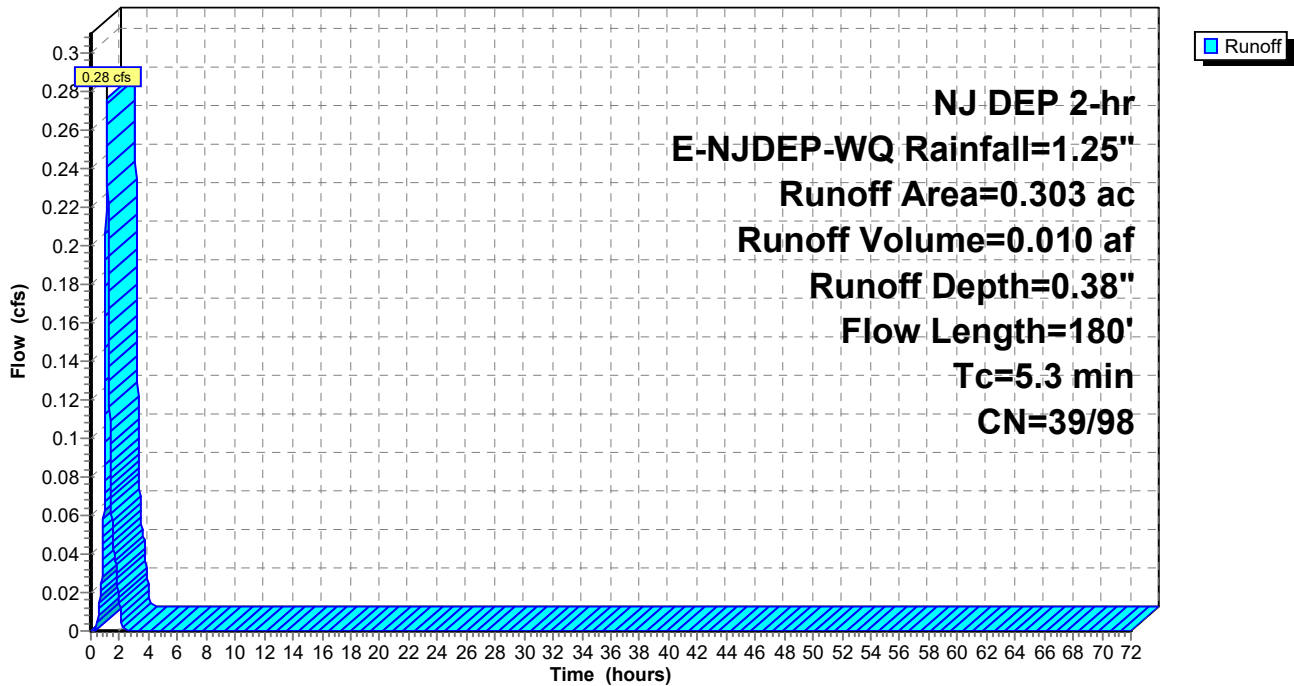
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.111	98	Paved parking, HSG A
0.192	39	>75% Grass cover, Good, HSG A
0.303	61	Weighted Average
0.192	39	63.37% Pervious Area
0.111	98	36.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	40	0.0290	0.17		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.3	20	0.0290	1.19		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.0	120	0.0090	1.93		Shallow Concentrated Flow, Paved Kv= 20.3 fps
5.3	180	Total			

Subcatchment EX. DA-5.: EX. DA-5

Hydrograph



Summary for Subcatchment P-B2-3: P-B2-3

Runoff = 4.28 cfs @ 1.09 hrs, Volume= 0.129 af, Depth= 1.03"
 Routed to Pond B-2 : BASIN 2

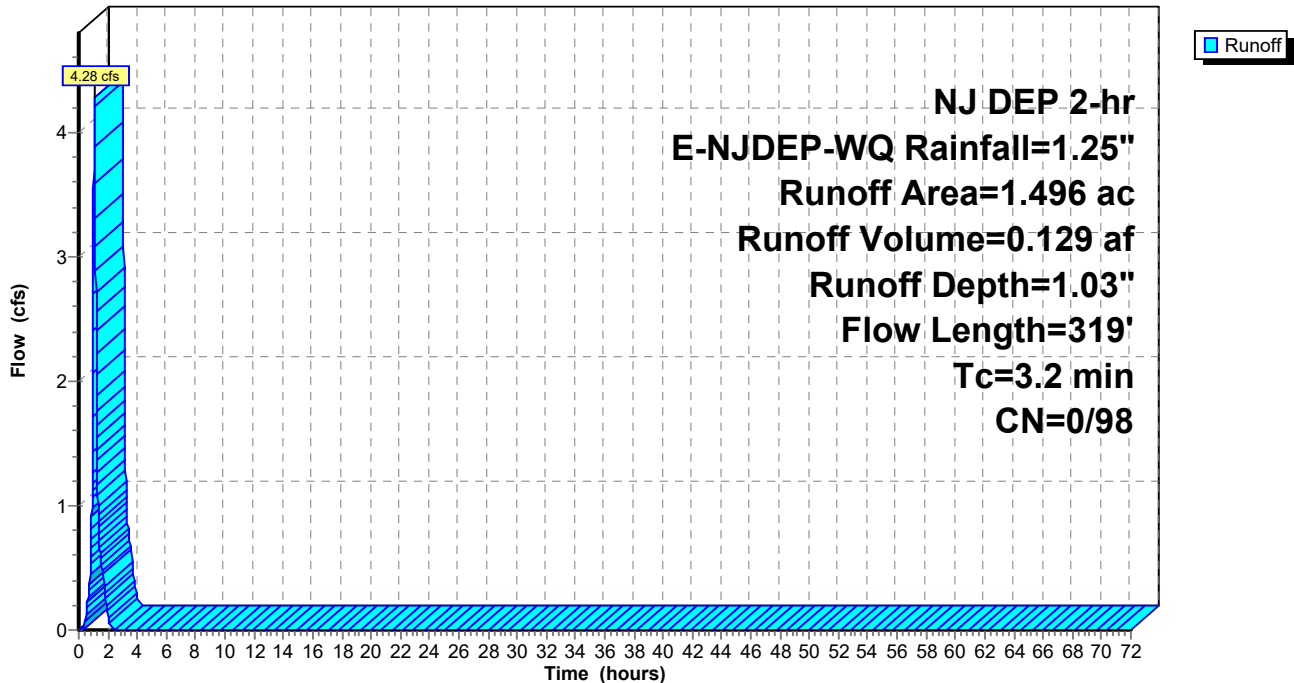
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
1.214	98	Paved parking, HSG D
* 0.282	98	>75% Grass cover, Good, HSG D
1.496	98	Weighted Average
1.496	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	7	0.0200	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.1	150	0.0120	2.22		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.8	113	0.0140	2.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	49	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.2	319	Total			

Subcatchment P-B2-3: P-B2-3

Hydrograph



Summary for Subcatchment P-B3-1: P-B3-1

Runoff = 0.89 cfs @ 1.10 hrs, Volume= 0.029 af, Depth= 0.96"
 Routed to Pond B-3 : BASIN 3

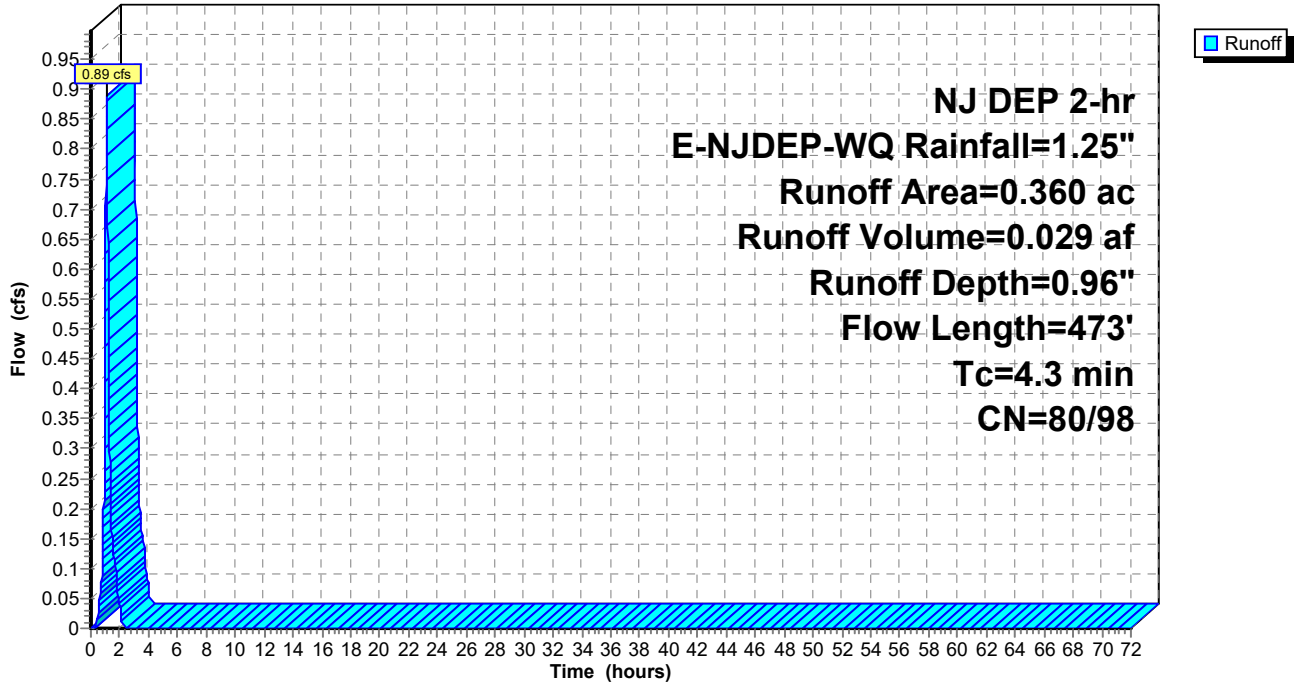
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
* 0.031	98	>75% Grass cover, Good, HSG D
0.030	80	>75% Grass cover, Good, HSG D
* 0.017	98	Concrete, HSG D
0.360	96	Weighted Average
0.030	80	8.33% Pervious Area
0.330	98	91.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	33	0.0900	0.25		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.9	390	0.0280	3.40		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.2	50	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.3	473	Total			

Subcatchment P-B3-1: P-B3-1

Hydrograph



Summary for Subcatchment P-B3-2: P-B3-2

Runoff = 2.91 cfs @ 1.10 hrs, Volume= 0.091 af, Depth= 1.03"
 Routed to Pond B-3 : BASIN 3

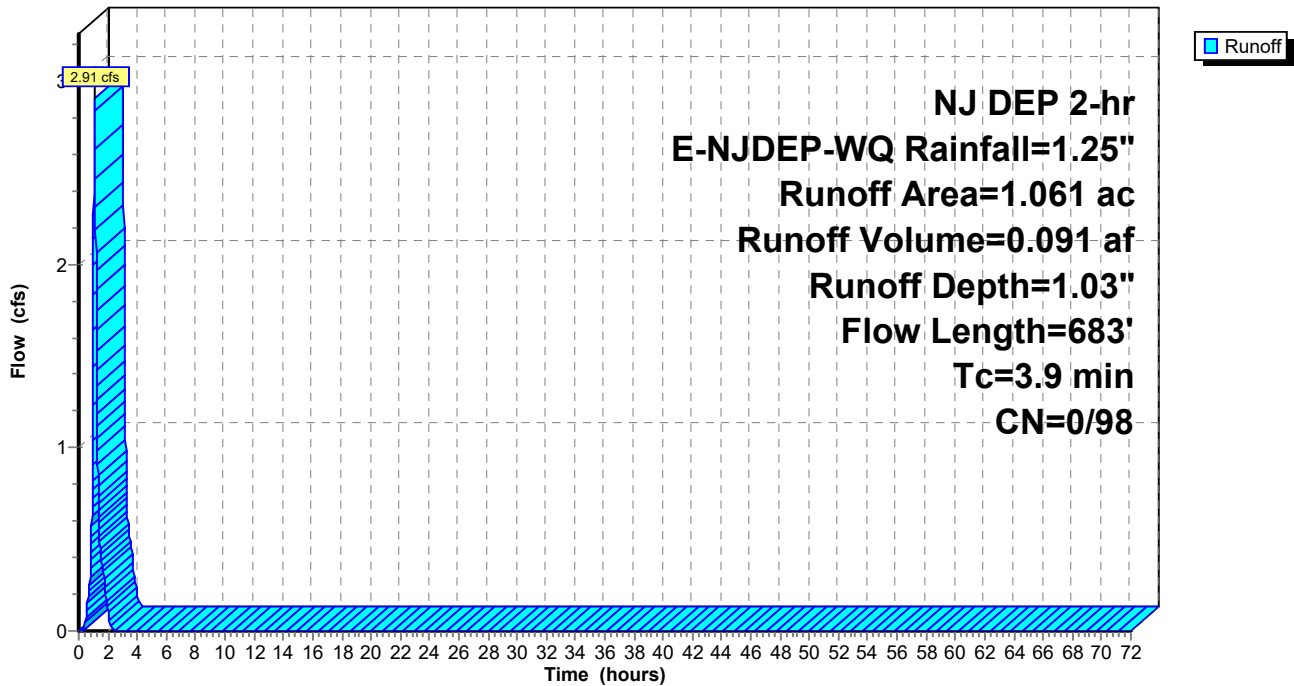
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
0.952	98	Paved parking, HSG D
* 0.109	98	>75% Grass cover, Good, HSG D
1.061	98	Weighted Average
1.061	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	8	0.0200	0.11		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
1.4	175	0.0100	2.03		Shallow Concentrated Flow, Paved Kv= 20.3 fps
1.2	500	0.0100	7.20	22.62	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013 Corrugated PE, smooth interior
3.9	683	Total			

Subcatchment P-B3-2: P-B3-2

Hydrograph



Summary for Subcatchment P-B4-1: P-B4-1

Runoff = 0.22 cfs @ 1.22 hrs, Volume= 0.013 af, Depth= 0.28"
 Routed to Pond B-4 : BASIN 4

