STORMWATER MANAGEMENT REPORT

Prepared for:

1980 US HWY 1, LLC

Block 148, Lots 34, 35.01 & 36
1980 US Highway 1
Township of North Brunswick
Middlesex County, New Jersey

Prepared by:

BOHLER

N.J. Certificate of Authorization 24GA28161700

30 Independence Boulevard, Suite 200
Warren, NJ 07059
908-668-8300

BENJ File No. J200616

Bradford A. Bohler, P.E.
New Jersey Professional Engineer License No. 47421

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Table of Contents

Appendices

A. Pre- vs. Post-Development Hydrographs

- Water Quality Storm Events
- 2-Year Storm Event
- 10-Year Storm Event
- 100-Year Storm Event

B. Design Calculations

- Emergency Spillway
- Conduit Outlet Protection Calculations
- Basin Drain Time
- Water Quality Storm Basin Drain Time
- Roof Drain Pipe Sizing
- Low Impact Development Checklist
- Manufactured Treatment Device Certification
- Geotechnical Report

C. Maps

- Tax Map
- Aerial Map
- Soil Map
- State Planning Area Map
- USGS Map
- HUC14 Map
- Drainage Area Maps
  - Existing Drainage Area Map
  - Proposed Drainage Area Map

1. Introduction

The subject property is located at 1980 US Highway 1 in the Township of North Brunswick, Middlesex County, New Jersey. The property is identified as Block 148, Lots 34, 35.01 and 36 on the Township of North Brunswick tax maps and is a total of 17.11 acres in size and will hereafter be referred to as "the site". The site is bordered to the north by Route 1 with commercial uses beyond; to the east by Adams Lane with commercial uses beyond; to the west by wooded land and Excelsior Avenue with residential uses beyond; and to the south by wooded land and the Amtrak right-of-way beyond. A tax map and aerial map is included at the beginning of Appendix C for reference.

The site is currently developed with a industrial use within the I-2 Zone. The existing development includes an industrial building ancillary parking and loading areas, sidewalks, driveways, stormwater and utility improvements along the site frontage. The back of the site is mostly wooded and wetland areas in the existing condition which will be maintained with the proposed improvements. A proposed stormwater management system will convey the runoff from the proposed development and impervious areas.

This report summarizes the design objectives, methodology, and calculations for the conveyance, detention, treatment and discharge of stormwater runoff leaving the site and is meant to accompany the Site Plan documents prepared by Bohler. Pre-development and post-development conditions are examined for stormwater quantity analysis, water quality analysis, groundwater recharge, soil erosion and sediment control, and low impact development based on the *NJDEP Stormwater Management Regulations* of March 2020.

2. Pre-Development Site Conditions

The site contains a total area of 17.11 acres. The studied watershed area is a total of 25.704 acres in size and consists of four unique drainage areas: Existing Drainage Area #1A, Existing Drainage Area #1B, Existing Drainage Area #2A, and Existing Drainage Area #2B, which are described in more detail below. In the existing condition, the site is developed and includes an industrial building ancillary parking and loading areas, sidewalks, driveways, stormwater and utility improvements along the site frontage. Currently, the runoff generated on site outfalls to the pockets of wetlands that exist on the southern and western side of the site via overland flow. The Existing Drainage Area Map in Appendix C illustrates the limits of each existing drainage area and how they relate to the existing site conditions.

2.1 Point of Analysis 1

Both Existing Drainage Area 1A and 1B flow to one point of analysis which is the wetland pocket located near the northwestern property corner. The Existing Drainage Area Map

in Appendix C illustrates the identified point of analysis and how it relates to the existing topography on the site.

2.1.1 Existing Drainage Area #1A

Located to the north of the proposed site, Existing Drainage Area #1A contains 2.395 acres of land, of which 1.325 acres are impervious surface, and includes mostly the offsite residential lots that drain to the wetland area and the northwest corner of the subject site. Existing Drainage Area #1A is composed entirely of off-site areas or areas that have no proposed improvements. The topography of the area slopes from southwest to northeast from a maximum elevation of approximately 113.5 to a minimum elevation of approximately 107 with slopes ranging from 2% to 10%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 48.4 minutes. The runoff from Existing Drainage Area #1A flows to the existing wetland pocket in the existing and proposed conditions and will be accounted for in the proposed stormwater management design. Existing Drainage Area #1A discharges to Point of Analysis 1.

2.1.2 Existing Drainage Area #1B

Existing Drainage Area #1B, which contains 5.463 acres of land, of which 3.494 acres are impervious surface, and includes the front portion of the site which flows to the existing wetlands at the northwest portion of the site. The topography of the area slopes from south to north from a maximum elevation of approximately 113.3 to a minimum elevation of approximately 107 with slopes ranging from 0% to 33%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 12.7 minutes. The runoff from Existing Drainage Area #1A flows from south to north into an existing depression along the site frontage on Route 1 and ultimately discharges to Point of Analysis 1.

2.2 Point of Analysis 2

Both Existing Drainage Area 2A and 2B flow to one point of analysis which is the wetland pocket located along the rear of the site. The Existing Drainage Area Map in Appendix C illustrates the identified point of analysis and how it relates to the existing topography on the site.

2.2.1 Existing Drainage Area #2A

Existing Drainage Area #2A, which contains 7.026 acres of land, of which 5.953 acres are impervious surface, and includes the rear portion of the site which flows to the existing wetlands at the southwest corner of the site. The topography of

the area slopes from north to south from a maximum elevation of approximately 113.3 to a minimum elevation of approximately 109 with slopes ranging from 0% to 33%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 72.3 minutes. The runoff from Existing Drainage Area #2A flows from north to south and ultimately discharges to Point of Analysis 2.

2.2.2 Existing Drainage Area #2B

Existing Drainage Area #1B, which contains 10.821 of land, of which 1.597 acres are impervious surface, and includes offsite areas to the west of the site and the existing wetland areas which are not to be disturbed in the proposed condition. The topography of the area slopes from east to west from a maximum elevation of approximately 148 to a minimum elevation of approximately 109 with slopes ranging from 0% to 45%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 62.9 minutes. The runoff from Existing Drainage Area #2B flows from east to west and ultimately discharges to Point of Analysis 2.

2.3 Pre-Development Flow Summary

TABLE 2.1

DATA	EXISTING DRAINAGE AREA #1A	EXISTING DRAINAGE AREA #1B	TOTAL TO POINT OF ANALYSIS 1	EXISTING DRAINAGE AREA #2A	EXISTING DRAINAGE AREA #2B	TOTAL TO POINT OF ANALYSIS 2
Area (acres)	2.395	5.463	7.858	7.026	10.821	17.847
Impervious (acres)	1.325	3.494	4.819	5.953	1.597	7.550
Tc (min)	48.4	12.7	48.4	72.3	62.9	72.3
2 Yr. Flow (CFS)	2.44	5.71	8.15	6.93	6.73	13.66
10 Yr. Flow (CFS)	4.15	7.42	11.57	10.99	13.22	24.21
100 Yr. Flow (CFS)	7.65	17.52	25.17	19.13	27.08	46.21

3. Post-Development Site Conditions

The post-development condition for the site includes the construction of a ±191,903 SF Industrial building with associated parking fields and loading areas, driveways, sidewalks, utility infrastructure, stormwater mechanical treatment devices, a bioretention basin facility, and other site improvements. The proposed site is designed in a manner that generally maintains the existing drainage patterns. The studied watershed area in the post-development condition

contains the same 25.704 acre area that was studied in the pre-development condition and consists of five unique drainage areas: Proposed Drainage Area #1A, Proposed Drainage Area #1B, Proposed Drainage Area #1C, Proposed Drainage Area #2A and Proposed Drainage Area #2B, which are described in more detail below.

A proposed stormwater conveyance system will collect the runoff from the proposed buildings and impervious areas via pervious pavement areas, inlets, manholes, and stormwater piping and redirect it to the proposed Filterra Water Quality Units or the bioretention basin on the site. The construction of the proposed improvements will occupy approximately 10.07 acres of land of which approximately 9.16 acres will be impervious coverage on the site in the post-development condition. The Proposed Drainage Area Map in Appendix C illustrates the limits of each proposed drainage area and how they relate to the proposed site conditions

3.1 Point of Analysis 1

Proposed Drainage Area 1A, 1B & 1C all flow to the same point of analysis in the post development condition flow that was identified in the existing condition, located near the northwestern property corner. As noted above, the Proposed Drainage Area Map in Appendix C illustrates the identified point of analysis and how it relates to the proposed topography on the site.

3.1.1 Proposed Drainage Area #1A

Proposed Drainage Area #1A is the same in the post-development condition as it was in the pre-development condition. No additional impervious areas are proposed within Proposed Drainage Area #1A and it continues to be 2.395 acres in size, of which 1.325 acres are impervious surface. Proposed Drainage Area #1A remains composed entirely of off-site areas or areas that have no proposed improvements. The topography of the area slopes from southeast to northwest from a maximum elevation of approximately 113.5 to a minimum elevation of approximately 107 with slopes ranging from 2% to 10%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 48.4 minutes. The runoff from Proposed Drainage Area #1A flows to the existing wetland pocket at the northwest corner of the site. Proposed Drainage Area #1A discharges to Point of Analysis 1.

The proposed peak runoff rates for Proposed Drainage Area #1A are analyzed at Point of Analysis 1, combined with the flows from Proposed Drainage Area #1B and Proposed Drainage Area #1C. The proposed runoff from Proposed Drainage Area #1A meets the stormwater management criteria set forth in NJAC § 7:8-5.4(a)3.i. The proposed runoff hydrograph for Proposed Drainage Area #1A does not exceed the existing runoff hydrograph for Existing Drainage Area #1A for the same storm events at any point along the hydrograph. Refer to

Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.1.2 Proposed Drainage Area 1B

Proposed Drainage Area #1B consists of approximately 1.346 acres of land, of which 1.265 acres are impervious surface, and includes the proposed proposed front parking field, sidewalks, driveways, stormwater and utility infrastructure. The drainage area also contains grass and landscape areas. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with an calculated time of concentration of 1.4 minutes. The runoff from Proposed Drainage Area #1B is captured by pervious pavement and detained before being discharged into the modified existing depression along the Route 1 frontage, and ultimately flows to the wetlands at the northwest corner of the site and Point of Analysis 1. The routing of the runoff from Proposed Drainage Area #1B is depicted on the Inlet Area Map in Appendix C.

The proposed peak runoff rates for Proposed Drainage Area #1B are analyzed at Point of Analysis 1, combined with the flows from Proposed Drainage Area #1A, and Proposed Drainage Area #1C. The flows tributary to Point of Analysis 1 from Proposed Drainage Area #1B meets the stormwater management criteria set forth in NJAC § 7:8-5.4(a)3.iii. Post-development peak runoff rates for the 2-, 10-, and 100-year storm events for flows tributary to Point of Analysis 1 meet or exceed the 50, 75 and 80 percent reductions, respectively, of the pre-development peak runoff rates. Refer to Section 3.3 for a comparison of pre-development flows to the post-development flows. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.1.3 Proposed Drainage Area #1C

Proposed Drainage Area #1C consists of approximately 1.821 acres of land, of which 1.123 acres are impervious surface, and includes off-site areas within the Route 1 Right-of-Way and on-site areas that flow directly to the modified existing depression along the site frontage. The on-site areas are treated by a Filterra Filter for 80% TSS prior to being discharged into the modified existing depression. A CN value of 98 and 80 were used for impervious and pervious areas, respectively, with an calculated time of concentration of 12.7 minutes. The runoff from Proposed Drainage Area #1C is routed through the modified existing depression and ultimately flows to the existing wetlands at the northwest corner of the site as it does in the pre-development condition. The routing of the runoff from Proposed Drainage Area #1C is depicted on the Inlet Area Map in Appendix C.

The proposed peak runoff rates for Proposed Drainage Area #1C are analyzed at Point of Analysis 1, combined with the flows from Proposed Drainage Area #1A, and Proposed Drainage Area #1B. The flows tributary to Point of Analysis 1 from Proposed Drainage Area #1C meets the stormwater management criteria set forth in NJAC § 7:8-5.4(a)3.iii. Post-development peak runoff rates for the 2-, 10-, and 100-year storm events for flows tributary to Point of Analysis 1 meet or exceed the 50, 75 and 80 percent reductions, respectively, of the pre-development peak runoff rates. Refer to Section 3.3 for a comparison of pre-development flows to the post-development flows. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.2 Point of Analysis 2

Proposed Drainage Area 2A & 2B all flow to the same point of analysis in the post development condition flow that was identified in the existing condition, located within the wetland along the rear of the site. As noted above, the Proposed Drainage Area Map in Appendix C illustrates the identified point of analysis and how it relates to the proposed topography on the site.

3.2.1 Proposed Drainage Area #2A

The remainder of the area of study in the post-development condition falls within Proposed Drainage Area #2A, which contains approximately 9.200 acres of land, of which 7.842 acres are impervious surface, and includes the area within the site that flows through the proposed stormwater improvements including the bioretention basin and 3 pervious pavement areas. The runoff from Proposed Drainage Area #2A is discharged into the wetland areas at the southwest corner of the site as it does in the existing conditions. A CN value of 98, 80 and 77 were used for impervious, wooded and grass areas, respectively, with a calculated time of concentration of 5.3 minutes. The routing of the runoff from Proposed Drainage Area #2A is depicted on the Proposed Drainage Area Map in Appendix C.

The proposed peak runoff rates for Proposed Drainage Area #2A are analyzed at Point of Analysis 2, combined with the flows from Proposed Drainage Area #2B. The flows tributary to Point of Analysis 1 from Proposed Drainage Area #2A meet the stormwater management criteria set forth in NJAC § 7:8-5.4(a)3.iii. Post-development peak runoff rates for the 2-, 10-, and 100-year storm events for flows tributary to Point of Analysis 2 meet or exceed the 50, 75 and 80 percent reductions, respectively, of the pre-development peak runoff rates. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.2.2 Proposed Drainage Area #2B

Proposed Drainage Area #2B is the same in the post-development condition as it was in the pre-development condition. No additional impervious areas are proposed within Proposed Drainage Area #2B and it continues to be 10.821 acres in size, of which 1.597 acres are impervious surface. Proposed Drainage Area #2B remains composed entirely of off-site areas or areas that have no proposed improvements. The topography of the area slopes from southwest to northeast from a maximum elevation of approximately 148 to a minimum elevation of approximately 109 with slopes ranging from 1% to 45%. A CN value of 98, 80 and 77 were used for impervious, grass and wooded areas, respectively, with a calculated time of concentration of 62.9 minutes. The runoff from Proposed Drainage Area #2B flows to the existing wetland pocket at the southwest corner of the site. Proposed Drainage Area #2B discharges to Point of Analysis 2.

The proposed peak runoff rates for Proposed Drainage Area #2B are analyzed at Point of Analysis 2, combined with the flows from Proposed Drainage Area #2A. The proposed runoff from Proposed Drainage Area #2B meets the stormwater management criteria set forth in NJAC § 7:8-5.4(a)3.i. The proposed runoff hydrograph for Proposed Drainage Area #2B does not exceed the existing runoff hydrograph for Existing Drainage Area #2B for the same storm events at any point along the hydrograph. Refer to Sections 2.2 and 3.3 for pre-development and post-development flows, respectively.

3.3 Proposed Structural Stormwater Management Strategies

The five drainage areas in the post development condition flow to the same point of analysis identified in the existing condition. Three of the drainage areas, Proposed Drainage Area #1B, Proposed Drainage Area #1C, and Proposed Drainage Area #2A, flow through the proposed on-site stormwater management system, which is described in more detail below.

3.3.1 Bio-Retention Systems

As part of the stormwater management design of the proposed site, a bio-retention system is proposed to capture water from a portion of the roof area. The bio-retention system meets the minimum requirements outlined in the *New Jersey Stormwater Best Management Practices Manual* by providing 18 inches of soil bed depth, an underdrain system, containment and treatment of the entire Water Quality Design Storm volume, a storage depth of less than 12 inches maximum in a flat-bottom system, and 1 foot minimum of separation between the bottom of the bio-retention basin and the seasonal

high ground water table. The bio-retention system can achieve between 80% TSS removal although it is treating clean runoff from the roof.

TABLE 3.2.1

DESIGN PARAMETERS		
TSS Removal Rate	**Depth of Soil Bed**	**Vegetation**
80%	18 inches	Terrestrial Forested Community
Storage Volume	Entire Water Quality Design Storm Volume	
Minimum Density of Vegetation	85%	
Appropriate Species Selection	See Chapter 7 of the *NJ Stormwater Best Management Practices Manual*	
Maximum Design Storm Drain Time	72 Hours, Using Slowest Design Permeability Rate	
Permeability Rate Factor of Safety	2	
Minimum Subsoil Design Permeability Rate	2 inches/hour	
Soil Testing Requirements	Must be consistent with Appendix E of the *NJ Stormwater Best Management Practices Manual*	

3.3.2 Manufactured Treatment Devices

Two Filterra High Capacity Biofiltration Systems are proposed on site for areas that is was not feasible to treat with another form of Green Infrastructure due to constraints on the space or in invert. The Filterra High Capacity Biofiltration Systems have been sized to treat the entire WQ design storm to a TSS removal rate of 80% for the area the filters will be serving before discharging to the points of analysis.

3.3.3 Pervious Paving Systems

Pervious paving materials have been proposed as part of the overall site design and stormwater management system to provide 80% TSS removal for pervious paved surfaces, and reduce the flow of runoff. The pervious paving system has been designed to have a maximum ratio of additional inflow area to the pavement surface area of less than 3:1, a maximum surface slope of 5%, a storage bed that fully contains the Water Quality Design Storm runoff volume.

TABLE 3.2.8

DESIGN PARAMETERS	
Porous Asphalt, Pervious Concrete and Permeable Interlocking Paver Units	6.4 inches/hour Minimum Infiltration Rate

3.3.4 Emergency Spillways

The emergency spillways associated with the proposed basins have been designed to pass a design storm that is equivalent to the 100-year storm plus 50%. At least one foot of freeboard is provided above the peak water elevation while the emergency spillway is operating.

3.4 Pre and Post-Development Flow Summary

TABLE 3.3

EXISTING DRAINAGE AREA 1 FLOW SUMMARY

	Existing Drainage Area #1B	Total Flows Requiring Reductions (cfs)	Required Reductions	Existing Drainage Area #1B Reduced Flow	Existing Drainage Area #1A	Total Flows Exempt from Reductions (cfs)	Maximum Allowable Flow to Point of Analysis 1
2 yr. Flow (cfs)	**5.71**	**5.71**	**50%**	**2.86**	**2.44**	**2.44**	**5.30**
10 yr. Flow (cfs)	**7.42**	**7.42**	**25%**	**5.57**	**4.15**	**4.15**	**9.72**
100 yr. Flow (cfs)	**17.52**	**17.52**	**20%**	**14.02**	**7.65**	**7.65**	**21.67**

EXISTING DRAINAGE AREA 2 FLOW SUMMARY

	Existing Drainage Area #2A	Total Flows Requiring Reductions (cfs)	Required Reductions	Existing Drainage Area #2A Reduced Flow	Existing Drainage Area #2B	Total Flows Exempt from Reductions (cfs)	Maximum Allowable Flow to Point of Analysis 2
2 yr. Flow (cfs)	**6.93**	**6.93**	**50%**	**3.47**	**6.73**	**6.73**	**10.20**
10 yr. Flow (cfs)	**10.99**	**10.99**	**25%**	**8.24**	**13.22**	**13.22**	**21.46**
100 yr. Flow (cfs)	**19.13**	**19.13**	**20%**	**15.30**	**27.08**	**27.08**	**42.38**

PROPOSED FLOWS WITH REDUCTIONS

	Maximum Allowable Flow to Point of Analysis 1 (cfs)	Total Proposed Flows to Point of Analysis 1 (cfs)	Maximum Allowable Flow to Point of Analysis 2 (cfs)	Total Proposed Flows to Point of Analysis 2 (cfs)
2 yr. Flow (cfs)	5.30	5.20	10.20	9.15
10 yr. Flow (cfs)	9.72	8.57	21.46	17.17
100 yr. Flow (cfs)	21.67	14.56	42.38	38.89

4. Stormwater Management Design Methodology

In accordance with the NJDEP Stormwater Management Regulations, the proposed development must meet the requirements, if appropriate, for stormwater quantity reductions, water quality, groundwater recharge, soil erosion and sediment control, and low impact development. The following sections describe how each of the above items are addressed on site in the post-development condition.

4.1 Stormwater Quantity Controls

The Assessment of stormwater quantity has been based upon the Soil Conservation Service Method (SCS) Unit Hydrograph as described in Technical Release Number 55 (TR55), "Urban Hydrology for Small Watersheds". Theoretical storms are modeled with the 24-Hour SCS Unit Dimensionless Hydrograph using the NOAA Atlas 14 Type D rainfall distribution and recurrence intervals of 2, 10, and 100 years. Hydrograph creation and routings are accomplished using the *HydroCAD* Version 10.00 program by HydroCAD Software Solutions, LLC. The following techniques from the *NJDEP Stormwater Management Regulations* is being applied to each drainage area as noted in section 3.3:

NJDOT

- No additional flow or volume discharge to NJDOT stormwater systems for any storm event

1. NJAC § 7:8-5.4(a)3.i states for stormwater runoff leaving the site, post-development runoff hydrographs for the 2-, 10-, and 100-year storms do not exceed, at any point in time, the pre-development runoff hydrographs for the same storm events. The above section of the NJAC will be applied to drainage areas that, under proposed conditions, will remain unchanged or have a net decrease in impervious coverage.

2. NJAC § 7:8-5.4(a)3.iii states the post-development peak runoff rates for the 2-, 10-, and 100-year storm events are 50, 75, and 80 percent, respectively, of the pre-development peak runoff rates. The above section of the NJAC will be applied to

drainage areas that are impacted by the proposed development and flow to a detention or retention system.

3. NJAC § 7:8-5.4(a)3.iv states in tidal flood hazard areas, stormwater runoff quantity analysis in accordance with (a) 3i, or iii above shall only be applied if the increase in volume of stormwater runoff could increase flood damages below the point of discharge.

The project's proposed stormwater management facilities for stormwater peak flow attenuation will consist of a bioretention basin, four pervious pavement areas and an existing depression that is being modified during the propose improvements addressing the drainage areas outlined in Section 3 of this report. The study requires the establishment of a point of analysis, as indicated in Section 2. Existing and proposed CN and Tc calculations, as well as existing and proposed hydrographs are provided in Appendix A. The information below describes the methodology in which the stormwater calculations were procured.

4.1.1 Site Soils

Site soil information has been obtained from the USDA Natural Resources Conservation Service (NRCS) web soil survey database, last revised in 2015. The major soil types present on site include Fallsington Bedrock Substratum Variant Loam, which is a poorly drained soil with 0 to 2 percent slopes, Elkton Loam, which is poorly drained with 0 to 2 percent slopes, Nixon Moderately Well Drained Wariant- Urban Land with 0 to 5 percent slopes, Lansdowne-Urban Land complex with 0 to 6 percent slopes, Udorthents with clayey substratum and 0 to 8 percent slopes and Nixon Moderately Well Drained Variant Loam with 0 to 2 percent slopes. These soils are classified as Hydrologic Soil Group Type C & D soils therefore, values used in the CN and time of concentration calculations are associated with Type C or D soils depending on where on site they are.

4.1.2 Rainfall Data

Rainfall data used in the stormwater calculations of this report are obtained from several different sources based on the latest NJDEP stormwater regulations. The Water Quality storm event is based on the NJDEP BMP Manual Chapter 5 definition of having a total rainfall depth of 1.25 inches and a total duration of two (2) hours. Twenty-four-hour rainfall frequency data in Middlesex County for all other storms is obtained from the NOAA Atlas 14, Volume 2, Precipitation-Frequency Atlas of the United States, updated in 2006 and listed in the table below:

TABLE 4.1

Event (year)	1	2	5	10	25	50	100
Rainfall (in)	2.76	3.35	4.30	5.12	6.36	7.43	8.63

4.1.3 Pipe Sizing

Calculations for sizing the stormwater pipe networks associated with the proposed stormwater management conveyance system can be found in Appendix B of this report. The Rational Method has been used to size the storm piping for the 25-year storm event. The calculations are conservatively based on a time of concentration of 6 minutes to any inlet. An Inlet Area Map is included in Appendix C.

4.2 Water Quality Controls

Water quality analysis is based on the requirements of NJAC § 7:8-5.5, which requires 80% TSS removal of post-development runoff from new impervious areas before discharging the runoff. A bioretention basin, four pervious pavement areas and two Filterra High Capacity Biofiltration Systems are proposed to provide 80% TSS removal for all impervious areas on the site and thus meet the water quality requirements.

4.3 Groundwater Recharge

The NJDEP Stormwater Management Regulations require that a proposed land development site comply with either of the following groundwater recharge requirements:

1. Demonstrate that 100% of the site's average annual pre-developed groundwater recharge volume will be maintained after development; or

2. Demonstrate that 100 percent of the difference between the site's pre-development and post-development 2-year runoff volume is infiltrated.

Additionally, NJAC § 7:8-5.4(a)2 states that the groundwater recharge requirement does not apply to projects within the urban redevelopment area nor projects where recharge would be inconsistent with a remedial action work plan.

The subject site is in State Planning Area 1, which is marked for urban redevelopment. Additionally, the existing infiltration rates on site do not meet the minimum tested rate of 1 in/hour to allow for infiltration to be proposed on site. Therefore, groundwater recharge is not required.

4.4 Soil Erosion and Sediment Control

The Soil Erosion and Sediment Control plans and details are included within the Site Plan documents prepared by Bohler and must be followed throughout construction. Silt fences, stabilized construction entrances, a temporary stockpile and inlet filters are proposed during construction. It is noted that stormwater from the site during construction will discharge to an existing wetland area; therefore, the offsite stability is considered stable. This report and the Site Plan documents prepared by Bohler are being submitted to the Freehold Soil Conservation District for approval.

4.5 Low-Impact Development and Non-Structural Stormwater Management Facilities

In accordance with the NJDEP regulations and the latest *New Jersey Stormwater Best Management Practices Manual*, several non-structural stormwater management strategies have been incorporated into the design of the site and are listed below:

4.5.1 Vegetation and Landscaping

A comprehensive Landscape Plan has been incorporated into the design of the proposed improvements on the site that provides low maintenance landscaping. The use of lawn areas has been minimized where applicable and fertilizers and pesticides are to be used sparingly.

4.5.1.1 Preservation of Natural Areas

The design of the improvements proposed on the site has preserved critical natural areas as part of the development. Specifically, large areas of wetlands along the western and southern sides of the site have been left outside the limit of disturbance. In some areas, the proposed development will remove existing improvements within wetland transition areas and convert them to landscape areas. The natural areas will be protected during construction and will have easements and/or deed restrictions established as required by other NJDEP regulations and permits to ensure these areas remain preserved in the future.

4.5.1.2 Native Ground Cover

Native plants including ground cover, shrubs and trees instead of turf grass have been proposed as part of the landscape design for the site. The native plantings will also require little or no irrigation once they are established.

4.5.2 Minimize Land Disturbance

The proposed design of the site incorporates the preservation of existing vegetative areas that will remain undisturbed. The undisturbed areas will be protected during construction and will have easements and/or deed restrictions established as required by other NJDEP regulations and permits to ensure these areas remain undisturbed in the future

4.5.3 Impervious Area Management

Impervious areas are the primary source of additional runoff in the post-development site condition. The sections below describe the measures that have been taken in the proposed site design to minimize the amount of impervious proposed on site

4.5.3.1 Streets, Sidewalks, and Parking, Driveway Areas

As part of the proposed site design, the minimum allowable parking and drive aisle sizes, in accordance with local ordinances are used in lieu of larger stalls and aisles to reduce the amount of impervious surface in the post-development condition.

4.5.4 Preventative Source Controls

The proposed development complies with this strategy by providing dumpster areas.

5. Conclusions

As demonstrated in the above sections, the stormwater management plan for the proposed development meets the *NJDEP Stormwater Management Regulations* of March 2020, and addresses the requirements for stormwater quantity reductions, water quality, groundwater recharge, soil erosion and sediment control, and low impact development. As a result of the design calculations contained herein, Bohler Engineering anticipates that the stormwater design will not have a negative impact to surrounding areas.

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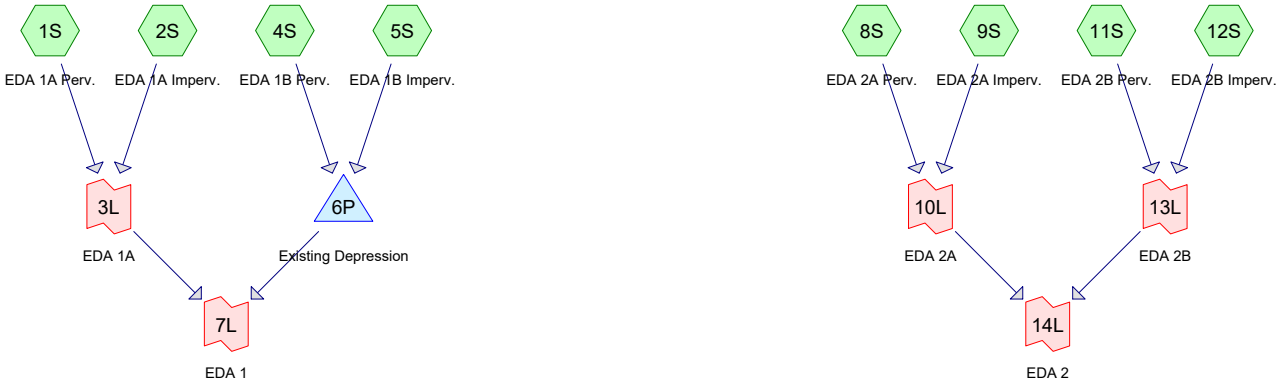
A. PRE- vs. POST-DEVELOPMENT HYDROGRAPHS

- **Water Quality Storm Event**
- **2-Year Storm Event**
- **10-Year Storm Event**
- **100-Year Storm Event**



Subcat Reach Pond Link

Routing Diagram for Existing

Prepared by Bohler Engineering, Printed 8/12/2021

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=405' Tc=48.4 min CN=77 Runoff=0.12 cfs 0.010 af

Subcatchment 2S: EDA 1A Imperv. Runoff Area=1.325 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=405' Tc=48.4 min CN=98 Runoff=1.44 cfs 0.114 af

Subcatchment 4S: EDA 1B Perv. Runoff Area=1.969 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=653' Tc=12.7 min CN=80 Runoff=0.65 cfs 0.028 af

Subcatchment 5S: EDA 1B Imperv. Runoff Area=3.494 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=653' Tc=12.7 min CN=98 Runoff=7.98 cfs 0.301 af

Subcatchment 8S: EDA 2A Perv. Runoff Area=1.074 ac 0.00% Impervious Runoff Depth=0.10"
Flow Length=1,211' Tc=72.3 min CN=76 Runoff=0.08 cfs 0.009 af

Subcatchment 9S: EDA 2A Imperv. Runoff Area=5.953 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=1,211' Tc=72.3 min CN=98 Runoff=4.81 cfs 0.513 af

Subcatchment 11S: EDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=591' Tc=62.9 min CN=77 Runoff=0.90 cfs 0.090 af

Subcatchment 12S: EDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=591' Tc=62.9 min CN=98 Runoff=1.43 cfs 0.138 af

Pond 6P: Existing Depression Peak Elev=109.46' Storage=4,105 cf Inflow=8.56 cfs 0.330 af
Outflow=4.94 cfs 0.330 af

Link 3L: EDA 1A Inflow=1.53 cfs 0.125 af
Primary=1.53 cfs 0.125 af

Link 7L: EDA 1 Inflow=5.99 cfs 0.454 af
Primary=5.99 cfs 0.454 af

Link 10L: EDA 2A Inflow=4.88 cfs 0.522 af
Primary=4.88 cfs 0.522 af

Link 13L: EDA 2B Inflow=2.24 cfs 0.228 af
Primary=2.24 cfs 0.228 af

Link 14L: EDA 2 Inflow=7.11 cfs 0.750 af
Primary=7.11 cfs 0.750 af

Total Runoff Area = 25.706 ac Runoff Volume = 1.204 af Average Runoff Depth = 0.56"
51.88% Pervious = 13.337 ac 48.12% Impervious = 12.369 ac

Summary for Subcatchment 1S: EDA 1A Perv.

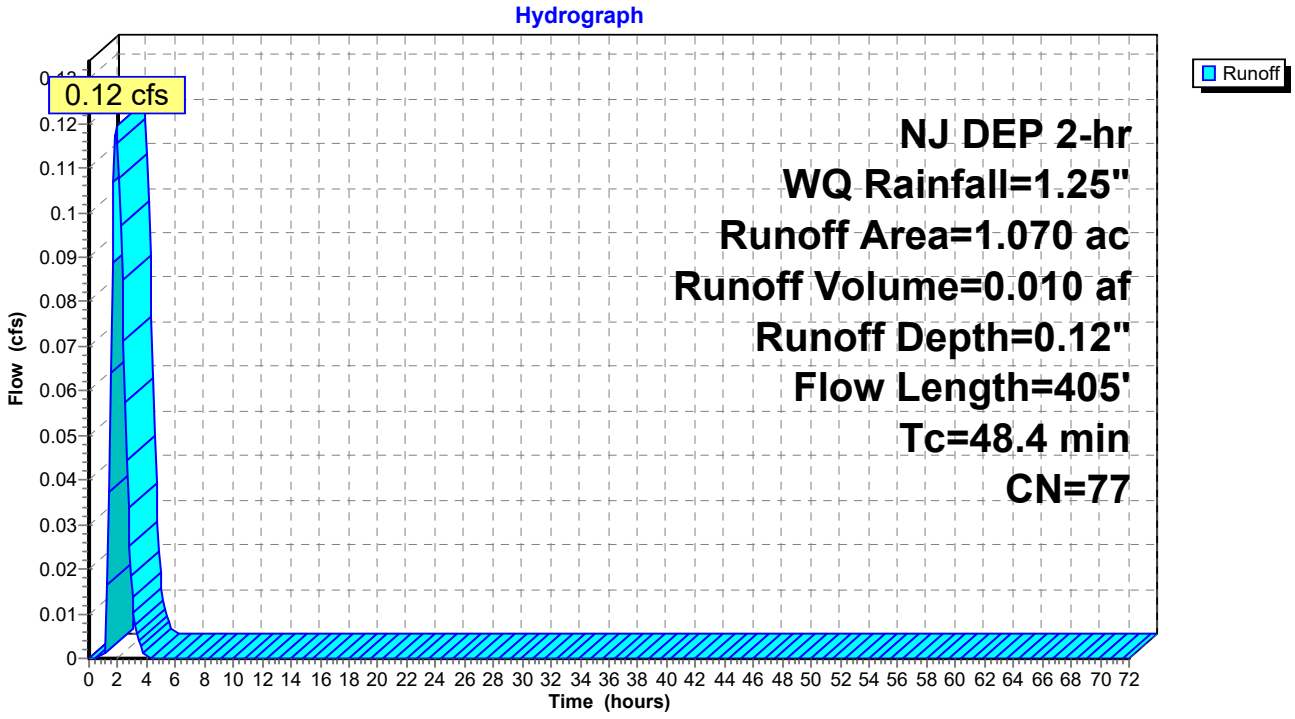
Runoff = 0.12 cfs @ 1.89 hrs, Volume= 0.010 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 1S: EDA 1A Perv.



Summary for Subcatchment 2S: EDA 1A Imperv.

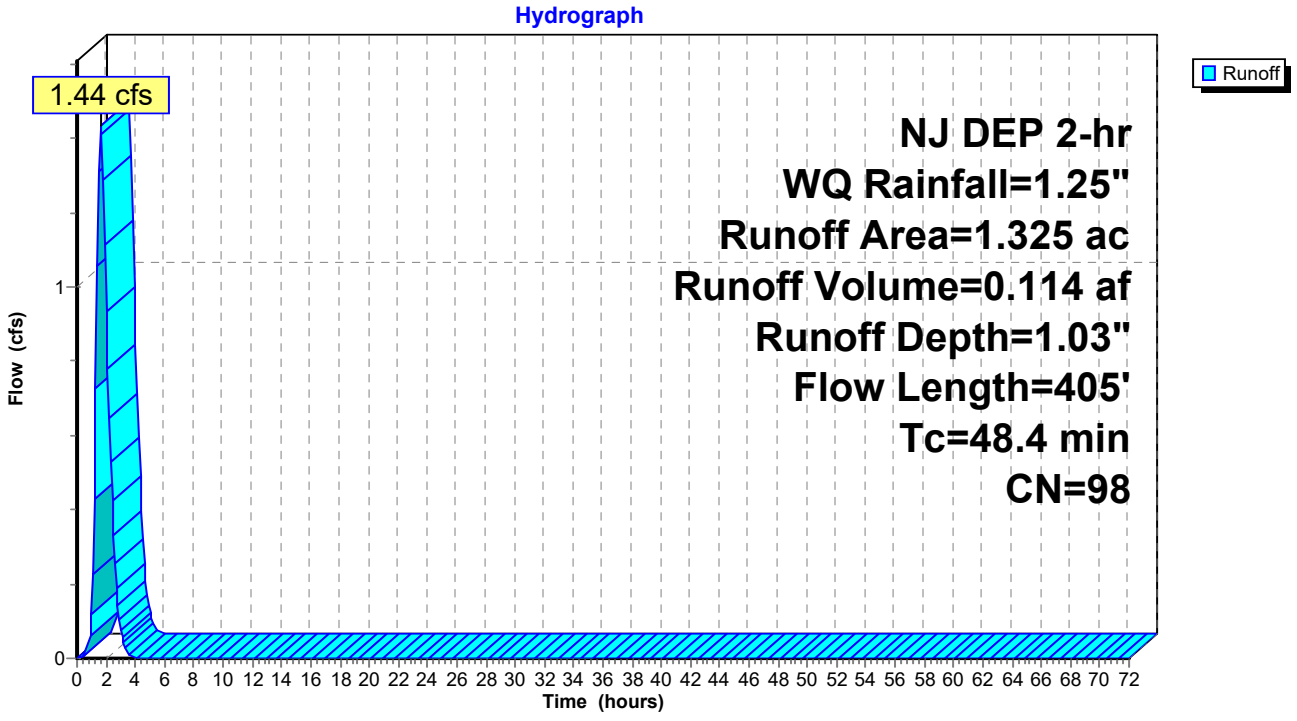
Runoff = 1.44 cfs @ 1.64 hrs, Volume= 0.114 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.325	98	Paved parking, HSG D
1.325		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 2S: EDA 1A Imperv.



Summary for Subcatchment 4S: EDA 1B Perv.

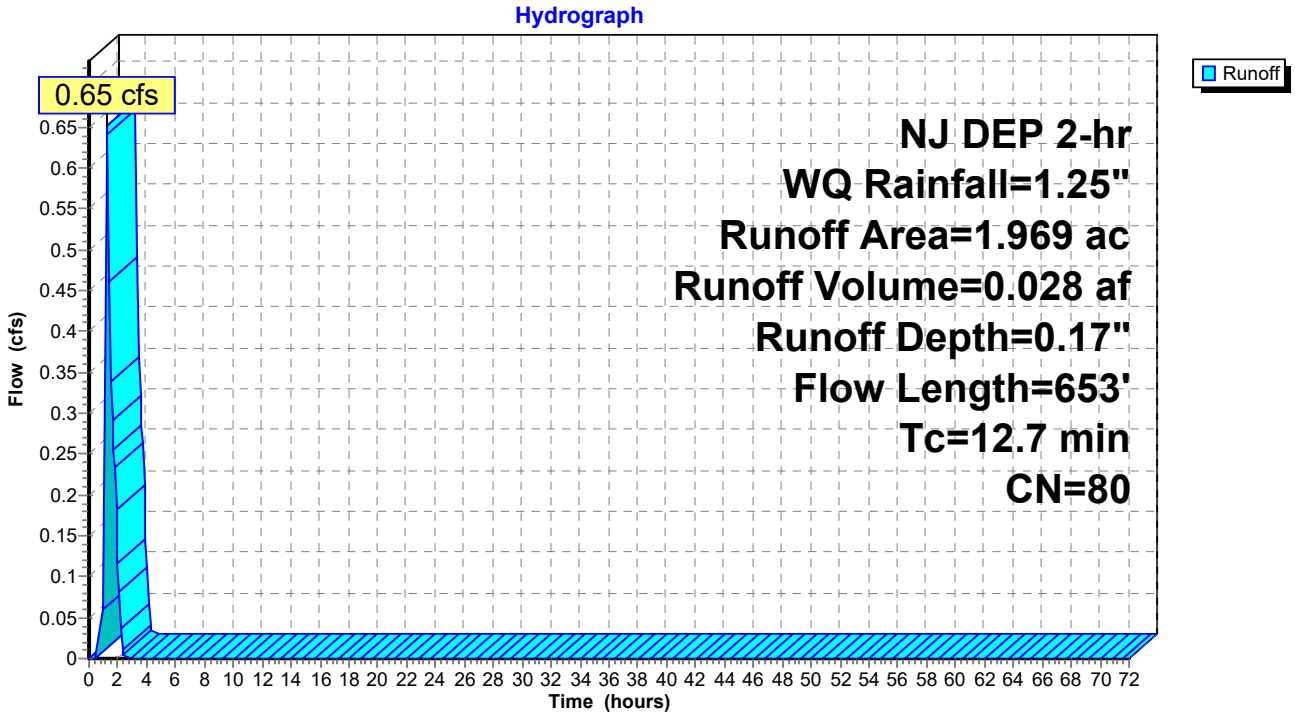
Runoff = 0.65 cfs @ 1.27 hrs, Volume= 0.028 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
1.969	80	>75% Grass cover, Good, HSG D
1.969	80	Weighted Average
1.969		100.00% Pervious 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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 4S: EDA 1B Perv.



Summary for Subcatchment 5S: EDA 1B Imperv.

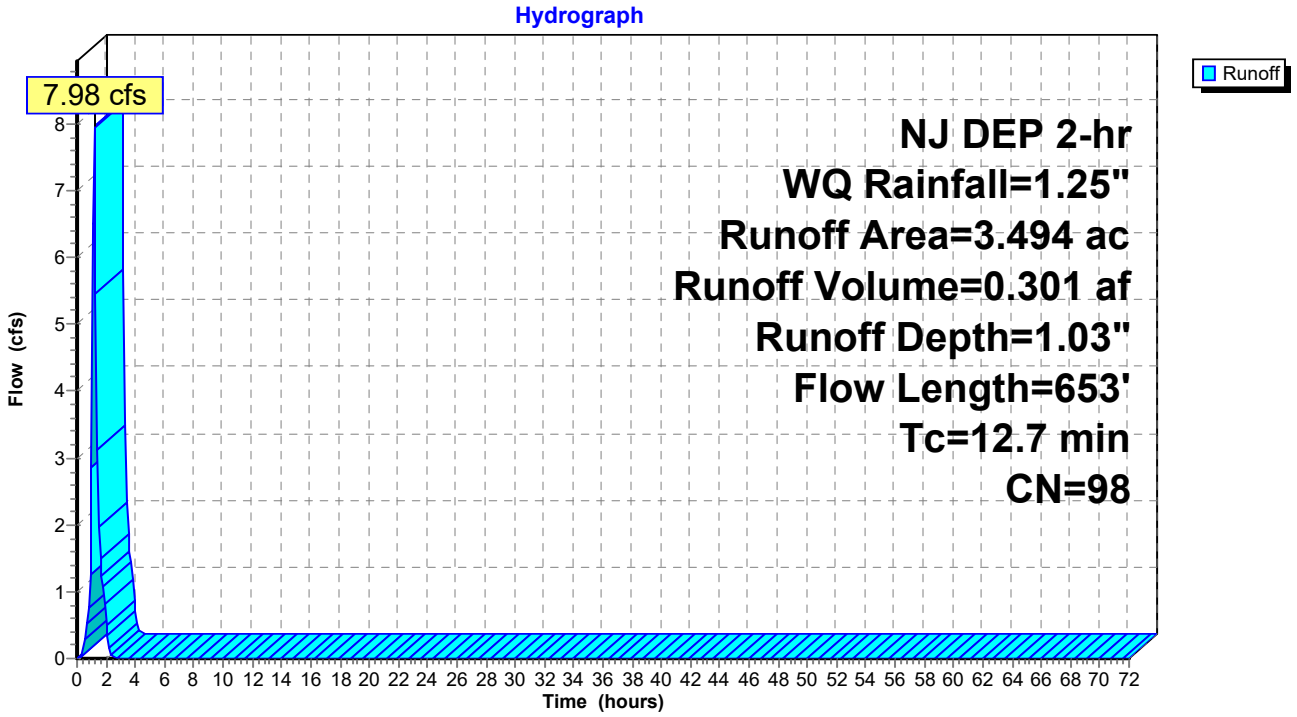
Runoff = 7.98 cfs @ 1.19 hrs, Volume= 0.301 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
3.494	98	Paved parking, HSG D
3.494		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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 5S: EDA 1B Imperv.



Summary for Subcatchment 8S: EDA 2A Perv.

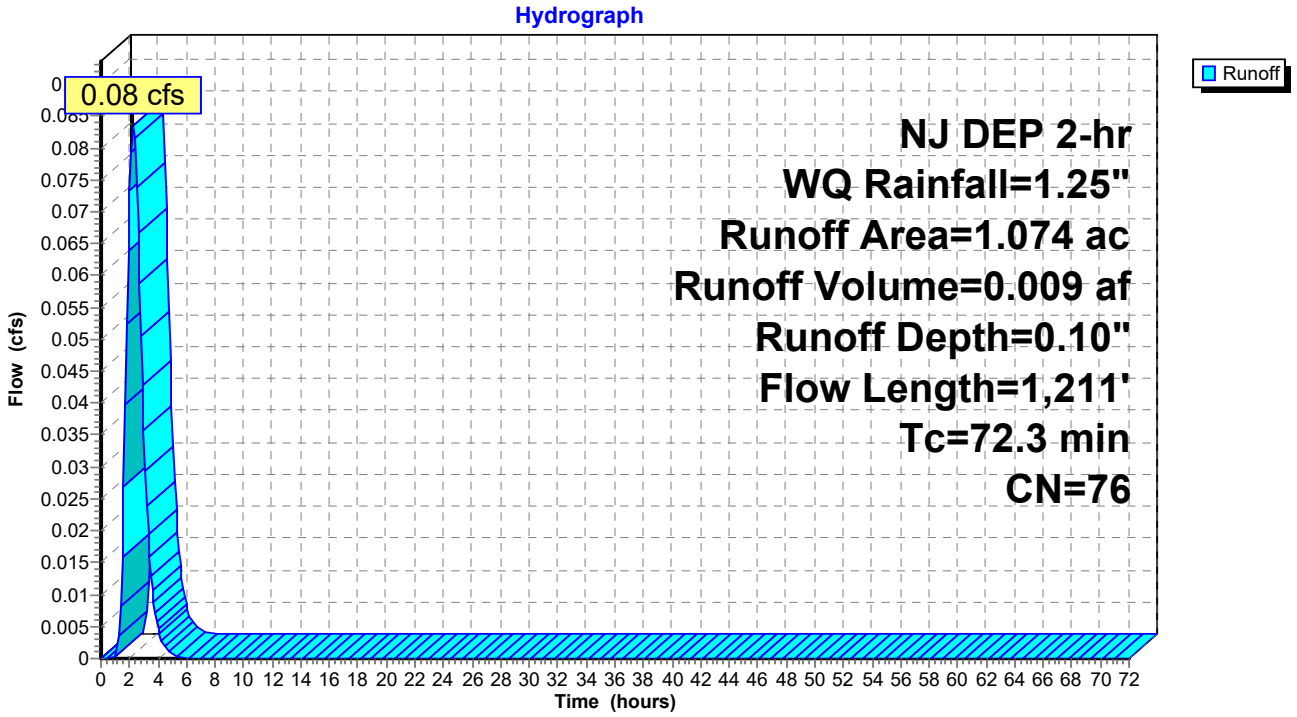
Runoff = 0.08 cfs @ 2.26 hrs, Volume= 0.009 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.143	77	Woods, Good, HSG D
0.383	70	Woods, Good, HSG C
0.483	80	>75% Grass cover, Good, HSG D
0.065	74	>75% Grass cover, Good, HSG C
1.074	76	Weighted Average
1.074		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 8S: EDA 2A Perv.



Summary for Subcatchment 9S: EDA 2A Imperv.

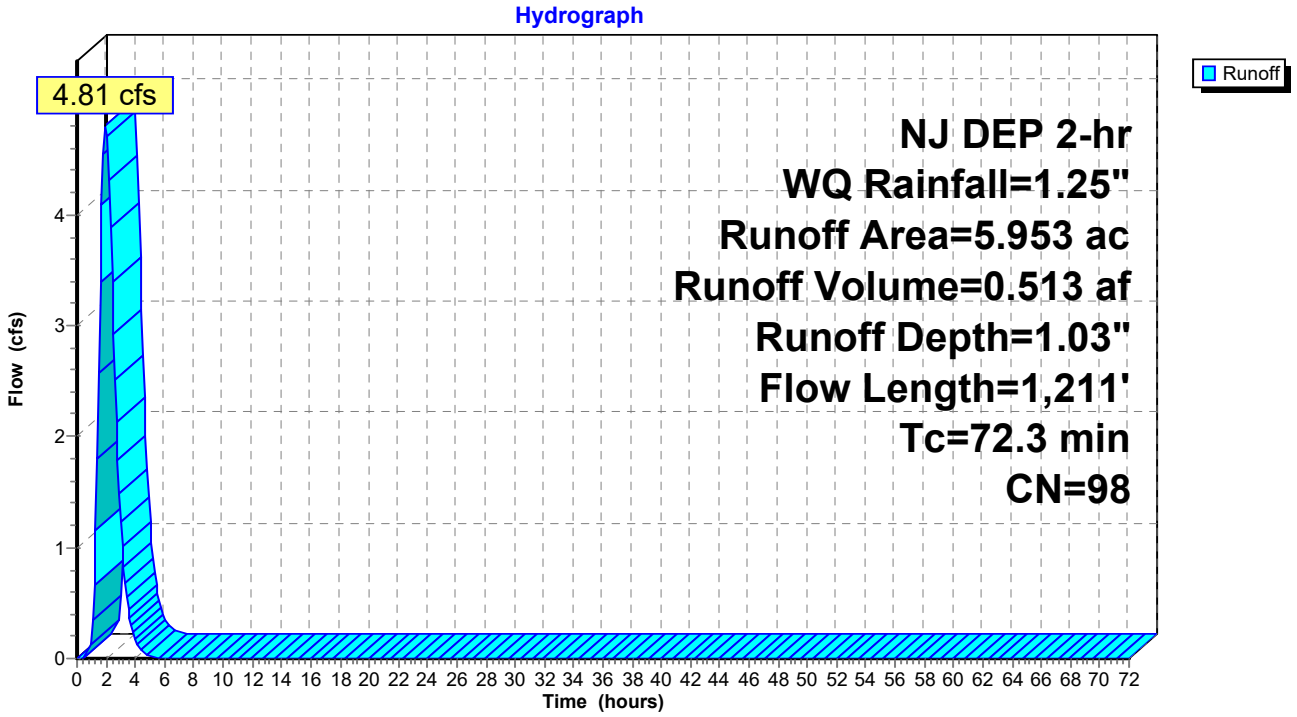
Runoff = 4.81 cfs @ 1.96 hrs, Volume= 0.513 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
5.953	98	Paved parking, HSG D
5.953		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 9S: EDA 2A Imperv.



Summary for Subcatchment 11S: EDA 2B Perv.

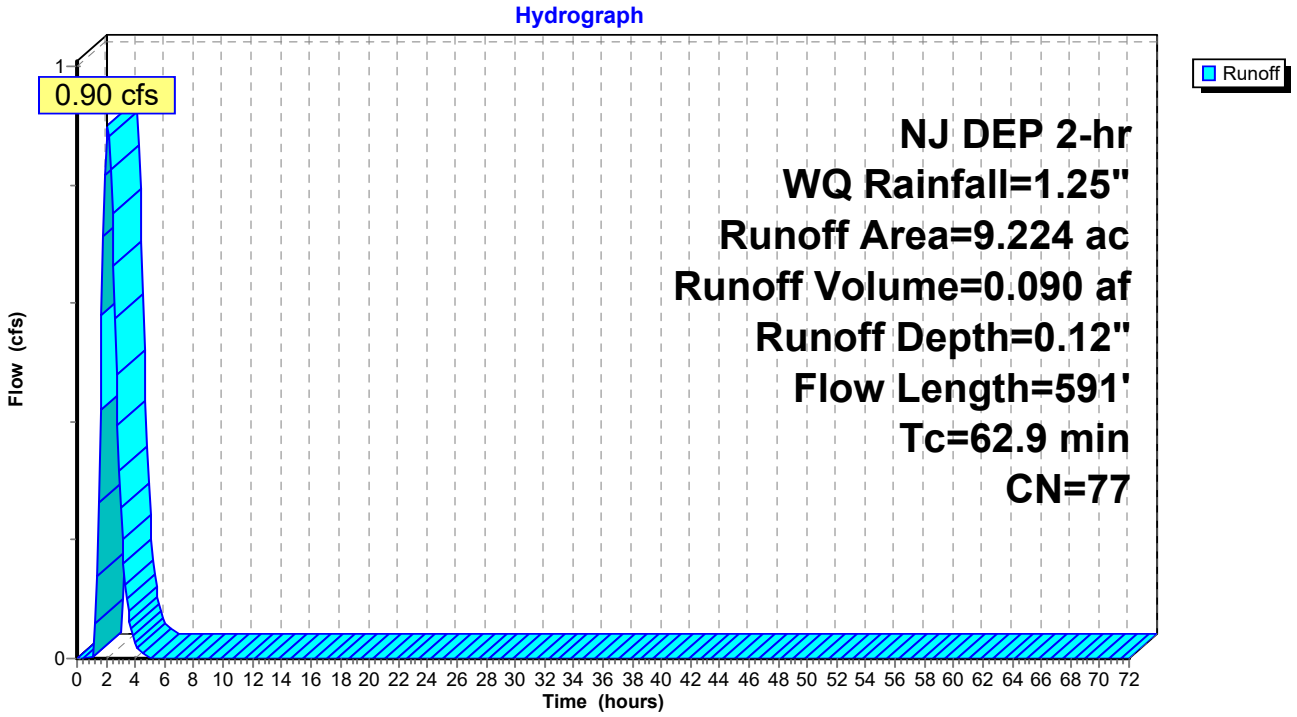
Runoff = 0.90 cfs @ 2.11 hrs, Volume= 0.090 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 11S: EDA 2B Perv.



Summary for Subcatchment 12S: EDA 2B Imperv.

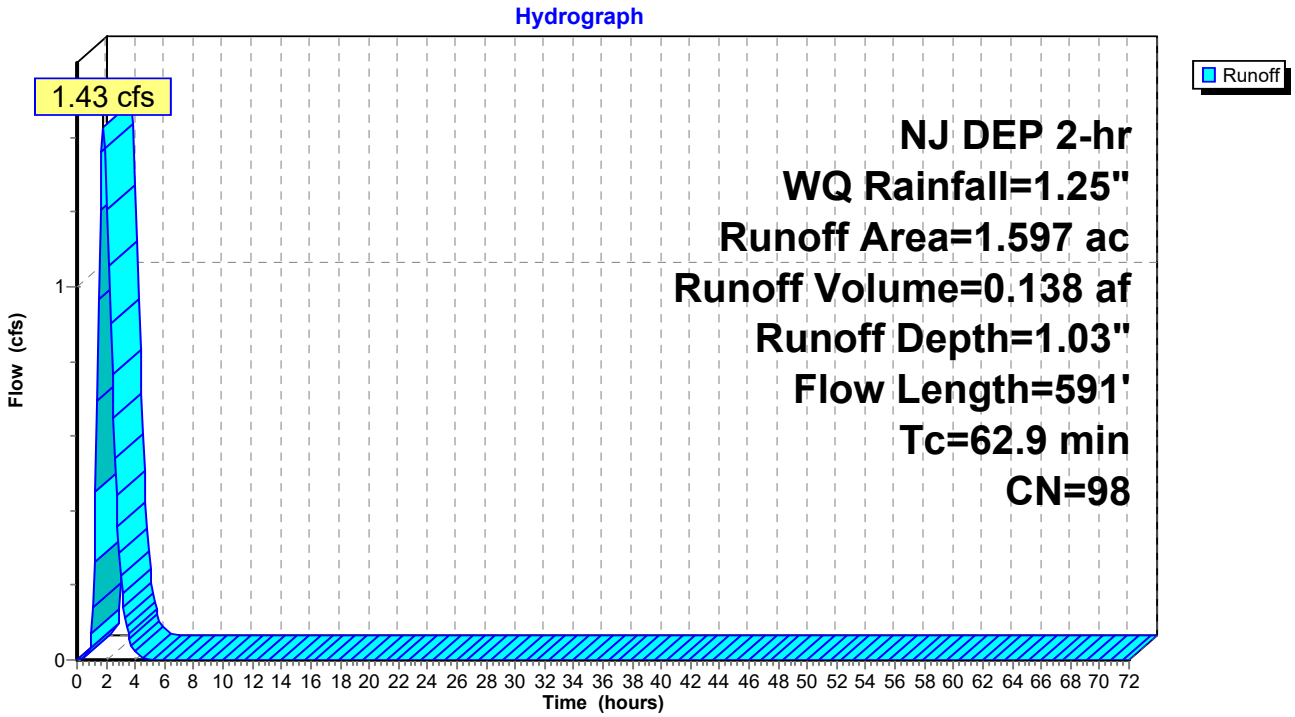
Runoff = 1.43 cfs @ 1.83 hrs, Volume= 0.138 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 12S: EDA 2B Imperv.



Summary for Pond 6P: Existing Depression

Inflow Area = 5.463 ac, 63.96% Impervious, Inflow Depth = 0.72" for WQ event
Inflow = 8.56 cfs @ 1.19 hrs, Volume= 0.330 af
Outflow = 4.94 cfs @ 1.35 hrs, Volume= 0.330 af, Atten= 42%, Lag= 9.3 min
Primary = 4.94 cfs @ 1.35 hrs, Volume= 0.330 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 109.46' @ 1.35 hrs Surf.Area= 7,389 sf Storage= 4,105 cf

Plug-Flow detention time= 10.4 min calculated for 0.329 af (100% of inflow)
Center-of-Mass det. time= 10.4 min (88.0 - 77.6)

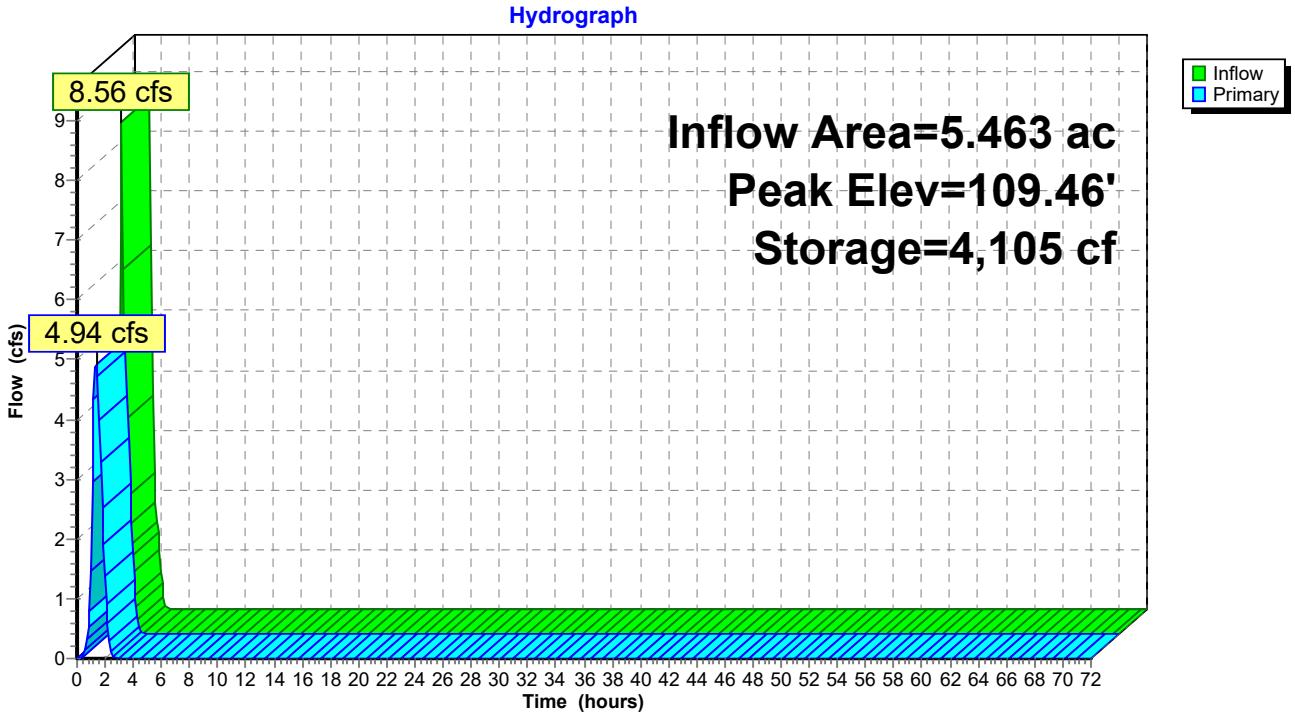
Volume	Invert	Avail.Storage	Storage Description
#1	107.95'	35,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.95	2	0	0
108.00	12	0	0
109.00	3,297	1,655	1,655
110.00	12,220	7,759	9,413
110.50	26,358	9,645	19,058
111.00	39,547	16,476	35,534

Device	Routing	Invert	Outlet Devices
#1	Primary	107.95'	**15.0" Round Culvert** L= 58.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.95' / 107.70' S= 0.0043 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	110.29'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.87 cfs @ 1.35 hrs HW=109.44' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 4.87 cfs @ 4.21 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Existing Depression

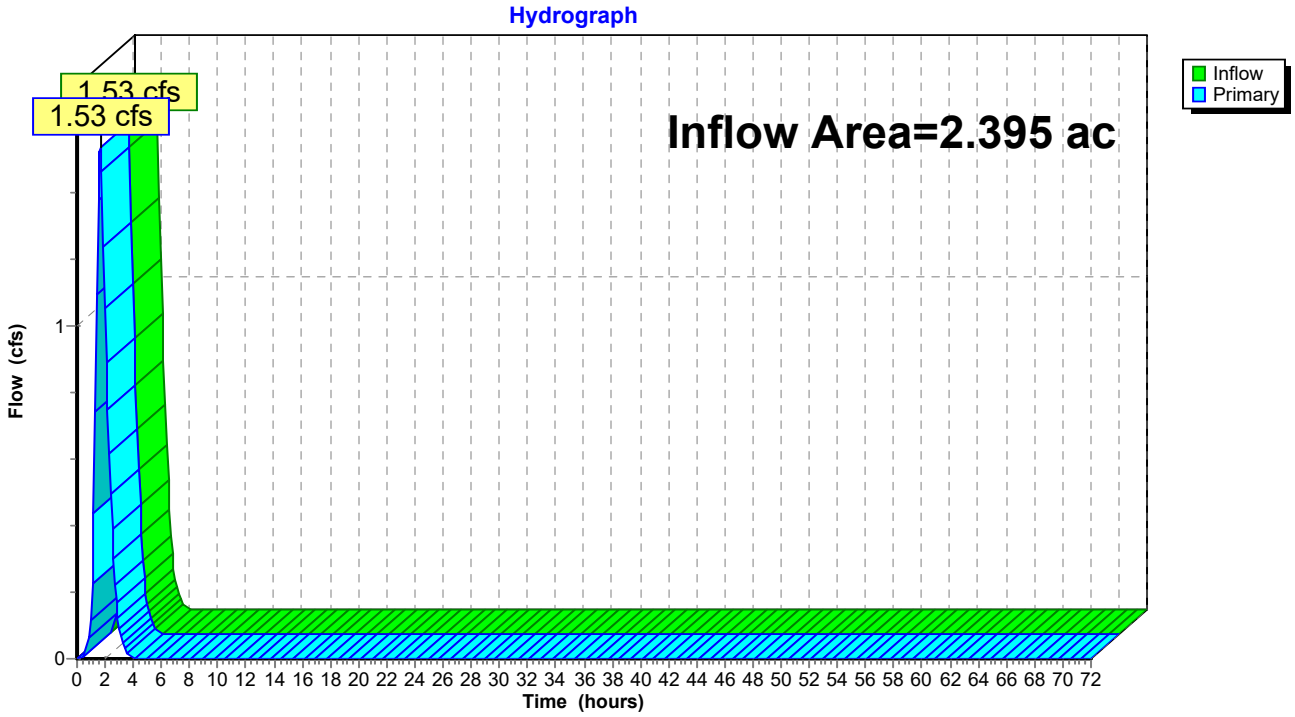


Summary for Link 3L: EDA 1A

Inflow Area = 2.395 ac, 55.32% Impervious, Inflow Depth = 0.62" for WQ event
Inflow = 1.53 cfs @ 1.65 hrs, Volume= 0.125 af
Primary = 1.53 cfs @ 1.65 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 3L: EDA 1A

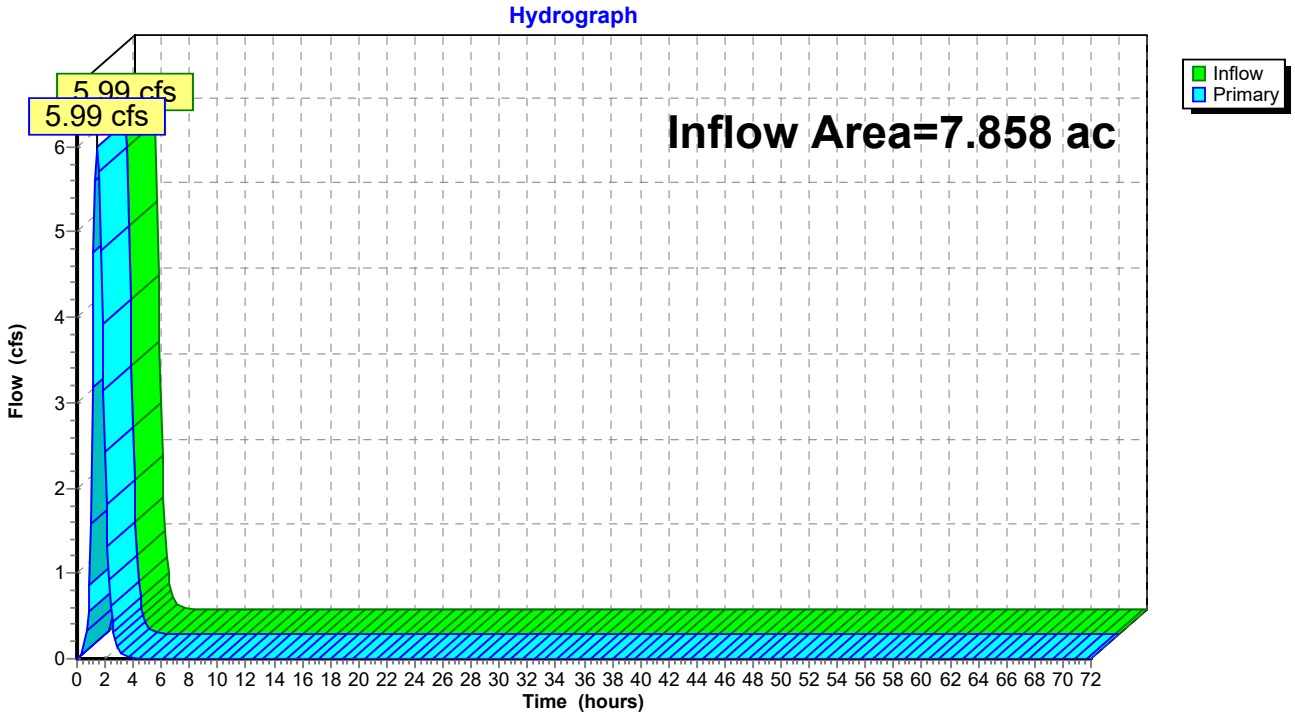


Summary for Link 7L: EDA 1

Inflow Area = 7.858 ac, 61.33% Impervious, Inflow Depth = 0.69" for WQ event
Inflow = 5.99 cfs @ 1.44 hrs, Volume= 0.454 af
Primary = 5.99 cfs @ 1.44 hrs, Volume= 0.454 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 7L: EDA 1

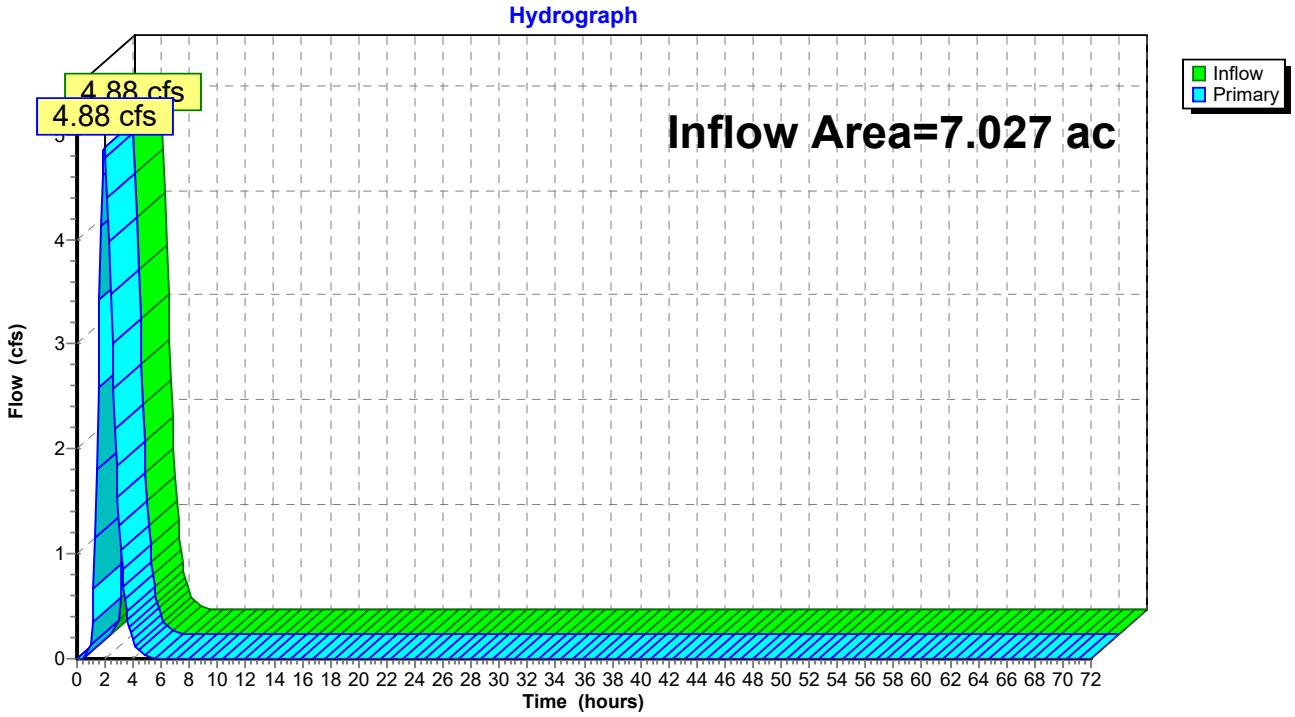


Summary for Link 10L: EDA 2A

Inflow Area = 7.027 ac, 84.72% Impervious, Inflow Depth = 0.89" for WQ event
Inflow = 4.88 cfs @ 1.96 hrs, Volume= 0.522 af
Primary = 4.88 cfs @ 1.96 hrs, Volume= 0.522 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2A

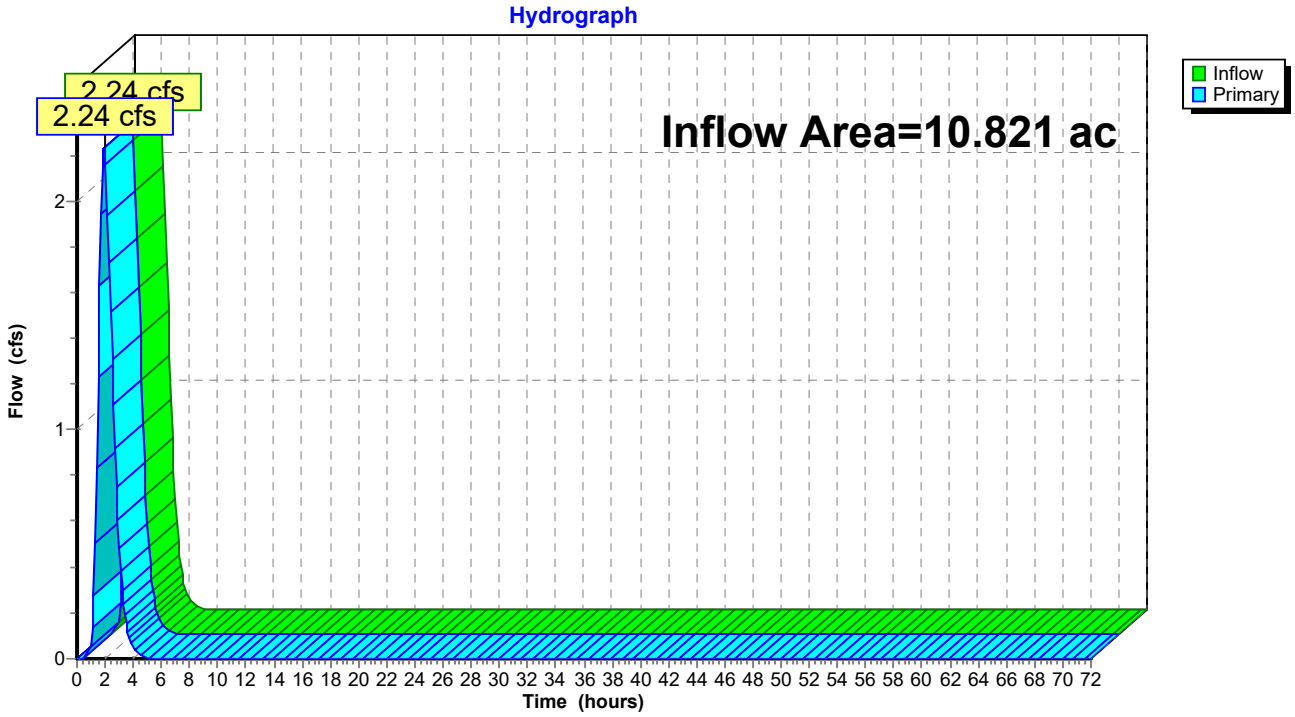


Summary for Link 13L: EDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 0.25" for WQ event
Inflow = 2.24 cfs @ 1.93 hrs, Volume= 0.228 af
Primary = 2.24 cfs @ 1.93 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 13L: EDA 2B

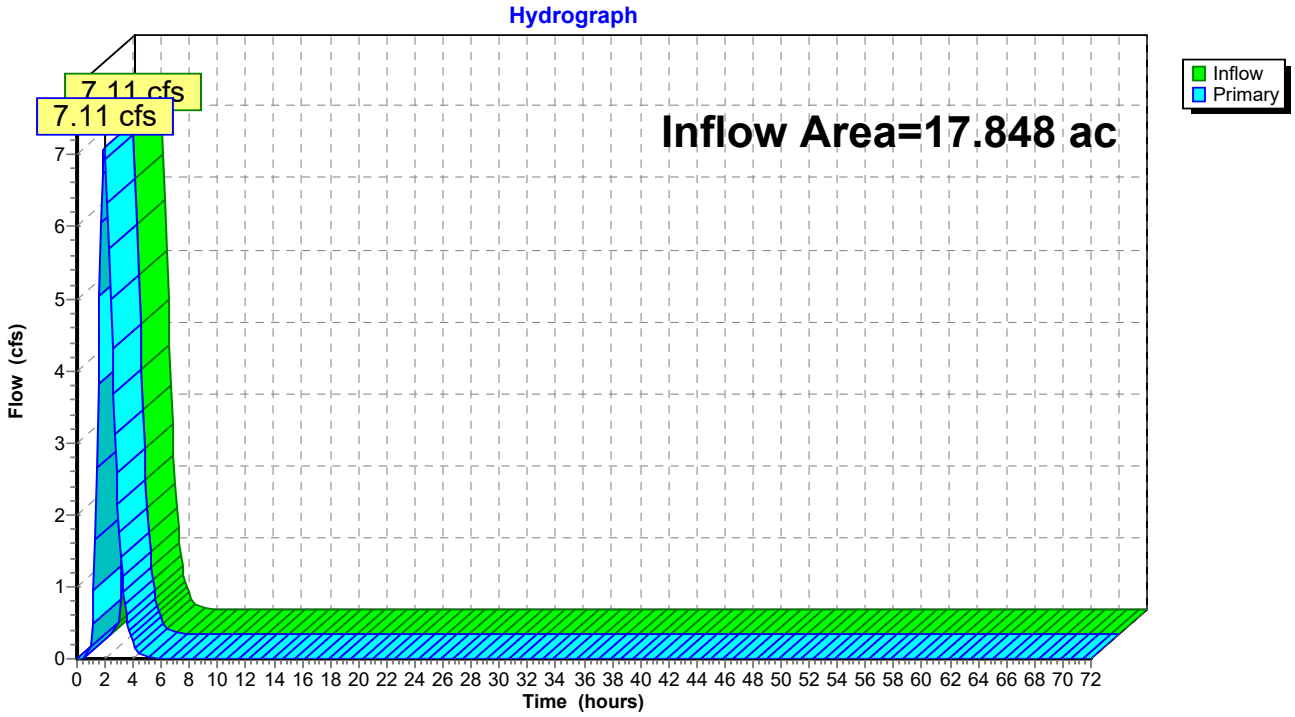


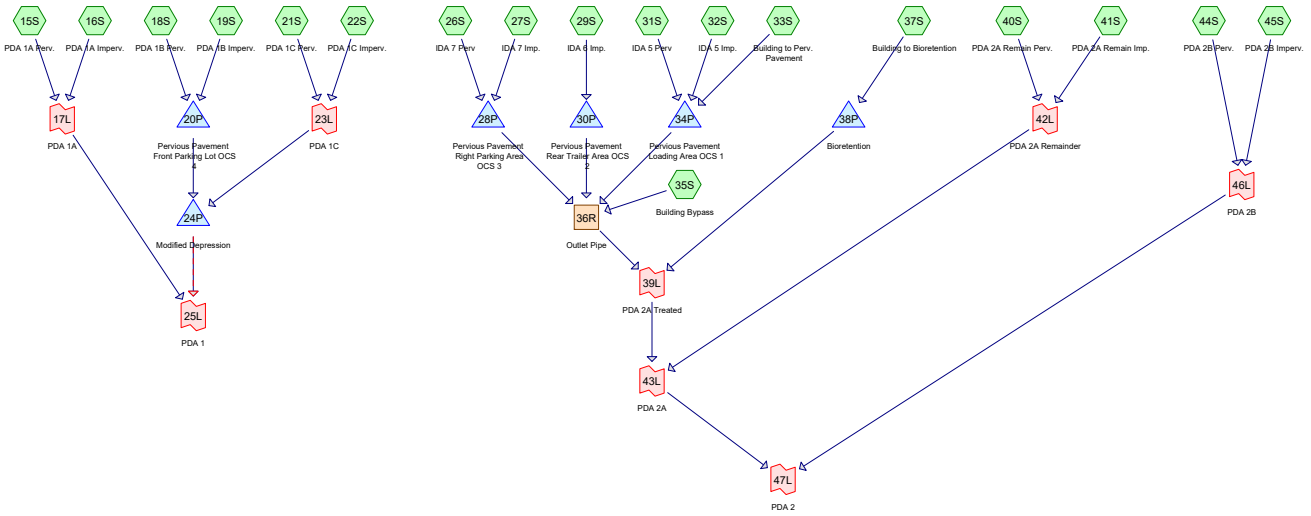
Summary for Link 14L: EDA 2

Inflow Area = 17.848 ac, 42.30% Impervious, Inflow Depth = 0.50" for WQ event
Inflow = 7.11 cfs @ 1.95 hrs, Volume= 0.750 af
Primary = 7.11 cfs @ 1.95 hrs, Volume= 0.750 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 14L: EDA 2





Subcat Reach Pond Link

Routing Diagram for Proposed

Prepared by {enter your company name here}, Printed 11/19/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.735	74	>75% Grass cover, Good, HSG C (31S, 40S, 44S)
4.756	80	>75% Grass cover, Good, HSG D (15S, 18S, 21S, 26S, 31S, 40S, 44S)
12.617	98	Paved parking, HSG D (16S, 19S, 22S, 27S, 29S, 32S, 33S, 35S, 37S, 41S, 45S)
0.871	70	Woods, Good, HSG C (40S, 44S)
6.596	77	Woods, Good, HSG D (15S, 21S, 44S)
25.575	**88**	**TOTAL AREA**

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15S: PDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=405' Tc=48.4 min CN=77 Runoff=0.12 cfs 0.010 af

Subcatchment 16S: PDA 1A Imperv. Runoff Area=1.330 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=405' Tc=48.4 min CN=98 Runoff=1.44 cfs 0.115 af

Subcatchment 18S: PDA 1B Perv. Runoff Area=0.081 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=317' Tc=1.5 min CN=80 Runoff=0.05 cfs 0.001 af

Subcatchment 19S: PDA 1B Imperv. Runoff Area=1.265 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=205' Tc=1.4 min CN=98 Runoff=3.94 cfs 0.109 af

Subcatchment 21S: PDA 1C Perv. Runoff Area=0.699 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=653' Tc=12.7 min CN=80 Runoff=0.25 cfs 0.010 af

Subcatchment 22S: PDA 1C Imperv. Runoff Area=1.120 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=653' Tc=12.7 min CN=98 Runoff=2.63 cfs 0.097 af

Subcatchment 26S: IDA 7 Perv Runoff Area=0.054 ac 0.00% Impervious Runoff Depth=0.17"
Flow Length=163' Tc=1.3 min CN=80 Runoff=0.03 cfs 0.001 af

Subcatchment 27S: IDA 7 Imp. Runoff Area=0.249 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=163' Tc=1.3 min CN=98 Runoff=0.78 cfs 0.021 af

Subcatchment 29S: IDA 6 Imp. Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=178' Tc=2.0 min CN=98 Runoff=1.14 cfs 0.032 af

Subcatchment 31S: IDA 5 Perv Runoff Area=0.047 ac 0.00% Impervious Runoff Depth=0.10"
Flow Length=390' Tc=4.6 min CN=76 Runoff=0.01 cfs 0.000 af

Subcatchment 32S: IDA 5 Imp. Runoff Area=2.005 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=390' Tc=4.6 min CN=98 Runoff=6.07 cfs 0.173 af

Subcatchment 33S: Building to Perv. Runoff Area=1.615 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=354' Slope=0.0050 '/' Tc=4.6 min CN=98 Runoff=4.89 cfs 0.139 af

Subcatchment 35S: Building Bypass Runoff Area=0.541 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=379' Slope=0.0050 '/' Tc=5.3 min CN=98 Runoff=1.61 cfs 0.047 af

Subcatchment 37S: Building to Runoff Area=2.239 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=560' Slope=0.0050 '/' Tc=7.4 min CN=98 Runoff=6.20 cfs 0.193 af

Subcatchment 40S: PDA 2A Remain Perv. Runoff Area=1.783 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=1,211' Tc=72.3 min CN=77 Runoff=0.16 cfs 0.017 af

Subcatchment 41S: PDA 2A Remain Imp. Runoff Area=0.282 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=456' Tc=2.9 min CN=98 Runoff=0.85 cfs 0.024 af

Subcatchment 44S: PDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=0.12"
Flow Length=591' Tc=62.9 min CN=77 Runoff=0.90 cfs 0.090 af

Subcatchment 45S: PDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=1.03"
Flow Length=591' Tc=62.9 min CN=98 Runoff=1.43 cfs 0.138 af

Reach 36R: Outlet Pipe Avg. Flow Depth=0.60' Max Vel=2.59 fps Inflow=1.82 cfs 0.401 af
18.0" Round Pipe n=0.013 L=381.0' S=0.0024 '/' Capacity=5.11 cfs Outflow=1.73 cfs 0.401 af

Pond 20P: Pervious Pavement Front Parking Peak Elev=110.84' Storage=3,617 cf Inflow=3.97 cfs 0.110 af
Outflow=0.42 cfs 0.110 af

Pond 24P: Modified Depression Peak Elev=108.32' Storage=1,744 cf Inflow=3.21 cfs 0.217 af
Primary=2.06 cfs 0.217 af Secondary=0.00 cfs 0.000 af Outflow=2.06 cfs 0.217 af

Pond 28P: Pervious Pavement Right Parking Peak Elev=115.07' Storage=950 cf Inflow=0.80 cfs 0.022 af
Outflow=0.01 cfs 0.015 af

Pond 30P: Pervious Pavement Rear Trailer Peak Elev=112.73' Storage=1,225 cf Inflow=1.14 cfs 0.032 af
Outflow=0.06 cfs 0.031 af

Pond 34P: Pervious Pavement Loading Peak Elev=113.13' Storage=12,340 cf Inflow=10.97 cfs 0.312 af
Outflow=0.38 cfs 0.308 af

Pond 38P: Bioretention Peak Elev=113.33' Storage=5,957 cf Inflow=6.20 cfs 0.193 af
Primary=0.47 cfs 0.193 af Secondary=0.00 cfs 0.000 af Outflow=0.47 cfs 0.193 af

Link 17L: PDA 1A Inflow=1.54 cfs 0.125 af
Primary=1.54 cfs 0.125 af

Link 23L: PDA 1C Inflow=2.83 cfs 0.107 af
Primary=2.83 cfs 0.107 af

Link 25L: PDA 1 Inflow=3.14 cfs 0.342 af
Primary=3.14 cfs 0.342 af

Link 39L: PDA 2A Treated Inflow=2.20 cfs 0.595 af
Primary=2.20 cfs 0.595 af

Link 42L: PDA 2A Remainder Inflow=0.85 cfs 0.042 af
Primary=0.85 cfs 0.042 af

Link 43L: PDA 2A Inflow=2.95 cfs 0.636 af
Primary=2.95 cfs 0.636 af

Link 46L: PDA 2B Inflow=2.24 cfs 0.228 af
Primary=2.24 cfs 0.228 af

Link 47L: PDA 2 Inflow=3.38 cfs 0.864 af
Primary=3.38 cfs 0.864 af

Total Runoff Area = 25.575 ac Runoff Volume = 1.218 af Average Runoff Depth = 0.57"
50.67% Pervious = 12.958 ac 49.33% Impervious = 12.617 ac

Summary for Subcatchment 15S: PDA 1A Perv.

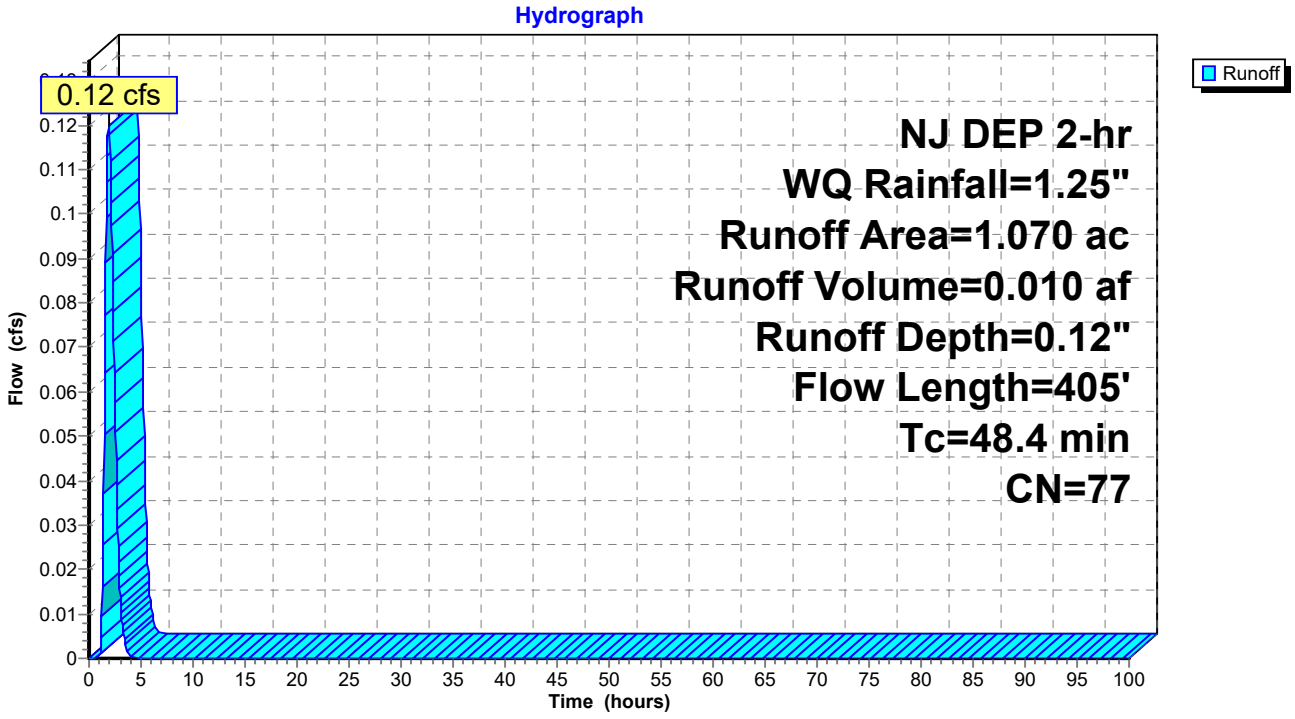
Runoff = 0.12 cfs @ 1.88 hrs, Volume= 0.010 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 15S: PDA 1A Perv.



Summary for Subcatchment 16S: PDA 1A Imperv.

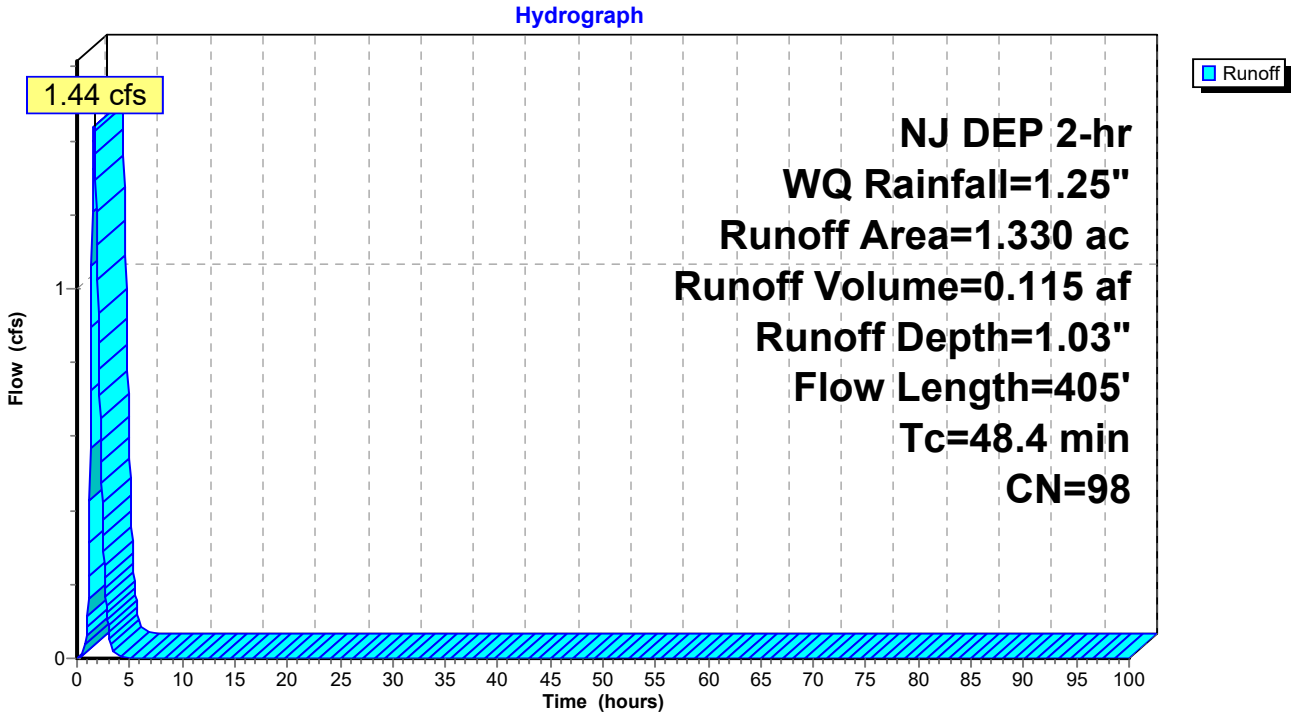
Runoff = 1.44 cfs @ 1.64 hrs, Volume= 0.115 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.330	98	Paved parking, HSG D
1.330		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 16S: PDA 1A Imperv.



Summary for Subcatchment 18S: PDA 1B Perv.