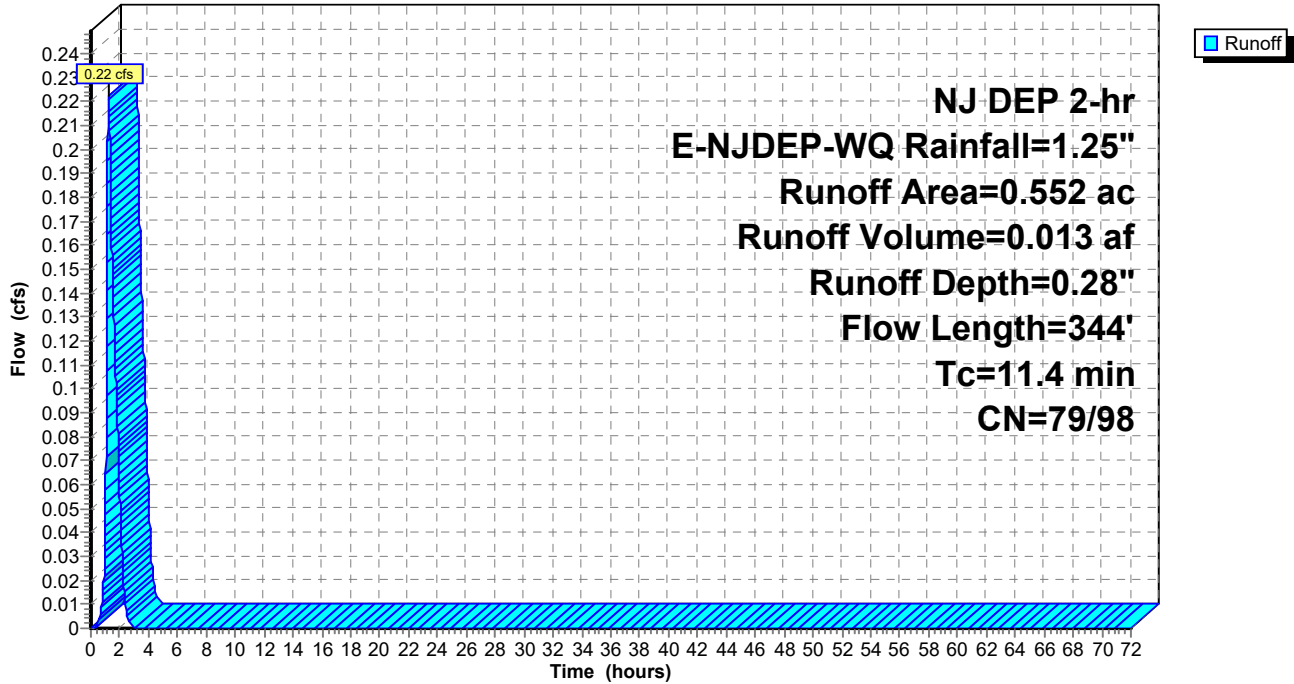
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.077	98	DA - Paved parking, HSG D
0.247	80	>75% Grass cover, Good, HSG D
0.228	77	Woods, Good, HSG D
0.552	81	Weighted Average
0.475	79	86.05% Pervious Area
0.077	98	13.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0550	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.35"
0.2	15	0.0550	1.17		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
5.8	266	0.0120	0.77		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.1	33	0.0050	4.03	4.95	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012 Corrugated PP, smooth interior
11.4	344	Total			

Subcatchment P-B4-1: P-B4-1

Hydrograph



Summary for Subcatchment P-B4-2: P-B4-2

Runoff = 1.75 cfs @ 1.14 hrs, Volume= 0.072 af, Depth= 0.87"
 Routed to Pond B-4 : BASIN 4

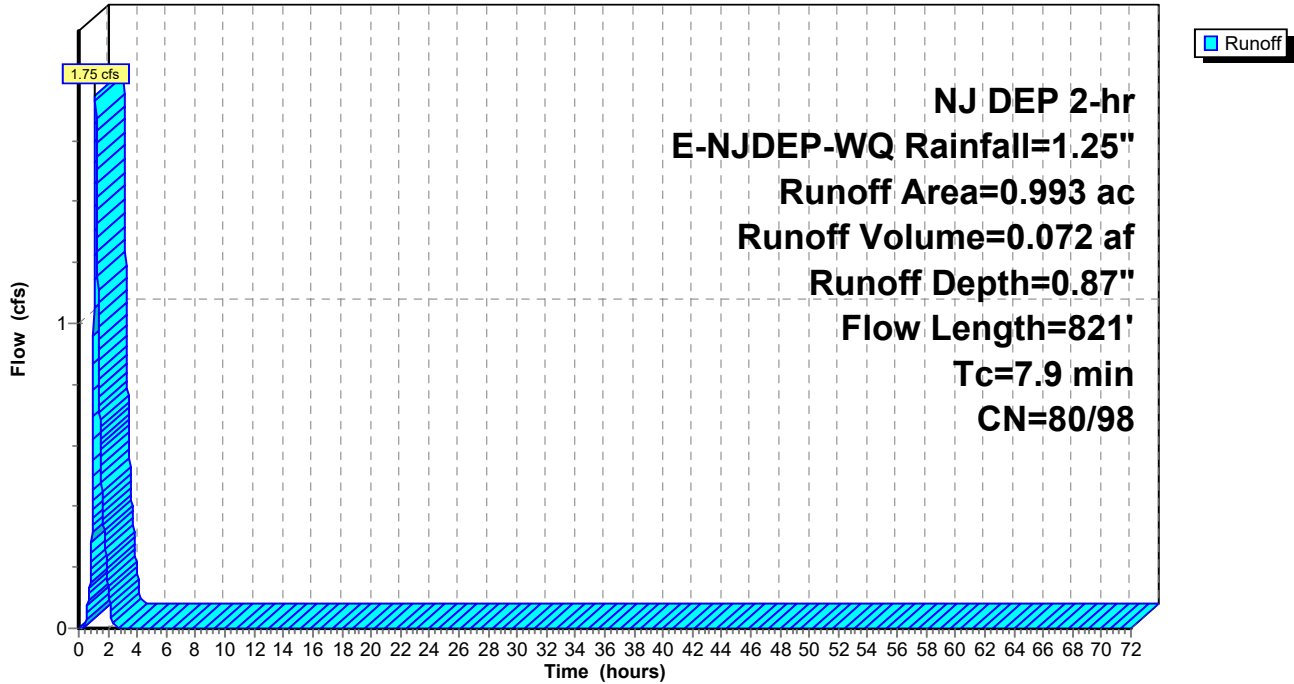
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 0.757	98	DA - Paved parking, HSG D
0.185	80	>75% Grass cover, Good, HSG D
* 0.051	98	Concrete, HSG D
0.993	95	Weighted Average
0.185	80	18.63% Pervious Area
0.808	98	81.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	30	0.0100	0.10		Sheet Flow, Grass: Short n= 0.150 P2= 3.35"
0.2	39	0.0260	3.27		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.4	75	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
2.5	677	0.0050	4.55	8.05	Pipe Channel, 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
7.9	821	Total			

Subcatchment P-B4-2: P-B4-2

Hydrograph



Summary for Subcatchment P-UG-1: UG-1

Runoff = 6.47 cfs @ 1.13 hrs, Volume= 0.247 af, Depth= 1.03"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

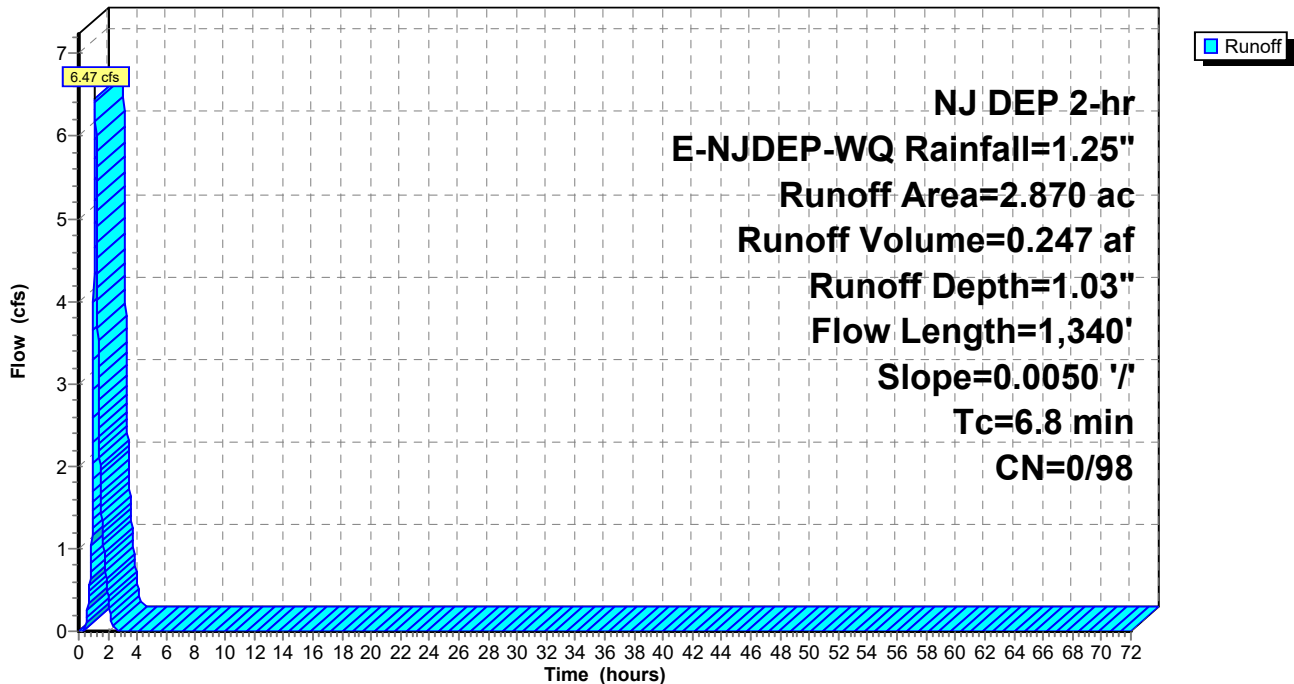
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 2.870	98	Roof, HSG D
2.870	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	200	0.0050	0.93		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
3.2	1,140	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013 Corrugated PE, smooth interior
6.8	1,340	Total			

Subcatchment P-UG-1: UG-1

Hydrograph



Summary for Subcatchment P-UG-2: UG-2

[47] Hint: Peak is 163% of capacity of segment #3

Runoff = 7.45 cfs @ 1.11 hrs, Volume= 0.247 af, Depth= 1.03"
 Routed to Pond UG-2 : UG BASIN 1 & 2 (Interconnected)

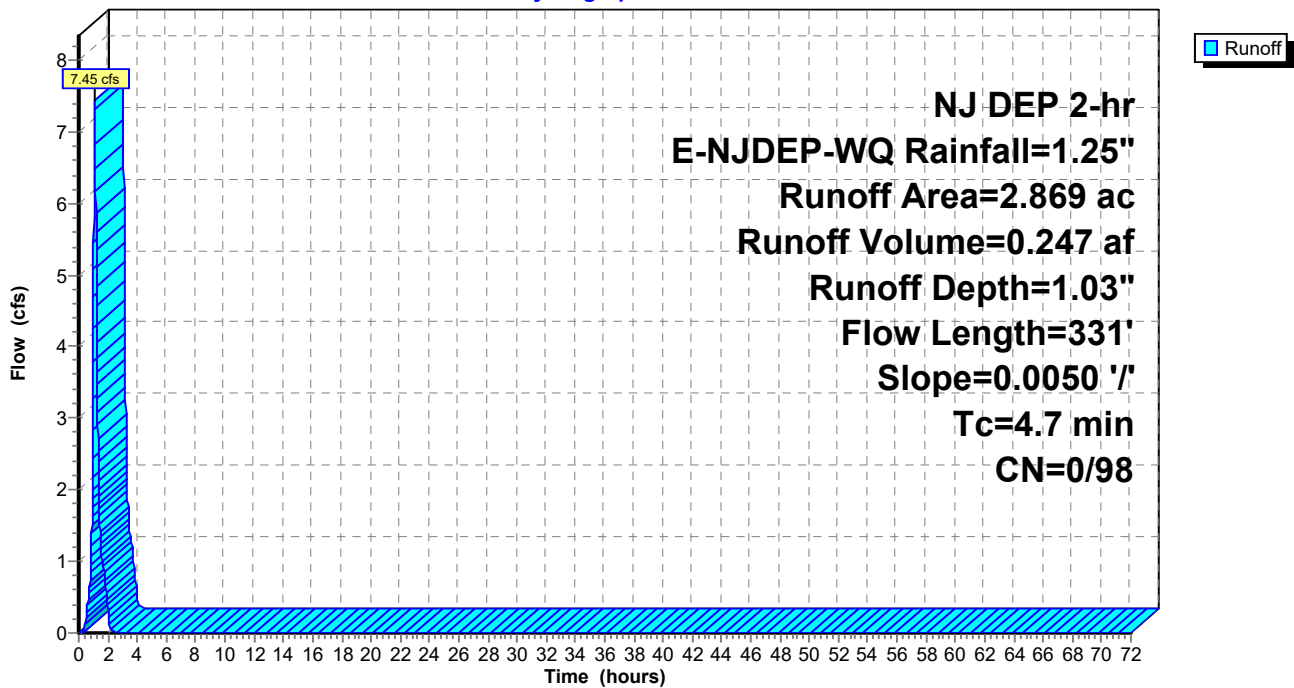
Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv. UI as Pervious, Time Span= 0.00-72.00 hrs, dt= NJ DEP 2-hr E-NJDEP-WQ Rainfall=1.25"

Area (ac)	CN	Description
* 2.869	98	Roof, HSG D
2.869	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.35"
2.5	213	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
0.1	18	0.0050	3.72	4.57	Pipe Channel, 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
4.7	331	Total			

Subcatchment P-UG-2: UG-2

Hydrograph



Summary for Reach 17R: E-1

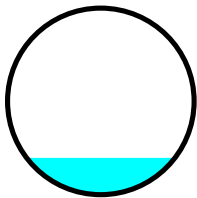
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.76" for E-NJDEP-WQ event
Inflow = 2.15 cfs @ 1.57 hrs, Volume= 0.300 af
Outflow = 2.14 cfs @ 1.58 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.8 min
Routed to Reach 18R : E-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.59 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 5.8 min