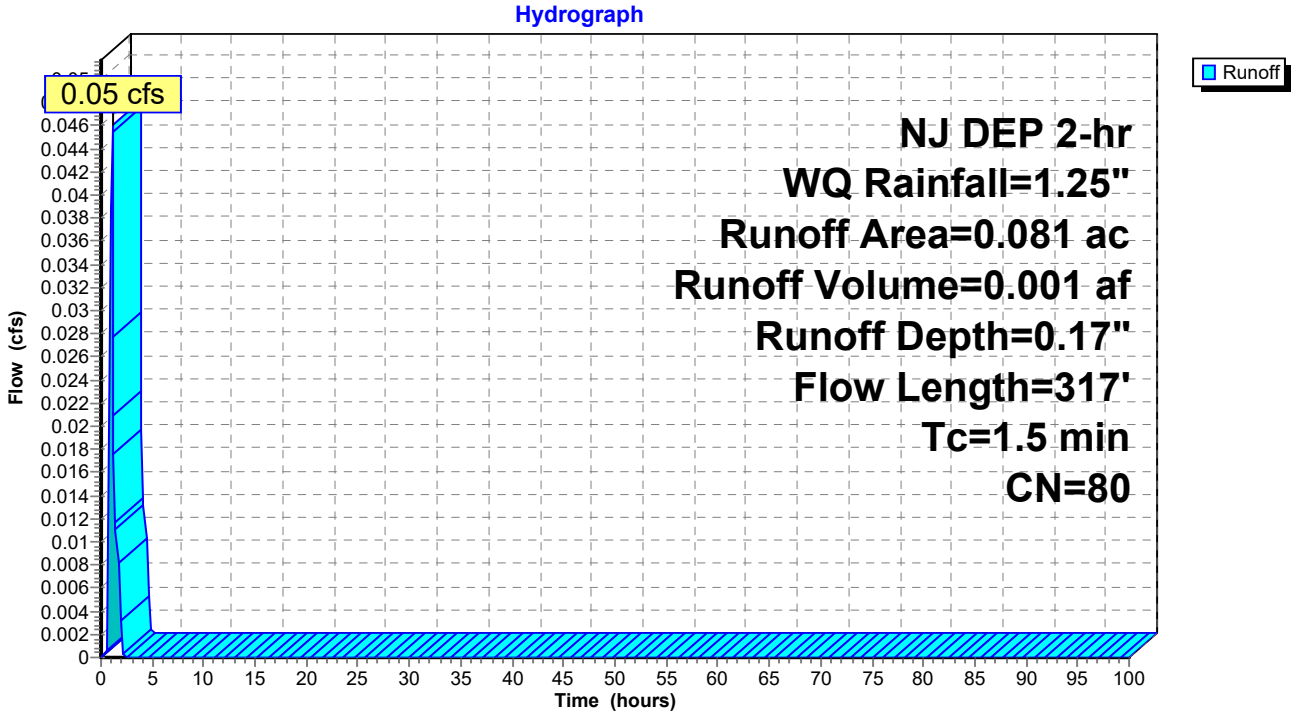
Runoff = 0.05 cfs @ 1.09 hrs, Volume= 0.001 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.081	80	>75% Grass cover, Good, HSG D
0.081	80	Weighted Average
0.081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.91		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	56	0.0750	5.56		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.1	15	0.0150	2.49		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	226	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.5	317	Total			

Subcatchment 18S: PDA 1B Perv.



Summary for Subcatchment 19S: PDA 1B Imperv.

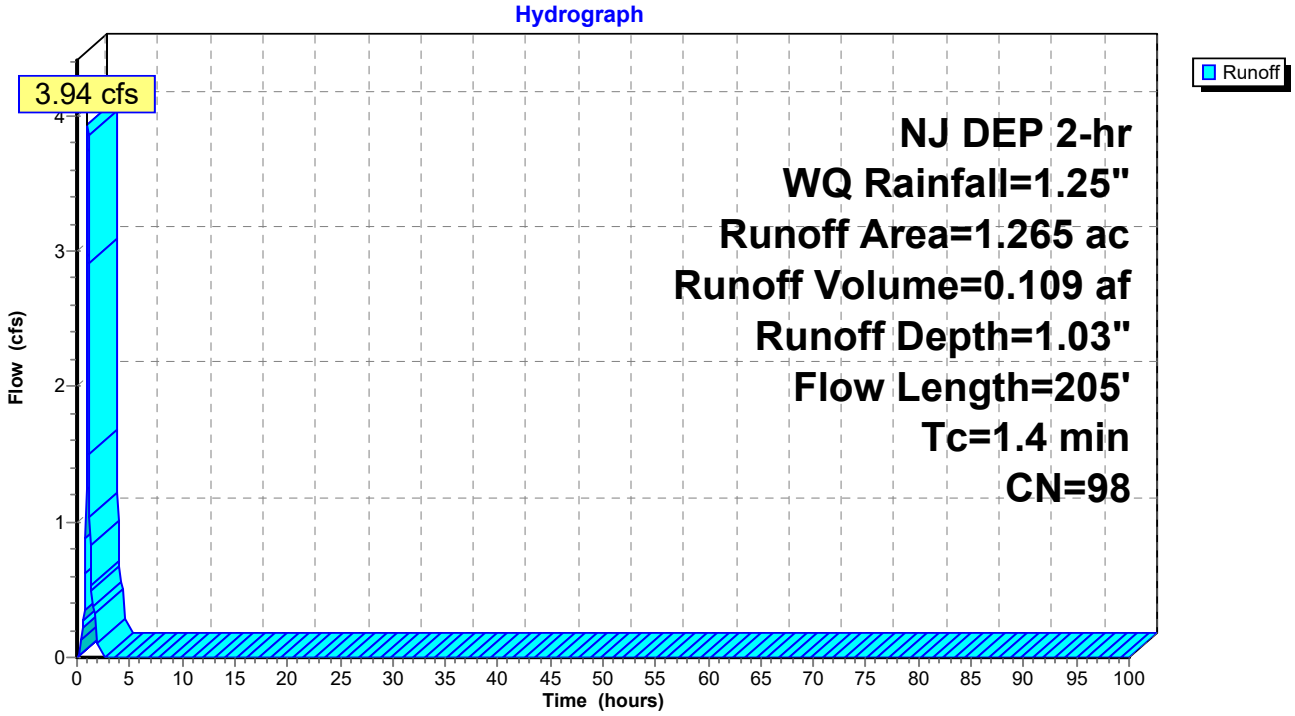
Runoff = 3.94 cfs @ 1.03 hrs, Volume= 0.109 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.265	98	Paved parking, HSG D
1.265		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	9	0.0150	0.77		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.4	50	0.0750	2.08		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
0.4	41	0.0500	1.70		**Sheet Flow, C-D** Smooth surfaces n= 0.011 P2= 3.34"
0.4	105	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.4	205	Total			

Subcatchment 19S: PDA 1B Imperv.



Summary for Subcatchment 21S: PDA 1C Perv.

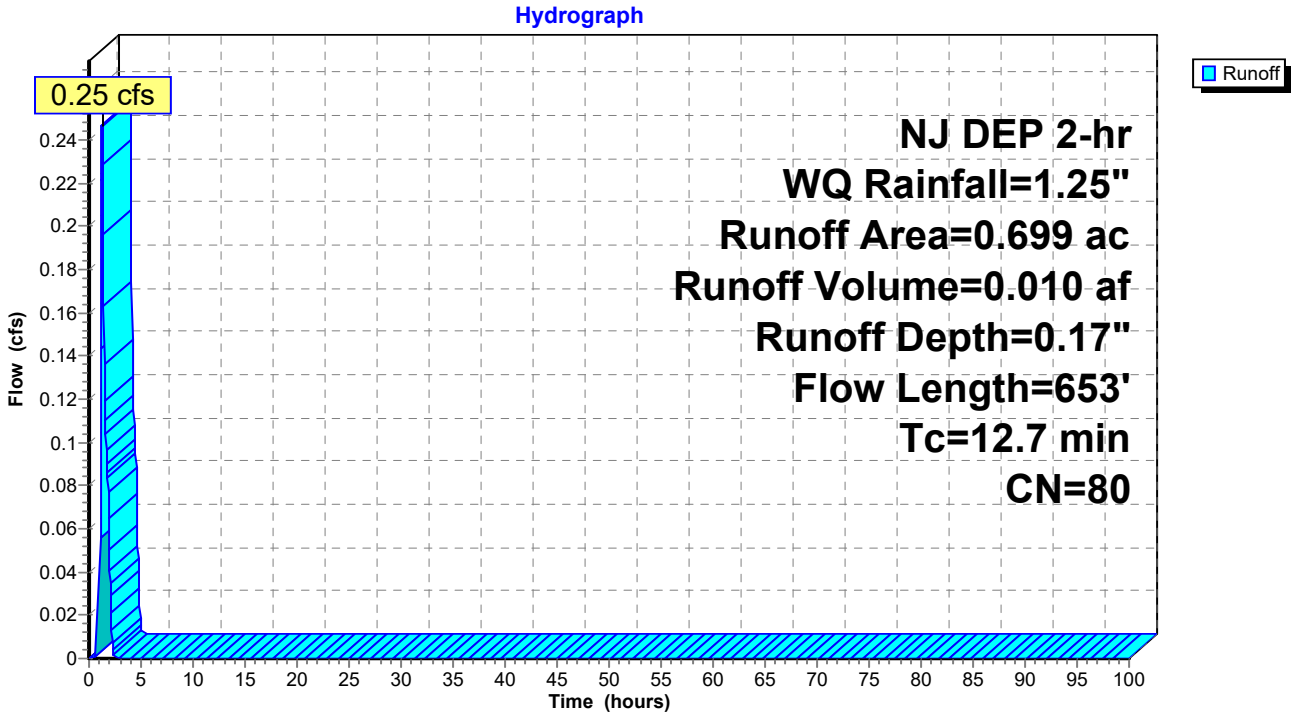
Runoff = 0.25 cfs @ 1.25 hrs, Volume= 0.010 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.093	77	Woods, Good, HSG D
0.606	80	>75% Grass cover, Good, HSG D
0.699	80	Weighted Average
0.699		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 21S: PDA 1C Perv.



Summary for Subcatchment 22S: PDA 1C Imperv.

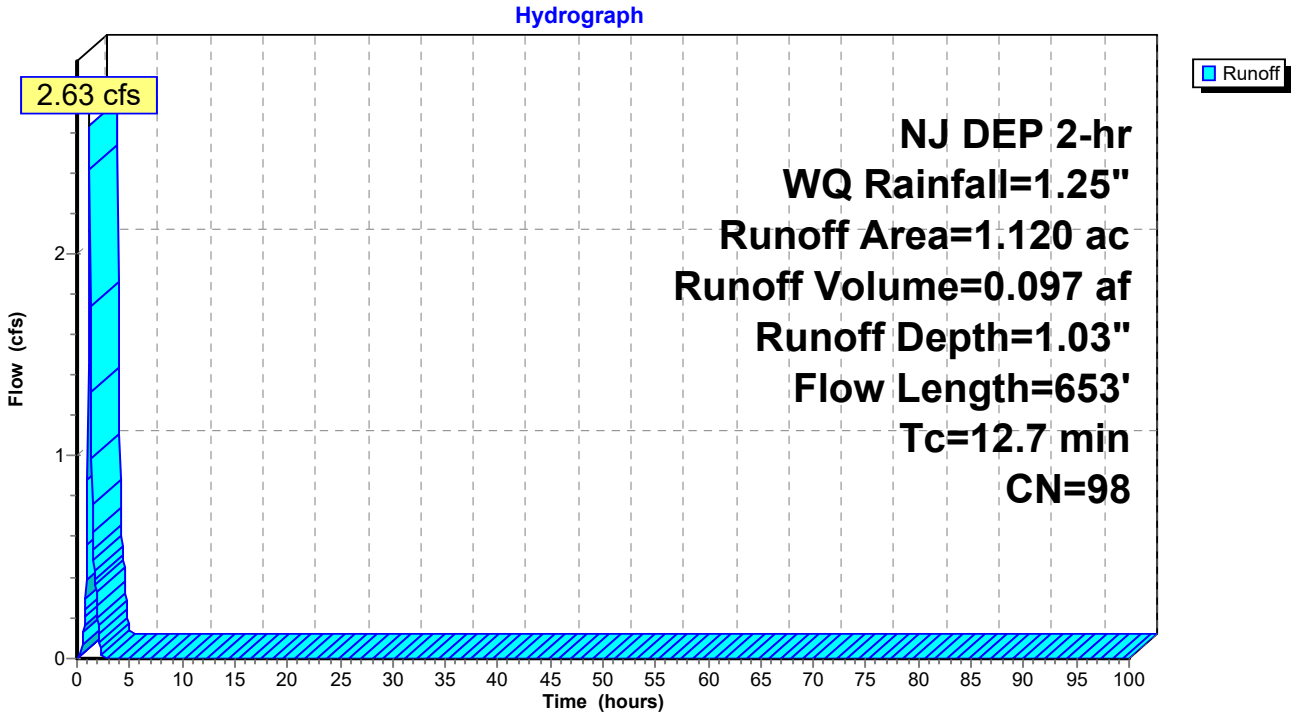
Runoff = 2.63 cfs @ 1.18 hrs, Volume= 0.097 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.120	98	Paved parking, HSG D
1.120		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 22S: PDA 1C Imperv.



Summary for Subcatchment 26S: IDA 7 Perv

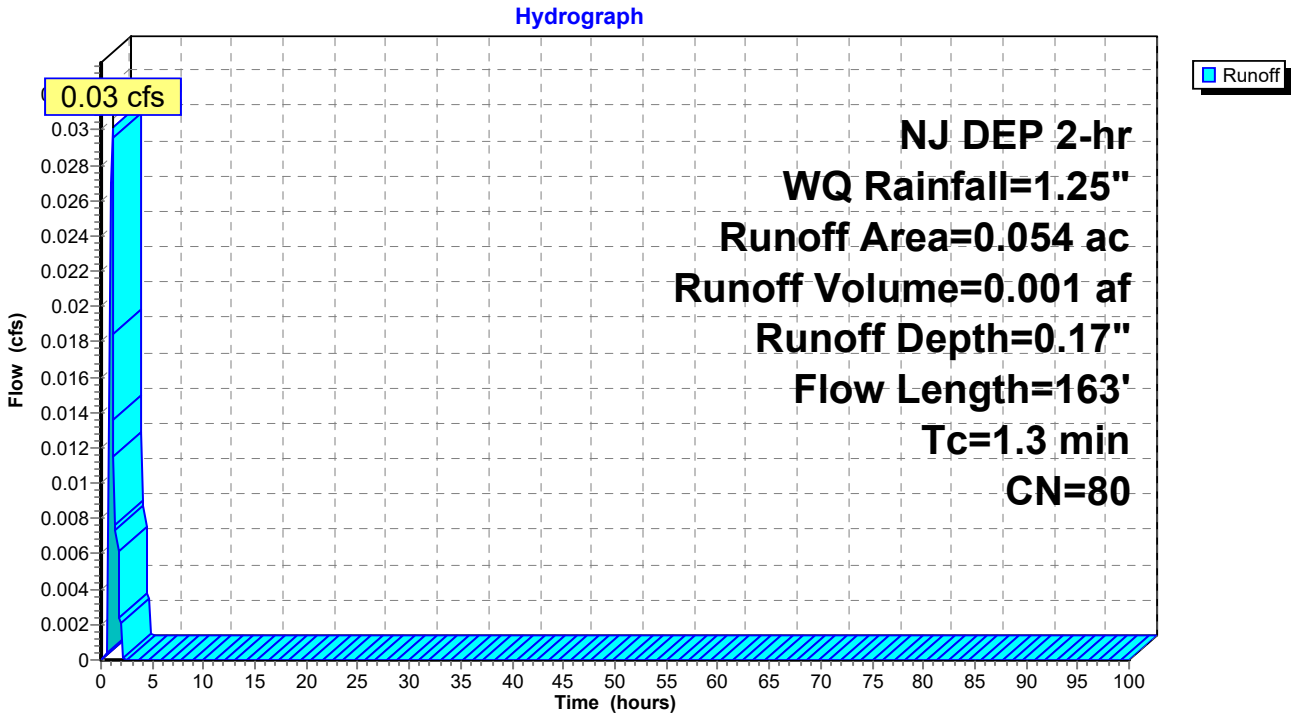
Runoff = 0.03 cfs @ 1.08 hrs, Volume= 0.001 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.054	80	>75% Grass cover, Good, HSG D
0.000	74	>75% Grass cover, Good, HSG C
0.054	80	Weighted Average
0.054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 26S: IDA 7 Perv



Summary for Subcatchment 27S: IDA 7 Imp.

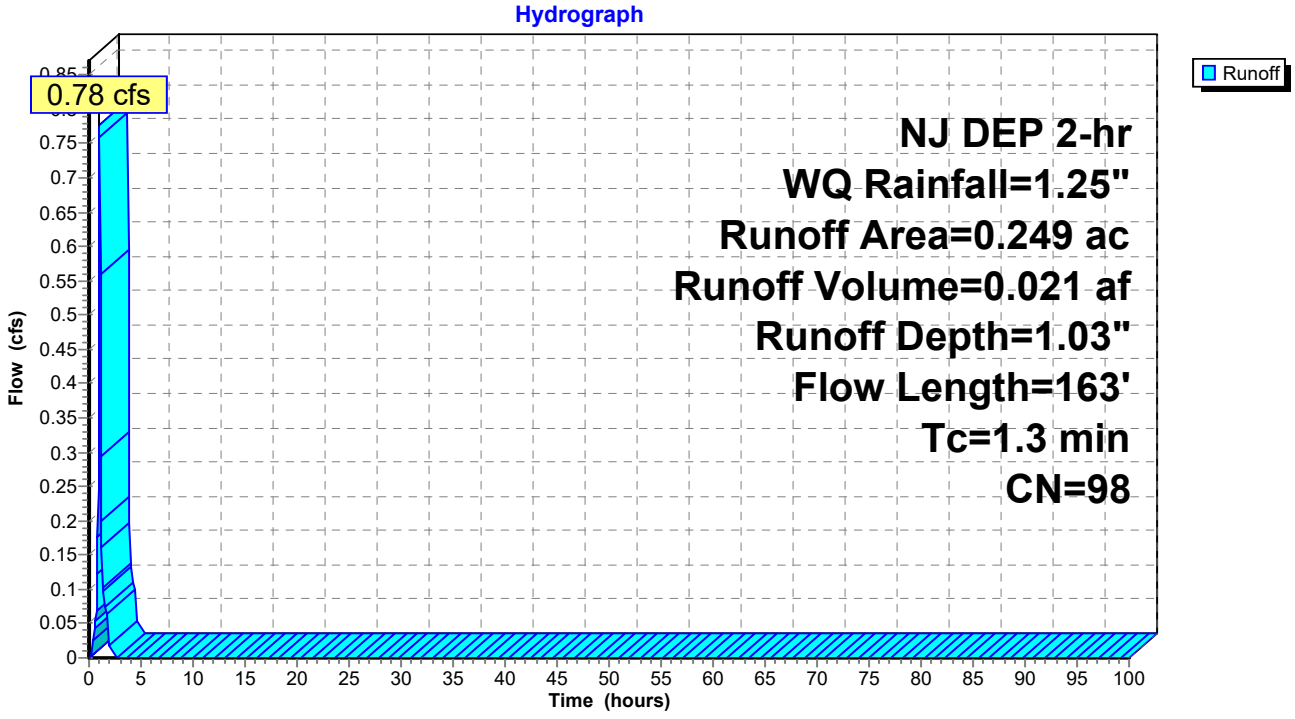
Runoff = 0.78 cfs @ 1.03 hrs, Volume= 0.021 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.249	98	Paved parking, HSG D
0.249		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 27S: IDA 7 Imp.



Summary for Subcatchment 29S: IDA 6 Imp.

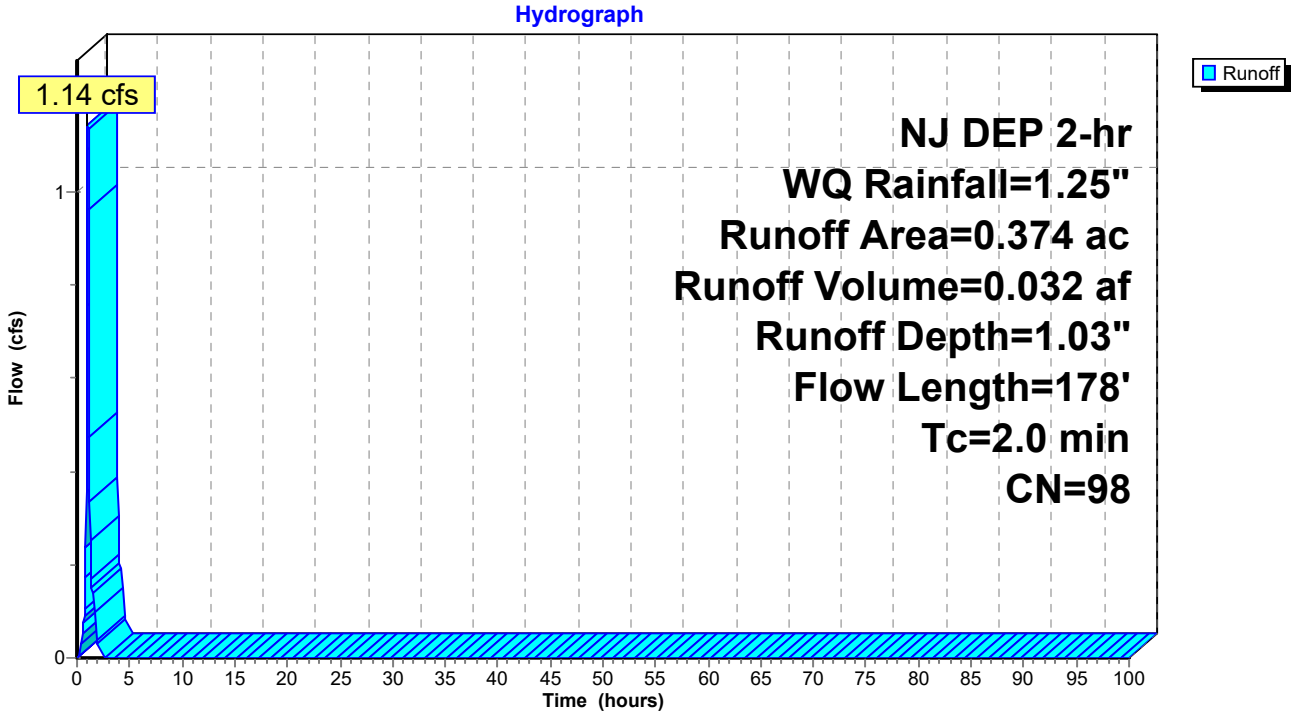
Runoff = 1.14 cfs @ 1.04 hrs, Volume= 0.032 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.374	98	Paved parking, HSG D
0.374		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	48	0.0290	3.46		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	30	0.0075	2.13	0.21	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
2.0	178	Total			

Subcatchment 29S: IDA 6 Imp.



Summary for Subcatchment 31S: IDA 5 Perv

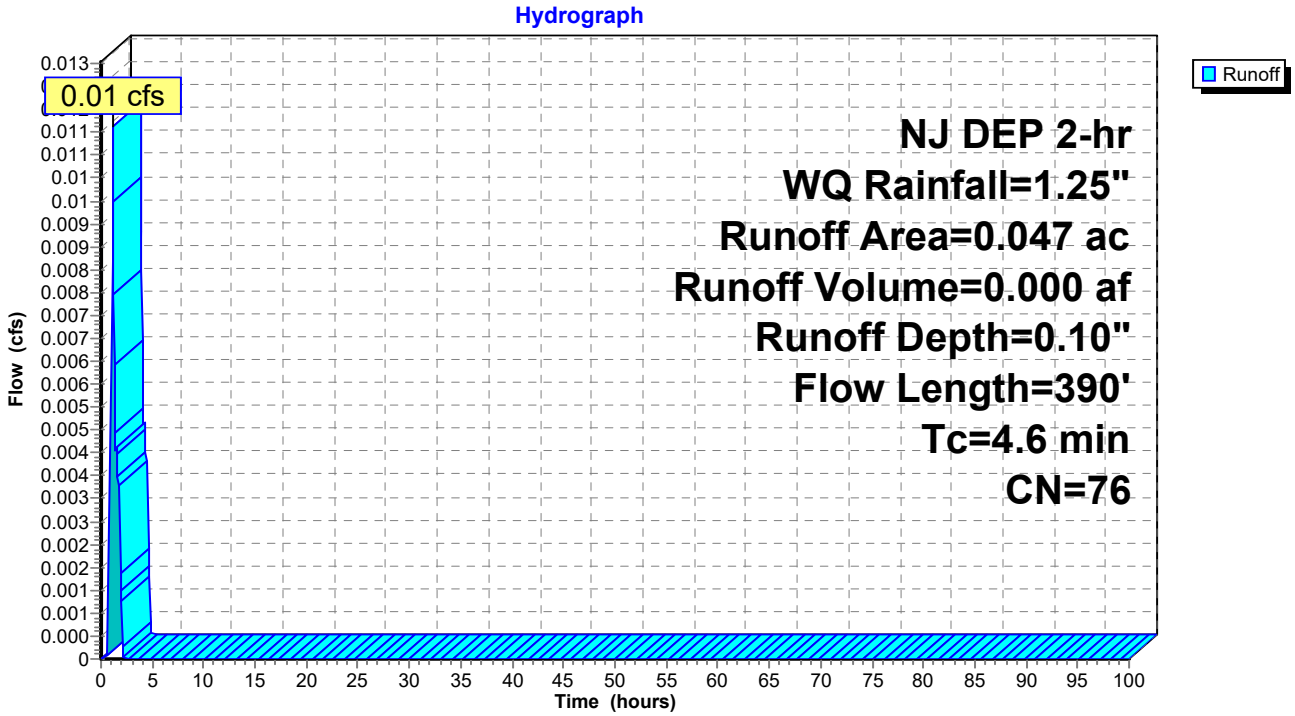
Runoff = 0.01 cfs @ 1.16 hrs, Volume= 0.000 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.014	80	>75% Grass cover, Good, HSG D
0.033	74	>75% Grass cover, Good, HSG C
0.047	76	Weighted Average
0.047		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 31S: IDA 5 Perv



Summary for Subcatchment 32S: IDA 5 Imp.

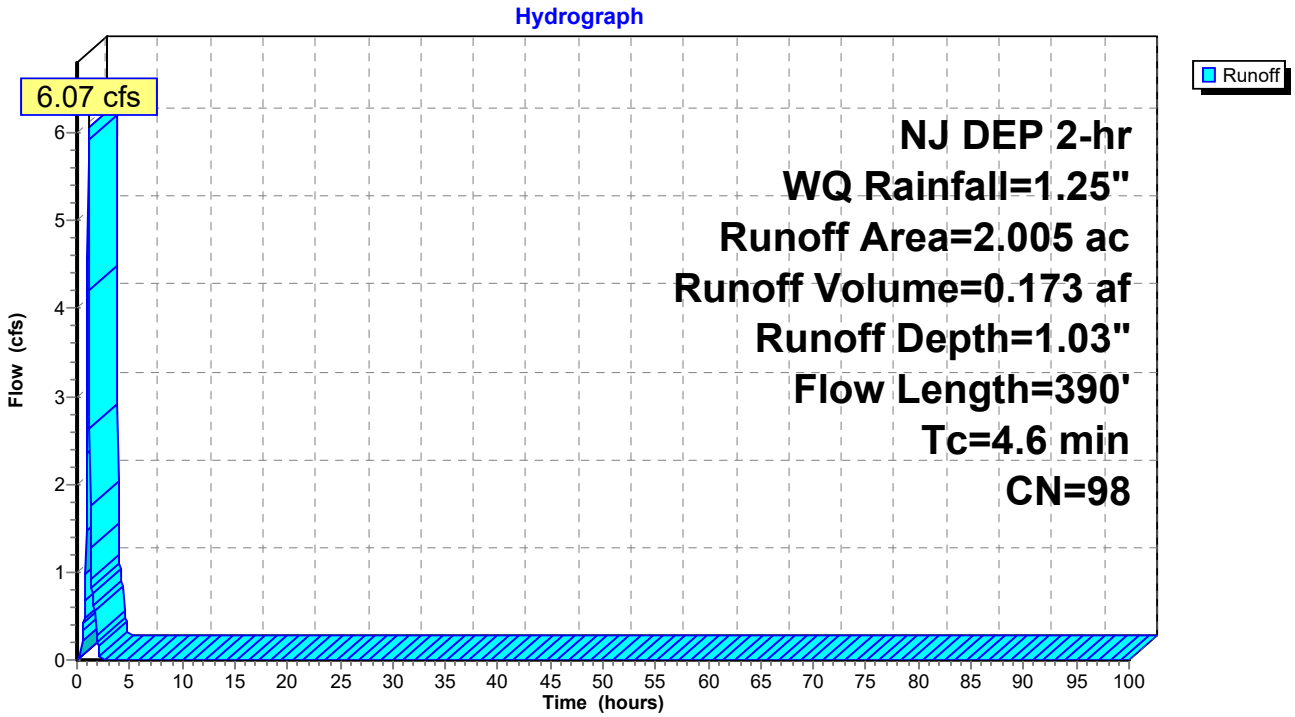
Runoff = 6.07 cfs @ 1.08 hrs, Volume= 0.173 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
2.005	98	Paved parking, HSG D
2.005		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 32S: IDA 5 Imp.



Summary for Subcatchment 33S: Building to Perv. Pavement

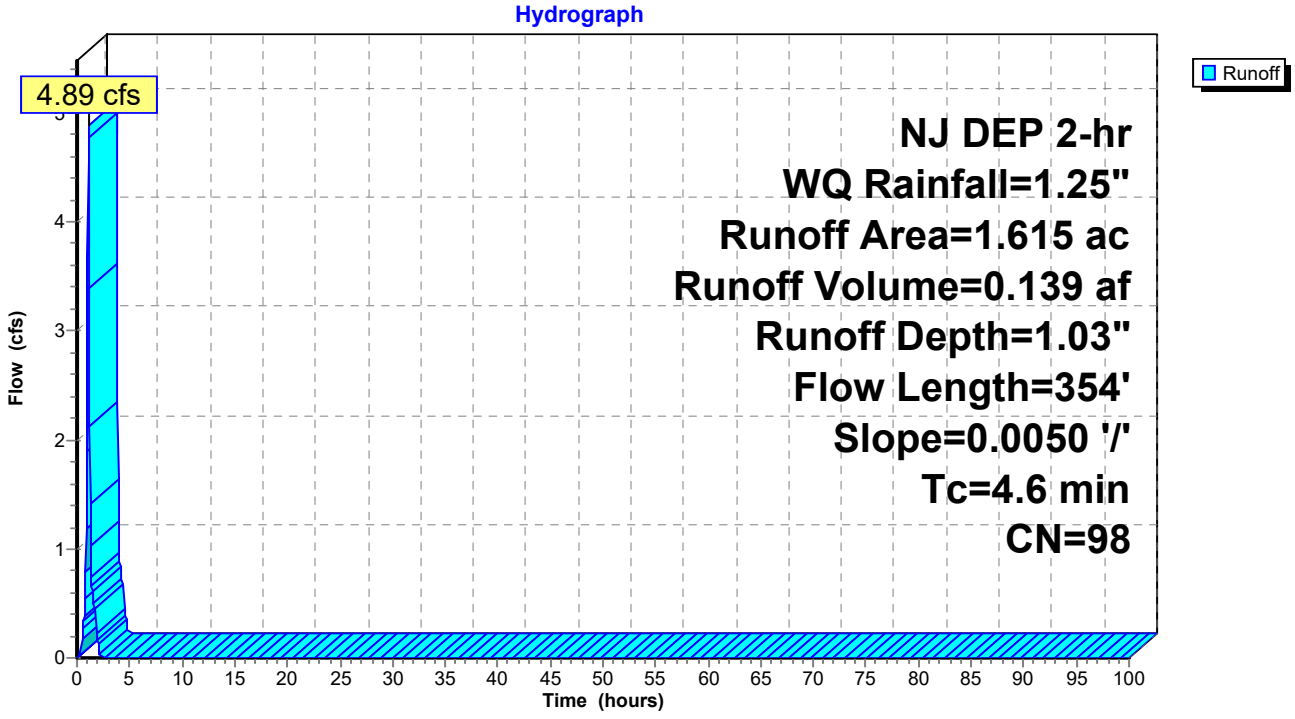
Runoff = 4.89 cfs @ 1.08 hrs, Volume= 0.139 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.615	98	Paved parking, HSG D
1.615		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
2.1	179	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	75	0.0050	3.21	2.52	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
4.6	354	Total			

Subcatchment 33S: Building to Perv. Pavement



Summary for Subcatchment 35S: Building Bypass

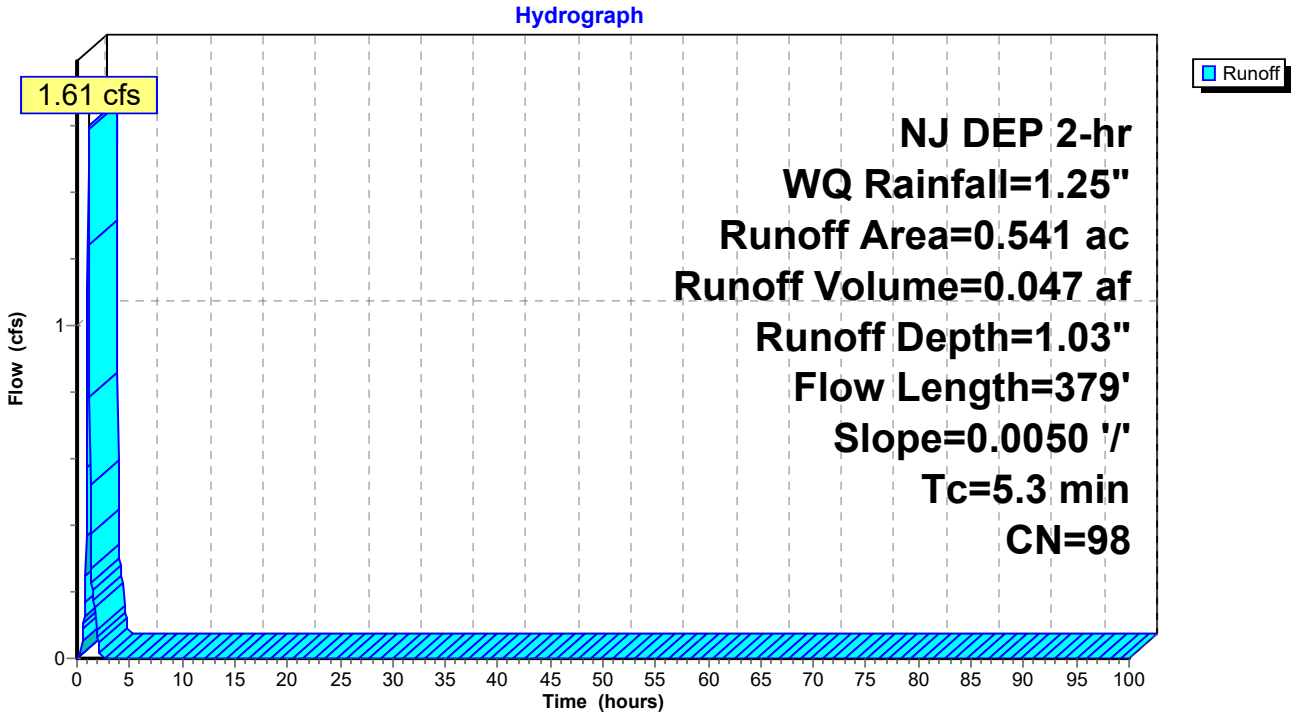
Runoff = 1.61 cfs @ 1.09 hrs, Volume= 0.047 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.541	98	Paved parking, HSG D
0.541		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= 3.34"
3.2	279	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.3	379	Total			

Subcatchment 35S: Building Bypass



Summary for Subcatchment 37S: Building to Bioretention

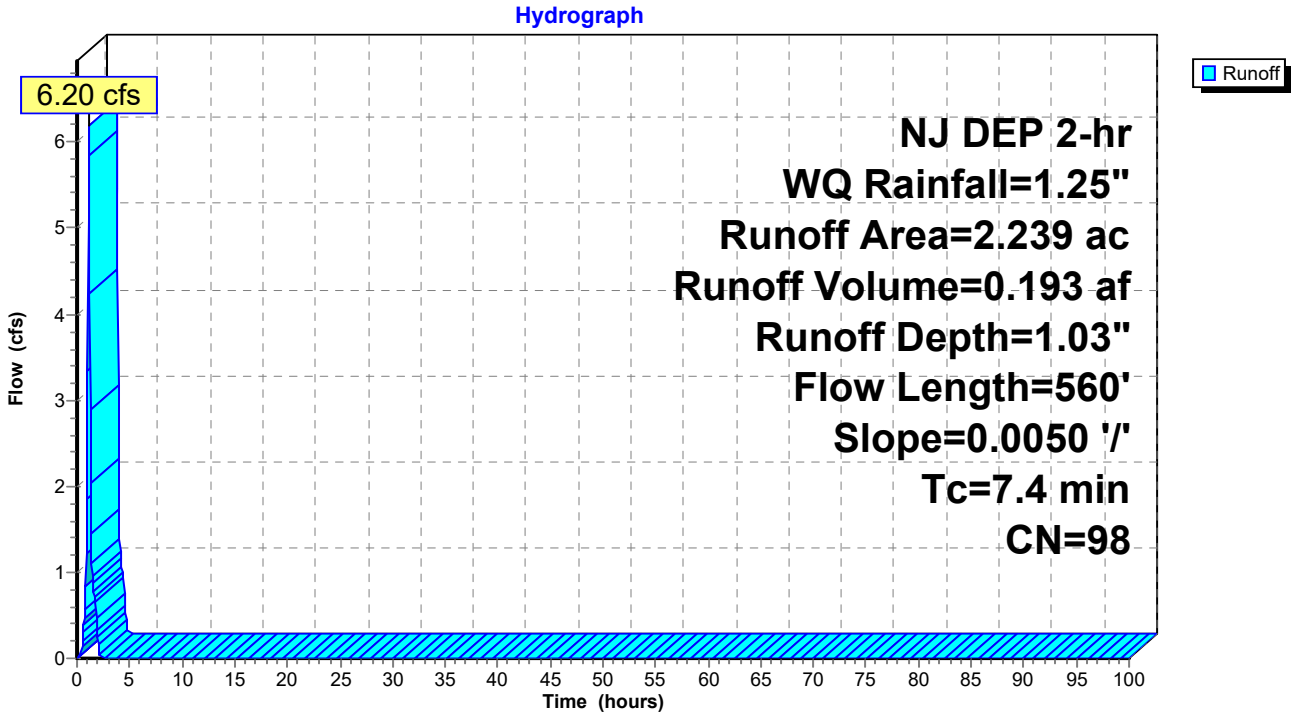
Runoff = 6.20 cfs @ 1.11 hrs, Volume= 0.193 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
2.239	98	Paved parking, HSG D
2.239		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
5.3	460	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
7.4	560	Total			

Subcatchment 37S: Building to Bioretention



Summary for Subcatchment 40S: PDA 2A Remain Perv.

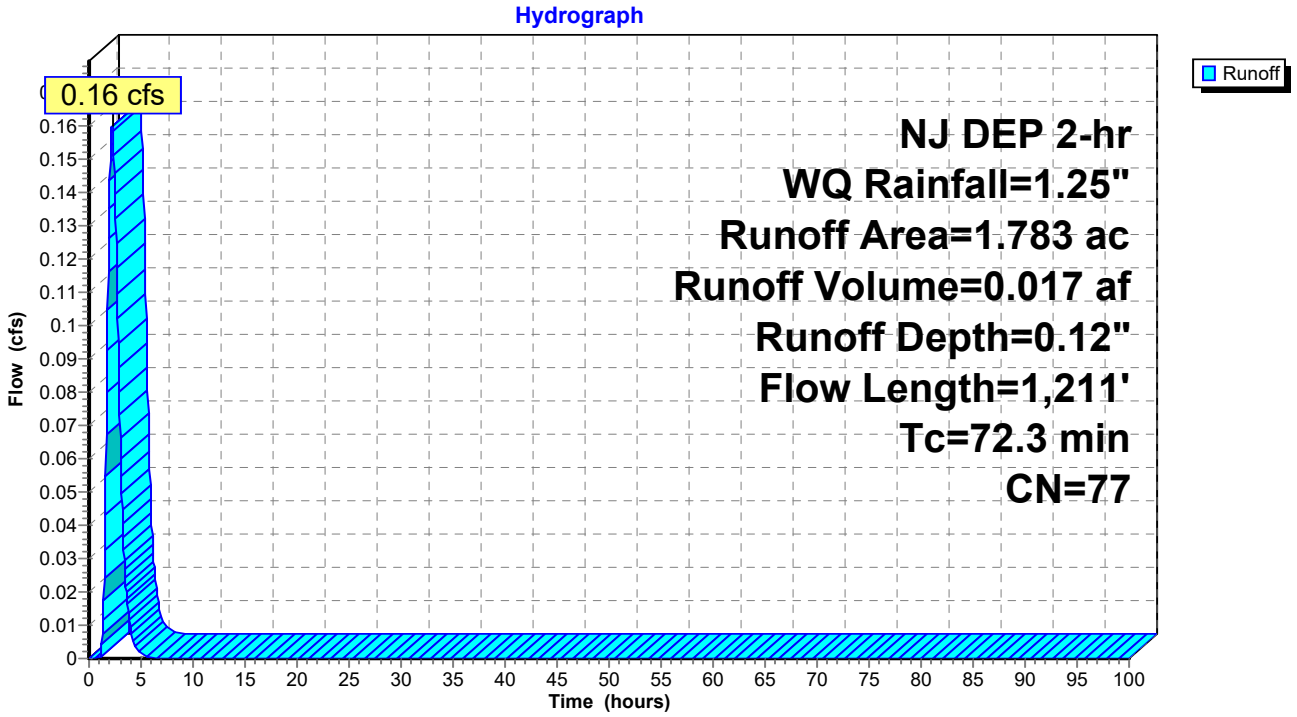
Runoff = 0.16 cfs @ 2.24 hrs, Volume= 0.017 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.109	70	Woods, Good, HSG C
1.103	80	>75% Grass cover, Good, HSG D
0.571	74	>75% Grass cover, Good, HSG C
1.783	77	Weighted Average
1.783		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 40S: PDA 2A Remain Perv.



Summary for Subcatchment 41S: PDA 2A Remain Imp.

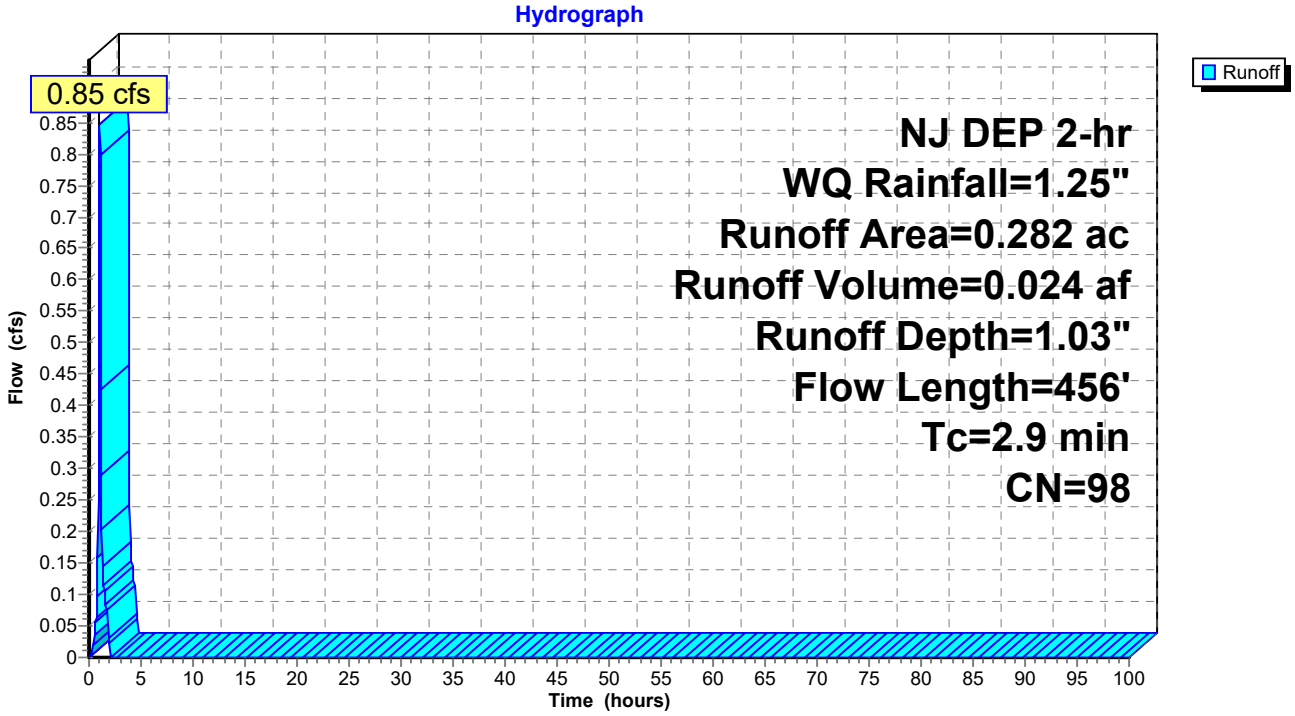
Runoff = 0.85 cfs @ 1.05 hrs, Volume= 0.024 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
0.282		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.97		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.5	202	0.0100	2.18	0.22	**Channel Flow, B-C** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.013 Asphalt, smooth
1.1	238	0.0050	3.72	4.57	**Pipe Channel, C-D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.9	456	Total			

Subcatchment 41S: PDA 2A Remain Imp.



Summary for Subcatchment 44S: PDA 2B Perv.

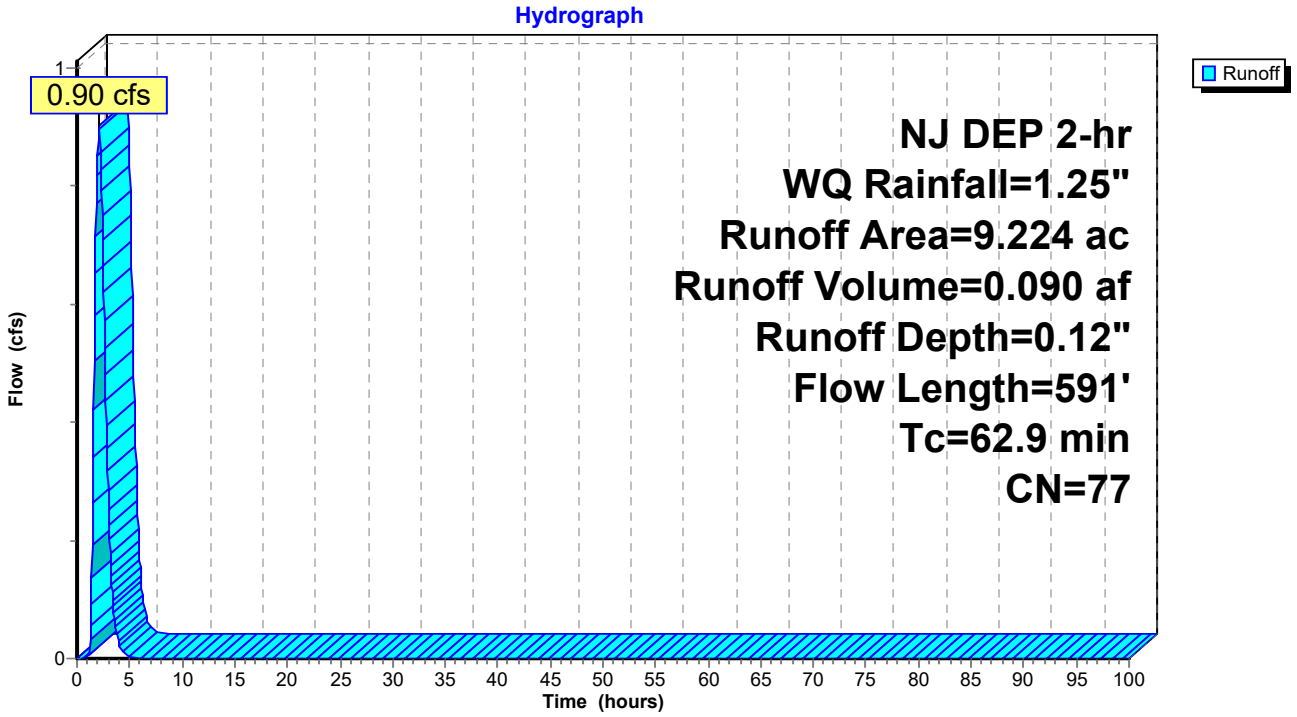
Runoff = 0.90 cfs @ 2.11 hrs, Volume= 0.090 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 44S: PDA 2B Perv.



Summary for Subcatchment 45S: PDA 2B Imperv.

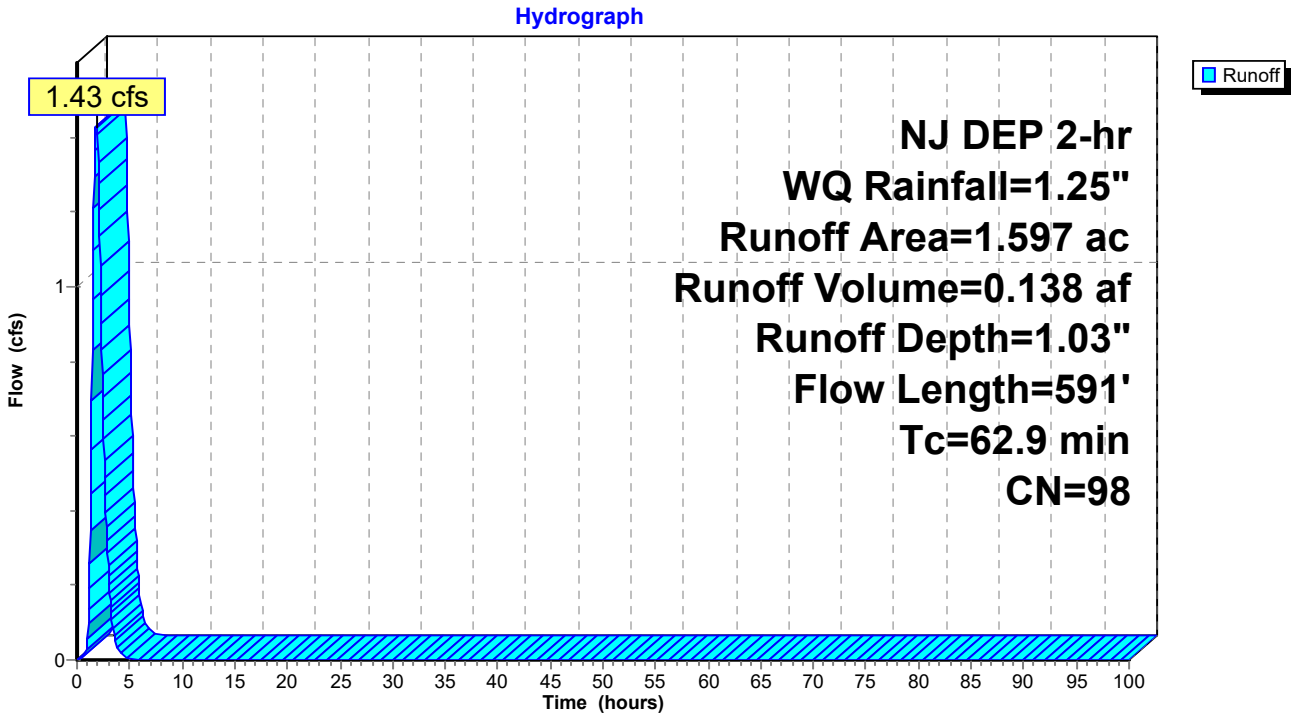
Runoff = 1.43 cfs @ 1.83 hrs, Volume= 0.138 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 45S: PDA 2B Imperv.



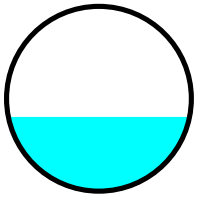
Summary for Reach 36R: Outlet Pipe

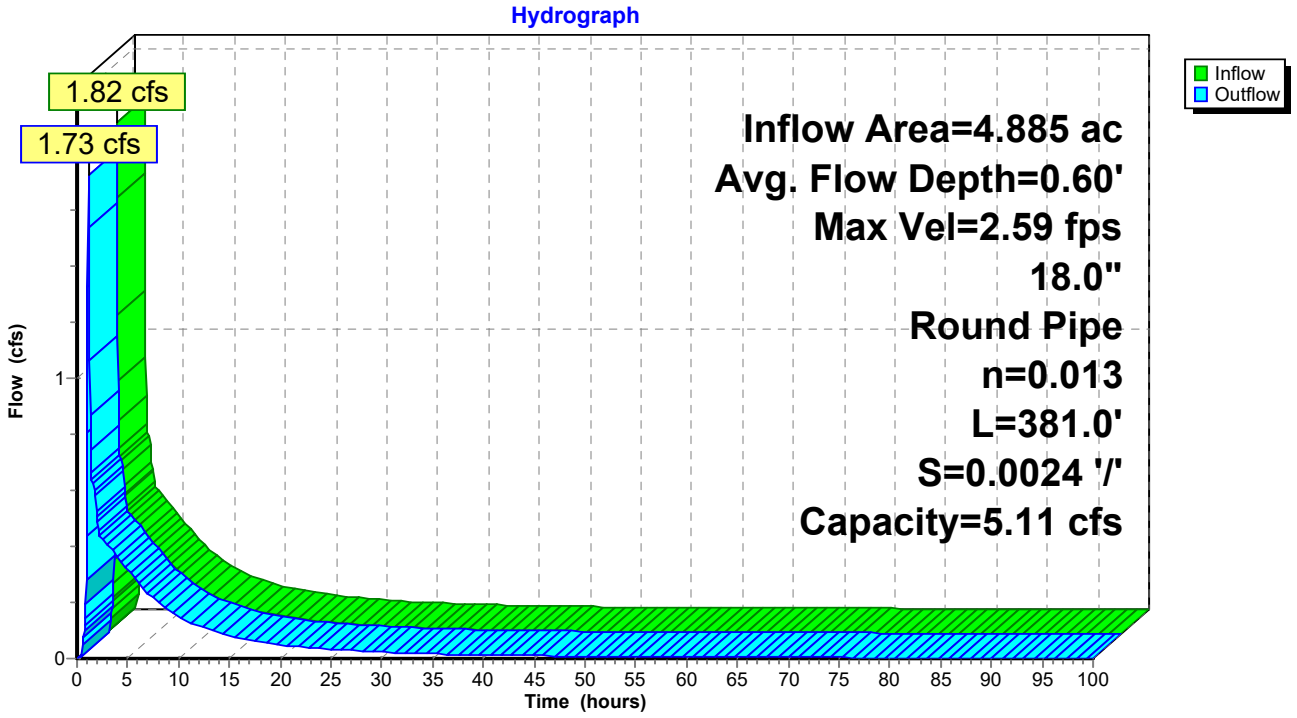
Inflow Area = 4.885 ac, 97.93% Impervious, Inflow Depth > 0.99" for WQ event
Inflow = 1.82 cfs @ 1.10 hrs, Volume= 0.401 af
Outflow = 1.73 cfs @ 1.13 hrs, Volume= 0.401 af, Atten= 5%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.59 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 9.4 min

Peak Storage= 252 cf @ 1.13 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.11 cfs

18.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 381.0' Slope= 0.0024 '/'
Inlet Invert= 110.60', Outlet Invert= 109.70'





Summary for Pond 20P: Pervious Pavement Front Parking Lot OCS 4

Inflow Area = 1.346 ac, 93.98% Impervious, Inflow Depth = 0.98" for WQ event
Inflow = 3.97 cfs @ 1.03 hrs, Volume= 0.110 af
Outflow = 0.42 cfs @ 1.54 hrs, Volume= 0.110 af, Atten= 89%, Lag= 30.7 min
Primary = 0.42 cfs @ 1.54 hrs, Volume= 0.110 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 110.84' @ 1.54 hrs Surf.Area= 26,712 sf Storage= 3,617 cf

Plug-Flow detention time= 234.3 min calculated for 0.110 af (100% of inflow)
Center-of-Mass det. time= 234.2 min (300.3 - 66.2)

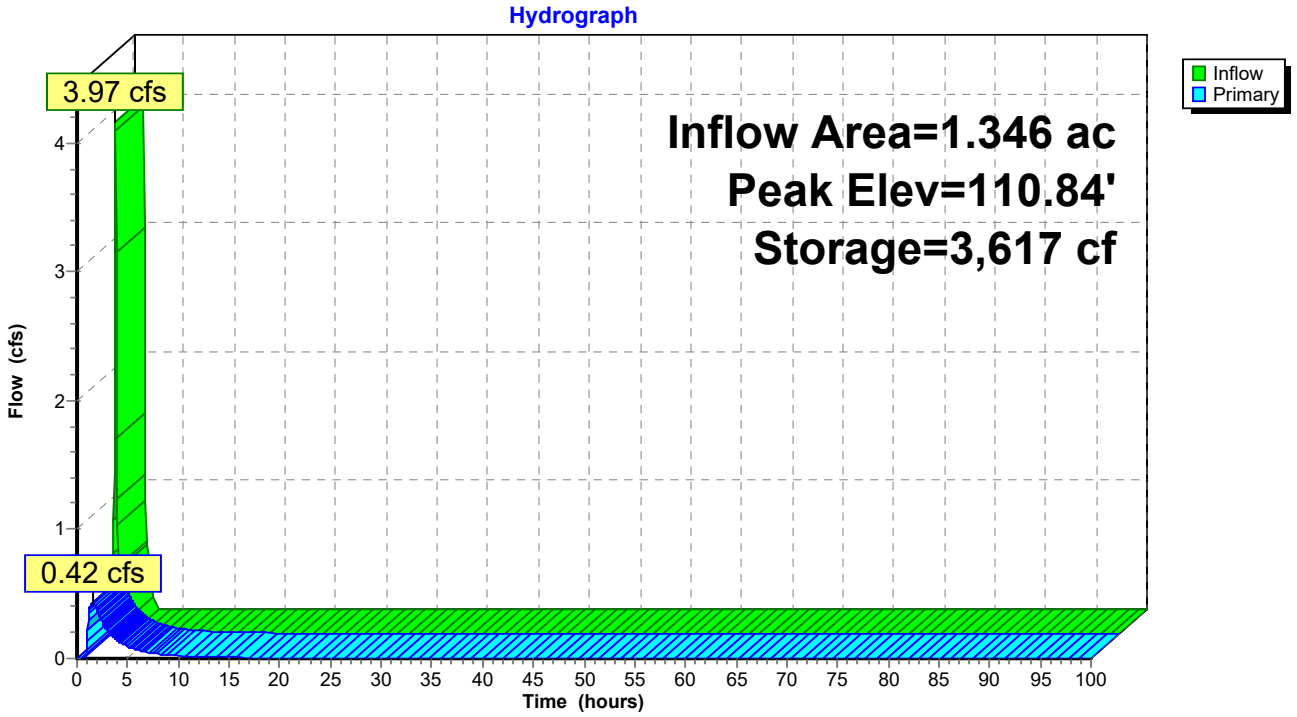
Volume	Invert	Avail.Storage	Storage Description
#1	110.50'	20,272 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 51,821 cf Overall - 1,140 cf Embedded = 50,681 cf x 40.0% Voids
#2	110.75'	425 cf	**15.0" Round Pipe Storage** Inside #1 L= 346.0' S= 0.0010 '/'
#3	110.76'	463 cf	**15.0" Round Pipe Storage** Inside #1 L= 377.0' S= 0.0010 '/'
#4	110.95'	189 cf	**15.0" Round Pipe Storage** Inside #1 L= 154.0' S= 0.0010 '/'
#5	110.81'	64 cf	**15.0" Round Pipe Storage** Inside #1 L= 52.0' S= 0.0010 '/'
		21,413 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.50	26,712	0	0
112.44	26,712	51,821	51,821

Device	Routing	Invert	Outlet Devices
#1	Primary	108.22'	**15.0" Round Culvert** L= 11.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 108.22' / 108.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	110.50'	**8.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	111.21'	**6.0" Vert. Orifice/Grate X 0.00** C= 0.600

Primary OutFlow Max=0.42 cfs @ 1.54 hrs HW=110.84' TW=108.23' (Dynamic Tailwater)
1=Culvert (Passes 0.42 cfs of 7.36 cfs potential flow)
2=Orifice/Grate (Orifice Controls 0.42 cfs @ 1.87 fps)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 20P: Pervious Pavement Front Parking Lot OCS 4



Summary for Pond 24P: Modified Depression

Inflow Area = 3.165 ac, 75.36% Impervious, Inflow Depth = 0.82" for WQ event
Inflow = 3.21 cfs @ 1.19 hrs, Volume= 0.217 af
Outflow = 2.06 cfs @ 1.34 hrs, Volume= 0.217 af, Atten= 36%, Lag= 9.0 min
Primary = 2.06 cfs @ 1.34 hrs, Volume= 0.217 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 108.32' @ 1.34 hrs Surf.Area= 3,621 sf Storage= 1,744 cf

Plug-Flow detention time= 14.8 min calculated for 0.217 af (100% of inflow)
Center-of-Mass det. time= 14.7 min (205.5 - 190.7)

Volume	Invert	Avail.Storage	Storage Description
#1	107.60'	12,350 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

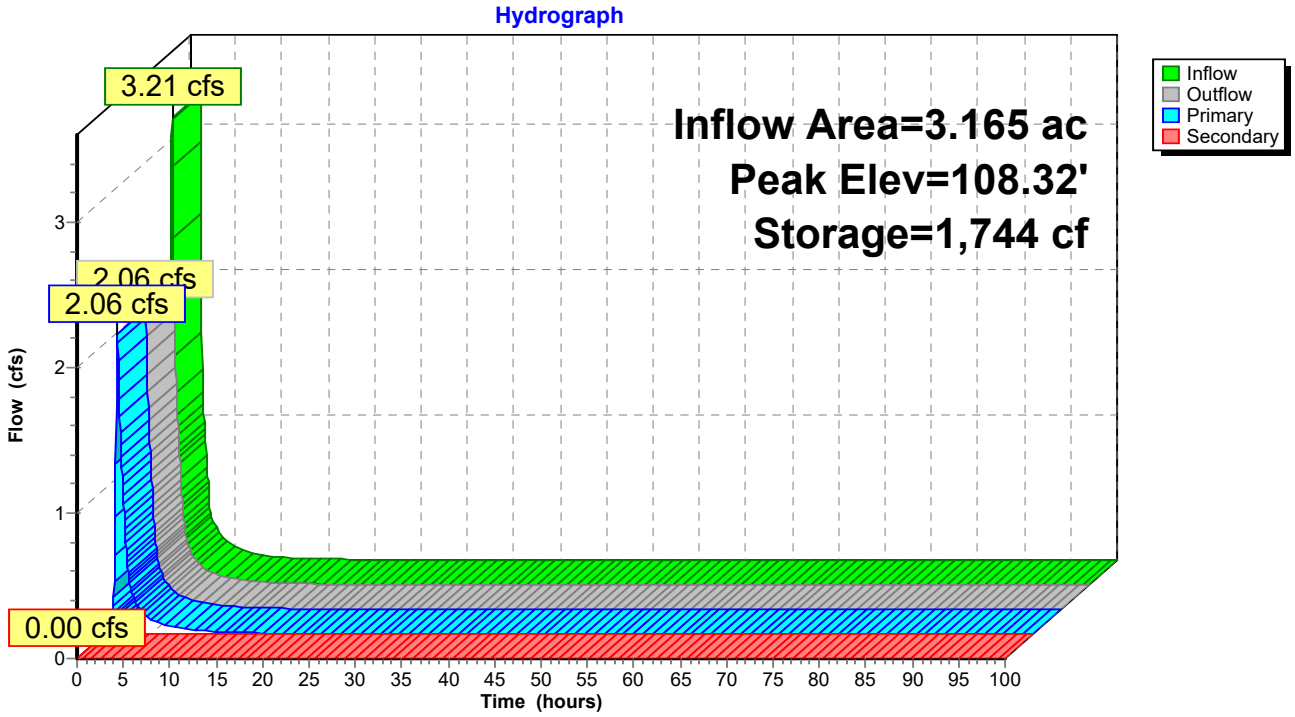
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.60	10	0	0
108.00	3,235	649	649
109.00	4,443	3,839	4,488
110.00	5,417	4,930	9,418
110.50	6,311	2,932	12,350

Device	Routing	Invert	Outlet Devices
#1	Primary	107.60'	**15.0" Round Culvert** L= 81.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.60' / 107.00' S= 0.0074 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Secondary	110.43'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.05 cfs @ 1.34 hrs HW=108.32' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.05 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 24P: Modified Depression



Summary for Pond 28P: Pervious Pavement Right Parking Area OCS 3

Inflow Area = 0.303 ac, 82.18% Impervious, Inflow Depth = 0.88" for WQ event
Inflow = 0.80 cfs @ 1.03 hrs, Volume= 0.022 af
Outflow = 0.01 cfs @ 2.05 hrs, Volume= 0.015 af, Atten= 99%, Lag= 60.9 min
Primary = 0.01 cfs @ 2.05 hrs, Volume= 0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.07' @ 2.05 hrs Surf.Area= 34,390 sf Storage= 950 cf

Plug-Flow detention time= 1,783.1 min calculated for 0.015 af (69% of inflow)
Center-of-Mass det. time= 1,774.6 min (1,841.0 - 66.4)

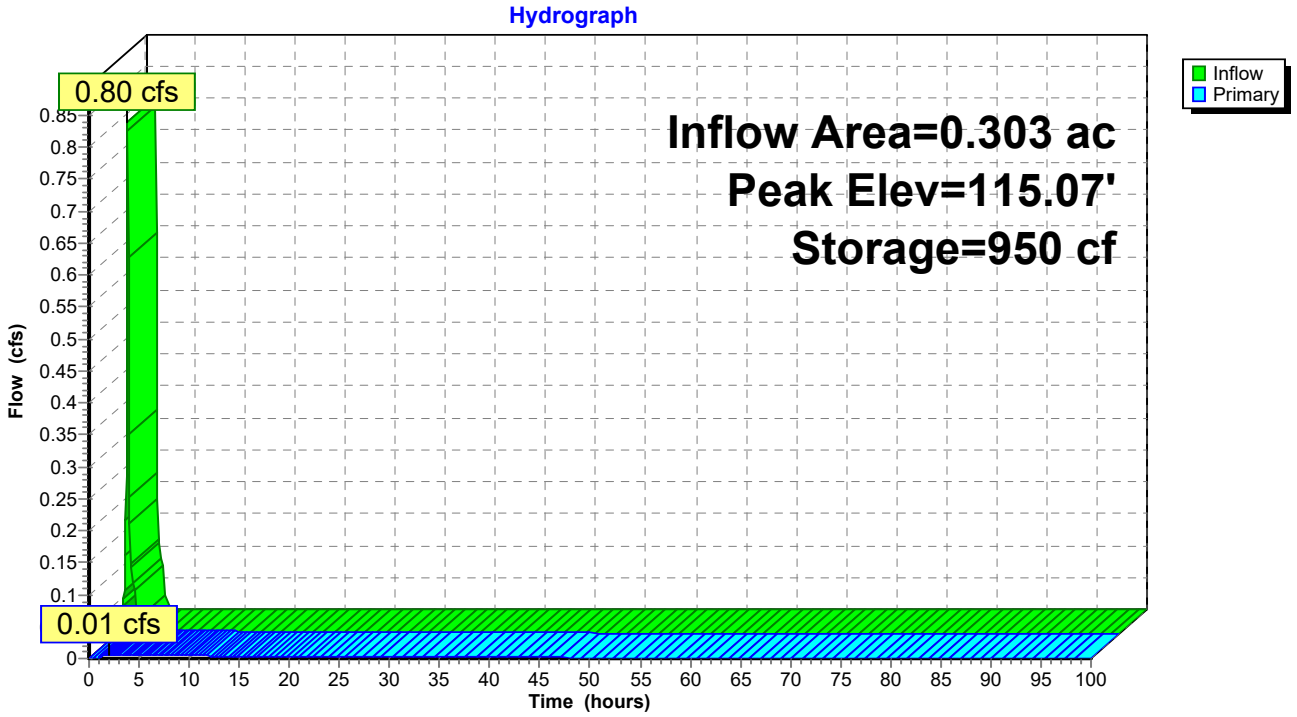
Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	39,440 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 99,043 cf Overall - 444 cf Embedded = 98,599 cf x 40.0% Voids
#2	115.25'	185 cf	**15.0" Round Pipe Storage** Inside #1 L= 151.0' S= 0.0010 '/'
#3	115.25'	259 cf	**15.0" Round Pipe Storage** Inside #1 L= 211.0' S= 0.0010 '/'
		39,884 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	34,390	0	0
117.88	34,390	99,043	99,043

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	**15.0" Round Culvert** L= 775.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 115.00' / 114.22' S= 0.0010 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	115.00'	**2.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.01 cfs @ 2.05 hrs HW=115.07' TW=110.91' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 0.01 cfs @ 0.38 fps)
↑**2=Orifice/Grate** (Passes 0.01 cfs of 0.01 cfs potential flow)

Pond 28P: Pervious Pavement Right Parking Area OCS 3



Summary for Pond 30P: Pervious Pavement Rear Trailer Area OCS 2

Inflow Area = 0.374 ac,100.00% Impervious, Inflow Depth = 1.03" for WQ event
Inflow = 1.14 cfs @ 1.04 hrs, Volume= 0.032 af
Outflow = 0.06 cfs @ 1.80 hrs, Volume= 0.031 af, Atten= 95%, Lag= 46.1 min
Primary = 0.06 cfs @ 1.80 hrs, Volume= 0.031 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 112.73' @ 1.80 hrs Surf.Area= 13,334 sf Storage= 1,225 cf

Plug-Flow detention time= 537.3 min calculated for 0.031 af (97% of inflow)
Center-of-Mass det. time= 535.9 min (602.5 - 66.6)

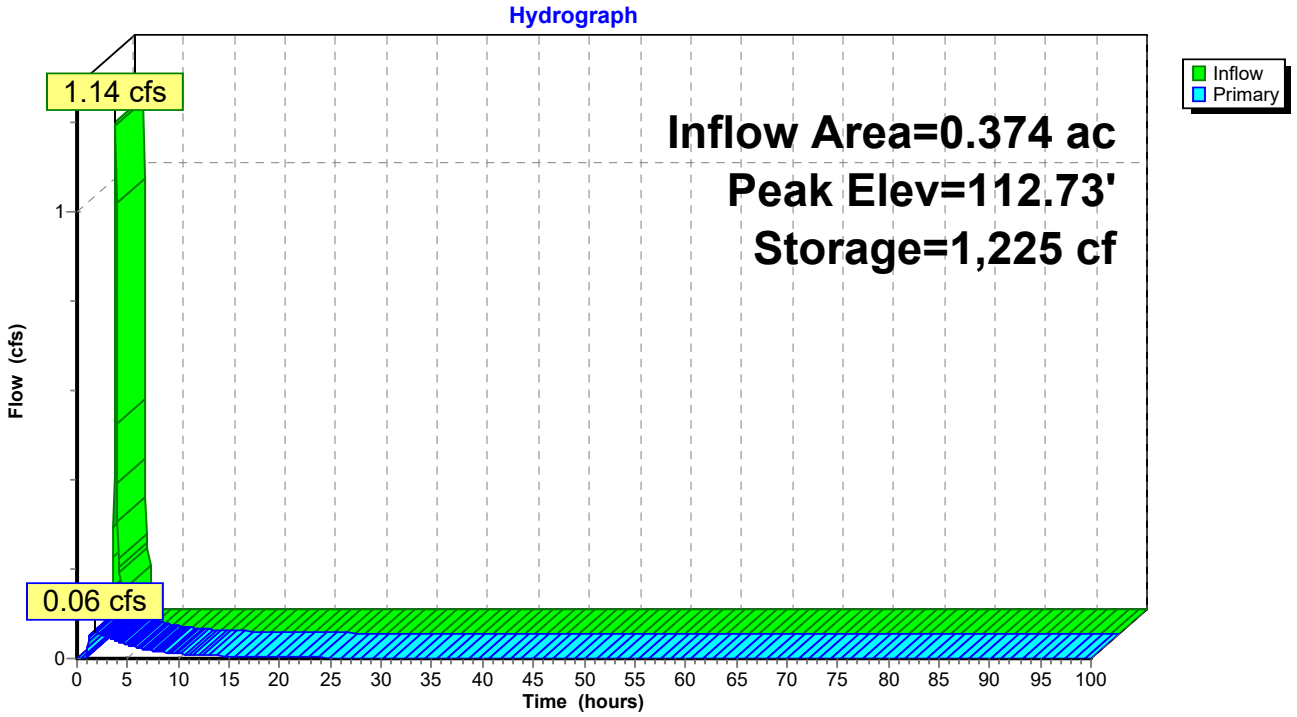
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	9,791 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 24,668 cf Overall - 191 cf Embedded = 24,476 cf x 40.0% Voids
#2	112.75'	191 cf	**15.0" Round Pipe Storage** Inside #1 L= 156.0' S= 0.0010 '/'
		9,982 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	13,334	0	0
114.35	13,334	24,668	24,668

Device	Routing	Invert	Outlet Devices
#1	Primary	110.67'	**15.0" Round Culvert** L= 36.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.67' / 110.63' S= 0.0011 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	112.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.75'	**0.5' long Sharp-Crested Rectangular Weir X 0.00** 2 End Contraction(s)

Primary OutFlow Max=0.06 cfs @ 1.80 hrs HW=112.73' TW=110.94' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.06 cfs of 5.70 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.71 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: Pervious Pavement Rear Trailer Area OCS 2



Summary for Pond 34P: Pervious Pavement Loading Area OCS 1

Inflow Area = 3.667 ac, 98.72% Impervious, Inflow Depth = 1.02" for WQ event
Inflow = 10.97 cfs @ 1.08 hrs, Volume= 0.312 af
Outflow = 0.38 cfs @ 1.92 hrs, Volume= 0.308 af, Atten= 97%, Lag= 50.5 min
Primary = 0.38 cfs @ 1.92 hrs, Volume= 0.308 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.13' @ 1.92 hrs Surf.Area= 48,644 sf Storage= 12,340 cf

Plug-Flow detention time= 673.5 min calculated for 0.308 af (98% of inflow)
Center-of-Mass det. time= 675.3 min (744.3 - 69.0)

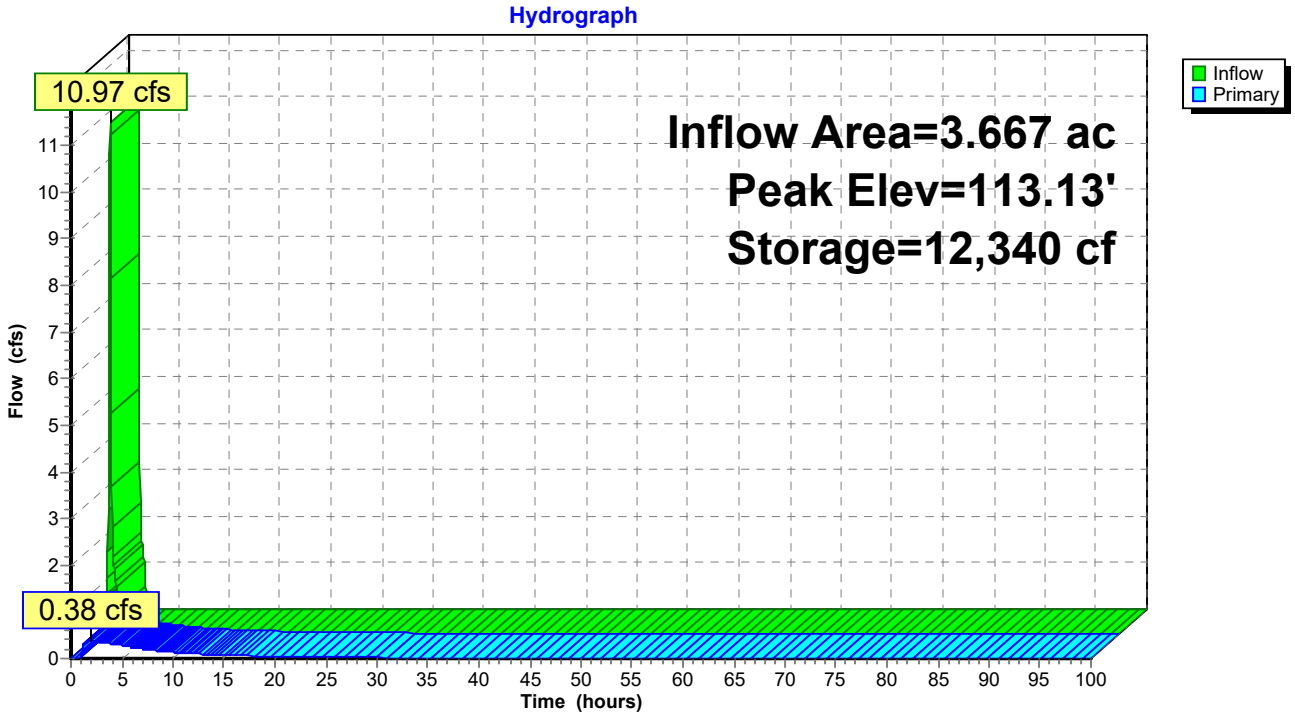
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	58,387 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 147,391 cf Overall - 1,424 cf Embedded = 145,968 cf x 40.0% Voids
#2	112.75'	668 cf	**15.0" Round Pipe Storage** Inside #1 L= 544.0' S= 0.0010 '/'
#3	112.75'	627 cf	**15.0" Round Pipe Storage** Inside #1 L= 511.0' S= 0.0010 '/'
#4	112.75'	129 cf	**15.0" Round Pipe Storage** Inside #1 L= 105.0' S= 0.0100 '/'
		59,811 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	48,644	0	0
115.53	48,644	147,391	147,391

Device	Routing	Invert	Outlet Devices
#1	Primary	110.61'	**18.0" Round Culvert** L= 1.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.61' / 110.61' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	112.50'	**3.5" W x 5.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.90'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.65'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.38 cfs @ 1.92 hrs HW=113.13' TW=110.92' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.38 cfs of 9.99 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.38 cfs @ 3.10 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Pervious Pavement Loading Area OCS 1



Summary for Pond 38P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 1.03" for WQ event
Inflow = 6.20 cfs @ 1.11 hrs, Volume= 0.193 af
Outflow = 0.47 cfs @ 1.85 hrs, Volume= 0.193 af, Atten= 92%, Lag= 44.1 min
Primary = 0.47 cfs @ 1.85 hrs, Volume= 0.193 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.33' @ 1.85 hrs Surf.Area= 10,198 sf Storage= 5,957 cf

Plug-Flow detention time= 110.5 min calculated for 0.193 af (100% of inflow)
Center-of-Mass det. time= 110.7 min (182.3 - 71.6)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	841 cf	**18.0" Round Pipe Storage**-Impervious L= 476.0' S= 0.0030 '/'
		34,324 cf	Total Available Storage

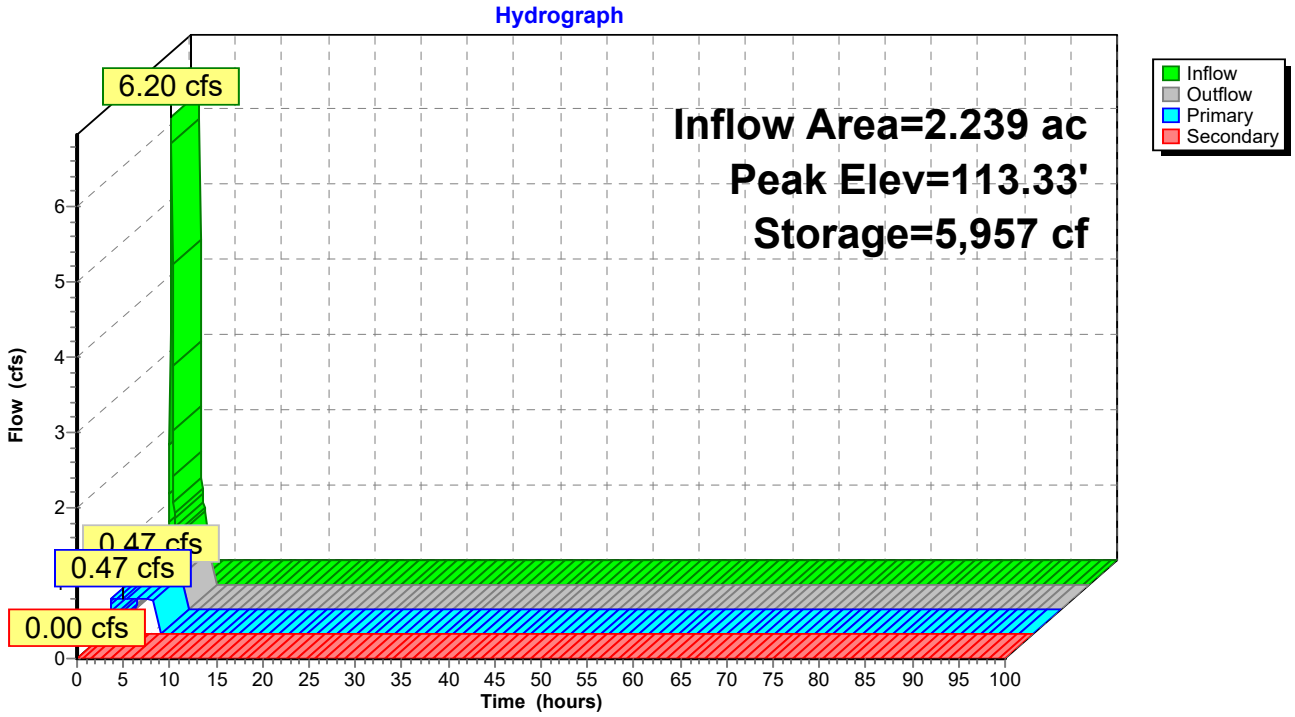
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.03'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.47 cfs @ 1.85 hrs HW=113.33' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.47 cfs of 11.57 cfs potential flow)
  - **2=Exfiltration** (Exfiltration Controls 0.47 cfs)
  - **3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.09 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=112.75' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 38P: Bioretention

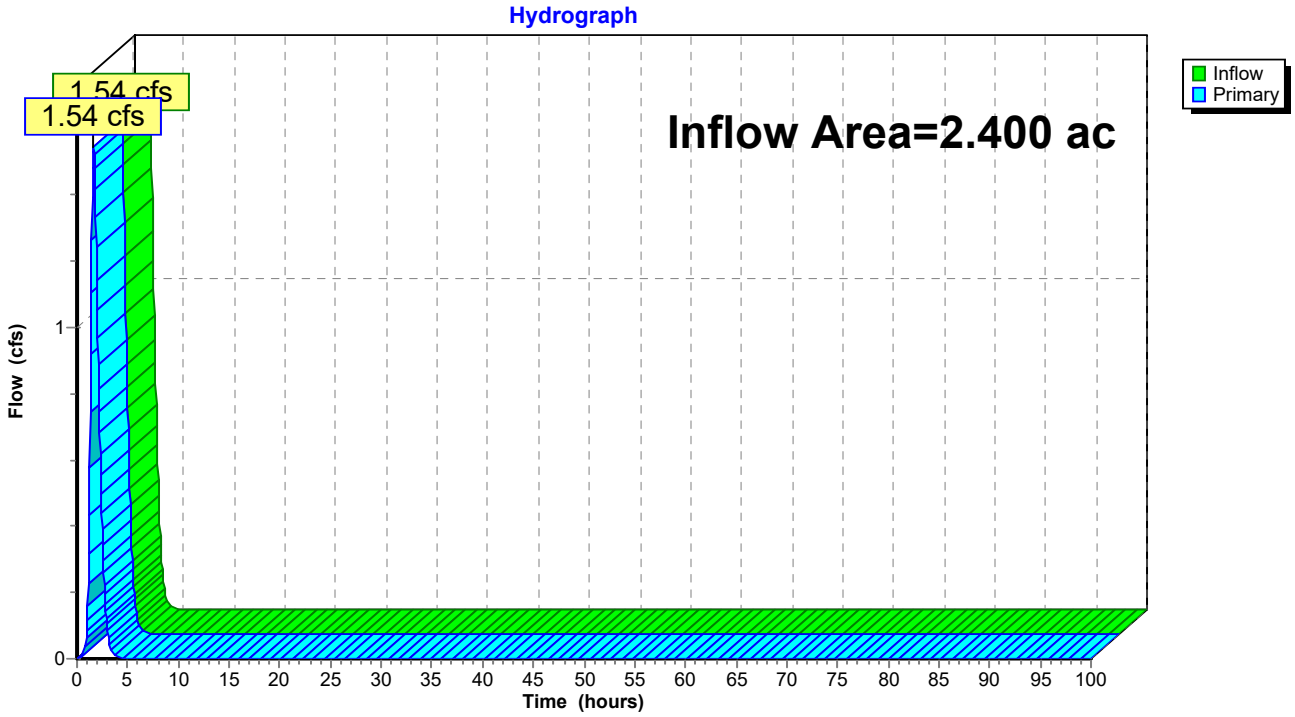


Summary for Link 17L: PDA 1A

Inflow Area = 2.400 ac, 55.42% Impervious, Inflow Depth = 0.63" for WQ event
Inflow = 1.54 cfs @ 1.65 hrs, Volume= 0.125 af
Primary = 1.54 cfs @ 1.65 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 17L: PDA 1A

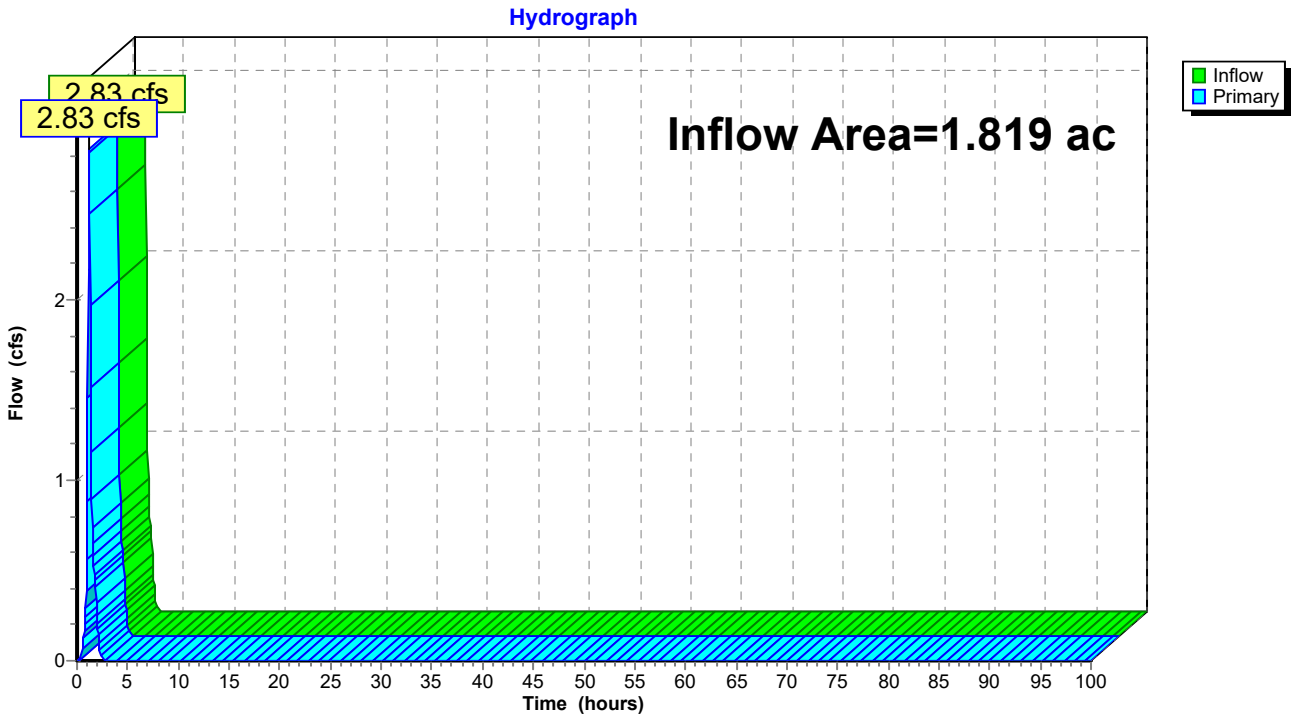


Summary for Link 23L: PDA 1C

Inflow Area = 1.819 ac, 61.57% Impervious, Inflow Depth = 0.70" for WQ event
Inflow = 2.83 cfs @ 1.19 hrs, Volume= 0.107 af
Primary = 2.83 cfs @ 1.19 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 23L: PDA 1C

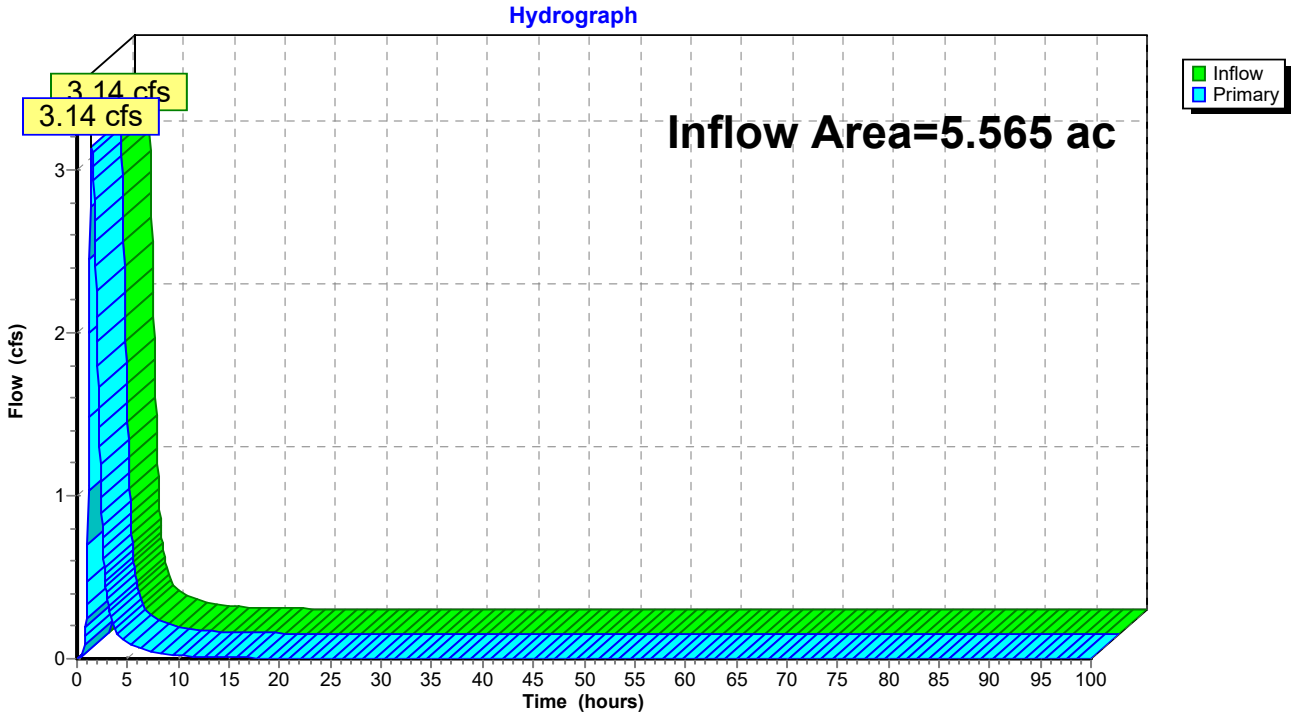


Summary for Link 25L: PDA 1

Inflow Area = 5.565 ac, 66.76% Impervious, Inflow Depth = 0.74" for WQ event
Inflow = 3.14 cfs @ 1.47 hrs, Volume= 0.342 af
Primary = 3.14 cfs @ 1.47 hrs, Volume= 0.342 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 25L: PDA 1

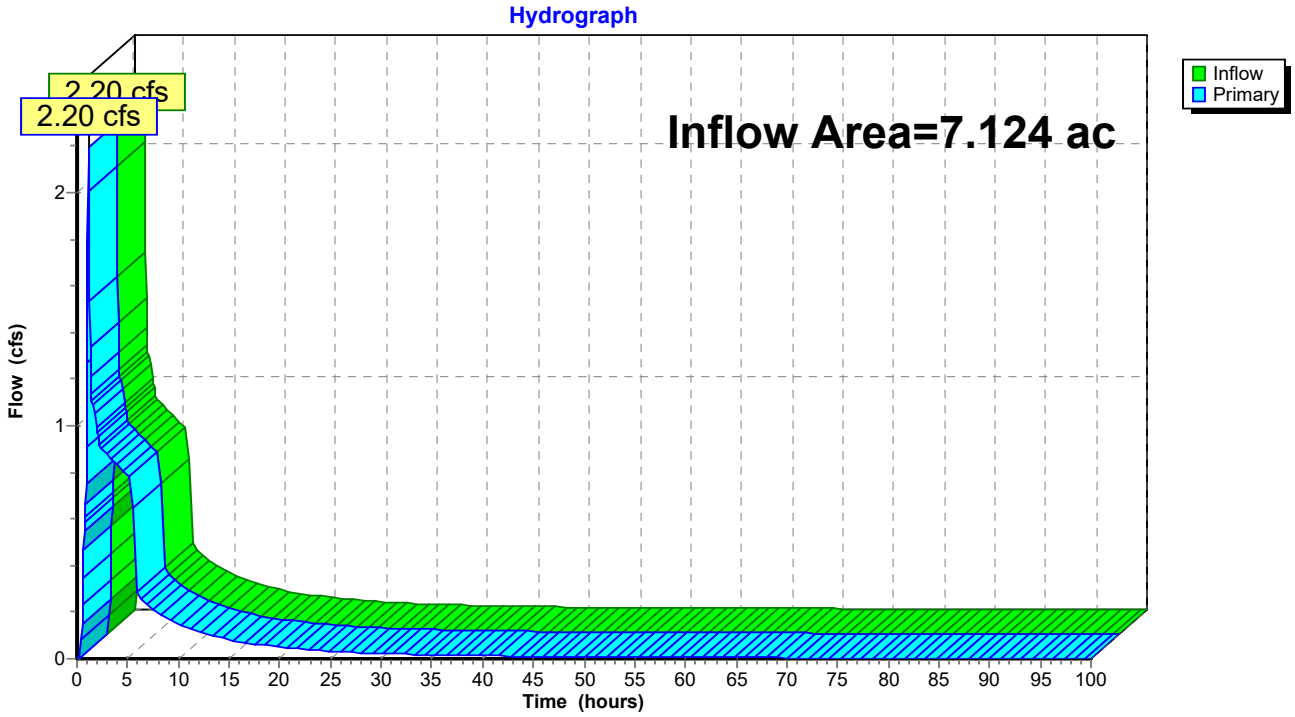


Summary for Link 39L: PDA 2A Treated

Inflow Area = 7.124 ac, 98.58% Impervious, Inflow Depth > 1.00" for WQ event
Inflow = 2.20 cfs @ 1.13 hrs, Volume= 0.595 af
Primary = 2.20 cfs @ 1.13 hrs, Volume= 0.595 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 39L: PDA 2A Treated

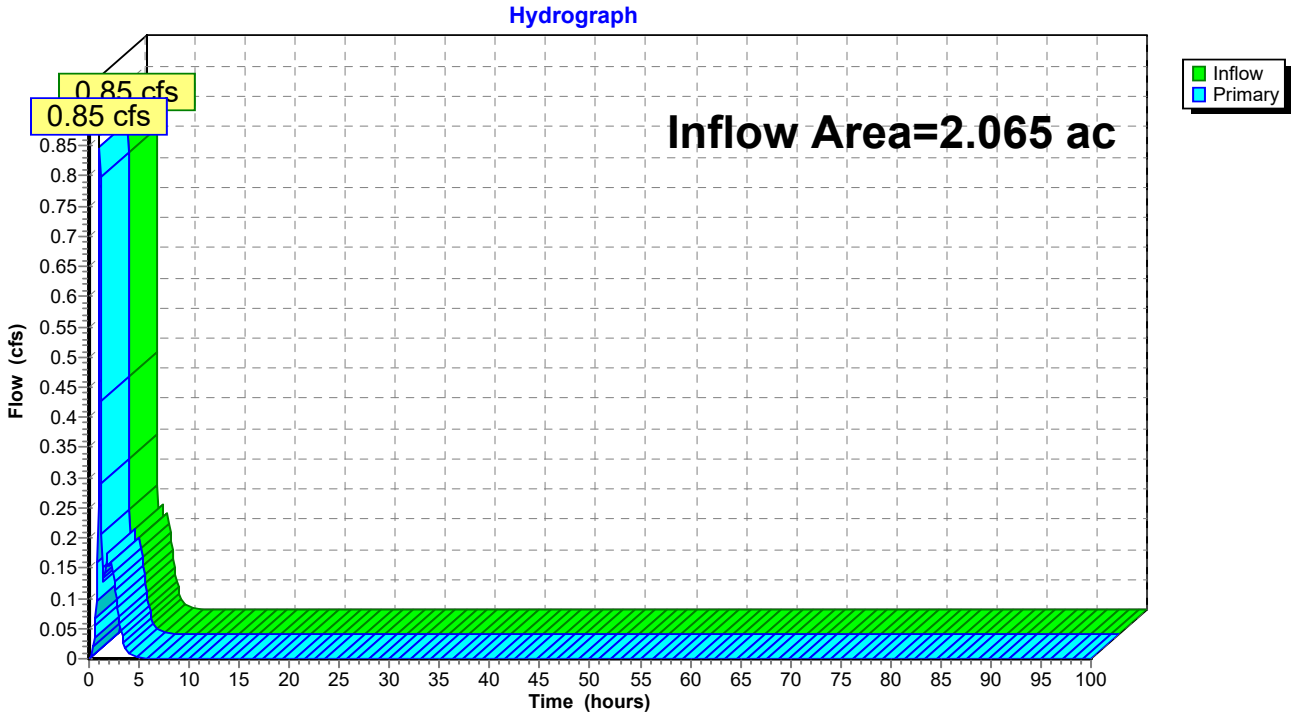


Summary for Link 42L: PDA 2A Remainder

Inflow Area = 2.065 ac, 13.66% Impervious, Inflow Depth = 0.24" for WQ event
Inflow = 0.85 cfs @ 1.05 hrs, Volume= 0.042 af
Primary = 0.85 cfs @ 1.05 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 42L: PDA 2A Remainder

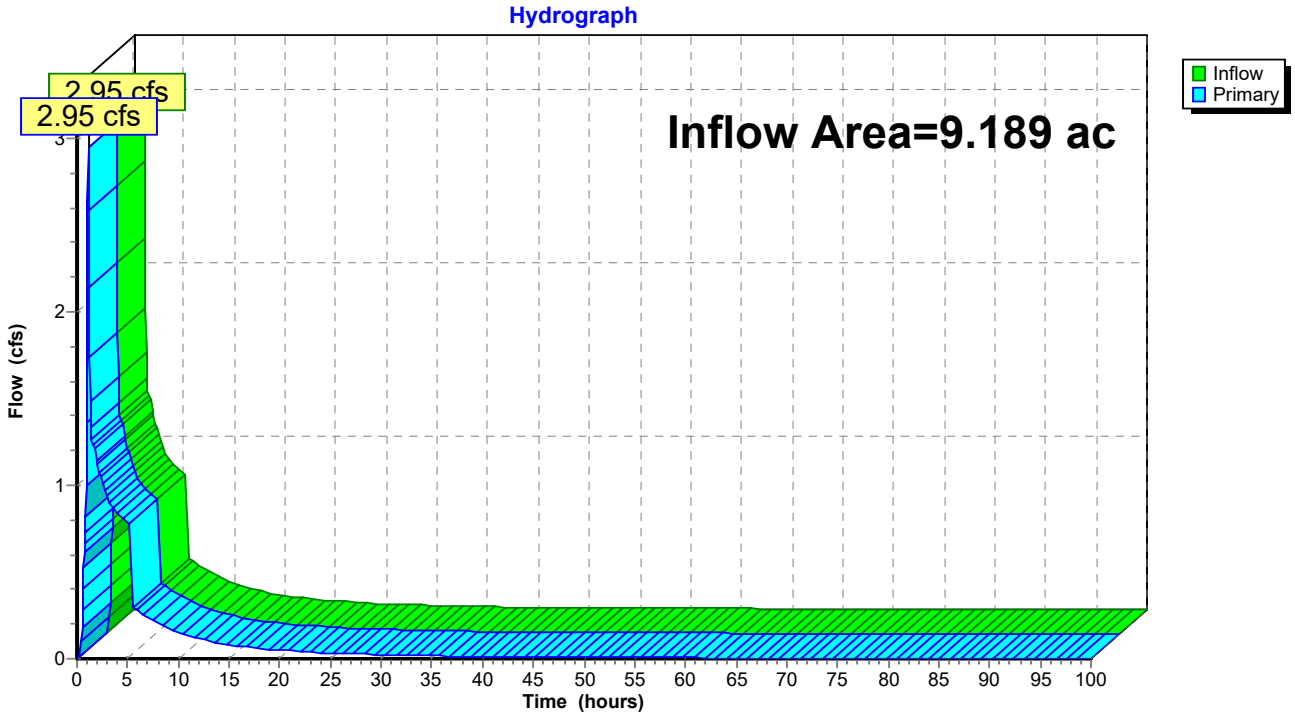


Summary for Link 43L: PDA 2A

Inflow Area = 9.189 ac, 79.50% Impervious, Inflow Depth > 0.83" for WQ event
Inflow = 2.95 cfs @ 1.10 hrs, Volume= 0.636 af
Primary = 2.95 cfs @ 1.10 hrs, Volume= 0.636 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 43L: PDA 2A

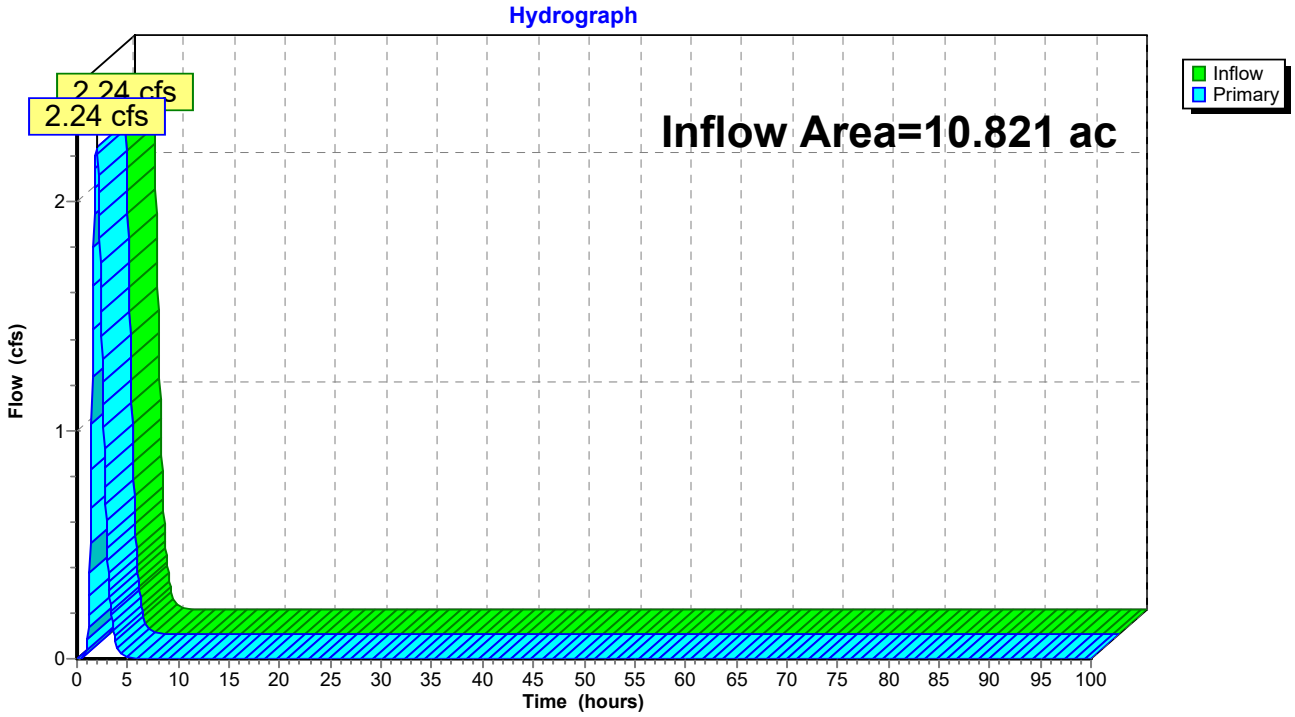


Summary for Link 46L: PDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 0.25" for WQ event
Inflow = 2.24 cfs @ 1.92 hrs, Volume= 0.228 af
Primary = 2.24 cfs @ 1.92 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 46L: PDA 2B

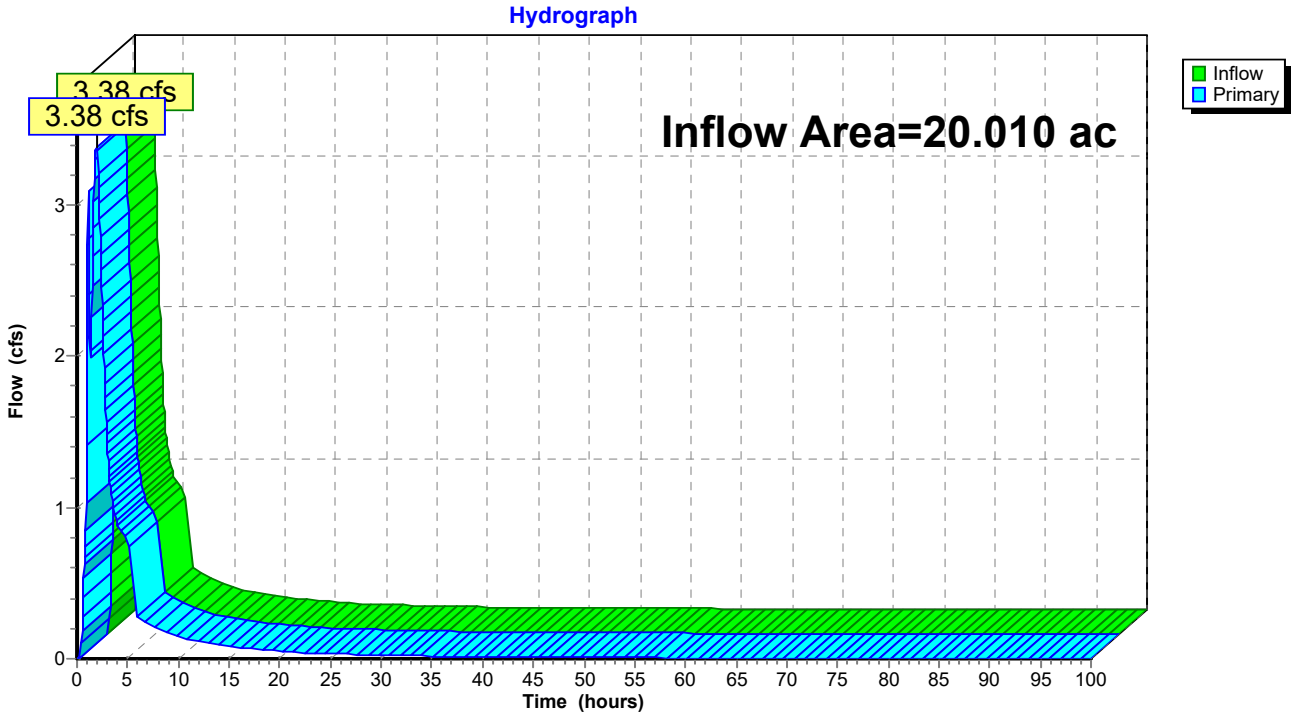


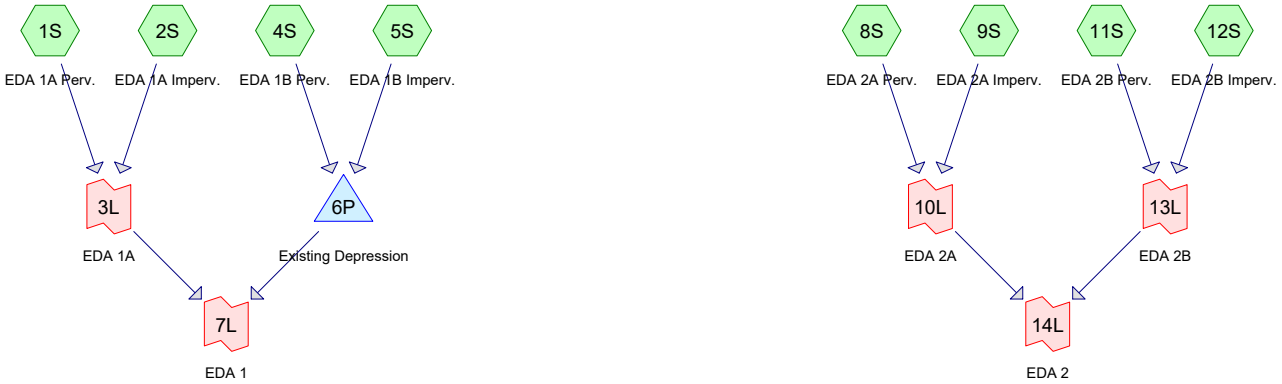
Summary for Link 47L: PDA 2

Inflow Area = 20.010 ac, 44.49% Impervious, Inflow Depth > 0.52" for WQ event
Inflow = 3.38 cfs @ 1.89 hrs, Volume= 0.864 af
Primary = 3.38 cfs @ 1.89 hrs, Volume= 0.864 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 47L: PDA 2





Subcat Reach Pond Link

Routing Diagram for Existing

Prepared by Bohler Engineering, Printed 8/12/2021

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=405' Tc=48.4 min CN=77 Runoff=0.66 cfs 0.118 af

Subcatchment 2S: EDA 1A Imperv. Runoff Area=1.325 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=405' Tc=48.4 min CN=98 Runoff=1.79 cfs 0.344 af

Subcatchment 4S: EDA 1B Perv. Runoff Area=1.969 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=653' Tc=12.7 min CN=80 Runoff=2.66 cfs 0.249 af

Subcatchment 5S: EDA 1B Imperv. Runoff Area=3.494 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=653' Tc=12.7 min CN=98 Runoff=8.59 cfs 0.908 af

Subcatchment 8S: EDA 2A Perv. Runoff Area=1.074 ac 0.00% Impervious Runoff Depth=1.26"
Flow Length=1,211' Tc=72.3 min CN=76 Runoff=0.49 cfs 0.113 af

Subcatchment 9S: EDA 2A Imperv. Runoff Area=5.953 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=1,211' Tc=72.3 min CN=98 Runoff=6.44 cfs 1.546 af

Subcatchment 11S: EDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=591' Tc=62.9 min CN=77 Runoff=4.88 cfs 1.015 af

Subcatchment 12S: EDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=591' Tc=62.9 min CN=98 Runoff=1.87 cfs 0.415 af

Pond 6P: Existing Depression Peak Elev=109.78' Storage=6,932 cf Inflow=11.25 cfs 1.157 af
Outflow=5.71 cfs 1.157 af

Link 3L: EDA 1A Inflow=2.44 cfs 0.462 af
Primary=2.44 cfs 0.462 af

Link 7L: EDA 1 Inflow=7.86 cfs 1.619 af
Primary=7.86 cfs 1.619 af

Link 10L: EDA 2A Inflow=6.93 cfs 1.659 af
Primary=6.93 cfs 1.659 af

Link 13L: EDA 2B Inflow=6.73 cfs 1.430 af
Primary=6.73 cfs 1.430 af

Link 14L: EDA 2 Inflow=13.64 cfs 3.088 af
Primary=13.64 cfs 3.088 af

Total Runoff Area = 25.706 ac Runoff Volume = 4.707 af Average Runoff Depth = 2.20"
51.88% Pervious = 13.337 ac 48.12% Impervious = 12.369 ac

Summary for Subcatchment 1S: EDA 1A Perv.

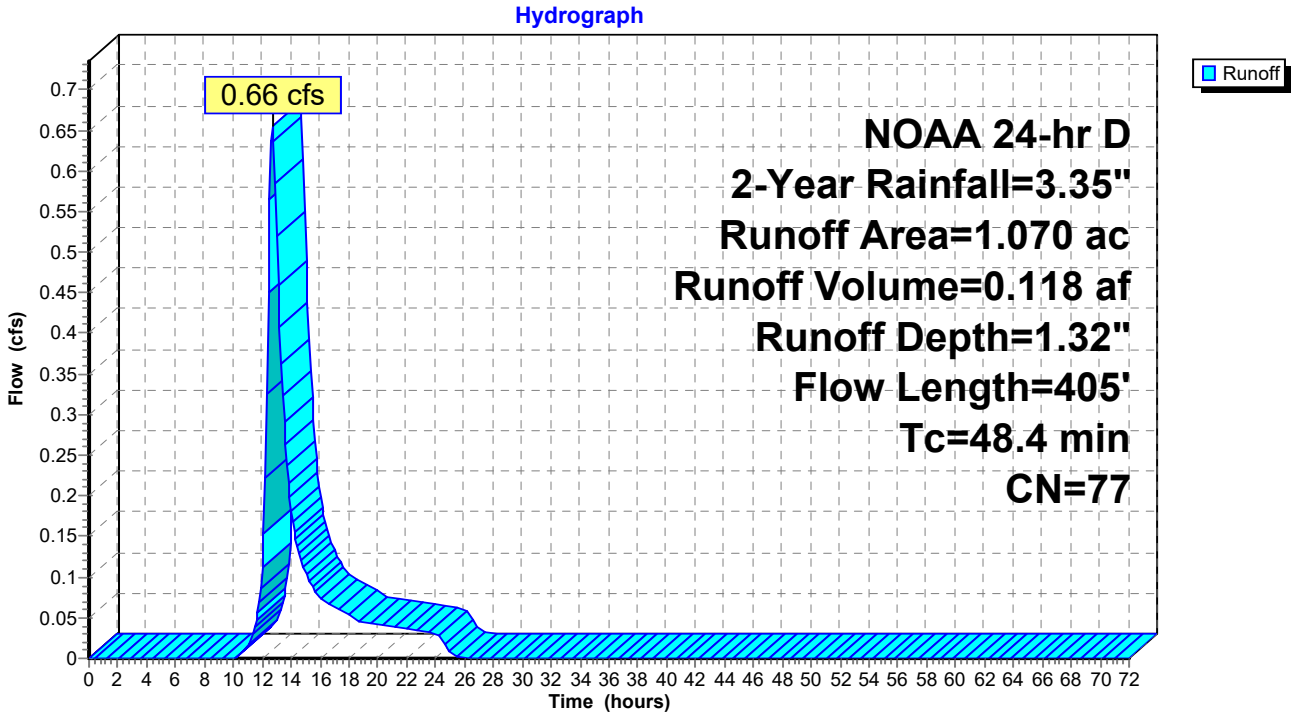
Runoff = 0.66 cfs @ 12.70 hrs, Volume= 0.118 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 1S: EDA 1A Perv.



Summary for Subcatchment 2S: EDA 1A Imperv.

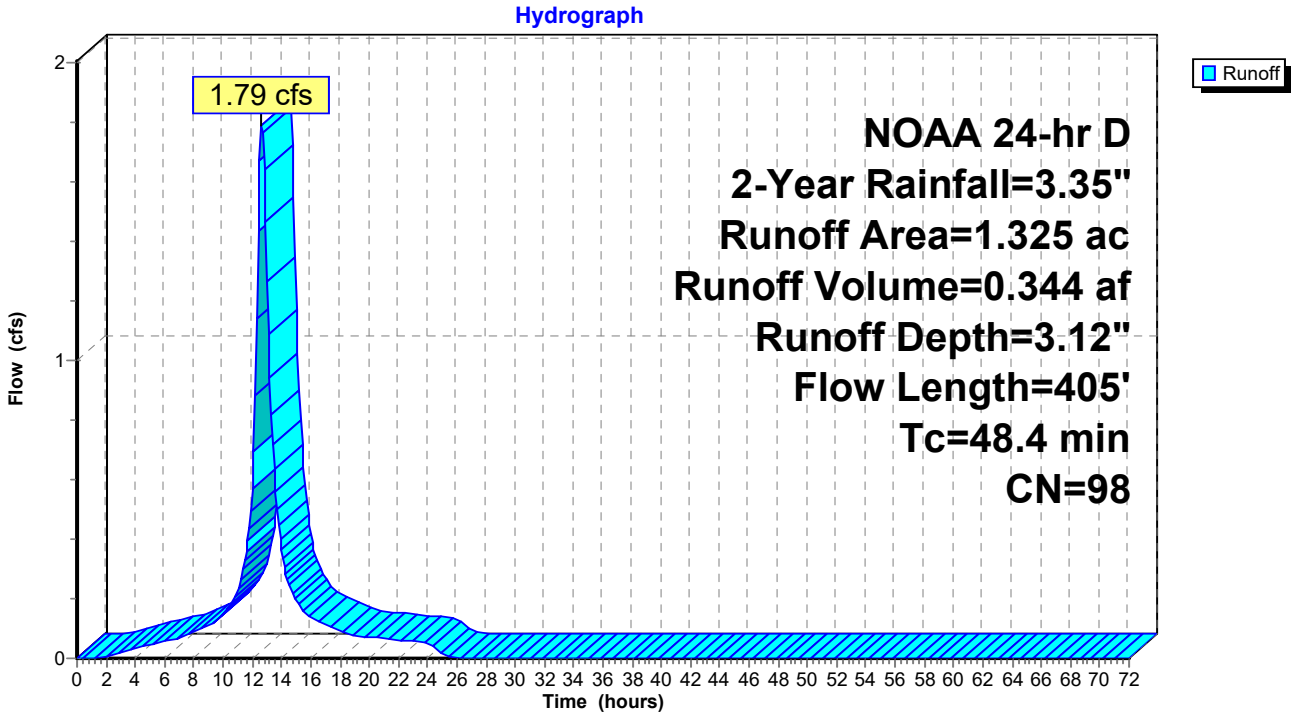
Runoff = 1.79 cfs @ 12.63 hrs, Volume= 0.344 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.325	98	Paved parking, HSG D
1.325		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 2S: EDA 1A Imperv.



Summary for Subcatchment 4S: EDA 1B Perv.

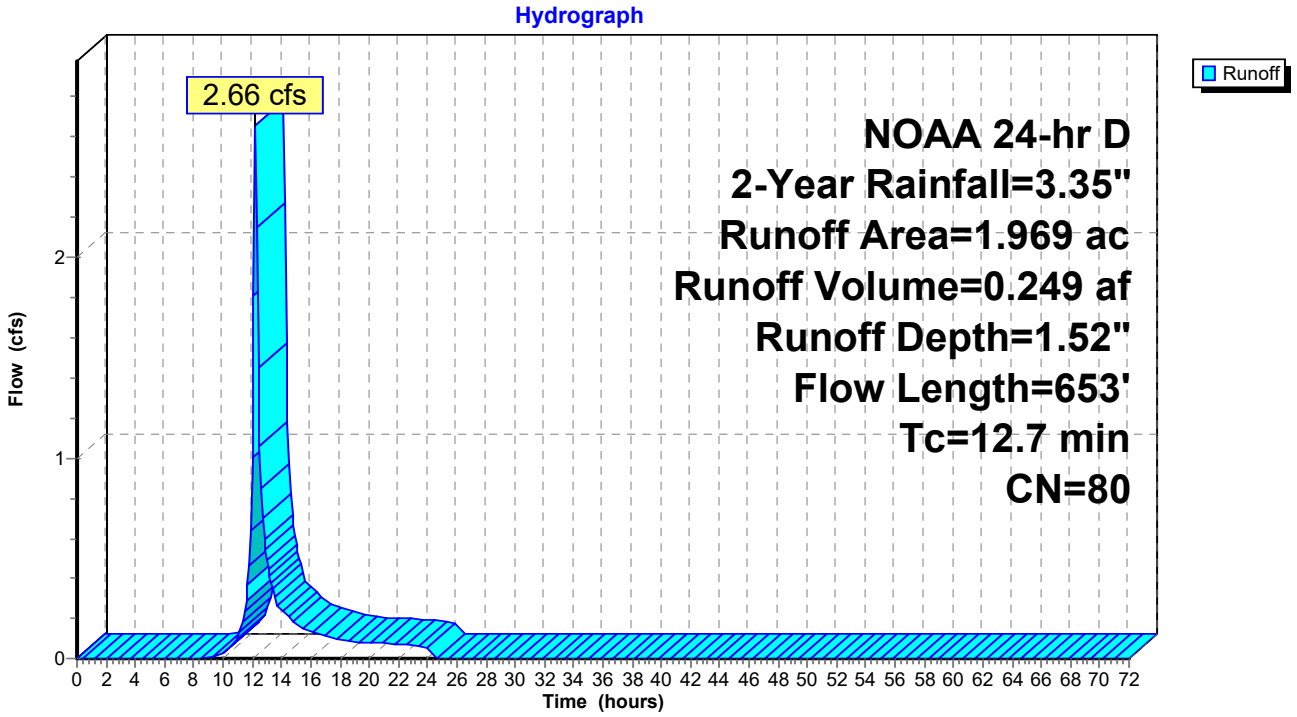
Runoff = 2.66 cfs @ 12.21 hrs, Volume= 0.249 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
1.969	80	>75% Grass cover, Good, HSG D
1.969	80	Weighted Average
1.969		100.00% Pervious 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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 4S: EDA 1B Perv.



Summary for Subcatchment 5S: EDA 1B Imperv.

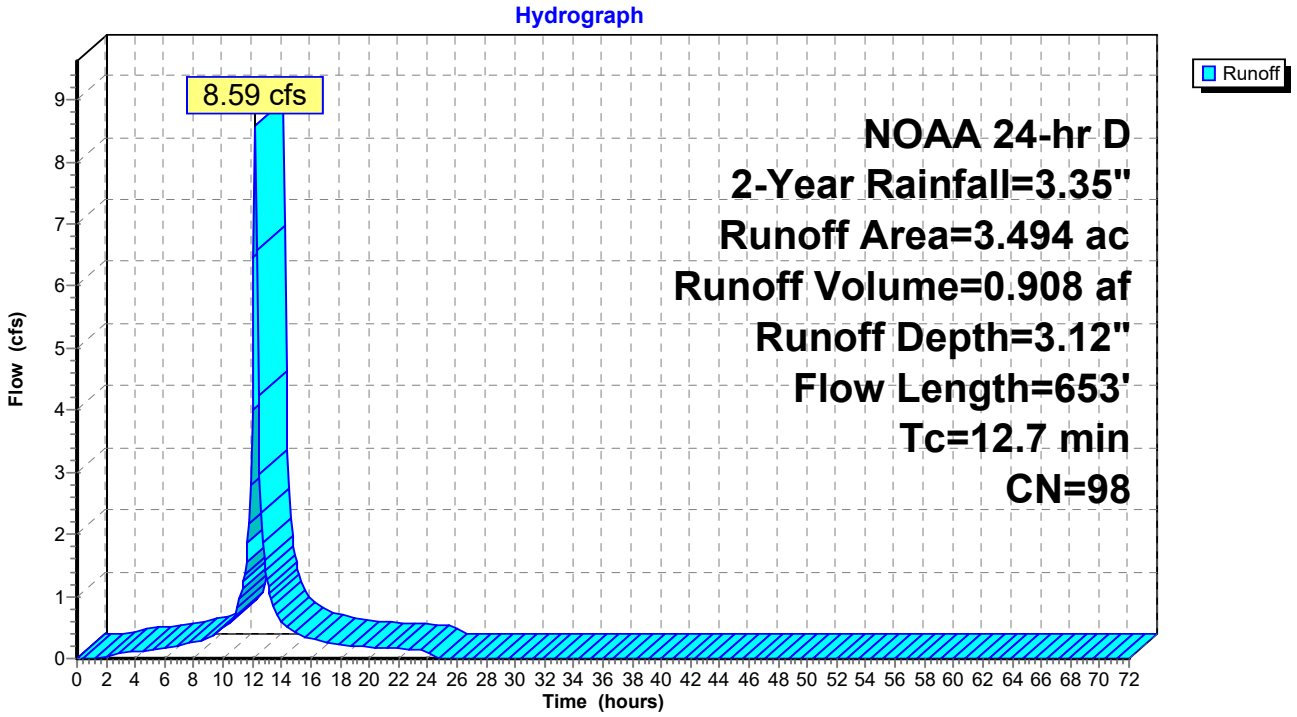
Runoff = 8.59 cfs @ 12.20 hrs, Volume= 0.908 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
3.494	98	Paved parking, HSG D
3.494		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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 5S: EDA 1B Imperv.



Summary for Subcatchment 8S: EDA 2A Perv.

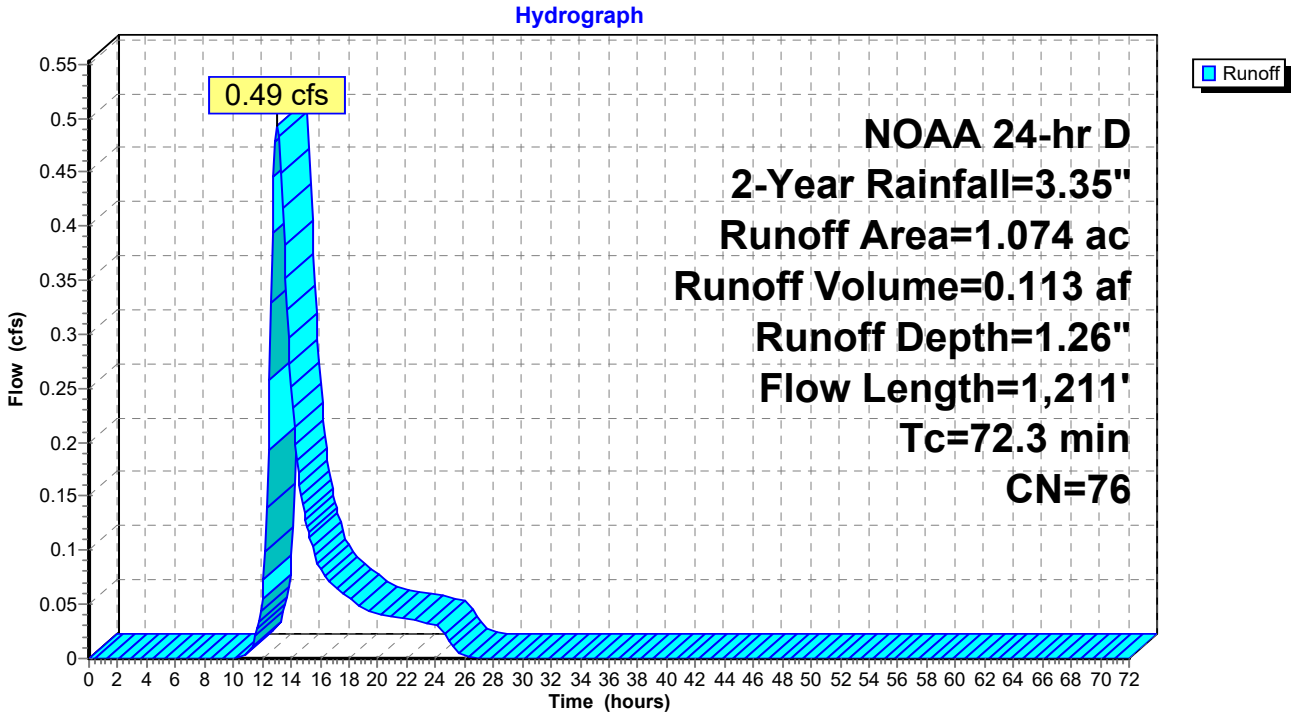
Runoff = 0.49 cfs @ 13.04 hrs, Volume= 0.113 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.143	77	Woods, Good, HSG D
0.383	70	Woods, Good, HSG C
0.483	80	>75% Grass cover, Good, HSG D
0.065	74	>75% Grass cover, Good, HSG C
1.074	76	Weighted Average
1.074		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 8S: EDA 2A Perv.



Summary for Subcatchment 9S: EDA 2A Imperv.

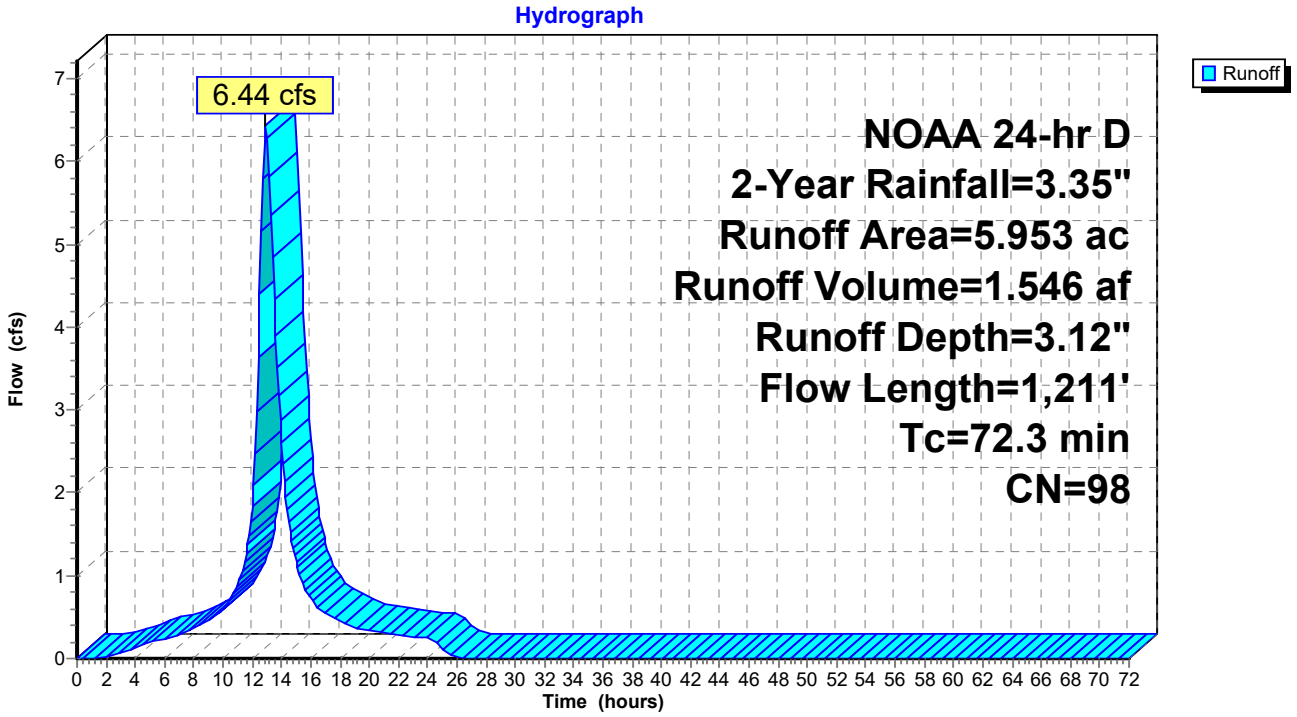
Runoff = 6.44 cfs @ 12.93 hrs, Volume= 1.546 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
5.953	98	Paved parking, HSG D
5.953		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 9S: EDA 2A Imperv.



Summary for Subcatchment 11S: EDA 2B Perv.

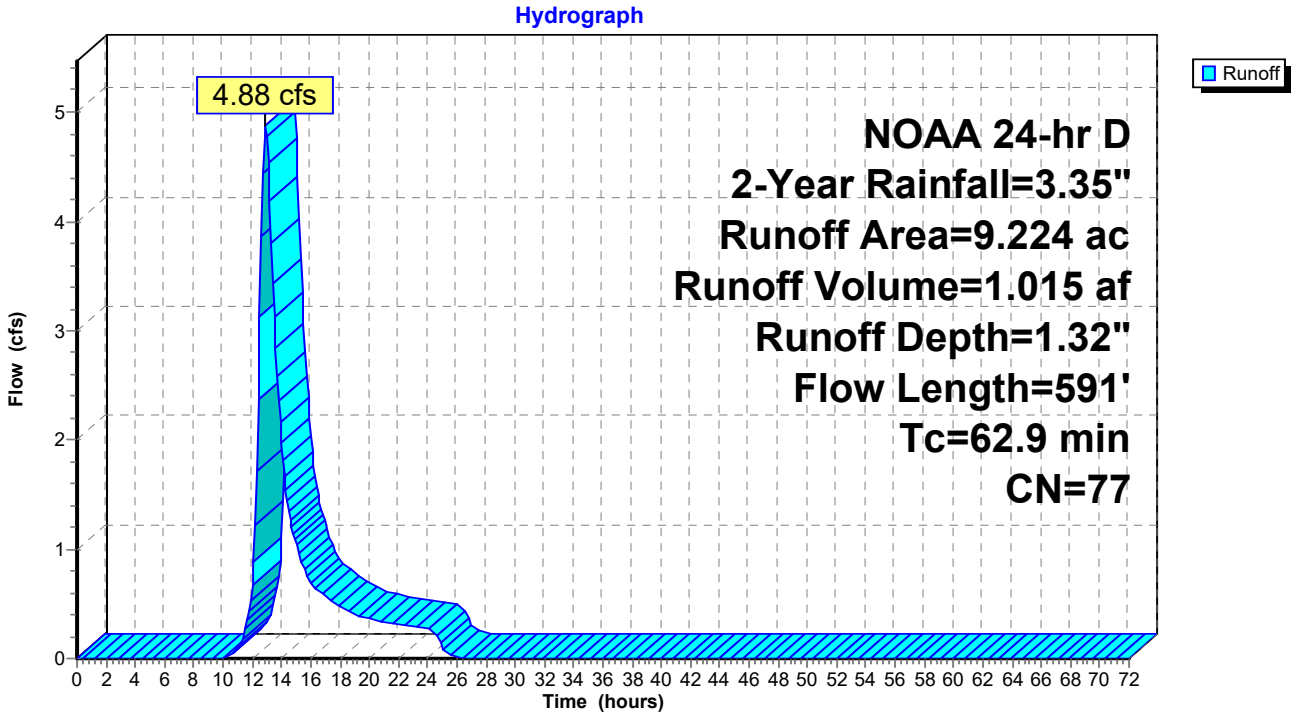
Runoff = 4.88 cfs @ 12.90 hrs, Volume= 1.015 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 11S: EDA 2B Perv.



Summary for Subcatchment 12S: EDA 2B Imperv.

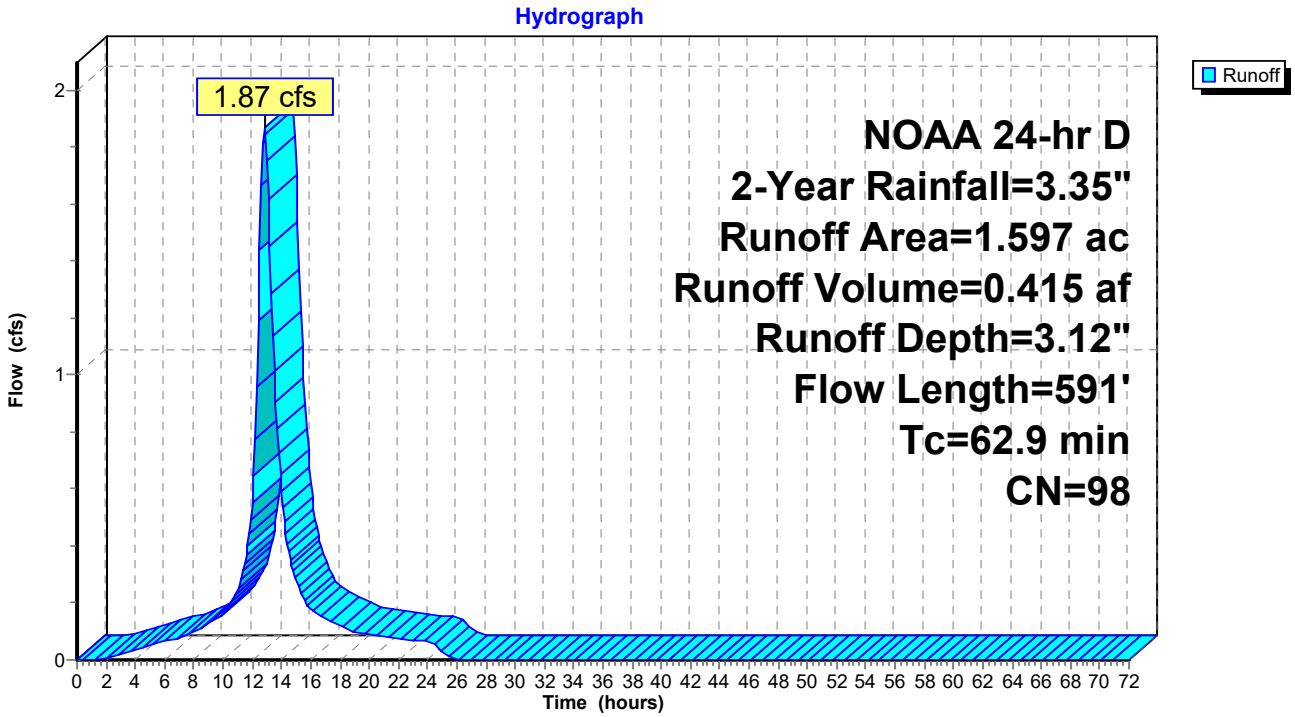
Runoff = 1.87 cfs @ 12.82 hrs, Volume= 0.415 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 12S: EDA 2B Imperv.



Summary for Pond 6P: Existing Depression

Inflow Area = 5.463 ac, 63.96% Impervious, Inflow Depth = 2.54" for 2-Year event
Inflow = 11.25 cfs @ 12.20 hrs, Volume= 1.157 af
Outflow = 5.71 cfs @ 12.42 hrs, Volume= 1.157 af, Atten= 49%, Lag= 12.8 min
Primary = 5.71 cfs @ 12.42 hrs, Volume= 1.157 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 109.78' @ 12.42 hrs Surf.Area= 10,250 sf Storage= 6,932 cf

Plug-Flow detention time= 9.8 min calculated for 1.155 af (100% of inflow)
Center-of-Mass det. time= 9.8 min (793.6 - 783.8)

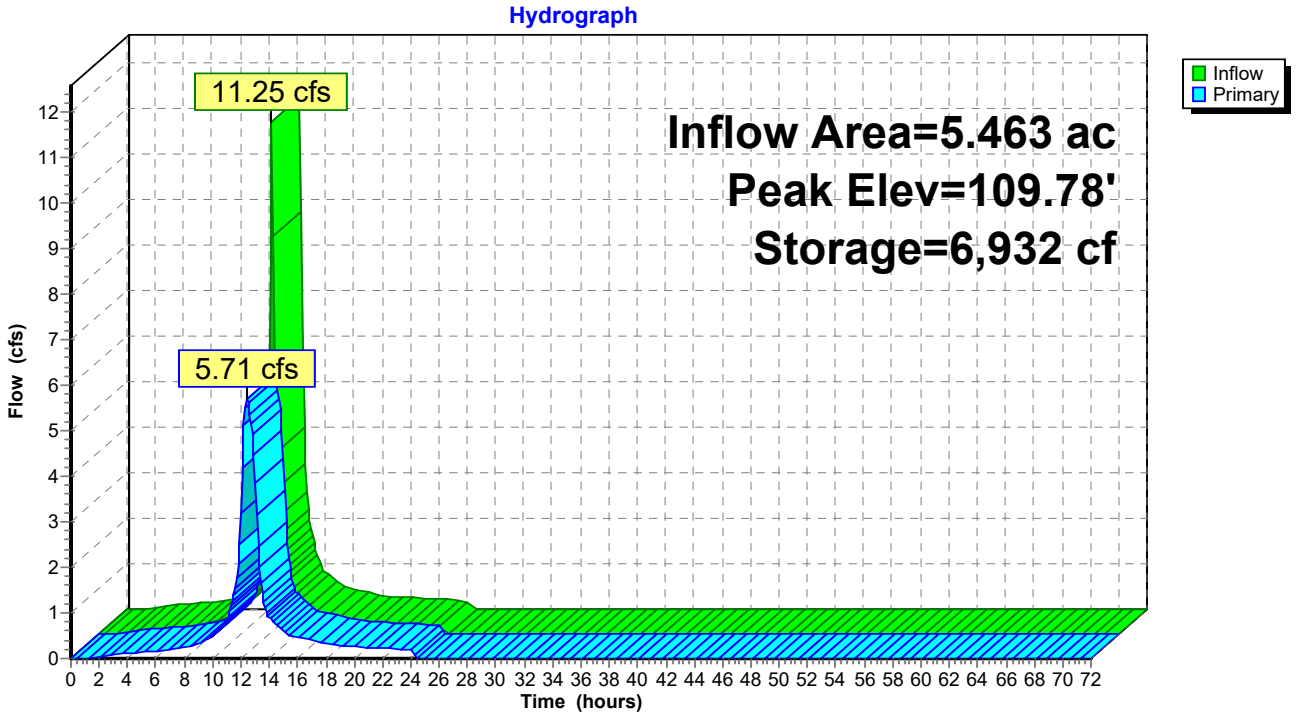
Volume	Invert	Avail.Storage	Storage Description
#1	107.95'	35,534 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.95	2	0	0
108.00	12	0	0
109.00	3,297	1,655	1,655
110.00	12,220	7,759	9,413
110.50	26,358	9,645	19,058
111.00	39,547	16,476	35,534

Device	Routing	Invert	Outlet Devices
#1	Primary	107.95'	**15.0" Round Culvert** L= 58.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.95' / 107.70' S= 0.0043 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	110.29'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.69 cfs @ 12.42 hrs HW=109.77' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 5.69 cfs @ 4.63 fps)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 6P: Existing Depression

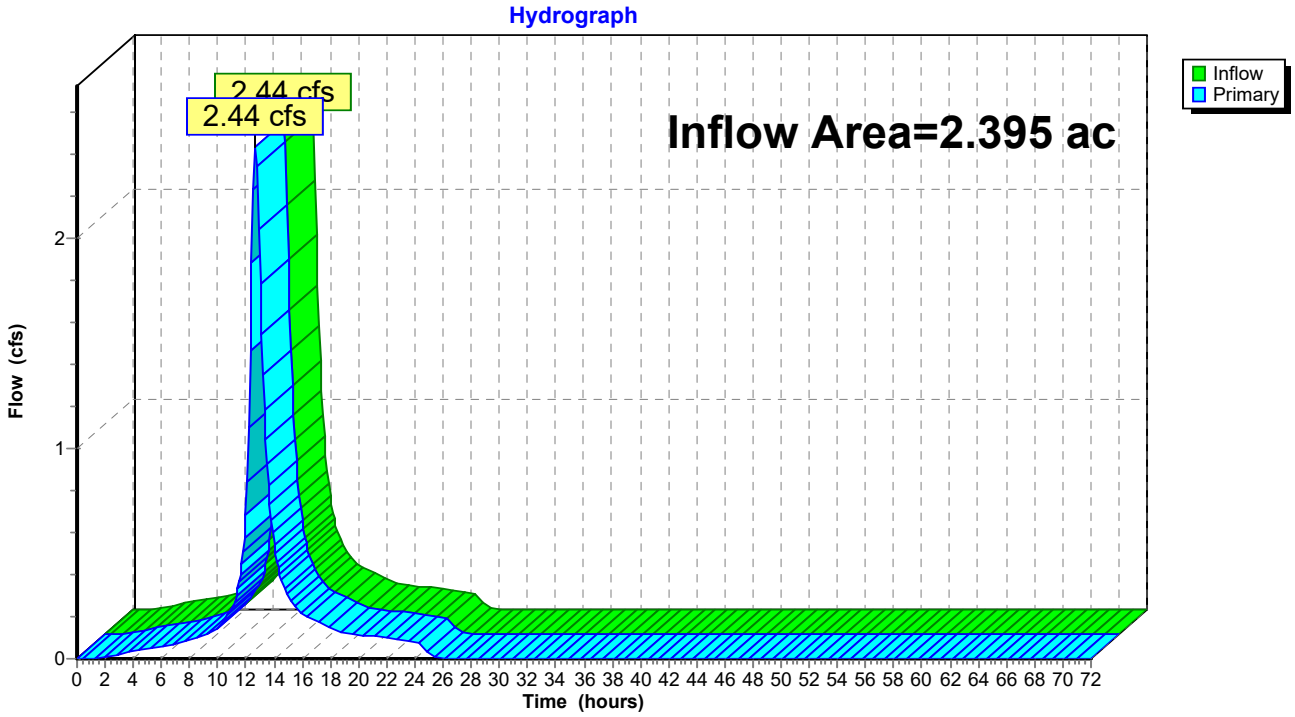


Summary for Link 3L: EDA 1A

Inflow Area = 2.395 ac, 55.32% Impervious, Inflow Depth = 2.31" for 2-Year event
Inflow = 2.44 cfs @ 12.65 hrs, Volume= 0.462 af
Primary = 2.44 cfs @ 12.65 hrs, Volume= 0.462 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 3L: EDA 1A

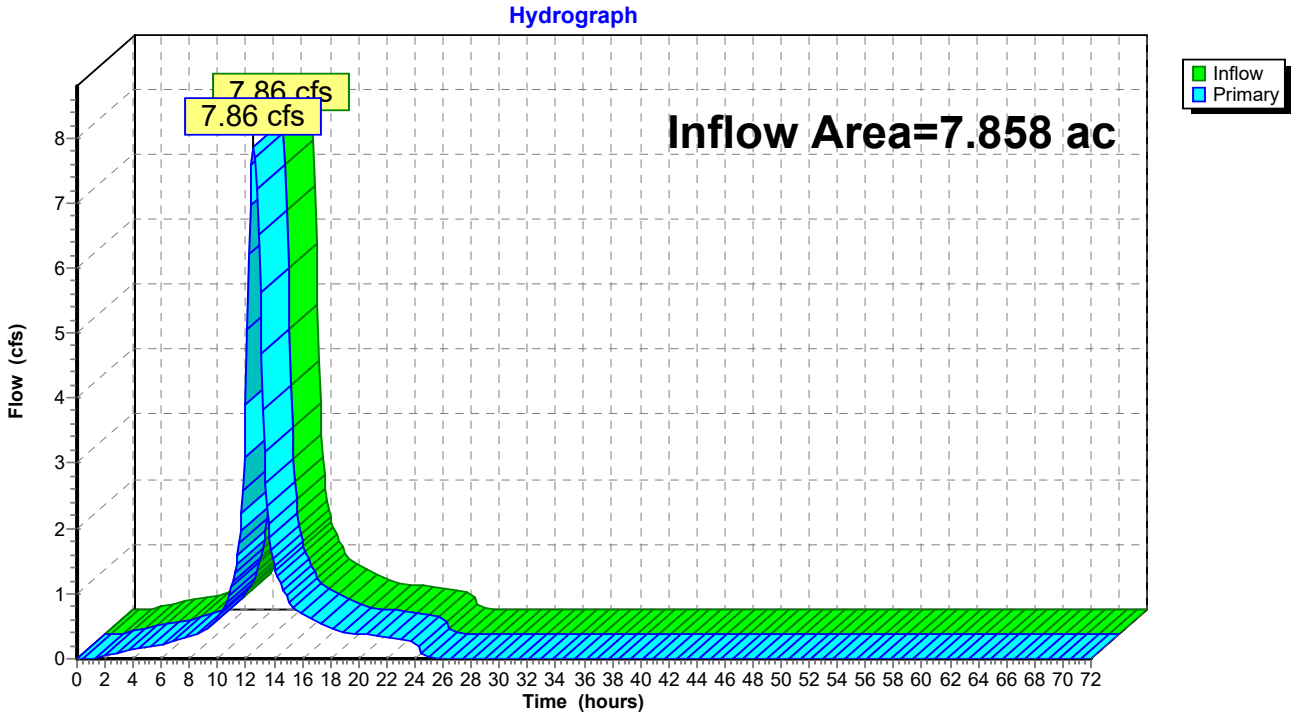


Summary for Link 7L: EDA 1

Inflow Area = 7.858 ac, 61.33% Impervious, Inflow Depth = 2.47" for 2-Year event
Inflow = 7.86 cfs @ 12.53 hrs, Volume= 1.619 af
Primary = 7.86 cfs @ 12.53 hrs, Volume= 1.619 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 7L: EDA 1

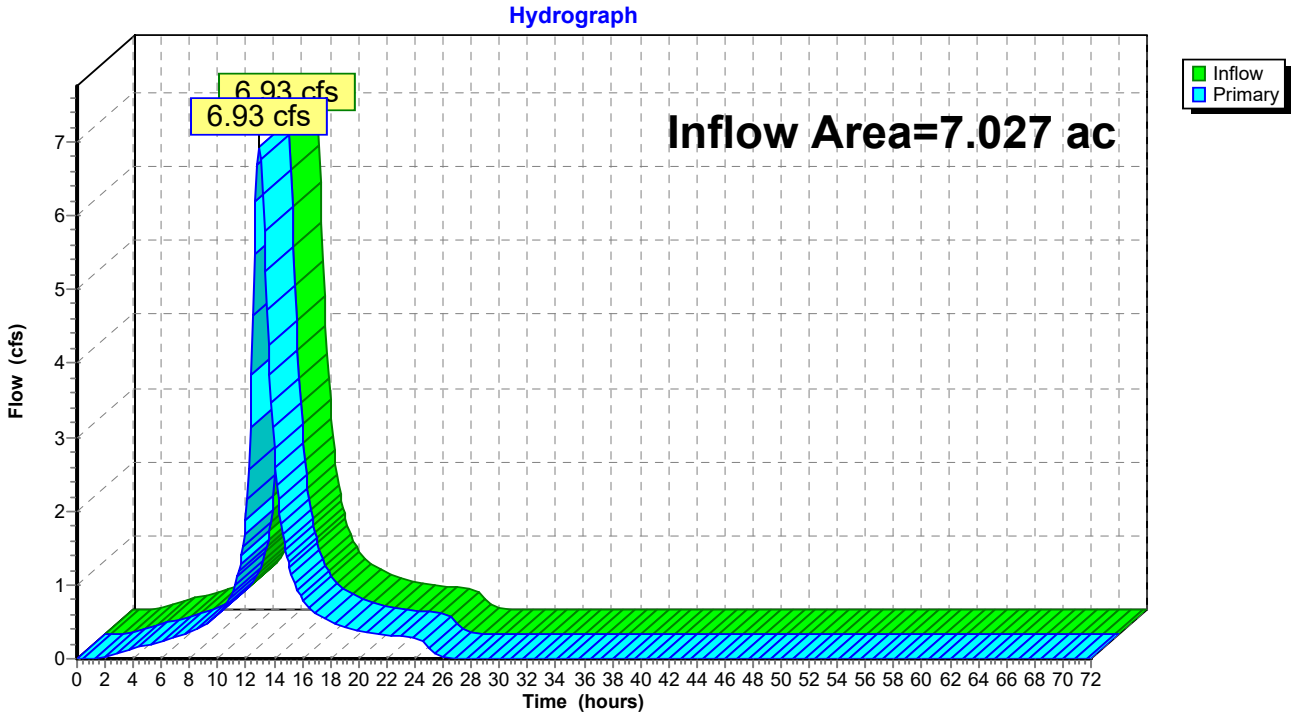


Summary for Link 10L: EDA 2A

Inflow Area = 7.027 ac, 84.72% Impervious, Inflow Depth = 2.83" for 2-Year event
Inflow = 6.93 cfs @ 12.94 hrs, Volume= 1.659 af
Primary = 6.93 cfs @ 12.94 hrs, Volume= 1.659 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2A

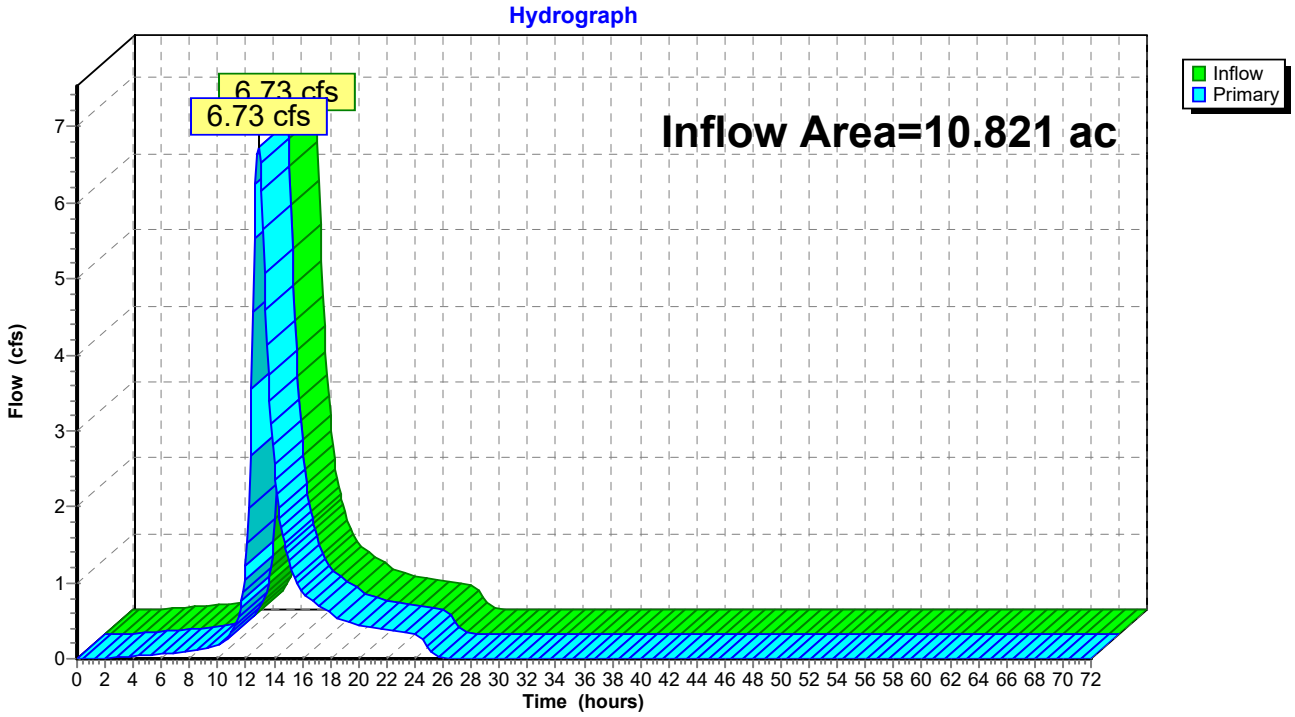


Summary for Link 13L: EDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 1.59" for 2-Year event
Inflow = 6.73 cfs @ 12.88 hrs, Volume= 1.430 af
Primary = 6.73 cfs @ 12.88 hrs, Volume= 1.430 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 13L: EDA 2B

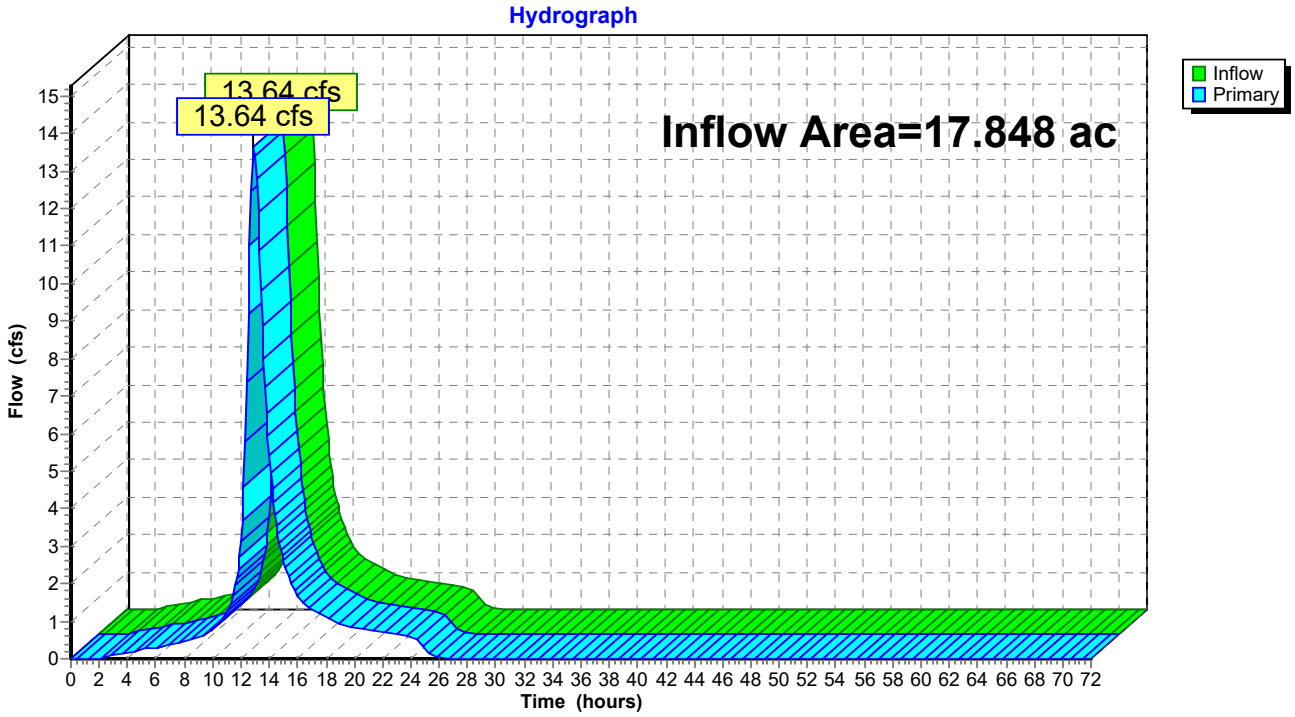


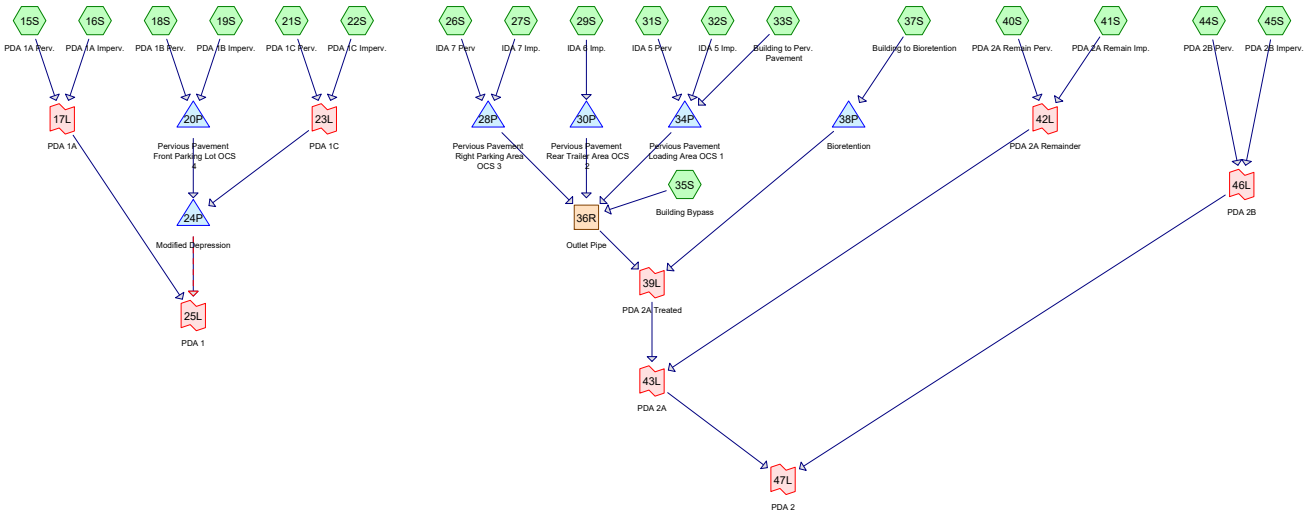
Summary for Link 14L: EDA 2

Inflow Area = 17.848 ac, 42.30% Impervious, Inflow Depth = 2.08" for 2-Year event
Inflow = 13.64 cfs @ 12.91 hrs, Volume= 3.088 af
Primary = 13.64 cfs @ 12.91 hrs, Volume= 3.088 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 14L: EDA 2





Subcat Reach Pond Link

Routing Diagram for Proposed

Prepared by {enter your company name here}, Printed 11/19/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.735	74	>75% Grass cover, Good, HSG C (31S, 40S, 44S)
4.756	80	>75% Grass cover, Good, HSG D (15S, 18S, 21S, 26S, 31S, 40S, 44S)
12.617	98	Paved parking, HSG D (16S, 19S, 22S, 27S, 29S, 32S, 33S, 35S, 37S, 41S, 45S)
0.871	70	Woods, Good, HSG C (40S, 44S)
6.596	77	Woods, Good, HSG D (15S, 21S, 44S)
25.575	**88**	**TOTAL AREA**

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15S: PDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=405' Tc=48.4 min CN=77 Runoff=0.66 cfs 0.118 af

Subcatchment 16S: PDA 1A Imperv. Runoff Area=1.330 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=405' Tc=48.4 min CN=98 Runoff=1.80 cfs 0.345 af

Subcatchment 18S: PDA 1B Perv. Runoff Area=0.081 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=317' Tc=1.5 min CN=80 Runoff=0.16 cfs 0.010 af

Subcatchment 19S: PDA 1B Imperv. Runoff Area=1.265 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=205' Tc=1.4 min CN=98 Runoff=4.42 cfs 0.329 af

Subcatchment 21S: PDA 1C Perv. Runoff Area=0.699 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=653' Tc=12.7 min CN=80 Runoff=0.97 cfs 0.088 af

Subcatchment 22S: PDA 1C Imperv. Runoff Area=1.120 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=653' Tc=12.7 min CN=98 Runoff=2.82 cfs 0.291 af

Subcatchment 26S: IDA 7 Perv Runoff Area=0.054 ac 0.00% Impervious Runoff Depth=1.52"
Flow Length=163' Tc=1.3 min CN=80 Runoff=0.11 cfs 0.007 af

Subcatchment 27S: IDA 7 Imp. Runoff Area=0.249 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=163' Tc=1.3 min CN=98 Runoff=0.87 cfs 0.065 af

Subcatchment 29S: IDA 6 Imp. Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=178' Tc=2.0 min CN=98 Runoff=1.32 cfs 0.097 af

Subcatchment 31S: IDA 5 Perv Runoff Area=0.047 ac 0.00% Impervious Runoff Depth=1.26"
Flow Length=390' Tc=4.6 min CN=76 Runoff=0.07 cfs 0.005 af

Subcatchment 32S: IDA 5 Imp. Runoff Area=2.005 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=390' Tc=4.6 min CN=98 Runoff=6.46 cfs 0.521 af

Subcatchment 33S: Building to Perv. Runoff Area=1.615 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=354' Slope=0.0050 '/' Tc=4.6 min CN=98 Runoff=5.20 cfs 0.419 af

Subcatchment 35S: Building Bypass Runoff Area=0.541 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=379' Slope=0.0050 '/' Tc=5.3 min CN=98 Runoff=1.69 cfs 0.141 af

Subcatchment 37S: Building to Runoff Area=2.239 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=560' Slope=0.0050 '/' Tc=7.4 min CN=98 Runoff=6.66 cfs 0.582 af

Subcatchment 40S: PDA 2A Remain Perv. Runoff Area=1.783 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=1,211' Tc=72.3 min CN=77 Runoff=0.87 cfs 0.196 af

Subcatchment 41S: PDA 2A Remain Imp. Runoff Area=0.282 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=456' Tc=2.9 min CN=98 Runoff=0.97 cfs 0.073 af

Subcatchment 44S: PDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=1.32"
Flow Length=591' Tc=62.9 min CN=77 Runoff=4.89 cfs 1.015 af

Subcatchment 45S: PDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=3.12"
Flow Length=591' Tc=62.9 min CN=98 Runoff=1.88 cfs 0.415 af

Reach 36R: Outlet Pipe Avg. Flow Depth=0.69' Max Vel=2.78 fps Inflow=2.27 cfs 1.236 af
18.0" Round Pipe n=0.013 L=381.0' S=0.0024 '/' Capacity=5.11 cfs Outflow=2.19 cfs 1.236 af

Pond 20P: Pervious Pavement Front Parking Peak Elev=111.06' Storage=6,059 cf Inflow=4.58 cfs 0.339 af
Outflow=0.87 cfs 0.339 af

Pond 24P: Modified Depression Peak Elev=108.57' Storage=2,704 cf Inflow=4.63 cfs 0.718 af
Primary=3.34 cfs 0.718 af Secondary=0.00 cfs 0.000 af Outflow=3.34 cfs 0.718 af

Pond 28P: Pervious Pavement Right Parking Peak Elev=115.16' Storage=2,164 cf Inflow=0.98 cfs 0.072 af
Outflow=0.04 cfs 0.062 af

Pond 30P: Pervious Pavement Rear Trailer Peak Elev=112.94' Storage=2,379 cf Inflow=1.32 cfs 0.097 af
Outflow=0.10 cfs 0.096 af

Pond 34P: Pervious Pavement Loading Peak Elev=113.78' Storage=25,519 cf Inflow=11.73 cfs 0.945 af
Outflow=0.61 cfs 0.938 af

Pond 38P: Bioretention Peak Elev=113.66' Storage=9,416 cf Inflow=6.66 cfs 0.582 af
Primary=0.55 cfs 0.582 af Secondary=0.00 cfs 0.000 af Outflow=0.55 cfs 0.582 af

Link 17L: PDA 1A Inflow=2.46 cfs 0.463 af
Primary=2.46 cfs 0.463 af

Link 23L: PDA 1C Inflow=3.78 cfs 0.379 af
Primary=3.78 cfs 0.379 af

Link 25L: PDA 1 Inflow=5.20 cfs 1.181 af
Primary=5.20 cfs 1.181 af

Link 39L: PDA 2A Treated Inflow=2.66 cfs 1.818 af
Primary=2.66 cfs 1.818 af

Link 42L: PDA 2A Remainder Inflow=1.11 cfs 0.269 af
Primary=1.11 cfs 0.269 af

Link 43L: PDA 2A Inflow=3.57 cfs 2.087 af
Primary=3.57 cfs 2.087 af

Link 46L: PDA 2B Inflow=6.74 cfs 1.430 af
Primary=6.74 cfs 1.430 af

Link 47L: PDA 2 Inflow=9.15 cfs 3.517 af
Primary=9.15 cfs 3.517 af

Total Runoff Area = 25.575 ac Runoff Volume = 4.716 af Average Runoff Depth = 2.21"
50.67% Pervious = 12.958 ac 49.33% Impervious = 12.617 ac

Summary for Subcatchment 15S: PDA 1A Perv.

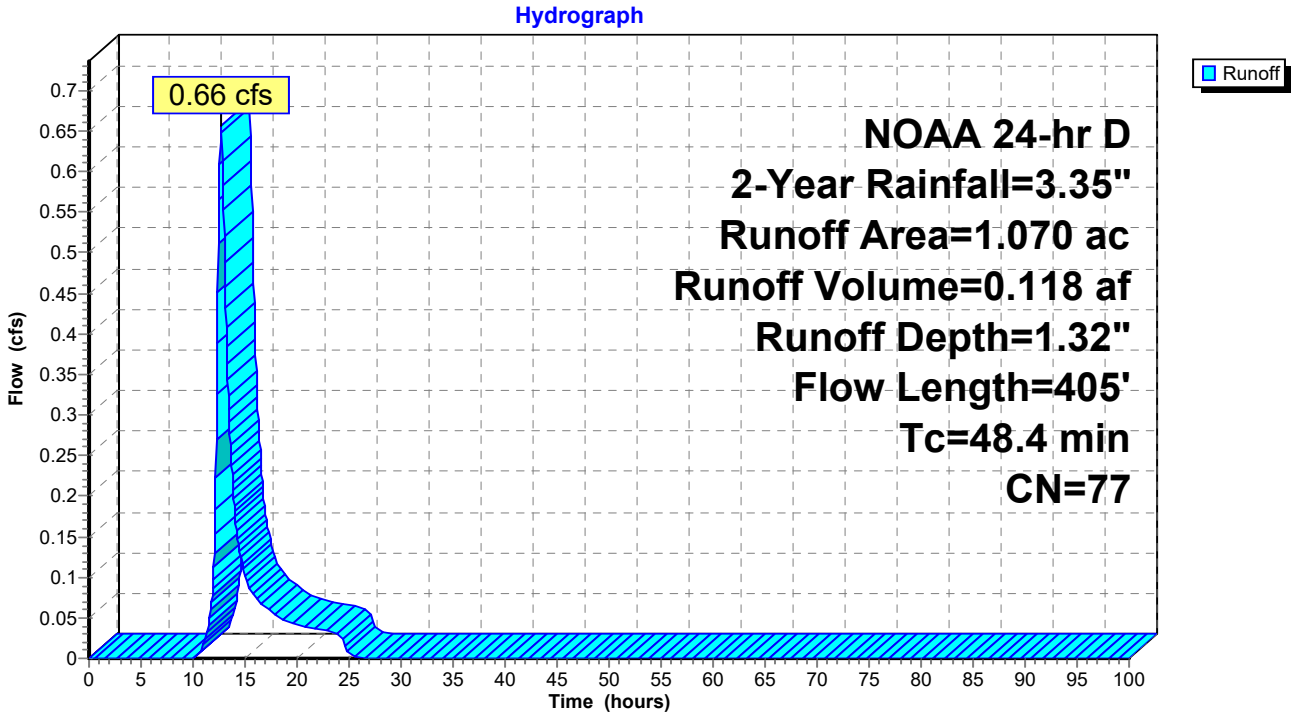
Runoff = 0.66 cfs @ 12.69 hrs, Volume= 0.118 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 15S: PDA 1A Perv.



Summary for Subcatchment 16S: PDA 1A Imperv.

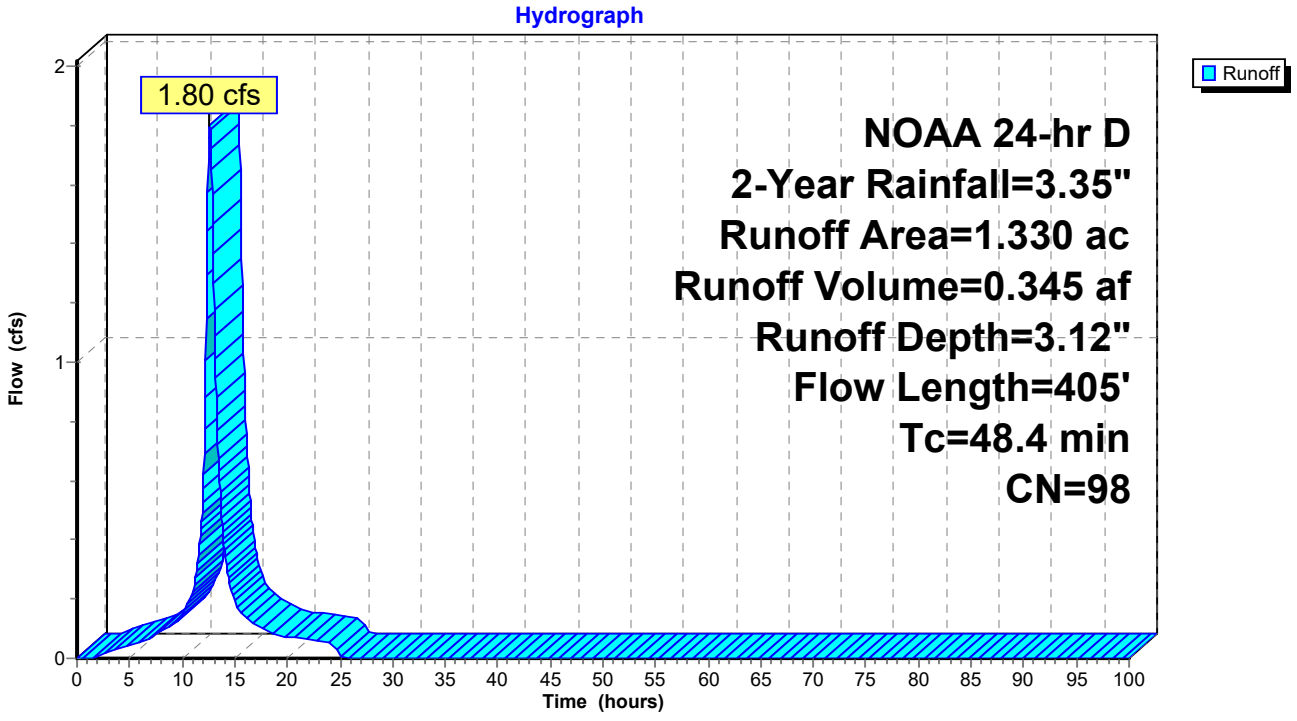
Runoff = 1.80 cfs @ 12.63 hrs, Volume= 0.345 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.330	98	Paved parking, HSG D
1.330		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 16S: PDA 1A Imperv.



Summary for Subcatchment 18S: PDA 1B Perv.

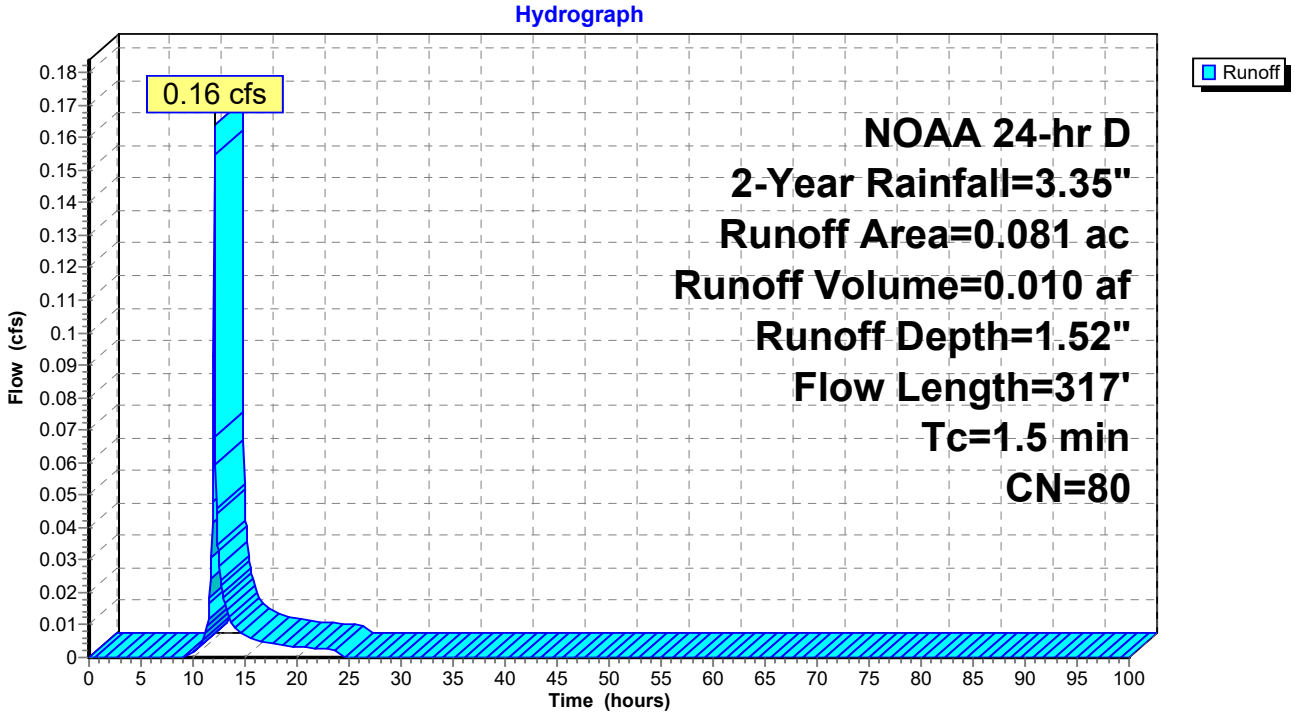
Runoff = 0.16 cfs @ 12.08 hrs, Volume= 0.010 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.081	80	>75% Grass cover, Good, HSG D
0.081	80	Weighted Average
0.081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.91		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	56	0.0750	5.56		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.1	15	0.0150	2.49		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	226	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.5	317	Total			

Subcatchment 18S: PDA 1B Perv.



Summary for Subcatchment 19S: PDA 1B Imperv.

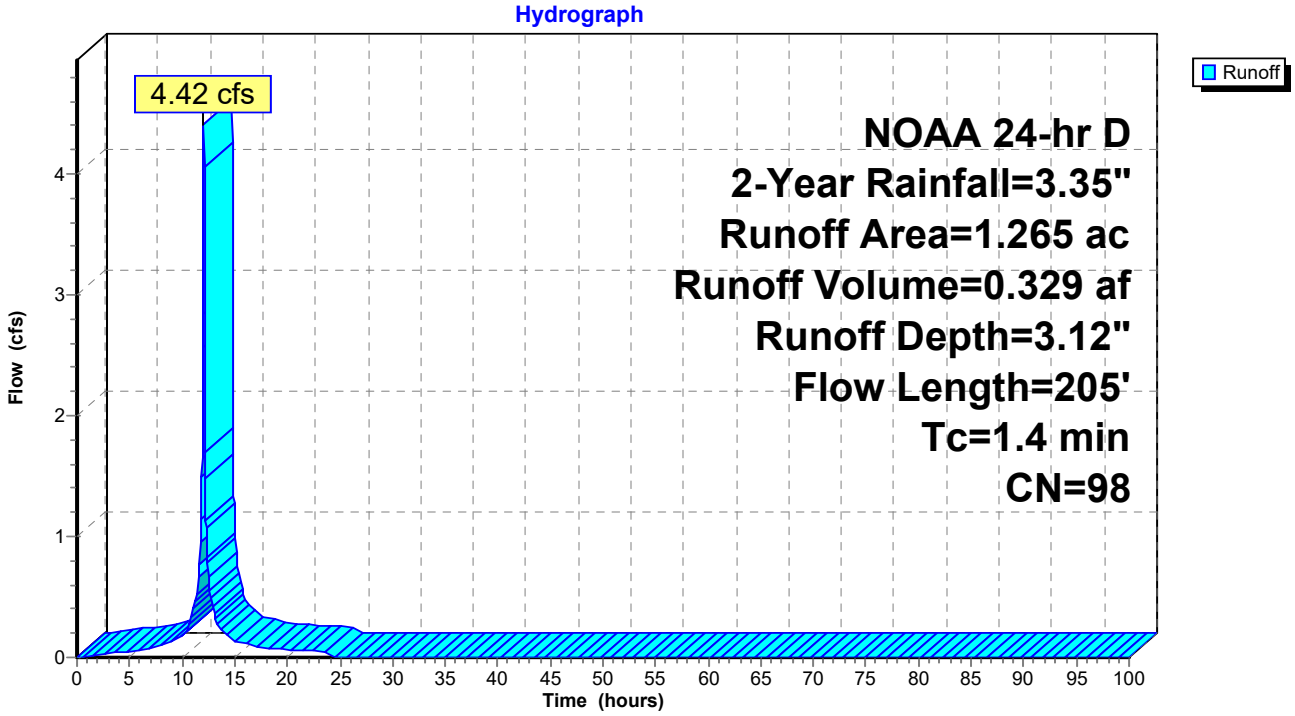
Runoff = 4.42 cfs @ 12.07 hrs, Volume= 0.329 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.265	98	Paved parking, HSG D
1.265		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	9	0.0150	0.77		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.4	50	0.0750	2.08		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
0.4	41	0.0500	1.70		**Sheet Flow, C-D** Smooth surfaces n= 0.011 P2= 3.34"
0.4	105	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.4	205	Total			

Subcatchment 19S: PDA 1B Imperv.



Summary for Subcatchment 21S: PDA 1C Perv.

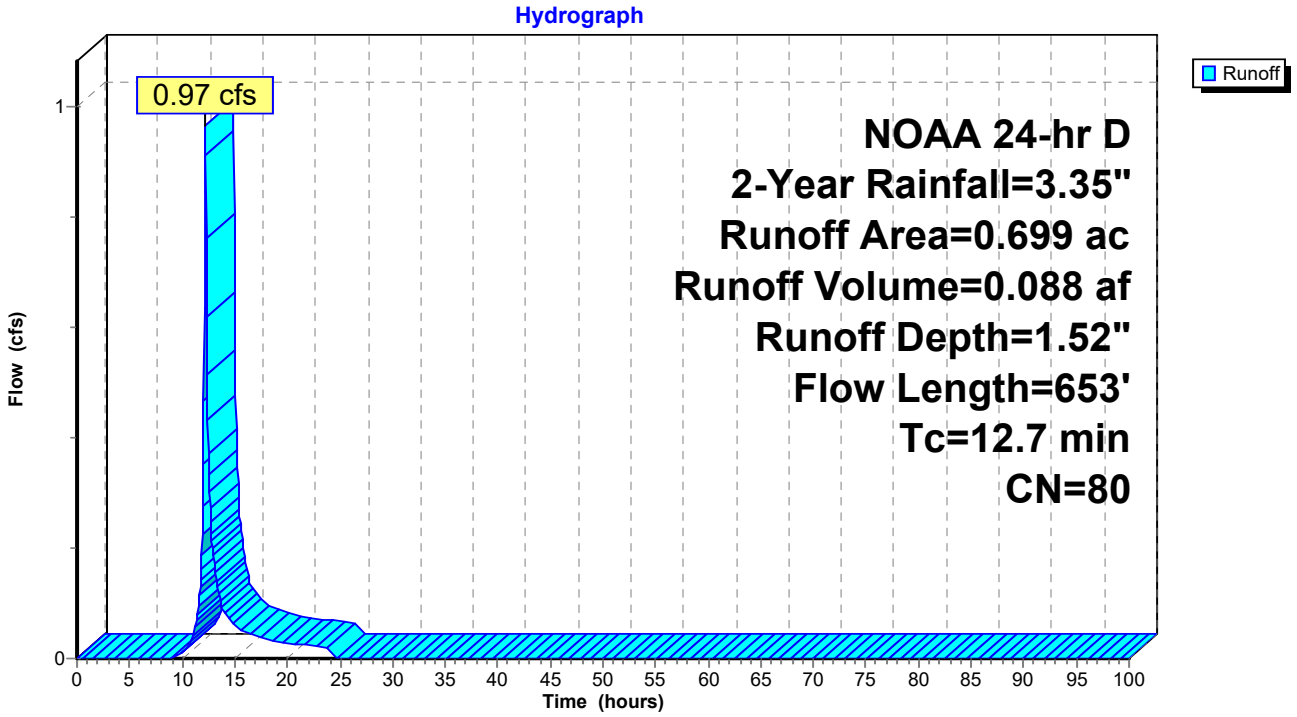
Runoff = 0.97 cfs @ 12.21 hrs, Volume= 0.088 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.093	77	Woods, Good, HSG D
0.606	80	>75% Grass cover, Good, HSG D
0.699	80	Weighted Average
0.699		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 21S: PDA 1C Perv.



Summary for Subcatchment 22S: PDA 1C Imperv.

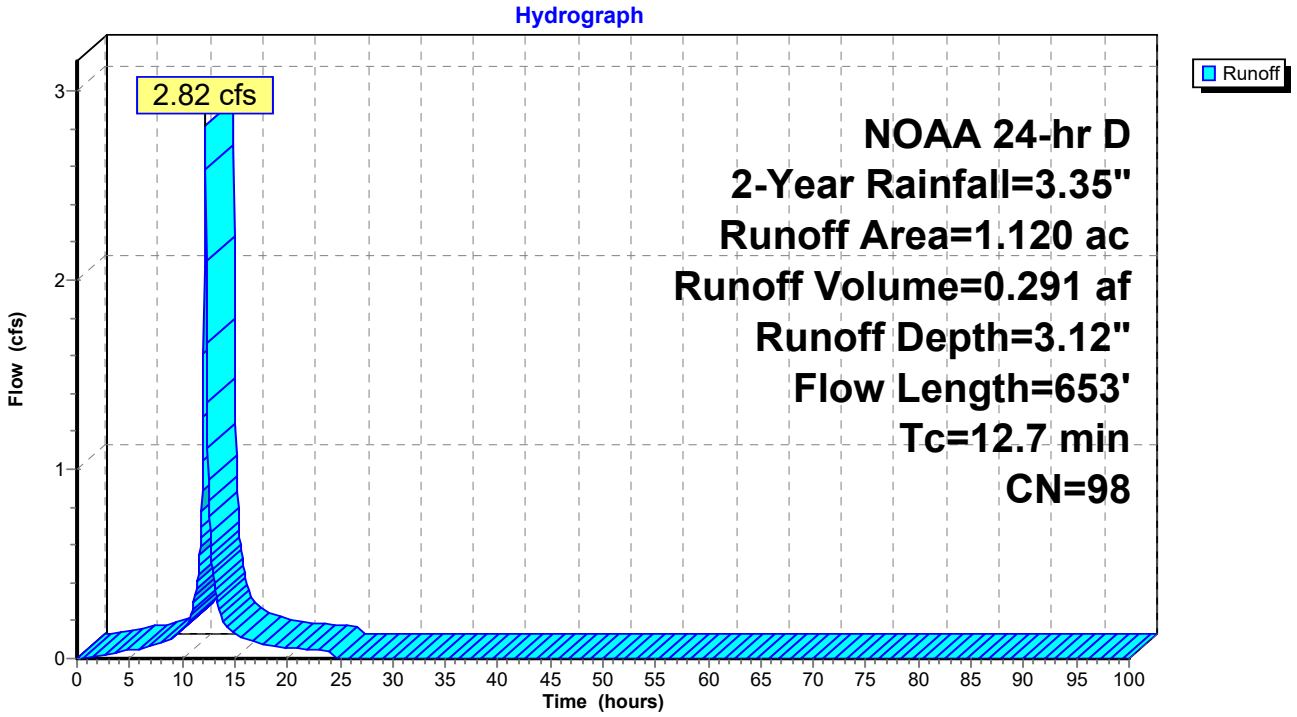
Runoff = 2.82 cfs @ 12.20 hrs, Volume= 0.291 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.120	98	Paved parking, HSG D
1.120		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 22S: PDA 1C Imperv.