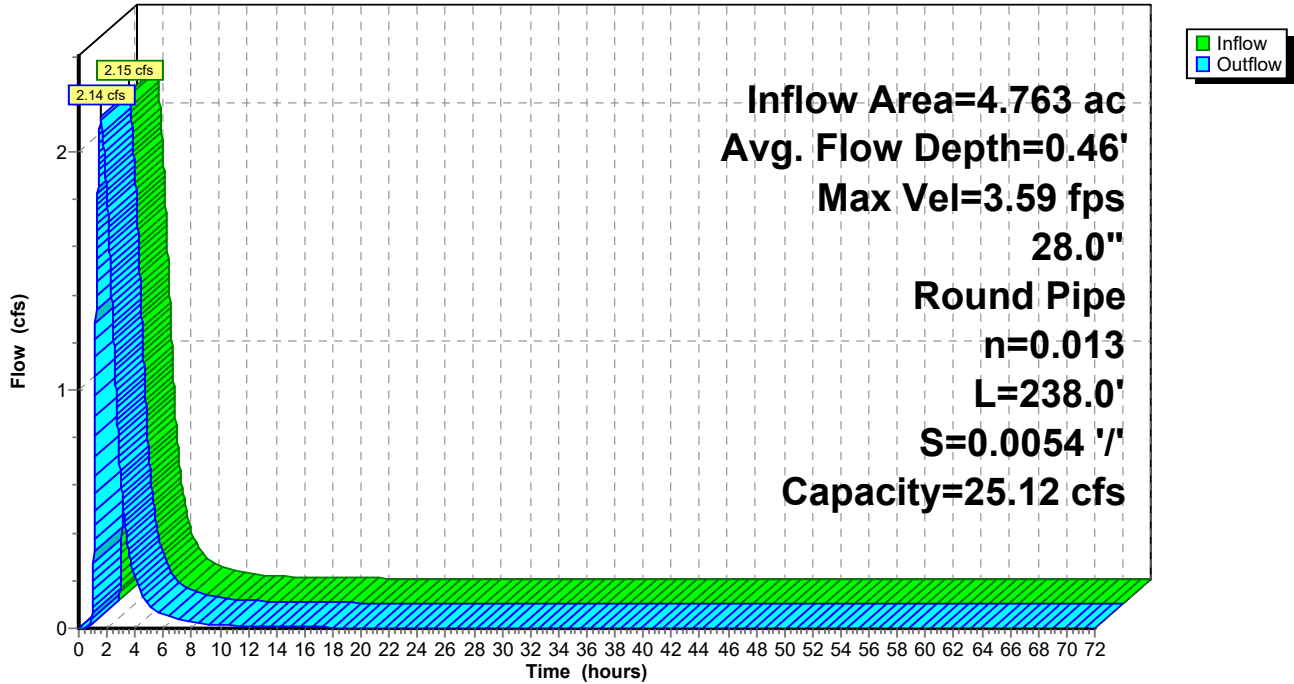
Peak Storage= 142 cf @ 1.58 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 1.86'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 25.12 cfs

28.0" Round Pipe
n= 0.013
Length= 238.0' Slope= 0.0054 '/'
Inlet Invert= 7.93', Outlet Invert= 6.64'



Reach 17R: E-1

Hydrograph



Summary for Reach 18R: E-2

[52] Hint: Inlet/Outlet conditions not evaluated

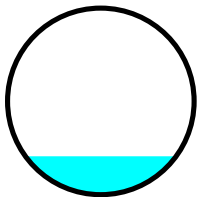
[62] Hint: Exceeded Reach 17R OUTLET depth by 0.02' @ 1.72 hrs

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.76" for E-NJDEP-WQ event
Inflow = 2.14 cfs @ 1.58 hrs, Volume= 0.300 af
Outflow = 2.14 cfs @ 1.59 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.8 min
Routed to Link P-PC : POND CREEK

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.37 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 6.0 min

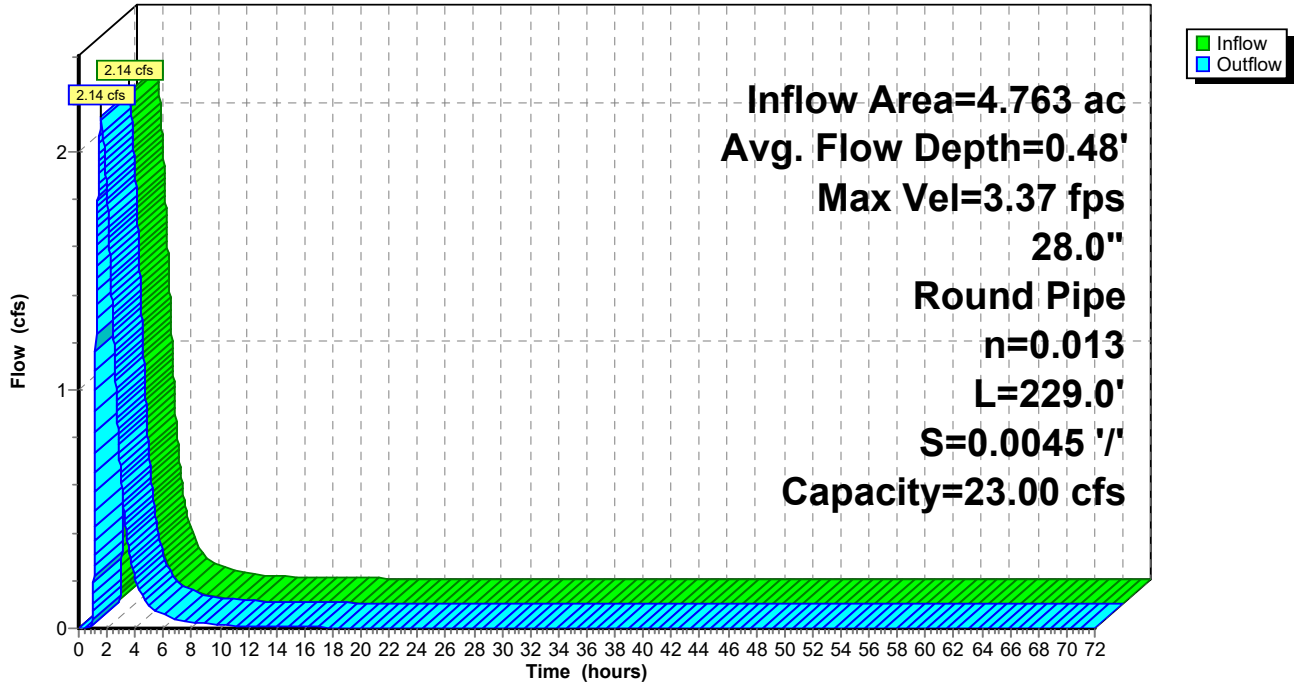
Peak Storage= 146 cf @ 1.59 hrs
Average Depth at Peak Storage= 0.48' , Surface Width= 1.89'
Bank-Full Depth= 2.33' Flow Area= 4.3 sf, Capacity= 23.00 cfs

28.0" Round Pipe
n= 0.013
Length= 229.0' Slope= 0.0045 '/'
Inlet Invert= 6.64', Outlet Invert= 5.60'



Reach 18R: E-2

Hydrograph



Summary for Pond B-2: BASIN 2

Inflow Area = 1.636 ac, 91.44% Impervious, Inflow Depth = 0.96" for E-NJDEP-WQ event
 Inflow = 4.35 cfs @ 1.09 hrs, Volume= 0.131 af
 Outflow = 0.67 cfs @ 1.41 hrs, Volume= 0.130 af, Atten= 85%, Lag= 18.8 min
 Primary = 0.67 cfs @ 1.41 hrs, Volume= 0.130 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 16.00' Surf.Area= 0.102 ac Storage= 0.093 af
 Peak Elev= 16.80' @ 1.41 hrs Surf.Area= 0.117 ac Storage= 0.182 af (0.088 af above start)

Plug-Flow detention time= 290.9 min calculated for 0.037 af (28% of inflow)
 Center-of-Mass det. time= 109.8 min (179.5 - 69.8)

Volume	Invert	Avail.Storage	Storage Description
#1	15.00'	0.335 af	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
15.00	0.085	0.000	0.000
16.00	0.102	0.093	0.093
17.00	0.121	0.112	0.205
18.00	0.140	0.130	0.335

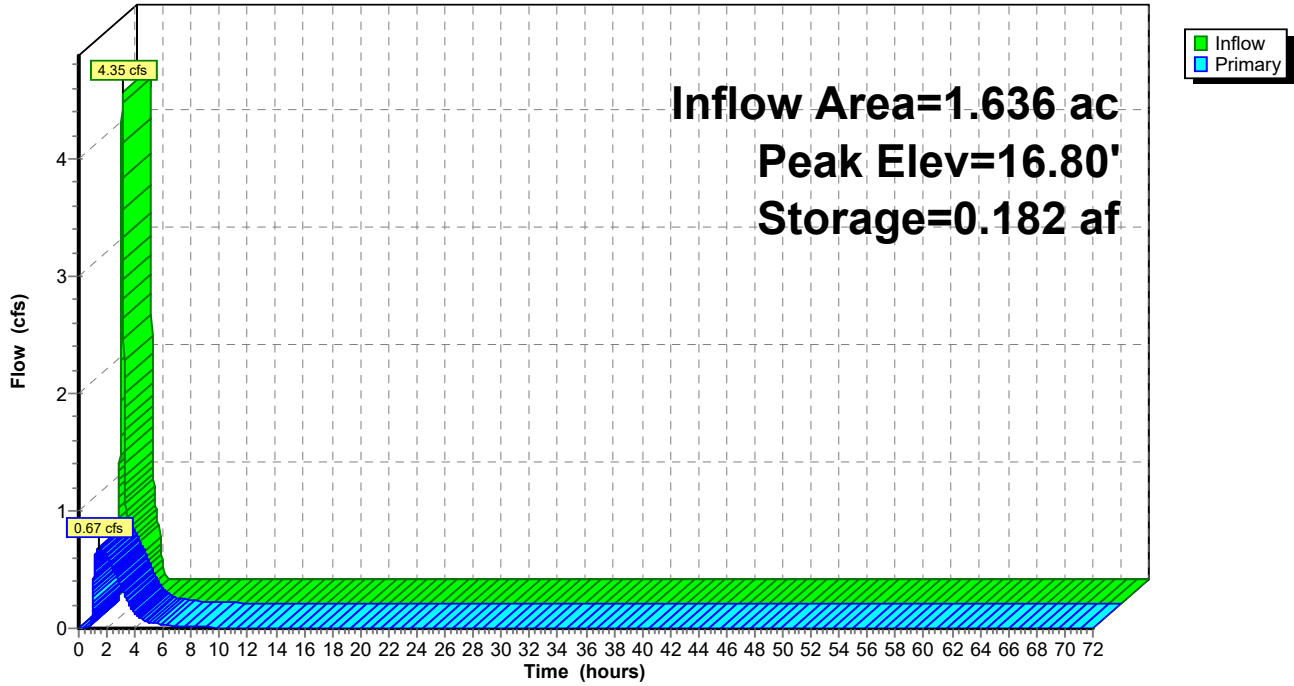
Device	Routing	Invert	Outlet Devices
#1	Primary	15.00'	24.0" Round Culvert L= 52.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 15.00' / 14.52' S= 0.0092 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	16.00'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	17.35'	1.5' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	17.50'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.67 cfs @ 1.41 hrs HW=16.80' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.67 cfs of 12.30 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.67 cfs @ 3.84 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-2: BASIN 2

Hydrograph



Summary for Pond B-3: BASIN 3

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth = 0.79" for E-NJDEP-WQ event
 Inflow = 3.98 cfs @ 1.10 hrs, Volume= 0.126 af
 Outflow = 0.26 cfs @ 1.86 hrs, Volume= 0.122 af, Atten= 93%, Lag= 45.4 min
 Primary = 0.26 cfs @ 1.86 hrs, Volume= 0.122 af
 Routed to Link D3B : POD 3B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.30' Surf.Area= 0.246 ac Storage= 0.191 af
 Peak Elev= 11.73' @ 1.86 hrs Surf.Area= 0.254 ac Storage= 0.298 af (0.107 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 419.6 min (491.0 - 71.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	10.50'	0.780 af	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (acres)	Perim. (feet)	Inc.Store (acre-feet)	Cum.Store (acre-feet)	Wet.Area (acres)
10.50	0.231	569.6	0.000	0.000	0.231
11.00	0.241	578.4	0.118	0.118	0.251
12.00	0.259	596.0	0.250	0.368	0.291
13.00	0.278	615.6	0.269	0.637	0.337
13.50	0.295	633.5	0.143	0.780	0.378