Summary for Subcatchment 26S: IDA 7 Perv

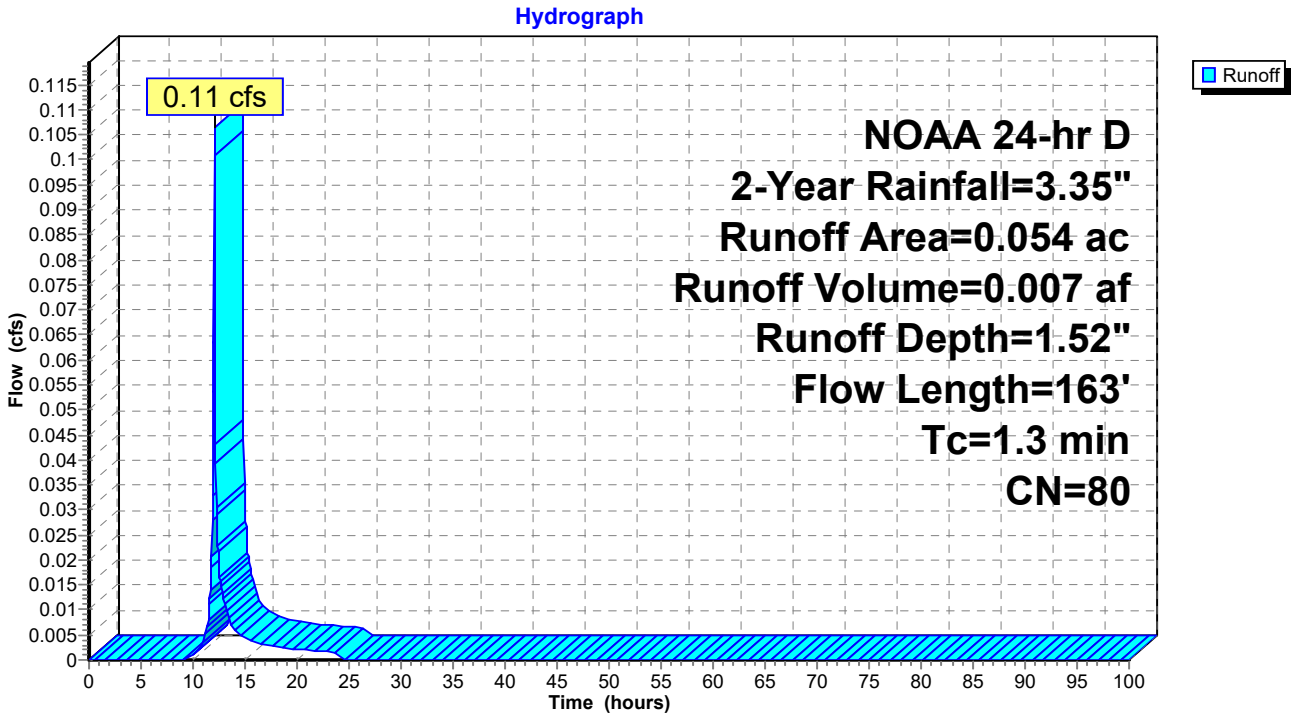
Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.054	80	>75% Grass cover, Good, HSG D
0.000	74	>75% Grass cover, Good, HSG C
0.054	80	Weighted Average
0.054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 26S: IDA 7 Perv



Summary for Subcatchment 27S: IDA 7 Imp.

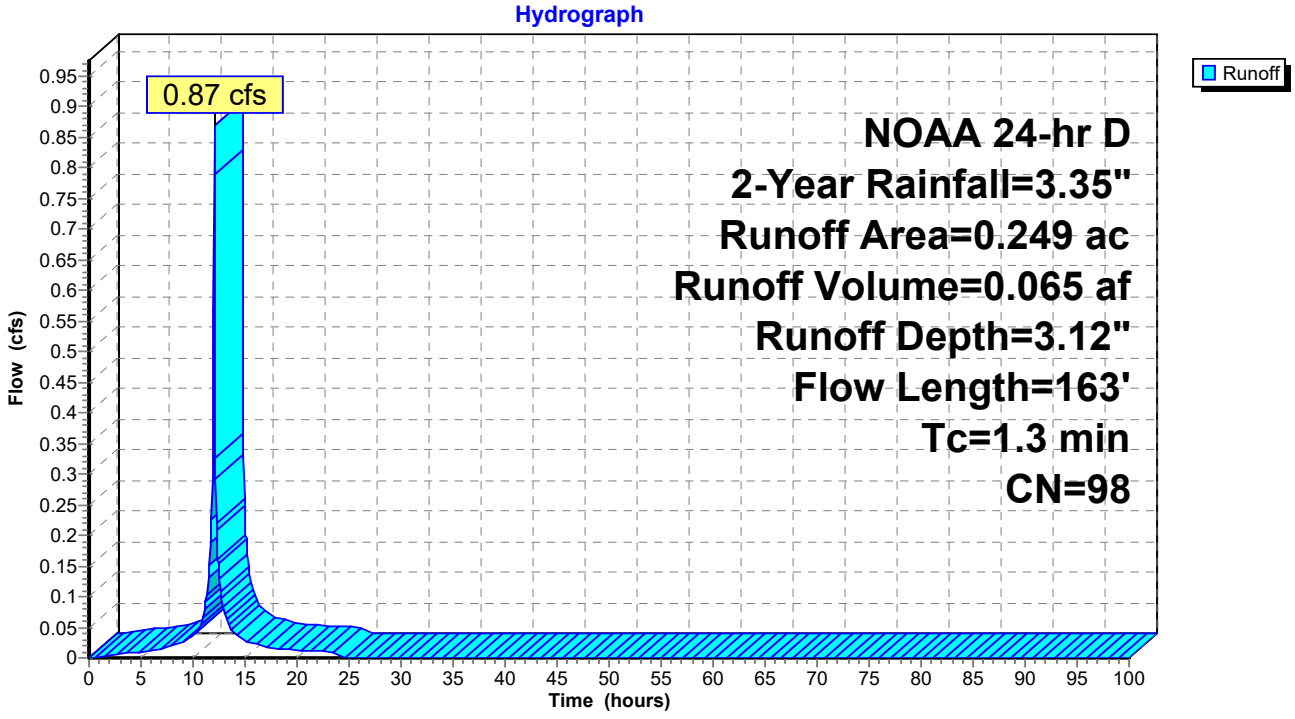
Runoff = 0.87 cfs @ 12.07 hrs, Volume= 0.065 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.249	98	Paved parking, HSG D
0.249		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 27S: IDA 7 Imp.



Summary for Subcatchment 29S: IDA 6 Imp.

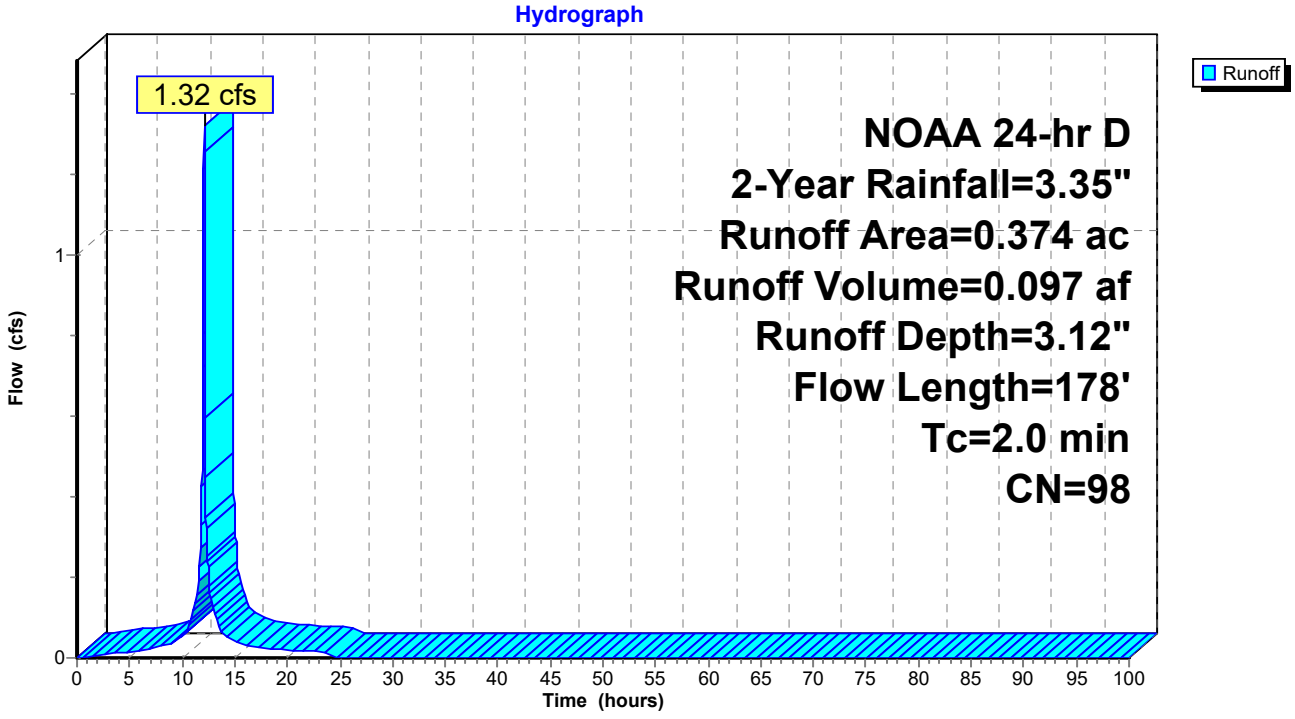
Runoff = 1.32 cfs @ 12.08 hrs, Volume= 0.097 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.374	98	Paved parking, HSG D
0.374		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	48	0.0290	3.46		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	30	0.0075	2.13	0.21	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
2.0	178	Total			

Subcatchment 29S: IDA 6 Imp.



Summary for Subcatchment 31S: IDA 5 Perv

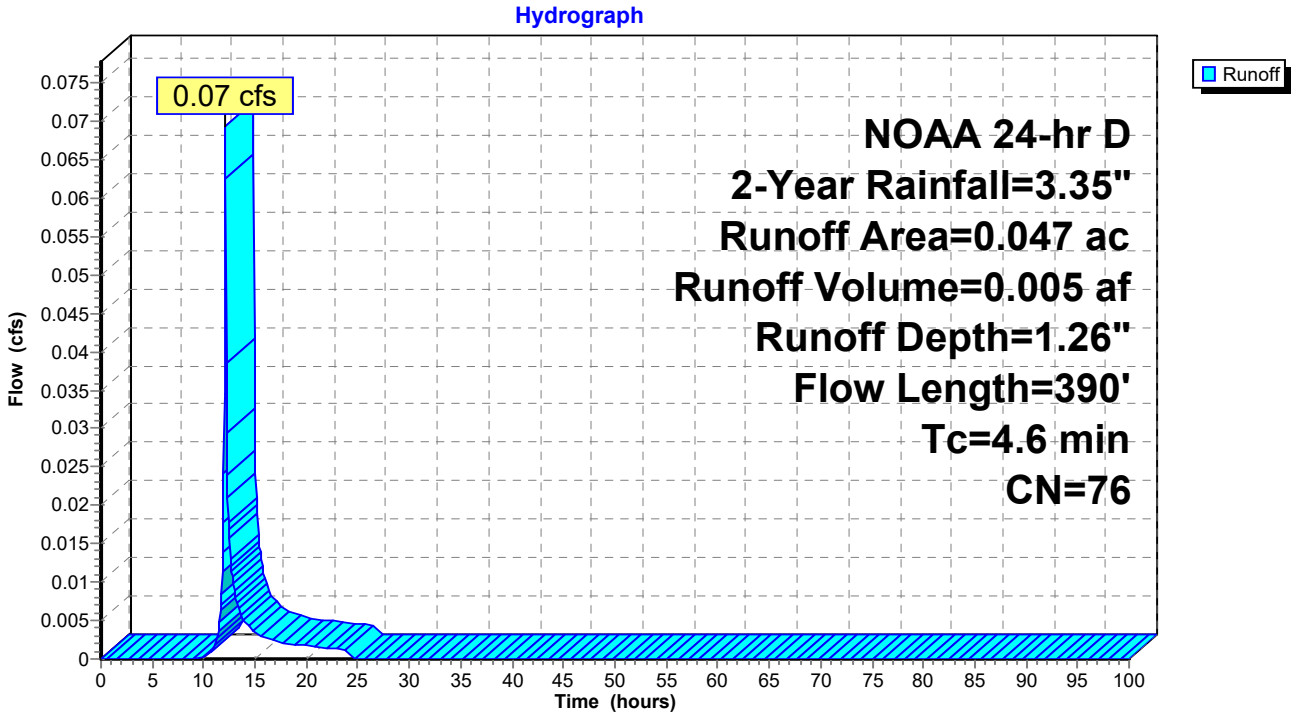
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.005 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.014	80	>75% Grass cover, Good, HSG D
0.033	74	>75% Grass cover, Good, HSG C
0.047	76	Weighted Average
0.047		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 31S: IDA 5 Perv



Summary for Subcatchment 32S: IDA 5 Imp.

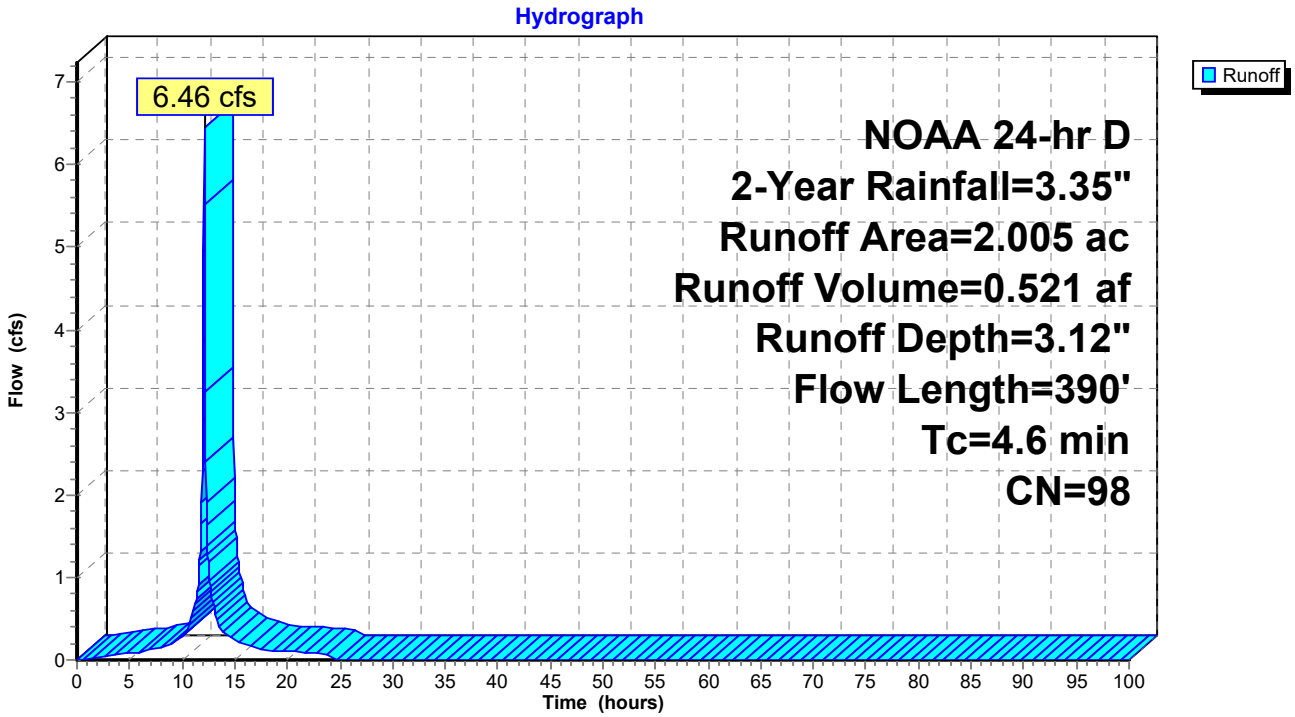
Runoff = 6.46 cfs @ 12.11 hrs, Volume= 0.521 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
2.005	98	Paved parking, HSG D
2.005		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 32S: IDA 5 Imp.



Summary for Subcatchment 33S: Building to Perv. Pavement

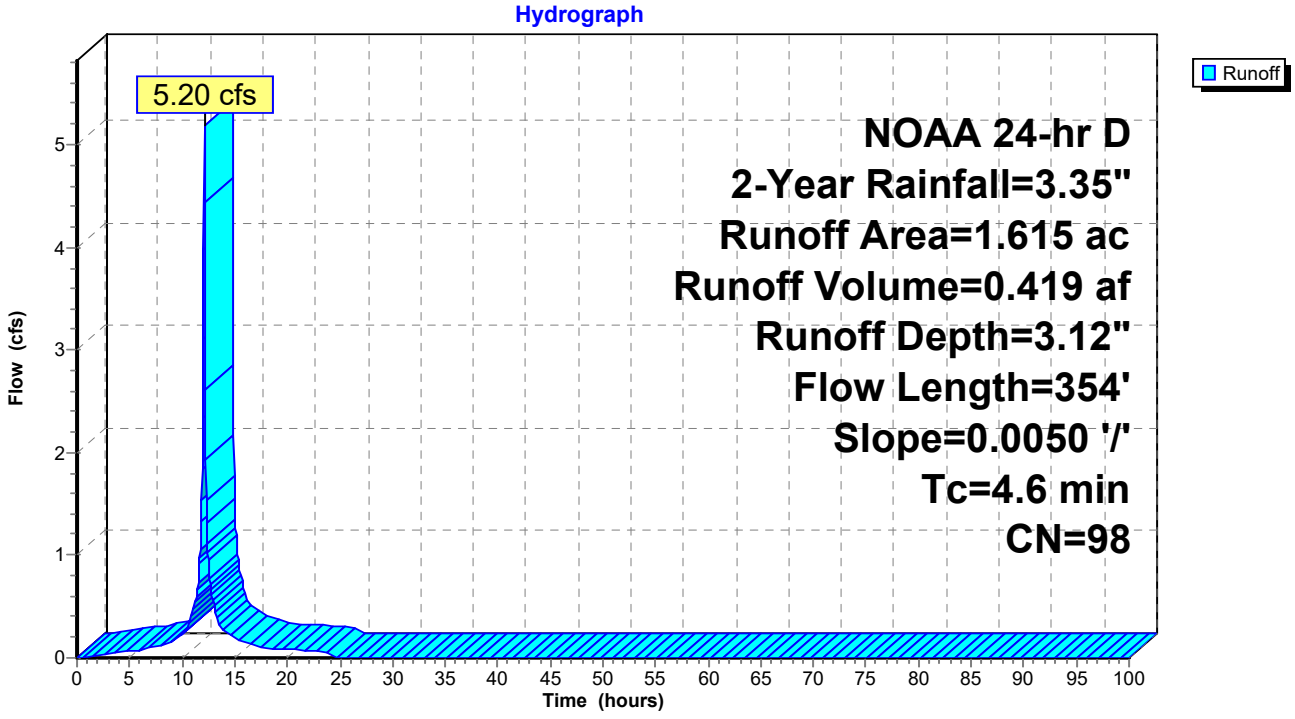
Runoff = 5.20 cfs @ 12.11 hrs, Volume= 0.419 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.615	98	Paved parking, HSG D
1.615		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
2.1	179	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	75	0.0050	3.21	2.52	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
4.6	354	Total			

Subcatchment 33S: Building to Perv. Pavement



Summary for Subcatchment 35S: Building Bypass

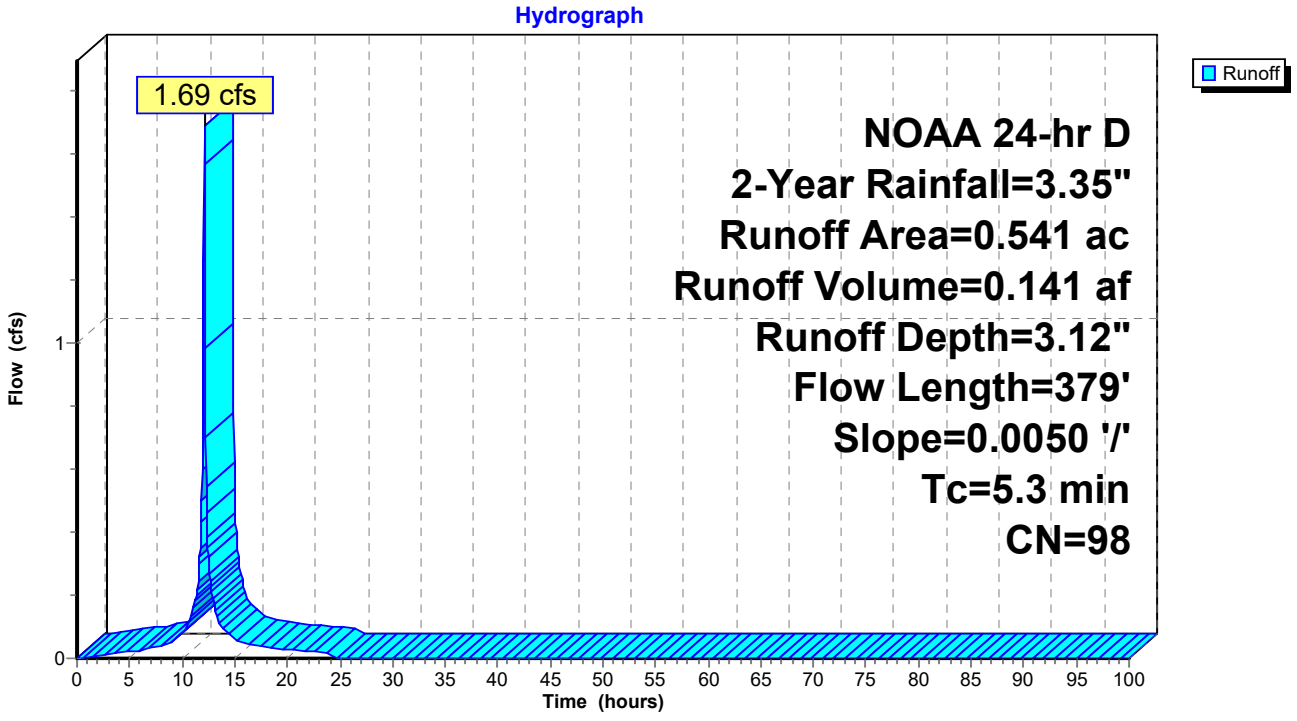
Runoff = 1.69 cfs @ 12.11 hrs, Volume= 0.141 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.541	98	Paved parking, HSG D
0.541		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= 3.34"
3.2	279	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.3	379	Total			

Subcatchment 35S: Building Bypass



Summary for Subcatchment 37S: Building to Bioretention

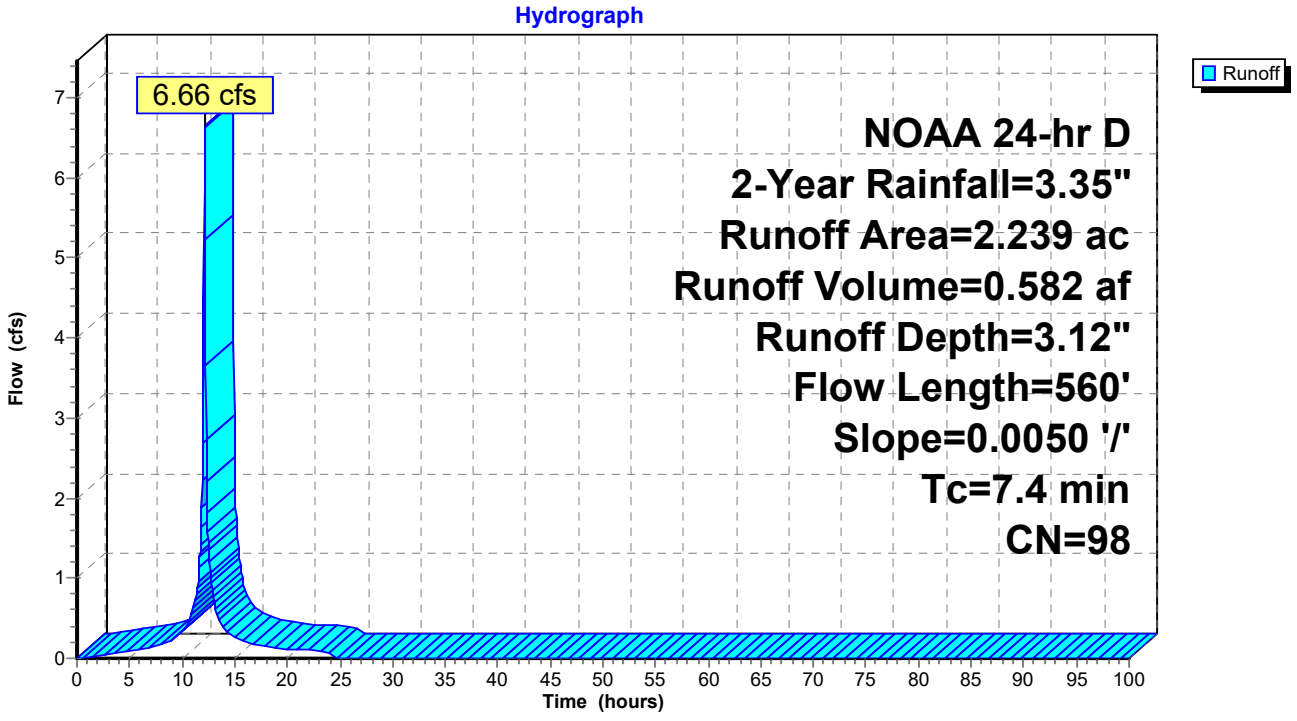
Runoff = 6.66 cfs @ 12.14 hrs, Volume= 0.582 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
2.239	98	Paved parking, HSG D
2.239		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
5.3	460	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
7.4	560	Total			

Subcatchment 37S: Building to Bioretention



Summary for Subcatchment 40S: PDA 2A Remain Perv.

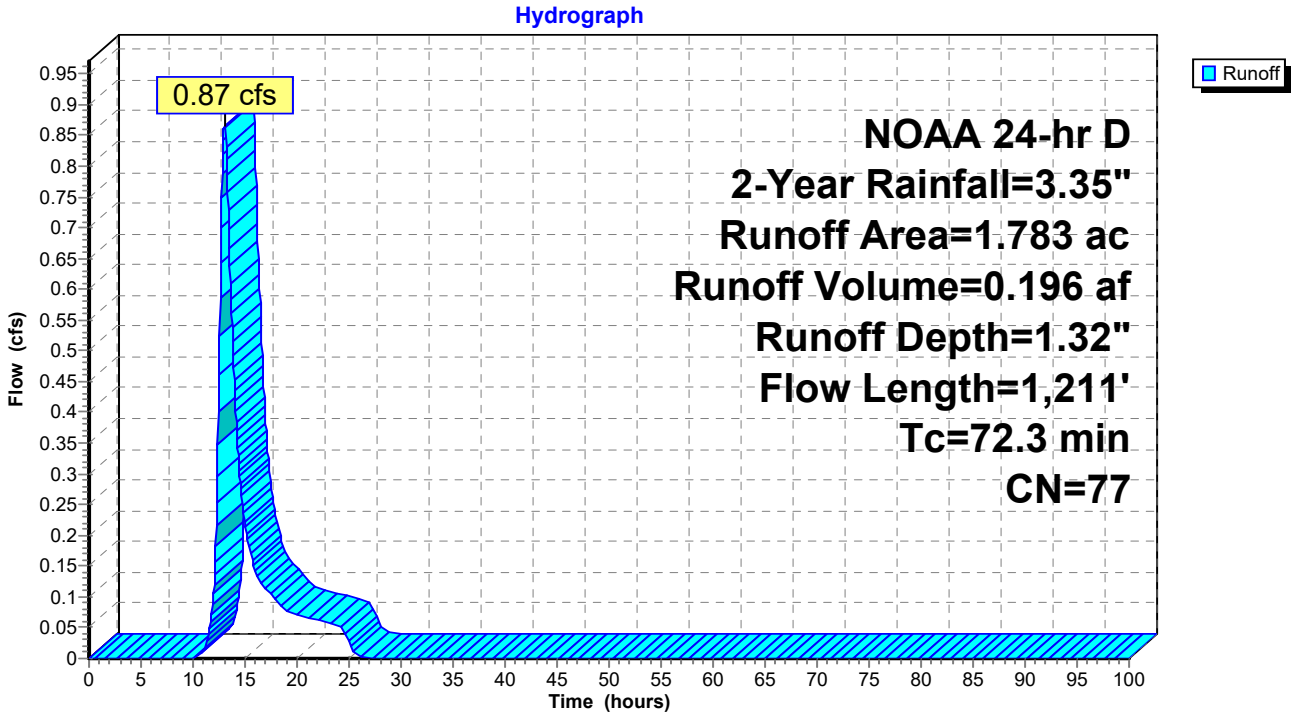
Runoff = 0.87 cfs @ 13.03 hrs, Volume= 0.196 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.109	70	Woods, Good, HSG C
1.103	80	>75% Grass cover, Good, HSG D
0.571	74	>75% Grass cover, Good, HSG C
1.783	77	Weighted Average
1.783		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 40S: PDA 2A Remain Perv.



Summary for Subcatchment 41S: PDA 2A Remain Imp.

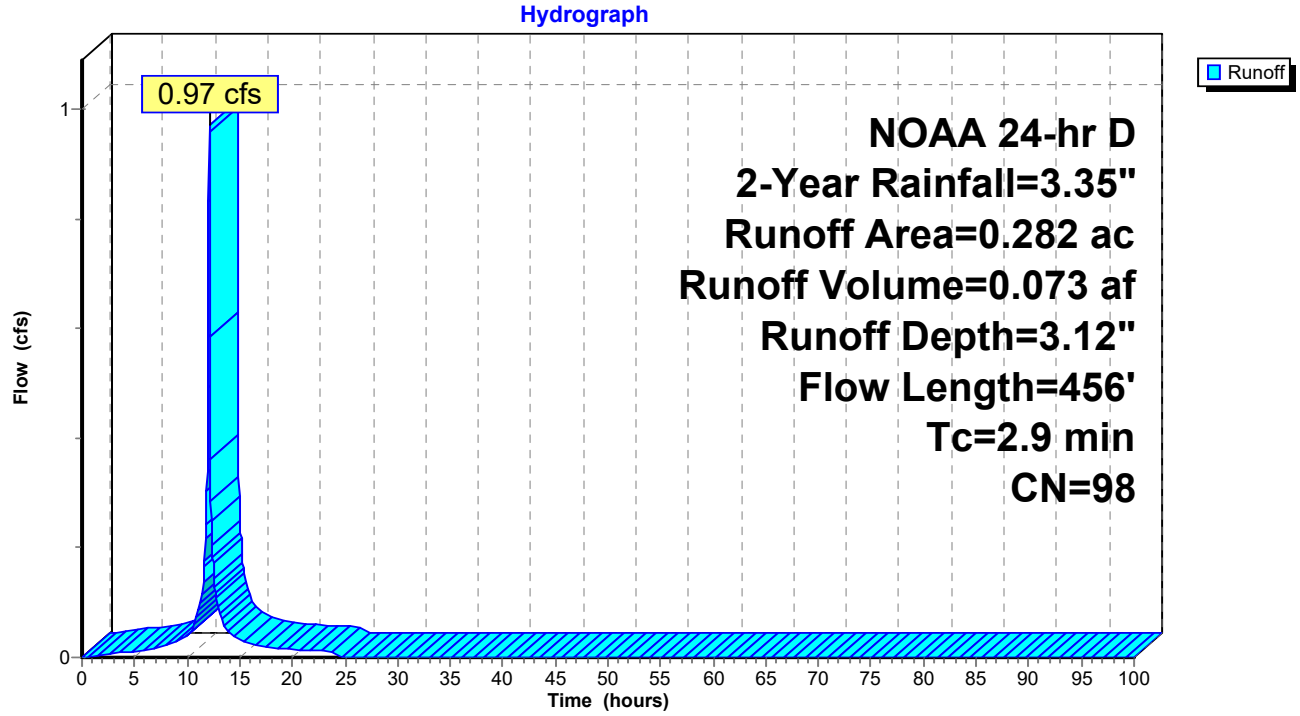
Runoff = 0.97 cfs @ 12.09 hrs, Volume= 0.073 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
0.282		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.97		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.5	202	0.0100	2.18	0.22	**Channel Flow, B-C** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.013 Asphalt, smooth
1.1	238	0.0050	3.72	4.57	**Pipe Channel, C-D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.9	456	Total			

Subcatchment 41S: PDA 2A Remain Imp.



Summary for Subcatchment 44S: PDA 2B Perv.

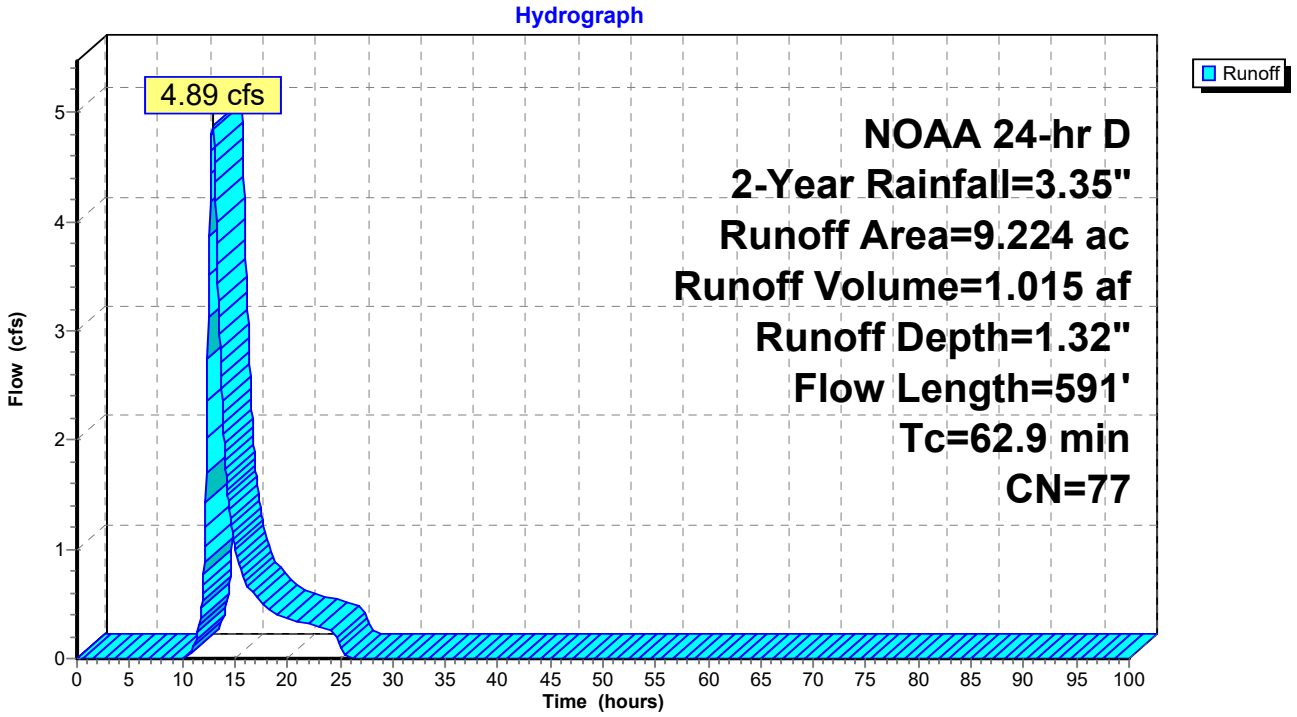
Runoff = 4.89 cfs @ 12.90 hrs, Volume= 1.015 af, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 44S: PDA 2B Perv.



Summary for Subcatchment 45S: PDA 2B Imperv.

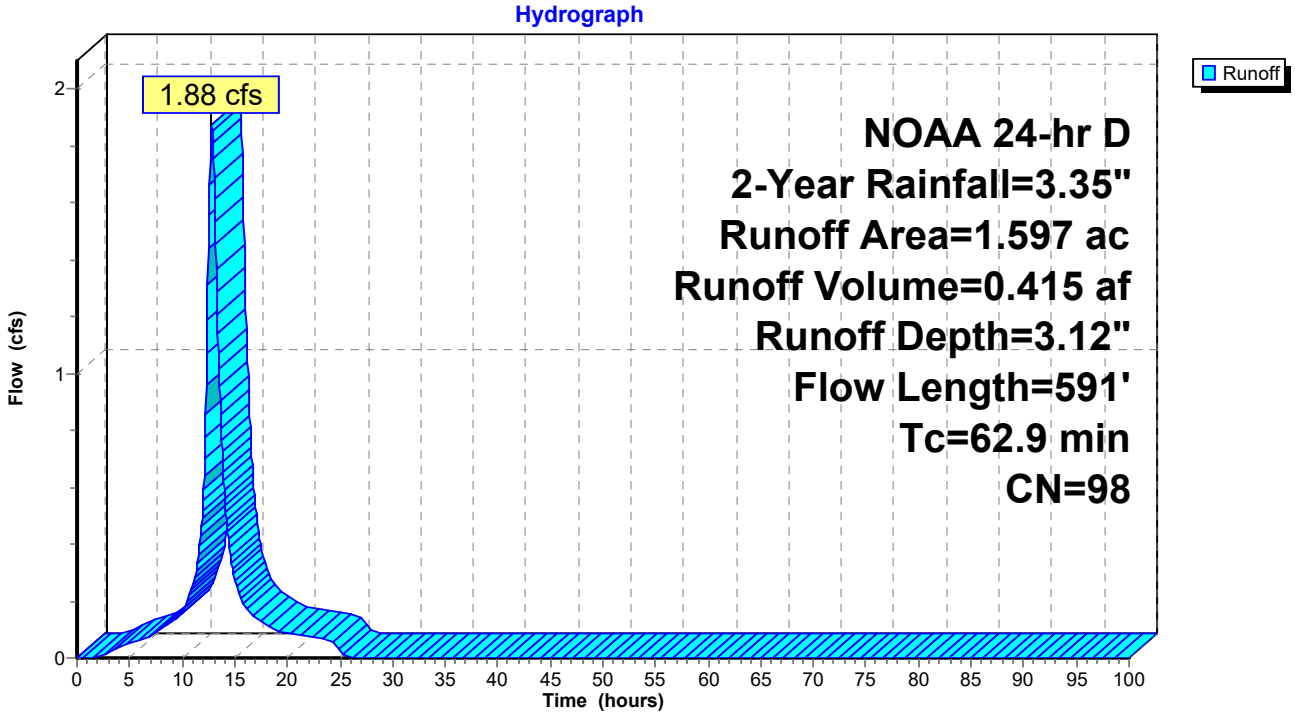
Runoff = 1.88 cfs @ 12.81 hrs, Volume= 0.415 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 2-Year Rainfall=3.35"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 45S: PDA 2B Imperv.



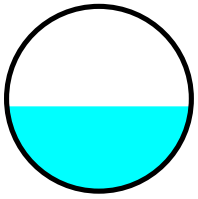
Summary for Reach 36R: Outlet Pipe

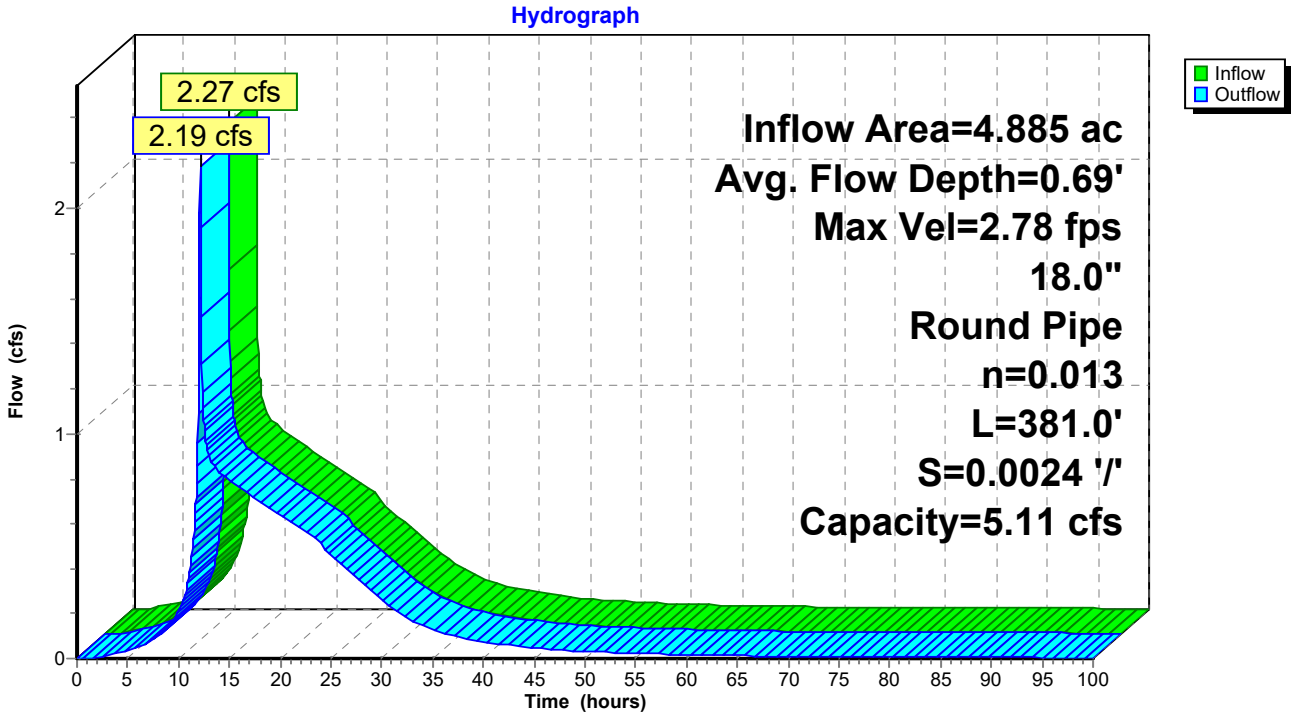
Inflow Area = 4.885 ac, 97.93% Impervious, Inflow Depth > 3.04" for 2-Year event
Inflow = 2.27 cfs @ 12.12 hrs, Volume= 1.236 af
Outflow = 2.19 cfs @ 12.15 hrs, Volume= 1.236 af, Atten= 4%, Lag= 1.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.78 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.96 fps, Avg. Travel Time= 6.6 min

Peak Storage= 301 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.11 cfs

18.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 381.0' Slope= 0.0024 '/'
Inlet Invert= 110.60', Outlet Invert= 109.70'





Summary for Pond 20P: Pervious Pavement Front Parking Lot OCS 4

Inflow Area = 1.346 ac, 93.98% Impervious, Inflow Depth = 3.02" for 2-Year event
Inflow = 4.58 cfs @ 12.07 hrs, Volume= 0.339 af
Outflow = 0.87 cfs @ 12.37 hrs, Volume= 0.339 af, Atten= 81%, Lag= 17.9 min
Primary = 0.87 cfs @ 12.37 hrs, Volume= 0.339 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 111.06' @ 12.37 hrs Surf.Area= 26,712 sf Storage= 6,059 cf

Plug-Flow detention time= 186.5 min calculated for 0.339 af (100% of inflow)
Center-of-Mass det. time= 185.9 min (941.8 - 755.9)

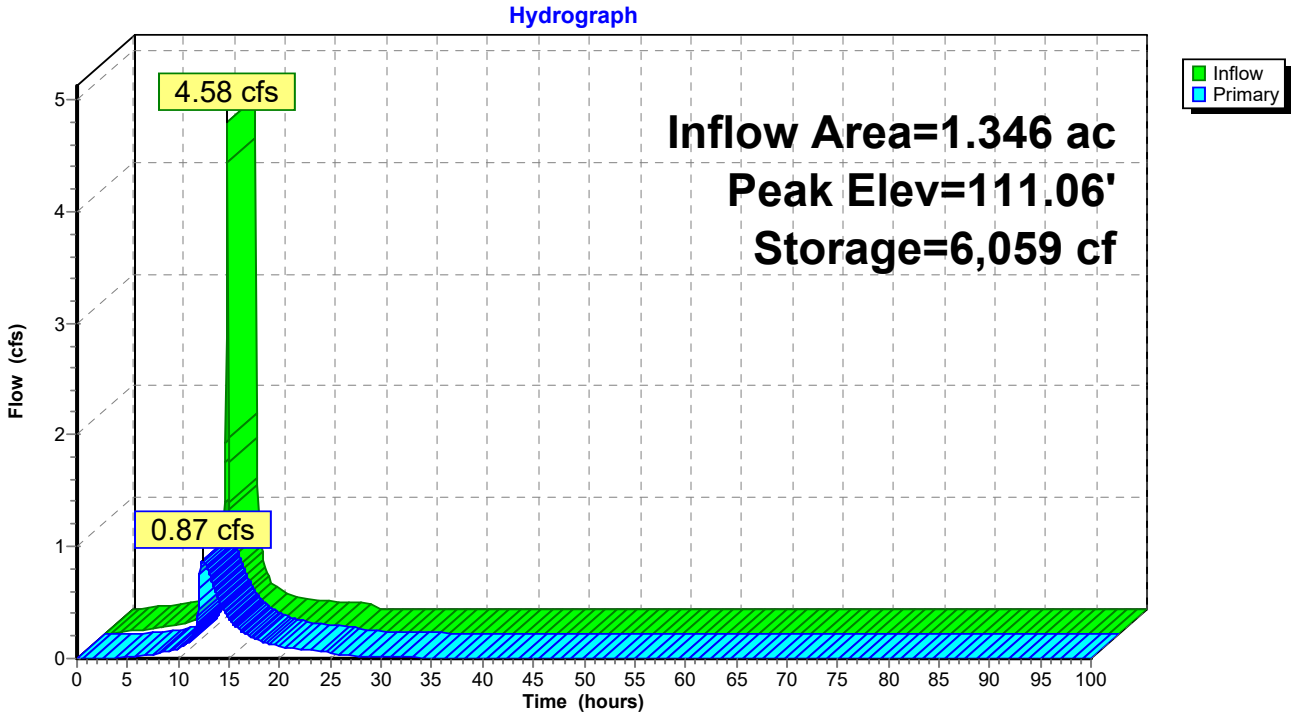
Volume	Invert	Avail.Storage	Storage Description
#1	110.50'	20,272 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 51,821 cf Overall - 1,140 cf Embedded = 50,681 cf x 40.0% Voids
#2	110.75'	425 cf	**15.0" Round Pipe Storage** Inside #1 L= 346.0' S= 0.0010 '/'
#3	110.76'	463 cf	**15.0" Round Pipe Storage** Inside #1 L= 377.0' S= 0.0010 '/'
#4	110.95'	189 cf	**15.0" Round Pipe Storage** Inside #1 L= 154.0' S= 0.0010 '/'
#5	110.81'	64 cf	**15.0" Round Pipe Storage** Inside #1 L= 52.0' S= 0.0010 '/'
		21,413 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.50	26,712	0	0
112.44	26,712	51,821	51,821

Device	Routing	Invert	Outlet Devices
#1	Primary	108.22'	**15.0" Round Culvert** L= 11.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 108.22' / 108.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	110.50'	**8.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	111.21'	**6.0" Vert. Orifice/Grate X 0.00** C= 0.600

Primary OutFlow Max=0.87 cfs @ 12.37 hrs HW=111.06' TW=108.57' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.87 cfs of 7.76 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.87 cfs @ 2.61 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Pond 20P: Pervious Pavement Front Parking Lot OCS 4



Summary for Pond 24P: Modified Depression

Inflow Area = 3.165 ac, 75.36% Impervious, Inflow Depth = 2.72" for 2-Year event
Inflow = 4.63 cfs @ 12.20 hrs, Volume= 0.718 af
Outflow = 3.34 cfs @ 12.34 hrs, Volume= 0.718 af, Atten= 28%, Lag= 8.0 min
Primary = 3.34 cfs @ 12.34 hrs, Volume= 0.718 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 108.57' @ 12.34 hrs Surf.Area= 3,928 sf Storage= 2,704 cf

Plug-Flow detention time= 14.5 min calculated for 0.718 af (100% of inflow)
Center-of-Mass det. time= 14.5 min (873.7 - 859.2)

Volume	Invert	Avail.Storage	Storage Description
#1	107.60'	12,350 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

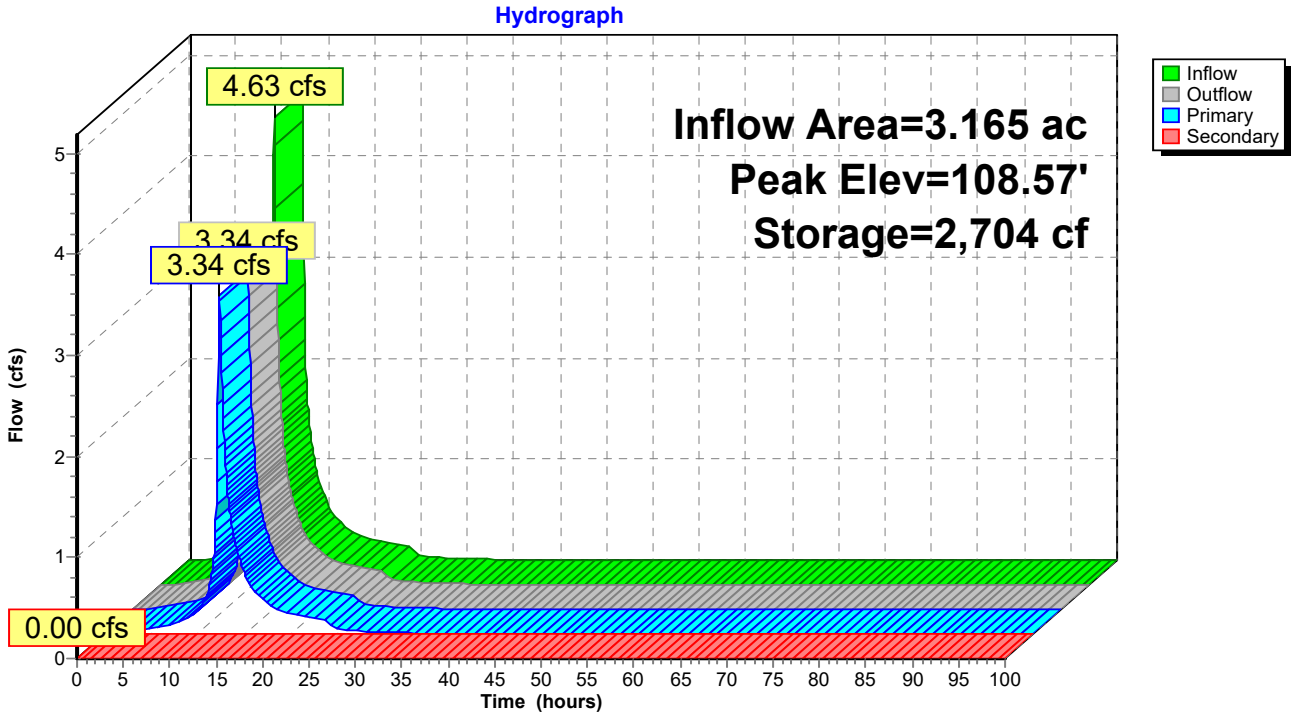
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.60	10	0	0
108.00	3,235	649	649
109.00	4,443	3,839	4,488
110.00	5,417	4,930	9,418
110.50	6,311	2,932	12,350

Device	Routing	Invert	Outlet Devices
#1	Primary	107.60'	**15.0" Round Culvert** L= 81.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.60' / 107.00' S= 0.0074 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Secondary	110.43'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=3.33 cfs @ 12.34 hrs HW=108.57' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 3.33 cfs @ 4.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 24P: Modified Depression



Summary for Pond 28P: Pervious Pavement Right Parking Area OCS 3

Inflow Area = 0.303 ac, 82.18% Impervious, Inflow Depth = 2.83" for 2-Year event
Inflow = 0.98 cfs @ 12.07 hrs, Volume= 0.072 af
Outflow = 0.04 cfs @ 14.59 hrs, Volume= 0.062 af, Atten= 96%, Lag= 151.4 min
Primary = 0.04 cfs @ 14.59 hrs, Volume= 0.062 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.16' @ 14.59 hrs Surf.Area= 34,390 sf Storage= 2,164 cf

Plug-Flow detention time= 1,114.0 min calculated for 0.062 af (87% of inflow)
Center-of-Mass det. time= 1,052.1 min (1,814.0 - 761.9)

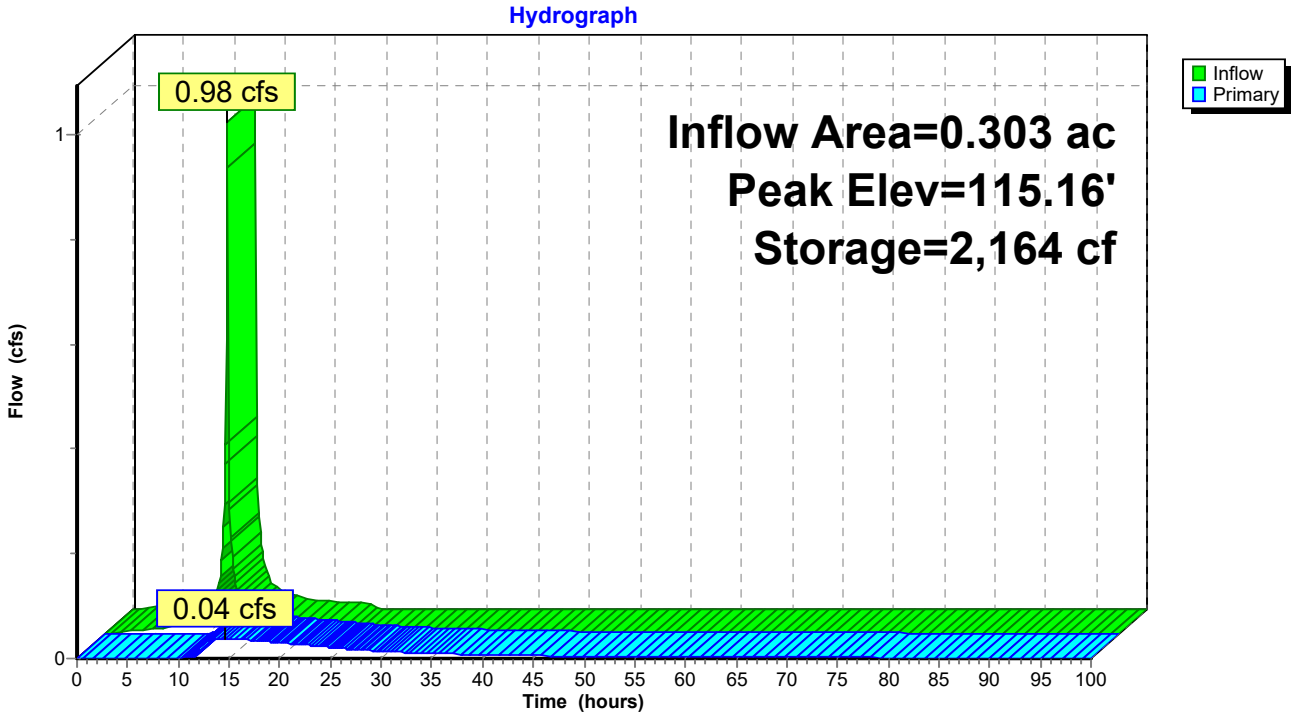
Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	39,440 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 99,043 cf Overall - 444 cf Embedded = 98,599 cf x 40.0% Voids
#2	115.25'	185 cf	**15.0" Round Pipe Storage** Inside #1 L= 151.0' S= 0.0010 '/'
#3	115.25'	259 cf	**15.0" Round Pipe Storage** Inside #1 L= 211.0' S= 0.0010 '/'
		39,884 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	34,390	0	0
117.88	34,390	99,043	99,043

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	**15.0" Round Culvert** L= 775.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 115.00' / 114.22' S= 0.0010 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	115.00'	**2.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.04 cfs @ 14.59 hrs HW=115.16' TW=111.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.04 cfs of 0.04 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.35 fps)

Pond 28P: Pervious Pavement Right Parking Area OCS 3



Summary for Pond 30P: Pervious Pavement Rear Trailer Area OCS 2

Inflow Area = 0.374 ac,100.00% Impervious, Inflow Depth = 3.12" for 2-Year event
Inflow = 1.32 cfs @ 12.08 hrs, Volume= 0.097 af
Outflow = 0.10 cfs @ 13.21 hrs, Volume= 0.096 af, Atten= 93%, Lag= 67.7 min
Primary = 0.10 cfs @ 13.21 hrs, Volume= 0.096 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 112.94' @ 13.21 hrs Surf.Area= 13,334 sf Storage= 2,379 cf

Plug-Flow detention time= 438.5 min calculated for 0.096 af (99% of inflow)
Center-of-Mass det. time= 430.8 min (1,184.4 - 753.6)

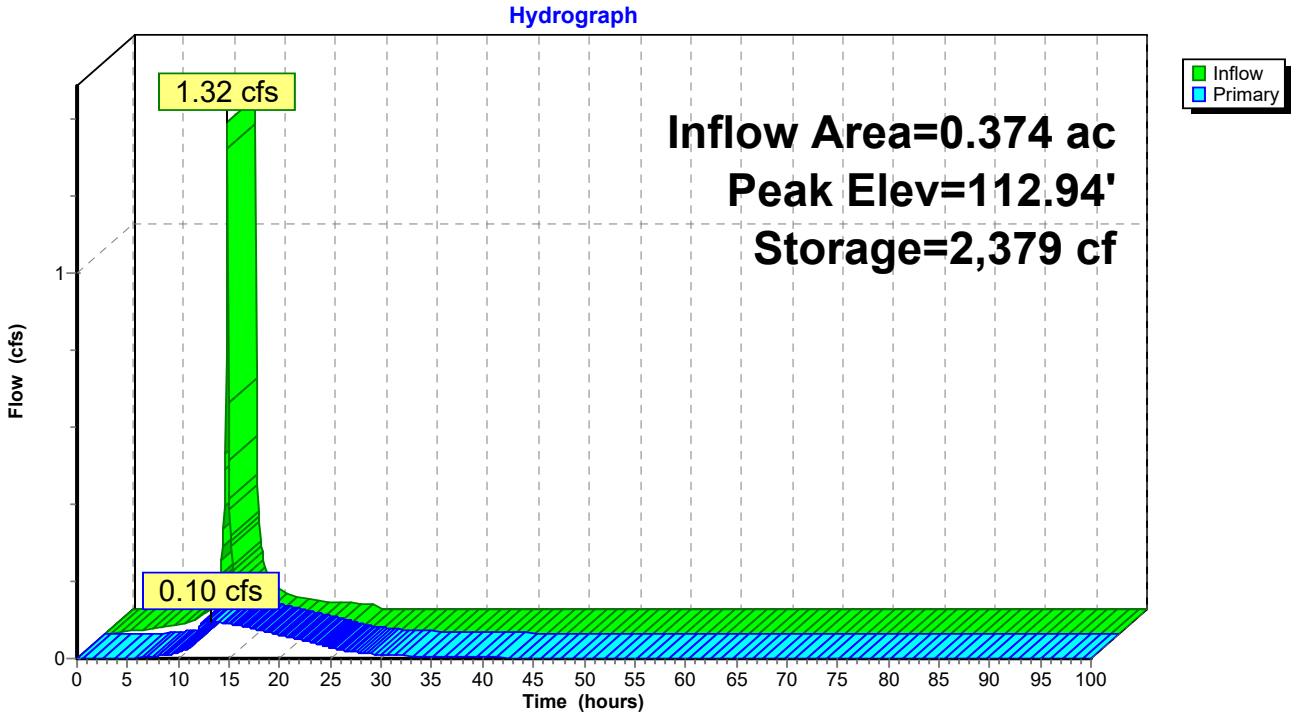
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	9,791 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 24,668 cf Overall - 191 cf Embedded = 24,476 cf x 40.0% Voids
#2	112.75'	191 cf	**15.0" Round Pipe Storage** Inside #1 L= 156.0' S= 0.0010 '/'
		9,982 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	13,334	0	0
114.35	13,334	24,668	24,668

Device	Routing	Invert	Outlet Devices
#1	Primary	110.67'	**15.0" Round Culvert** L= 36.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.67' / 110.63' S= 0.0011 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	112.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.75'	**0.5' long Sharp-Crested Rectangular Weir X 0.00** 2 End Contraction(s)

Primary OutFlow Max=0.10 cfs @ 13.21 hrs HW=112.94' TW=111.02' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.10 cfs of 6.38 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.10 cfs @ 2.81 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: Pervious Pavement Rear Trailer Area OCS 2



Summary for Pond 34P: Pervious Pavement Loading Area OCS 1

Inflow Area = 3.667 ac, 98.72% Impervious, Inflow Depth = 3.09" for 2-Year event
Inflow = 11.73 cfs @ 12.11 hrs, Volume= 0.945 af
Outflow = 0.61 cfs @ 13.95 hrs, Volume= 0.938 af, Atten= 95%, Lag= 110.5 min
Primary = 0.61 cfs @ 13.95 hrs, Volume= 0.938 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.78' @ 13.95 hrs Surf.Area= 48,644 sf Storage= 25,519 cf

Plug-Flow detention time= 647.4 min calculated for 0.938 af (99% of inflow)
Center-of-Mass det. time= 642.0 min (1,398.6 - 756.6)

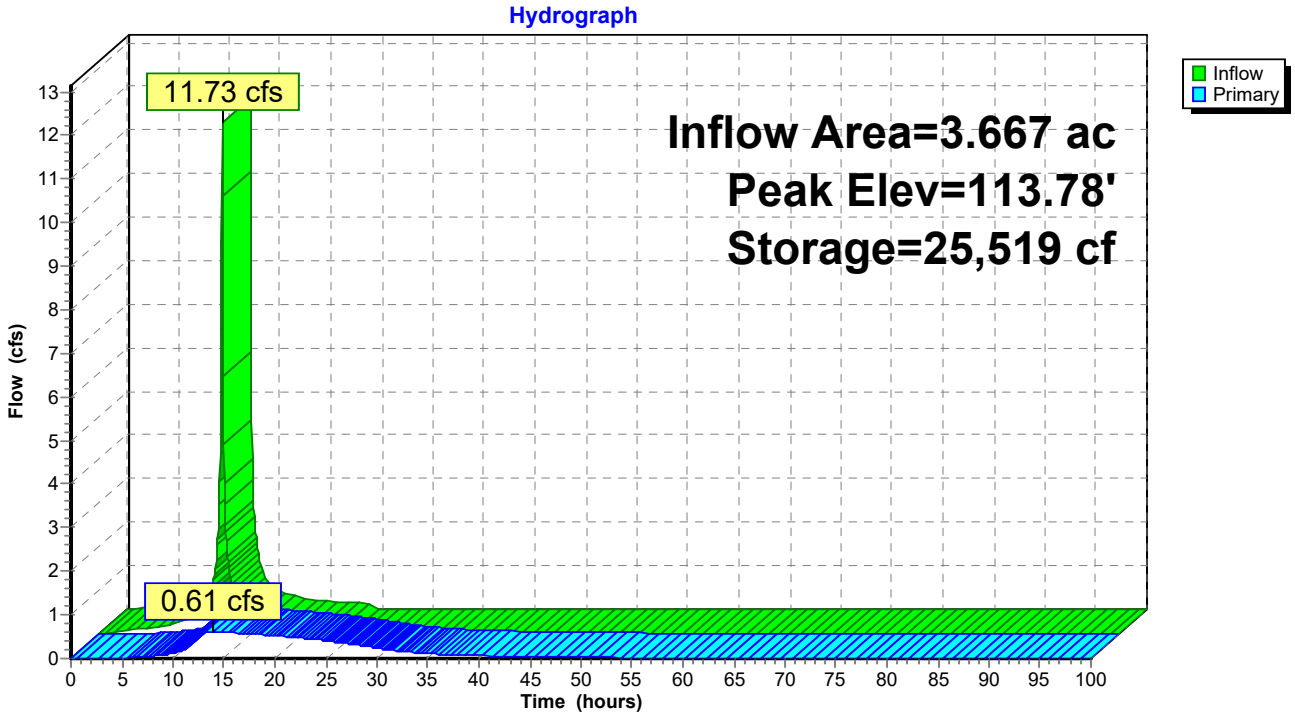
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	58,387 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 147,391 cf Overall - 1,424 cf Embedded = 145,968 cf x 40.0% Voids
#2	112.75'	668 cf	**15.0" Round Pipe Storage** Inside #1 L= 544.0' S= 0.0010 '/'
#3	112.75'	627 cf	**15.0" Round Pipe Storage** Inside #1 L= 511.0' S= 0.0010 '/'
#4	112.75'	129 cf	**15.0" Round Pipe Storage** Inside #1 L= 105.0' S= 0.0100 '/'
		59,811 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	48,644	0	0
115.53	48,644	147,391	147,391

Device	Routing	Invert	Outlet Devices
#1	Primary	110.61'	**18.0" Round Culvert** L= 1.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.61' / 110.61' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	112.50'	**3.5" W x 5.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.90'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.65'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.61 cfs @ 13.95 hrs HW=113.78' TW=111.01' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.61 cfs of 11.69 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.61 cfs @ 4.99 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Pervious Pavement Loading Area OCS 1



Summary for Pond 38P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 3.12" for 2-Year event
Inflow = 6.66 cfs @ 12.14 hrs, Volume= 0.582 af
Outflow = 0.55 cfs @ 13.34 hrs, Volume= 0.582 af, Atten= 92%, Lag= 72.0 min
Primary = 0.55 cfs @ 13.34 hrs, Volume= 0.582 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.66' @ 13.34 hrs Surf.Area= 10,231 sf Storage= 9,416 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 135.0 min (893.6 - 758.6)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	841 cf	**18.0" Round Pipe Storage**-Impervious L= 476.0' S= 0.0030 '/'
		34,324 cf	Total Available Storage

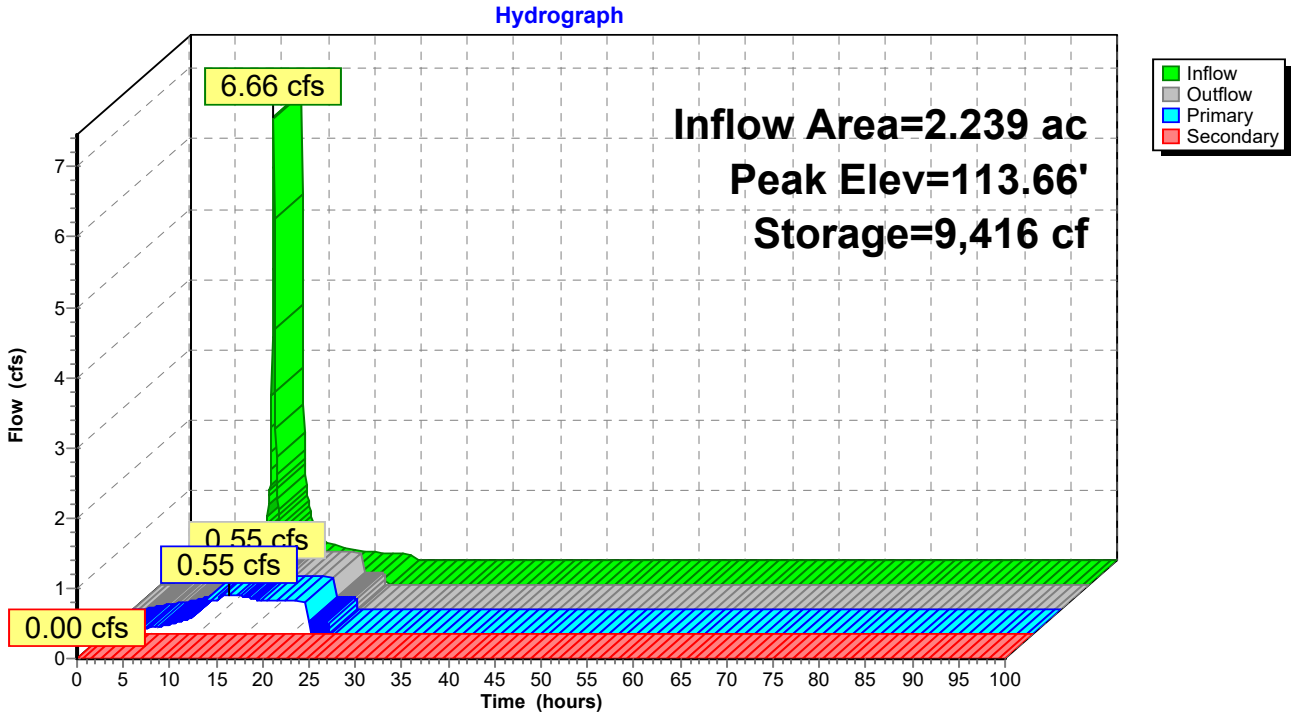
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.03'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.55 cfs @ 13.34 hrs HW=113.66' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.55 cfs of 12.48 cfs potential flow)
  └**2=Exfiltration** (Exfiltration Controls 0.47 cfs)
  └**3=Orifice/Grate** (Orifice Controls 0.08 cfs @ 2.29 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=112.75' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 38P: Bioretention

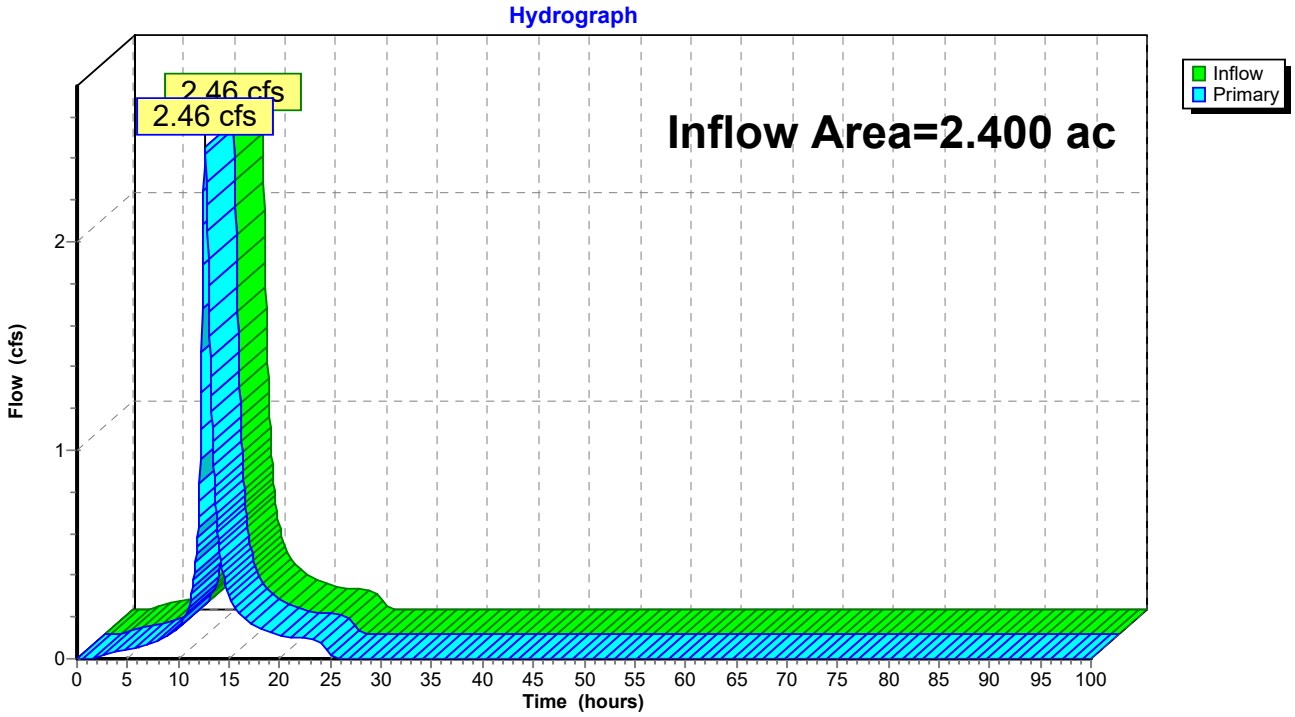


Summary for Link 17L: PDA 1A

Inflow Area = 2.400 ac, 55.42% Impervious, Inflow Depth = 2.32" for 2-Year event
Inflow = 2.46 cfs @ 12.65 hrs, Volume= 0.463 af
Primary = 2.46 cfs @ 12.65 hrs, Volume= 0.463 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 17L: PDA 1A

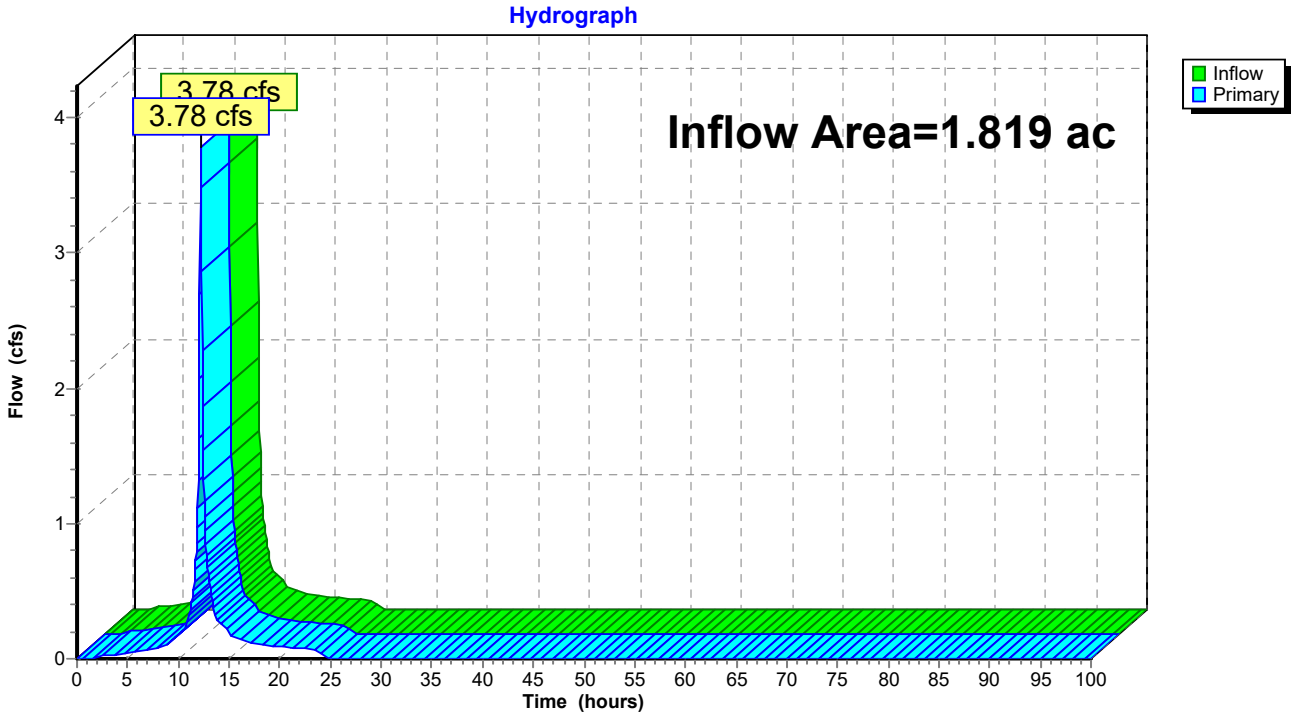


Summary for Link 23L: PDA 1C

Inflow Area = 1.819 ac, 61.57% Impervious, Inflow Depth = 2.50" for 2-Year event
Inflow = 3.78 cfs @ 12.20 hrs, Volume= 0.379 af
Primary = 3.78 cfs @ 12.20 hrs, Volume= 0.379 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 23L: PDA 1C

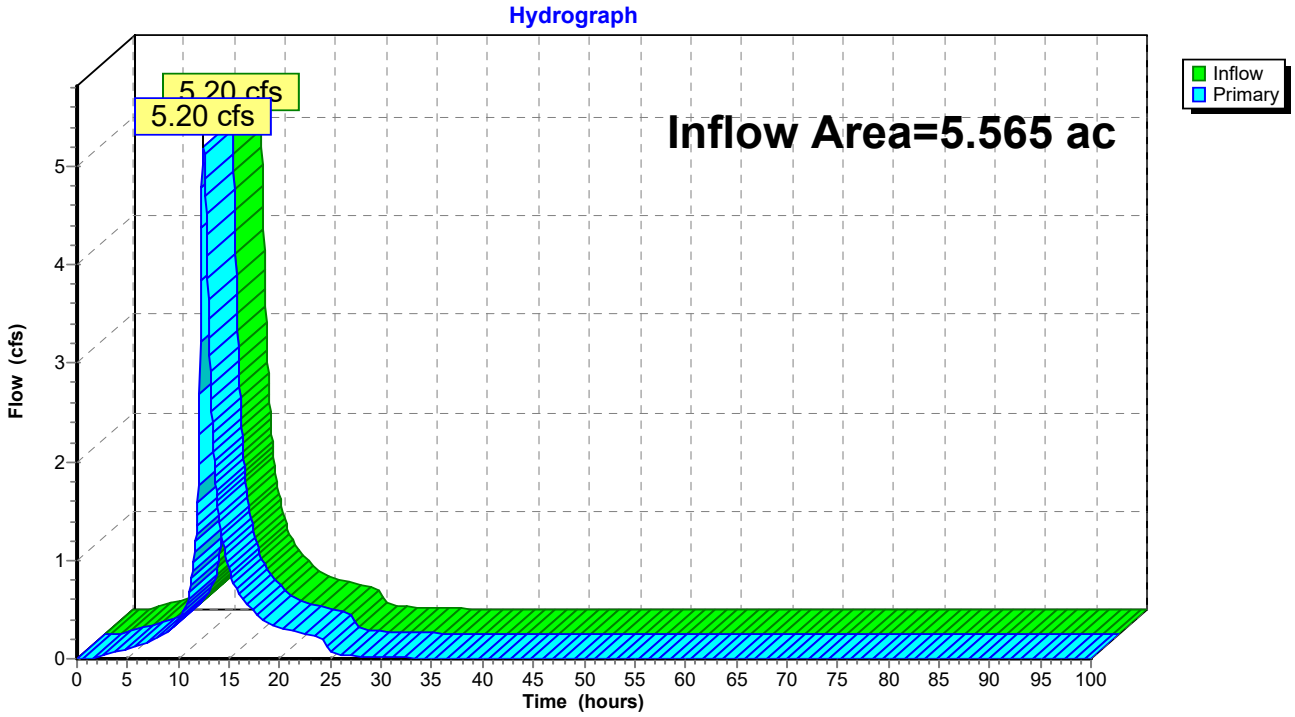


Summary for Link 25L: PDA 1

Inflow Area = 5.565 ac, 66.76% Impervious, Inflow Depth = 2.55" for 2-Year event
Inflow = 5.20 cfs @ 12.46 hrs, Volume= 1.181 af
Primary = 5.20 cfs @ 12.46 hrs, Volume= 1.181 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 25L: PDA 1

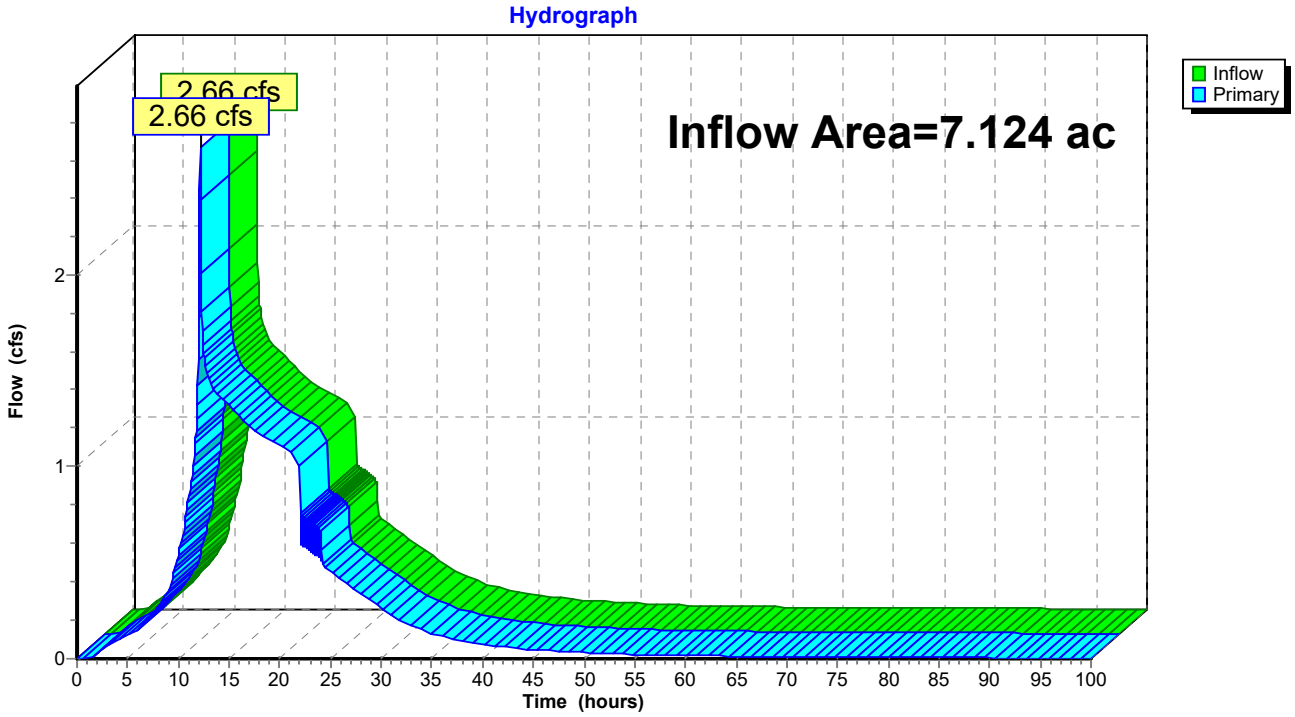


Summary for Link 39L: PDA 2A Treated

Inflow Area = 7.124 ac, 98.58% Impervious, Inflow Depth > 3.06" for 2-Year event
Inflow = 2.66 cfs @ 12.15 hrs, Volume= 1.818 af
Primary = 2.66 cfs @ 12.15 hrs, Volume= 1.818 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 39L: PDA 2A Treated

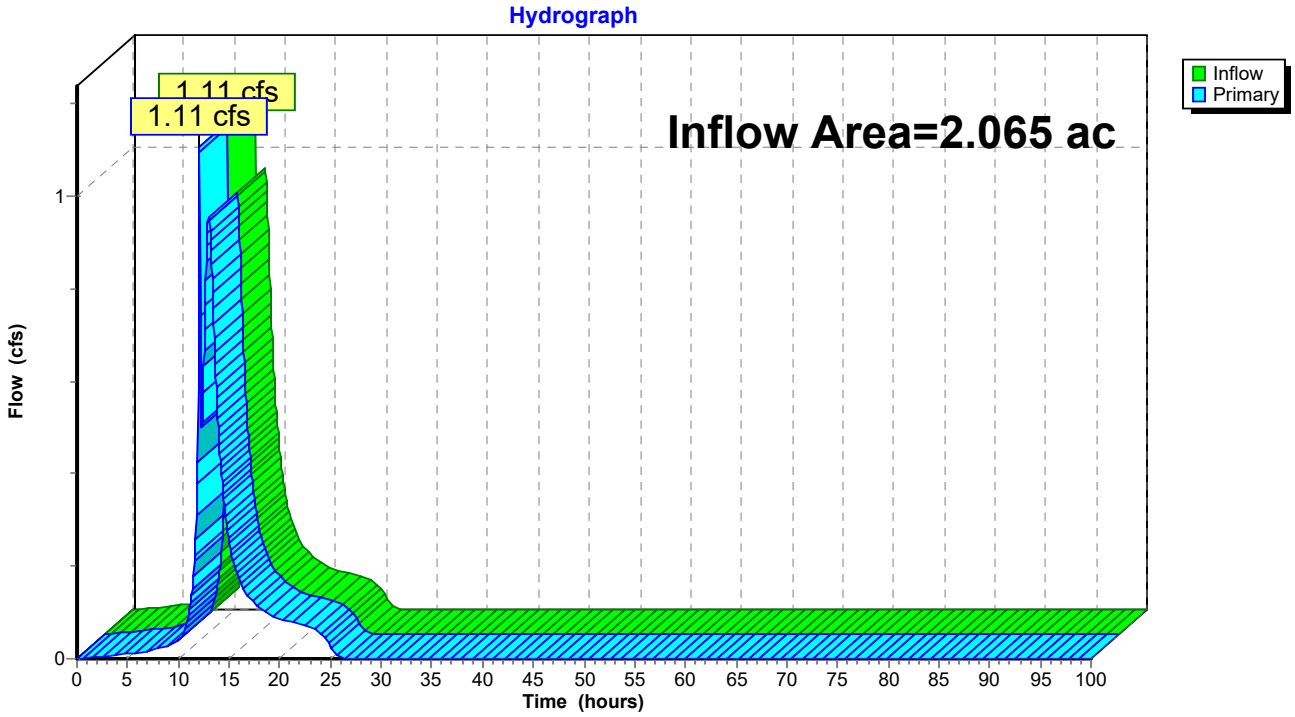


Summary for Link 42L: PDA 2A Remainder

Inflow Area = 2.065 ac, 13.66% Impervious, Inflow Depth = 1.57" for 2-Year event
Inflow = 1.11 cfs @ 12.09 hrs, Volume= 0.269 af
Primary = 1.11 cfs @ 12.09 hrs, Volume= 0.269 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 42L: PDA 2A Remainder

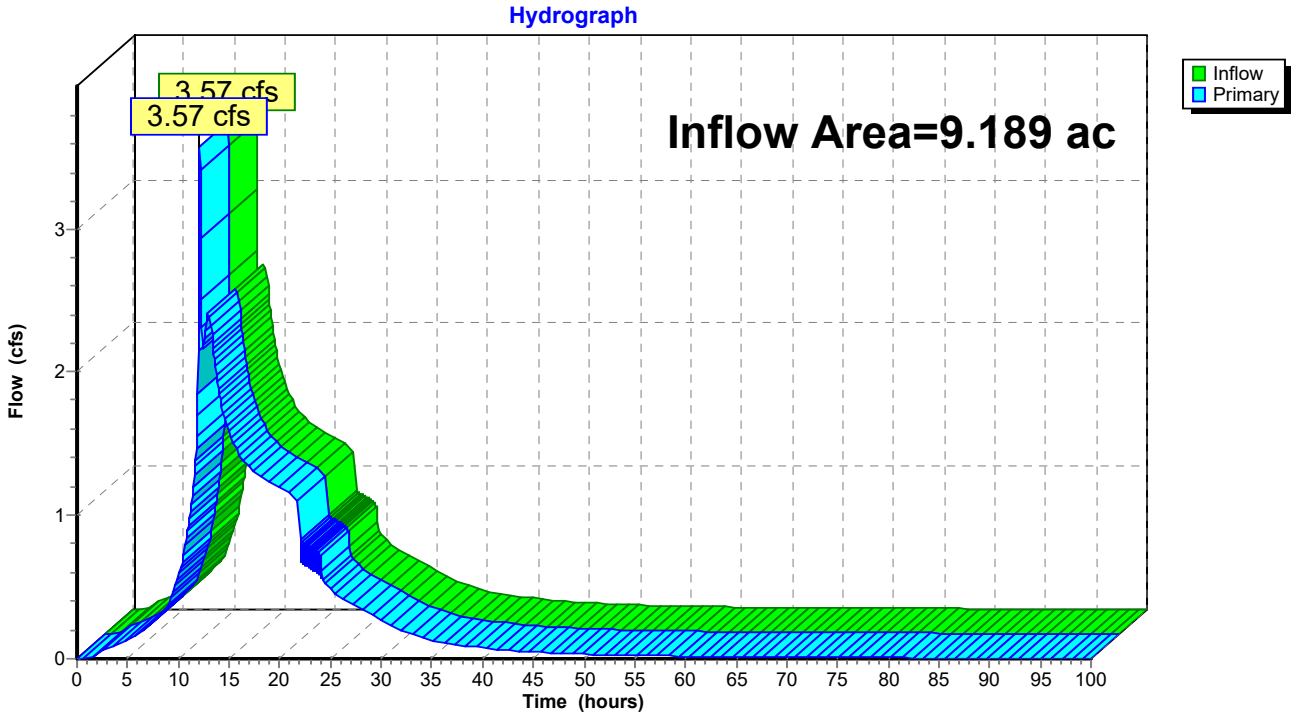


Summary for Link 43L: PDA 2A

Inflow Area = 9.189 ac, 79.50% Impervious, Inflow Depth > 2.73" for 2-Year event
Inflow = 3.57 cfs @ 12.11 hrs, Volume= 2.087 af
Primary = 3.57 cfs @ 12.11 hrs, Volume= 2.087 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 43L: PDA 2A

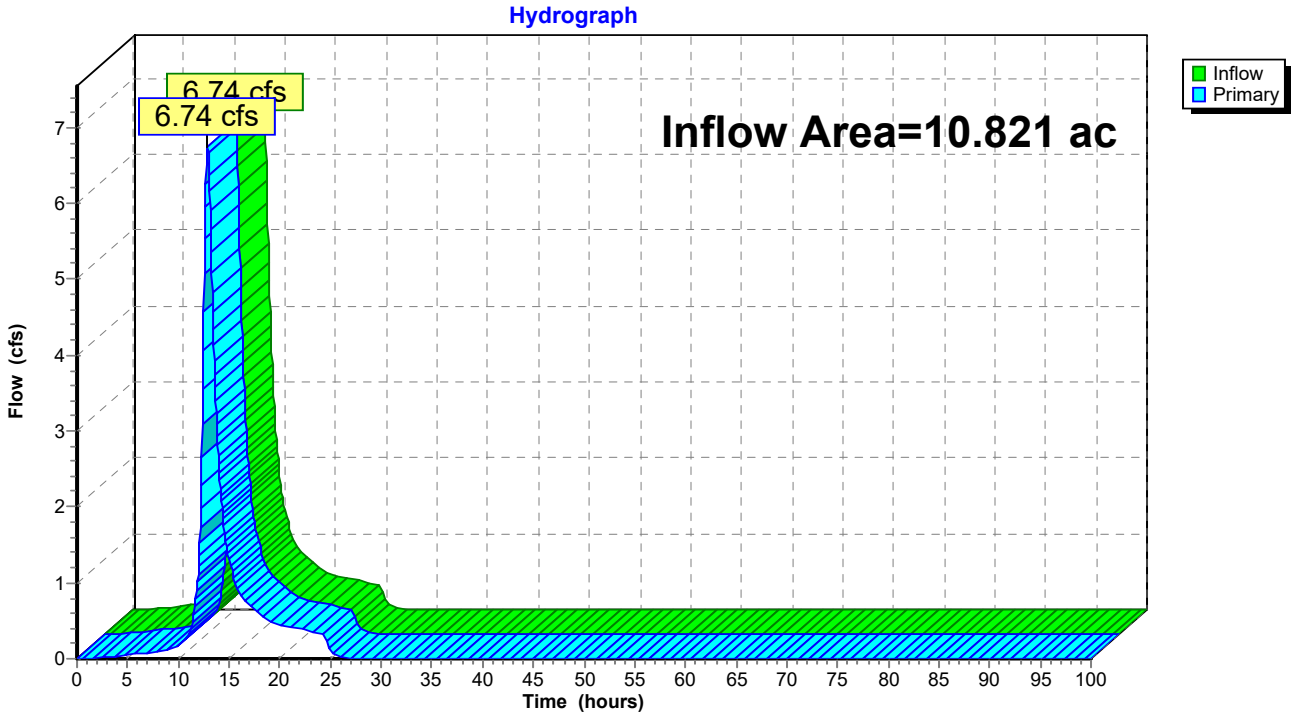


Summary for Link 46L: PDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 1.59" for 2-Year event
Inflow = 6.74 cfs @ 12.88 hrs, Volume= 1.430 af
Primary = 6.74 cfs @ 12.88 hrs, Volume= 1.430 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 46L: PDA 2B

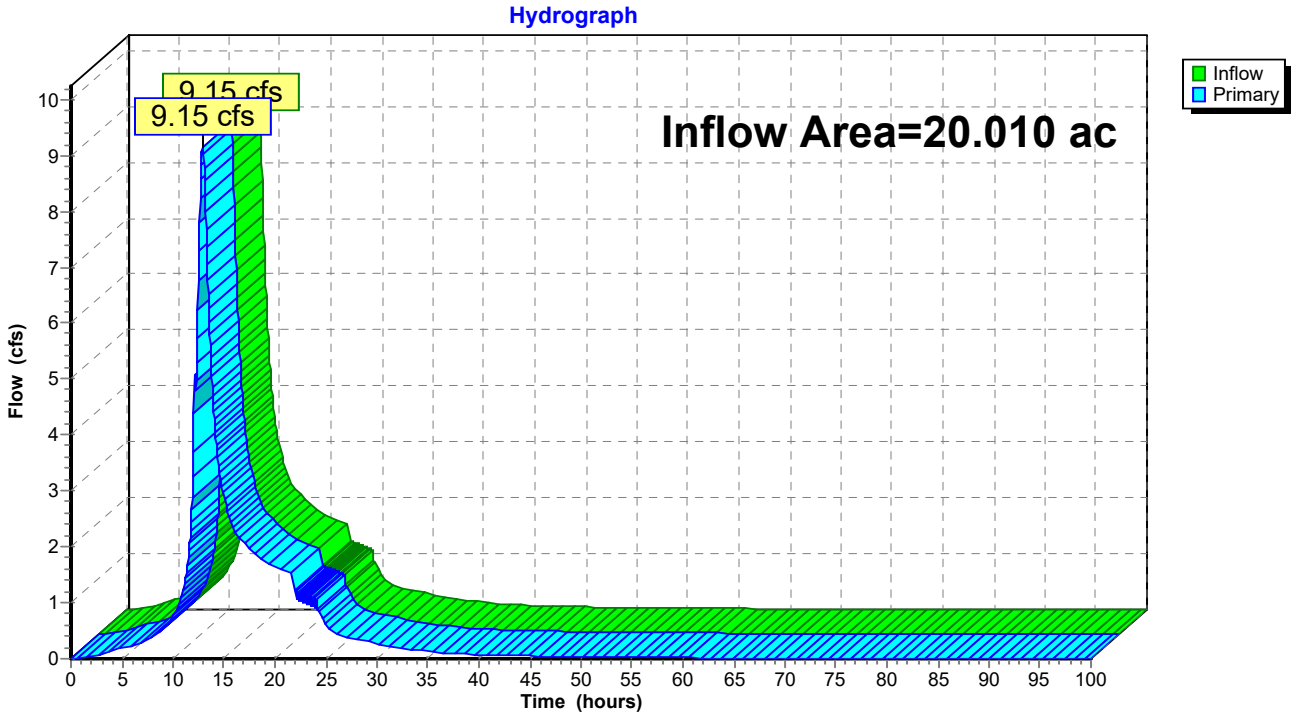


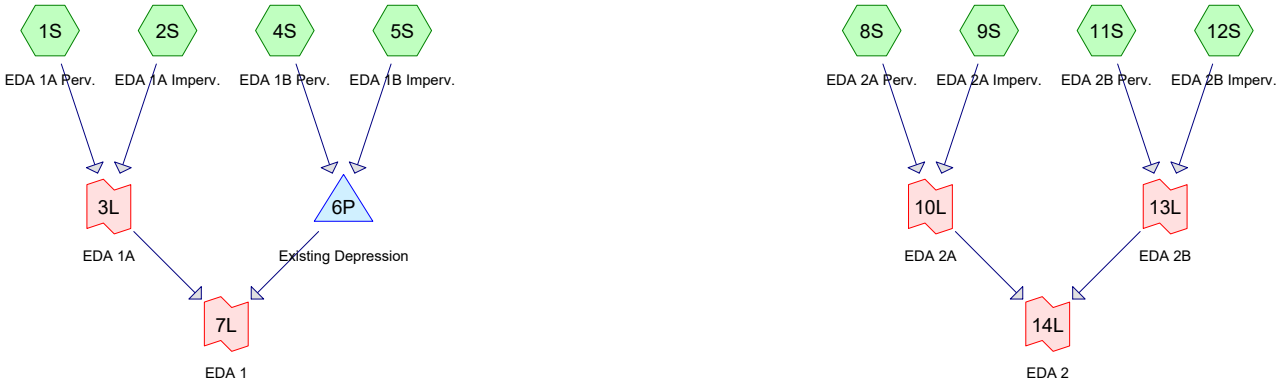
Summary for Link 47L: PDA 2

Inflow Area = 20.010 ac, 44.49% Impervious, Inflow Depth > 2.11" for 2-Year event
Inflow = 9.15 cfs @ 12.89 hrs, Volume= 3.517 af
Primary = 9.15 cfs @ 12.89 hrs, Volume= 3.517 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 47L: PDA 2





Subcat Reach Pond Link

Routing Diagram for Existing

Prepared by Bohler Engineering, Printed 8/12/2021

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=2.72"
Flow Length=405' Tc=48.4 min CN=77 Runoff=1.39 cfs 0.243 af

Subcatchment 2S: EDA 1A Imperv. Runoff Area=1.325 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=405' Tc=48.4 min CN=98 Runoff=2.76 cfs 0.539 af

Subcatchment 4S: EDA 1B Perv. Runoff Area=1.969 ac 0.00% Impervious Runoff Depth=3.00"
Flow Length=653' Tc=12.7 min CN=80 Runoff=5.26 cfs 0.492 af

Subcatchment 5S: EDA 1B Imperv. Runoff Area=3.494 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=653' Tc=12.7 min CN=98 Runoff=13.22 cfs 1.422 af

Subcatchment 8S: EDA 2A Perv. Runoff Area=1.074 ac 0.00% Impervious Runoff Depth=2.63"
Flow Length=1,211' Tc=72.3 min CN=76 Runoff=1.07 cfs 0.236 af

Subcatchment 9S: EDA 2A Imperv. Runoff Area=5.953 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=1,211' Tc=72.3 min CN=98 Runoff=9.92 cfs 2.422 af

Subcatchment 11S: EDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=2.72"
Flow Length=591' Tc=62.9 min CN=77 Runoff=10.35 cfs 2.094 af

Subcatchment 12S: EDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=591' Tc=62.9 min CN=98 Runoff=2.89 cfs 0.650 af

Pond 6P: Existing Depression Peak Elev=110.32' Storage=14,668 cf Inflow=18.48 cfs 1.914 af
Outflow=7.42 cfs 1.914 af

Link 3L: EDA 1A Inflow=4.15 cfs 0.782 af
Primary=4.15 cfs 0.782 af

Link 7L: EDA 1 Inflow=11.37 cfs 2.696 af
Primary=11.37 cfs 2.696 af

Link 10L: EDA 2A Inflow=10.99 cfs 2.658 af
Primary=10.99 cfs 2.658 af

Link 13L: EDA 2B Inflow=13.22 cfs 2.743 af
Primary=13.22 cfs 2.743 af

Link 14L: EDA 2 Inflow=24.14 cfs 5.402 af
Primary=24.14 cfs 5.402 af

Total Runoff Area = 25.706 ac Runoff Volume = 8.097 af Average Runoff Depth = 3.78"
51.88% Pervious = 13.337 ac 48.12% Impervious = 12.369 ac

Summary for Subcatchment 1S: EDA 1A Perv.