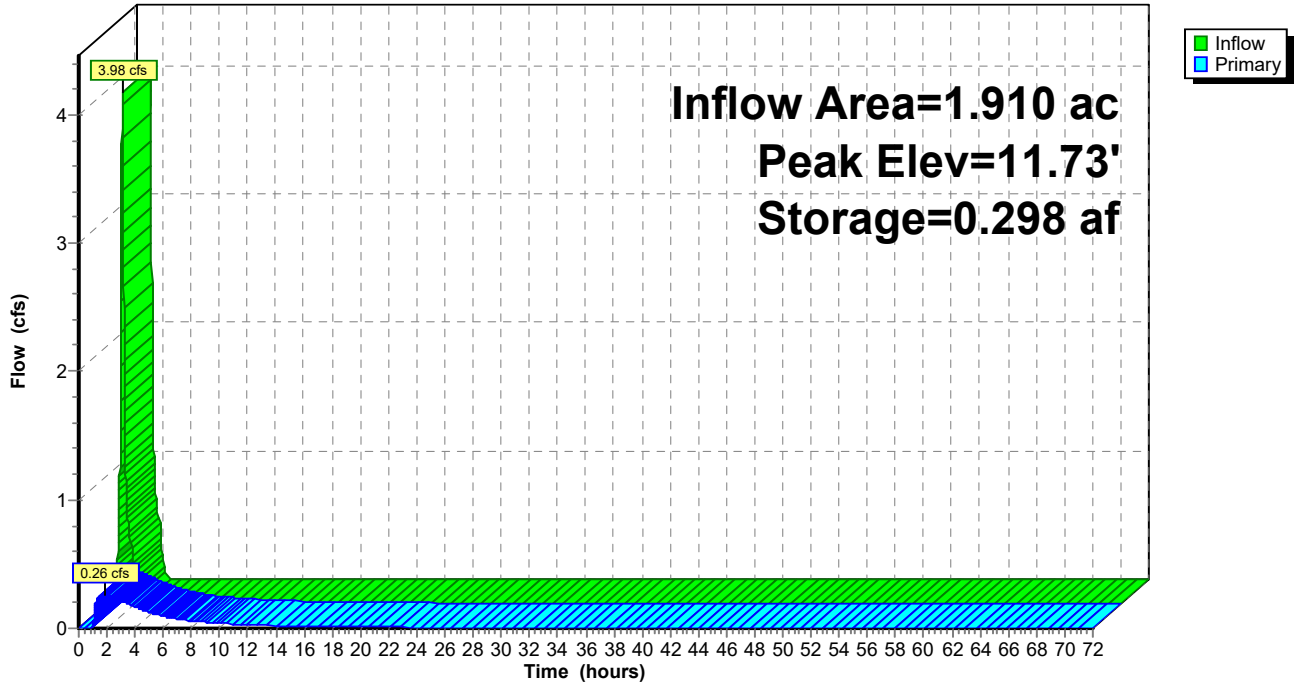
Device	Routing	Invert	Outlet Devices
#1	Primary	6.35'	24.0" Round Culvert L= 70.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.35' / 6.00' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	11.30'	4.5" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.75'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	12.00'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.26 cfs @ 1.86 hrs HW=11.73' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.26 cfs of 31.60 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.26 cfs @ 2.36 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-3: BASIN 3

Hydrograph



Summary for Pond B-4: BASIN 4

Inflow Area = 1.834 ac, 48.26% Impervious, Inflow Depth = 0.58" for E-NJDEP-WQ event
 Inflow = 2.02 cfs @ 1.15 hrs, Volume= 0.089 af
 Outflow = 0.69 cfs @ 1.54 hrs, Volume= 0.089 af, Atten= 66%, Lag= 23.3 min
 Primary = 0.69 cfs @ 1.54 hrs, Volume= 0.089 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.60' Surf.Area= 4,225 sf Storage= 3,964 cf
 Peak Elev= 14.08' @ 1.54 hrs Surf.Area= 4,441 sf Storage= 6,064 cf (2,100 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 87.2 min (166.5 - 79.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	12.60'	15,656 cf	Custom Stage Data (Irregular) Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
12.60	3,598	261.0	0	0	3,598	
13.00	3,956	273.0	1,510	1,510	4,119	
14.00	4,409	283.0	4,180	5,691	4,642	
14.10	4,447	284.0	443	6,133	4,695	
15.00	5,055	304.0	4,273	10,406	5,667	
16.00	5,447	312.0	5,250	15,656	6,166	

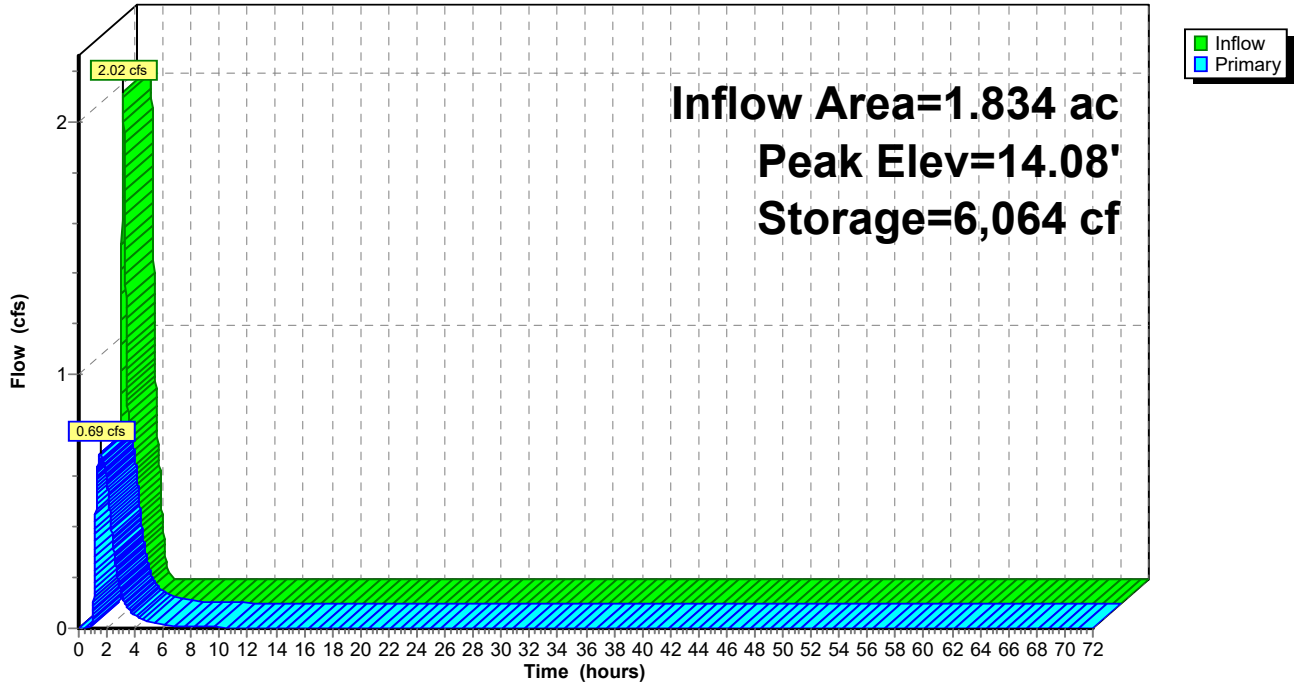
Device	Routing	Invert	Outlet Devices
#1	Primary	9.68'	15.0" Round Culvert L= 11.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.68' / 9.63' S= 0.0045 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.60'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.25'	1.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.20'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.69 cfs @ 1.54 hrs HW=14.08' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.69 cfs of 11.49 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.69 cfs @ 2.53 fps)
- 3=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-4: BASIN 4

Hydrograph



Summary for Pond B-5: BASIN 5

Inflow Area = 2.929 ac, 81.19% Impervious, Inflow Depth = 0.87" for E-NJDEP-WQ event
 Inflow = 4.95 cfs @ 1.15 hrs, Volume= 0.212 af
 Outflow = 1.46 cfs @ 1.57 hrs, Volume= 0.211 af, Atten= 71%, Lag= 25.1 min
 Primary = 1.46 cfs @ 1.57 hrs, Volume= 0.211 af
 Routed to Link 16L : Existing Storm Sewer

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 13.90' Surf.Area= 8,129 sf Storage= 9,986 cf
 Peak Elev= 14.56' @ 1.57 hrs Surf.Area= 8,614 sf Storage= 15,480 cf (5,494 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 99.1 min (177.2 - 78.1)

Volume	Invert	Avail.Storage	Storage Description		
#1	12.60'	28,631 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
12.60	6,858	409.0	0	0	6,858
13.00	7,629	429.0	2,896	2,896	8,202
14.00	8,186	439.0	7,906	10,802	9,018
14.10	8,239	440.0	821	11,623	9,101
15.00	8,985	459.0	7,748	19,372	10,519
16.00	9,537	468.1	9,260	28,631	11,335

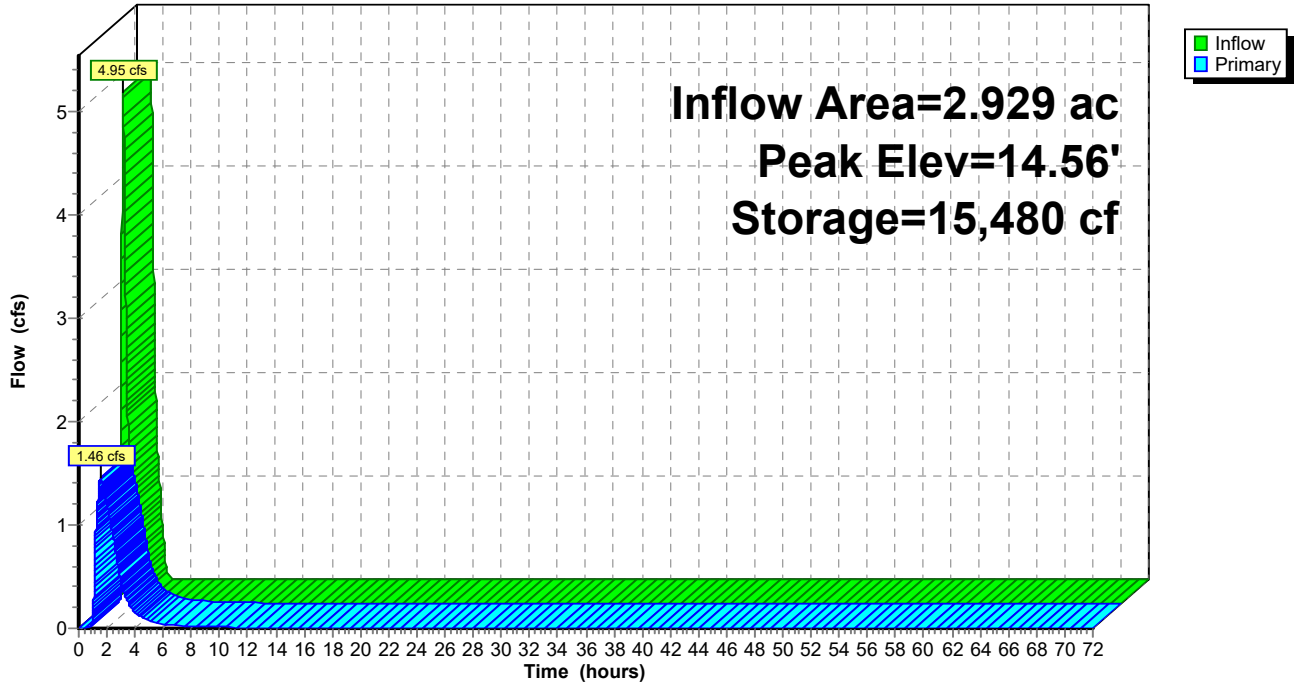
Device	Routing	Invert	Outlet Devices
#1	Primary	9.18'	15.0" Round Culvert L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 9.18' / 9.13' S= 0.0050 '/ Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	13.90'	5.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.50'	3.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)
#4	Device 1	15.40'	2.0" x 2.0" Horiz. Orifice/Grate X 24.00 columns X 24 rows C= 0.600 in 48.0" x 48.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=1.46 cfs @ 1.57 hrs HW=14.56' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 1.46 cfs of 12.88 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 1.32 cfs @ 3.23 fps)
- 3=Sharp-Crested Rectangular Weir (Weir Controls 0.14 cfs @ 0.79 fps)
- 4=Orifice/Grate (Controls 0.00 cfs)

Pond B-5: BASIN 5

Hydrograph



Summary for Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Inflow Area = 5.739 ac, 100.00% Impervious, Inflow Depth = 1.03" for E-NJDEP-WQ event
 Inflow = 13.80 cfs @ 1.12 hrs, Volume= 0.495 af
 Outflow = 0.45 cfs @ 2.08 hrs, Volume= 0.479 af, Atten= 97%, Lag= 58.1 min
 Primary = 0.45 cfs @ 2.08 hrs, Volume= 0.479 af
 Routed to Link D3A : POD 3A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
 Starting Elev= 11.00' Surf.Area= 0.631 ac Storage= 0.542 af
 Peak Elev= 12.00' @ 2.08 hrs Surf.Area= 0.631 ac Storage= 1.000 af (0.459 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= 688.7 min (762.2 - 73.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.25'	0.518 af	53.29'W x 324.00'L x 5.50'H Field A 2.180 af Overall - 0.886 af Embedded = 1.295 af x 40.0% Voids
#2A	9.75'	0.739 af	ADS N-12 48" x 128 Inside #1 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 8 rows 50.29' Header x 12.40 sf x 2 = 1,247.3 cf Inside
#3B	9.25'	0.309 af	33.67'W x 304.00'L x 5.50'H Field B 1.292 af Overall - 0.519 af Embedded = 0.773 af x 40.0% Voids
#4B	9.75'	0.433 af	ADS N-12 48" x 75 Inside #3 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf Row Length Adjustment= -8.00' x 12.40 sf x 5 rows 30.67' Header x 12.40 sf x 2 = 760.5 cf Inside
		1.999 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	6.34'	24.0" Round Culvert L= 41.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 6.34' / 6.14' S= 0.0049 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf
#2	Device 1	11.00'	4.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	11.85'	
#4	Device 1	13.45'	2.7' long Sharp-Crested Rectangular Weir X 3.00 2 End Contraction(s)

Primary OutFlow Max=0.45 cfs @ 2.08 hrs HW=12.00' TW=0.00' (Dynamic Tailwater)

- 1=Culvert (Passes 0.45 cfs of 32.66 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.38 cfs @ 4.40 fps)
- 3=Orifice/Grate (Orifice Controls 0.07 cfs @ 1.33 fps)
- 4=Sharp-Crested Rectangular Weir(Controls 0.00 cfs)

Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field A

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)
 Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
 Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
 Row Length Adjustment= -8.00' x 12.40 sf x 8 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

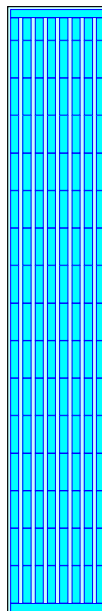
16 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 321.00' Row Length +18.0"
 End Stone x 2 = 324.00' Base Length
 8 Rows x 54.0" Wide + 24.5" Spacing x 7 + 18.0" Side Stone x 2 = 53.29' Base Width
 6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

128 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 8 Rows + 50.29' Header x 12.40 sf x 2 =
 32,197.7 cf Chamber Storage
 128 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 8 Rows + 50.29' Header x 14.86 sf x 2 =
 38,573.0 cf Displacement

94,969.0 cf Field - 38,573.0 cf Chambers = 56,395.9 cf Stone x 40.0% Voids = 22,558.4 cf Stone Storage

Chamber Storage + Stone Storage = 54,756.0 cf = 1.257 af
 Overall Storage Efficiency = 57.7%
 Overall System Size = 324.00' x 53.29' x 5.50'

128 Chambers
 3,517.4 cy Field
 2,088.7 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected) - Chamber Wizard Field B

Chamber Model = ADS N-12 48" (ADS N-12@ Pipe)

Inside= 47.7"W x 47.7"H => 12.40 sf x 20.00'L = 248.0 cf
Outside= 54.0"W x 54.0"H => 14.86 sf x 20.00'L = 297.1 cf
Row Length Adjustment= -8.00' x 12.40 sf x 5 rows

54.0" Wide + 24.5" Spacing = 78.5" C-C Row Spacing

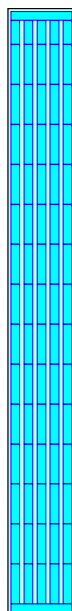
15 Chambers/Row x 20.00' Long -8.00' Row Adjustment +4.50' Header x 2 = 301.00' Row Length +18.0"
End Stone x 2 = 304.00' Base Length
5 Rows x 54.0" Wide + 24.5" Spacing x 4 + 18.0" Side Stone x 2 = 33.67' Base Width
6.0" Stone Base + 54.0" Chamber Height + 6.0" Stone Cover = 5.50' Field Height

75 Chambers x 248.0 cf -8.00' Row Adjustment x 12.40 sf x 5 Rows + 30.67' Header x 12.40 sf x 2 =
18,864.5 cf Chamber Storage
75 Chambers x 297.1 cf -8.00' Row Adjustment x 14.86 sf x 5 Rows + 30.67' Header x 14.86 sf x 2 =
22,599.9 cf Displacement

56,292.6 cf Field - 22,599.9 cf Chambers = 33,692.7 cf Stone x 40.0% Voids = 13,477.1 cf Stone Storage

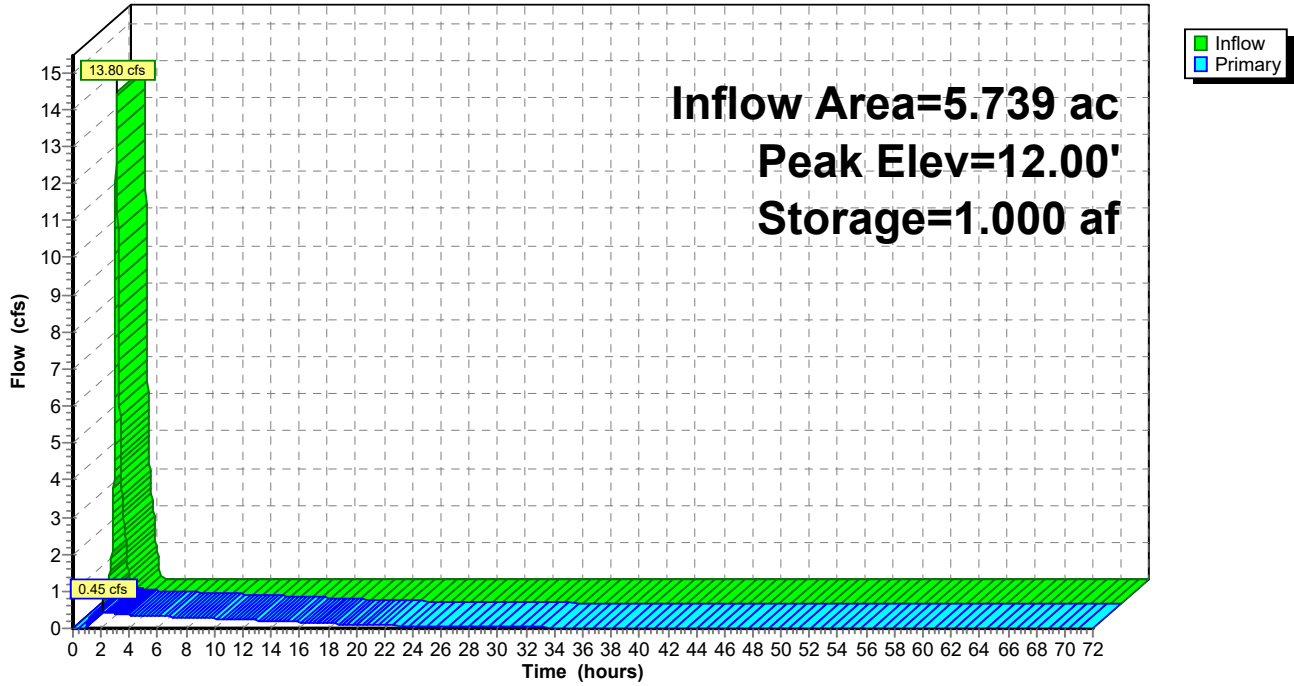
Chamber Storage + Stone Storage = 32,341.6 cf = 0.742 af
Overall Storage Efficiency = 57.5%
Overall System Size = 304.00' x 33.67' x 5.50'

75 Chambers
2,084.9 cy Field
1,247.9 cy Stone



Pond UG-2: UG BASIN 1 & 2 (Interconnected)

Hydrograph



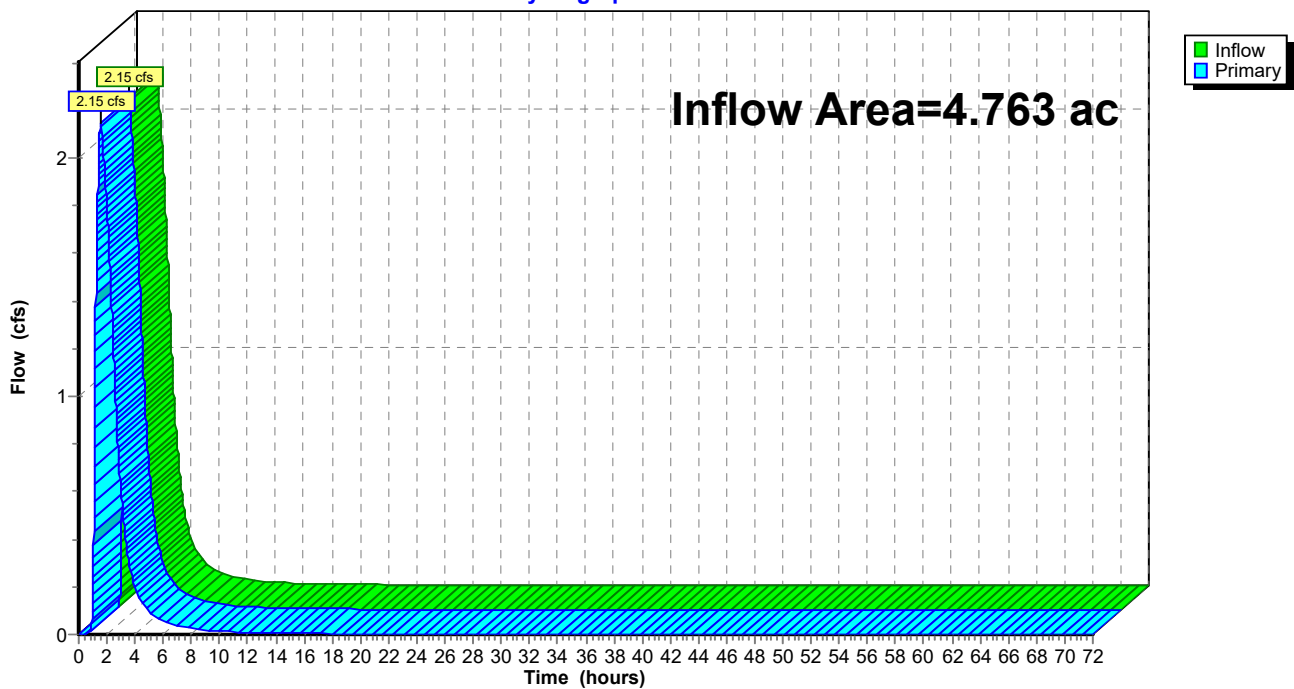
Summary for Link 16L: Existing Storm Sewer

Inflow Area = 4.763 ac, 68.51% Impervious, Inflow Depth = 0.76" for E-NJDEP-WQ event
Inflow = 2.15 cfs @ 1.57 hrs, Volume= 0.300 af
Primary = 2.15 cfs @ 1.57 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min
Routed to Reach 17r : E-1

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link 16L: Existing Storm Sewer

Hydrograph



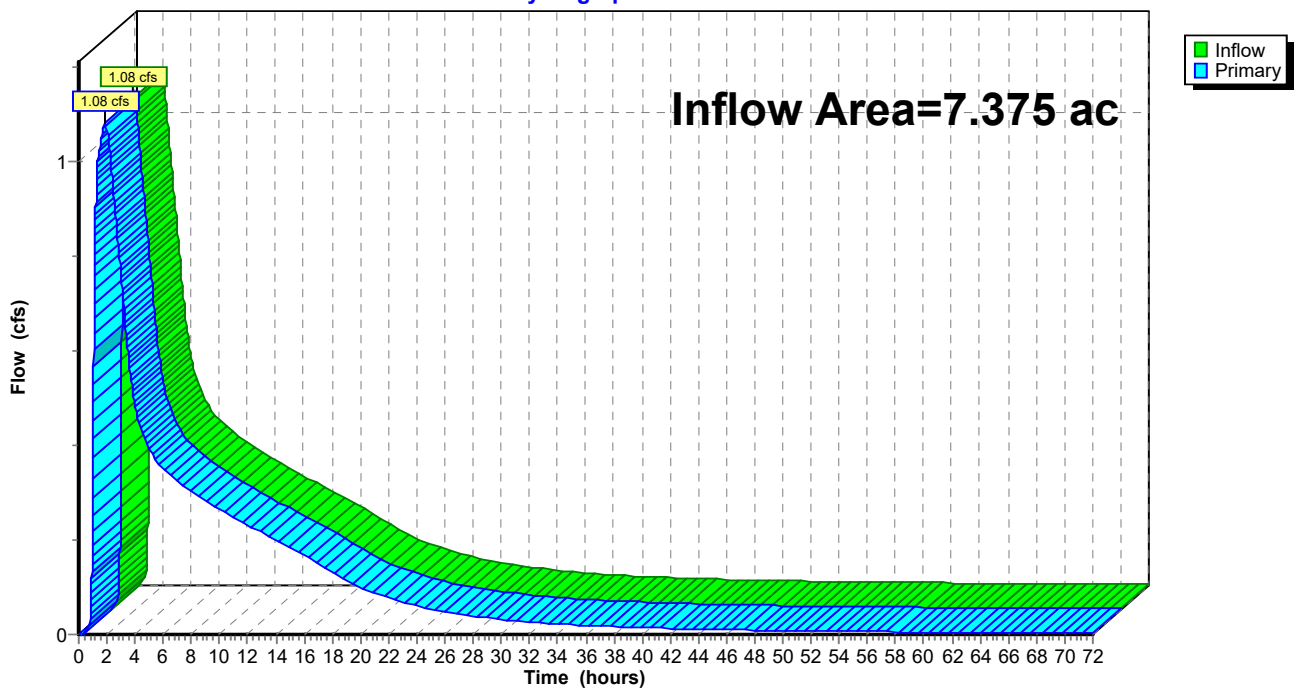
Summary for Link D3A: POD 3A

Inflow Area = 7.375 ac, 98.10% Impervious, Inflow Depth > 0.99" for E-NJDEP-WQ event
Inflow = 1.08 cfs @ 1.84 hrs, Volume= 0.609 af
Primary = 1.08 cfs @ 1.84 hrs, Volume= 0.609 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3A: POD 3A

Hydrograph



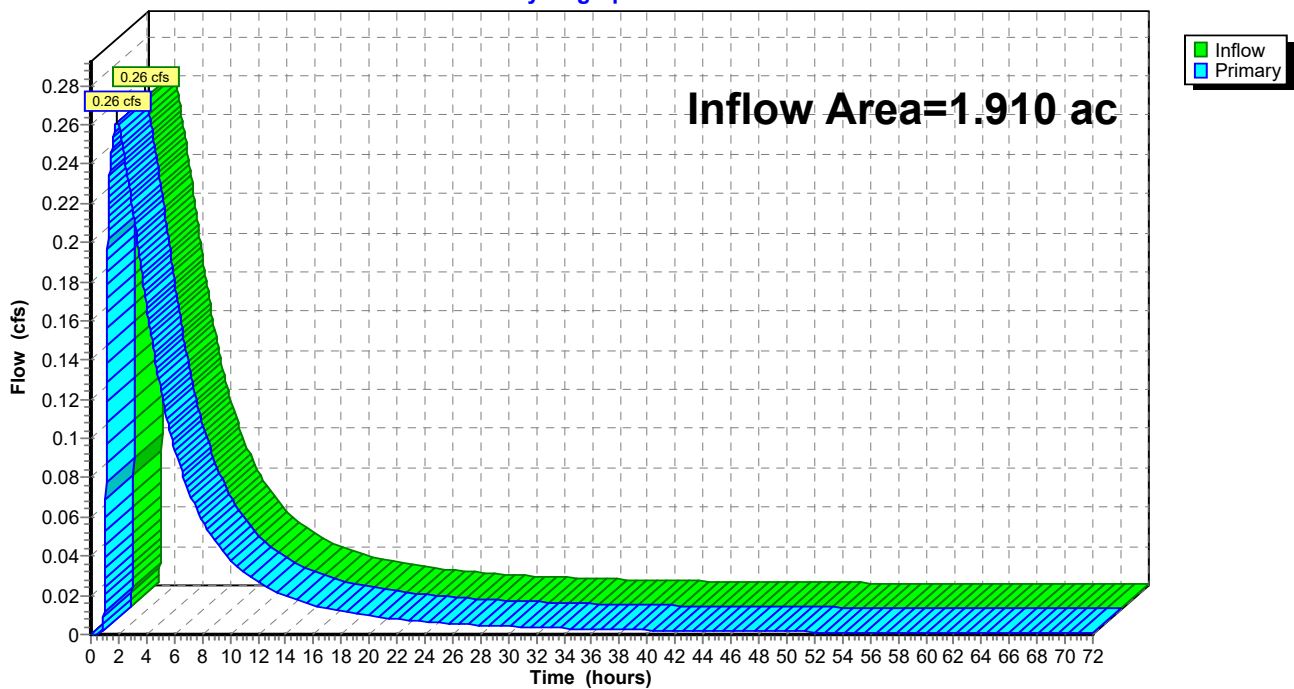
Summary for Link D3B: POD 3B

Inflow Area = 1.910 ac, 72.83% Impervious, Inflow Depth > 0.77" for E-NJDEP-WQ event
 Inflow = 0.26 cfs @ 1.86 hrs, Volume= 0.122 af
 Primary = 0.26 cfs @ 1.86 hrs, Volume= 0.122 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-DC : DUCK CREEK