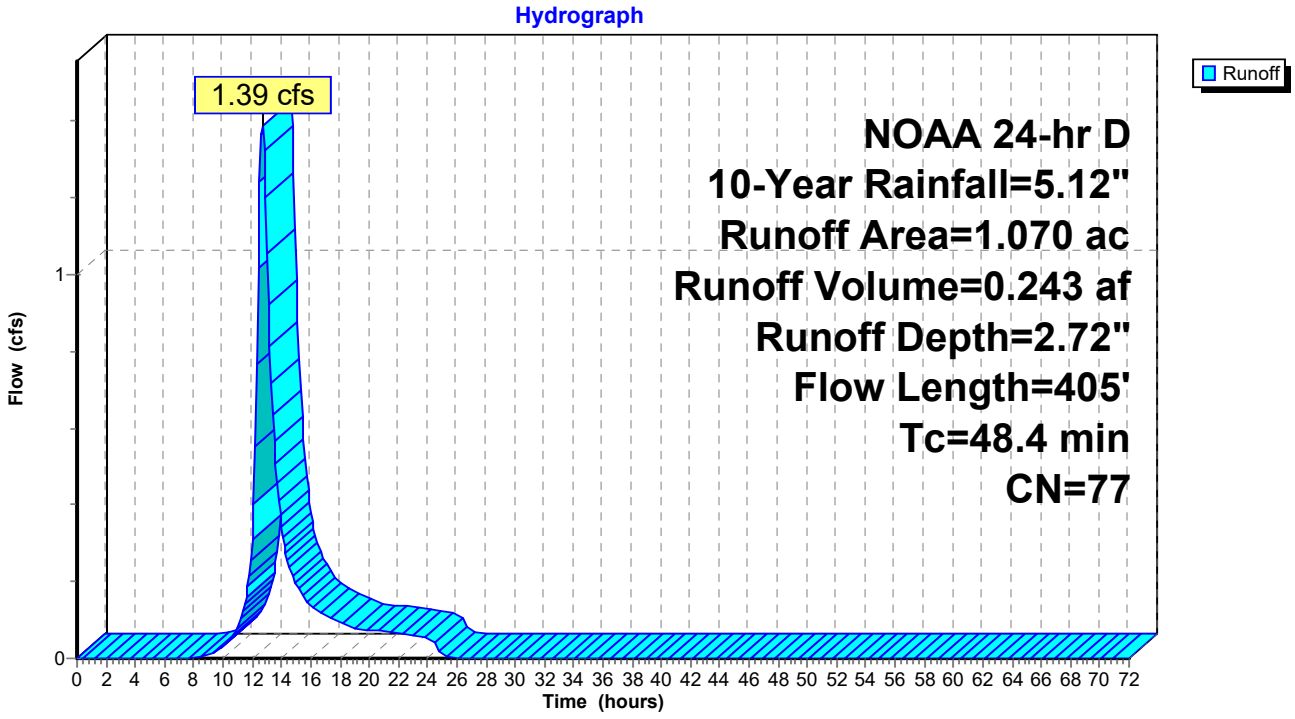
Runoff = 1.39 cfs @ 12.67 hrs, Volume= 0.243 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 1S: EDA 1A Perv.



Summary for Subcatchment 2S: EDA 1A Imperv.

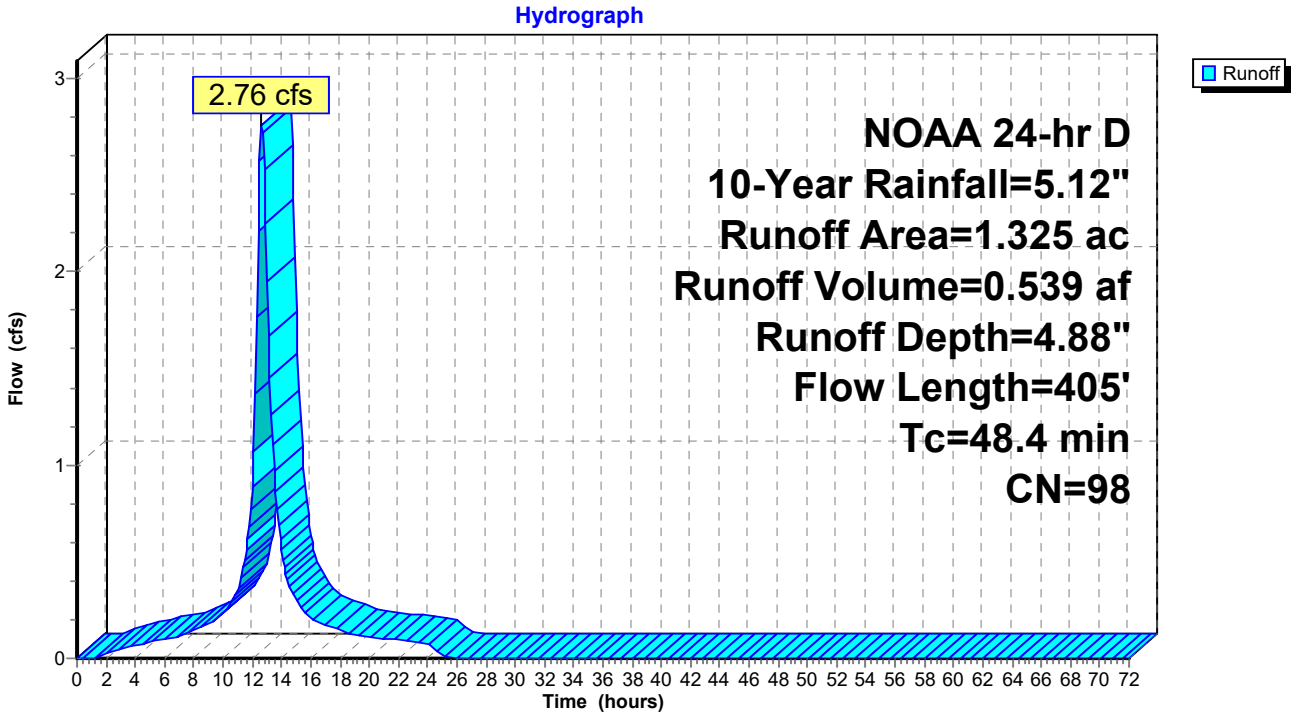
Runoff = 2.76 cfs @ 12.63 hrs, Volume= 0.539 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.325	98	Paved parking, HSG D
1.325		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 2S: EDA 1A Imperv.



Summary for Subcatchment 4S: EDA 1B Perv.

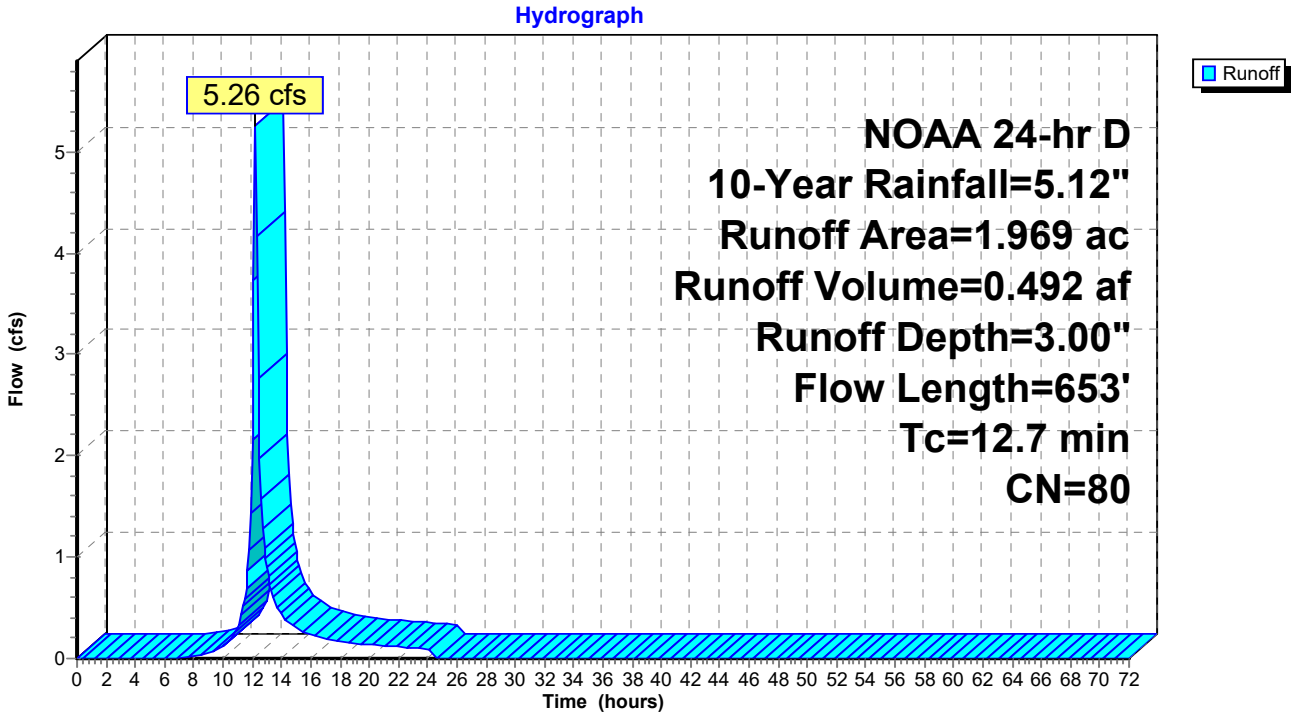
Runoff = 5.26 cfs @ 12.21 hrs, Volume= 0.492 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
1.969	80	>75% Grass cover, Good, HSG D
1.969	80	Weighted Average
1.969		100.00% Pervious 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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 4S: EDA 1B Perv.



Summary for Subcatchment 5S: EDA 1B Imperv.

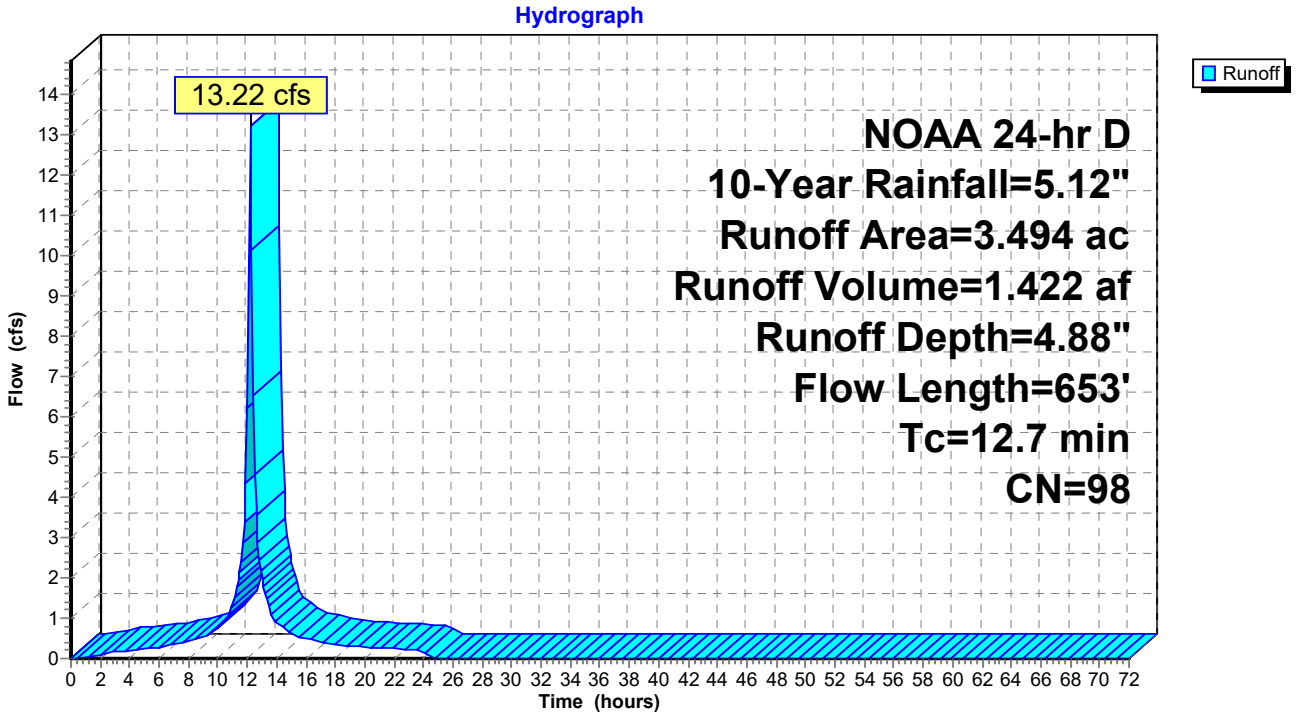
Runoff = 13.22 cfs @ 12.20 hrs, Volume= 1.422 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
3.494	98	Paved parking, HSG D
3.494		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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 5S: EDA 1B Imperv.



Summary for Subcatchment 8S: EDA 2A Perv.

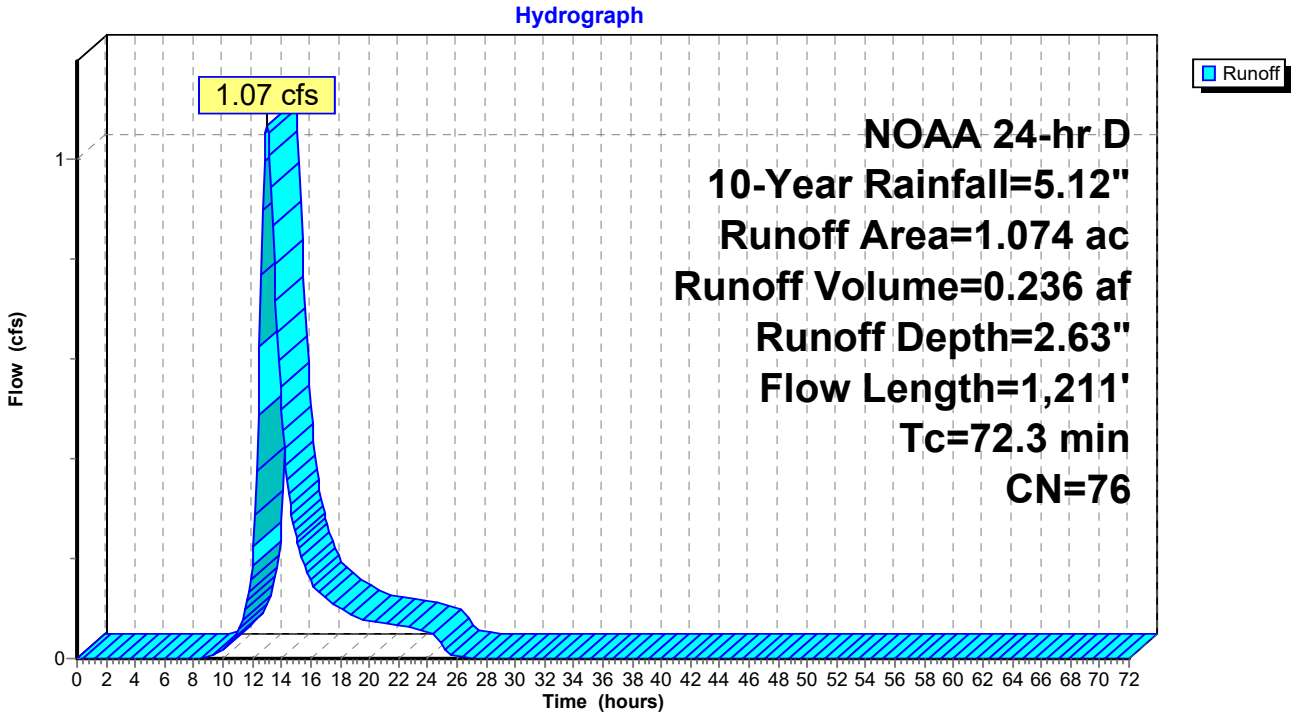
Runoff = 1.07 cfs @ 13.00 hrs, Volume= 0.236 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.143	77	Woods, Good, HSG D
0.383	70	Woods, Good, HSG C
0.483	80	>75% Grass cover, Good, HSG D
0.065	74	>75% Grass cover, Good, HSG C
1.074	76	Weighted Average
1.074		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 8S: EDA 2A Perv.



Summary for Subcatchment 9S: EDA 2A Imperv.

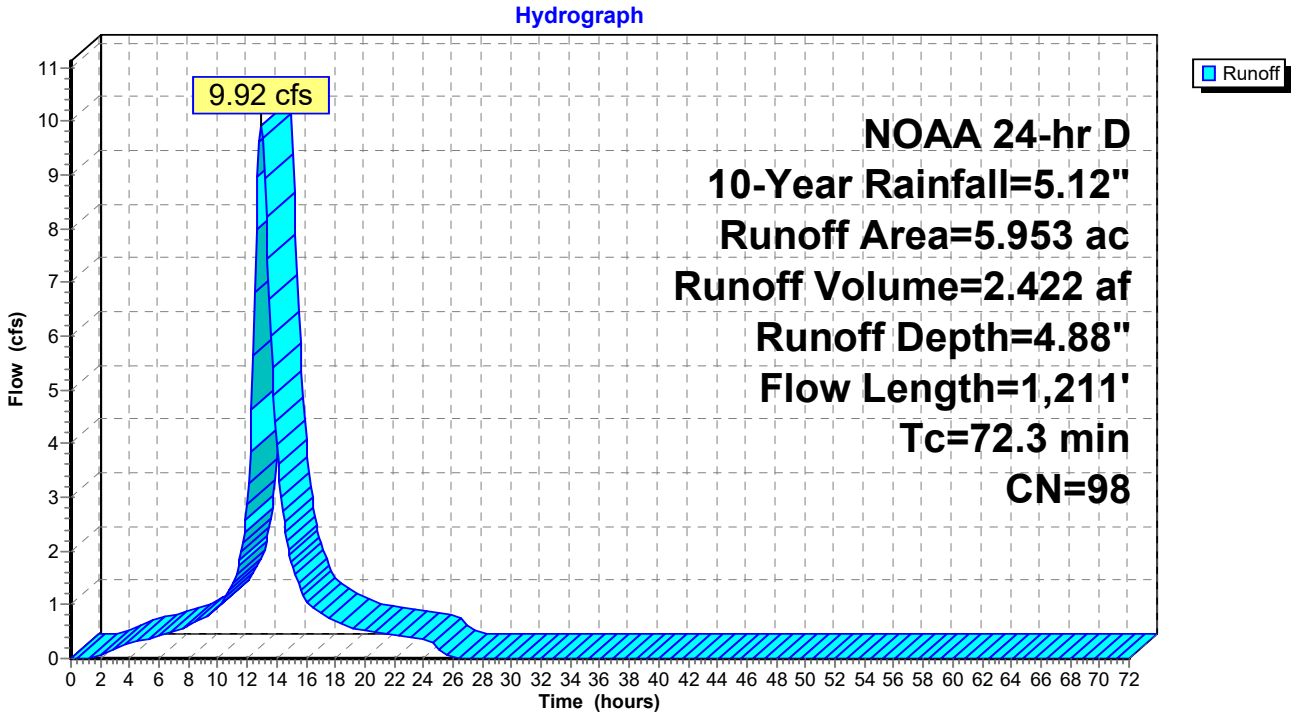
Runoff = 9.92 cfs @ 12.93 hrs, Volume= 2.422 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
5.953	98	Paved parking, HSG D
5.953		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 9S: EDA 2A Imperv.



Summary for Subcatchment 11S: EDA 2B Perv.

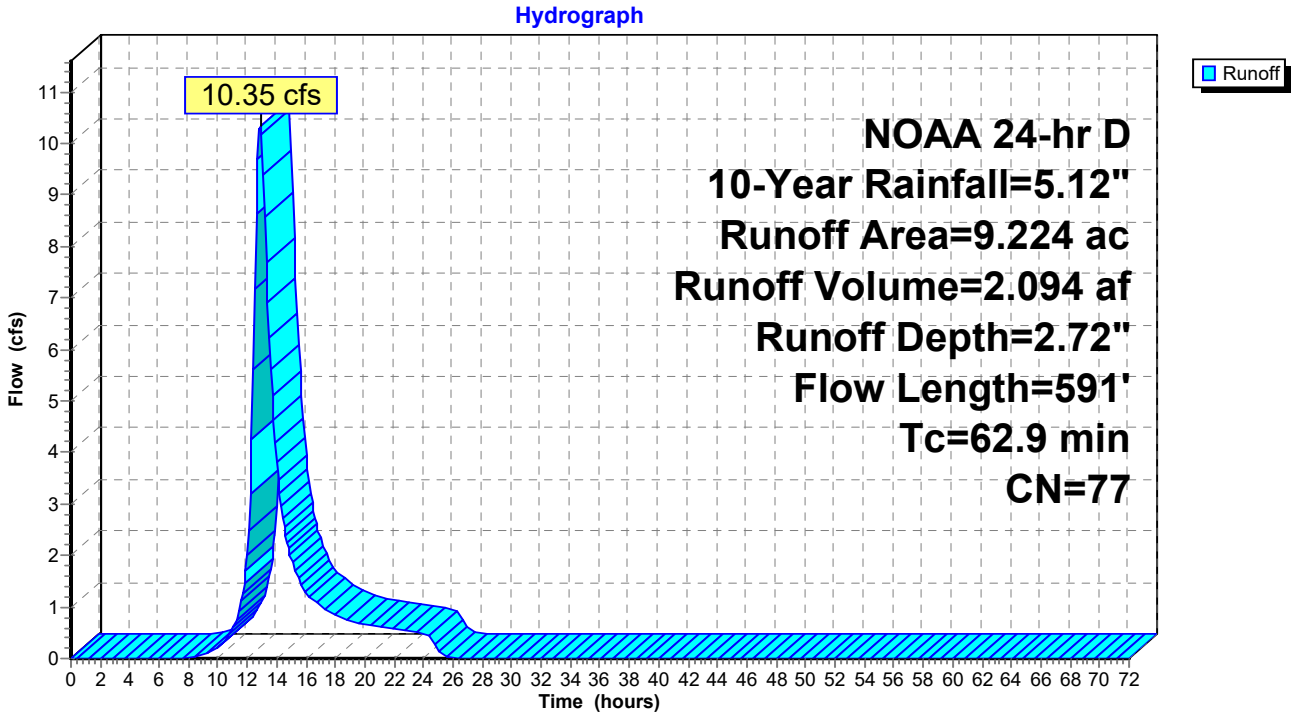
Runoff = 10.35 cfs @ 12.87 hrs, Volume= 2.094 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 11S: EDA 2B Perv.



Summary for Subcatchment 12S: EDA 2B Imperv.

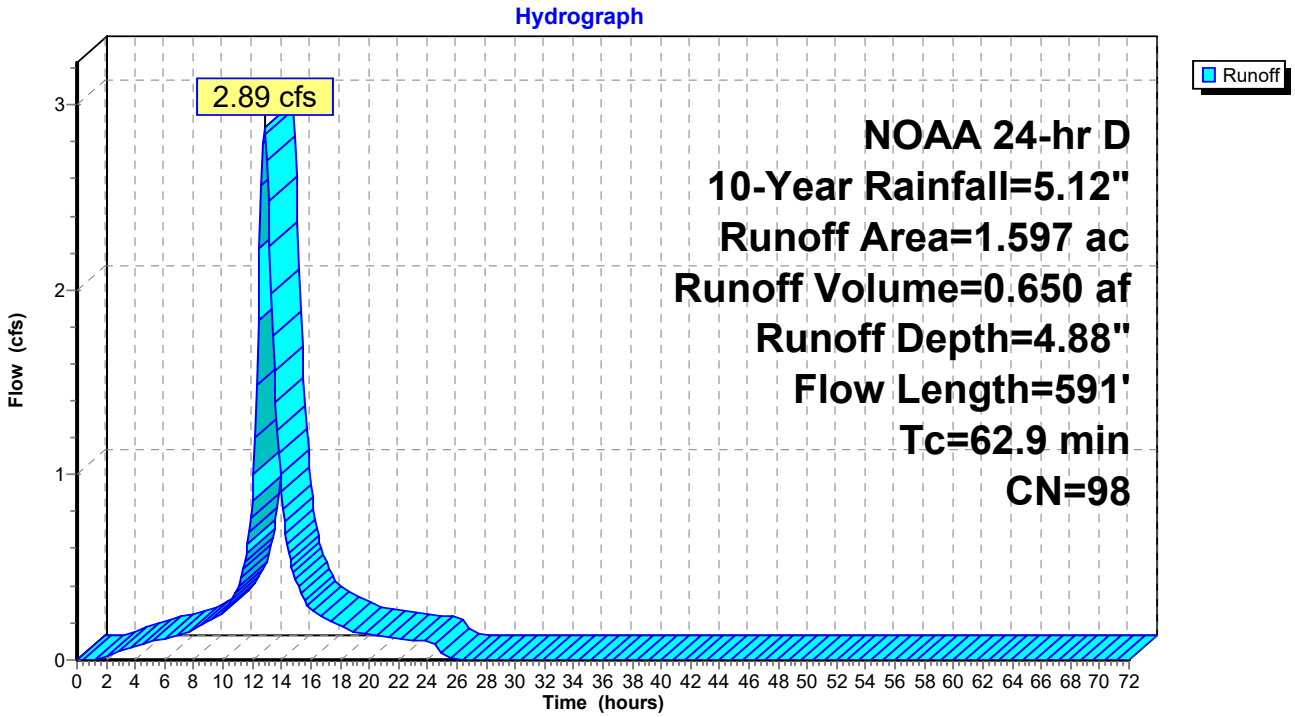
Runoff = 2.89 cfs @ 12.82 hrs, Volume= 0.650 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 12S: EDA 2B Imperv.



Summary for Pond 6P: Existing Depression

Inflow Area = 5.463 ac, 63.96% Impervious, Inflow Depth = 4.20" for 10-Year event
Inflow = 18.48 cfs @ 12.20 hrs, Volume= 1.914 af
Outflow = 7.42 cfs @ 12.48 hrs, Volume= 1.914 af, Atten= 60%, Lag= 16.6 min
Primary = 7.42 cfs @ 12.48 hrs, Volume= 1.914 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 110.32' @ 12.48 hrs Surf.Area= 21,131 sf Storage= 14,668 cf

Plug-Flow detention time= 14.6 min calculated for 1.911 af (100% of inflow)
Center-of-Mass det. time= 14.6 min (790.5 - 775.9)

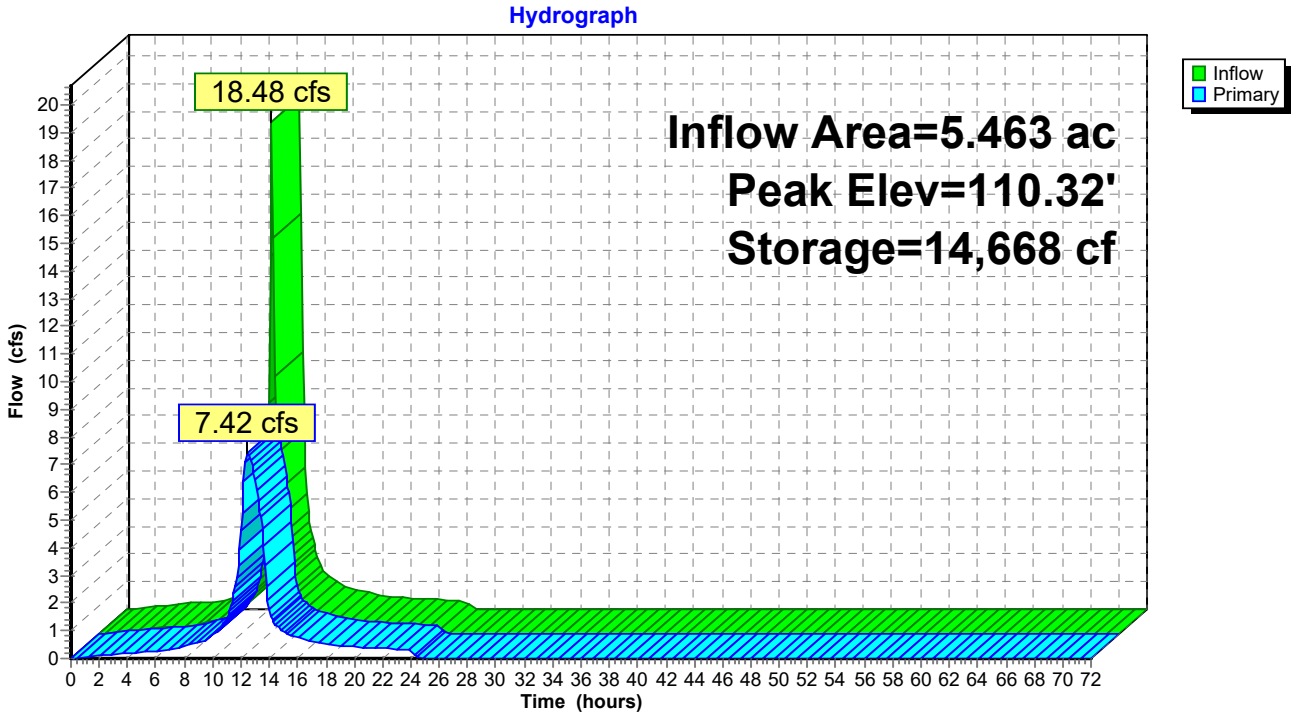
Volume	Invert	Avail.Storage	Storage Description
#1	107.95'	35,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.95	2	0	0
108.00	12	0	0
109.00	3,297	1,655	1,655
110.00	12,220	7,759	9,413
110.50	26,358	9,645	19,058
111.00	39,547	16,476	35,534

Device	Routing	Invert	Outlet Devices
#1	Primary	107.95'	**15.0" Round Culvert** L= 58.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.95' / 107.70' S= 0.0043 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	110.29'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.40 cfs @ 12.48 hrs HW=110.31' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 7.32 cfs @ 5.96 fps)
2=Broad-Crested Rectangular Weir (Weir Controls 0.08 cfs @ 0.37 fps)

Pond 6P: Existing Depression

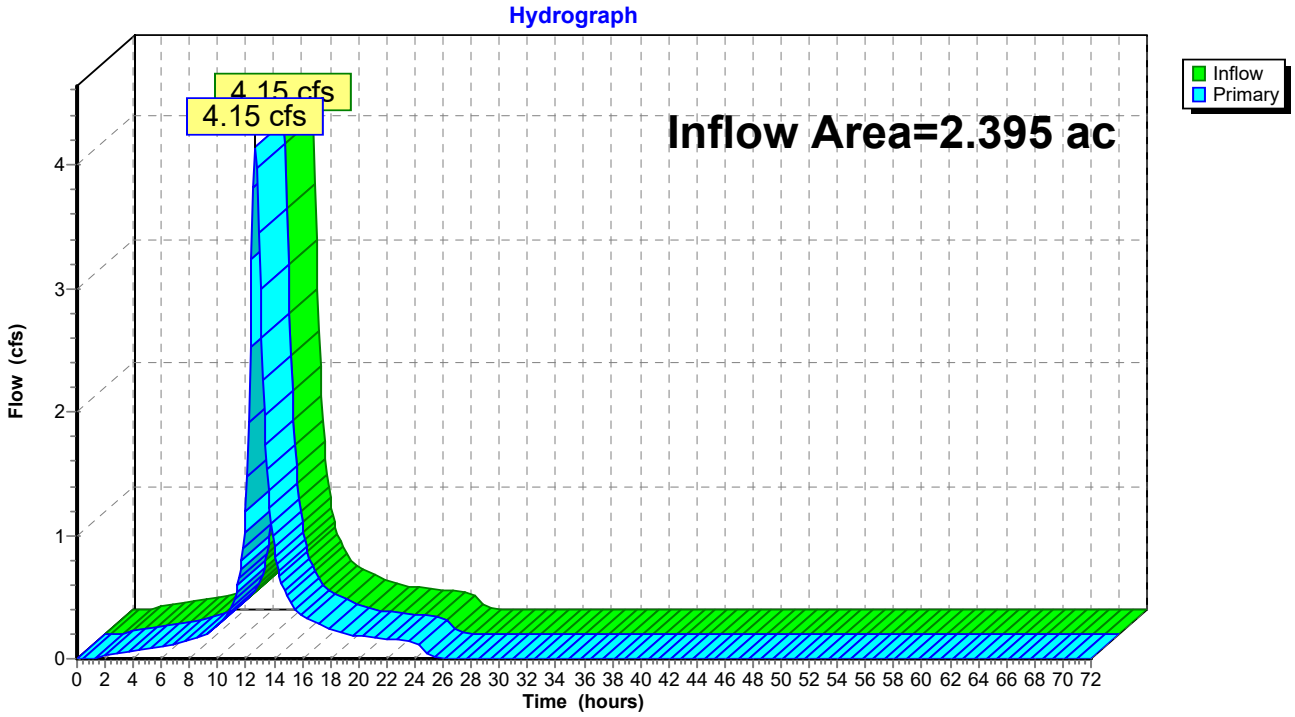


Summary for Link 3L: EDA 1A

Inflow Area = 2.395 ac, 55.32% Impervious, Inflow Depth = 3.92" for 10-Year event
Inflow = 4.15 cfs @ 12.65 hrs, Volume= 0.782 af
Primary = 4.15 cfs @ 12.65 hrs, Volume= 0.782 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 3L: EDA 1A

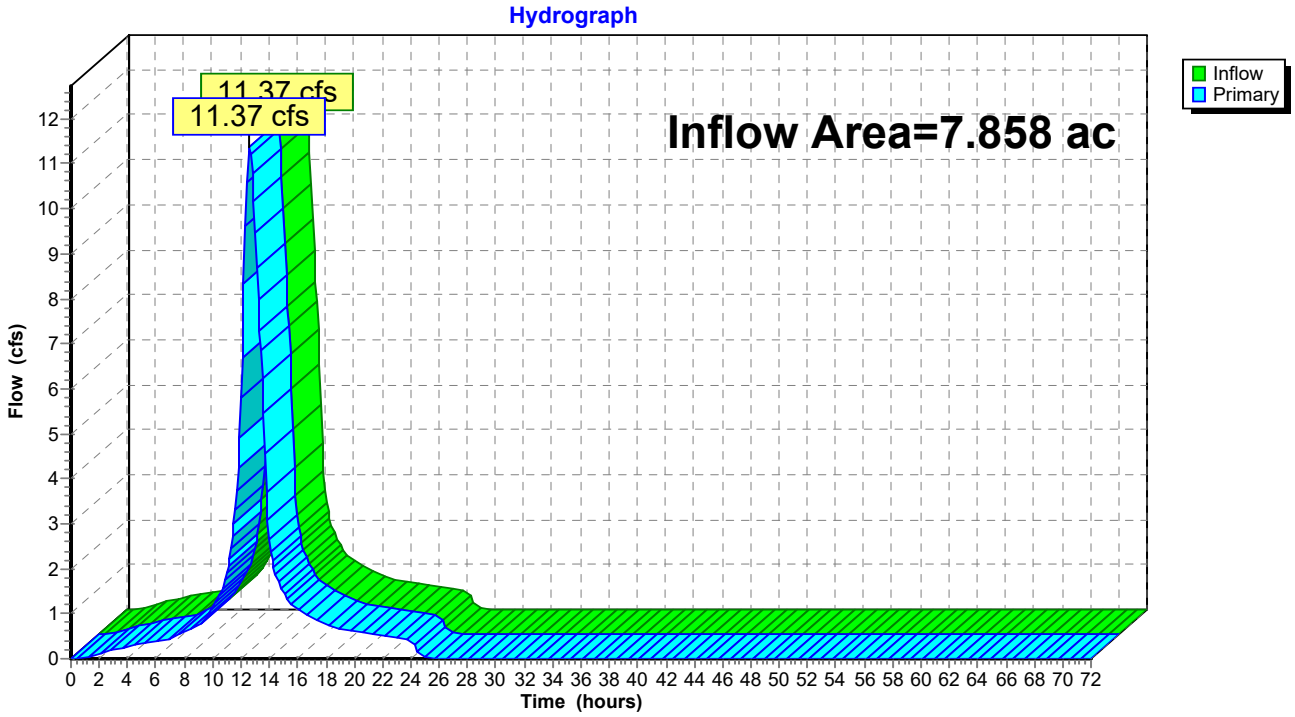


Summary for Link 7L: EDA 1

Inflow Area = 7.858 ac, 61.33% Impervious, Inflow Depth = 4.12" for 10-Year event
Inflow = 11.37 cfs @ 12.60 hrs, Volume= 2.696 af
Primary = 11.37 cfs @ 12.60 hrs, Volume= 2.696 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 7L: EDA 1

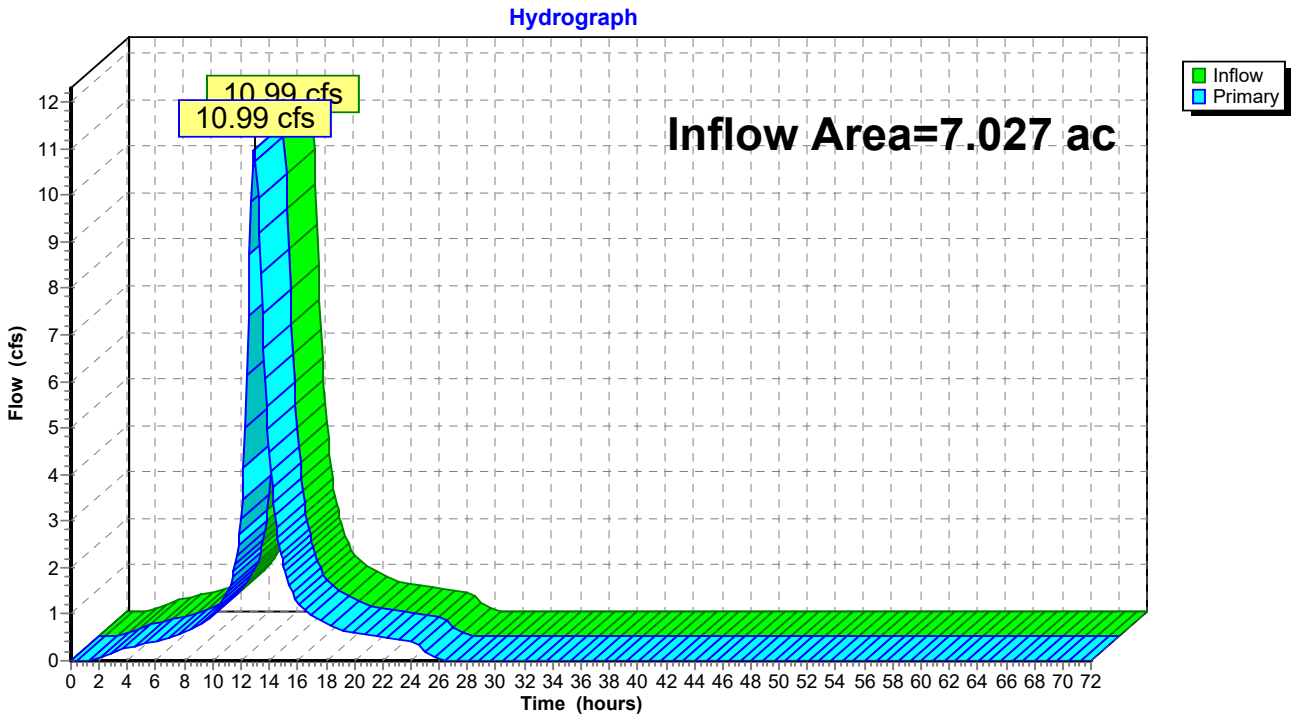


Summary for Link 10L: EDA 2A

Inflow Area = 7.027 ac, 84.72% Impervious, Inflow Depth = 4.54" for 10-Year event
Inflow = 10.99 cfs @ 12.94 hrs, Volume= 2.658 af
Primary = 10.99 cfs @ 12.94 hrs, Volume= 2.658 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2A

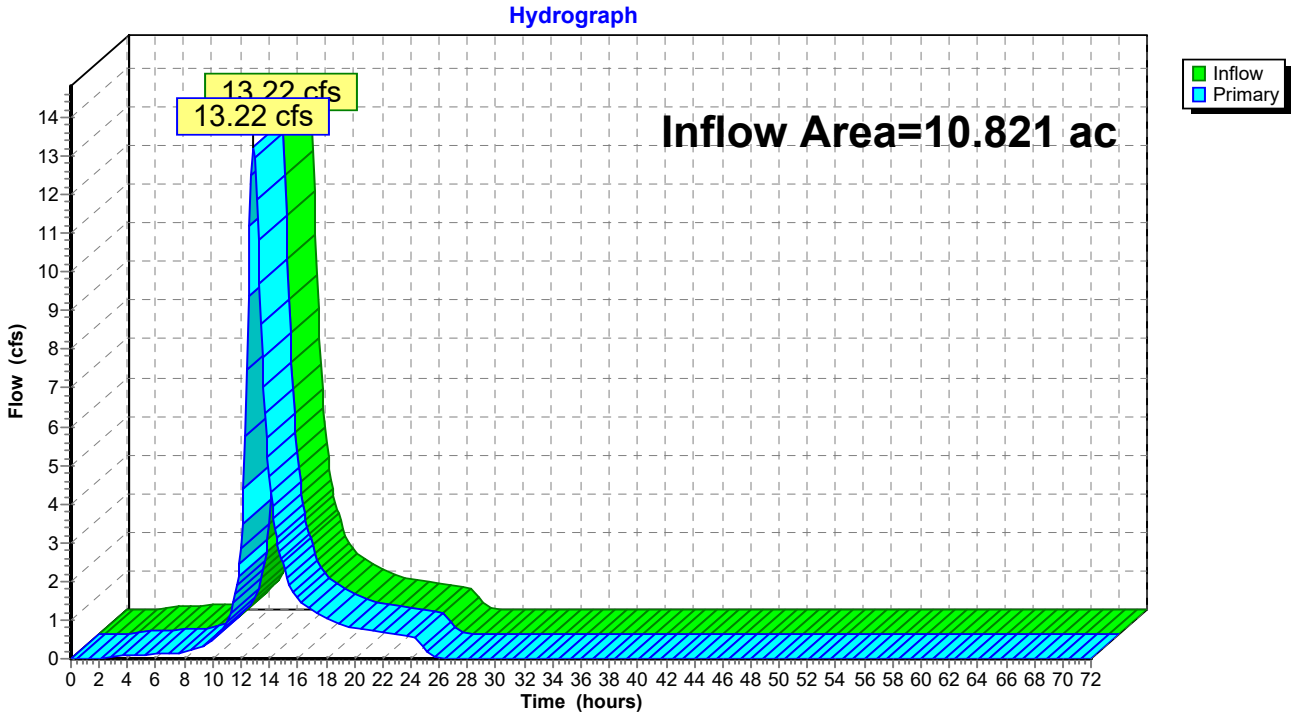


Summary for Link 13L: EDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 3.04" for 10-Year event
Inflow = 13.22 cfs @ 12.86 hrs, Volume= 2.743 af
Primary = 13.22 cfs @ 12.86 hrs, Volume= 2.743 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 13L: EDA 2B

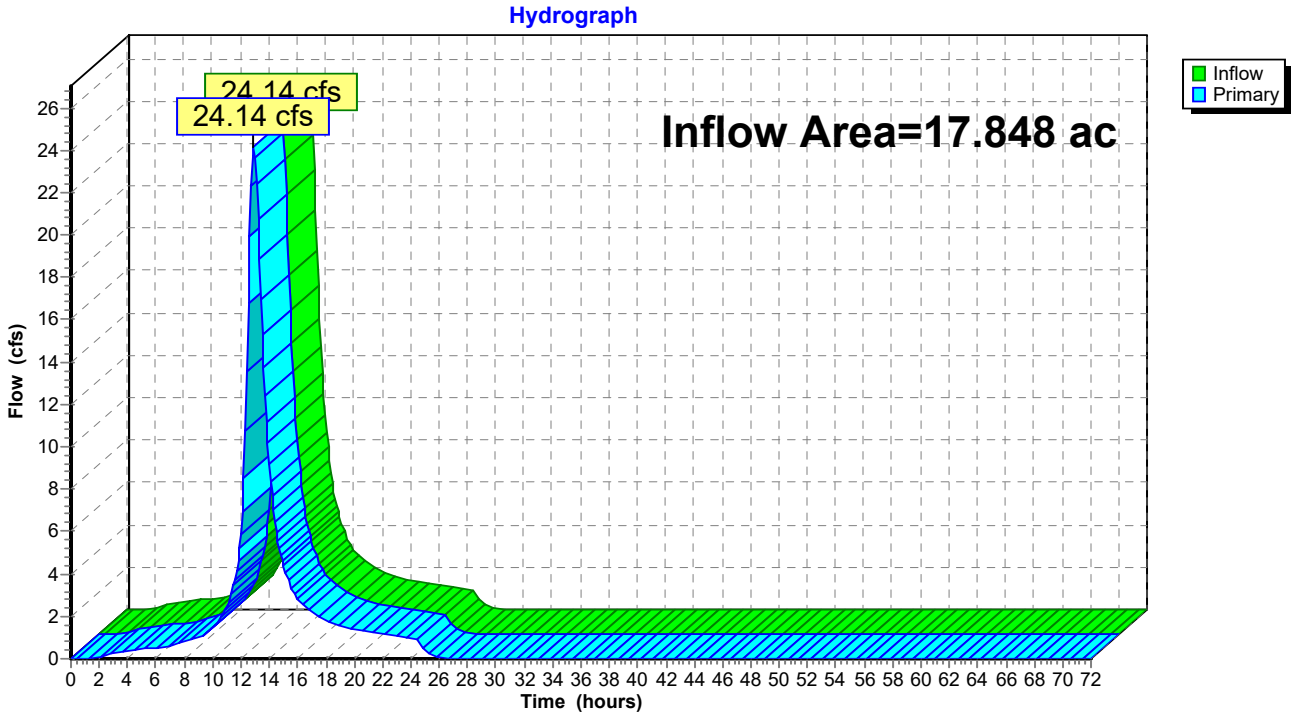


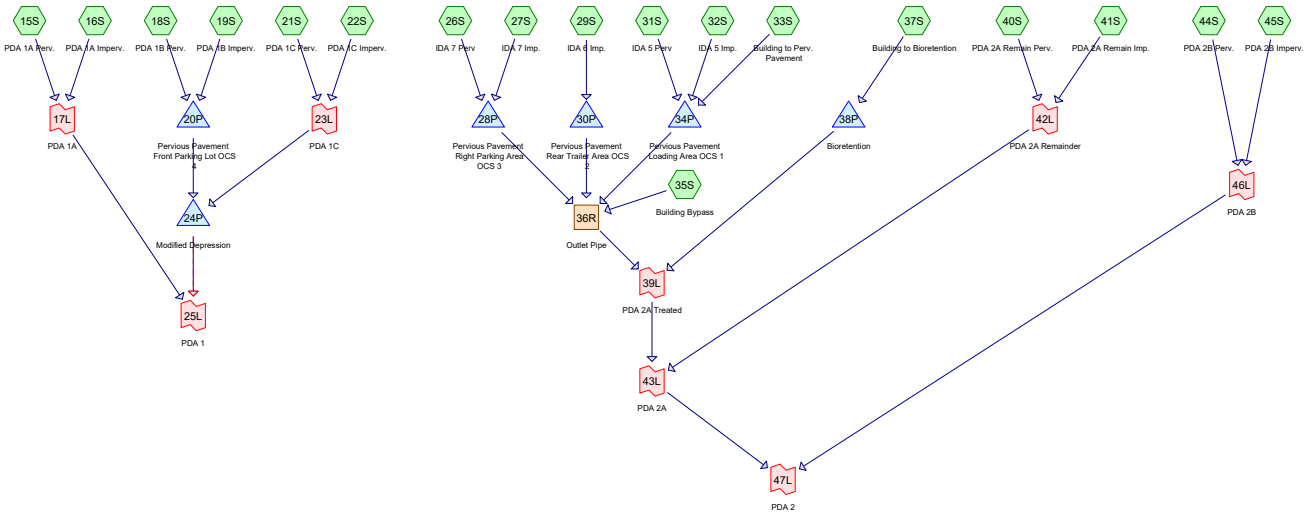
Summary for Link 14L: EDA 2

Inflow Area = 17.848 ac, 42.30% Impervious, Inflow Depth = 3.63" for 10-Year event
Inflow = 24.14 cfs @ 12.89 hrs, Volume= 5.402 af
Primary = 24.14 cfs @ 12.89 hrs, Volume= 5.402 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 14L: EDA 2





Subcat Reach Pond Link

Routing Diagram for Proposed

Prepared by {enter your company name here}, Printed 11/19/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.735	74	>75% Grass cover, Good, HSG C (31S, 40S, 44S)
4.756	80	>75% Grass cover, Good, HSG D (15S, 18S, 21S, 26S, 31S, 40S, 44S)
12.617	98	Paved parking, HSG D (16S, 19S, 22S, 27S, 29S, 32S, 33S, 35S, 37S, 41S, 45S)
0.871	70	Woods, Good, HSG C (40S, 44S)
6.596	77	Woods, Good, HSG D (15S, 21S, 44S)
25.575	**88**	**TOTAL AREA**

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15S: PDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=2.72"
Flow Length=405' Tc=48.4 min CN=77 Runoff=1.40 cfs 0.243 af

Subcatchment 16S: PDA 1A Imperv. Runoff Area=1.330 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=405' Tc=48.4 min CN=98 Runoff=2.78 cfs 0.541 af

Subcatchment 18S: PDA 1B Perv. Runoff Area=0.081 ac 0.00% Impervious Runoff Depth=3.00"
Flow Length=317' Tc=1.5 min CN=80 Runoff=0.31 cfs 0.020 af

Subcatchment 19S: PDA 1B Imperv. Runoff Area=1.265 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=205' Tc=1.4 min CN=98 Runoff=6.80 cfs 0.515 af

Subcatchment 21S: PDA 1C Perv. Runoff Area=0.699 ac 0.00% Impervious Runoff Depth=3.00"
Flow Length=653' Tc=12.7 min CN=80 Runoff=1.91 cfs 0.175 af

Subcatchment 22S: PDA 1C Imperv. Runoff Area=1.120 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=653' Tc=12.7 min CN=98 Runoff=4.34 cfs 0.456 af

Subcatchment 26S: IDA 7 Perv Runoff Area=0.054 ac 0.00% Impervious Runoff Depth=3.00"
Flow Length=163' Tc=1.3 min CN=80 Runoff=0.21 cfs 0.013 af

Subcatchment 27S: IDA 7 Imp. Runoff Area=0.249 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=163' Tc=1.3 min CN=98 Runoff=1.34 cfs 0.101 af

Subcatchment 29S: IDA 6 Imp. Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=178' Tc=2.0 min CN=98 Runoff=2.04 cfs 0.152 af

Subcatchment 31S: IDA 5 Perv Runoff Area=0.047 ac 0.00% Impervious Runoff Depth=2.63"
Flow Length=390' Tc=4.6 min CN=76 Runoff=0.15 cfs 0.010 af

Subcatchment 32S: IDA 5 Imp. Runoff Area=2.005 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=390' Tc=4.6 min CN=98 Runoff=9.94 cfs 0.816 af

Subcatchment 33S: Building to Perv. Runoff Area=1.615 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=354' Slope=0.0050 '/' Tc=4.6 min CN=98 Runoff=8.01 cfs 0.657 af

Subcatchment 35S: Building Bypass Runoff Area=0.541 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=379' Slope=0.0050 '/' Tc=5.3 min CN=98 Runoff=2.60 cfs 0.220 af

Subcatchment 37S: Building to Runoff Area=2.239 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=560' Slope=0.0050 '/' Tc=7.4 min CN=98 Runoff=10.24 cfs 0.911 af

Subcatchment 40S: PDA 2A Remain Perv. Runoff Area=1.783 ac 0.00% Impervious Runoff Depth=2.72"
Flow Length=1,211' Tc=72.3 min CN=77 Runoff=1.84 cfs 0.405 af

Subcatchment 41S: PDA 2A Remain Imp. Runoff Area=0.282 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=456' Tc=2.9 min CN=98 Runoff=1.50 cfs 0.115 af

Subcatchment 44S: PDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=2.72"
Flow Length=591' Tc=62.9 min CN=77 Runoff=10.36 cfs 2.094 af

Subcatchment 45S: PDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=4.88"
Flow Length=591' Tc=62.9 min CN=98 Runoff=2.89 cfs 0.650 af

Reach 36R: Outlet Pipe Avg. Flow Depth=0.87' Max Vel=3.07 fps Inflow=3.39 cfs 1.951 af
18.0" Round Pipe n=0.013 L=381.0' S=0.0024 '/' Capacity=5.11 cfs Outflow=3.28 cfs 1.951 af

Pond 20P: Pervious Pavement Front Parking Peak Elev=111.34' Storage=9,218 cf Inflow=7.11 cfs 0.535 af
Outflow=1.23 cfs 0.535 af

Pond 24P: Modified Depression Peak Elev=108.98' Storage=4,391 cf Inflow=7.45 cfs 1.165 af
Primary=5.13 cfs 1.165 af Secondary=0.00 cfs 0.000 af Outflow=5.13 cfs 1.165 af

Pond 28P: Pervious Pavement Right Parking Peak Elev=115.25' Storage=3,409 cf Inflow=1.55 cfs 0.115 af
Outflow=0.06 cfs 0.105 af

Pond 30P: Pervious Pavement Rear Trailer Peak Elev=113.20' Storage=3,738 cf Inflow=2.04 cfs 0.152 af
Outflow=0.13 cfs 0.151 af

Pond 34P: Pervious Pavement Loading Peak Elev=114.51' Storage=40,011 cf Inflow=18.09 cfs 1.483 af
Outflow=0.90 cfs 1.475 af

Pond 38P: Bioretention Peak Elev=114.38' Storage=17,126 cf Inflow=10.24 cfs 0.911 af
Primary=0.64 cfs 0.912 af Secondary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.912 af

Link 17L: PDA 1A Inflow=4.17 cfs 0.784 af
Primary=4.17 cfs 0.784 af

Link 23L: PDA 1C Inflow=6.25 cfs 0.630 af
Primary=6.25 cfs 0.630 af

Link 25L: PDA 1 Inflow=8.57 cfs 1.949 af
Primary=8.57 cfs 1.949 af

Link 39L: PDA 2A Treated Inflow=3.83 cfs 2.863 af
Primary=3.83 cfs 2.863 af

Link 42L: PDA 2A Remainder Inflow=1.98 cfs 0.519 af
Primary=1.98 cfs 0.519 af

Link 43L: PDA 2A Inflow=5.42 cfs 3.382 af
Primary=5.42 cfs 3.382 af

Link 46L: PDA 2B Inflow=13.23 cfs 2.743 af
Primary=13.23 cfs 2.743 af

Link 47L: PDA 2 Inflow=17.17 cfs 6.126 af
Primary=17.17 cfs 6.126 af

Total Runoff Area = 25.575 ac Runoff Volume = 8.094 af Average Runoff Depth = 3.80"
50.67% Pervious = 12.958 ac 49.33% Impervious = 12.617 ac

Summary for Subcatchment 15S: PDA 1A Perv.

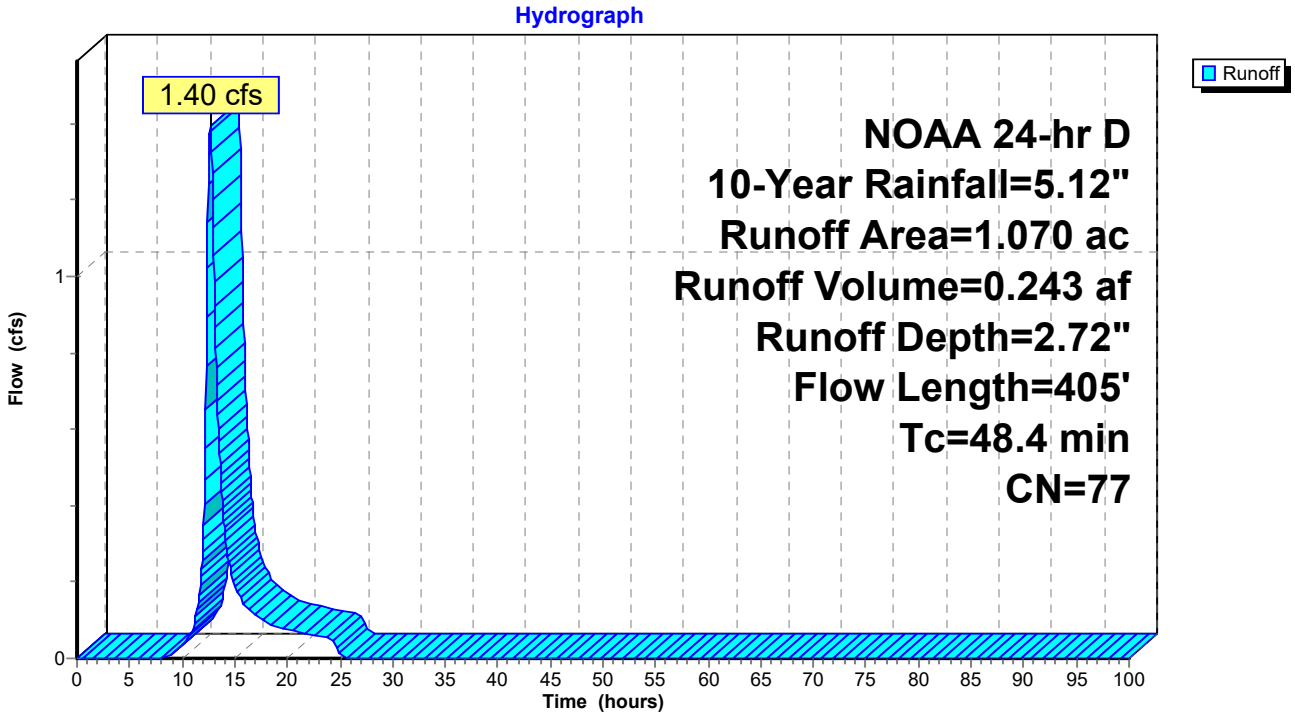
Runoff = 1.40 cfs @ 12.67 hrs, Volume= 0.243 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 15S: PDA 1A Perv.



Summary for Subcatchment 16S: PDA 1A Imperv.

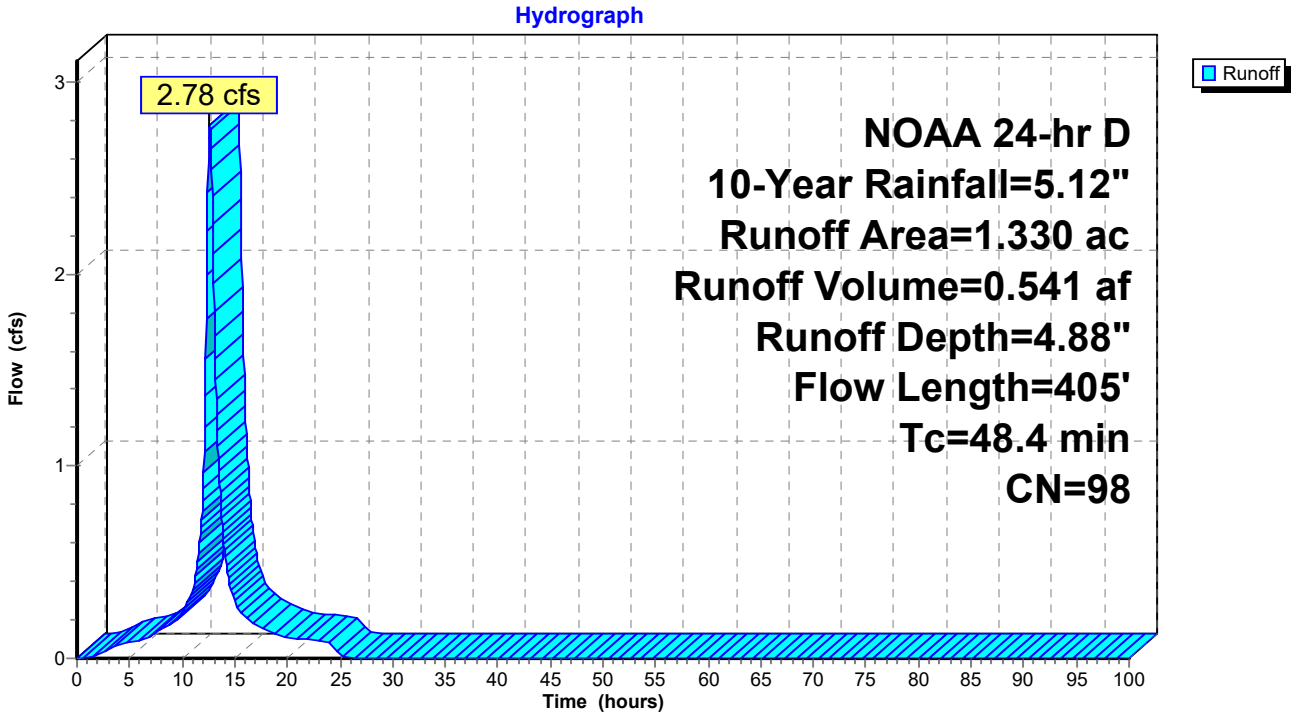
Runoff = 2.78 cfs @ 12.63 hrs, Volume= 0.541 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.330	98	Paved parking, HSG D
1.330		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 16S: PDA 1A Imperv.



Summary for Subcatchment 18S: PDA 1B Perv.

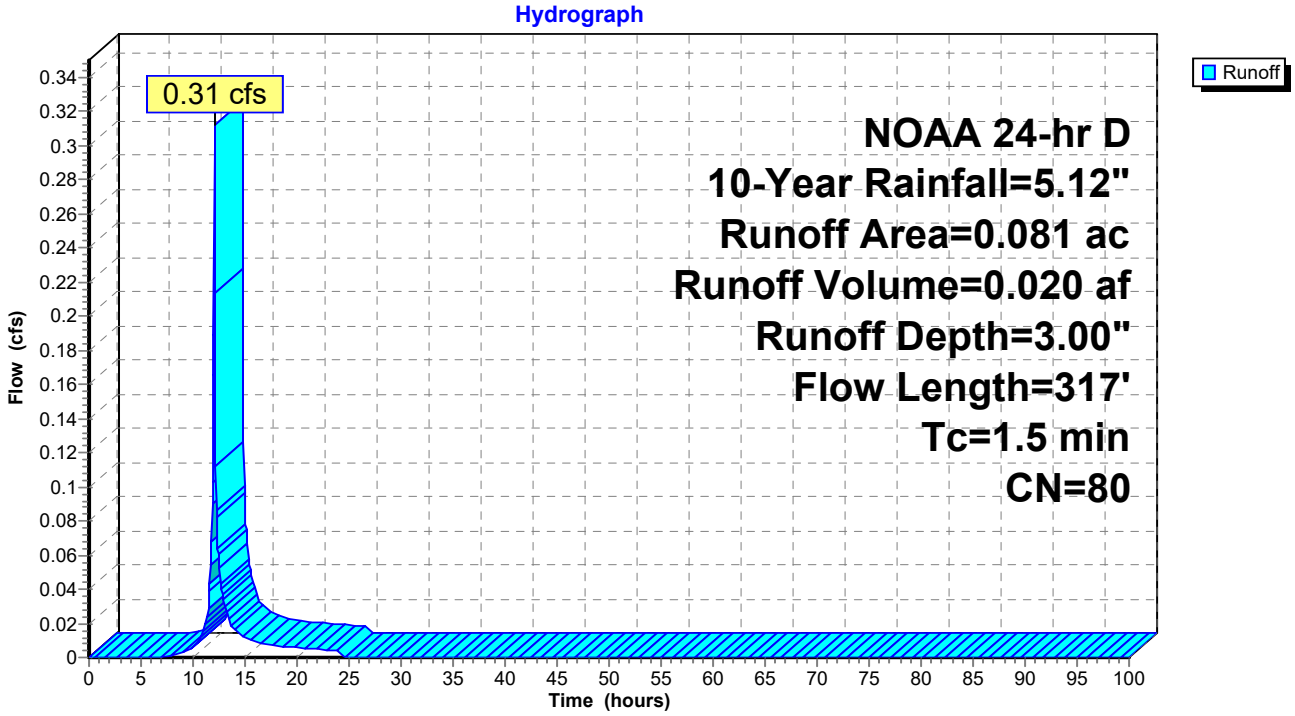
Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.020 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.081	80	>75% Grass cover, Good, HSG D
0.081	80	Weighted Average
0.081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.91		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	56	0.0750	5.56		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.1	15	0.0150	2.49		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	226	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.5	317	Total			

Subcatchment 18S: PDA 1B Perv.



Summary for Subcatchment 19S: PDA 1B Imperv.

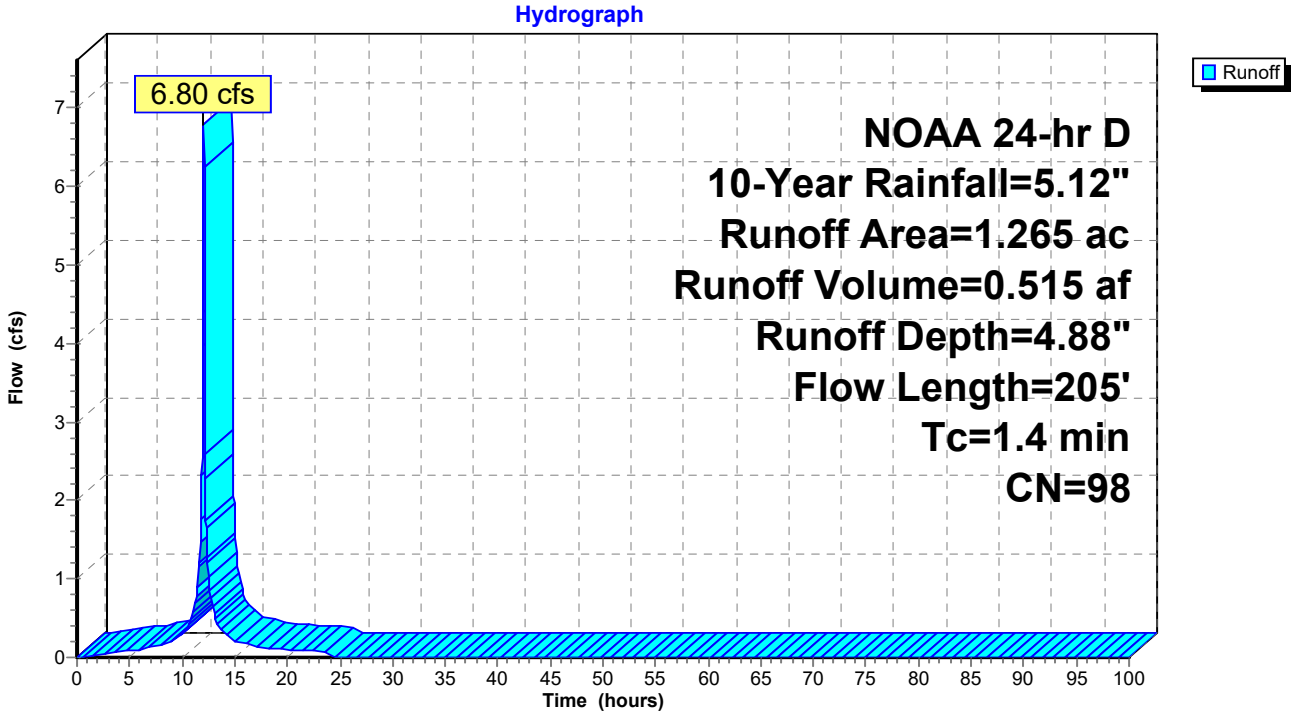
Runoff = 6.80 cfs @ 12.07 hrs, Volume= 0.515 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.265	98	Paved parking, HSG D
1.265		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	9	0.0150	0.77		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.4	50	0.0750	2.08		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
0.4	41	0.0500	1.70		**Sheet Flow, C-D** Smooth surfaces n= 0.011 P2= 3.34"
0.4	105	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.4	205	Total			

Subcatchment 19S: PDA 1B Imperv.



Summary for Subcatchment 21S: PDA 1C Perv.

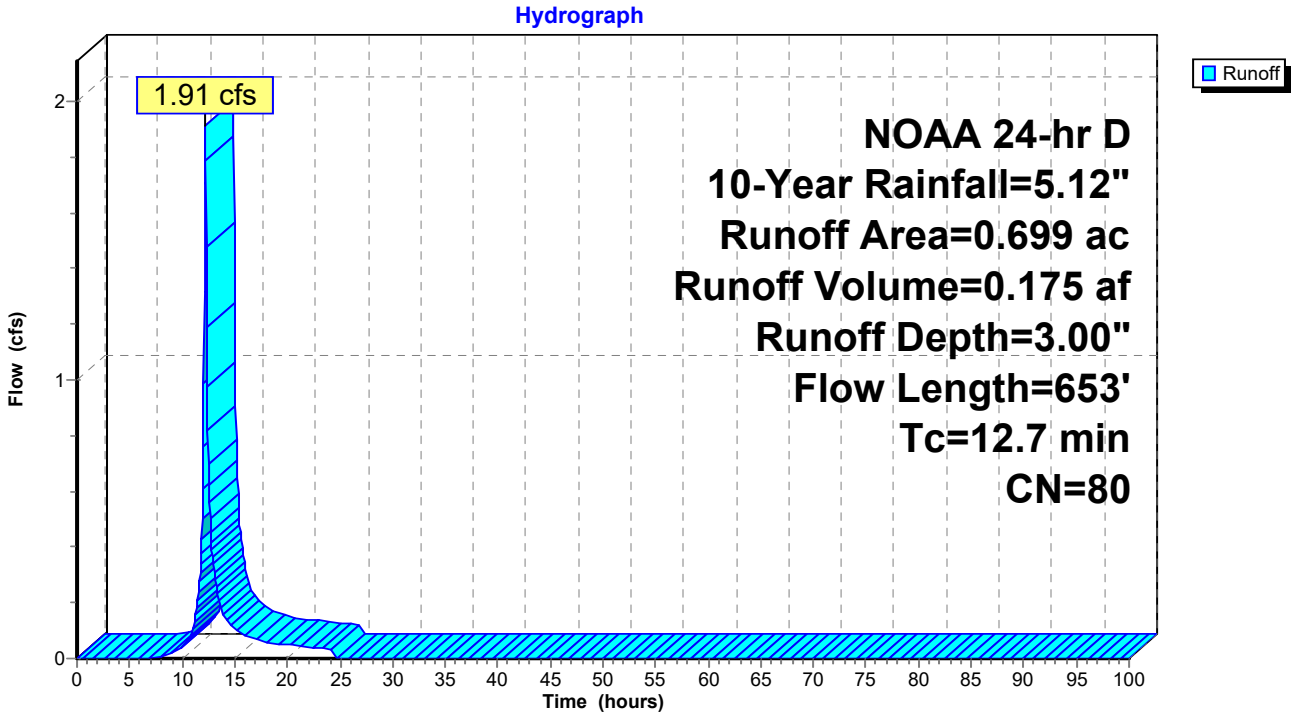
Runoff = 1.91 cfs @ 12.21 hrs, Volume= 0.175 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.093	77	Woods, Good, HSG D
0.606	80	>75% Grass cover, Good, HSG D
0.699	80	Weighted Average
0.699		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 21S: PDA 1C Perv.



Summary for Subcatchment 22S: PDA 1C Imperv.

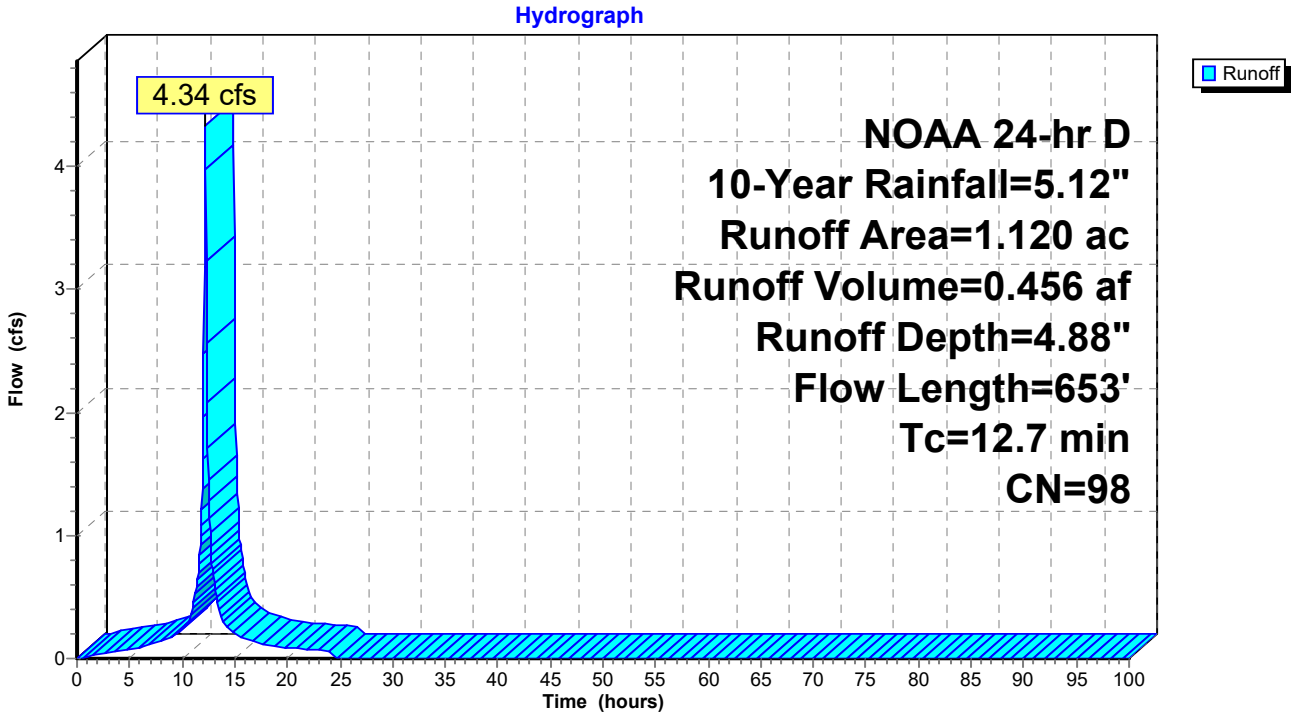
Runoff = 4.34 cfs @ 12.20 hrs, Volume= 0.456 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.120	98	Paved parking, HSG D
1.120		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 22S: PDA 1C Imperv.



Summary for Subcatchment 26S: IDA 7 Perv

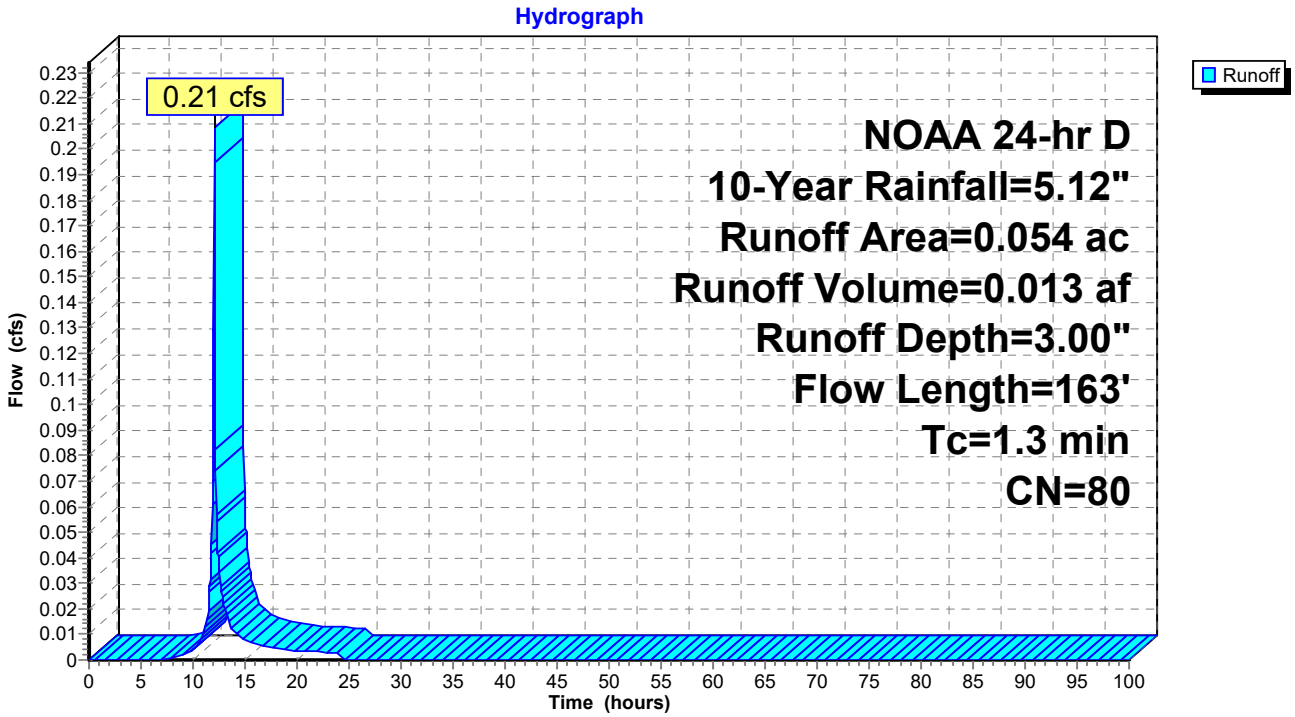
Runoff = 0.21 cfs @ 12.07 hrs, Volume= 0.013 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.054	80	>75% Grass cover, Good, HSG D
0.000	74	>75% Grass cover, Good, HSG C
0.054	80	Weighted Average
0.054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 26S: IDA 7 Perv



Summary for Subcatchment 27S: IDA 7 Imp.

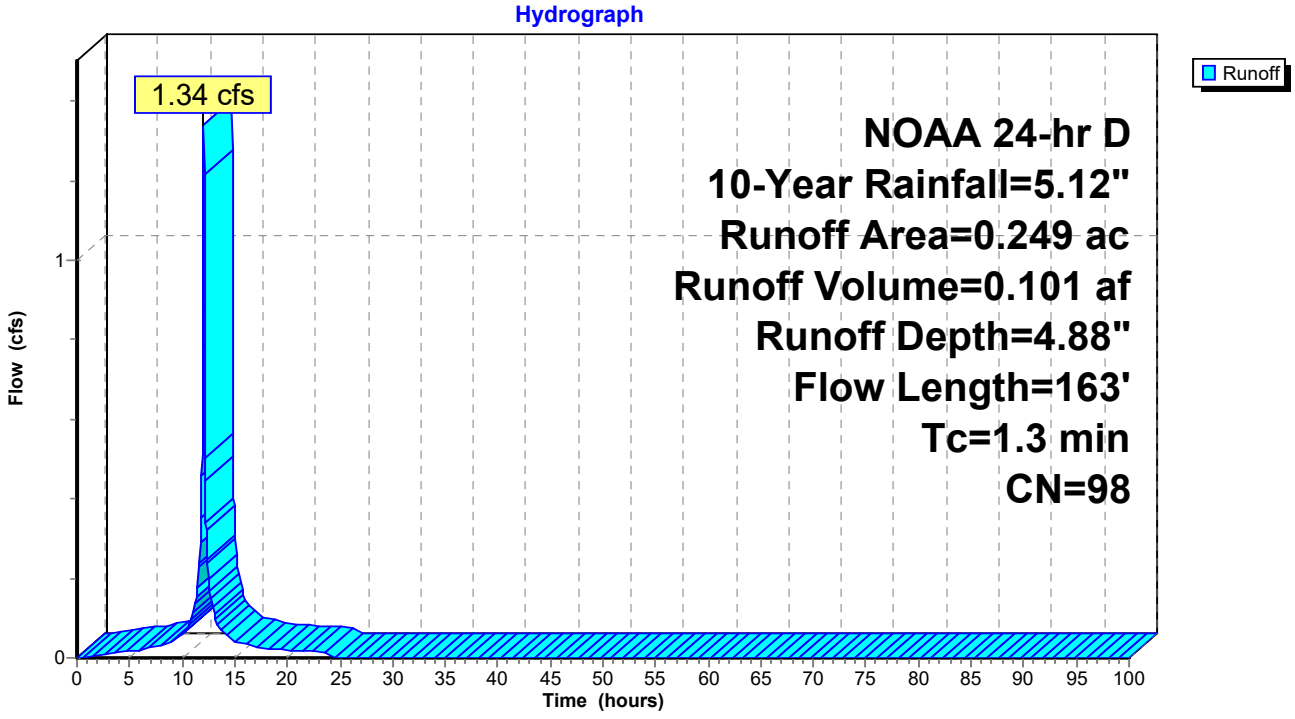
Runoff = 1.34 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.249	98	Paved parking, HSG D
0.249		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 27S: IDA 7 Imp.



Summary for Subcatchment 29S: IDA 6 Imp.

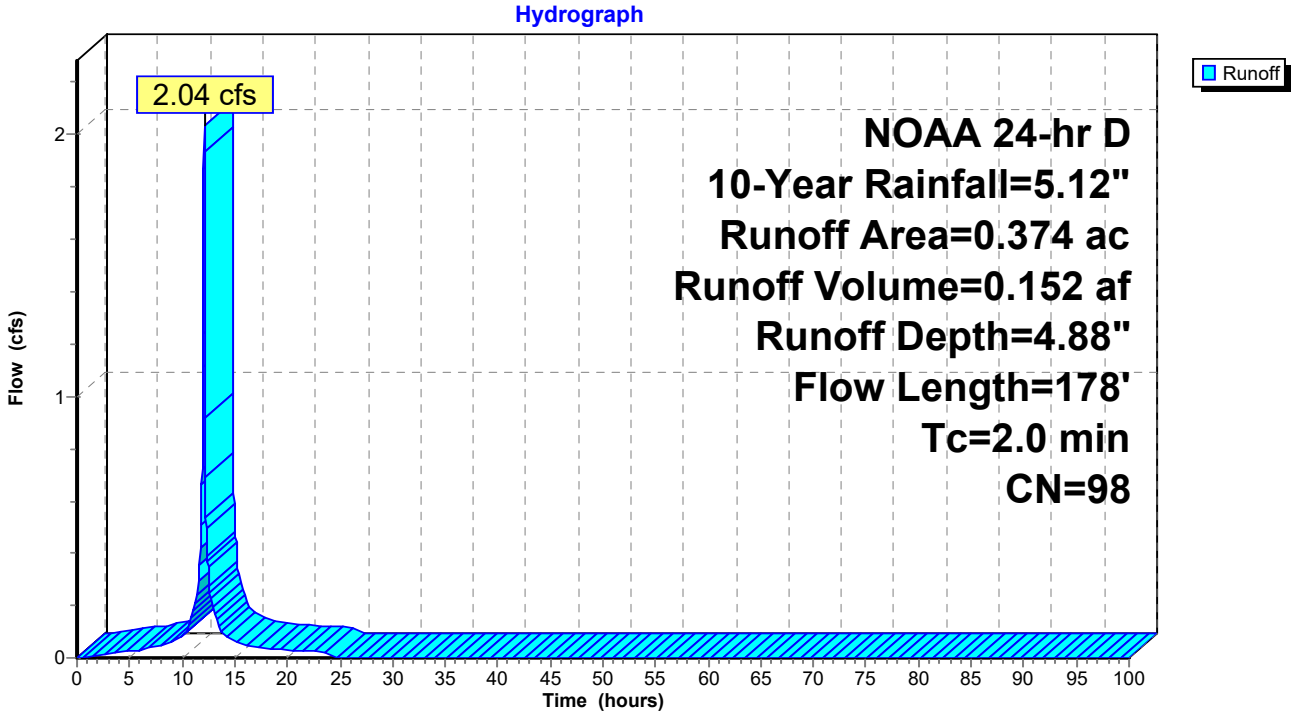
Runoff = 2.04 cfs @ 12.08 hrs, Volume= 0.152 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.374	98	Paved parking, HSG D
0.374		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	48	0.0290	3.46		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	30	0.0075	2.13	0.21	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
2.0	178	Total			

Subcatchment 29S: IDA 6 Imp.



Summary for Subcatchment 31S: IDA 5 Perv

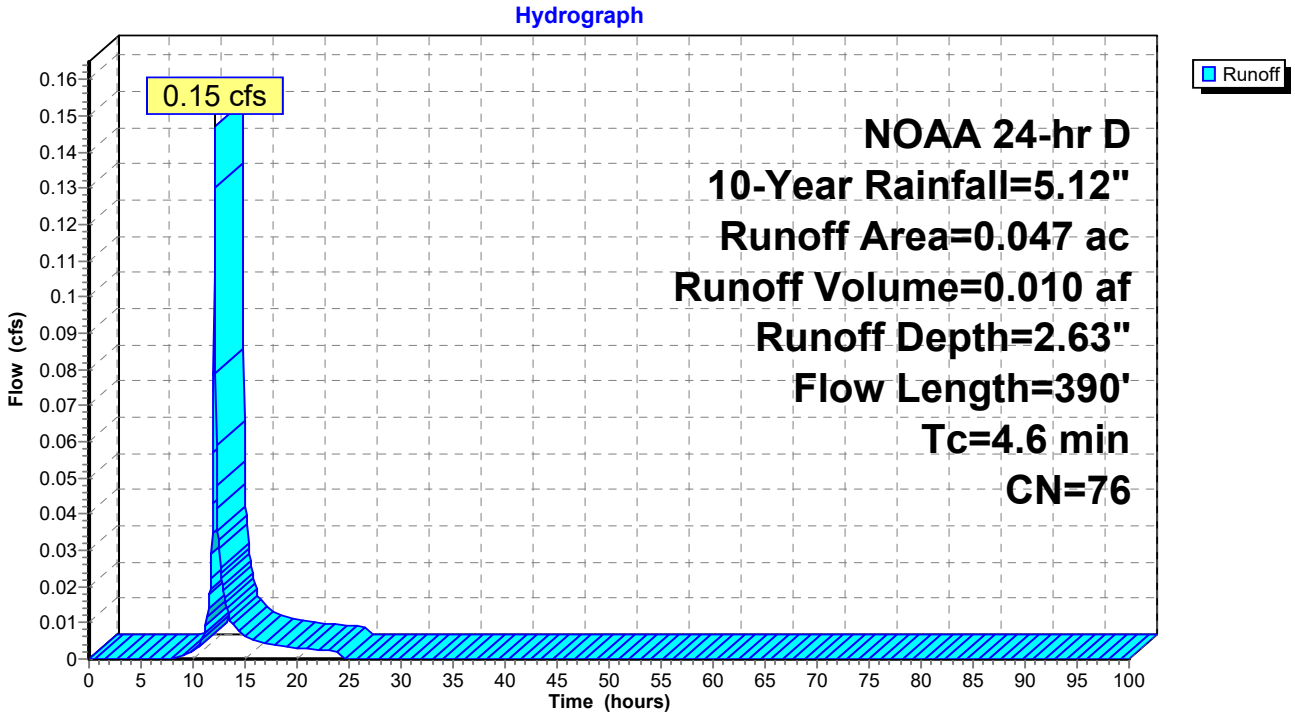
Runoff = 0.15 cfs @ 12.11 hrs, Volume= 0.010 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.014	80	>75% Grass cover, Good, HSG D
0.033	74	>75% Grass cover, Good, HSG C
0.047	76	Weighted Average
0.047		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 31S: IDA 5 Perv



Summary for Subcatchment 32S: IDA 5 Imp.

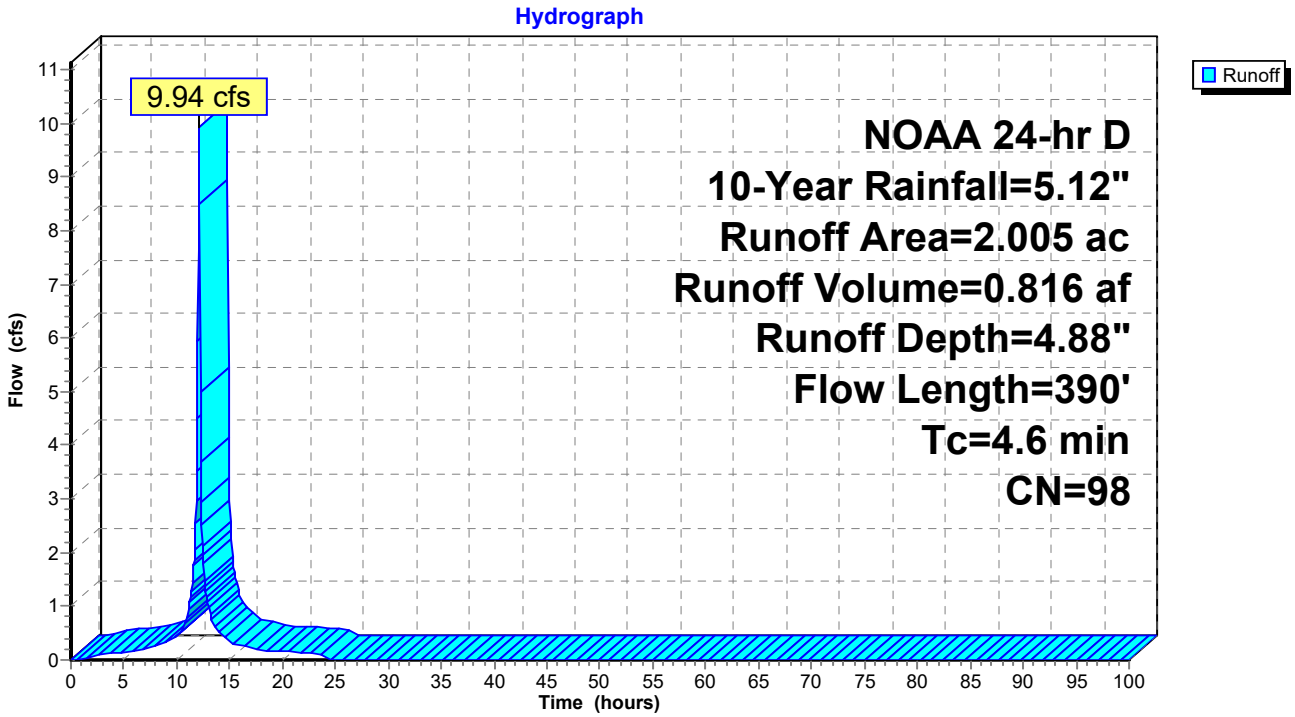
Runoff = 9.94 cfs @ 12.11 hrs, Volume= 0.816 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
2.005	98	Paved parking, HSG D
2.005		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 32S: IDA 5 Imp.



Summary for Subcatchment 33S: Building to Perv. Pavement

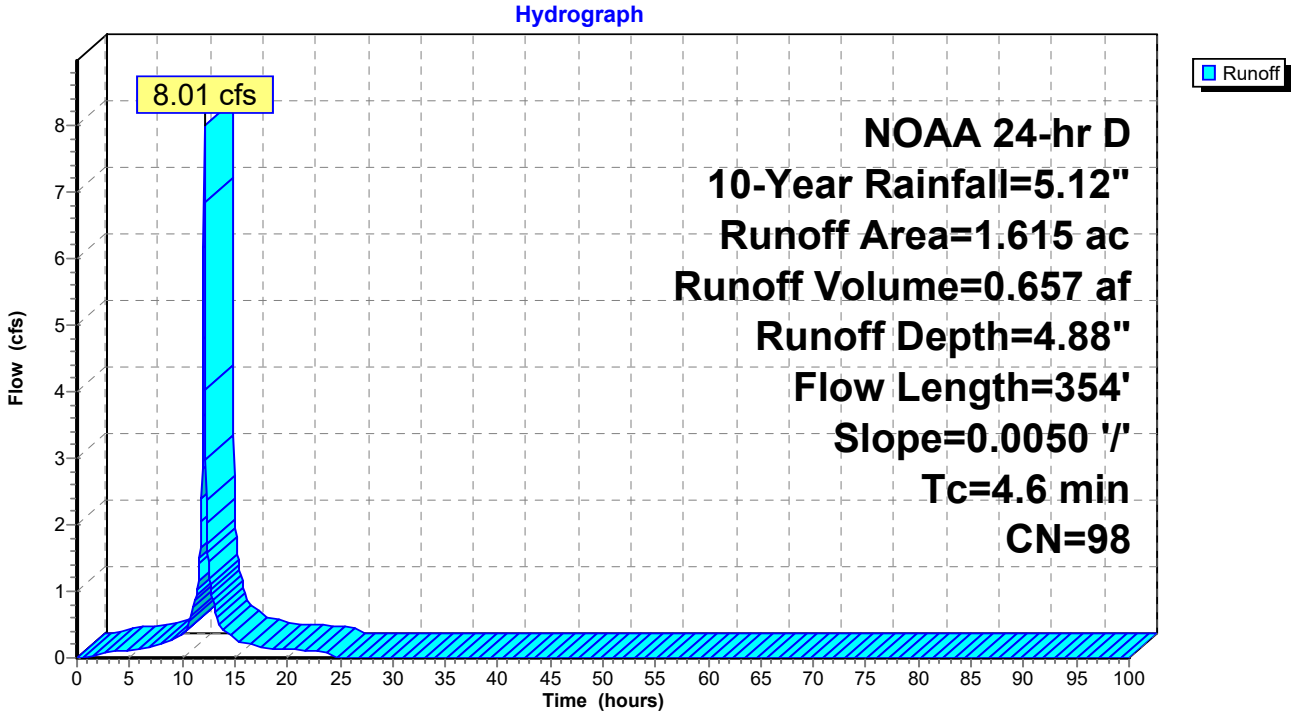
Runoff = 8.01 cfs @ 12.11 hrs, Volume= 0.657 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.615	98	Paved parking, HSG D
1.615		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
2.1	179	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	75	0.0050	3.21	2.52	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
4.6	354	Total			

Subcatchment 33S: Building to Perv. Pavement



Summary for Subcatchment 35S: Building Bypass

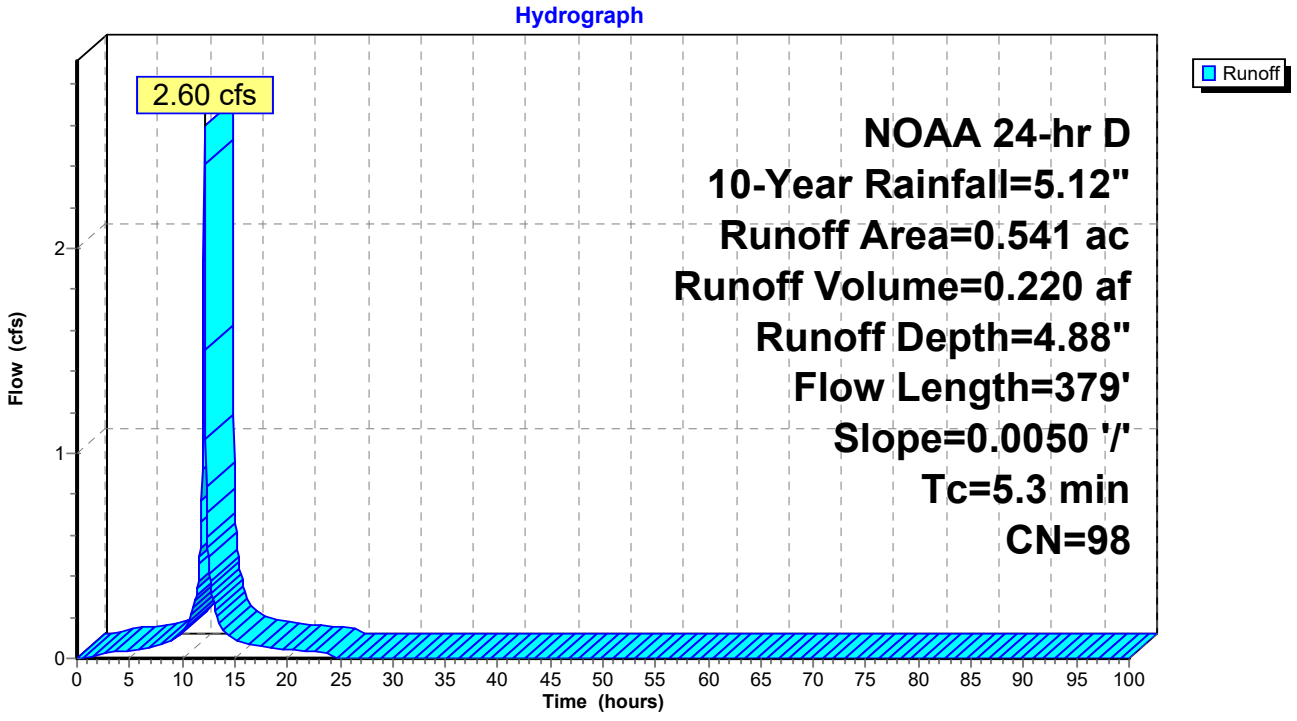
Runoff = 2.60 cfs @ 12.11 hrs, Volume= 0.220 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.541	98	Paved parking, HSG D
0.541		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= 3.34"
3.2	279	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.3	379	Total			

Subcatchment 35S: Building Bypass



Summary for Subcatchment 37S: Building to Bioretention

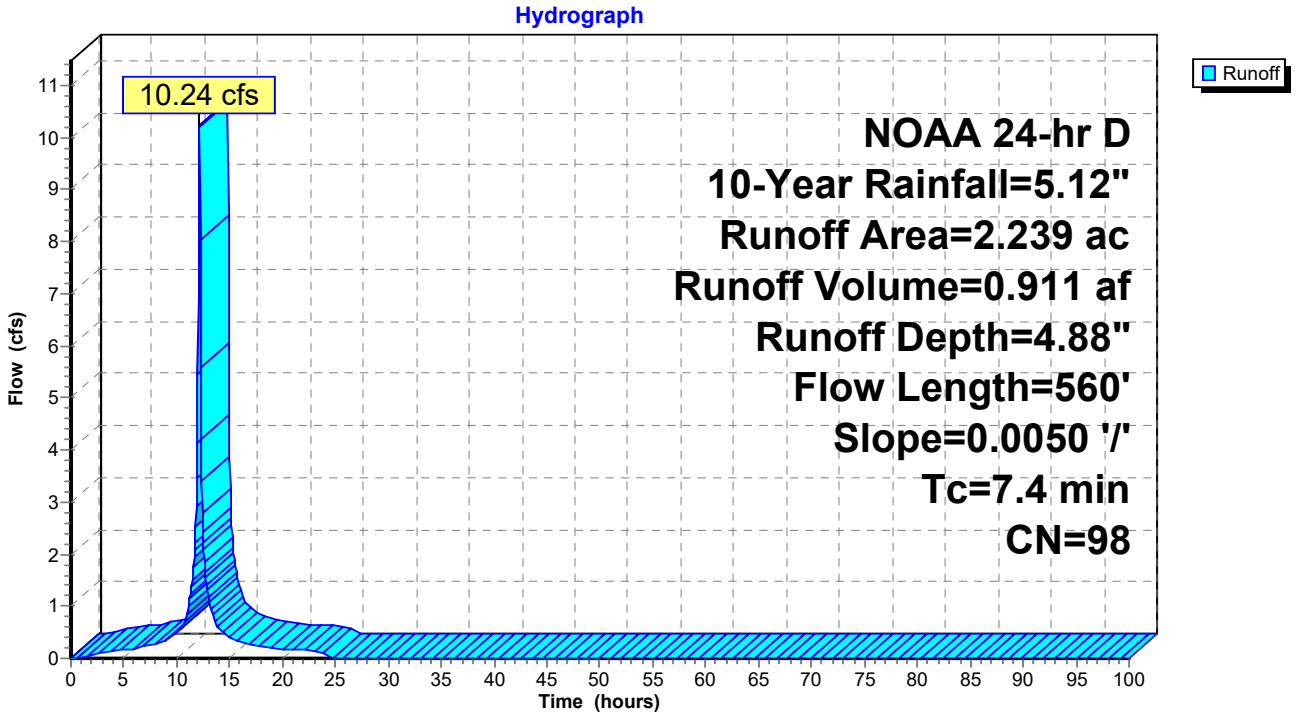
Runoff = 10.24 cfs @ 12.14 hrs, Volume= 0.911 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
2.239	98	Paved parking, HSG D
2.239		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
5.3	460	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
7.4	560	Total			

Subcatchment 37S: Building to Bioretention



Summary for Subcatchment 40S: PDA 2A Remain Perv.

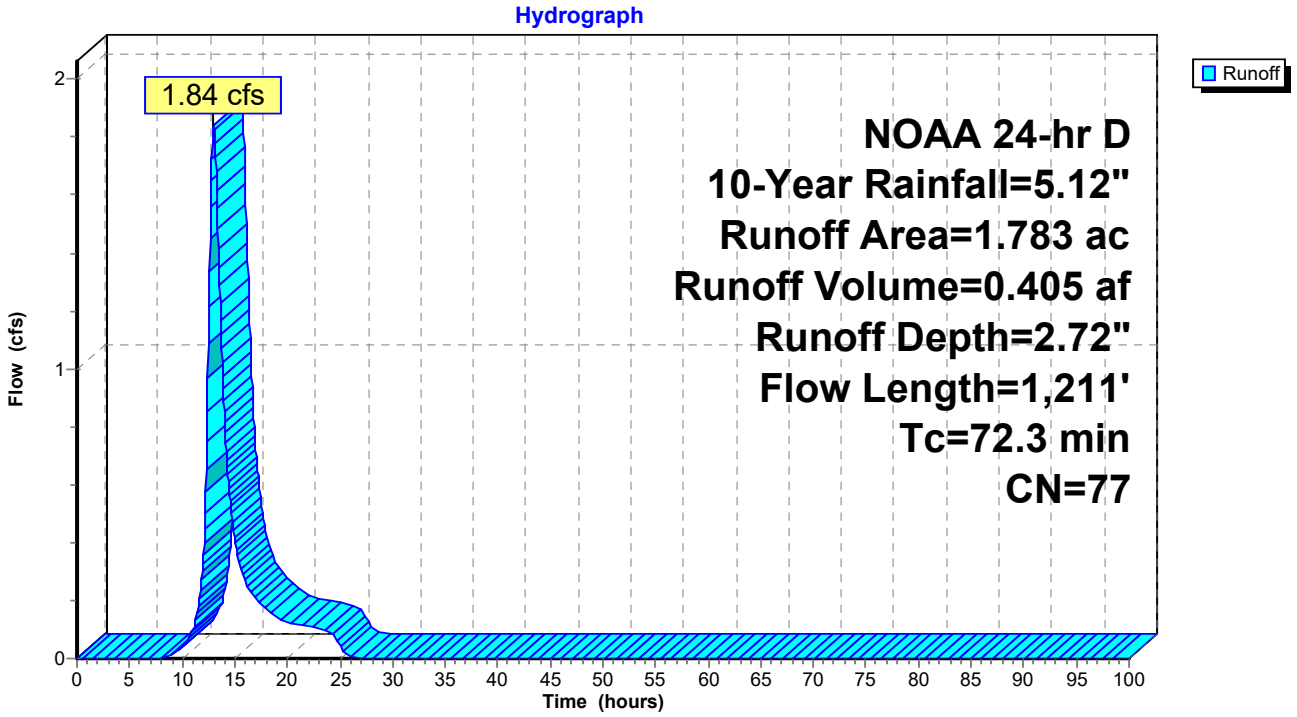
Runoff = 1.84 cfs @ 12.98 hrs, Volume= 0.405 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.109	70	Woods, Good, HSG C
1.103	80	>75% Grass cover, Good, HSG D
0.571	74	>75% Grass cover, Good, HSG C
1.783	77	Weighted Average
1.783		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 40S: PDA 2A Remain Perv.



Summary for Subcatchment 41S: PDA 2A Remain Imp.

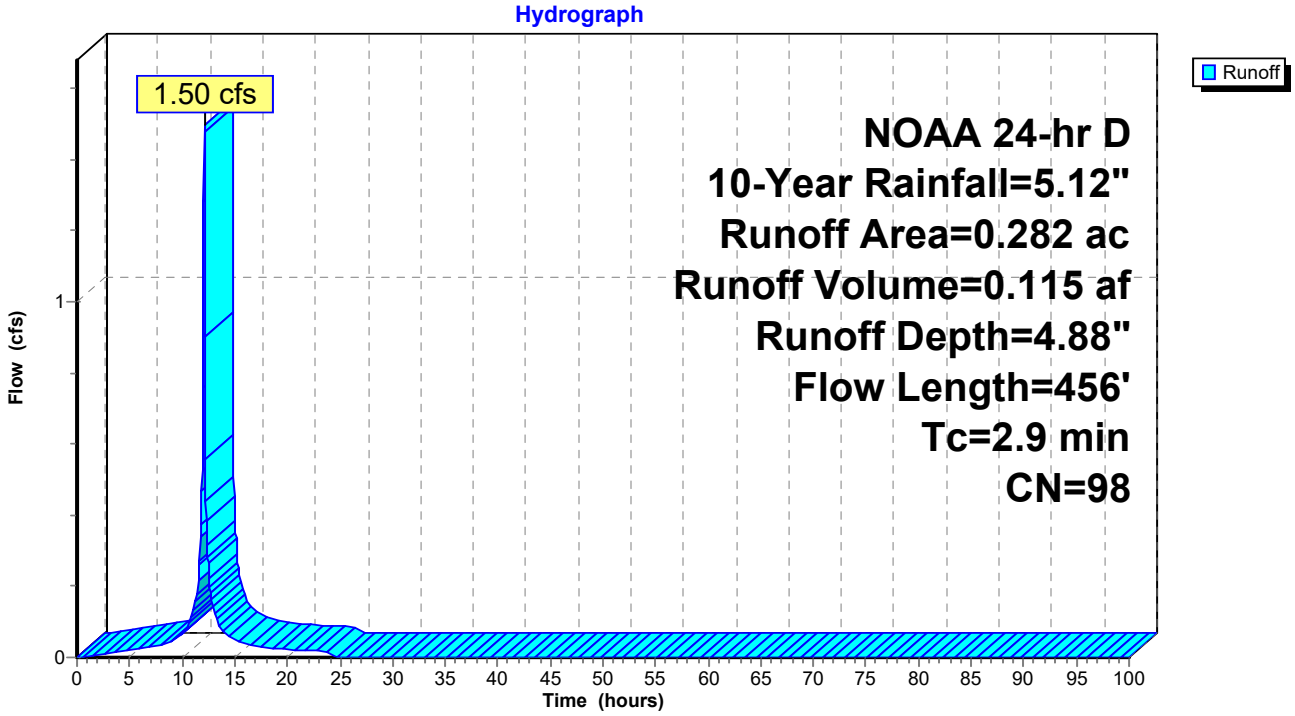
Runoff = 1.50 cfs @ 12.09 hrs, Volume= 0.115 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
0.282		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.97		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.5	202	0.0100	2.18	0.22	**Channel Flow, B-C** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.013 Asphalt, smooth
1.1	238	0.0050	3.72	4.57	**Pipe Channel, C-D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.9	456	Total			

Subcatchment 41S: PDA 2A Remain Imp.



Summary for Subcatchment 44S: PDA 2B Perv.

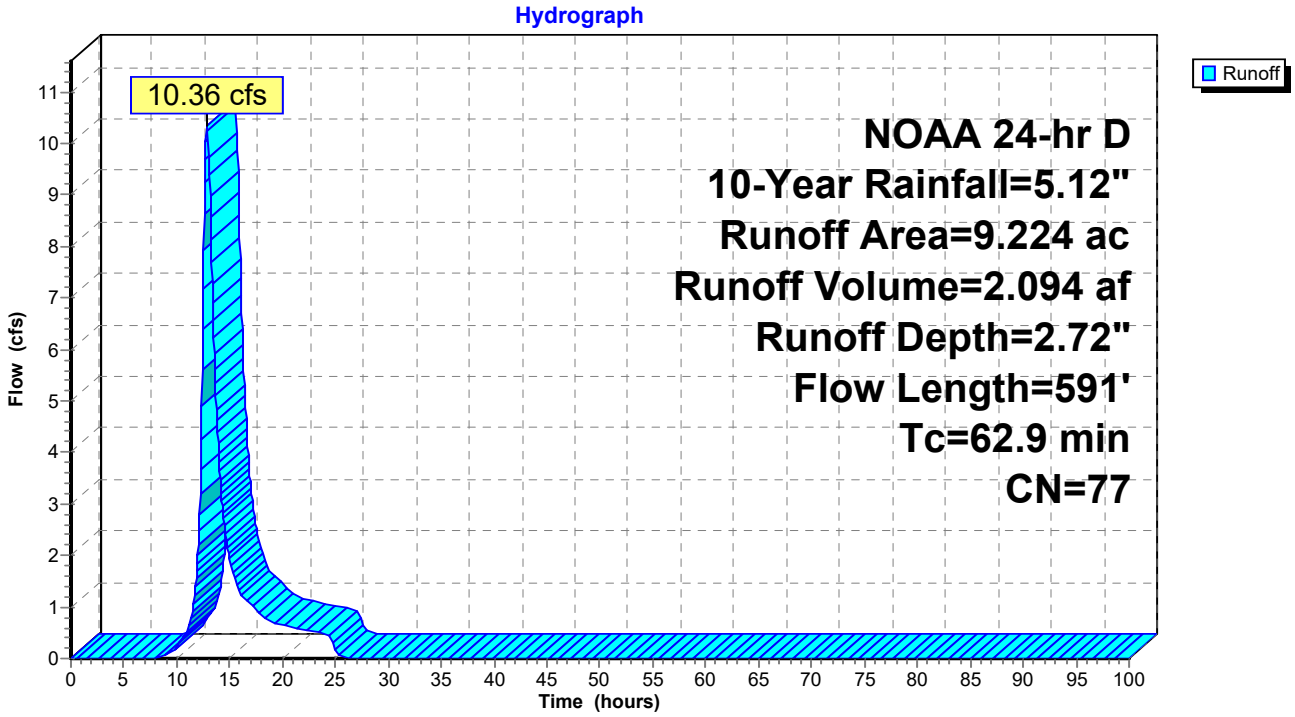
Runoff = 10.36 cfs @ 12.87 hrs, Volume= 2.094 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 44S: PDA 2B Perv.



Summary for Subcatchment 45S: PDA 2B Imperv.

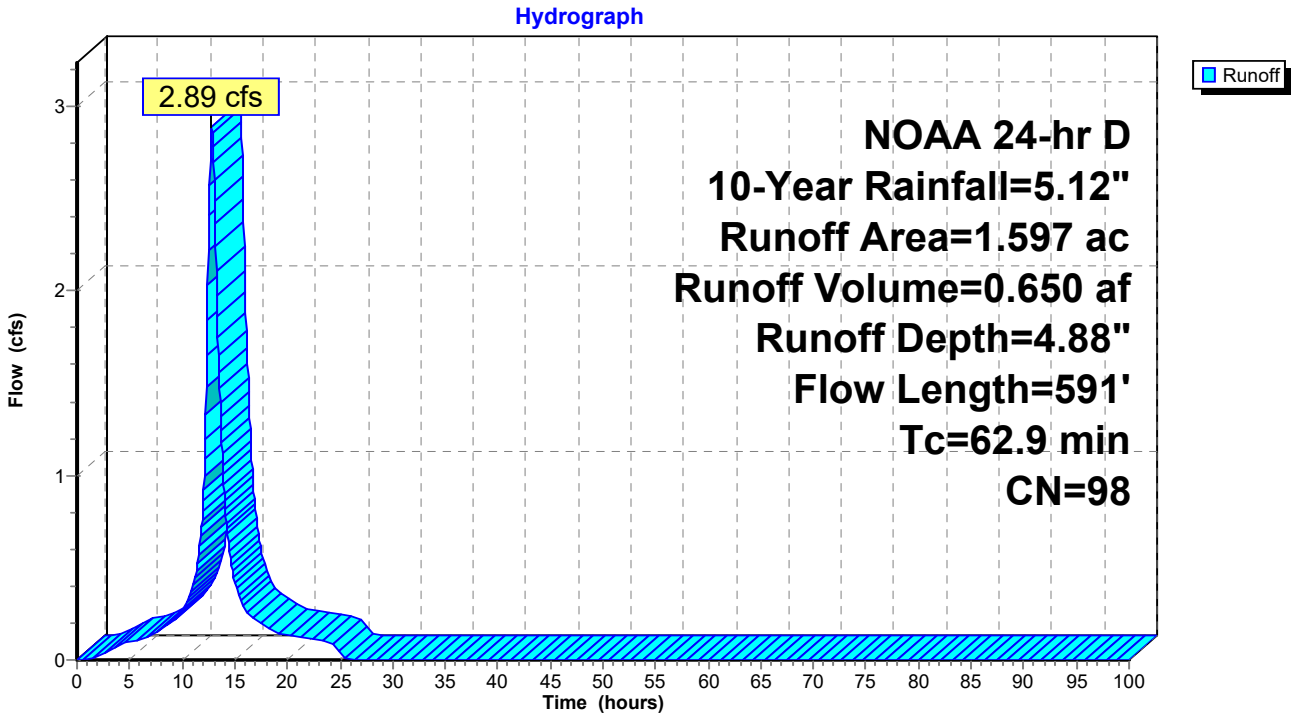
Runoff = 2.89 cfs @ 12.81 hrs, Volume= 0.650 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 10-Year Rainfall=5.12"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 45S: PDA 2B Imperv.



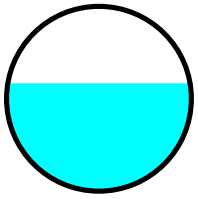
Summary for Reach 36R: Outlet Pipe

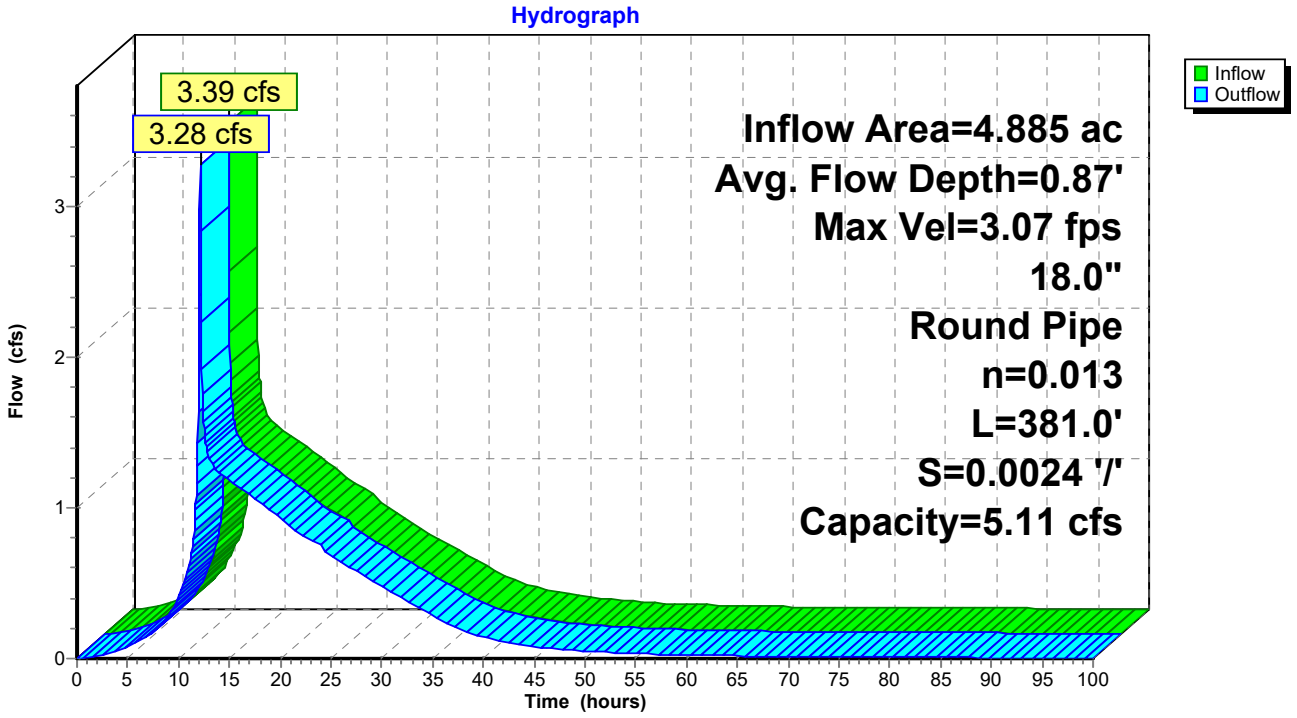
Inflow Area = 4.885 ac, 97.93% Impervious, Inflow Depth > 4.79" for 10-Year event
Inflow = 3.39 cfs @ 12.12 hrs, Volume= 1.951 af
Outflow = 3.28 cfs @ 12.15 hrs, Volume= 1.951 af, Atten= 3%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.07 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.10 fps, Avg. Travel Time= 5.8 min

Peak Storage= 407 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.87'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.11 cfs

18.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 381.0' Slope= 0.0024 '/'
Inlet Invert= 110.60', Outlet Invert= 109.70'





Summary for Pond 20P: Pervious Pavement Front Parking Lot OCS 4

Inflow Area = 1.346 ac, 93.98% Impervious, Inflow Depth = 4.77" for 10-Year event
Inflow = 7.11 cfs @ 12.07 hrs, Volume= 0.535 af
Outflow = 1.23 cfs @ 12.47 hrs, Volume= 0.535 af, Atten= 83%, Lag= 23.9 min
Primary = 1.23 cfs @ 12.47 hrs, Volume= 0.535 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 111.34' @ 12.47 hrs Surf.Area= 26,712 sf Storage= 9,218 cf

Plug-Flow detention time= 163.6 min calculated for 0.534 af (100% of inflow)
Center-of-Mass det. time= 165.0 min (912.7 - 747.7)

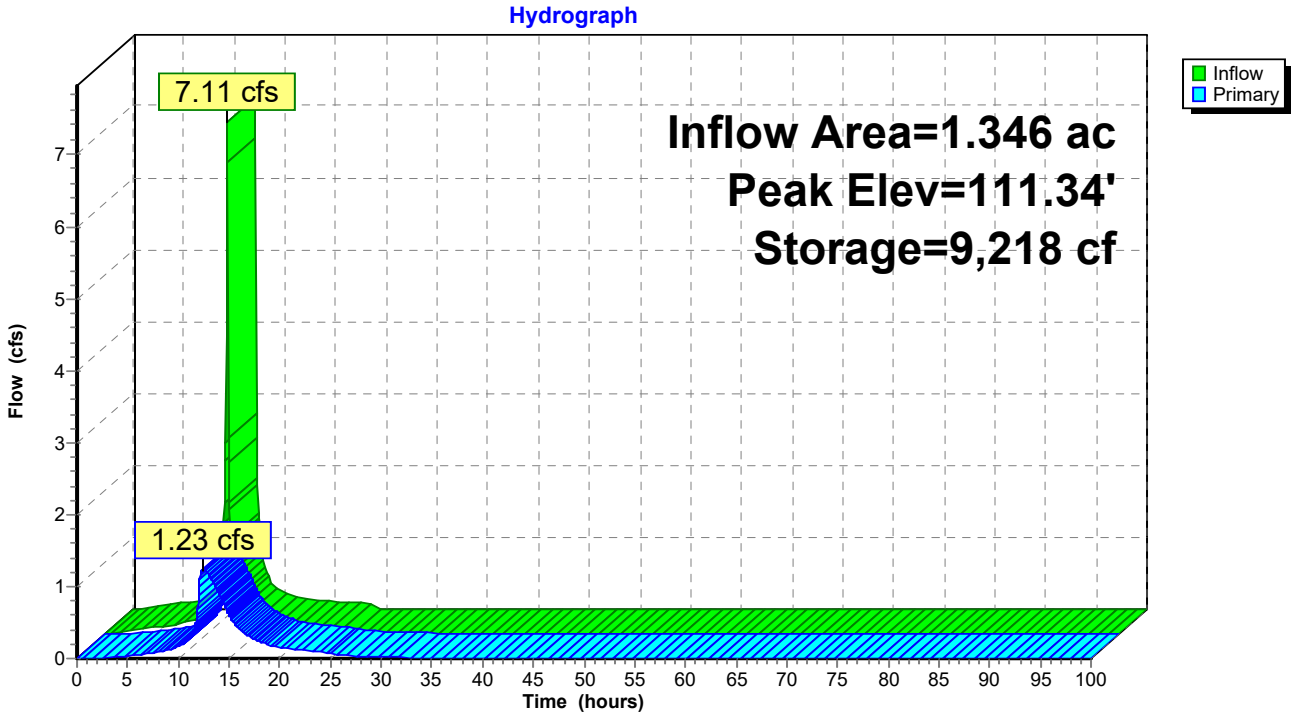
Volume	Invert	Avail.Storage	Storage Description
#1	110.50'	20,272 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 51,821 cf Overall - 1,140 cf Embedded = 50,681 cf x 40.0% Voids
#2	110.75'	425 cf	**15.0" Round Pipe Storage** Inside #1 L= 346.0' S= 0.0010 '/'
#3	110.76'	463 cf	**15.0" Round Pipe Storage** Inside #1 L= 377.0' S= 0.0010 '/'
#4	110.95'	189 cf	**15.0" Round Pipe Storage** Inside #1 L= 154.0' S= 0.0010 '/'
#5	110.81'	64 cf	**15.0" Round Pipe Storage** Inside #1 L= 52.0' S= 0.0010 '/'
		21,413 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.50	26,712	0	0
112.44	26,712	51,821	51,821

Device	Routing	Invert	Outlet Devices
#1	Primary	108.22'	**15.0" Round Culvert** L= 11.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 108.22' / 108.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	110.50'	**8.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	111.21'	**6.0" Vert. Orifice/Grate X 0.00** C= 0.600

Primary OutFlow Max=1.23 cfs @ 12.47 hrs HW=111.34' TW=108.90' (Dynamic Tailwater)
- **1=Culvert** (Passes 1.23 cfs of 8.15 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 1.23 cfs @ 3.69 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Pond 20P: Pervious Pavement Front Parking Lot OCS 4



Summary for Pond 24P: Modified Depression

Inflow Area = 3.165 ac, 75.36% Impervious, Inflow Depth = 4.42" for 10-Year event
Inflow = 7.45 cfs @ 12.20 hrs, Volume= 1.165 af
Outflow = 5.13 cfs @ 12.35 hrs, Volume= 1.165 af, Atten= 31%, Lag= 8.6 min
Primary = 5.13 cfs @ 12.35 hrs, Volume= 1.165 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 108.98' @ 12.35 hrs Surf.Area= 4,416 sf Storage= 4,391 cf

Plug-Flow detention time= 14.4 min calculated for 1.165 af (100% of inflow)
Center-of-Mass det. time= 14.4 min (853.9 - 839.5)

Volume	Invert	Avail.Storage	Storage Description
#1	107.60'	12,350 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

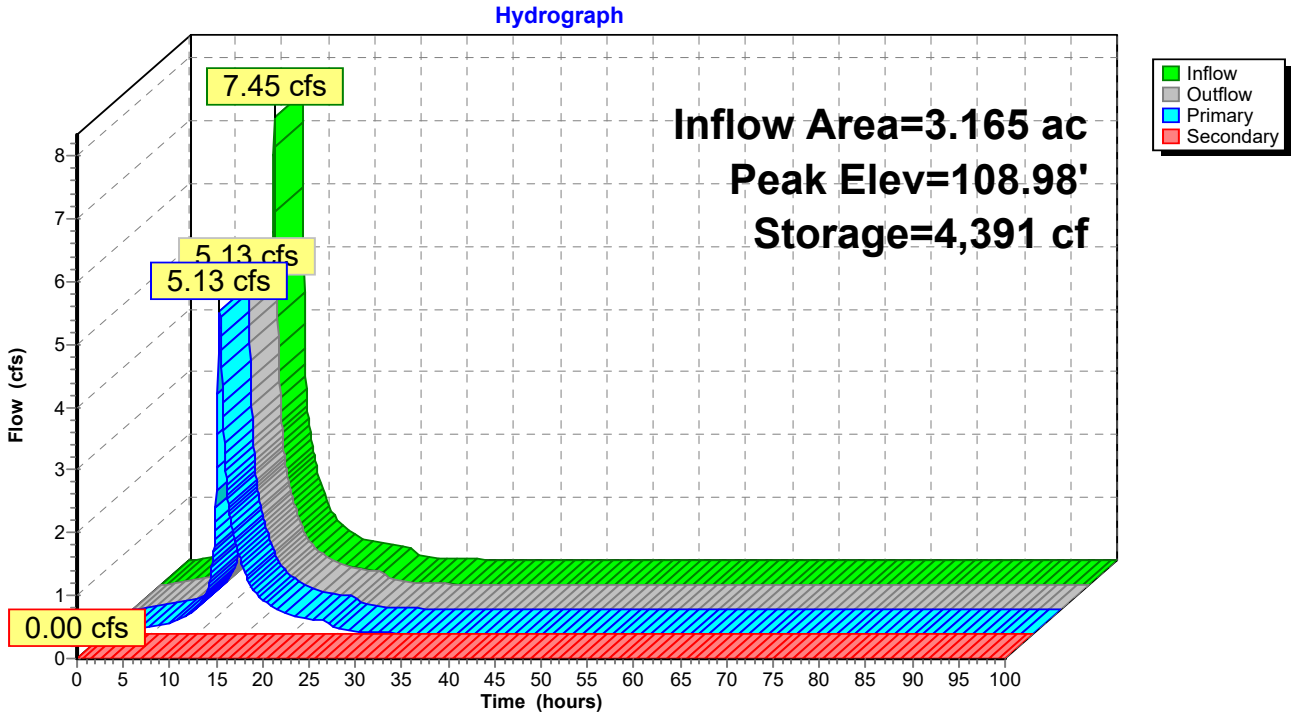
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.60	10	0	0
108.00	3,235	649	649
109.00	4,443	3,839	4,488
110.00	5,417	4,930	9,418
110.50	6,311	2,932	12,350

Device	Routing	Invert	Outlet Devices
#1	Primary	107.60'	**15.0" Round Culvert** L= 81.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.60' / 107.00' S= 0.0074 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Secondary	110.43'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.12 cfs @ 12.35 hrs HW=108.98' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 5.12 cfs @ 4.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 24P: Modified Depression



Summary for Pond 28P: Pervious Pavement Right Parking Area OCS 3

Inflow Area = 0.303 ac, 82.18% Impervious, Inflow Depth = 4.55" for 10-Year event
Inflow = 1.55 cfs @ 12.07 hrs, Volume= 0.115 af
Outflow = 0.06 cfs @ 14.43 hrs, Volume= 0.105 af, Atten= 96%, Lag= 141.7 min
Primary = 0.06 cfs @ 14.43 hrs, Volume= 0.105 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.25' @ 14.43 hrs Surf.Area= 34,390 sf Storage= 3,409 cf

Plug-Flow detention time= 971.2 min calculated for 0.105 af (91% of inflow)
Center-of-Mass det. time= 923.9 min (1,677.9 - 754.0)

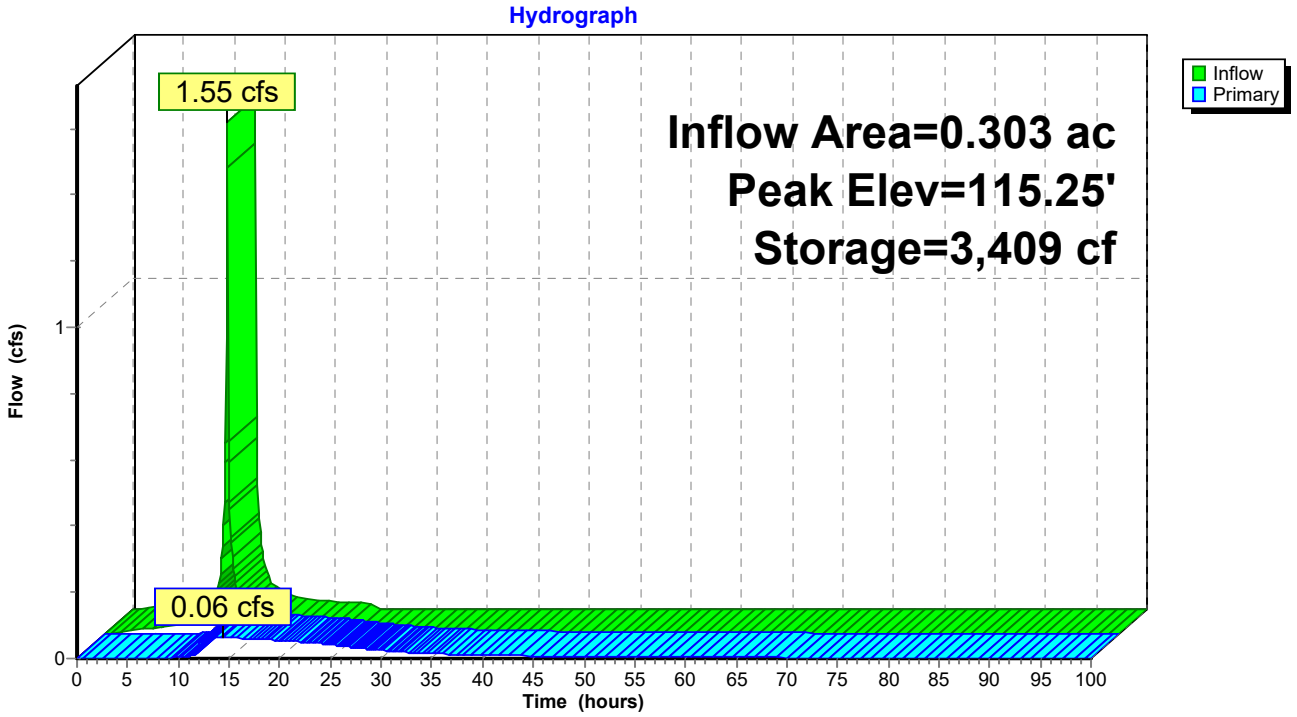
Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	39,440 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 99,043 cf Overall - 444 cf Embedded = 98,599 cf x 40.0% Voids
#2	115.25'	185 cf	**15.0" Round Pipe Storage** Inside #1 L= 151.0' S= 0.0010 '/'
#3	115.25'	259 cf	**15.0" Round Pipe Storage** Inside #1 L= 211.0' S= 0.0010 '/'
		39,884 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	34,390	0	0
117.88	34,390	99,043	99,043

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	**15.0" Round Culvert** L= 775.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 115.00' / 114.22' S= 0.0010 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	115.00'	**2.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.06 cfs @ 14.43 hrs HW=115.25' TW=111.10' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.06 cfs of 0.10 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.82 fps)

Pond 28P: Pervious Pavement Right Parking Area OCS 3



Summary for Pond 30P: Pervious Pavement Rear Trailer Area OCS 2

Inflow Area = 0.374 ac,100.00% Impervious, Inflow Depth = 4.88" for 10-Year event
Inflow = 2.04 cfs @ 12.08 hrs, Volume= 0.152 af
Outflow = 0.13 cfs @ 13.39 hrs, Volume= 0.151 af, Atten= 94%, Lag= 78.9 min
Primary = 0.13 cfs @ 13.39 hrs, Volume= 0.151 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.20' @ 13.39 hrs Surf.Area= 13,334 sf Storage= 3,738 cf

Plug-Flow detention time= 450.3 min calculated for 0.151 af (99% of inflow)
Center-of-Mass det. time= 447.0 min (1,192.1 - 745.2)

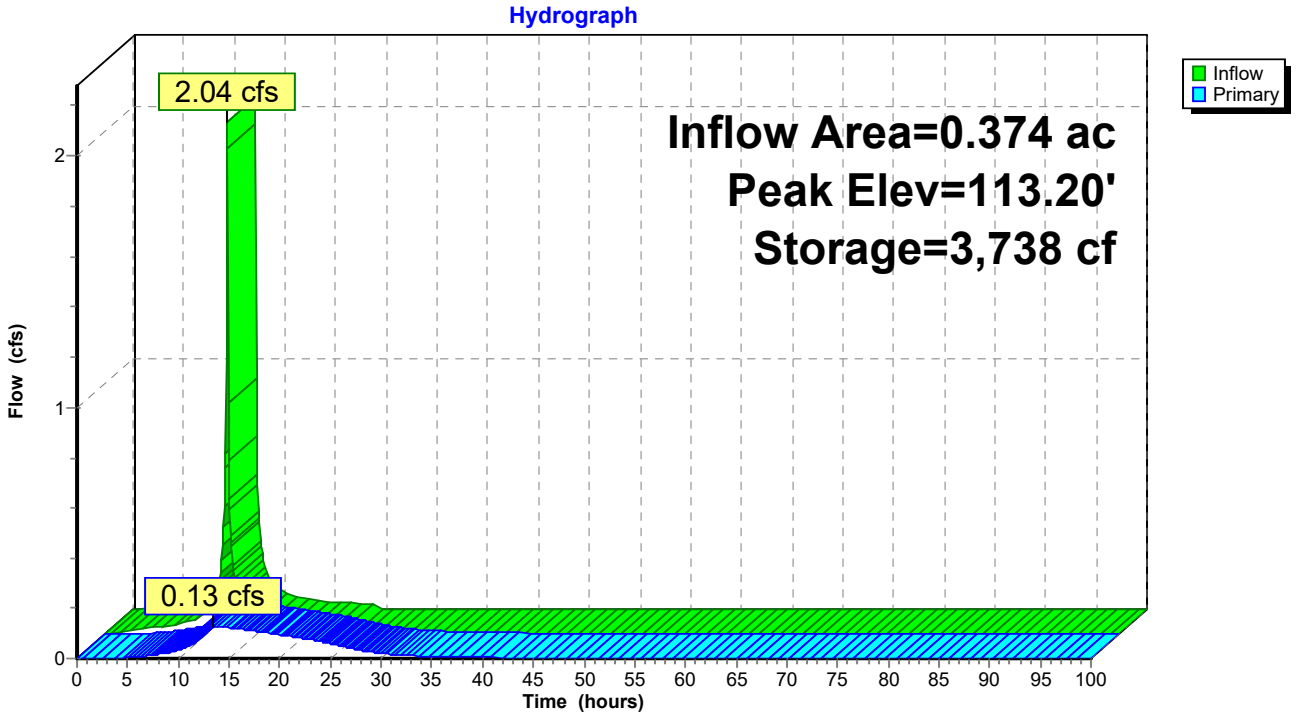
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	9,791 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 24,668 cf Overall - 191 cf Embedded = 24,476 cf x 40.0% Voids
#2	112.75'	191 cf	**15.0" Round Pipe Storage** Inside #1 L= 156.0' S= 0.0010 '/'
		9,982 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	13,334	0	0
114.35	13,334	24,668	24,668

Device	Routing	Invert	Outlet Devices
#1	Primary	110.67'	**15.0" Round Culvert** L= 36.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.67' / 110.63' S= 0.0011 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	112.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.75'	**0.5' long Sharp-Crested Rectangular Weir X 0.00** 2 End Contraction(s)

Primary OutFlow Max=0.13 cfs @ 13.39 hrs HW=113.20' TW=111.11' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.13 cfs of 7.09 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 3.70 fps)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: Pervious Pavement Rear Trailer Area OCS 2



Summary for Pond 34P: Pervious Pavement Loading Area OCS 1

Inflow Area = 3.667 ac, 98.72% Impervious, Inflow Depth = 4.85" for 10-Year event
Inflow = 18.09 cfs @ 12.11 hrs, Volume= 1.483 af
Outflow = 0.90 cfs @ 14.04 hrs, Volume= 1.475 af, Atten= 95%, Lag= 116.3 min
Primary = 0.90 cfs @ 14.04 hrs, Volume= 1.475 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 114.51' @ 14.04 hrs Surf.Area= 48,644 sf Storage= 40,011 cf

Plug-Flow detention time= 675.4 min calculated for 1.474 af (99% of inflow)
Center-of-Mass det. time= 673.3 min (1,421.5 - 748.2)

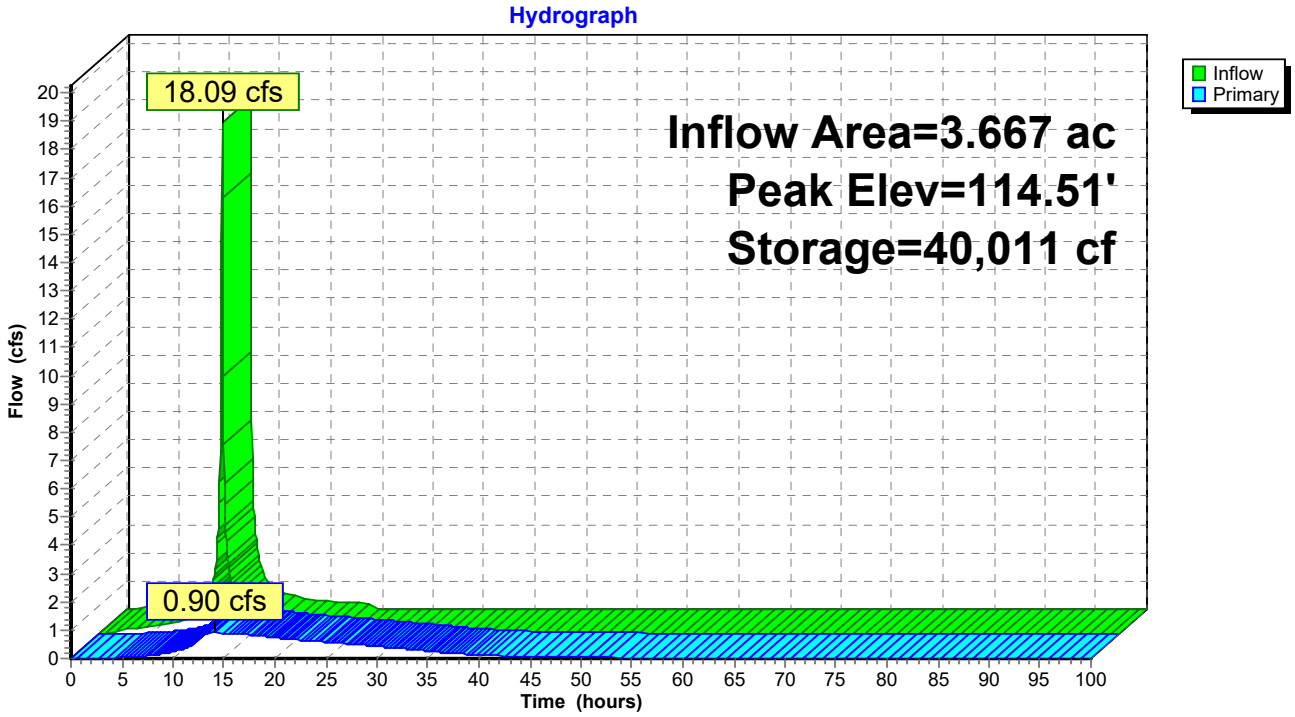
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	58,387 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 147,391 cf Overall - 1,424 cf Embedded = 145,968 cf x 40.0% Voids
#2	112.75'	668 cf	**15.0" Round Pipe Storage** Inside #1 L= 544.0' S= 0.0010 '/'
#3	112.75'	627 cf	**15.0" Round Pipe Storage** Inside #1 L= 511.0' S= 0.0010 '/'
#4	112.75'	129 cf	**15.0" Round Pipe Storage** Inside #1 L= 105.0' S= 0.0100 '/'
		59,811 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	48,644	0	0
115.53	48,644	147,391	147,391

Device	Routing	Invert	Outlet Devices
#1	Primary	110.61'	**18.0" Round Culvert** L= 1.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.61' / 110.61' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	112.50'	**3.5" W x 5.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.90'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.65'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.90 cfs @ 14.04 hrs HW=114.51' TW=111.10' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.90 cfs of 13.33 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.79 cfs @ 6.46 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 3.43 fps)
  - **4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 34P: Pervious Pavement Loading Area OCS 1



Summary for Pond 38P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 4.88" for 10-Year event
Inflow = 10.24 cfs @ 12.14 hrs, Volume= 0.911 af
Outflow = 0.64 cfs @ 13.67 hrs, Volume= 0.912 af, Atten= 94%, Lag= 91.9 min
Primary = 0.64 cfs @ 13.67 hrs, Volume= 0.912 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 114.38' @ 13.67 hrs Surf.Area= 10,303 sf Storage= 17,126 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 235.8 min (985.9 - 750.2)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	841 cf	**18.0" Round Pipe Storage**-Impervious L= 476.0' S= 0.0030 '/'
		34,324 cf	Total Available Storage

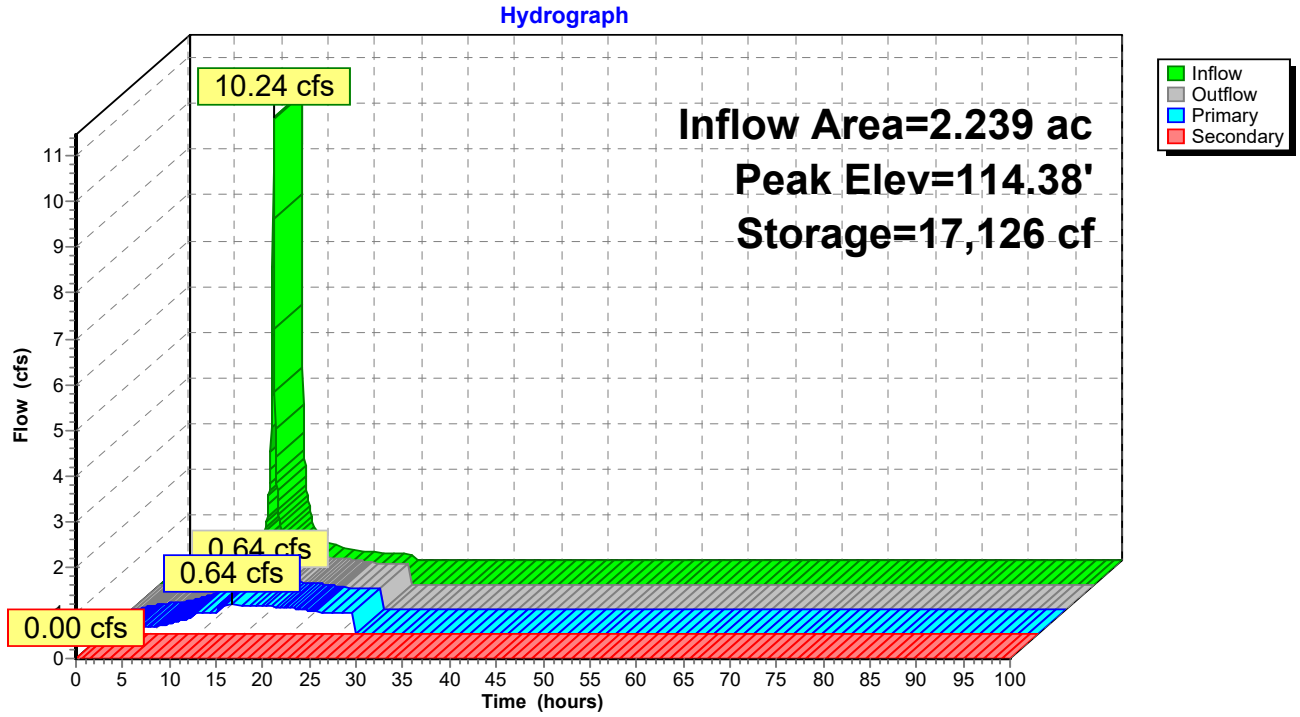
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.03'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.64 cfs @ 13.67 hrs HW=114.38' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.64 cfs of 14.24 cfs potential flow)
  ├─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)
  ├─**3=Orifice/Grate** (Orifice Controls 0.16 cfs @ 4.67 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=112.75' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 38P: Bioretention

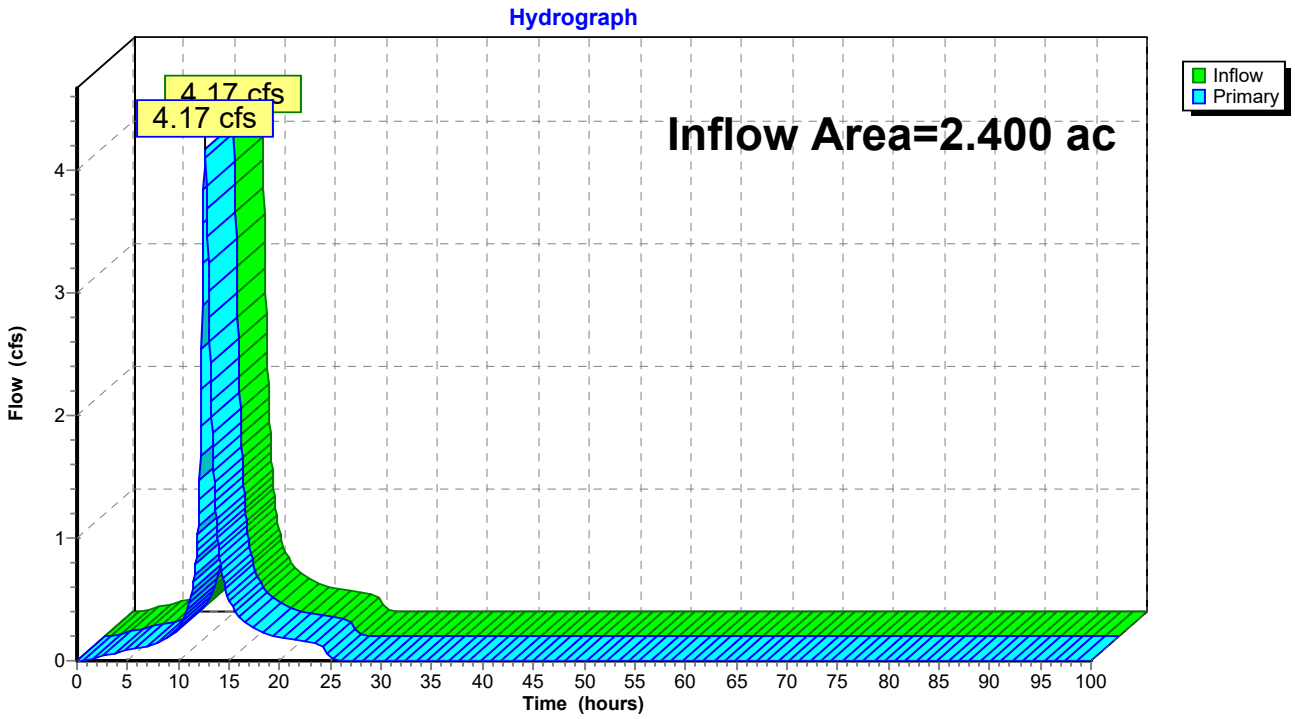


Summary for Link 17L: PDA 1A

Inflow Area = 2.400 ac, 55.42% Impervious, Inflow Depth = 3.92" for 10-Year event
Inflow = 4.17 cfs @ 12.65 hrs, Volume= 0.784 af
Primary = 4.17 cfs @ 12.65 hrs, Volume= 0.784 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 17L: PDA 1A

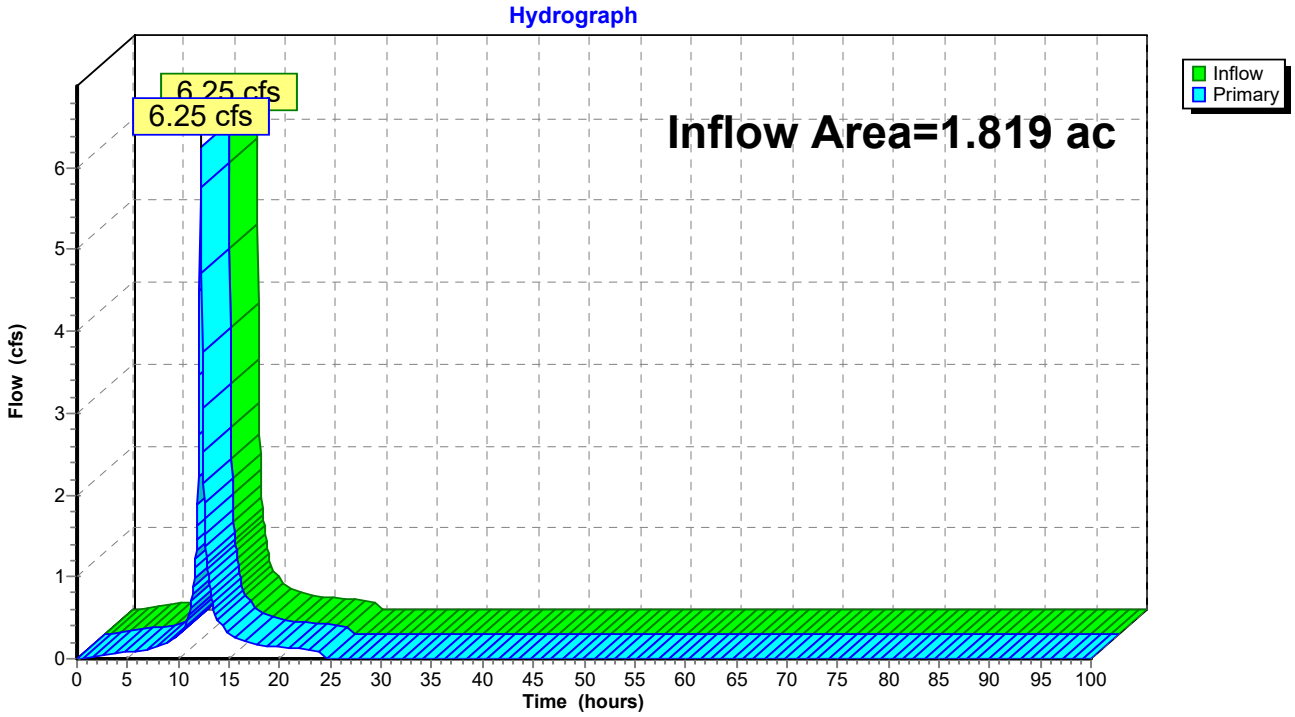


Summary for Link 23L: PDA 1C

Inflow Area = 1.819 ac, 61.57% Impervious, Inflow Depth = 4.16" for 10-Year event
Inflow = 6.25 cfs @ 12.20 hrs, Volume= 0.630 af
Primary = 6.25 cfs @ 12.20 hrs, Volume= 0.630 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 23L: PDA 1C

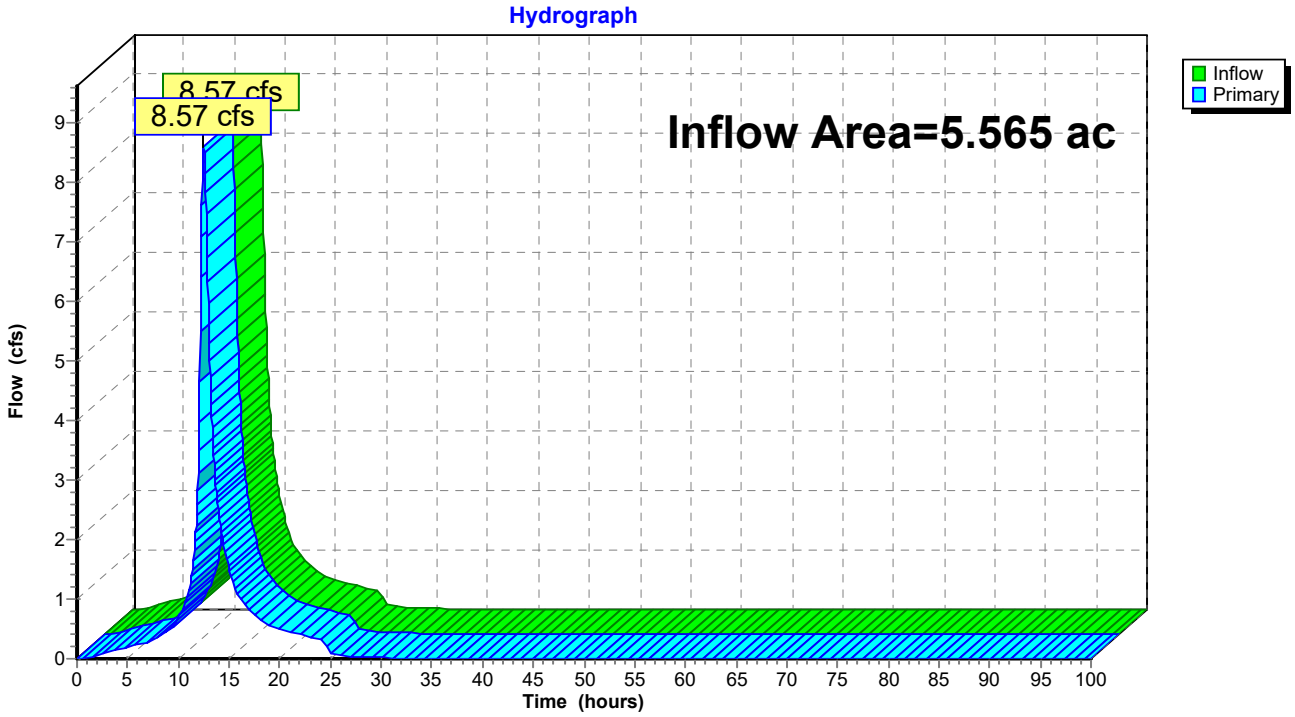


Summary for Link 25L: PDA 1

Inflow Area = 5.565 ac, 66.76% Impervious, Inflow Depth = 4.20" for 10-Year event
Inflow = 8.57 cfs @ 12.52 hrs, Volume= 1.949 af
Primary = 8.57 cfs @ 12.52 hrs, Volume= 1.949 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 25L: PDA 1

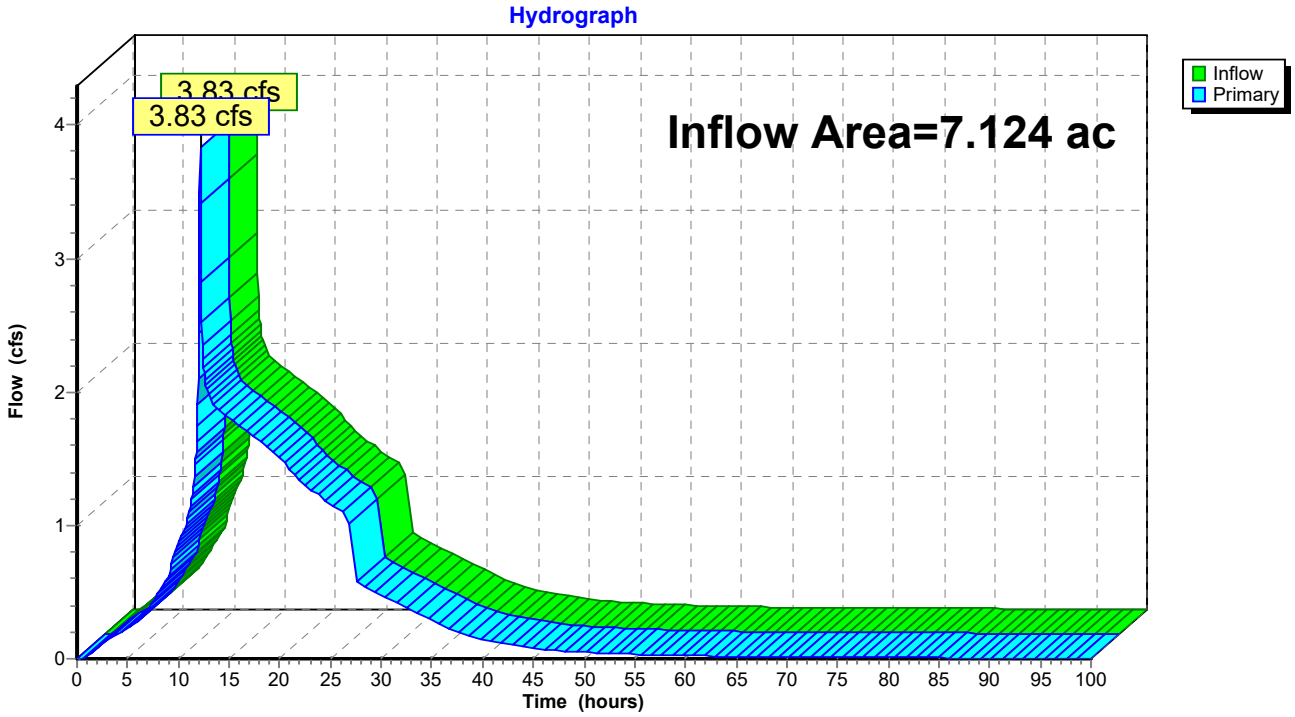


Summary for Link 39L: PDA 2A Treated

Inflow Area = 7.124 ac, 98.58% Impervious, Inflow Depth > 4.82" for 10-Year event
Inflow = 3.83 cfs @ 12.15 hrs, Volume= 2.863 af
Primary = 3.83 cfs @ 12.15 hrs, Volume= 2.863 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 39L: PDA 2A Treated

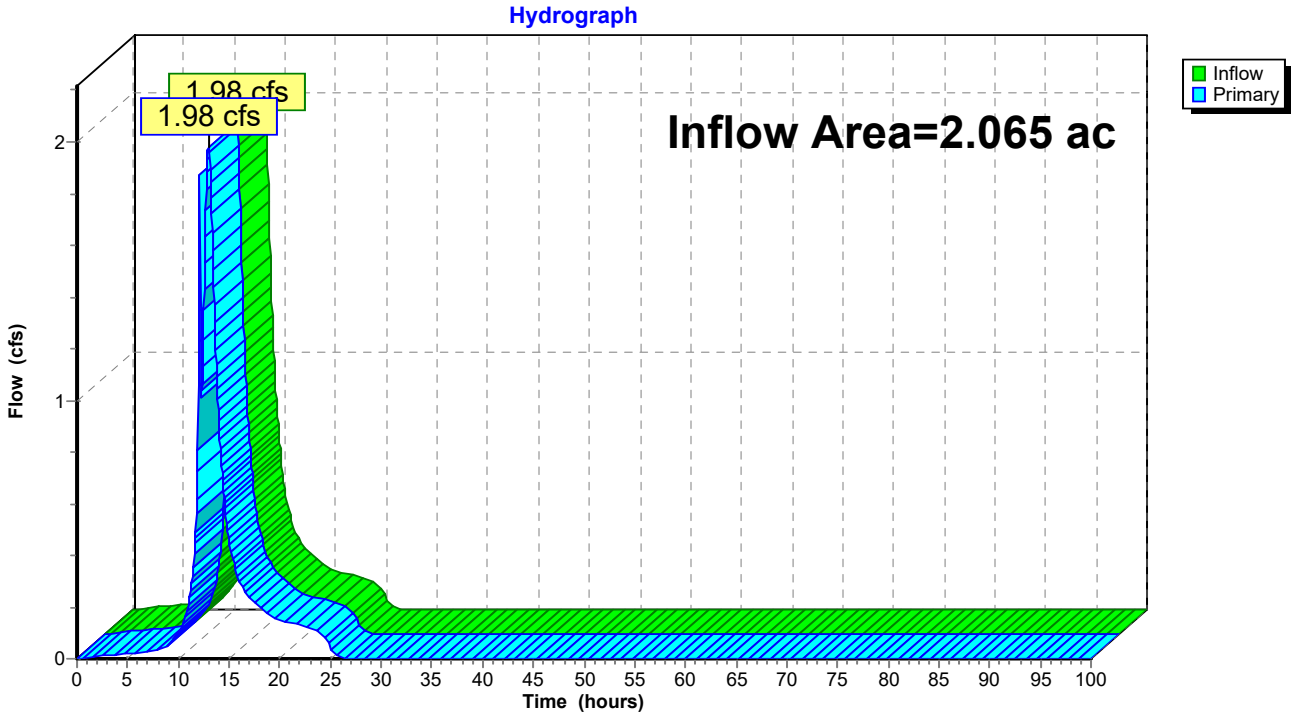


Summary for Link 42L: PDA 2A Remainder

Inflow Area = 2.065 ac, 13.66% Impervious, Inflow Depth = 3.02" for 10-Year event
Inflow = 1.98 cfs @ 12.96 hrs, Volume= 0.519 af
Primary = 1.98 cfs @ 12.96 hrs, Volume= 0.519 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 42L: PDA 2A Remainder

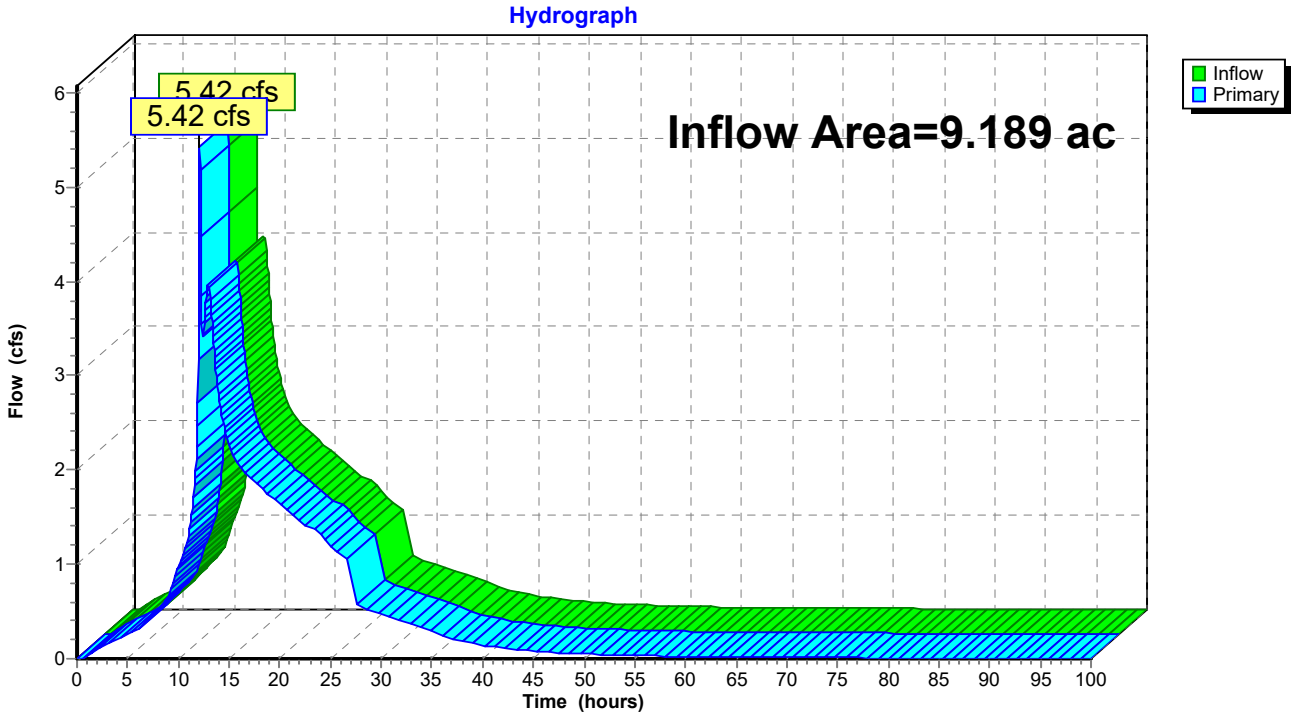


Summary for Link 43L: PDA 2A

Inflow Area = 9.189 ac, 79.50% Impervious, Inflow Depth > 4.42" for 10-Year event
Inflow = 5.42 cfs @ 12.12 hrs, Volume= 3.382 af
Primary = 5.42 cfs @ 12.12 hrs, Volume= 3.382 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 43L: PDA 2A

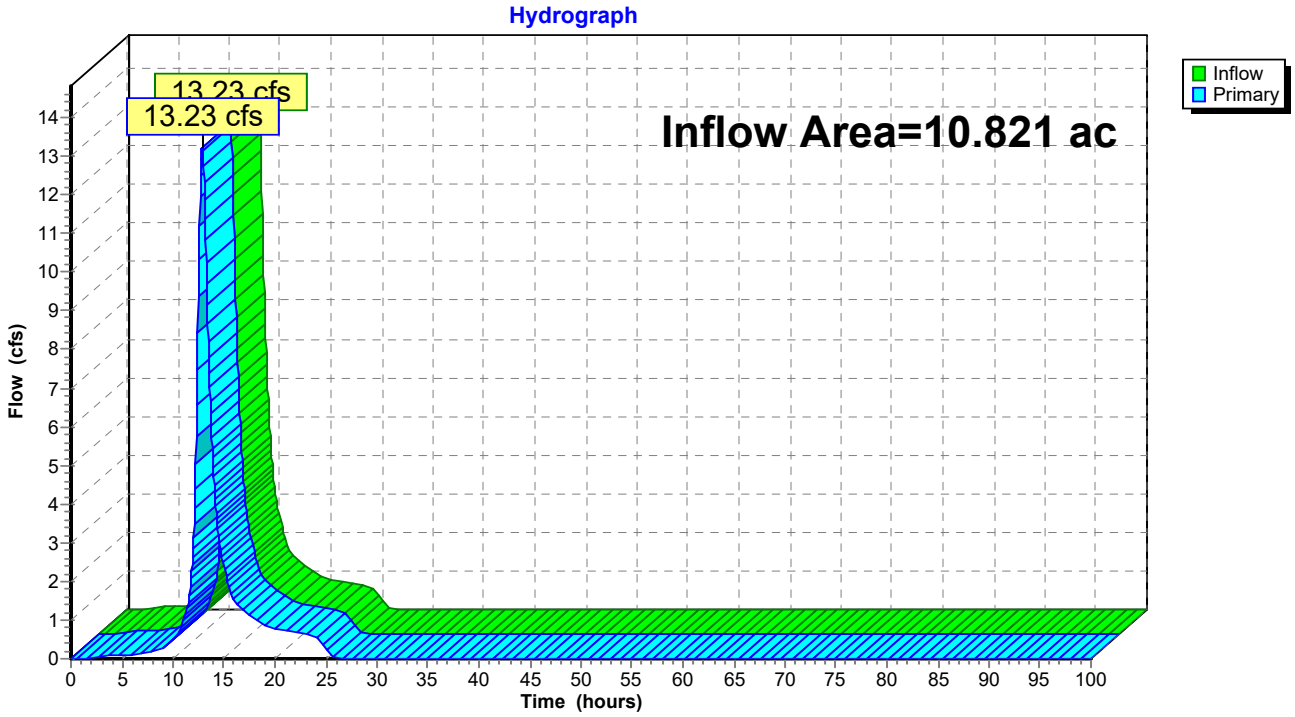


Summary for Link 46L: PDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 3.04" for 10-Year event
Inflow = 13.23 cfs @ 12.85 hrs, Volume= 2.743 af
Primary = 13.23 cfs @ 12.85 hrs, Volume= 2.743 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 46L: PDA 2B

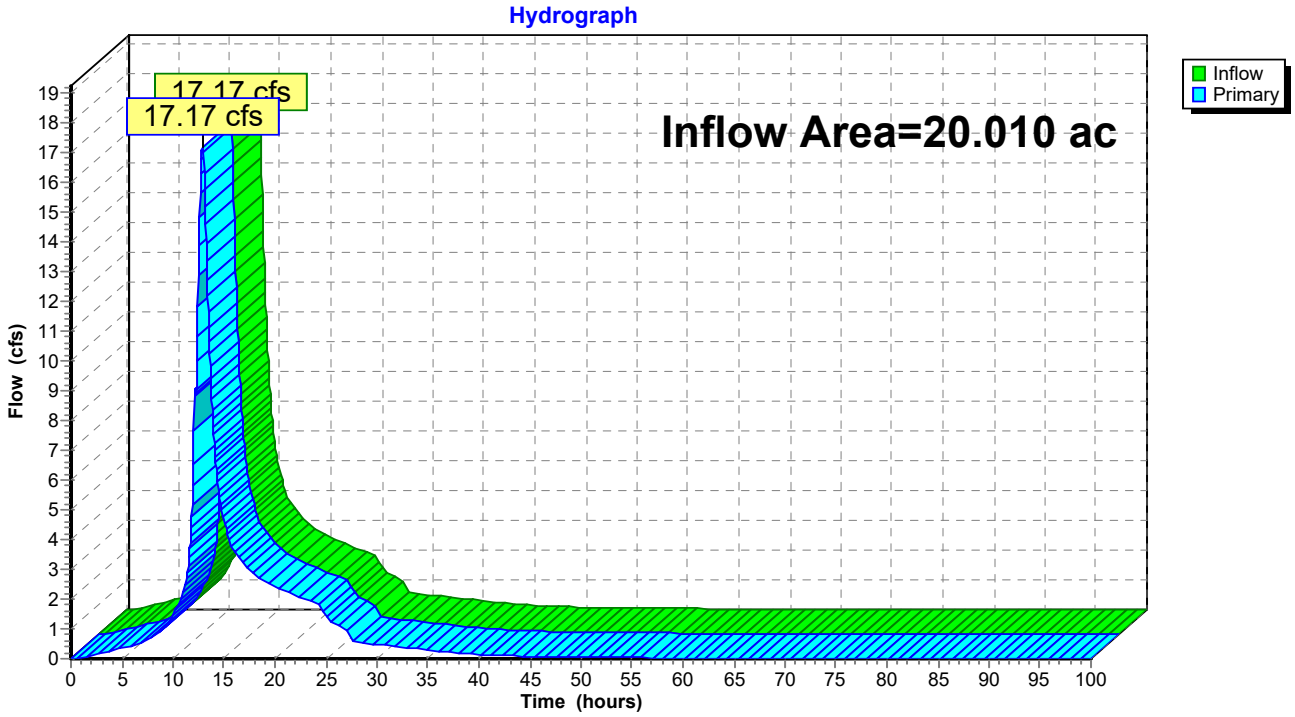


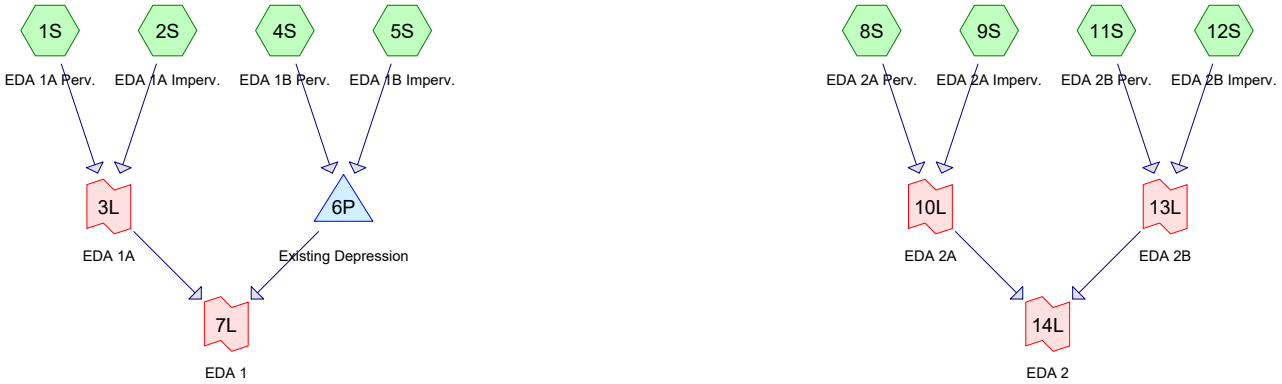
Summary for Link 47L: PDA 2

Inflow Area = 20.010 ac, 44.49% Impervious, Inflow Depth > 3.67" for 10-Year event
Inflow = 17.17 cfs @ 12.87 hrs, Volume= 6.126 af
Primary = 17.17 cfs @ 12.87 hrs, Volume= 6.126 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 47L: PDA 2





Subcat Reach Pond Link

Routing Diagram for Existing

Prepared by Bohler Engineering, Printed 8/12/2021

Time span=0.00-72.00 hrs, dt=0.10 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: EDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=5.86"
Flow Length=405' Tc=48.4 min CN=77 Runoff=2.97 cfs 0.522 af

Subcatchment 2S: EDA 1A Imperv. Runoff Area=1.325 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=405' Tc=48.4 min CN=98 Runoff=4.67 cfs 0.926 af

Subcatchment 4S: EDA 1B Perv. Runoff Area=1.969 ac 0.00% Impervious Runoff Depth=6.22"
Flow Length=653' Tc=12.7 min CN=80 Runoff=10.66 cfs 1.020 af

Subcatchment 5S: EDA 1B Imperv. Runoff Area=3.494 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=653' Tc=12.7 min CN=98 Runoff=22.37 cfs 2.443 af

Subcatchment 8S: EDA 2A Perv. Runoff Area=1.074 ac 0.00% Impervious Runoff Depth=5.73"
Flow Length=1,211' Tc=72.3 min CN=76 Runoff=2.33 cfs 0.513 af

Subcatchment 9S: EDA 2A Imperv. Runoff Area=5.953 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=1,211' Tc=72.3 min CN=98 Runoff=16.80 cfs 4.162 af

Subcatchment 11S: EDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=5.86"
Flow Length=591' Tc=62.9 min CN=77 Runoff=22.21 cfs 4.501 af

Subcatchment 12S: EDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=591' Tc=62.9 min CN=98 Runoff=4.88 cfs 1.117 af

Pond 6P: Existing Depression Peak Elev=110.78' Storage=27,516 cf Inflow=33.03 cfs 3.463 af
Outflow=17.52 cfs 3.463 af

Link 3L: EDA 1A Inflow=7.65 cfs 1.448 af
Primary=7.65 cfs 1.448 af

Link 7L: EDA 1 Inflow=23.71 cfs 4.912 af
Primary=23.71 cfs 4.912 af

Link 10L: EDA 2A Inflow=19.13 cfs 4.675 af
Primary=19.13 cfs 4.675 af

Link 13L: EDA 2B Inflow=27.08 cfs 5.617 af
Primary=27.08 cfs 5.617 af

Link 14L: EDA 2 Inflow=45.99 cfs 10.293 af
Primary=45.99 cfs 10.293 af

Total Runoff Area = 25.706 ac Runoff Volume = 15.204 af Average Runoff Depth = 7.10"
51.88% Pervious = 13.337 ac 48.12% Impervious = 12.369 ac

Summary for Subcatchment 1S: EDA 1A Perv.

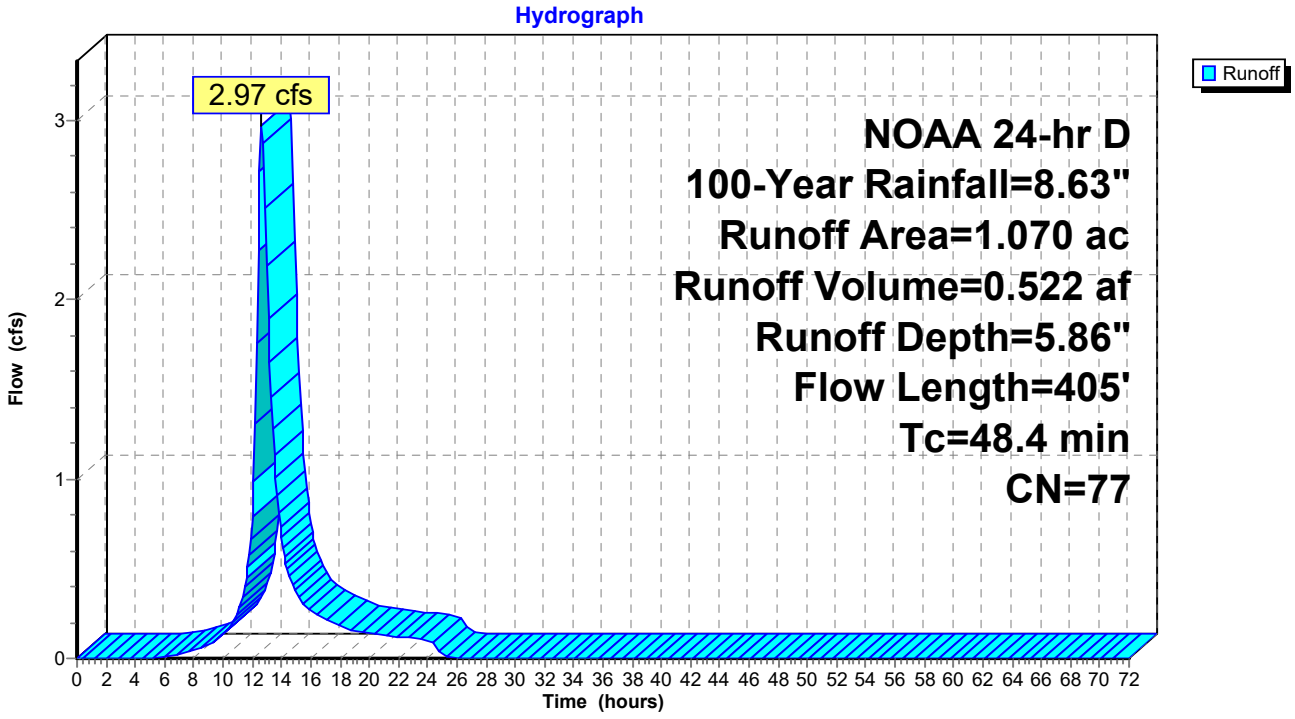
Runoff = 2.97 cfs @ 12.65 hrs, Volume= 0.522 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 1S: EDA 1A Perv.



Summary for Subcatchment 2S: EDA 1A Imperv.

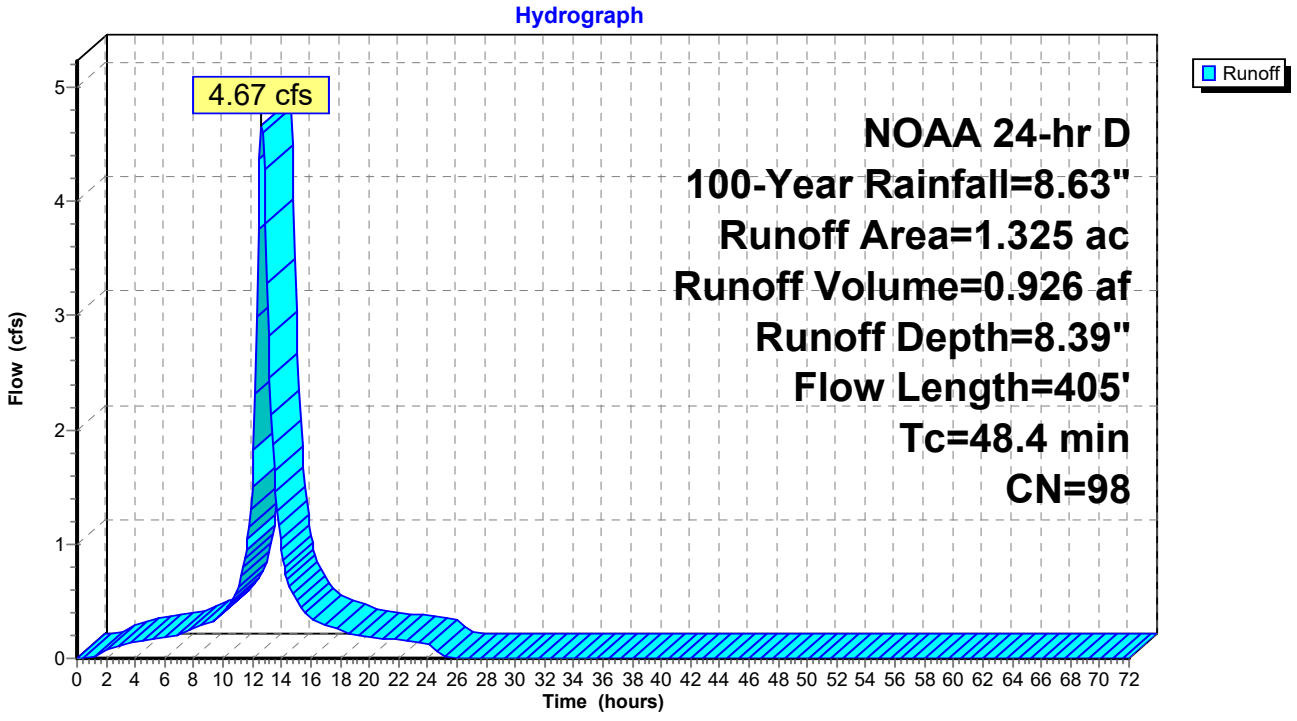
Runoff = 4.67 cfs @ 12.63 hrs, Volume= 0.926 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.325	98	Paved parking, HSG D
1.325		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 2S: EDA 1A Imperv.



Summary for Subcatchment 4S: EDA 1B Perv.