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link D3B: POD 3B

Hydrograph



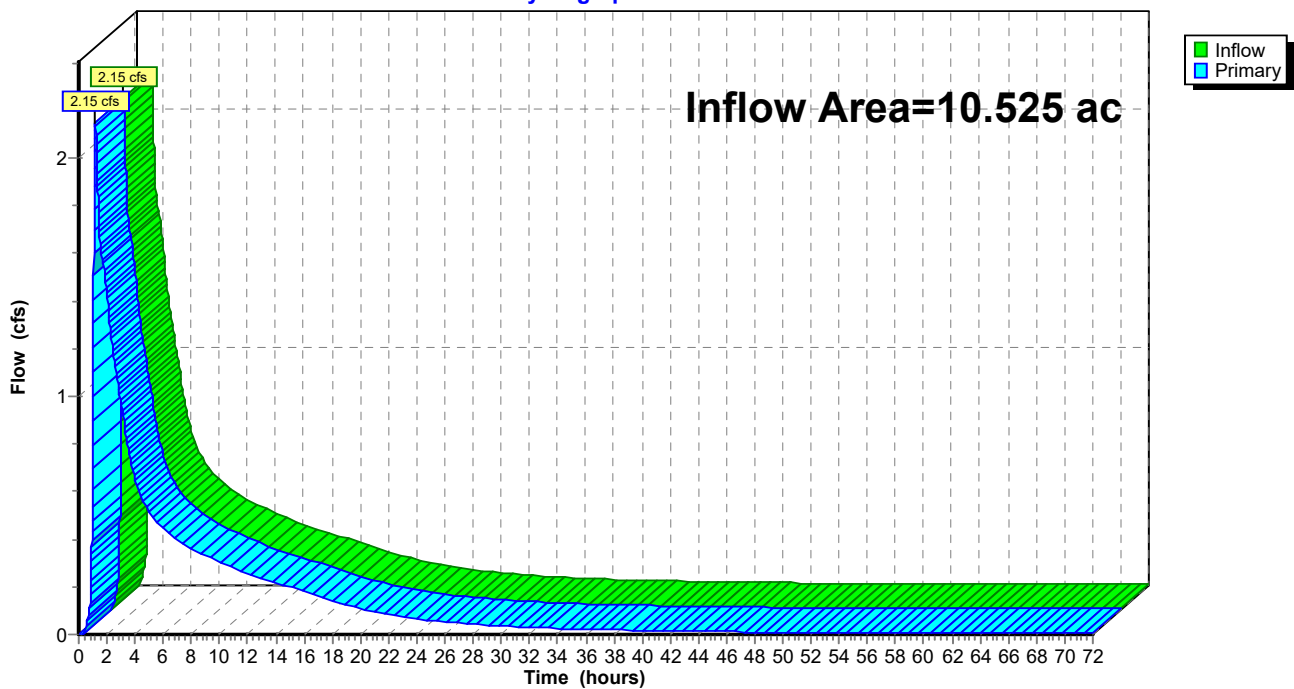
Summary for Link P-DC: DUCK CREEK

Inflow Area = 10.525 ac, 86.46% Impervious, Inflow Depth > 0.89" for E-NJDEP-WQ event
Inflow = 2.15 cfs @ 1.17 hrs, Volume= 0.780 af
Primary = 2.15 cfs @ 1.17 hrs, Volume= 0.780 af, Atten= 0%, Lag= 0.0 min
Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-DC: DUCK CREEK

Hydrograph



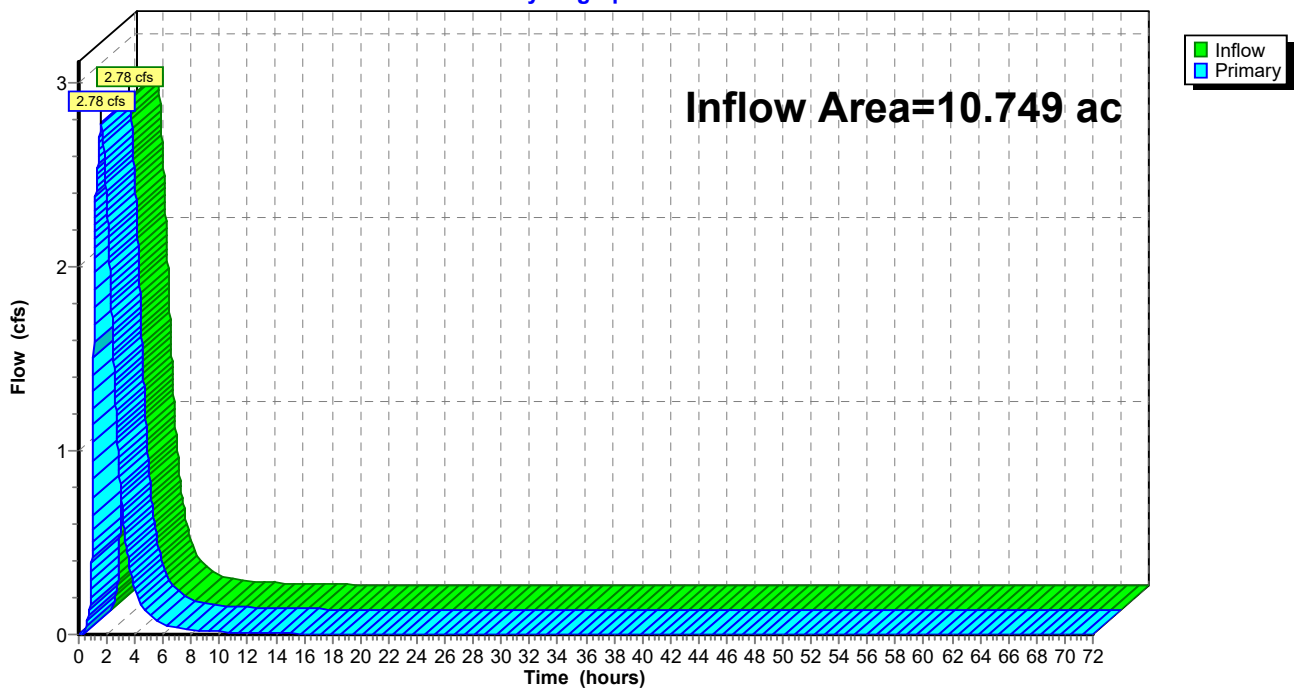
Summary for Link P-PC: POND CREEK

Inflow Area = 10.749 ac, 36.27% Impervious, Inflow Depth = 0.45" for E-NJDEP-WQ event
 Inflow = 2.78 cfs @ 1.56 hrs, Volume= 0.407 af
 Primary = 2.78 cfs @ 1.56 hrs, Volume= 0.407 af, Atten= 0%, Lag= 0.0 min
 Routed to Link P-SR : SOUTH RIVER

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P-PC: POND CREEK

Hydrograph



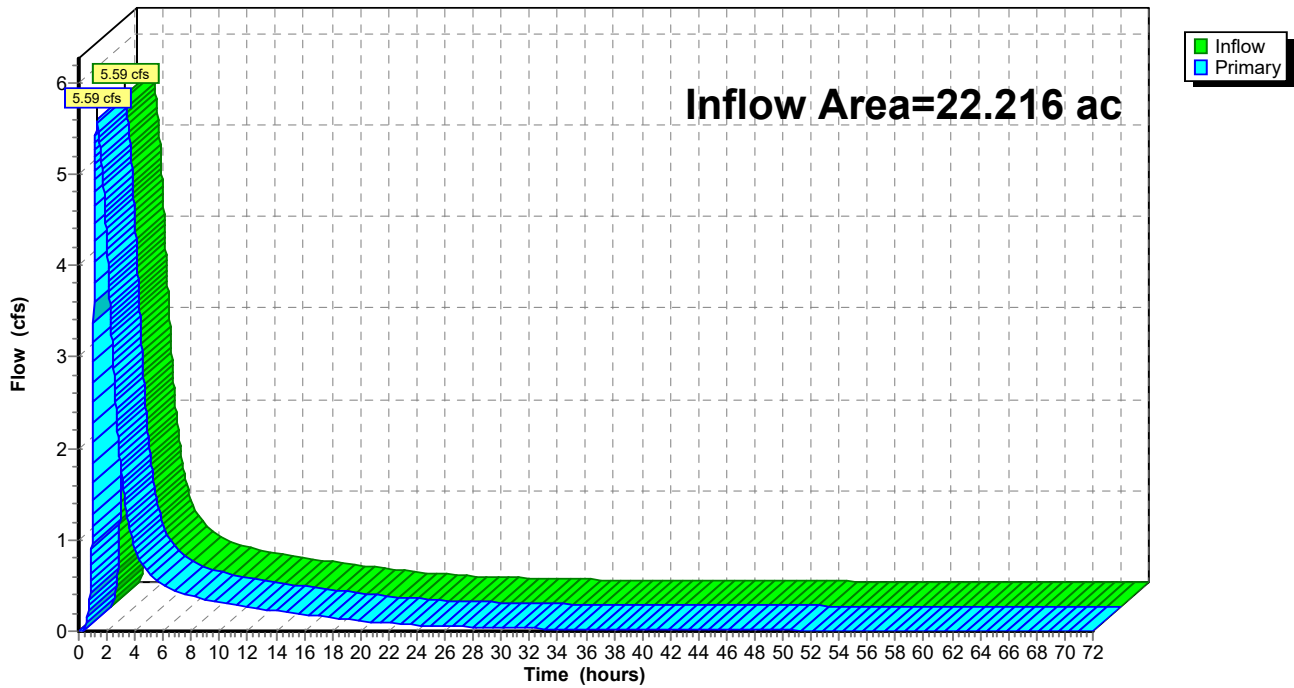
Summary for Link P-SR: SOUTH RIVER

Inflow Area = 22.216 ac, 62.75% Impervious, Inflow Depth > 0.68" for E-NJDEP-WQ event
Inflow = 5.59 cfs @ 1.28 hrs, Volume= 1.268 af
Primary = 5.59 cfs @ 1.28 hrs, Volume= 1.268 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