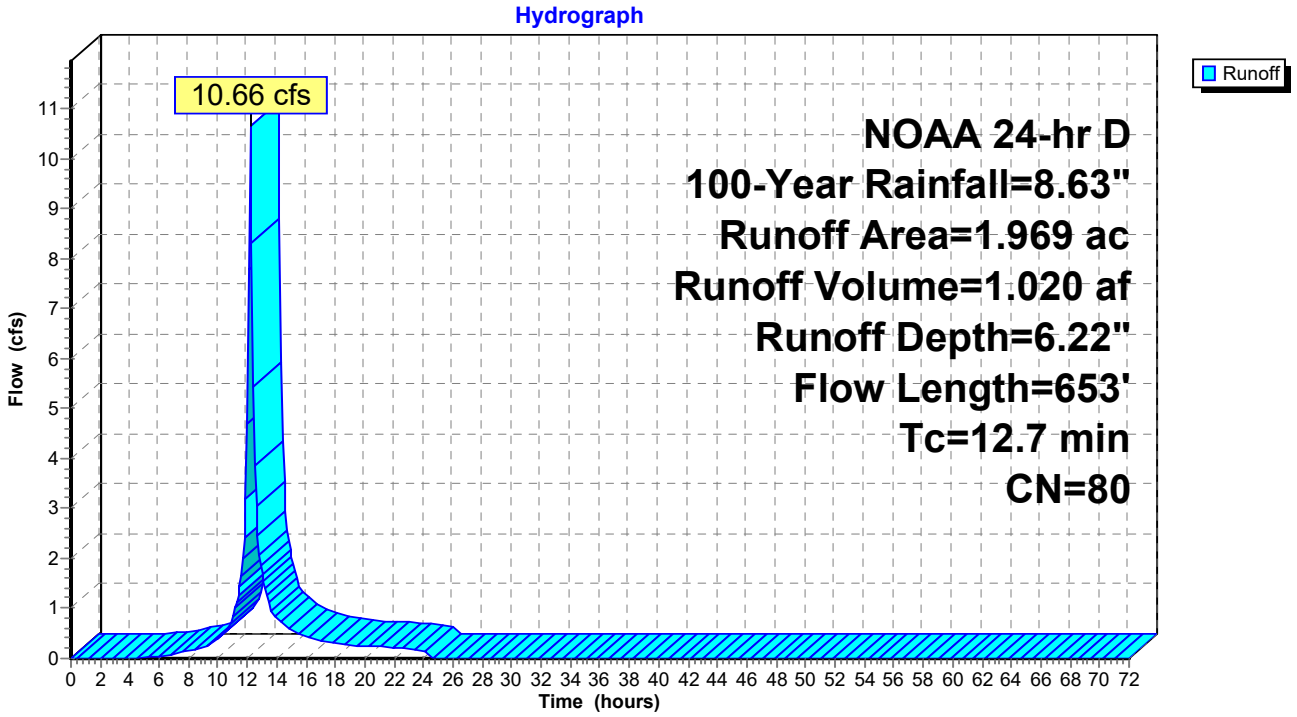
Runoff = 10.66 cfs @ 12.21 hrs, Volume= 1.020 af, Depth= 6.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
1.969	80	>75% Grass cover, Good, HSG D
1.969	80	Weighted Average
1.969		100.00% Pervious 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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 4S: EDA 1B Perv.



Summary for Subcatchment 5S: EDA 1B Imperv.

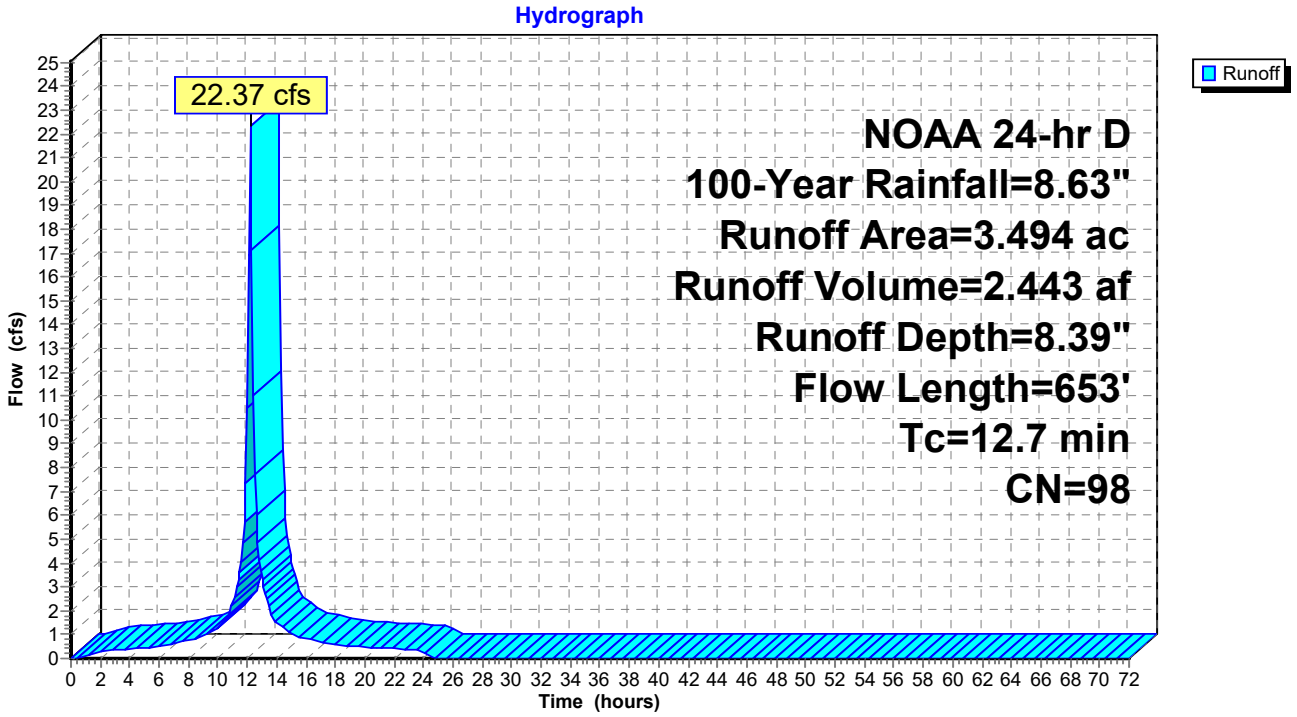
Runoff = 22.37 cfs @ 12.20 hrs, Volume= 2.443 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
3.494	98	Paved parking, HSG D
3.494		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= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow,** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 5S: EDA 1B Imperv.



Summary for Subcatchment 8S: EDA 2A Perv.

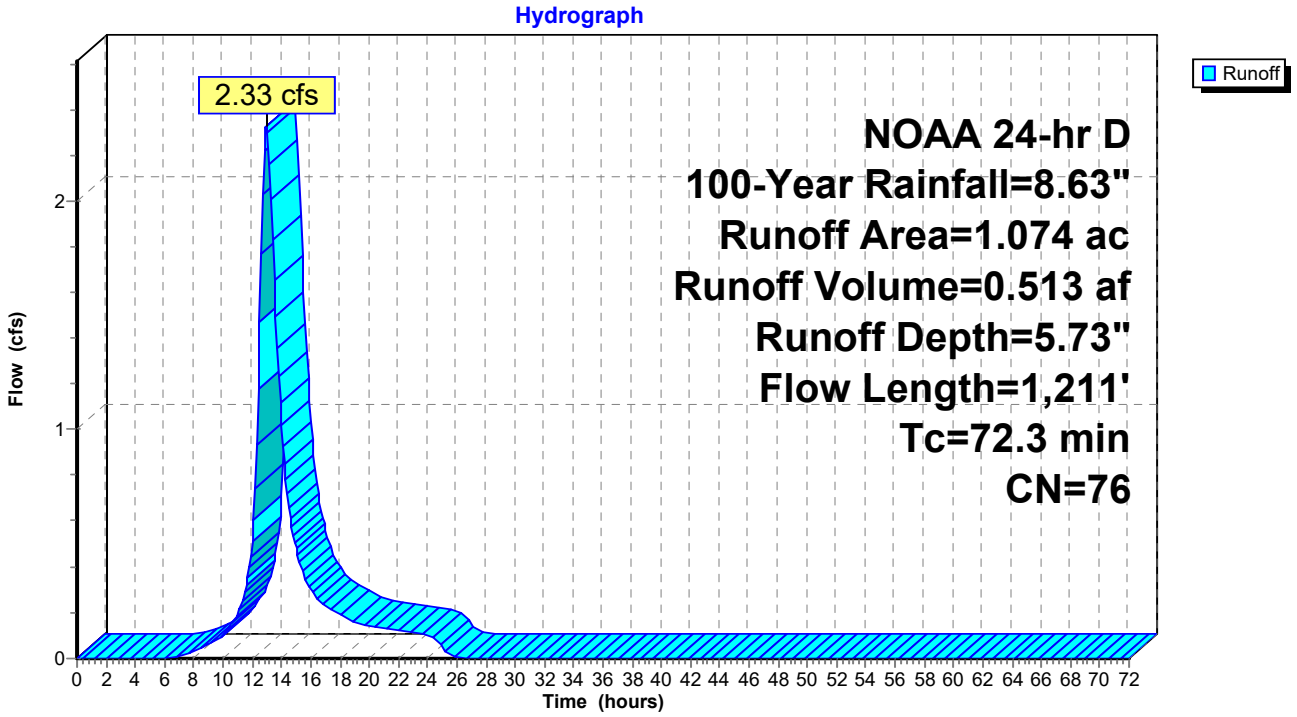
Runoff = 2.33 cfs @ 12.97 hrs, Volume= 0.513 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.143	77	Woods, Good, HSG D
0.383	70	Woods, Good, HSG C
0.483	80	>75% Grass cover, Good, HSG D
0.065	74	>75% Grass cover, Good, HSG C
1.074	76	Weighted Average
1.074		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 8S: EDA 2A Perv.



Summary for Subcatchment 9S: EDA 2A Imperv.

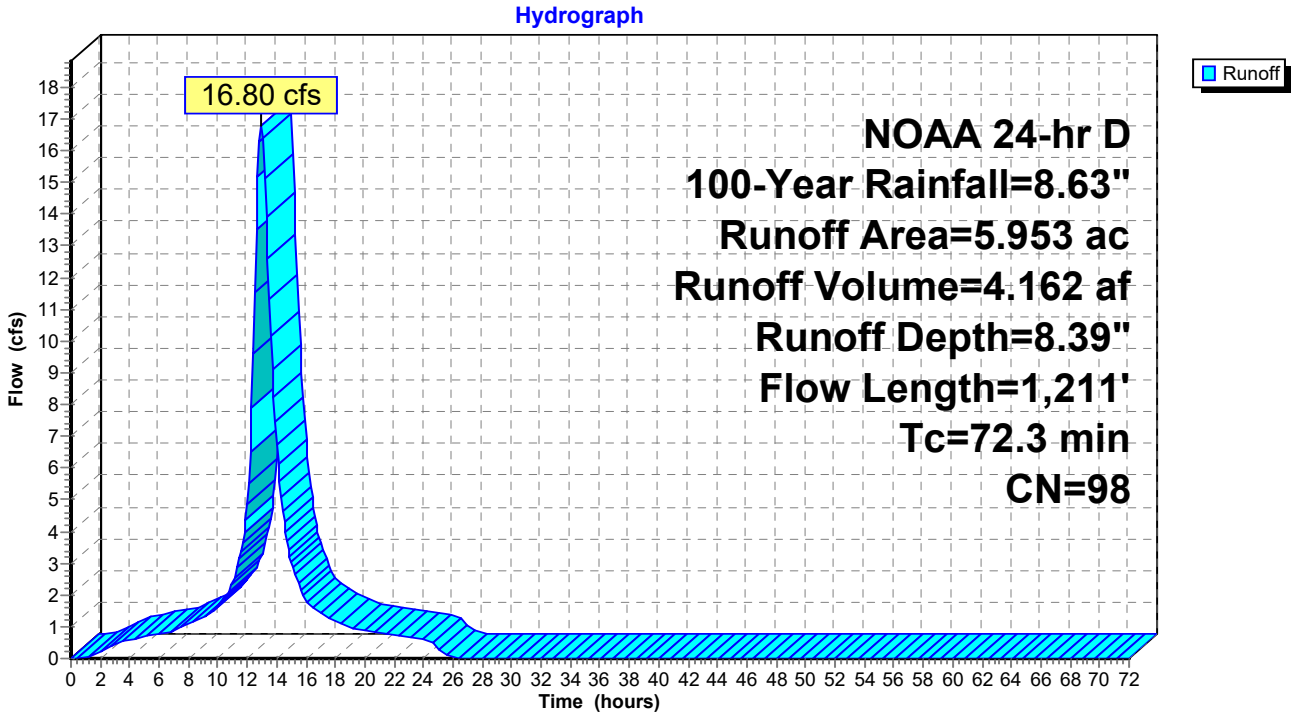
Runoff = 16.80 cfs @ 12.93 hrs, Volume= 4.162 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
5.953	98	Paved parking, HSG D
5.953		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 9S: EDA 2A Imperv.



Summary for Subcatchment 11S: EDA 2B Perv.

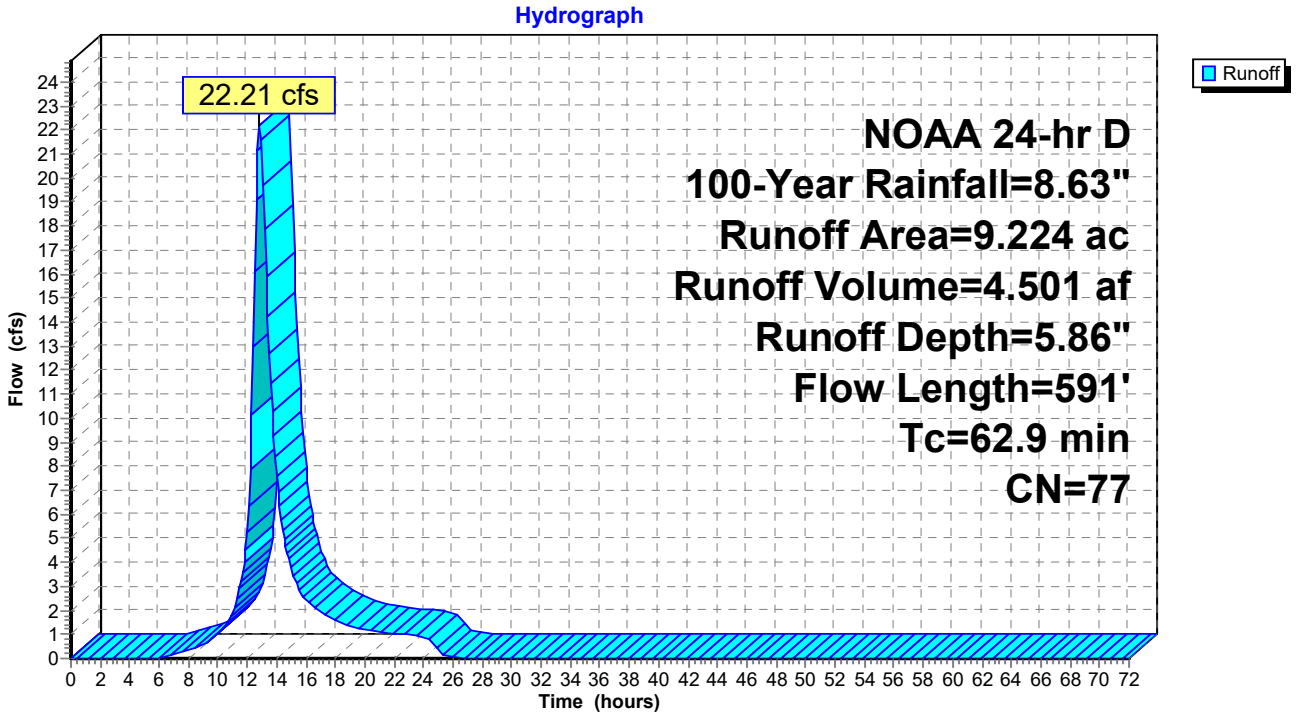
Runoff = 22.21 cfs @ 12.84 hrs, Volume= 4.501 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 11S: EDA 2B Perv.



Summary for Subcatchment 12S: EDA 2B Imperv.

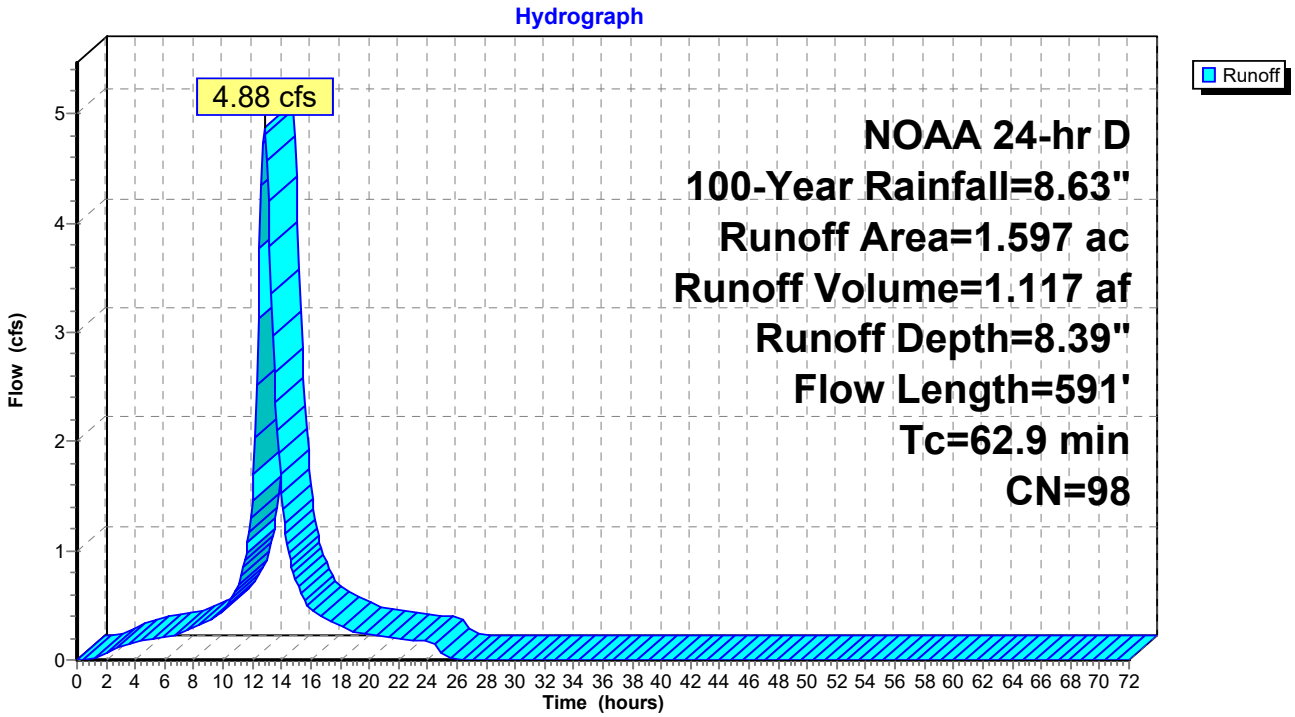
Runoff = 4.88 cfs @ 12.82 hrs, Volume= 1.117 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 12S: EDA 2B Imperv.



Summary for Pond 6P: Existing Depression

Inflow Area = 5.463 ac, 63.96% Impervious, Inflow Depth = 7.61" for 100-Year event
Inflow = 33.03 cfs @ 12.20 hrs, Volume= 3.463 af
Outflow = 17.52 cfs @ 12.41 hrs, Volume= 3.463 af, Atten= 47%, Lag= 12.3 min
Primary = 17.52 cfs @ 12.41 hrs, Volume= 3.463 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 110.78' @ 12.41 hrs Surf.Area= 33,778 sf Storage= 27,516 cf

Plug-Flow detention time= 17.4 min calculated for 3.458 af (100% of inflow)
Center-of-Mass det. time= 17.4 min (784.0 - 766.6)

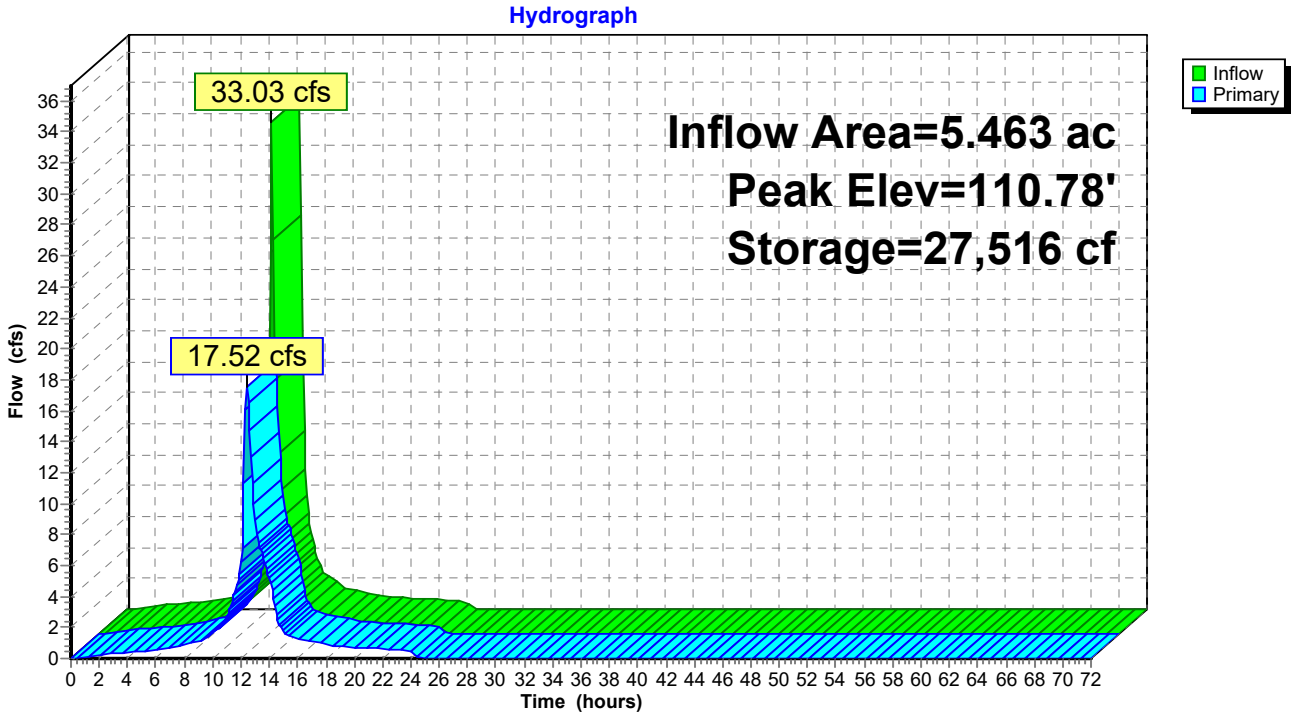
Volume	Invert	Avail.Storage	Storage Description
#1	107.95'	35,534 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.95	2	0	0
108.00	12	0	0
109.00	3,297	1,655	1,655
110.00	12,220	7,759	9,413
110.50	26,358	9,645	19,058
111.00	39,547	16,476	35,534

Device	Routing	Invert	Outlet Devices
#1	Primary	107.95'	**15.0" Round Culvert** L= 58.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.95' / 107.70' S= 0.0043 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Primary	110.29'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=17.43 cfs @ 12.41 hrs HW=110.78' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 8.48 cfs @ 6.91 fps)
2=Broad-Crested Rectangular Weir (Weir Controls 8.95 cfs @ 1.83 fps)

Pond 6P: Existing Depression

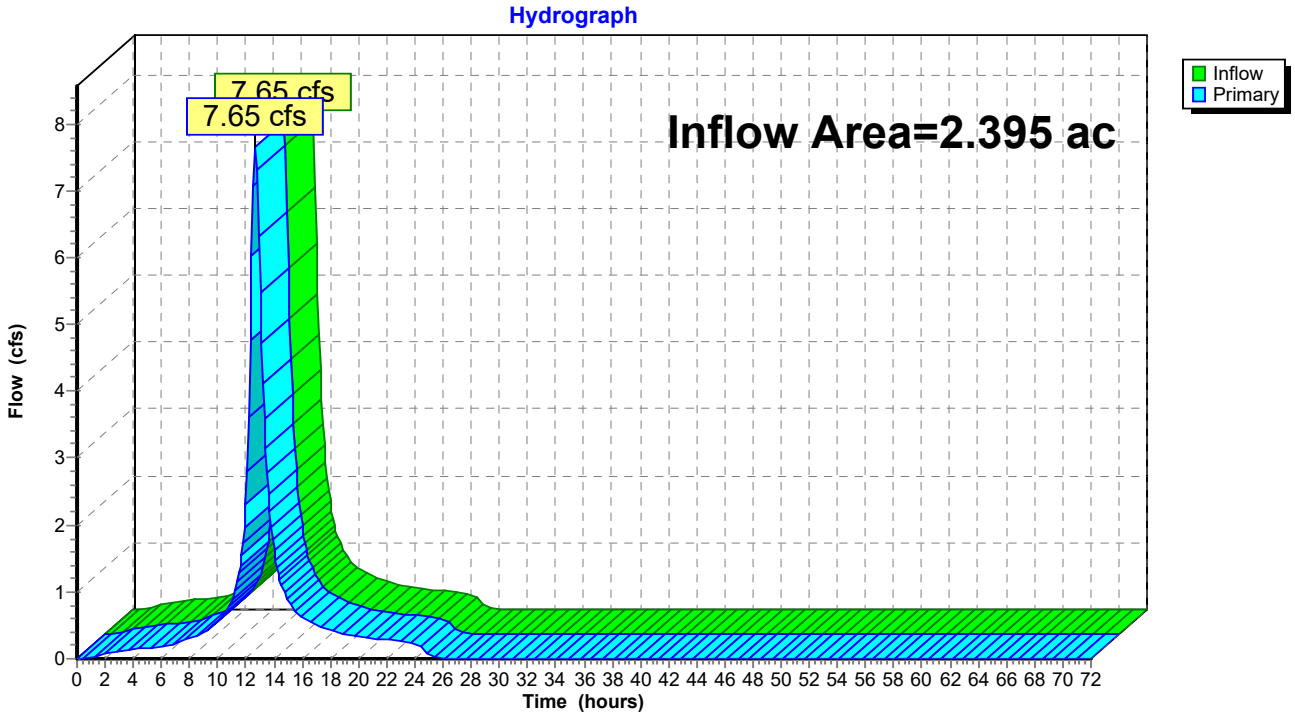


Summary for Link 3L: EDA 1A

Inflow Area = 2.395 ac, 55.32% Impervious, Inflow Depth = 7.26" for 100-Year event
Inflow = 7.65 cfs @ 12.64 hrs, Volume= 1.448 af
Primary = 7.65 cfs @ 12.64 hrs, Volume= 1.448 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 3L: EDA 1A

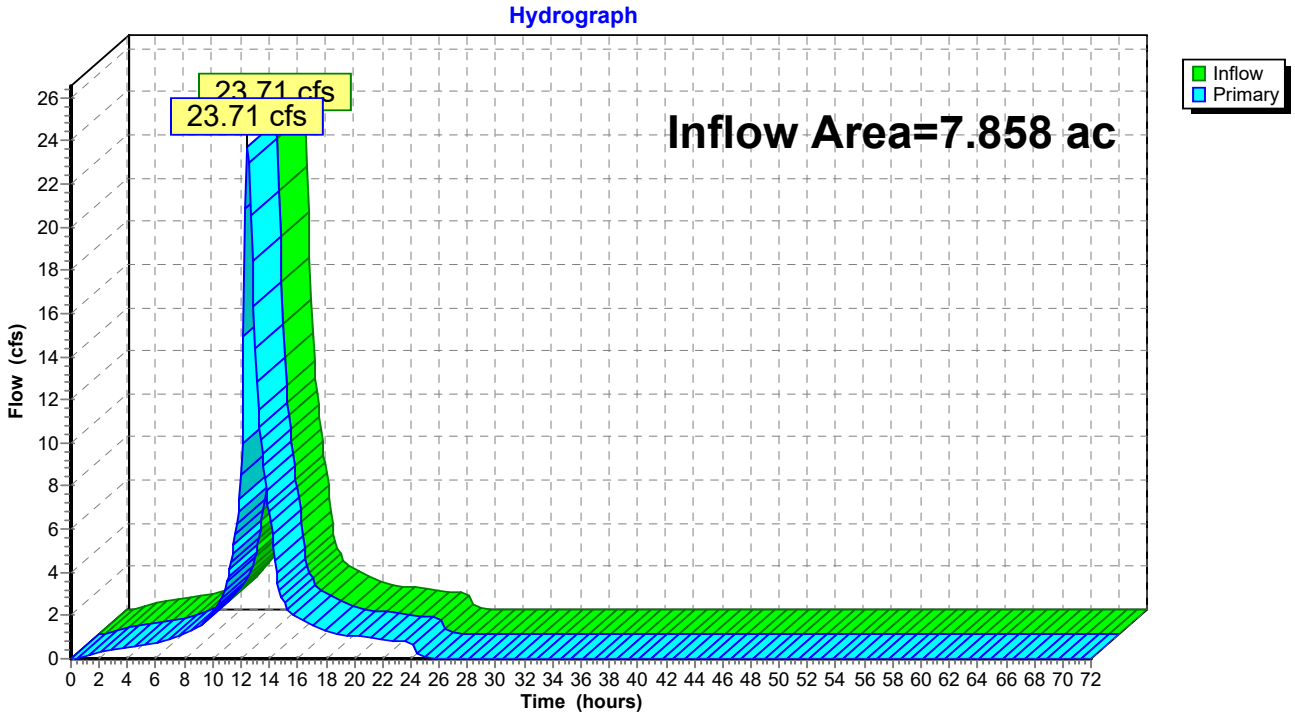


Summary for Link 7L: EDA 1

Inflow Area = 7.858 ac, 61.33% Impervious, Inflow Depth = 7.50" for 100-Year event
Inflow = 23.71 cfs @ 12.45 hrs, Volume= 4.912 af
Primary = 23.71 cfs @ 12.45 hrs, Volume= 4.912 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 7L: EDA 1

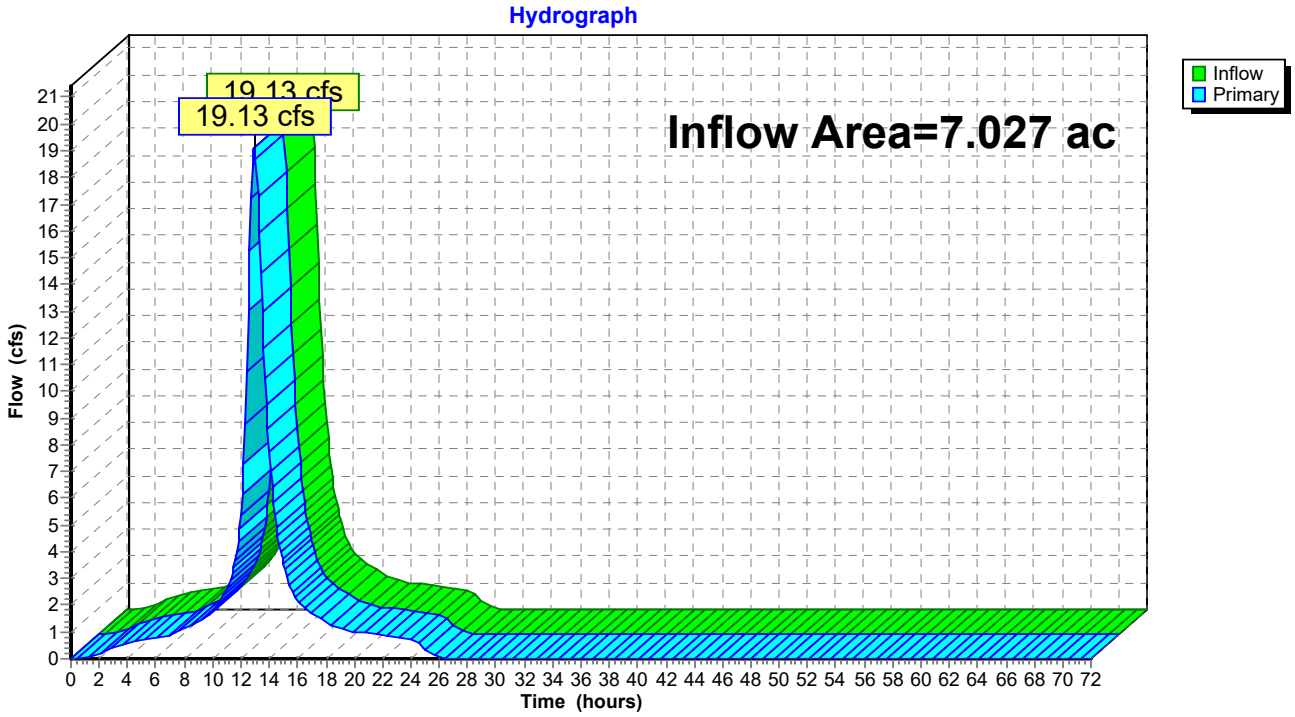


Summary for Link 10L: EDA 2A

Inflow Area = 7.027 ac, 84.72% Impervious, Inflow Depth = 7.98" for 100-Year event
Inflow = 19.13 cfs @ 12.93 hrs, Volume= 4.675 af
Primary = 19.13 cfs @ 12.93 hrs, Volume= 4.675 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 10L: EDA 2A

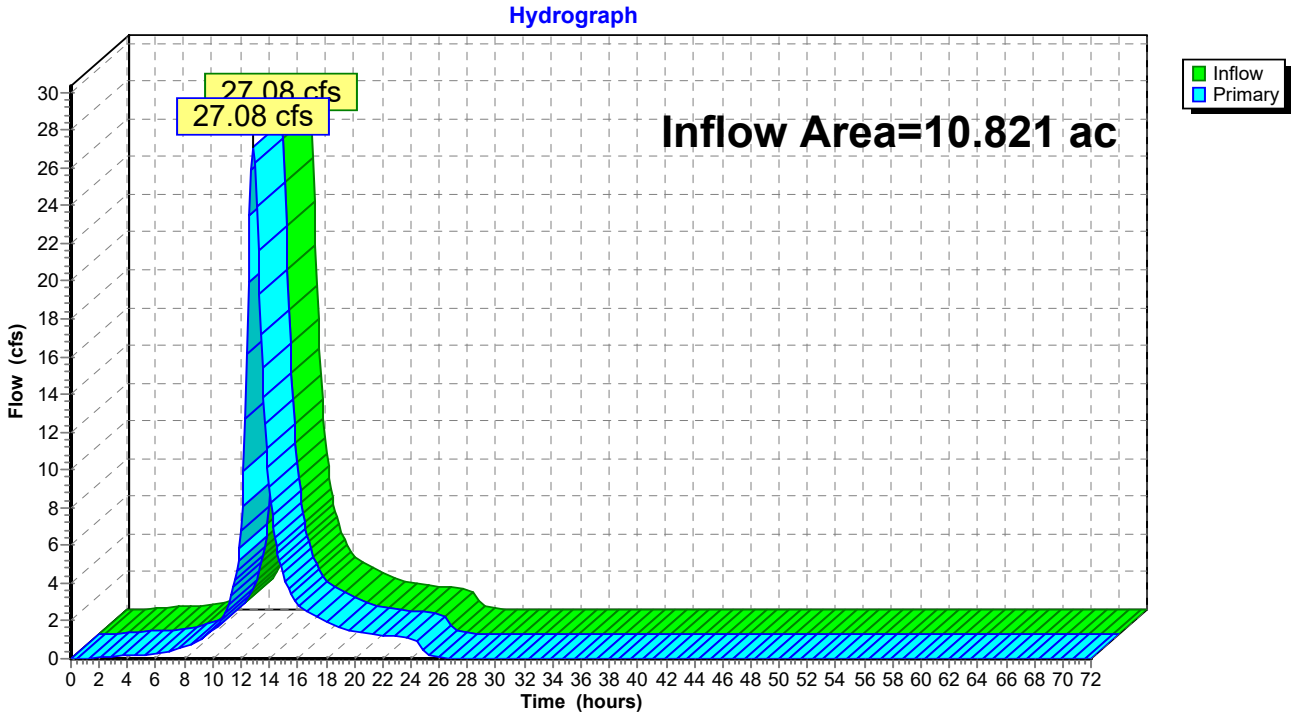


Summary for Link 13L: EDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 6.23" for 100-Year event
Inflow = 27.08 cfs @ 12.84 hrs, Volume= 5.617 af
Primary = 27.08 cfs @ 12.84 hrs, Volume= 5.617 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 13L: EDA 2B

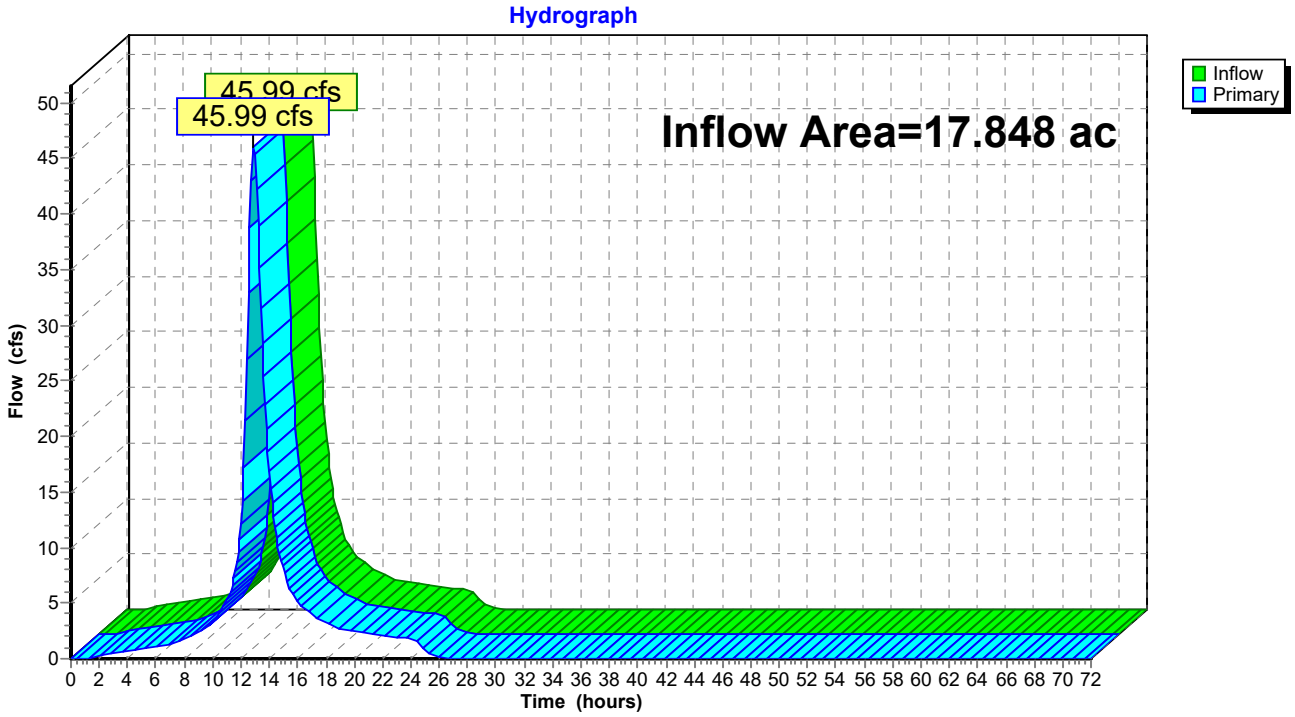


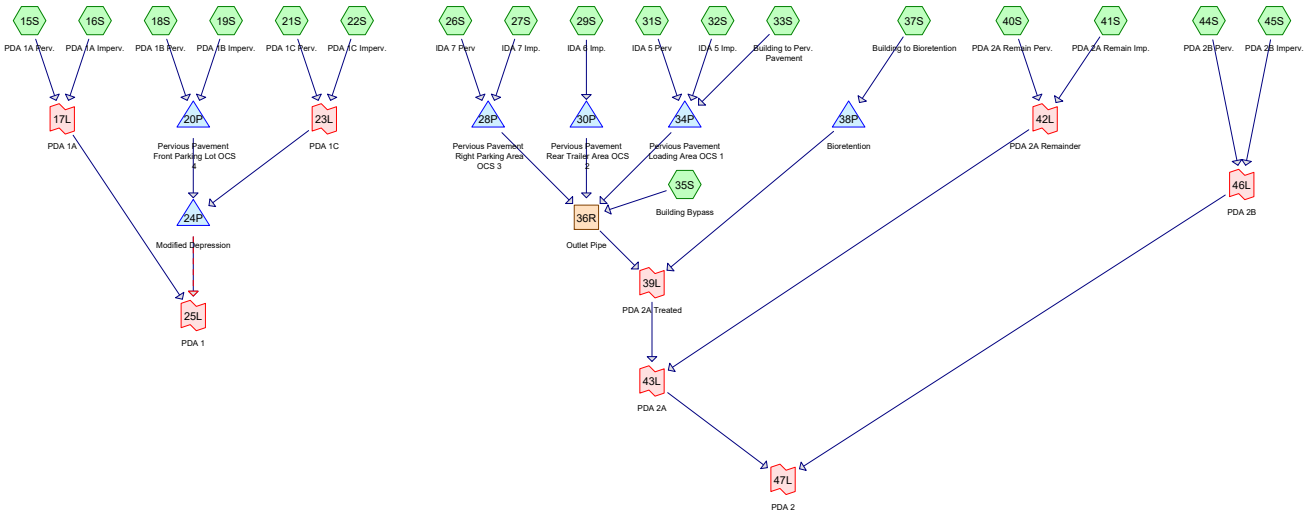
Summary for Link 14L: EDA 2

Inflow Area = 17.848 ac, 42.30% Impervious, Inflow Depth = 6.92" for 100-Year event
Inflow = 45.99 cfs @ 12.88 hrs, Volume= 10.293 af
Primary = 45.99 cfs @ 12.88 hrs, Volume= 10.293 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Link 14L: EDA 2





Subcat Reach Pond Link

Routing Diagram for Proposed

Prepared by {enter your company name here}, Printed 11/19/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.735	74	>75% Grass cover, Good, HSG C (31S, 40S, 44S)
4.756	80	>75% Grass cover, Good, HSG D (15S, 18S, 21S, 26S, 31S, 40S, 44S)
12.617	98	Paved parking, HSG D (16S, 19S, 22S, 27S, 29S, 32S, 33S, 35S, 37S, 41S, 45S)
0.871	70	Woods, Good, HSG C (40S, 44S)
6.596	77	Woods, Good, HSG D (15S, 21S, 44S)
25.575	**88**	**TOTAL AREA**

Time span=0.00-100.00 hrs, dt=0.05 hrs, 2001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15S: PDA 1A Perv. Runoff Area=1.070 ac 0.00% Impervious Runoff Depth=5.86"
Flow Length=405' Tc=48.4 min CN=77 Runoff=2.99 cfs 0.522 af

Subcatchment 16S: PDA 1A Imperv. Runoff Area=1.330 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=405' Tc=48.4 min CN=98 Runoff=4.70 cfs 0.930 af

Subcatchment 18S: PDA 1B Perv. Runoff Area=0.081 ac 0.00% Impervious Runoff Depth=6.22"
Flow Length=317' Tc=1.5 min CN=80 Runoff=0.63 cfs 0.042 af

Subcatchment 19S: PDA 1B Imperv. Runoff Area=1.265 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=205' Tc=1.4 min CN=98 Runoff=11.49 cfs 0.884 af

Subcatchment 21S: PDA 1C Perv. Runoff Area=0.699 ac 0.00% Impervious Runoff Depth=6.22"
Flow Length=653' Tc=12.7 min CN=80 Runoff=3.88 cfs 0.362 af

Subcatchment 22S: PDA 1C Imperv. Runoff Area=1.120 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=653' Tc=12.7 min CN=98 Runoff=7.34 cfs 0.783 af

Subcatchment 26S: IDA 7 Perv Runoff Area=0.054 ac 0.00% Impervious Runoff Depth=6.22"
Flow Length=163' Tc=1.3 min CN=80 Runoff=0.42 cfs 0.028 af

Subcatchment 27S: IDA 7 Imp. Runoff Area=0.249 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=163' Tc=1.3 min CN=98 Runoff=2.27 cfs 0.174 af

Subcatchment 29S: IDA 6 Imp. Runoff Area=0.374 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=178' Tc=2.0 min CN=98 Runoff=3.44 cfs 0.261 af

Subcatchment 31S: IDA 5 Perv Runoff Area=0.047 ac 0.00% Impervious Runoff Depth=5.73"
Flow Length=390' Tc=4.6 min CN=76 Runoff=0.31 cfs 0.022 af

Subcatchment 32S: IDA 5 Imp. Runoff Area=2.005 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=390' Tc=4.6 min CN=98 Runoff=16.81 cfs 1.402 af

Subcatchment 33S: Building to Perv. Runoff Area=1.615 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=354' Slope=0.0050 '/' Tc=4.6 min CN=98 Runoff=13.54 cfs 1.129 af

Subcatchment 35S: Building Bypass Runoff Area=0.541 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=379' Slope=0.0050 '/' Tc=5.3 min CN=98 Runoff=4.40 cfs 0.378 af

Subcatchment 37S: Building to Runoff Area=2.239 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=560' Slope=0.0050 '/' Tc=7.4 min CN=98 Runoff=17.32 cfs 1.565 af

Subcatchment 40S: PDA 2A Remain Perv. Runoff Area=1.783 ac 0.00% Impervious Runoff Depth=5.86"
Flow Length=1,211' Tc=72.3 min CN=77 Runoff=3.96 cfs 0.870 af

Subcatchment 41S: PDA 2A Remain Imp. Runoff Area=0.282 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=456' Tc=2.9 min CN=98 Runoff=2.53 cfs 0.197 af

Subcatchment 44S: PDA 2B Perv. Runoff Area=9.224 ac 0.00% Impervious Runoff Depth=5.86"
Flow Length=591' Tc=62.9 min CN=77 Runoff=22.20 cfs 4.501 af

Subcatchment 45S: PDA 2B Imperv. Runoff Area=1.597 ac 100.00% Impervious Runoff Depth=8.39"
Flow Length=591' Tc=62.9 min CN=98 Runoff=4.89 cfs 1.117 af

Reach 36R: Outlet Pipe Avg. Flow Depth=1.50' Max Vel=3.29 fps Inflow=7.53 cfs 3.374 af
18.0" Round Pipe n=0.013 L=381.0' S=0.0024 '/' Capacity=5.11 cfs Outflow=5.53 cfs 3.374 af

Pond 20P: Pervious Pavement Front Peak Elev=111.93' Storage=15,831 cf Inflow=12.12 cfs 0.926 af
Outflow=1.74 cfs 0.926 af

Pond 24P: Modified Depression Peak Elev=109.87' Storage=8,712 cf Inflow=12.88 cfs 2.071 af
Primary=7.42 cfs 2.071 af Secondary=0.00 cfs 0.000 af Outflow=7.42 cfs 2.071 af

Pond 28P: Pervious Pavement Right Parking Peak Elev=115.44' Storage=6,027 cf Inflow=2.68 cfs 0.202 af
Outflow=0.09 cfs 0.191 af

Pond 30P: Pervious Pavement Rear Trailer Peak Elev=113.71' Storage=6,564 cf Inflow=3.44 cfs 0.261 af
Outflow=0.17 cfs 0.260 af

Pond 34P: Pervious Pavement Loading Peak Elev=115.38' Storage=56,899 cf Inflow=30.66 cfs 2.553 af
Outflow=5.95 cfs 2.544 af

Pond 38P: Bioretention Peak Elev=115.02' Storage=24,094 cf Inflow=17.32 cfs 1.565 af
Primary=7.64 cfs 1.566 af Secondary=0.00 cfs 0.000 af Outflow=7.64 cfs 1.566 af

Link 17L: PDA 1A Inflow=7.68 cfs 1.452 af
Primary=7.68 cfs 1.452 af

Link 23L: PDA 1C Inflow=11.21 cfs 1.145 af
Primary=11.21 cfs 1.145 af

Link 25L: PDA 1 Inflow=14.56 cfs 3.523 af
Primary=14.56 cfs 3.523 af

Link 39L: PDA 2A Treated Inflow=12.74 cfs 4.940 af
Primary=12.74 cfs 4.940 af

Link 42L: PDA 2A Remainder Inflow=4.20 cfs 1.067 af
Primary=4.20 cfs 1.067 af

Link 43L: PDA 2A Inflow=14.98 cfs 6.007 af
Primary=14.98 cfs 6.007 af

Link 46L: PDA 2B Inflow=27.08 cfs 5.617 af
Primary=27.08 cfs 5.617 af

Link 47L: PDA 2 Inflow=38.89 cfs 11.624 af
Primary=38.89 cfs 11.624 af

Total Runoff Area = 25.575 ac Runoff Volume = 15.169 af Average Runoff Depth = 7.12"
50.67% Pervious = 12.958 ac 49.33% Impervious = 12.617 ac

Summary for Subcatchment 15S: PDA 1A Perv.

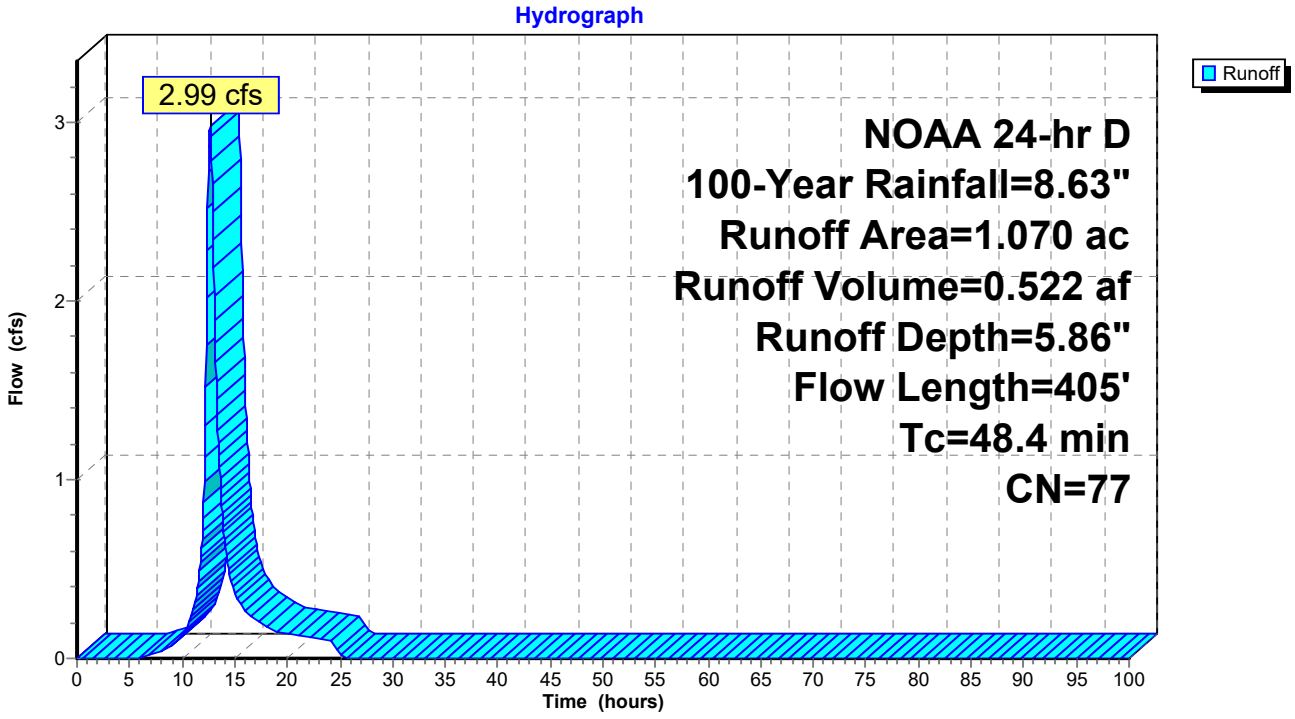
Runoff = 2.99 cfs @ 12.65 hrs, Volume= 0.522 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.966	77	Woods, Good, HSG D
0.104	80	>75% Grass cover, Good, HSG D
1.070	77	Weighted Average
1.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 15S: PDA 1A Perv.



Summary for Subcatchment 16S: PDA 1A Imperv.

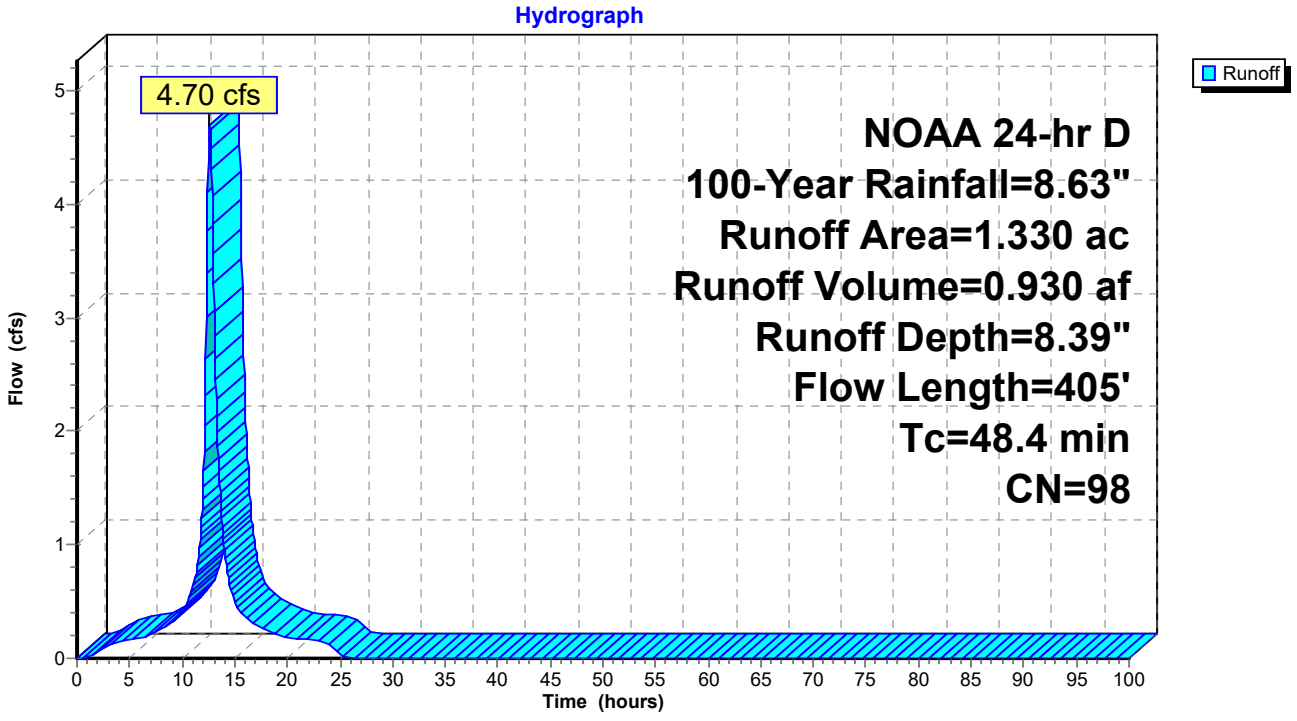
Runoff = 4.70 cfs @ 12.63 hrs, Volume= 0.930 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.330	98	Paved parking, HSG D
1.330		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
36.6	100	0.0050	0.05		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
11.8	305	0.0074	0.43		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
48.4	405	Total			

Subcatchment 16S: PDA 1A Imperv.



Summary for Subcatchment 18S: PDA 1B Perv.

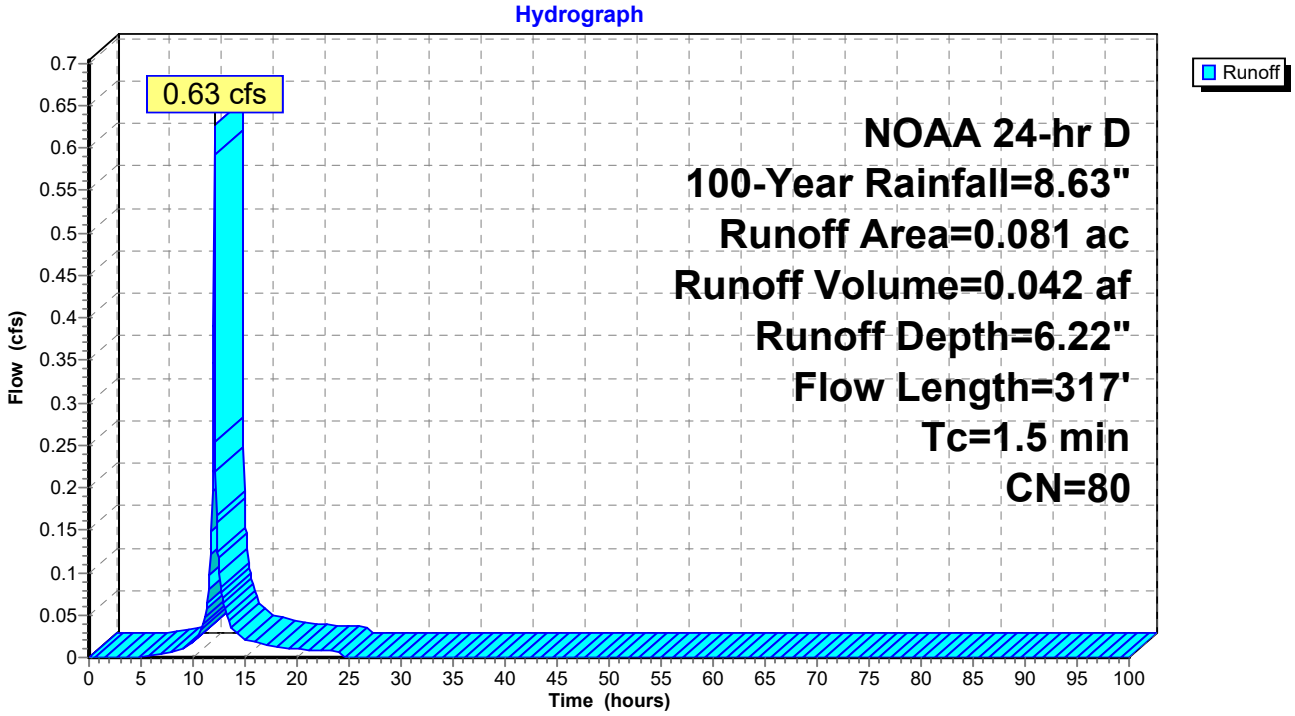
Runoff = 0.63 cfs @ 12.07 hrs, Volume= 0.042 af, Depth= 6.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.081	80	>75% Grass cover, Good, HSG D
0.081	80	Weighted Average
0.081		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.91		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	56	0.0750	5.56		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.1	15	0.0150	2.49		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	226	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.5	317	Total			

Subcatchment 18S: PDA 1B Perv.



Summary for Subcatchment 19S: PDA 1B Imperv.

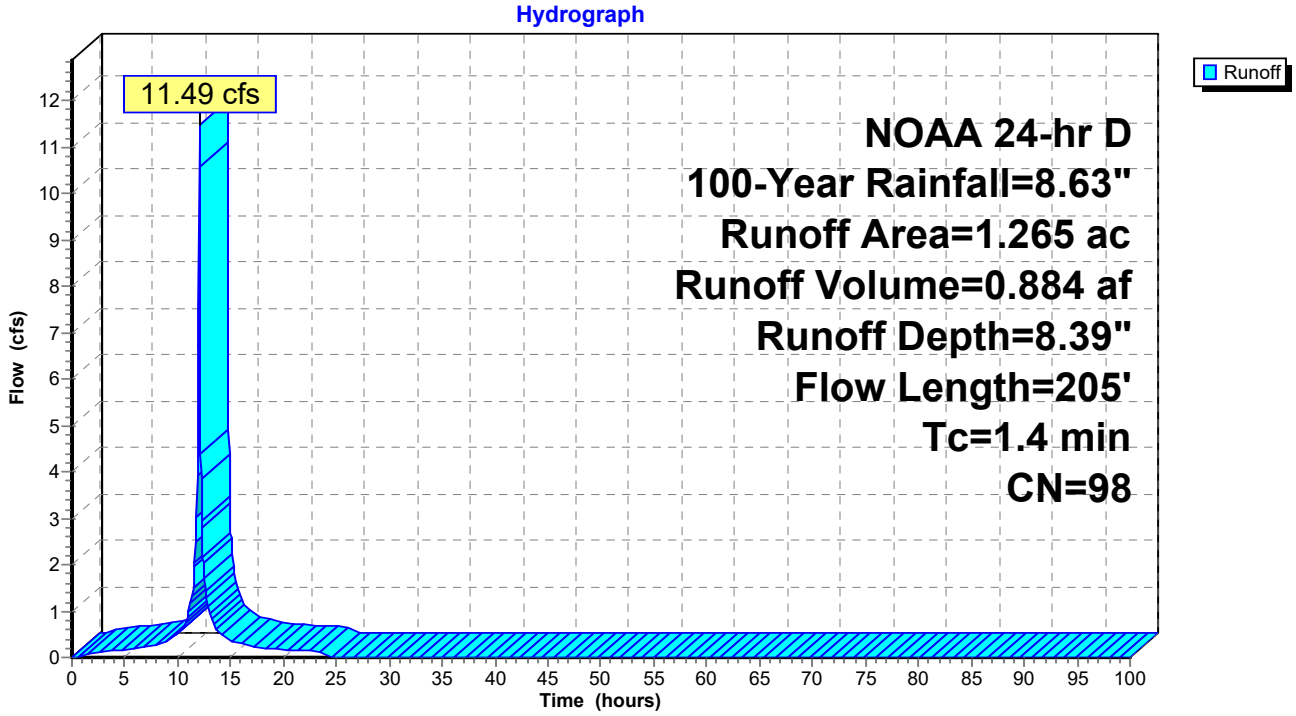
Runoff = 11.49 cfs @ 12.07 hrs, Volume= 0.884 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.265	98	Paved parking, HSG D
1.265		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	9	0.0150	0.77		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.4	50	0.0750	2.08		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
0.4	41	0.0500	1.70		**Sheet Flow, C-D** Smooth surfaces n= 0.011 P2= 3.34"
0.4	105	0.0500	4.54		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
1.4	205	Total			

Subcatchment 19S: PDA 1B Imperv.



Summary for Subcatchment 21S: PDA 1C Perv.

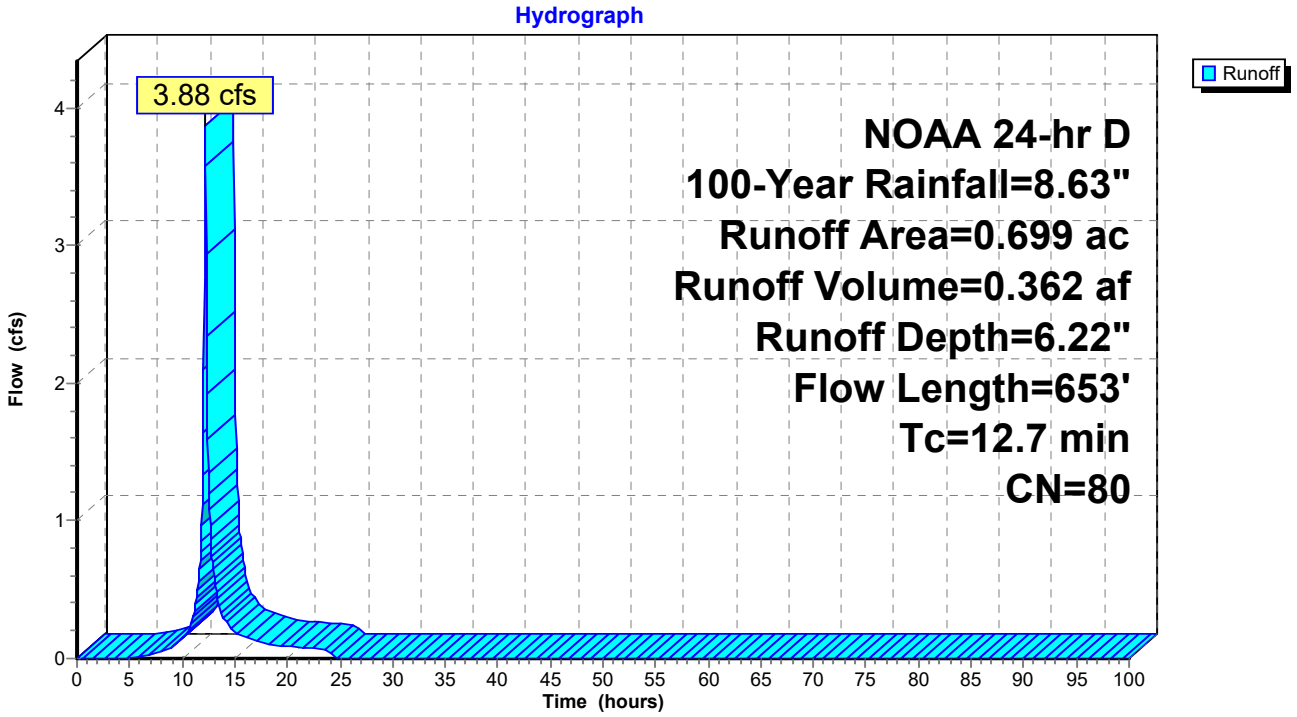
Runoff = 3.88 cfs @ 12.20 hrs, Volume= 0.362 af, Depth= 6.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.093	77	Woods, Good, HSG D
0.606	80	>75% Grass cover, Good, HSG D
0.699	80	Weighted Average
0.699		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	100	0.0050	0.81		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 21S: PDA 1C Perv.



Summary for Subcatchment 22S: PDA 1C Imperv.

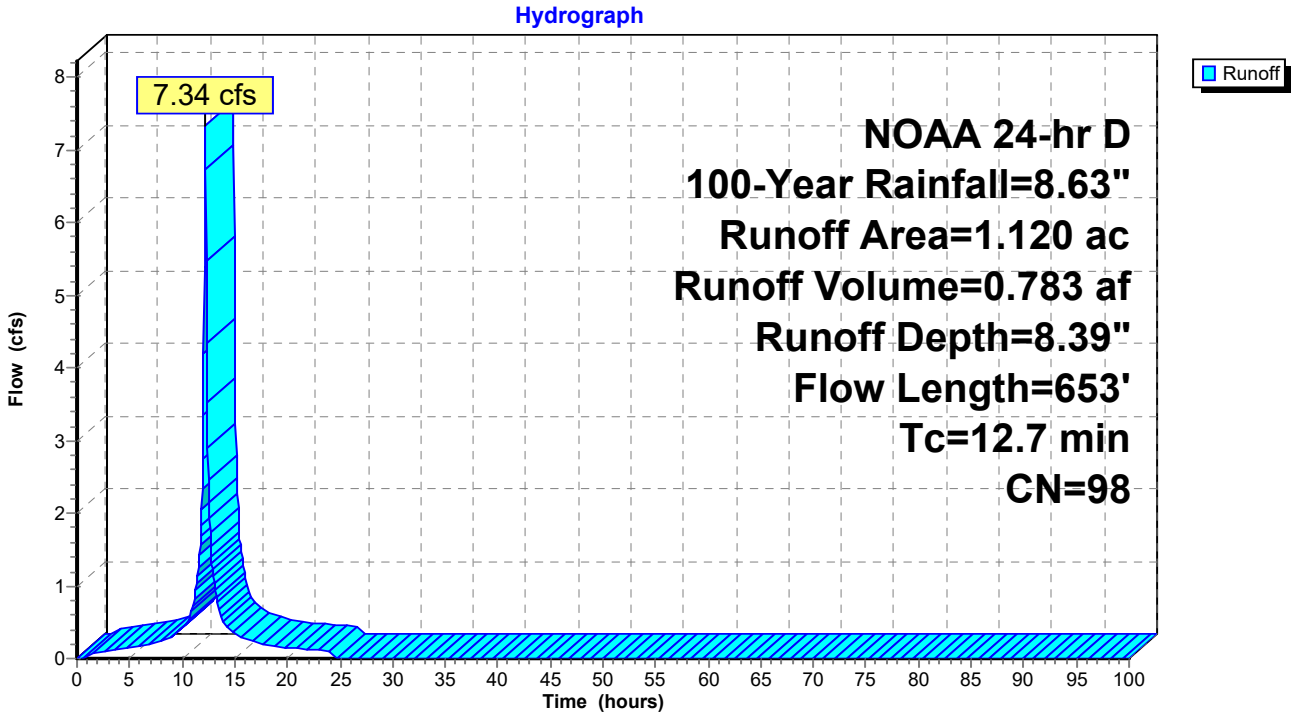
Runoff = 7.34 cfs @ 12.20 hrs, Volume= 0.783 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.120	98	Paved parking, HSG D
1.120		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.1	93	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.6	78	0.0099	2.02		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
2.9	108	0.0055	0.62	0.06	**Channel Flow, D-E** Area= 0.1 sf Perim= 5.0' r= 0.02' n= 0.013 Asphalt, smooth
0.2	16	0.0500	1.57		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
5.6	246	0.0110	0.73		**Shallow Concentrated Flow, F-G** Short Grass Pasture Kv= 7.0 fps
0.2	12	0.0220	1.04		**Shallow Concentrated Flow, G-H** Short Grass Pasture Kv= 7.0 fps
12.7	653	Total			

Subcatchment 22S: PDA 1C Imperv.



Summary for Subcatchment 26S: IDA 7 Perv

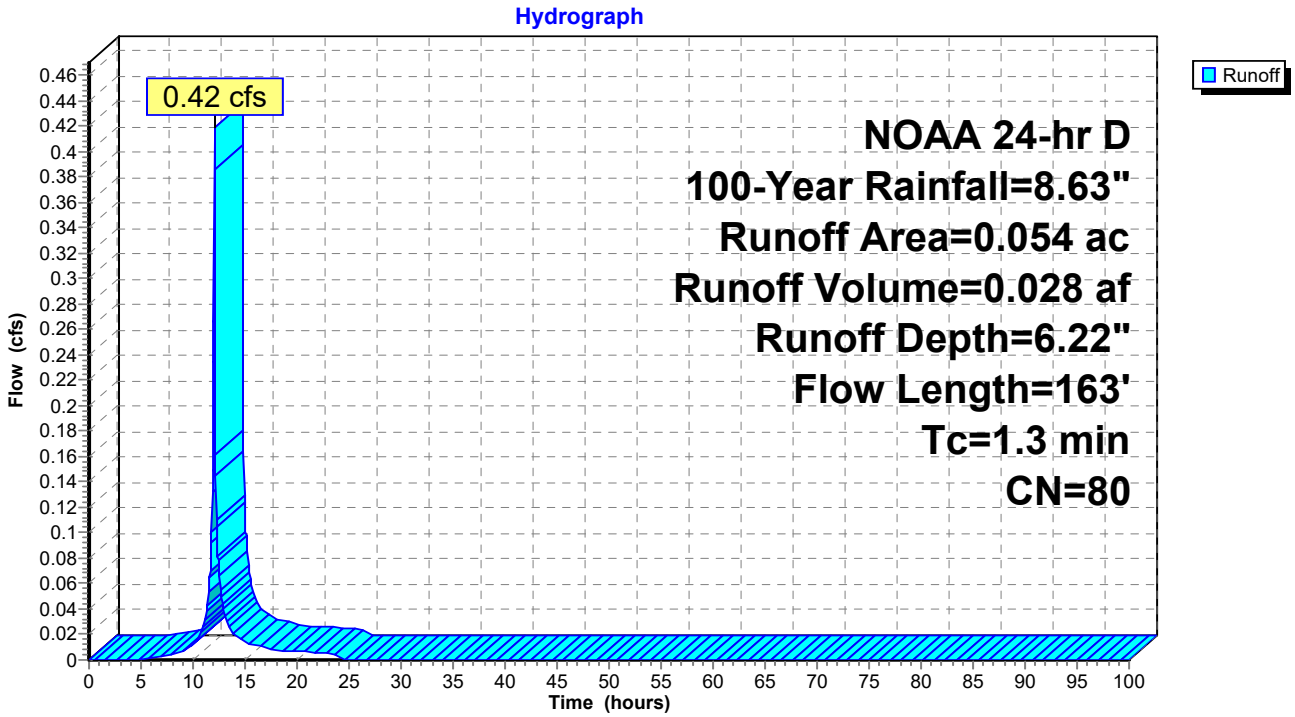
Runoff = 0.42 cfs @ 12.07 hrs, Volume= 0.028 af, Depth= 6.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.054	80	>75% Grass cover, Good, HSG D
0.000	74	>75% Grass cover, Good, HSG C
0.054	80	Weighted Average
0.054		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 26S: IDA 7 Perv



Summary for Subcatchment 27S: IDA 7 Imp.

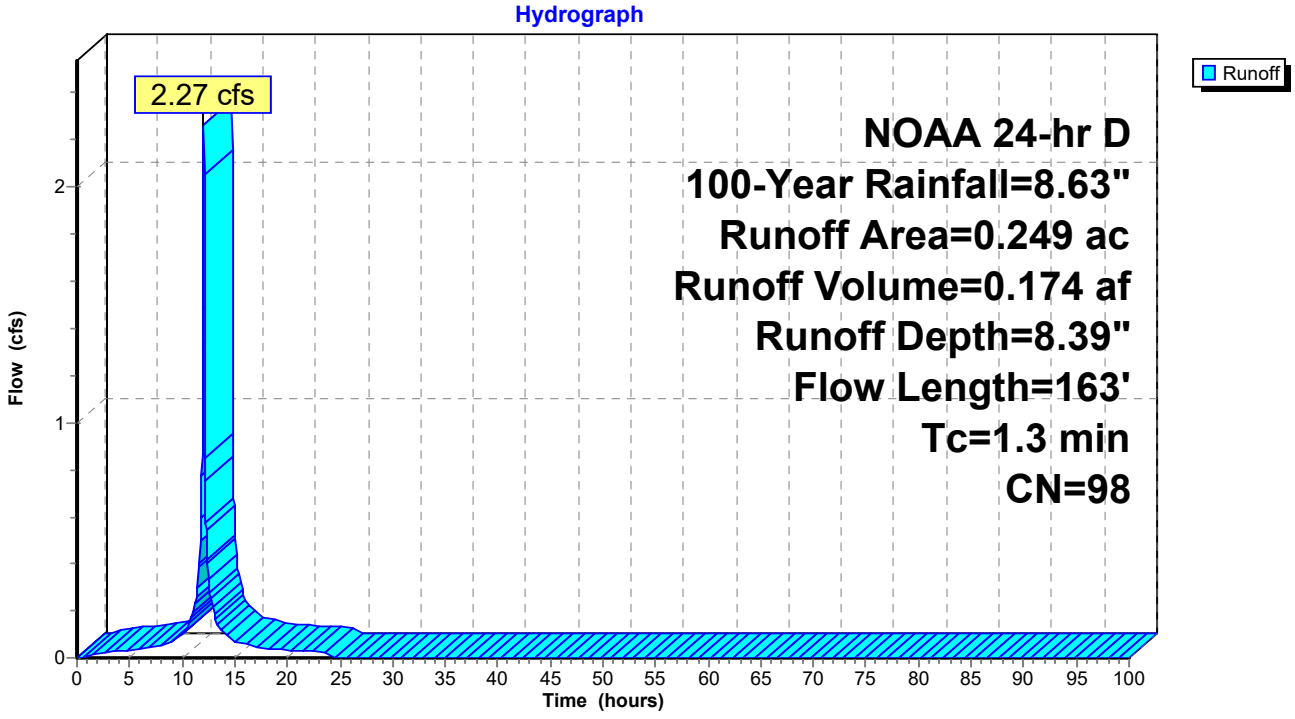
Runoff = 2.27 cfs @ 12.07 hrs, Volume= 0.174 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.249	98	Paved parking, HSG D
0.249		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	34	0.0200	1.13		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	102	0.0186	2.77		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	27	0.0100	2.46	0.25	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
1.3	163	Total			

Subcatchment 27S: IDA 7 Imp.



Summary for Subcatchment 29S: IDA 6 Imp.

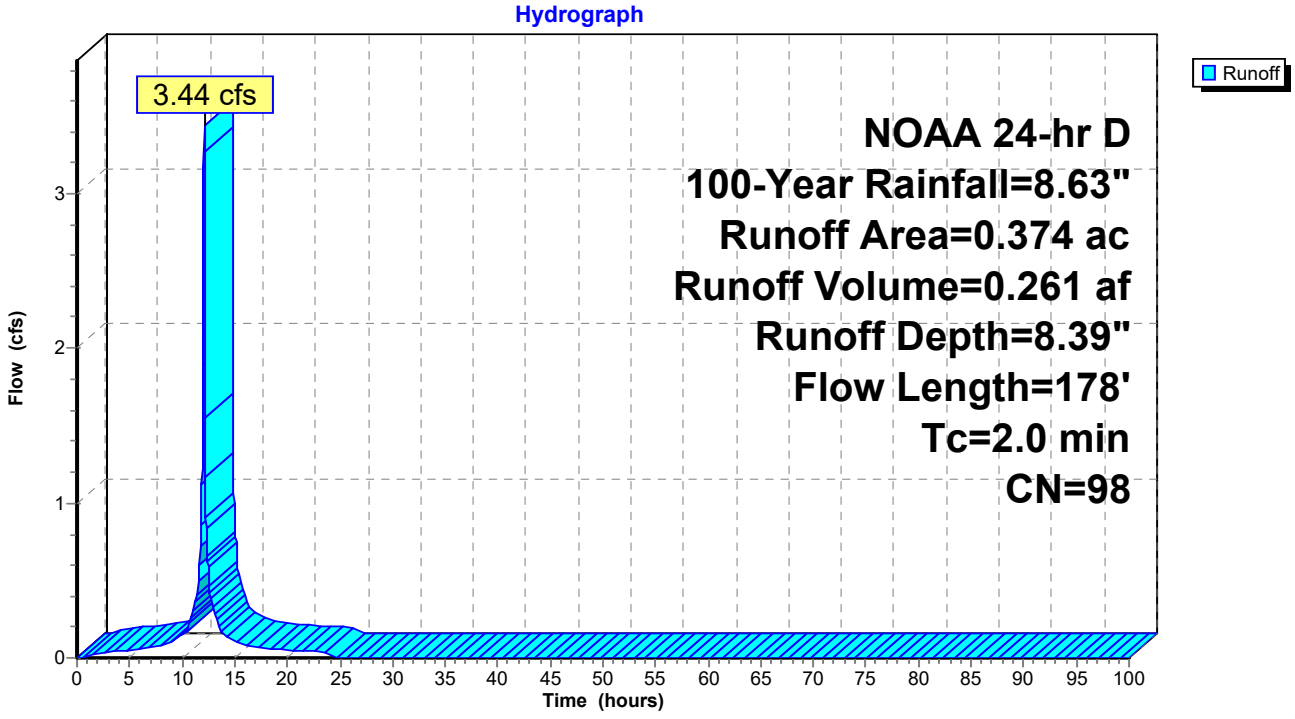
Runoff = 3.44 cfs @ 12.08 hrs, Volume= 0.261 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.374	98	Paved parking, HSG D
0.374		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	100	0.0100	1.07		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.2	48	0.0290	3.46		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.2	30	0.0075	2.13	0.21	**Channel Flow, C-D** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
2.0	178	Total			

Subcatchment 29S: IDA 6 Imp.



Summary for Subcatchment 31S: IDA 5 Perv

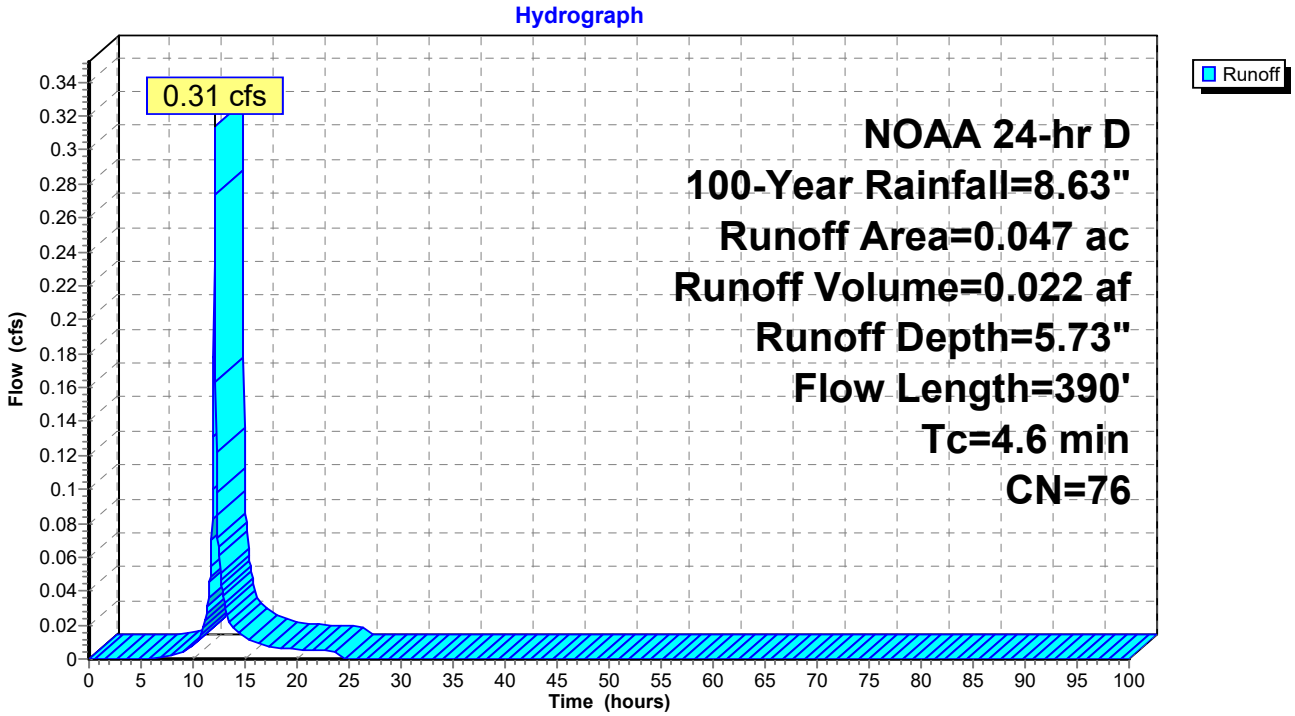
Runoff = 0.31 cfs @ 12.11 hrs, Volume= 0.022 af, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.014	80	>75% Grass cover, Good, HSG D
0.033	74	>75% Grass cover, Good, HSG C
0.047	76	Weighted Average
0.047		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 31S: IDA 5 Perv



Summary for Subcatchment 32S: IDA 5 Imp.

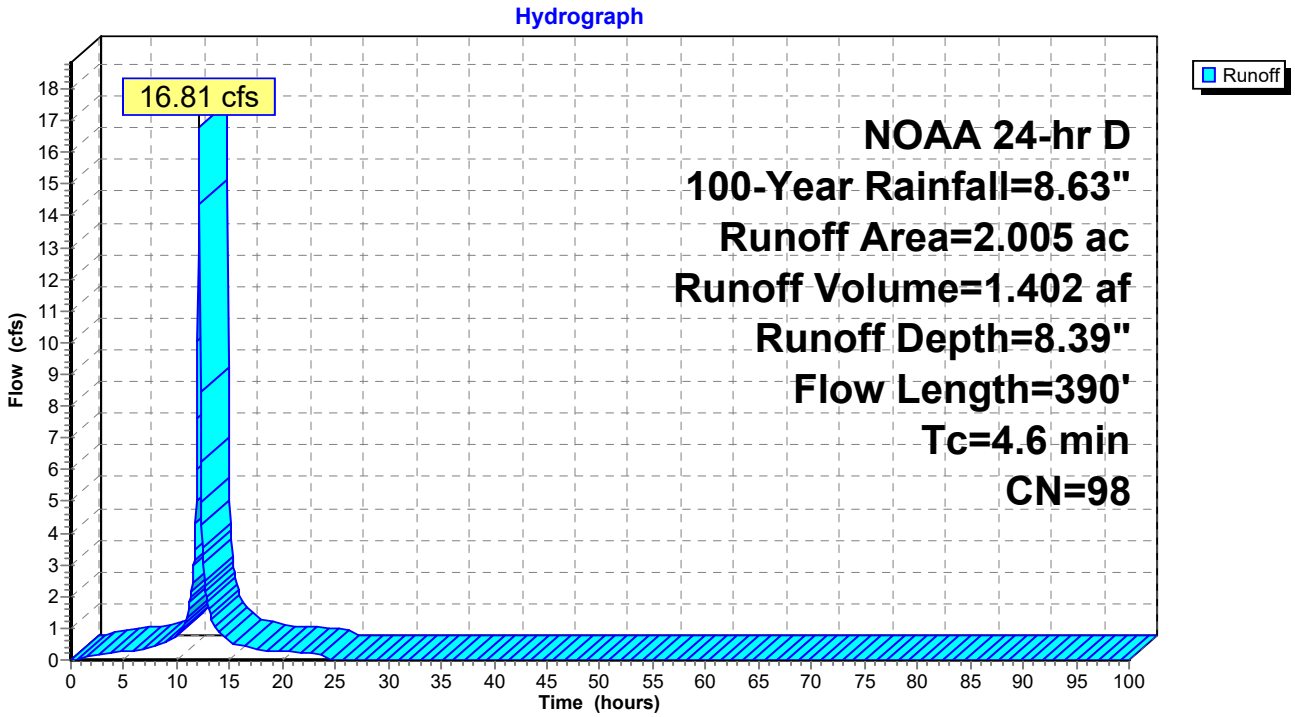
Runoff = 16.81 cfs @ 12.11 hrs, Volume= 1.402 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
2.005	98	Paved parking, HSG D
2.005		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	60	0.0050	0.73		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
0.6	40	0.0155	1.06		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
1.8	182	0.0070	1.70		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
0.8	108	0.0075	2.13	0.21	**Channel Flow, D-E** Area= 0.1 sf Perim= 1.0' r= 0.10' n= 0.013 Asphalt, smooth
4.6	390	Total			

Subcatchment 32S: IDA 5 Imp.



Summary for Subcatchment 33S: Building to Perv. Pavement

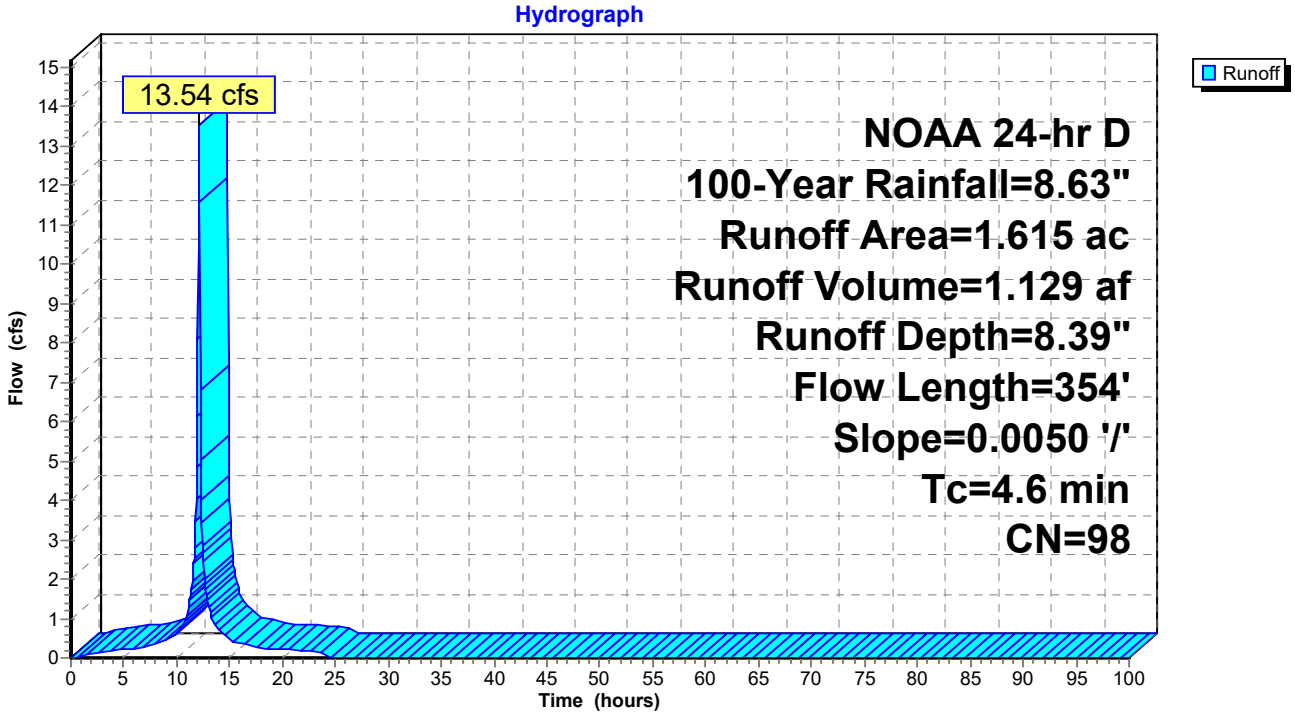
Runoff = 13.54 cfs @ 12.11 hrs, Volume= 1.129 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.615	98	Paved parking, HSG D
1.615		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
2.1	179	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
0.4	75	0.0050	3.21	2.52	**Pipe Channel, RCP_Round 12"** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
4.6	354	Total			

Subcatchment 33S: Building to Perv. Pavement



Summary for Subcatchment 35S: Building Bypass

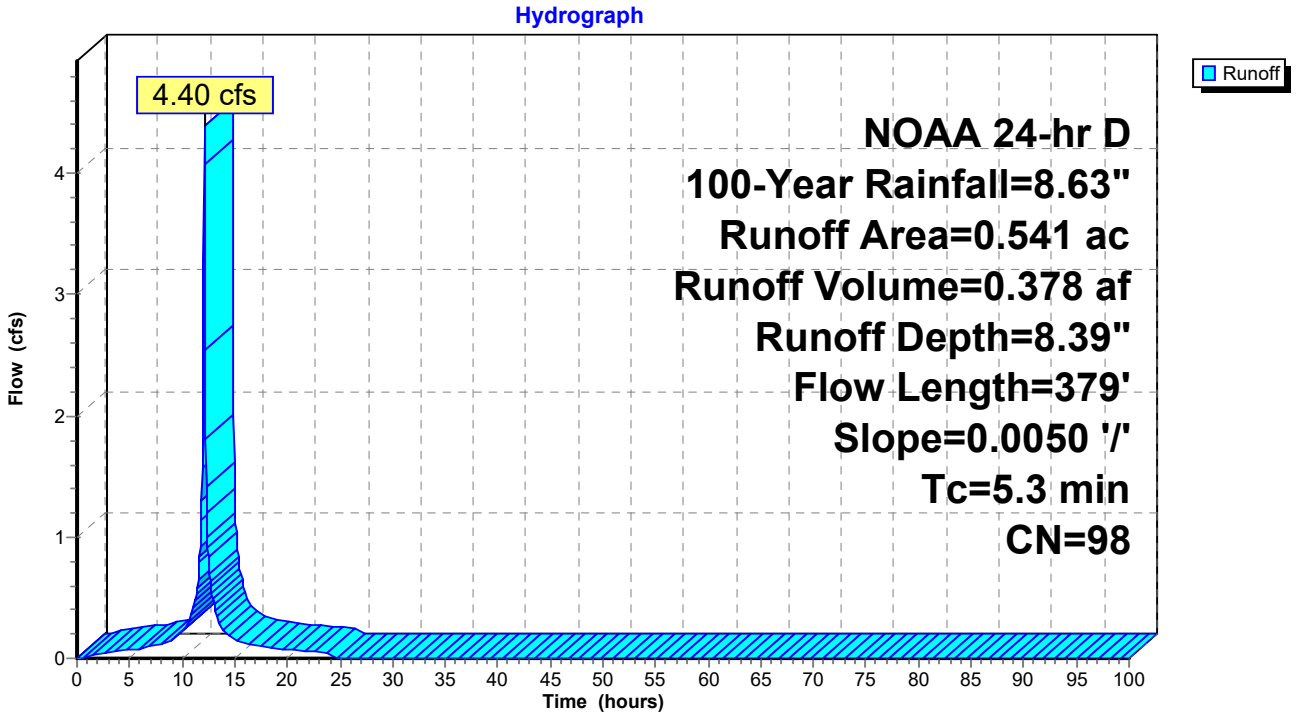
Runoff = 4.40 cfs @ 12.11 hrs, Volume= 0.378 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.541	98	Paved parking, HSG D
0.541		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= 3.34"
3.2	279	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.3	379	Total			

Subcatchment 35S: Building Bypass



Summary for Subcatchment 37S: Building to Bioretention

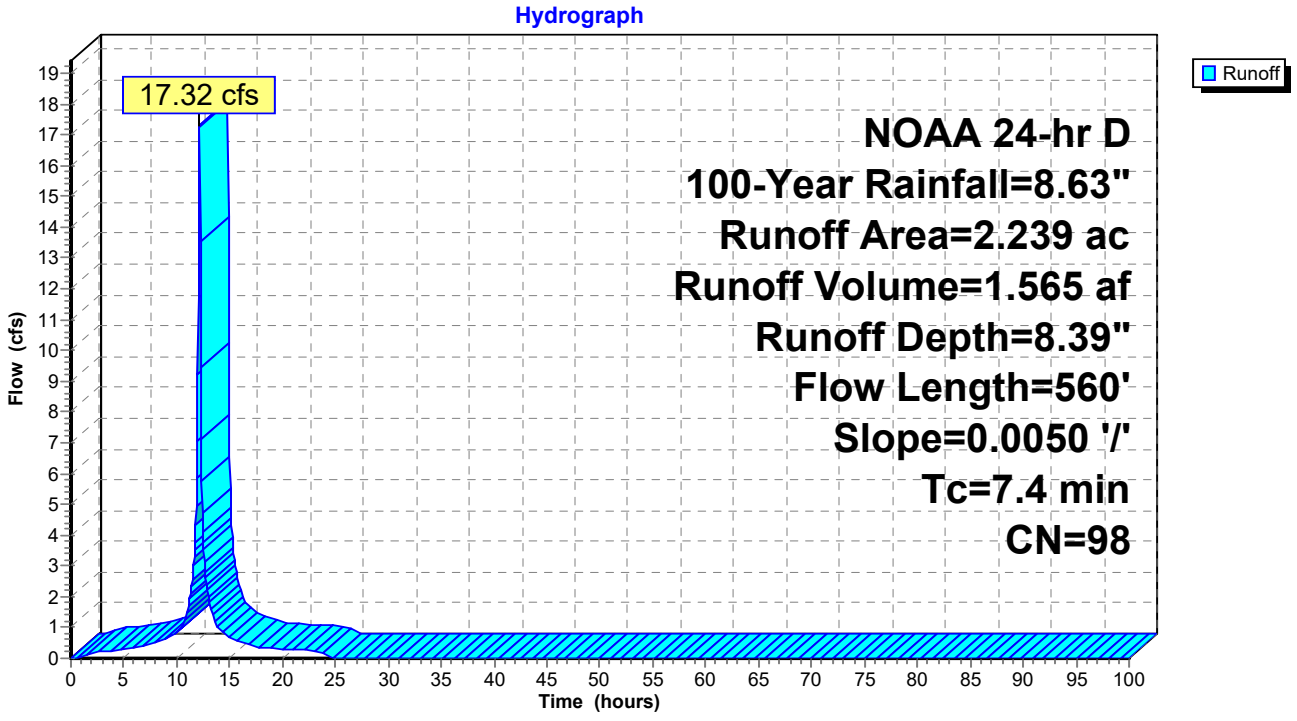
Runoff = 17.32 cfs @ 12.14 hrs, Volume= 1.565 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
2.239	98	Paved parking, HSG D
2.239		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, A-B** Smooth surfaces n= 0.011 P2= 3.34"
5.3	460	0.0050	1.44		**Shallow Concentrated Flow, B-C** Paved Kv= 20.3 fps
7.4	560	Total			

Subcatchment 37S: Building to Bioretention



Summary for Subcatchment 40S: PDA 2A Remain Perv.