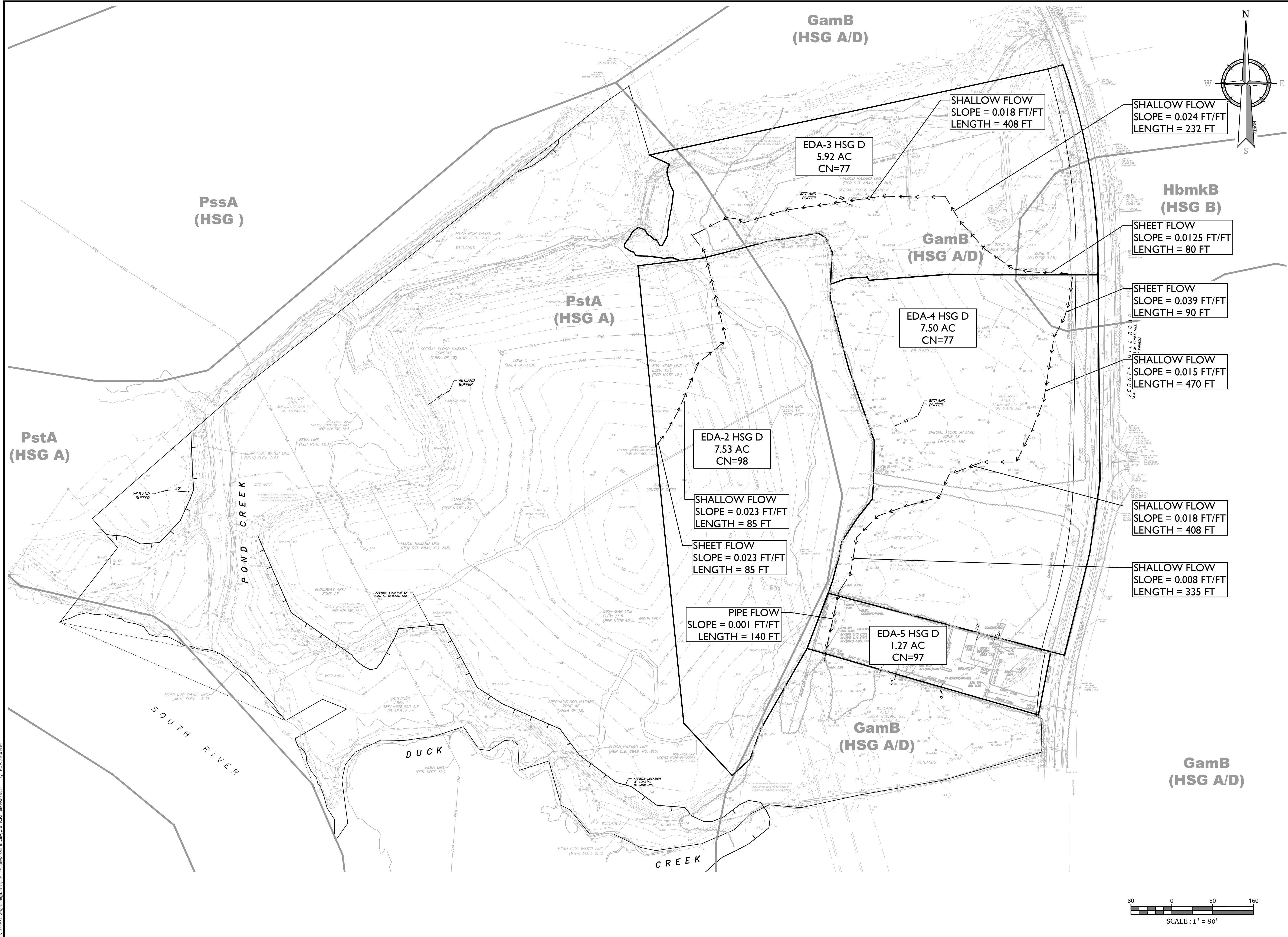
Link P-SR: SOUTH RIVER

Hydrograph



APPENDIX G

Drainage Area Maps Water Quality Exhibit



**GamB
(HSG A/D)**

**PssA
(HSG)**

**PstA
(HSG A)**

**GamB
(HSG A/D)**

**HbmkB
(HSG B)**

**PstA
(HSG A)**

**GamB
(HSG A/D)**

**GamB
(HSG A/D)**

EDA-3 HSG D
5.92 AC
CN=77

EDA-4 HSG D
7.50 AC
CN=77

EDA-2 HSG D
7.53 AC
CN=98

EDA-5 HSG D
1.27 AC
CN=97

SHALLOW FLOW
SLOPE = 0.018 FT/FT
LENGTH = 408 FT

SHALLOW FLOW
SLOPE = 0.024 FT/FT
LENGTH = 232 FT

SHEET FLOW
SLOPE = 0.0125 FT/FT
LENGTH = 80 FT

SHEET FLOW
SLOPE = 0.039 FT/FT
LENGTH = 90 FT

SHALLOW FLOW
SLOPE = 0.015 FT/FT
LENGTH = 470 FT

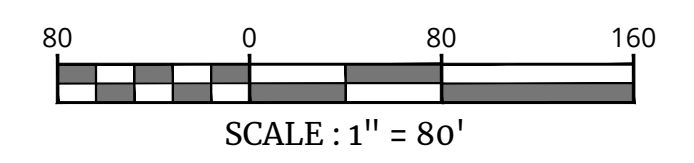
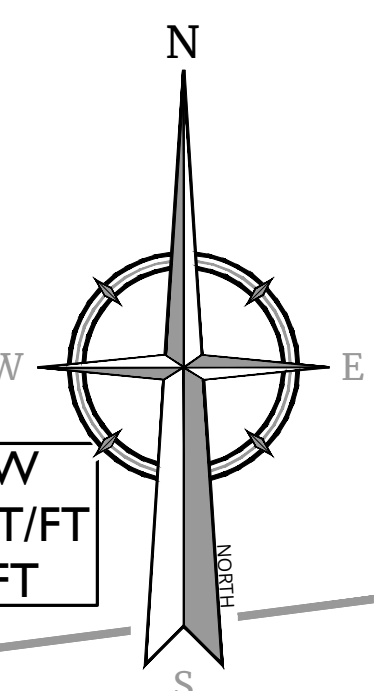
SHALLOW FLOW
SLOPE = 0.023 FT/FT
LENGTH = 85 FT

SHEET FLOW
SLOPE = 0.023 FT/FT
LENGTH = 85 FT

SHALLOW FLOW
SLOPE = 0.018 FT/FT
LENGTH = 408 FT

SHALLOW FLOW
SLOPE = 0.008 FT/FT
LENGTH = 335 FT

PIPE FLOW
SLOPE = 0.001 FT/FT
LENGTH = 140 FT



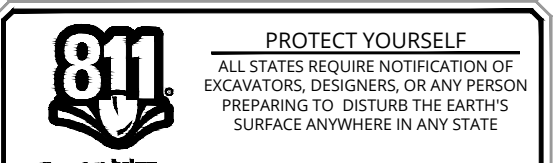
Colliers

Engineering & Design

www.colliersengineering.com

Copyright © 2025, Colliers Engineering & Design All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

Doing Business as **MASER CONSULTING**



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

REV	DATE	DESCRIPTION	DRAWN BY	TR	TBR	DATE	DESCRIPTION
1	4/20/24	MFS					REVISED PER CME REVIEW LETTER DATED 6/6/24
2	6/20/24	TR					REVISED PER BOROUGH COMMENTS
3	2/20/25	TBR					

DRAINAGE AREA MAPS

FOR
JERNEE MILL INDUSTRIAL

BLOCK 58
LOTS 2.01 & 9

BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

Colliers

Engineering & Design

HOLMDEL (Headquarters)
101 Crawford's Corner Road,
Suite 3400
Holmdel, NJ 07733
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

SCALE: AS SHOWN	DATE: 6/2023	DRAWN BY: SS	CHECKED BY: MFS
PROJECT NUMBER: 10000657C	DRAWING NAME: C-DRNG-EXISTING		

SHEET TITLE:
EXISTING DRAINAGE MAP

SHEET NUMBER:
1 of 3

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.

201010000657C:\Engineering\Change\Change\DRNG-EXISTING.dwg, 01.10.2025, DRNG-EXISTING MAP, BY: THOMAS BRUCKLEY

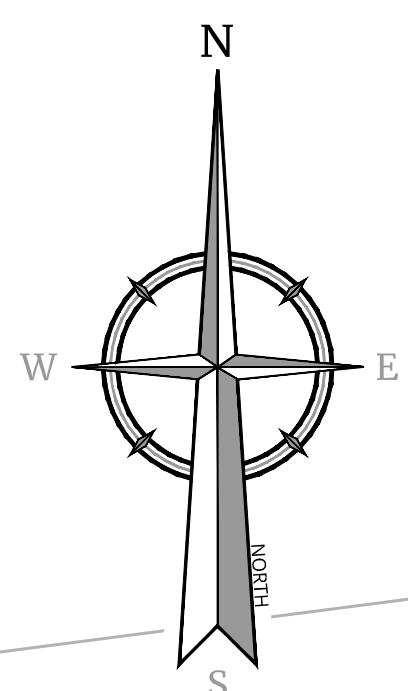
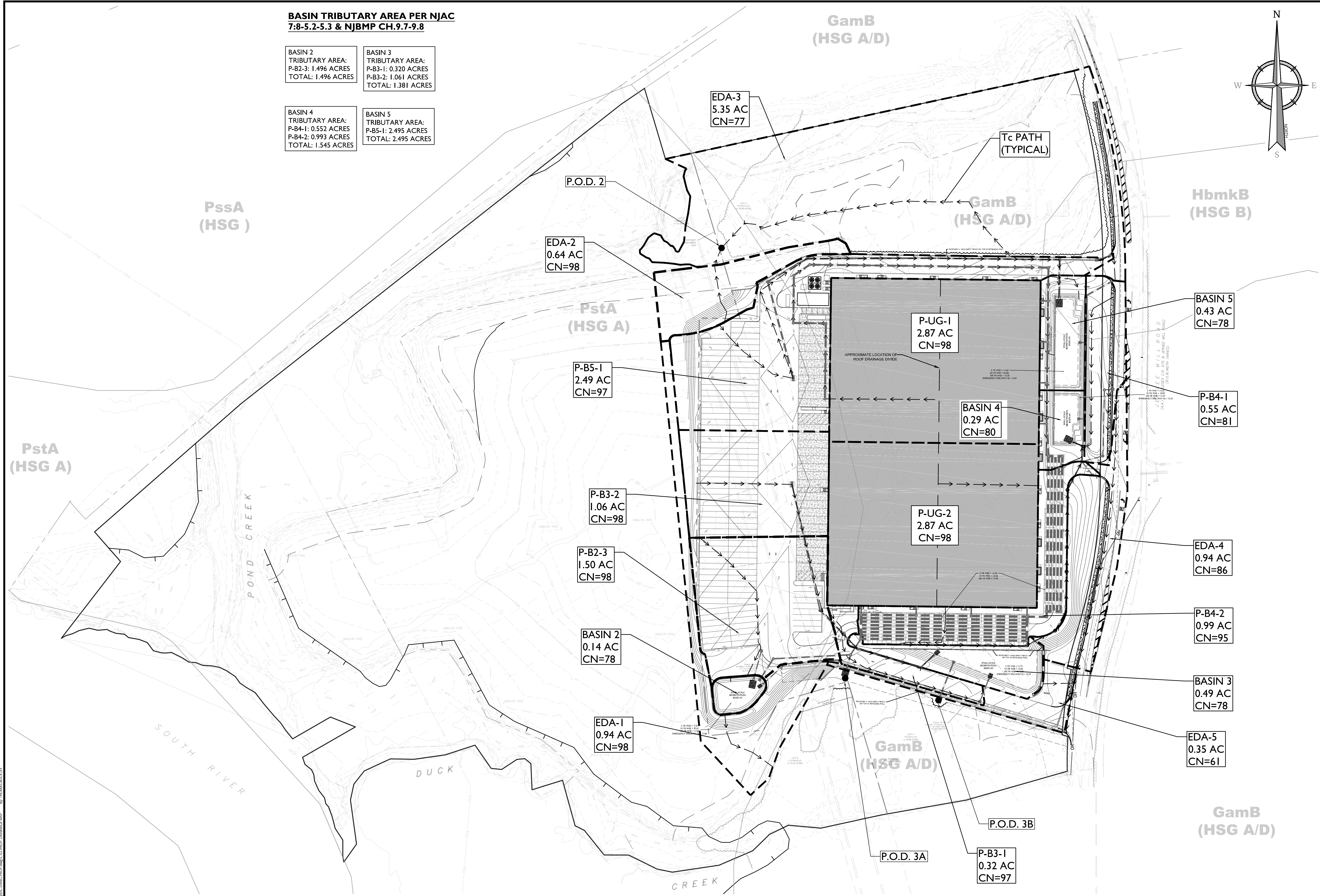
**BASIN TRIBUTARY AREA PER NJAC
7:8-5.2-5.3 & NJBMP CH.9.7-9.8**

BASIN 2
TRIBUTARY AREA:
P-B2-3: 1.496 ACRES
TOTAL: 1.496 ACRES

BASIN 3
TRIBUTARY AREA:
P-B3-1: 0.320 ACRES
P-B3-2: 1.061 ACRES
TOTAL: 1.381 ACRES

BASIN 4
TRIBUTARY AREA:
P-B4-1: 0.552 ACRES
P-B4-2: 0.993 ACRES
TOTAL: 1.545 ACRES

BASIN 5
TRIBUTARY AREA:
P-B5-1: 2.495 ACRES
TOTAL: 2.495 ACRES



Colliers

Engineering & Design

www.colliersengineering.com

Copyright © 2025, Colliers Engineering & Design All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for which the services were contracted or to whom it is loaned. This drawing may not be copied, reprinted, distributed, or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

Doing Business as **MASER CONSULTING**

811 PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION OF EXCAVATIONS, DISBURERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN ANY STATE
FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM

REV	DATE	DRAWN BY	DESCRIPTION
1	4/20/24	MFS	REVISED PER SHEET PLANS
2	6/20/24	TR	REVISED PER CME REVIEW LETTER DATED 6/6/24
3	2/20/25	TBB	REVISED PER SPOUGH COMMENTS

DRAINAGE AREA MAPS

FOR
JERNEE MILL INDUSTRIAL

BLOCK 58
LOTS 2.01 & 9

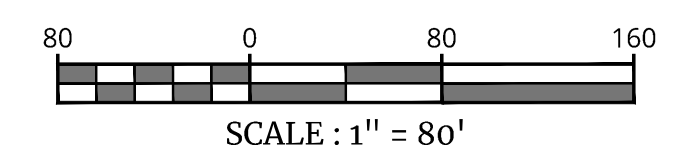
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

HOLMDEL (Headquarters)
101 Crawford's Corner Road,
Suite 3400
Holmdel, NJ 07733
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

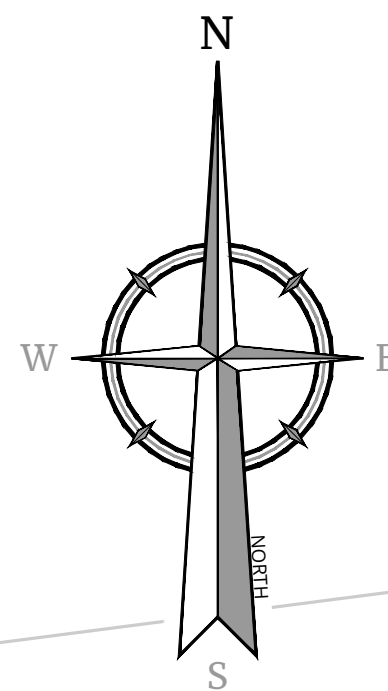
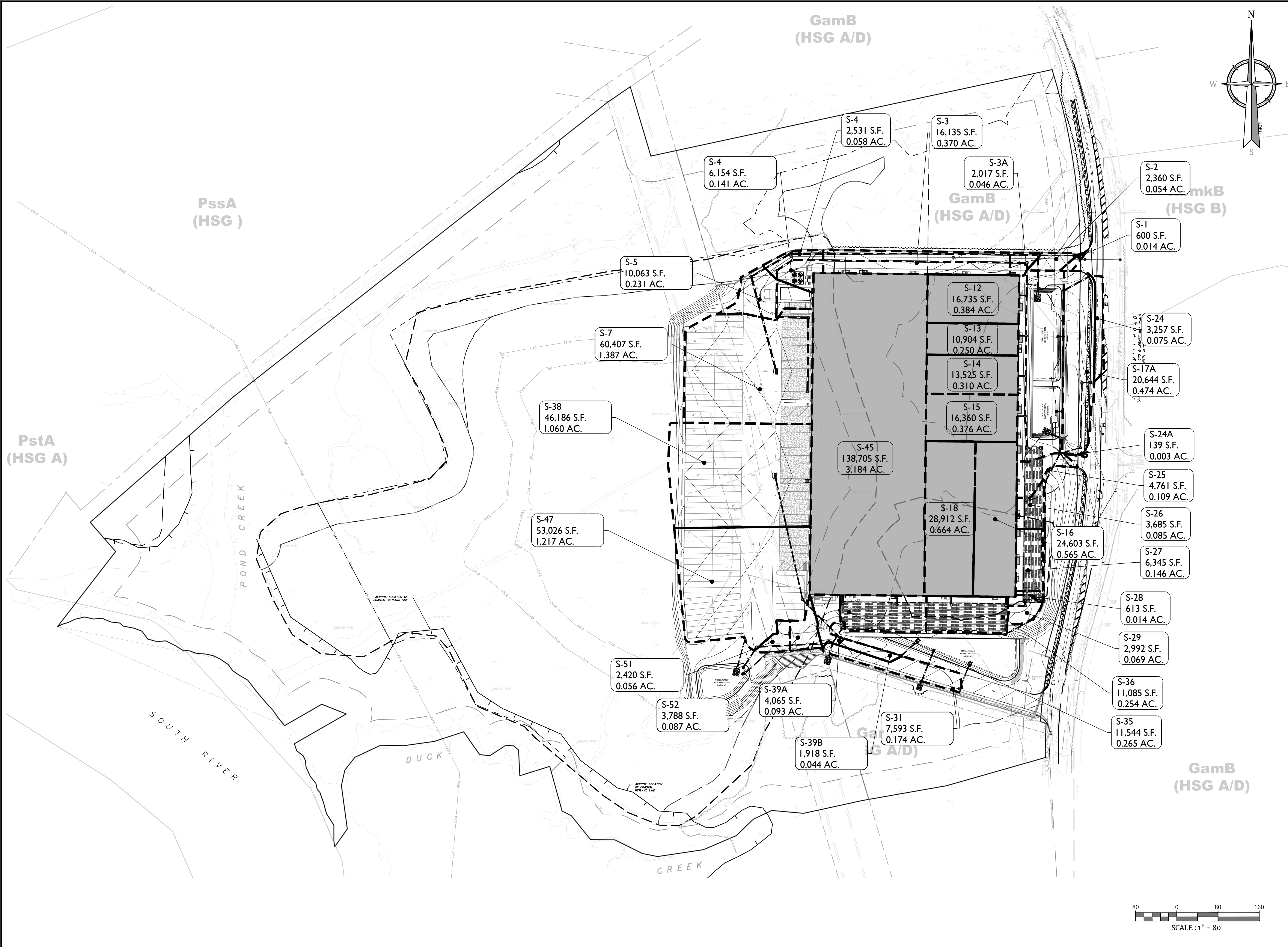
SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	6/2023	SS	MFS
PROJECT NUMBER:	DRAWING NAME:		
10000657C	C-DRNG-PROP		

SHEET TITLE:
PROPOSED DRAINAGE MAP

SHEET NUMBER:
2 of 3



NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.



Colliers
Engineering & Design
www.colliersengineering.com

Doing Business as **MASER CONSULTING**

811 PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN ANY STATE
FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM

REV	DATE	DESCRIPTION
1	4/2/24	MFS
2	6/2/24	TR REVISED PER CHECK REVIEW LETTER DATED 6/6/24
3	7/2/25	TJB REVISED PER BOROUGH COMMENTS

DRAINAGE AREA MAPS
FOR
JERNEE MILL INDUSTRIAL

BLOCK 58
LOTS 2.01 & 9

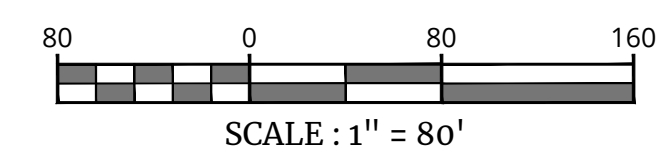
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

Colliers HOLMDEL (Headquarters)
Engineering & Design
101 Crawford's Corner Road,
Suite 3400
Holmdel, NJ 07733
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

SCALE: AS SHOWN	DATE: 6/2023	DRAWN BY: SS	CHECKED BY: MFS
PROJECT NUMBER: 10000657C	DRAWING NAME: C-DRNG-INLET		

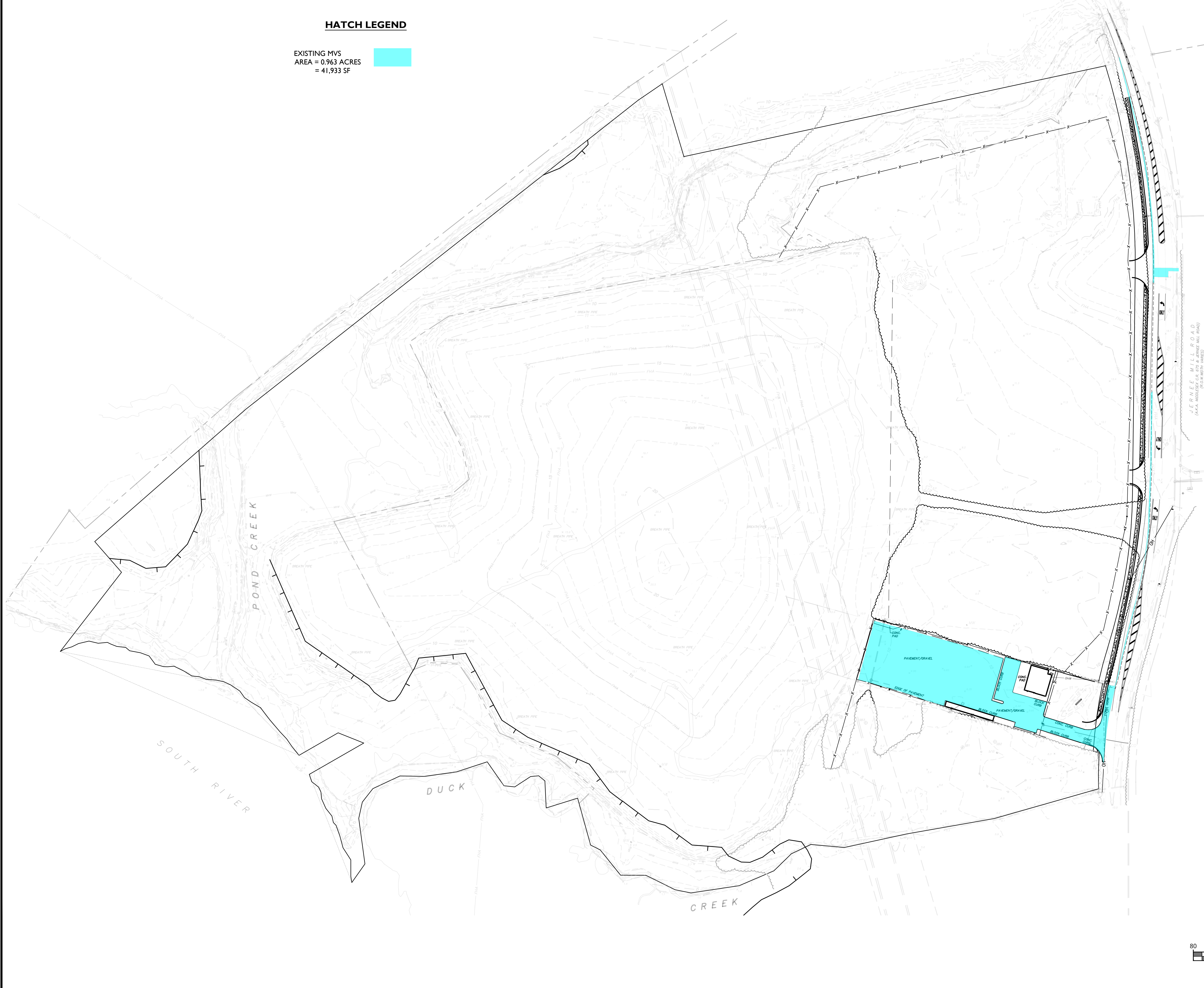
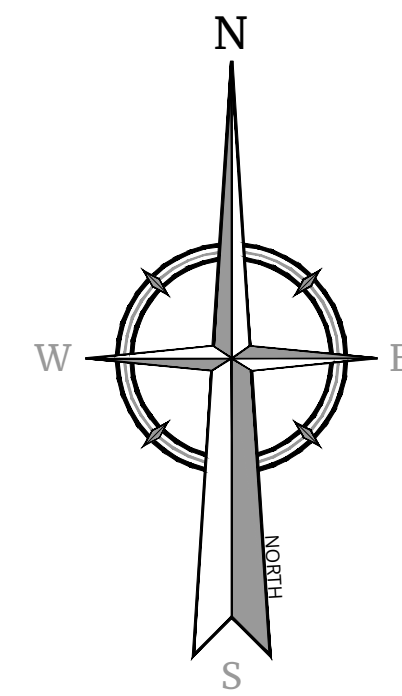
SHEET TITLE:
INLET DRAINAGE MAP

SHEET NUMBER:
3 of 3



HATCH LEGEND

EXISTING MVS
 AREA = 0.963 ACRES
 = 41,933 SF



2010/10/06/057/Engineering/CD/MS/C-EXBT-MVS MAP.dwg/ST/EXISTING MVS MAP BY THOMAS BUCKLEY

Colliers

Engineering & Design

www.colliersengineering.com

Copyright © 2025, Colliers Engineering & Design All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, revised, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

Doing Business as **MASER CONSULTING**



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

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

REV	DATE	DRAWN BY	DESCRIPTION

WATER QUALITY EXHIBIT

FOR
JERNEE MILL INDUSTRIAL

**BLOCK 58
 LOTS 2.01 & 9**

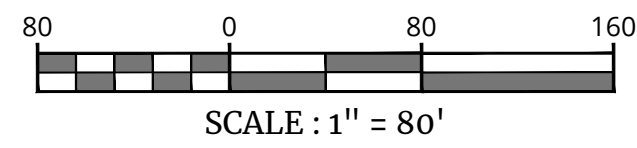
**BOROUGH OF SAYREVILLE
 MIDDLESEX COUNTY
 NEW JERSEY**

Colliers
 Engineering & Design
 101 Crawford's Corner Road,
 Suite 3400
 Holmdel, NJ 07733
 Phone: 732.383.1950
 COLLIER'S ENGINEERING & DESIGN, INC.
 DOING BUSINESS AS MASER CONSULTING


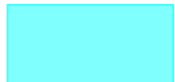
SCALE:	DATE:	DRAWN BY:	CHECKED BY:
AS SHOWN	6/28/24	TR	MFS
PROJECT NUMBER:	DRAWING NAME:		
10000657C	C-EXBT-MVS MAP		

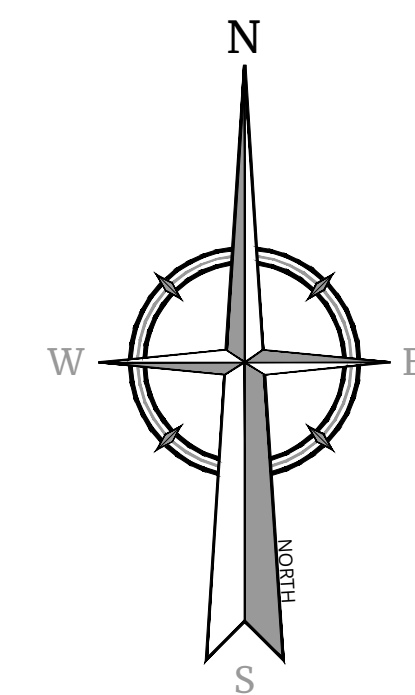
**EXISTING CONDITIONS
 WATER QUALITY EXHIBIT**

SHEET NUMBER:
1 of 2



HATCH LEGEND

- TREATED MVS
AREA = 5.079 ACRES
= 221,227 SF 
- NON-TREATED MVS
AREA = 0.482 ACRES
= 20,990 SF 

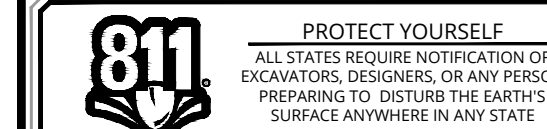


Engineering
& Design

www.colliersengineering.com

Copyright © 2025, Colliers Engineering & Design All Rights Reserved. This drawing and all the information contained herein is authorized for use only by the party for whom the services were contracted or to whom it is certified. This drawing may not be copied, reprinted, disclosed, distributed or relied upon for any other purpose without the express written consent of Colliers Engineering & Design.

Doing Business as 



PROTECT YOURSELF
ALL STATES REQUIRE NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN ANY STATE
FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT: WWW.CALL811.COM

REV.	DATE	DRAWN BY	DESCRIPTION

WATER QUALITY EXHIBIT

FOR
JERNEE MILL
INDUSTRIAL

BLOCK 58
LOTS 2.01 & 9

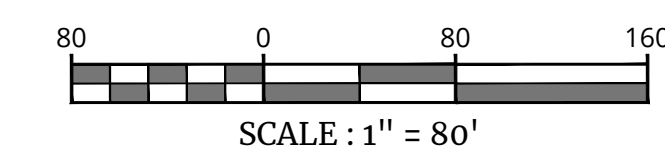
BOROUGH OF SAYREVILLE
MIDDLESEX COUNTY
NEW JERSEY

 **HOLMDEL (Headquarters)**
101 Crawford's Corner Road,
Suite 3400
Holmdel, NJ 07733
Phone: 732.383.1950
COLLIERS ENGINEERING & DESIGN, INC.
DOING BUSINESS AS MASER CONSULTING

SCALE: AS SHOWN	DATE: 6/28/24	DRAWN BY: TR	CHECKED BY: MFS
PROJECT NUMBER: 1000657C	DRAWING NAME: C-EXBT-MVS MAP		

SHEET TITLE:
**PROPOSED CONDITIONS
WATER QUALITY EXHIBIT**

SHEET NUMBER:
2 of 2



20101000657C:Engineering\CONTRACTS\0825\MVS MAP.dwg:6/28/24:TRP: WJD MAP: By: THOMAS BRIDLEY

NOTE: DO NOT SCALE DRAWINGS FOR CONSTRUCTION.



Engineering & Design

Colliers Engineering & Design is a trusted provider of multi-discipline engineering, design and consulting services providing customized solutions for public and private clients through a network of offices nationwide.

For a full listing of our office locations, please visit colliersengineering.com

1 877 627 3772



*Civil/Site • Traffic/Transportation • Governmental • Survey/Geospatial
Infrastructure • Geotechnical/Environmental • Telecommunications • Utilities/Energy*