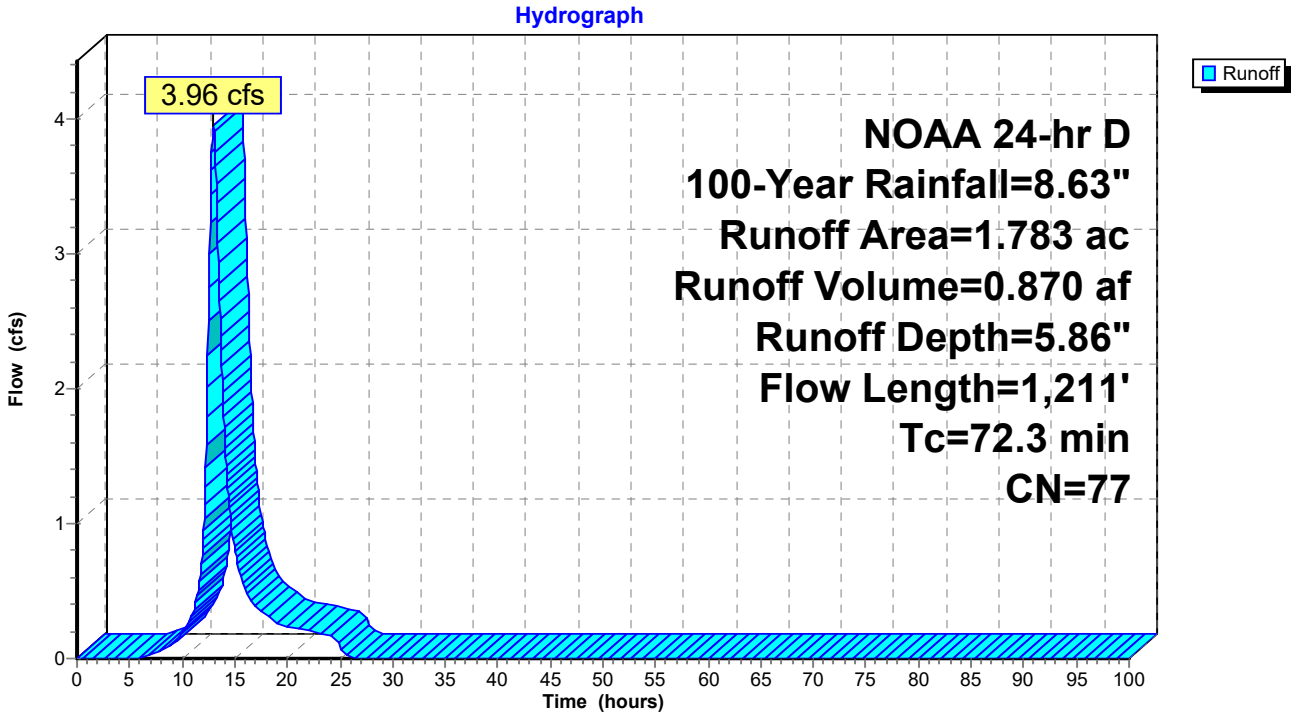
Runoff = 3.96 cfs @ 12.96 hrs, Volume= 0.870 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.000	77	Woods, Good, HSG D
0.109	70	Woods, Good, HSG C
1.103	80	>75% Grass cover, Good, HSG D
0.571	74	>75% Grass cover, Good, HSG C
1.783	77	Weighted Average
1.783		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.4174	0.22		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
1.2	65	0.0077	0.88		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.34"
7.1	268	0.0080	0.63		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
14.6	361	0.0068	0.41		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, F-G** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
72.3	1,211	Total			

Subcatchment 40S: PDA 2A Remain Perv.



Summary for Subcatchment 41S: PDA 2A Remain Imp.

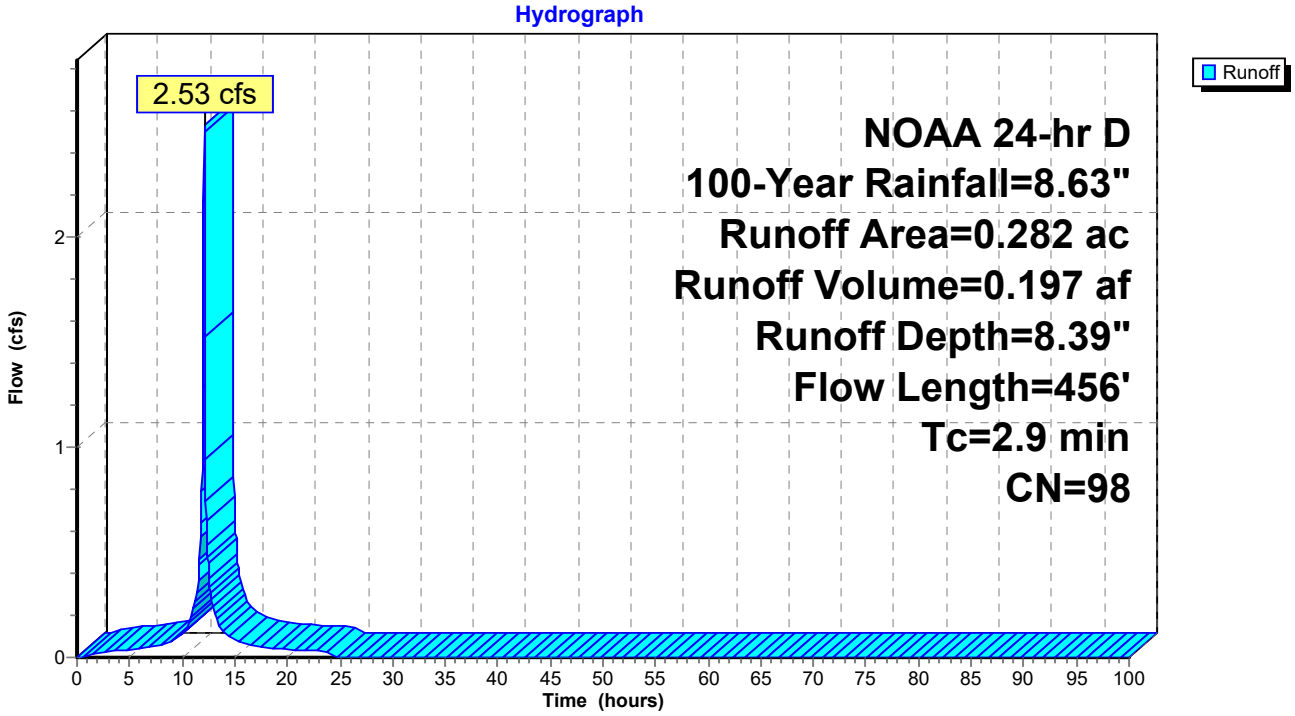
Runoff = 2.53 cfs @ 12.09 hrs, Volume= 0.197 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
0.282	98	Paved parking, HSG D
0.282		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	16	0.0200	0.97		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.34"
1.5	202	0.0100	2.18	0.22	**Channel Flow, B-C** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.013 Asphalt, smooth
1.1	238	0.0050	3.72	4.57	**Pipe Channel, C-D** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.9	456	Total			

Subcatchment 41S: PDA 2A Remain Imp.



Summary for Subcatchment 44S: PDA 2B Perv.

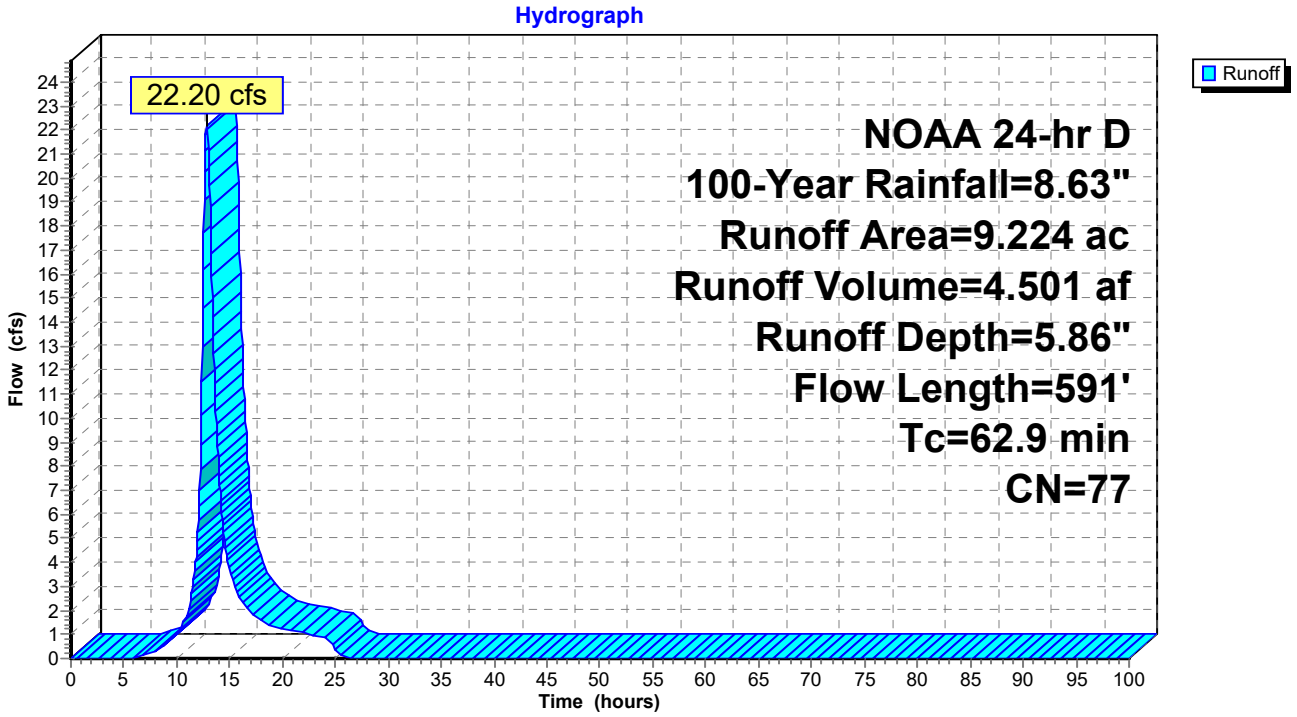
Runoff = 22.20 cfs @ 12.84 hrs, Volume= 4.501 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
5.537	77	Woods, Good, HSG D
0.762	70	Woods, Good, HSG C
2.794	80	>75% Grass cover, Good, HSG D
0.131	74	>75% Grass cover, Good, HSG C
9.224	77	Weighted Average
9.224		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 44S: PDA 2B Perv.



Summary for Subcatchment 45S: PDA 2B Imperv.

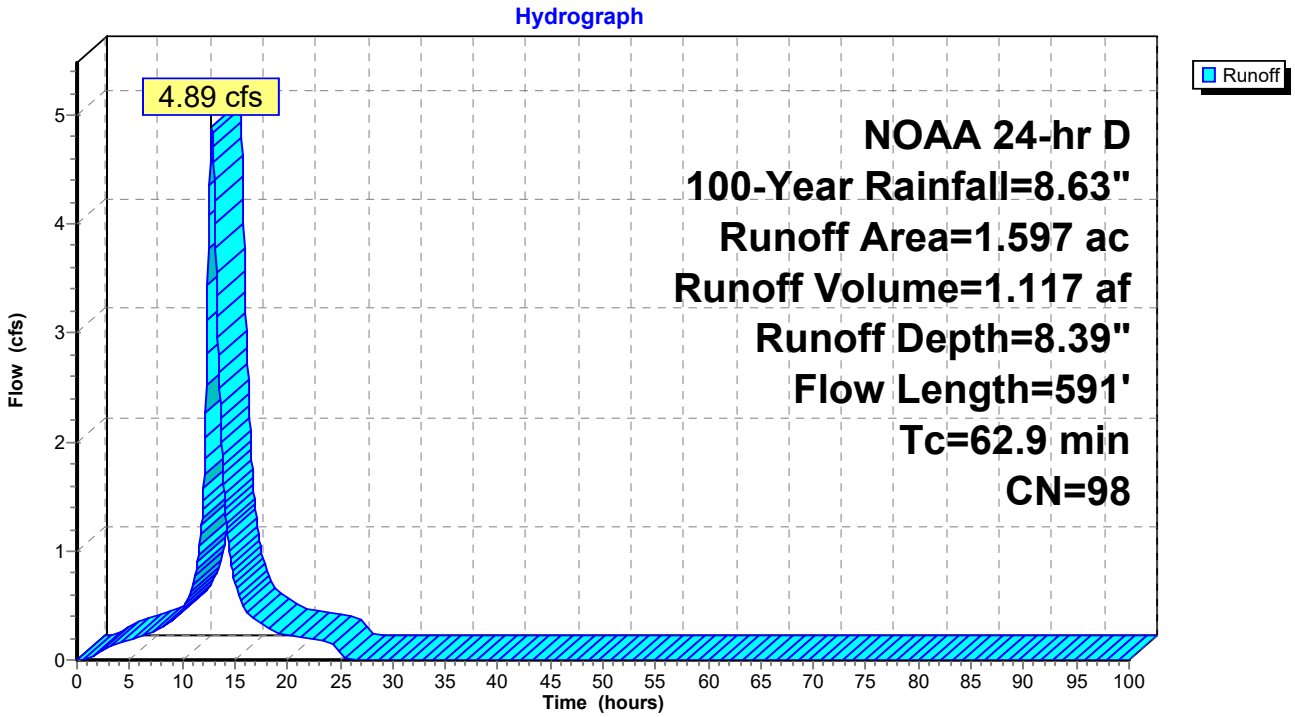
Runoff = 4.89 cfs @ 12.81 hrs, Volume= 1.117 af, Depth= 8.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
NOAA 24-hr D 100-Year Rainfall=8.63"

Area (ac)	CN	Description
1.597	98	Paved parking, HSG D
1.597		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.10		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.34"
0.3	9	0.0100	0.50		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
46.6	419	0.0009	0.15		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
0.1	63	0.0190	11.73	36.85	**Pipe Channel, D-E** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
62.9	591	Total			

Subcatchment 45S: PDA 2B Imperv.



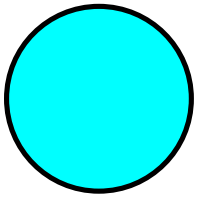
Summary for Reach 36R: Outlet Pipe

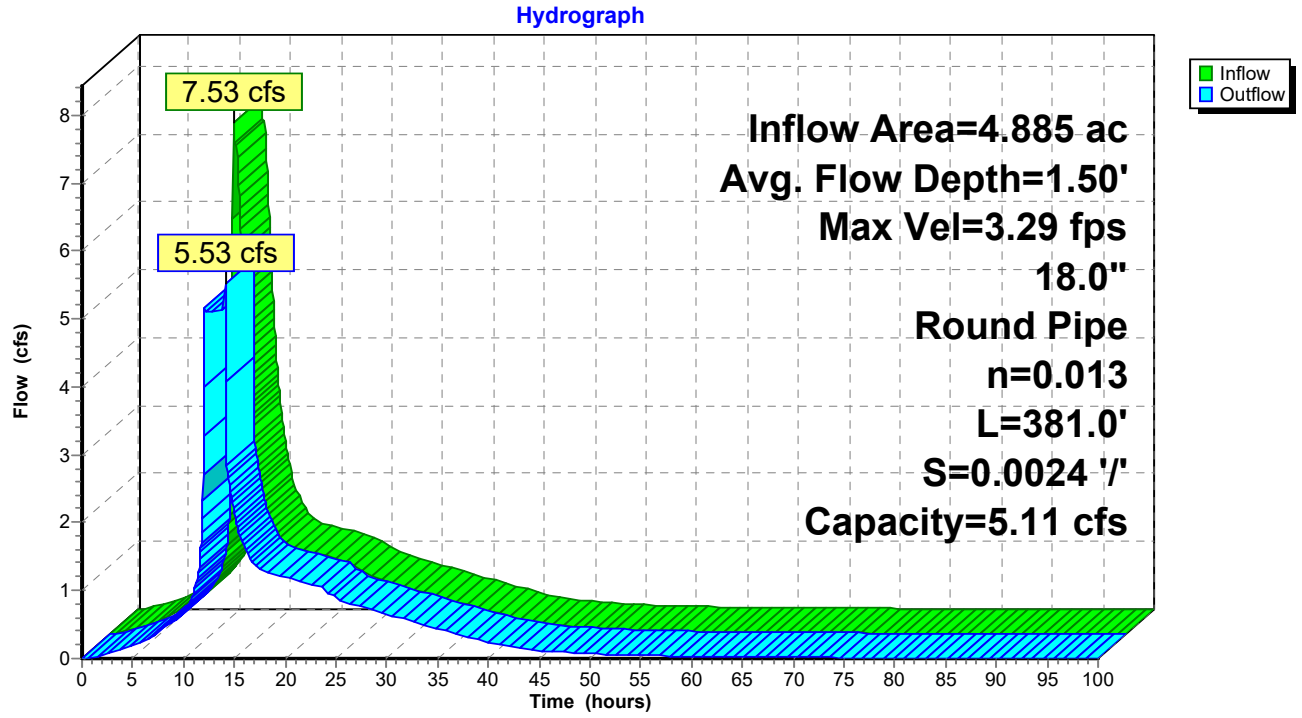
Inflow Area = 4.885 ac, 97.93% Impervious, Inflow Depth > 8.29" for 100-Year event
Inflow = 7.53 cfs @ 12.17 hrs, Volume= 3.374 af
Outflow = 5.53 cfs @ 14.14 hrs, Volume= 3.374 af, Atten= 27%, Lag= 118.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.29 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 5.2 min

Peak Storage= 673 cf @ 12.15 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.11 cfs

18.0" Round Pipe
n= 0.013 Concrete pipe, bends & connections
Length= 381.0' Slope= 0.0024 '/'
Inlet Invert= 110.60', Outlet Invert= 109.70'





Summary for Pond 20P: Pervious Pavement Front Parking Lot OCS 4

Inflow Area = 1.346 ac, 93.98% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 12.12 cfs @ 12.07 hrs, Volume= 0.926 af
Outflow = 1.74 cfs @ 12.54 hrs, Volume= 0.926 af, Atten= 86%, Lag= 28.4 min
Primary = 1.74 cfs @ 12.54 hrs, Volume= 0.926 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 111.93' @ 12.54 hrs Surf.Area= 26,712 sf Storage= 15,831 cf

Plug-Flow detention time= 155.1 min calculated for 0.926 af (100% of inflow)
Center-of-Mass det. time= 154.8 min (894.5 - 739.8)

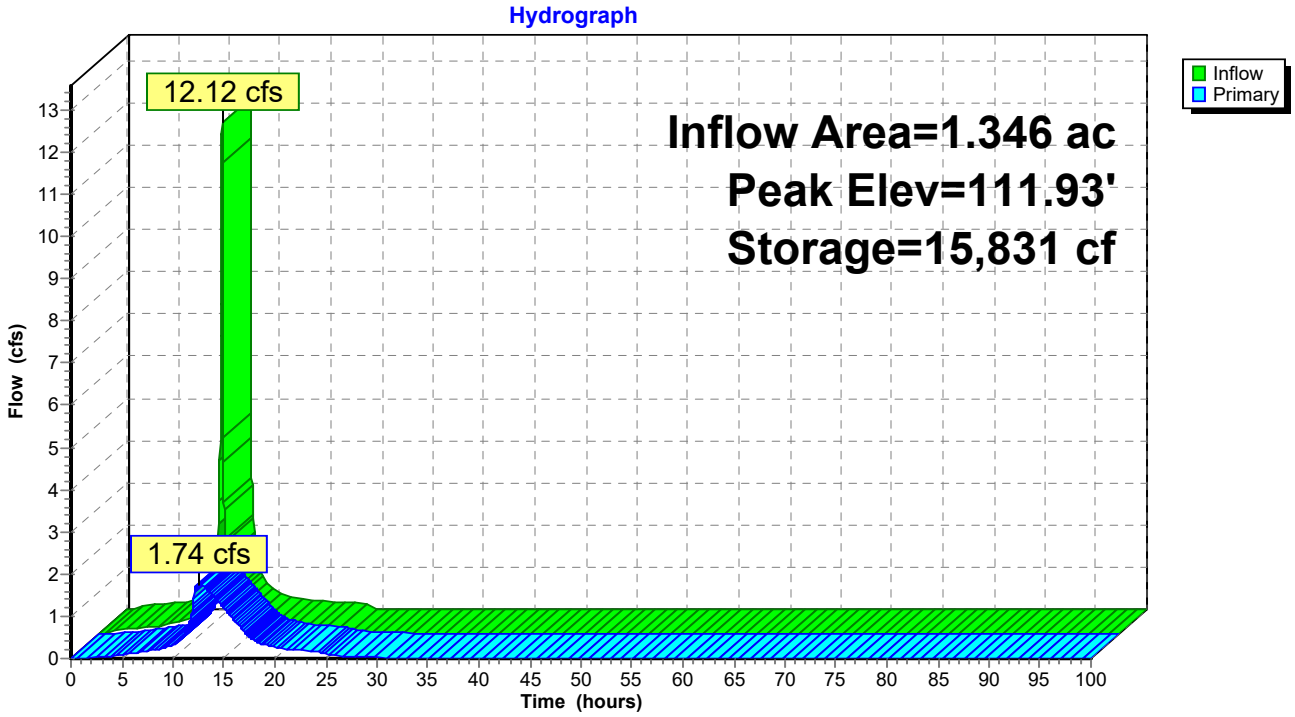
Volume	Invert	Avail.Storage	Storage Description
#1	110.50'	20,272 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 51,821 cf Overall - 1,140 cf Embedded = 50,681 cf x 40.0% Voids
#2	110.75'	425 cf	**15.0" Round Pipe Storage** Inside #1 L= 346.0' S= 0.0010 '/'
#3	110.76'	463 cf	**15.0" Round Pipe Storage** Inside #1 L= 377.0' S= 0.0010 '/'
#4	110.95'	189 cf	**15.0" Round Pipe Storage** Inside #1 L= 154.0' S= 0.0010 '/'
#5	110.81'	64 cf	**15.0" Round Pipe Storage** Inside #1 L= 52.0' S= 0.0010 '/'
		21,413 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
110.50	26,712	0	0
112.44	26,712	51,821	51,821

Device	Routing	Invert	Outlet Devices
#1	Primary	108.22'	**15.0" Round Culvert** L= 11.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 108.22' / 108.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	110.50'	**8.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#3	Primary	111.21'	**6.0" Vert. Orifice/Grate X 0.00** C= 0.600

Primary OutFlow Max=1.74 cfs @ 12.54 hrs HW=111.93' TW=109.74' (Dynamic Tailwater)
- **1=Culvert** (Passes 1.74 cfs of 7.71 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 1.74 cfs @ 5.22 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)

Pond 20P: Pervious Pavement Front Parking Lot OCS 4



Summary for Pond 24P: Modified Depression

Inflow Area = 3.165 ac, 75.36% Impervious, Inflow Depth = 7.85" for 100-Year event
Inflow = 12.88 cfs @ 12.20 hrs, Volume= 2.071 af
Outflow = 7.42 cfs @ 12.39 hrs, Volume= 2.071 af, Atten= 42%, Lag= 11.4 min
Primary = 7.42 cfs @ 12.39 hrs, Volume= 2.071 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 109.87' @ 12.39 hrs Surf.Area= 5,289 sf Storage= 8,712 cf

Plug-Flow detention time= 15.1 min calculated for 2.071 af (100% of inflow)
Center-of-Mass det. time= 15.1 min (839.7 - 824.6)

Volume	Invert	Avail.Storage	Storage Description
#1	107.60'	12,350 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

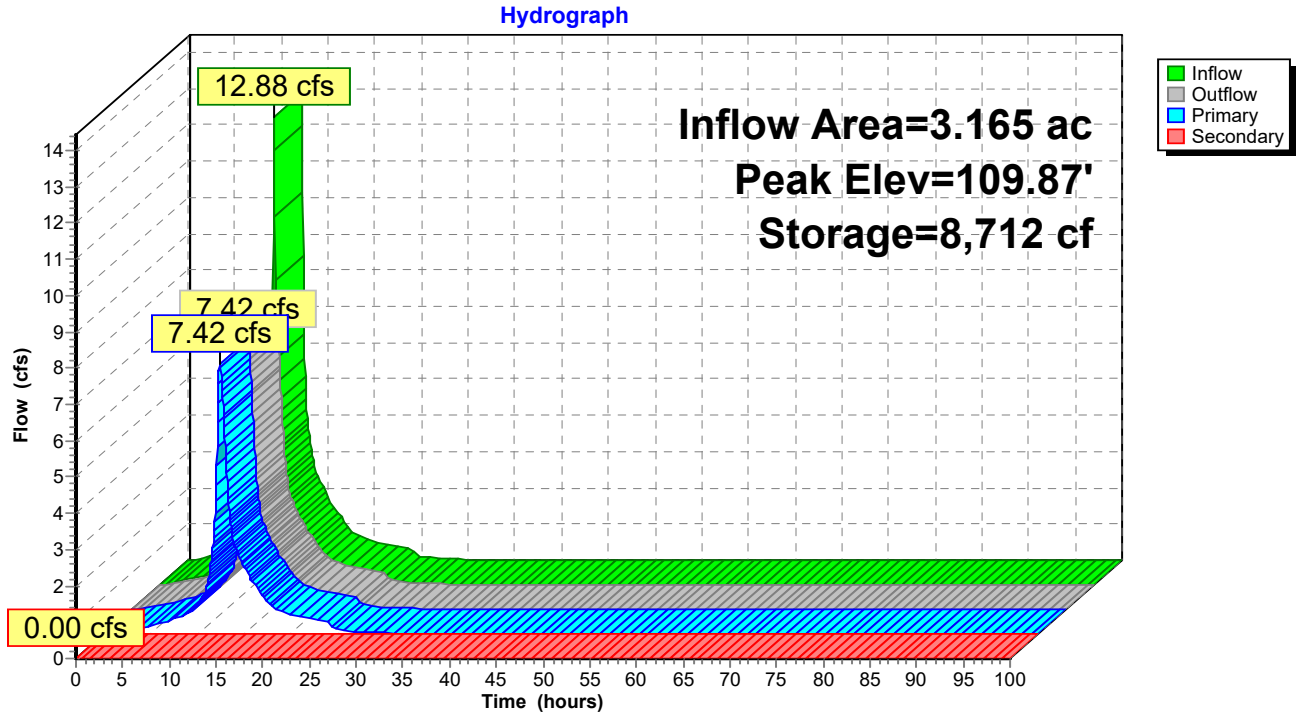
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
107.60	10	0	0
108.00	3,235	649	649
109.00	4,443	3,839	4,488
110.00	5,417	4,930	9,418
110.50	6,311	2,932	12,350

Device	Routing	Invert	Outlet Devices
#1	Primary	107.60'	**15.0" Round Culvert** L= 81.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 107.60' / 107.00' S= 0.0074 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.23 sf
#2	Secondary	110.43'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.41 cfs @ 12.39 hrs HW=109.87' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 7.41 cfs @ 6.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=107.60' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 24P: Modified Depression



Summary for Pond 28P: Pervious Pavement Right Parking Area OCS 3

Inflow Area = 0.303 ac, 82.18% Impervious, Inflow Depth = 8.00" for 100-Year event
Inflow = 2.68 cfs @ 12.07 hrs, Volume= 0.202 af
Outflow = 0.09 cfs @ 14.72 hrs, Volume= 0.191 af, Atten= 96%, Lag= 159.3 min
Primary = 0.09 cfs @ 14.72 hrs, Volume= 0.191 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.44' @ 14.72 hrs Surf.Area= 34,390 sf Storage= 6,027 cf

Plug-Flow detention time= 960.5 min calculated for 0.191 af (95% of inflow)
Center-of-Mass det. time= 928.2 min (1,673.9 - 745.8)

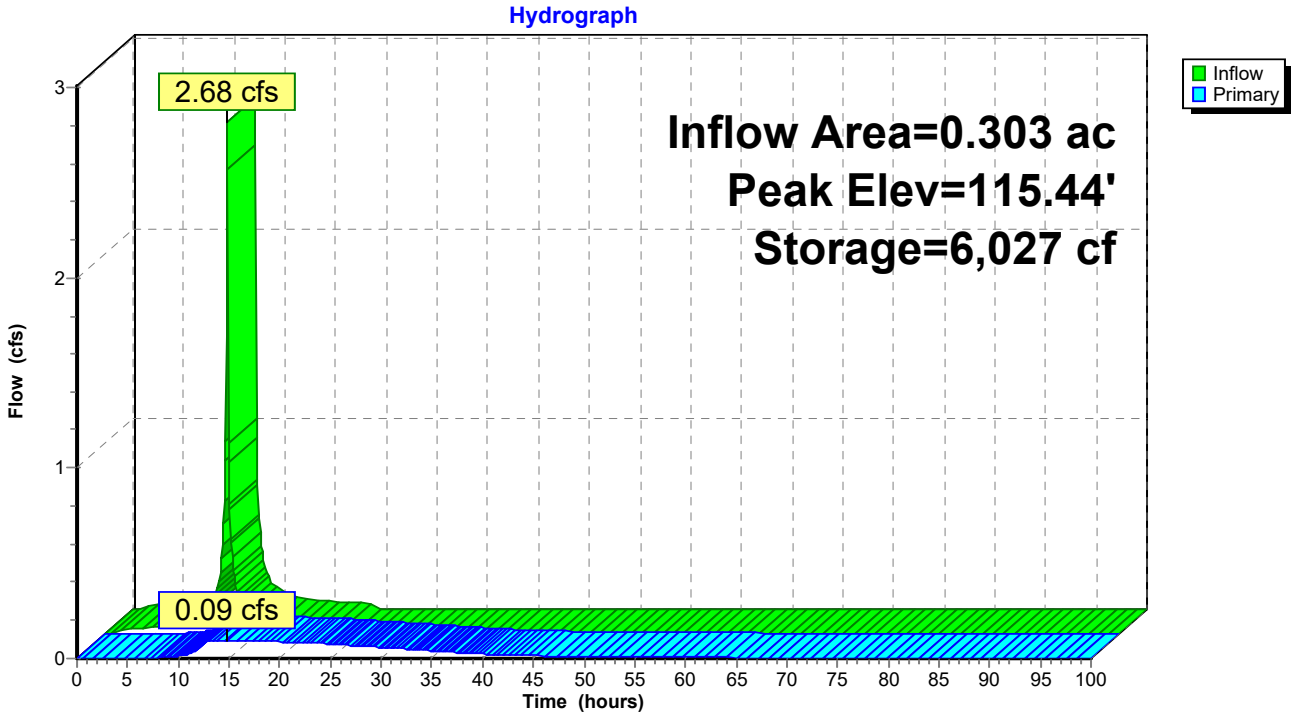
Volume	Invert	Avail.Storage	Storage Description
#1	115.00'	39,440 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 99,043 cf Overall - 444 cf Embedded = 98,599 cf x 40.0% Voids
#2	115.25'	185 cf	**15.0" Round Pipe Storage** Inside #1 L= 151.0' S= 0.0010 '/'
#3	115.25'	259 cf	**15.0" Round Pipe Storage** Inside #1 L= 211.0' S= 0.0010 '/'
		39,884 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
115.00	34,390	0	0
117.88	34,390	99,043	99,043

Device	Routing	Invert	Outlet Devices
#1	Primary	115.00'	**15.0" Round Culvert** L= 775.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 115.00' / 114.22' S= 0.0010 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	115.00'	**2.5" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.09 cfs @ 14.72 hrs HW=115.44' TW=111.31' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.09 cfs of 0.32 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.09 cfs @ 2.78 fps)

Pond 28P: Pervious Pavement Right Parking Area OCS 3



Summary for Pond 30P: Pervious Pavement Rear Trailer Area OCS 2

Inflow Area = 0.374 ac,100.00% Impervious, Inflow Depth = 8.39" for 100-Year event
Inflow = 3.44 cfs @ 12.08 hrs, Volume= 0.261 af
Outflow = 0.17 cfs @ 13.67 hrs, Volume= 0.260 af, Atten= 95%, Lag= 95.5 min
Primary = 0.17 cfs @ 13.67 hrs, Volume= 0.260 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 113.71' @ 13.67 hrs Surf.Area= 13,334 sf Storage= 6,564 cf

Plug-Flow detention time= 513.6 min calculated for 0.260 af (99% of inflow)
Center-of-Mass det. time= 512.1 min (1,249.5 - 737.3)

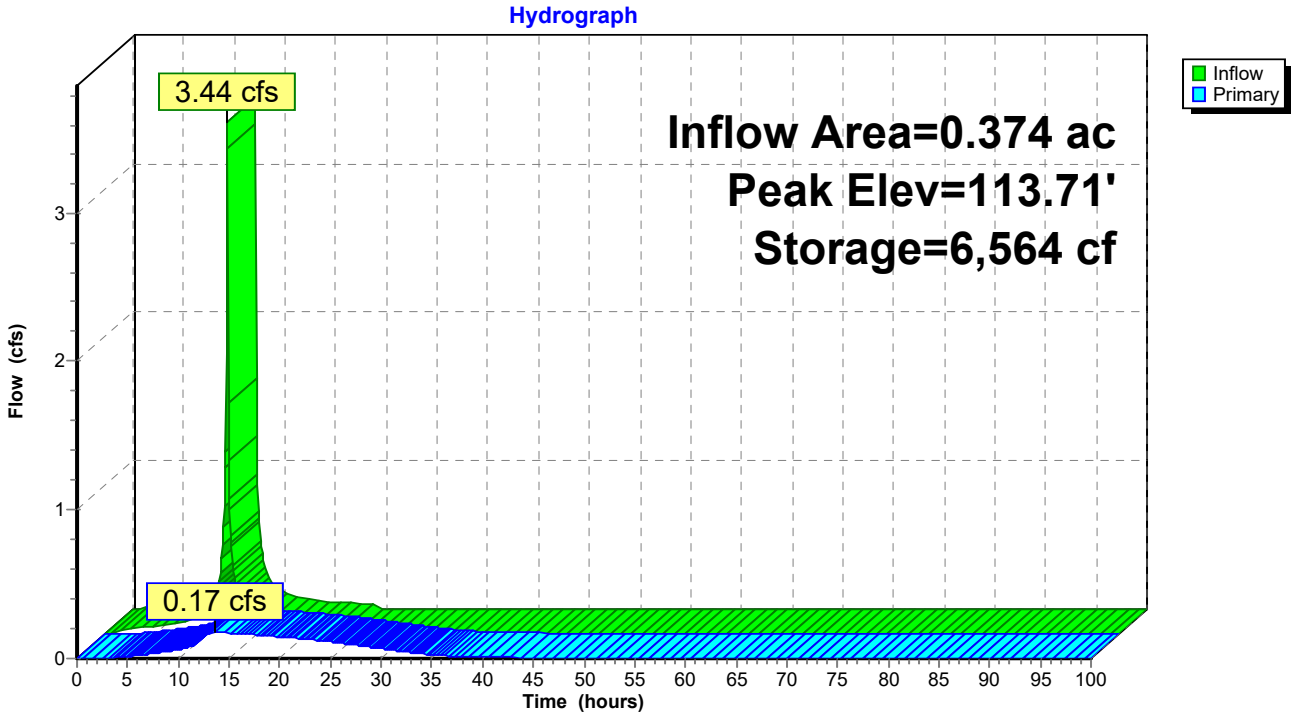
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	9,791 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 24,668 cf Overall - 191 cf Embedded = 24,476 cf x 40.0% Voids
#2	112.75'	191 cf	**15.0" Round Pipe Storage** Inside #1 L= 156.0' S= 0.0010 '/'
		9,982 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	13,334	0	0
114.35	13,334	24,668	24,668

Device	Routing	Invert	Outlet Devices
#1	Primary	110.67'	**15.0" Round Culvert** L= 36.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.67' / 110.63' S= 0.0011 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	112.50'	**2.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.75'	**0.5' long Sharp-Crested Rectangular Weir X 0.00** 2 End Contraction(s)

Primary OutFlow Max=0.17 cfs @ 13.67 hrs HW=113.71' TW=112.10' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.17 cfs of 6.62 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.17 cfs @ 5.07 fps)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: Pervious Pavement Rear Trailer Area OCS 2



Summary for Pond 34P: Pervious Pavement Loading Area OCS 1

Inflow Area = 3.667 ac, 98.72% Impervious, Inflow Depth = 8.36" for 100-Year event
Inflow = 30.66 cfs @ 12.11 hrs, Volume= 2.553 af
Outflow = 5.95 cfs @ 12.47 hrs, Volume= 2.544 af, Atten= 81%, Lag= 22.0 min
Primary = 5.95 cfs @ 12.47 hrs, Volume= 2.544 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.38' @ 12.47 hrs Surf.Area= 48,644 sf Storage= 56,899 cf

Plug-Flow detention time= 516.9 min calculated for 2.543 af (100% of inflow)
Center-of-Mass det. time= 516.3 min (1,256.7 - 740.4)

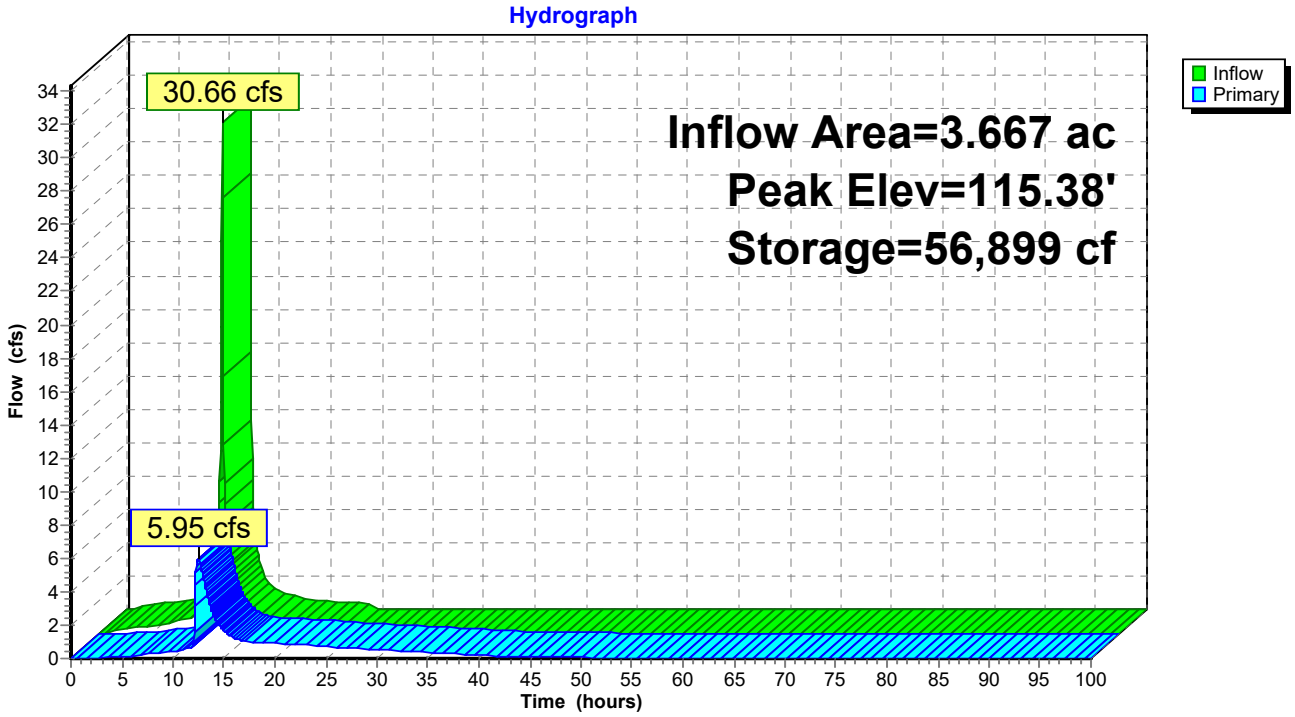
Volume	Invert	Avail.Storage	Storage Description
#1	112.50'	58,387 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) 147,391 cf Overall - 1,424 cf Embedded = 145,968 cf x 40.0% Voids
#2	112.75'	668 cf	**15.0" Round Pipe Storage** Inside #1 L= 544.0' S= 0.0010 '/'
#3	112.75'	627 cf	**15.0" Round Pipe Storage** Inside #1 L= 511.0' S= 0.0010 '/'
#4	112.75'	129 cf	**15.0" Round Pipe Storage** Inside #1 L= 105.0' S= 0.0100 '/'
		59,811 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.50	48,644	0	0
115.53	48,644	147,391	147,391

Device	Routing	Invert	Outlet Devices
#1	Primary	110.61'	**18.0" Round Culvert** L= 1.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 110.61' / 110.61' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	112.50'	**3.5" W x 5.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	113.90'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.65'	**2.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.95 cfs @ 12.47 hrs HW=115.38' TW=112.10' (Dynamic Tailwater)
- **1=Culvert** (Passes 5.95 cfs of 13.60 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.96 cfs @ 7.87 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.19 cfs @ 5.65 fps)
  - **4=Sharp-Crested Rectangular Weir** (Weir Controls 4.80 cfs @ 2.79 fps)

Pond 34P: Pervious Pavement Loading Area OCS 1



Summary for Pond 38P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 8.39" for 100-Year event
Inflow = 17.32 cfs @ 12.14 hrs, Volume= 1.565 af
Outflow = 7.64 cfs @ 12.30 hrs, Volume= 1.566 af, Atten= 56%, Lag= 9.7 min
Primary = 7.64 cfs @ 12.30 hrs, Volume= 1.566 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.02' @ 12.30 hrs Surf.Area= 10,367 sf Storage= 24,094 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 244.2 min (986.5 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	841 cf	**18.0" Round Pipe Storage**-Impervious L= 476.0' S= 0.0030 '/'
		34,324 cf	Total Available Storage

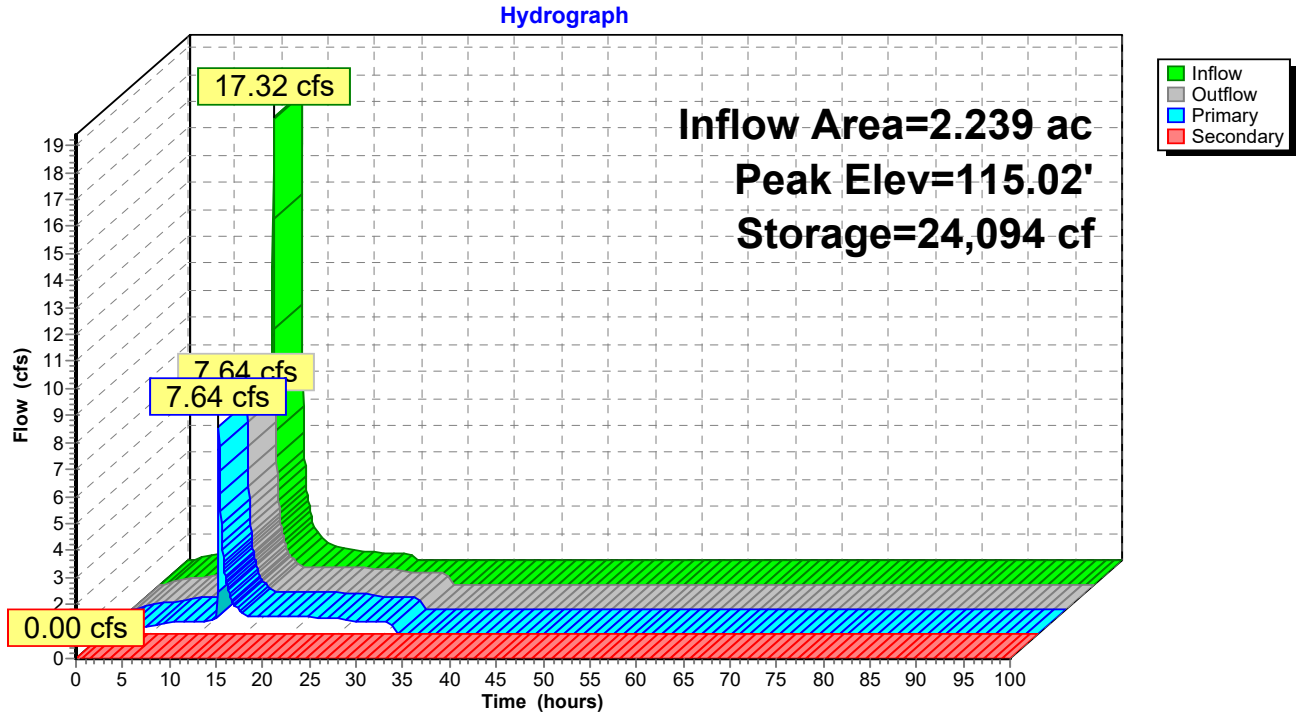
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.03'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=7.60 cfs @ 12.30 hrs HW=115.02' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 7.60 cfs of 15.67 cfs potential flow)
  - **2=Exfiltration** (Exfiltration Controls 0.48 cfs)
  - **3=Orifice/Grate** (Orifice Controls 0.21 cfs @ 6.07 fps)
  - **4=Orifice/Grate** (Weir Controls 6.91 cfs @ 1.55 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=112.75' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 38P: Bioretention

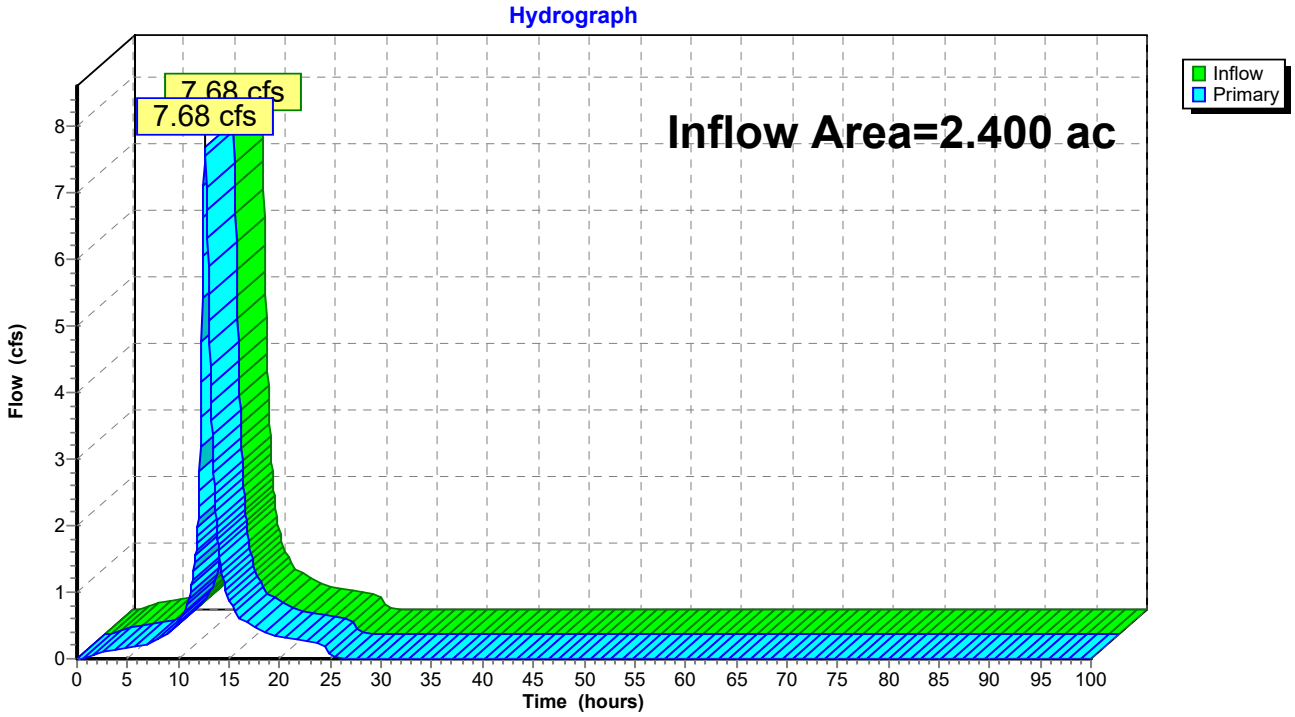


Summary for Link 17L: PDA 1A

Inflow Area = 2.400 ac, 55.42% Impervious, Inflow Depth = 7.26" for 100-Year event
Inflow = 7.68 cfs @ 12.64 hrs, Volume= 1.452 af
Primary = 7.68 cfs @ 12.64 hrs, Volume= 1.452 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 17L: PDA 1A

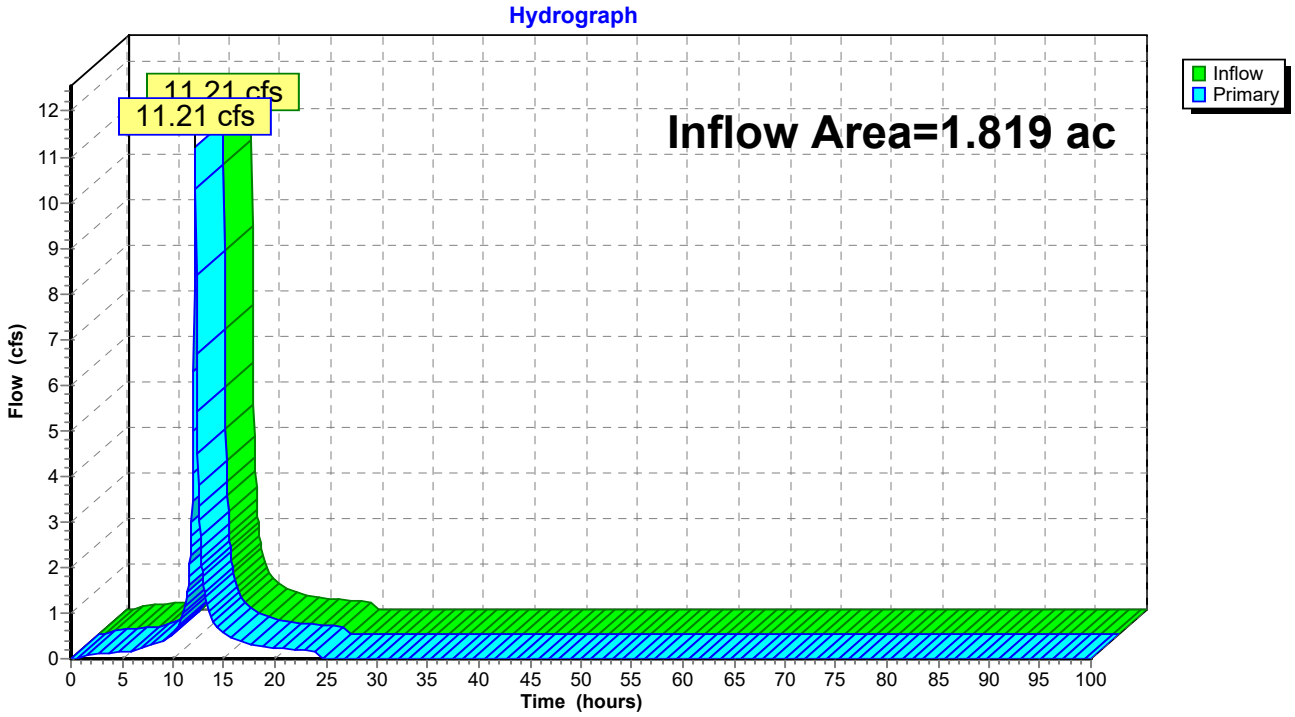


Summary for Link 23L: PDA 1C

Inflow Area = 1.819 ac, 61.57% Impervious, Inflow Depth = 7.56" for 100-Year event
Inflow = 11.21 cfs @ 12.20 hrs, Volume= 1.145 af
Primary = 11.21 cfs @ 12.20 hrs, Volume= 1.145 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 23L: PDA 1C

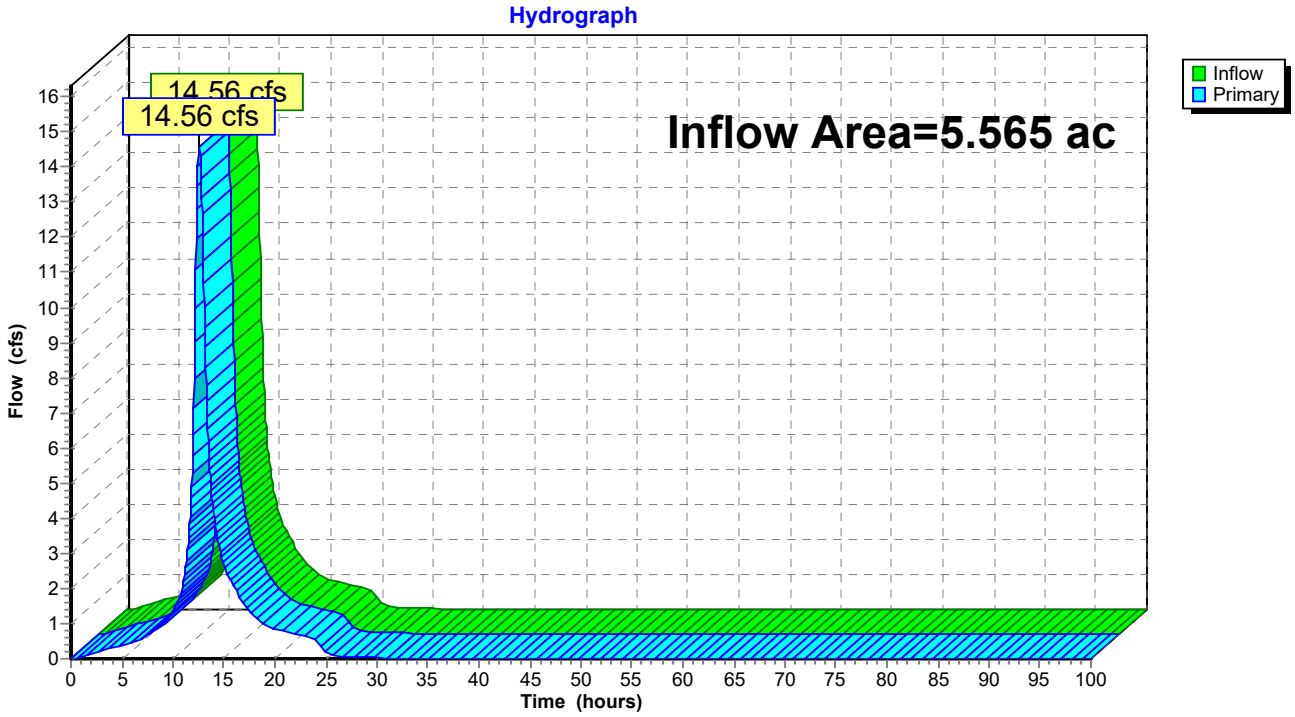


Summary for Link 25L: PDA 1

Inflow Area = 5.565 ac, 66.76% Impervious, Inflow Depth = 7.60" for 100-Year event
Inflow = 14.56 cfs @ 12.58 hrs, Volume= 3.523 af
Primary = 14.56 cfs @ 12.58 hrs, Volume= 3.523 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 25L: PDA 1

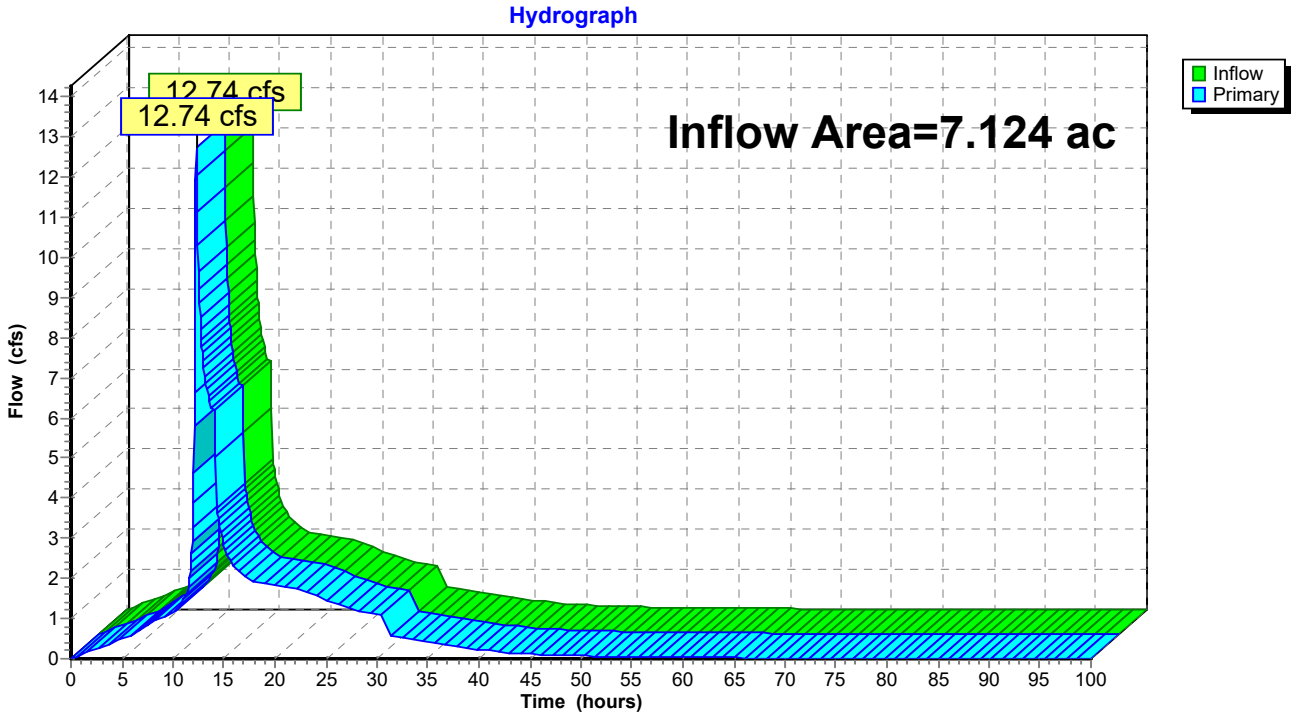


Summary for Link 39L: PDA 2A Treated

Inflow Area = 7.124 ac, 98.58% Impervious, Inflow Depth > 8.32" for 100-Year event
Inflow = 12.74 cfs @ 12.30 hrs, Volume= 4.940 af
Primary = 12.74 cfs @ 12.30 hrs, Volume= 4.940 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 39L: PDA 2A Treated

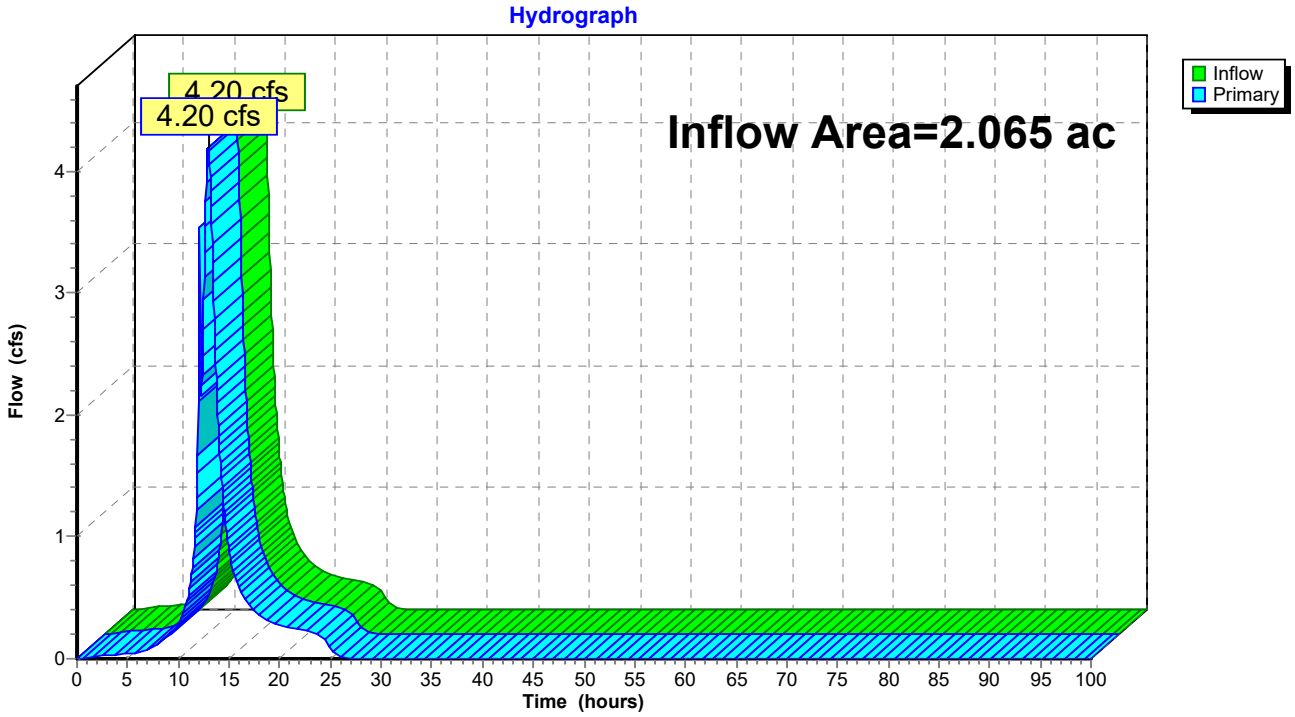


Summary for Link 42L: PDA 2A Remainder

Inflow Area = 2.065 ac, 13.66% Impervious, Inflow Depth = 6.20" for 100-Year event
Inflow = 4.20 cfs @ 12.94 hrs, Volume= 1.067 af
Primary = 4.20 cfs @ 12.94 hrs, Volume= 1.067 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 42L: PDA 2A Remainder

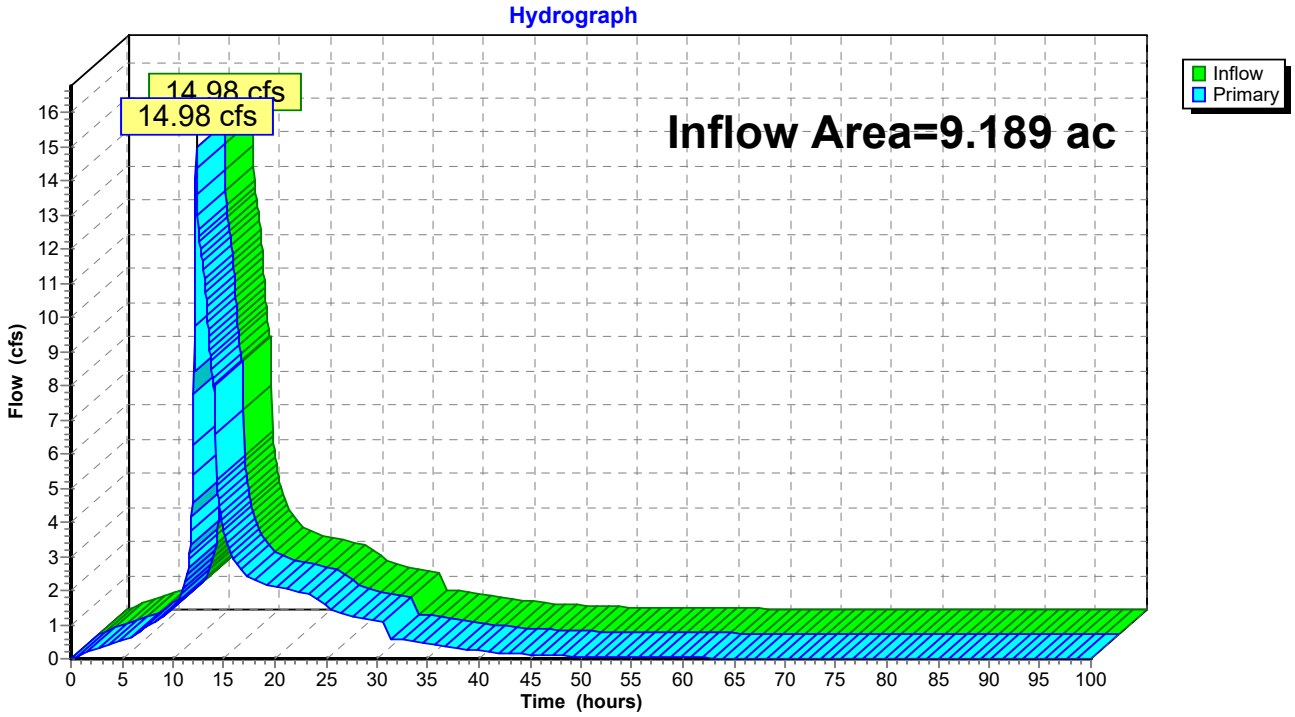


Summary for Link 43L: PDA 2A

Inflow Area = 9.189 ac, 79.50% Impervious, Inflow Depth > 7.84" for 100-Year event
Inflow = 14.98 cfs @ 12.31 hrs, Volume= 6.007 af
Primary = 14.98 cfs @ 12.31 hrs, Volume= 6.007 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 43L: PDA 2A

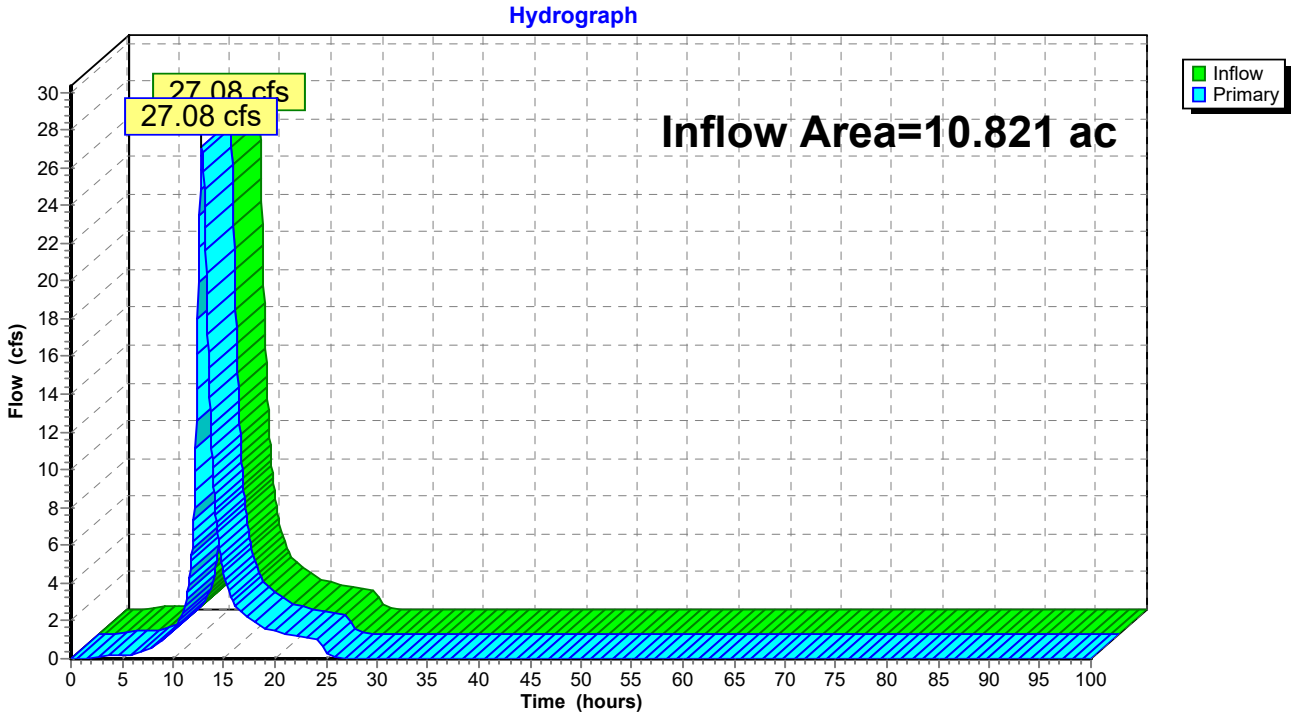


Summary for Link 46L: PDA 2B

Inflow Area = 10.821 ac, 14.76% Impervious, Inflow Depth = 6.23" for 100-Year event
Inflow = 27.08 cfs @ 12.83 hrs, Volume= 5.617 af
Primary = 27.08 cfs @ 12.83 hrs, Volume= 5.617 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 46L: PDA 2B

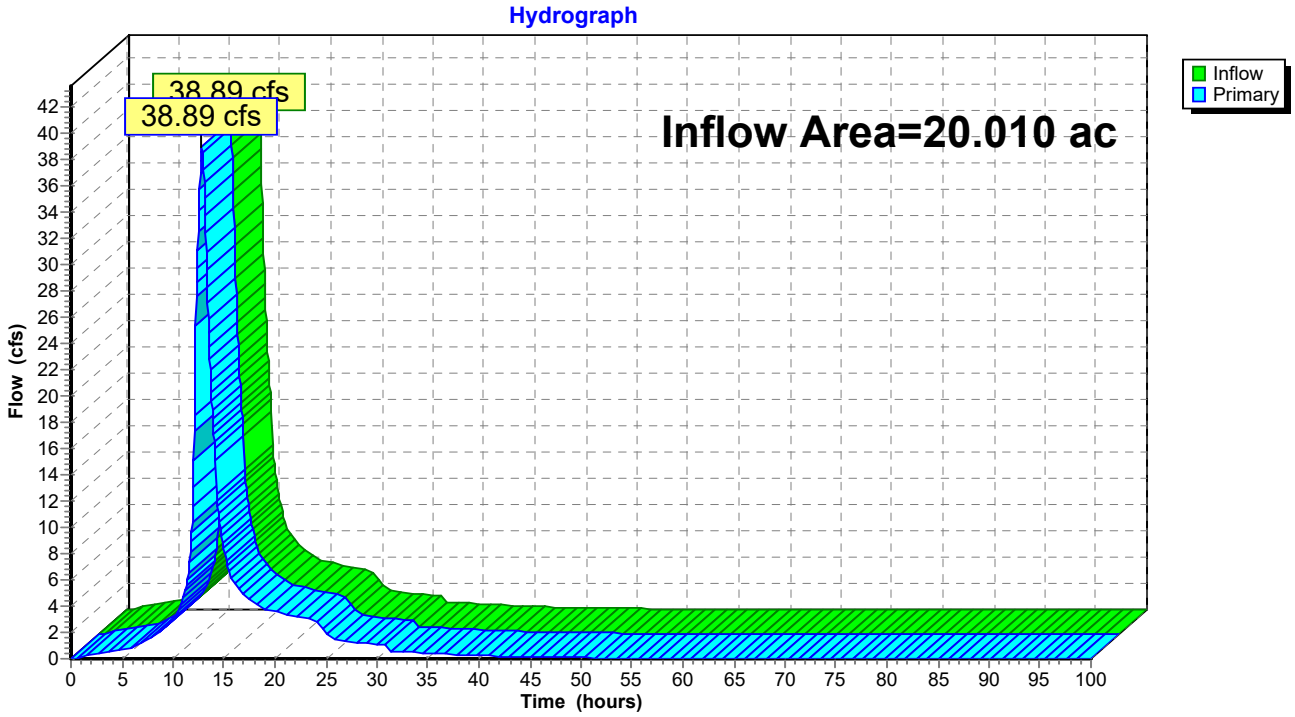


Summary for Link 47L: PDA 2

Inflow Area = 20.010 ac, 44.49% Impervious, Inflow Depth > 6.97" for 100-Year event
Inflow = 38.89 cfs @ 12.82 hrs, Volume= 11.624 af
Primary = 38.89 cfs @ 12.82 hrs, Volume= 11.624 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs

Link 47L: PDA 2



B. DESIGN CALCULATIONS

- **Emergency Spillway**
- **Conduit Outlet Protection Calculations**
- **Basin Drain Time**
- **Water Quality Storm Basin Drain Time**
- **Roof Drain Pipe Sizing**
- **Low Impact Development Checklist**
- **NJDEP Non-structural Strategies Point System**
- **Manufactured Treatment Devices Sizing & Certification**
- **Geotechnical Report**

Summary for Pond 33P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 12.71" for Failure event
Inflow = 27.34 cfs @ 12.11 hrs, Volume= 2.371 af
Outflow = 25.11 cfs @ 12.14 hrs, Volume= 2.372 af, Atten= 8%, Lag= 1.7 min
Primary = 16.13 cfs @ 12.13 hrs, Volume= 2.243 af
Secondary = 9.02 cfs @ 12.15 hrs, Volume= 0.129 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.21' @ 12.15 hrs Surf.Area= 10,386 sf Storage= 27,200 cf

Plug-Flow detention time= 207.6 min calculated for 2.371 af (100% of inflow)
Center-of-Mass det. time= 208.0 min (944.0 - 736.0)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	3,210 cf	**30.0" Round Pipe Storage**-Impervious L= 654.0' S= 0.0030 '/'
		36,693 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.00'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=16.04 cfs @ 12.13 hrs HW=115.20' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 16.04 cfs @ 9.07 fps)
  ├**2=Exfiltration** (Passes < 0.48 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 0.22 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 16.43 cfs potential flow)

Secondary OutFlow Max=8.86 cfs @ 12.15 hrs HW=115.21' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 8.86 cfs @ 1.11 fps)

Summary for Pond 33P: Bioretention

Inflow Area = 2.239 ac,100.00% Impervious, Inflow Depth = 8.39" for 100-Year event
Inflow = 17.32 cfs @ 12.14 hrs, Volume= 1.565 af
Outflow = 15.91 cfs @ 12.17 hrs, Volume= 1.011 af, Atten= 8%, Lag= 1.9 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 15.91 cfs @ 12.17 hrs, Volume= 1.011 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-100.00 hrs, dt= 0.05 hrs
Peak Elev= 115.33' @ 12.17 hrs Surf.Area= 10,398 sf Storage= 27,373 cf

Plug-Flow detention time= 234.3 min calculated for 1.011 af (65% of inflow)
Center-of-Mass det. time= 117.7 min (860.1 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	33,483 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)
#2	112.75'	841 cf	**18.0" Round Pipe Storage**-Impervious L= 476.0' S= 0.0030 '/'
		34,324 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
112.75	10,140	0	0
113.00	10,165	2,538	2,538
114.00	10,265	10,215	12,753
115.00	10,365	10,315	23,068
116.00	10,465	10,415	33,483

Device	Routing	Invert	Outlet Devices
#1	Primary	109.83'	**18.0" Round Culvert X 0.00** L= 103.0' Box, 0° wingwalls, square crown edge, Ke= 0.700 Inlet / Outlet Invert= 109.83' / 109.80' S= 0.0003 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf
#2	Device 1	112.75'	**2.000 in/hr Exfiltration over Surface area**
#3	Device 1	113.33'	**2.5" Vert. Orifice/Grate** C= 0.600
#4	Device 1	114.80'	**60.0" x 60.0" Horiz. Orifice/Grate** C= 0.600 in 60.0" x 60.0" Grate (100% open area) Limited to weir flow at low heads
#5	Secondary	115.03'	**38.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=112.75' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Controls 0.00 cfs)
  - **2=Exfiltration** (Passes 0.00 cfs of 0.47 cfs potential flow)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=15.51 cfs @ 12.17 hrs HW=115.33' (Free Discharge)
- **5=Broad-Crested Rectangular Weir** (Weir Controls 15.51 cfs @ 1.36 fps)

BOHLER

35 Technology Drive, Warren, NJ 07059
(908) 668-8300

Date: 8/9/2021
Project: N. Brunswick, NJ
Project No: J200616

Calculated By: APR
Checked By: AS

Conduit Outlet Protection Calculations

Rip Rap Pad # 1

Design Parameters:

Design Storm Flow for 25 Year, Q	8.00	cfs
Vertical Dimension of Outlet Pipe, D_o	15	in
Horizontal Dimension of Outlet Pipe, W_o	15	in
Tailwater Depth, TW [1]	0.74	ft

Apron Dimension Calculations:

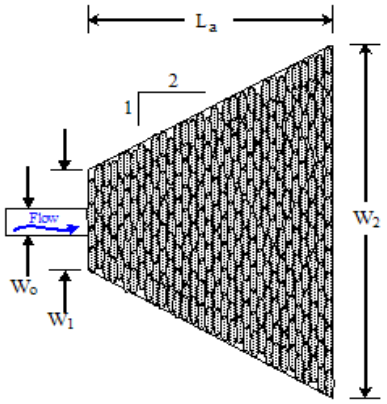
Unit Dicharge, $q = Q/W_o$ = 6.40 cfs per foot

- **Case I: $TW < 1/2\ D_o$**

  Apron Length, $L_a = \frac{1.8q}{D_o^{1/2}} + 7D_o$ = → L_a =

  Width, $W_1 = 3W_o$ = → W_1 =

  Width, $W_2 = 3W_o + L_a$ = → W_2 =

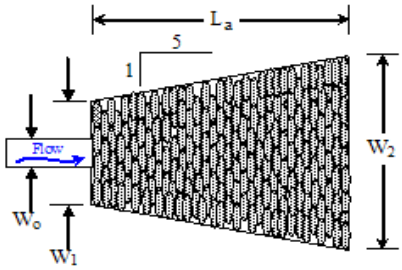


- **Case II: $TW \geq 1/2\ D_o$**

  Apron Length, $L_a = \frac{3q}{D_o^{1/2}}$ = 17.17 ft or → L_a = **18 ft**

  Width, $W_1 = 3W_o$ = 3.75 ft or → W_1 = **6 ft**

  Width, $W_2 = 3W_o + 0.4L_a$ = 10.62 ft or → W_2 = **11 ft**



Rip Rap Stone Size Calculations:

Median Stone, $d_{50} = \frac{0.02q^{1.33}}{TW}$ = 3.83 in → d_{50} = **6 in**

Notes:

1. Where there is a well-defined channel downstream of the apron, the bottom width of the apron shall be at least equal to the bottom width of the channel and the structural lining shall extend at least one foot above the tailwater elevation, but no lower than two-thirds of the vertical conduit dimension above the conduit invert.
2. The side slopes shall be 2:1 or flatter.
3. The bottom grade shall be 0.0% (level).
4. There shall be no overfall at the end of the apron or at the end of the culvert.
5. 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.
6. 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.
7. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
8. No bends or curves at the intersection of the conduit and apron will be permitted.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.
2. For multiple pipes, increase rip-rap sizes by 25% when pipe spacing is greater than or equal to $1/4W_o$.

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Date: 8/9/2021
Project: N. Brunswick, NJ
Project No: J200616

(908) 668-8300

Calculated By: APR
Checked By: AS

Conduit Outlet Protection Calculations

Scour Hole # 1

Design Parameters:

Design Storm Flow for 25 Year, Q	13.39	cfs
Vertical Dimension of Outlet Pipe, D_o	30	in
Horizontal Dimension of Outlet Pipe, W_o	30	in
Tailwater Depth, TW [1]	0.91	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 Dicharge, $q = Q/D_o$ = 5.36 cfs per foot

- **Case I: $y = 1/2\ D_o$**

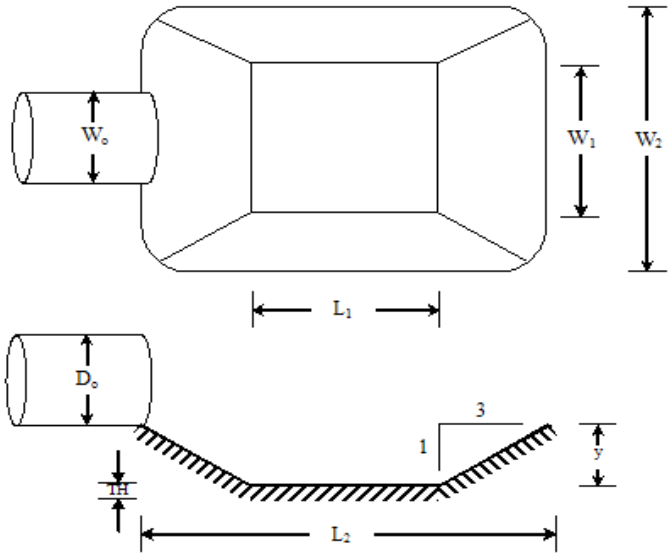
  Median Stone, $d_{50} = \frac{0.0125\ q^{1.33}}{TW}$ = 1.54 in Therefore, use *d50* = 6 in

  Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric . . . . . *TH* = 12 in

- **Case II: $y = D_o$**

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

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



Notes:

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

Footnote:

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

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Date: 11/19/2021
Project: N. Brunswick, NJ
Project No: J200616

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Calculated By: APR
Checked By: BE

Conduit Outlet Protection Calculations

Scour Hole # 2

Design Parameters:

Design Storm Flow for 25 Year, Q	5.99	cfs
Vertical Dimension of Outlet Pipe, D_o	15	in
Horizontal Dimension of Outlet Pipe, W_o	15	in
Tailwater Depth, TW [1]	0.25	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 Dicharge, $q = Q/D_o$ = 4.79 cfs per foot

- **Case I: $y = 1/2\ D_o$**

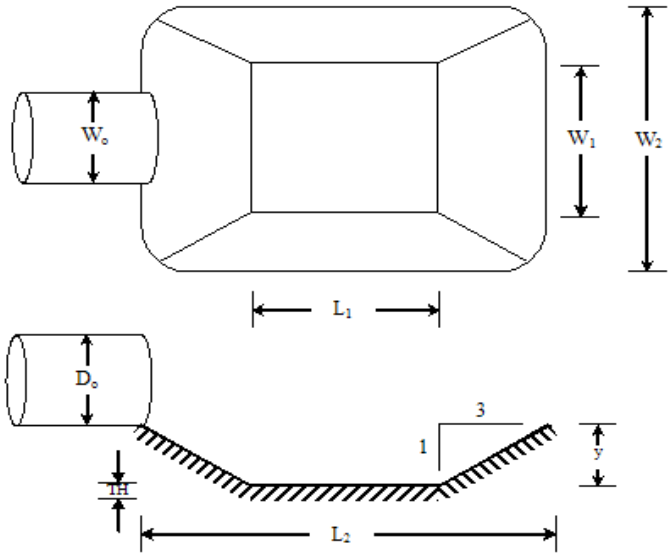
  Median Stone, $d_{50} = \dfrac{0.0125\ q^{1.33}}{TW}$ = 4.82 in Therefore, use *d50* = 6 in

  Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric . . . . . *TH* = 12 in

- **Case II: $y = D_o$**

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

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



Notes:

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

Footnote:

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

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Date: 11/19/2021
Project: N. Brunswick, NJ
Project No: J200616

Calculated By: APR
Checked By: BE

Conduit Outlet Protection Calculations

Scour Hole # 3

Design Parameters:

Design Storm Flow for 25 Year, Q	4.73	cfs
Vertical Dimension of Outlet Pipe, D_o	18	in
Horizontal Dimension of Outlet Pipe, W_o	18	in
Tailwater Depth, TW [1]	0.30	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 Dicharge, $q = Q/D_o$ = 3.15 cfs per foot

- **Case I: $y = 1/2\ D_o$**

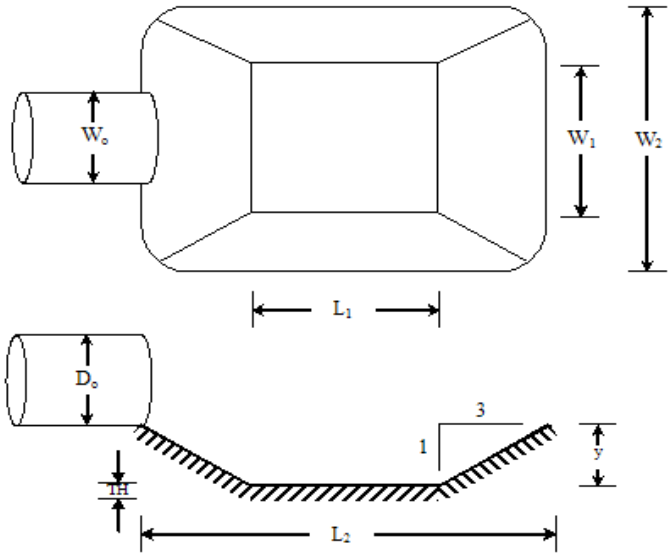
  Median Stone, $d_{50} = \dfrac{0.0125\ q^{1.33}}{TW}$ = 2.30 in Therefore, use ***d50 =*** **6 in**

  Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric ***TH =*** **12 in**

- **Case II: $y = D_o$**

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

  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 $TW = 0.2D_o$.

Hydrograph for Pond 33P: Bioretention

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	112.75	0.00	0.00	0.00
0.25	0.00	0	112.75	0.00	0.00	0.00
0.50	0.00	0	112.75	0.00	0.00	0.00
0.75	0.05	0	112.75	0.05	0.05	0.00
1.00	0.08	0	112.75	0.08	0.08	0.00
1.25	0.11	0	112.75	0.11	0.11	0.00
1.50	0.14	0	112.75	0.14	0.14	0.00
1.75	0.15	0	112.75	0.15	0.15	0.00
2.00	0.17	0	112.75	0.17	0.17	0.00
2.25	0.19	0	112.75	0.19	0.19	0.00
2.50	0.20	0	112.75	0.20	0.20	0.00
2.75	0.21	0	112.75	0.21	0.21	0.00
3.00	0.22	0	112.75	0.22	0.22	0.00
3.25	0.24	0	112.75	0.24	0.24	0.00
3.50	0.25	0	112.75	0.25	0.25	0.00
3.75	0.25	0	112.75	0.25	0.25	0.00
4.00	0.26	0	112.75	0.26	0.26	0.00
4.25	0.27	0	112.75	0.27	0.27	0.00
4.50	0.28	0	112.75	0.28	0.28	0.00
4.75	0.29	0	112.75	0.29	0.29	0.00
5.00	0.29	0	112.75	0.29	0.29	0.00
5.25	0.30	0	112.75	0.30	0.30	0.00
5.50	0.31	0	112.75	0.31	0.31	0.00
5.75	0.32	0	112.75	0.32	0.32	0.00
6.00	0.32	0	112.75	0.32	0.32	0.00
6.25	0.34	0	112.75	0.34	0.34	0.00
6.50	0.36	0	112.75	0.36	0.36	0.00
6.75	0.39	0	112.75	0.39	0.39	0.00
7.00	0.41	0	112.75	0.41	0.41	0.00
7.25	0.43	0	112.75	0.43	0.43	0.00
7.50	0.45	1	112.75	0.45	0.45	0.00
7.75	0.48	5	112.75	0.47	0.47	0.00
8.00	0.50	22	112.75	0.47	0.47	0.00
8.25	0.52	58	112.76	0.47	0.47	0.00
8.50	0.54	115	112.76	0.47	0.47	0.00
8.75	0.57	191	112.77	0.47	0.47	0.00
9.00	0.59	288	112.78	0.47	0.47	0.00
9.25	0.66	424	112.79	0.47	0.47	0.00
9.50	0.74	628	112.81	0.47	0.47	0.00
9.75	0.81	901	112.84	0.47	0.47	0.00
10.00	0.89	1,244	112.87	0.47	0.47	0.00
10.25	0.96	1,655	112.91	0.47	0.47	0.00
10.50	1.04	2,137	112.96	0.47	0.47	0.00
10.75	1.30	2,759	113.02	0.47	0.47	0.00
11.00	1.58	3,631	113.11	0.47	0.47	0.00
11.25	2.04	4,830	113.22	0.47	0.47	0.00
11.50	2.55	6,471	113.38	0.48	0.48	0.00
11.75	3.98	8,972	113.61	0.54	0.54	0.00
12.00	**10.74**	14,214	114.09	0.61	0.61	0.00
12.25	**7.50**	**24,698**	**115.00**	**6.52**	**6.52**	**0.00**
12.50	3.59	**24,029**	**114.94**	**4.22**	**4.22**	**0.00**
12.75	2.39	23,524	114.90	2.76	2.76	0.00
13.00	1.88	23,273	114.88	2.13	2.13	0.00

Hydrograph for Pond 33P: Bioretention (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
13.25	1.50	23,070	114.86	1.68	1.68	0.00
13.50	1.21	22,916	114.85	1.38	1.38	0.00
13.75	1.03	22,778	114.84	1.14	1.14	0.00
14.00	0.95	22,700	114.83	1.02	1.02	0.00
14.25	0.87	22,641	114.83	0.94	0.94	0.00
14.50	0.79	22,582	114.82	0.86	0.86	0.00
14.75	0.72	22,519	114.82	0.79	0.79	0.00
15.00	0.64	22,448	114.81	0.73	0.73	0.00
15.25	0.59	22,367	114.80	0.68	0.68	0.00
15.50	0.57	22,285	114.80	0.67	0.67	0.00
15.75	0.55	22,185	114.79	0.67	0.67	0.00
16.00	0.53	22,065	114.78	0.67	0.67	0.00
16.25	0.50	21,928	114.76	0.67	0.67	0.00
16.50	0.48	21,771	114.75	0.67	0.67	0.00
16.75	0.46	21,596	114.74	0.67	0.67	0.00
17.00	0.44	21,402	114.72	0.66	0.66	0.00
17.25	0.42	21,190	114.70	0.66	0.66	0.00
17.50	0.40	20,960	114.68	0.66	0.66	0.00
17.75	0.37	20,711	114.66	0.66	0.66	0.00
18.00	0.35	20,446	114.64	0.66	0.66	0.00
18.25	0.34	20,163	114.61	0.66	0.66	0.00
18.50	0.33	19,876	114.59	0.65	0.65	0.00
18.75	0.33	19,585	114.56	0.65	0.65	0.00
19.00	0.32	19,291	114.54	0.65	0.65	0.00
19.25	0.32	18,994	114.51	0.65	0.65	0.00
19.50	0.31	18,695	114.49	0.65	0.65	0.00
19.75	0.31	18,392	114.46	0.64	0.64	0.00
20.00	0.30	18,087	114.43	0.64	0.64	0.00
20.25	0.30	17,779	114.41	0.64	0.64	0.00
20.50	0.29	17,468	114.38	0.64	0.64	0.00
20.75	0.28	17,154	114.35	0.63	0.63	0.00
21.00	0.28	16,838	114.33	0.63	0.63	0.00
21.25	0.27	16,519	114.30	0.63	0.63	0.00
21.50	0.27	16,198	114.27	0.63	0.63	0.00
21.75	0.26	15,874	114.24	0.62	0.62	0.00
22.00	0.26	15,548	114.21	0.62	0.62	0.00
22.25	0.25	15,219	114.18	0.62	0.62	0.00
22.50	0.25	14,888	114.15	0.62	0.62	0.00
22.75	0.24	14,555	114.12	0.61	0.61	0.00
23.00	0.23	14,221	114.09	0.61	0.61	0.00
23.25	0.23	13,883	114.06	0.61	0.61	0.00
23.50	0.22	13,544	114.03	0.60	0.60	0.00
23.75	0.22	13,204	114.00	0.60	0.60	0.00
24.00	0.21	12,861	113.97	0.60	0.60	0.00
24.25	0.00	12,391	113.93	0.59	0.59	0.00
24.50	0.00	11,862	113.88	0.58	0.58	0.00
24.75	0.00	11,339	113.83	0.58	0.58	0.00
25.00	0.00	10,822	113.78	0.57	0.57	0.00
25.25	0.00	10,311	113.74	0.56	0.56	0.00
25.50	0.00	9,806	113.69	0.56	0.56	0.00
25.75	0.00	9,308	113.64	0.55	0.55	0.00
26.00	0.00	8,818	113.60	0.54	0.54	0.00
26.25	0.00	8,337	113.55	0.53	0.53	0.00

Hydrograph for Pond 33P: Bioretention (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
26.50	0.00	7,865	113.51	0.52	0.52	0.00
26.75	0.00	7,405	113.47	0.50	0.50	0.00
27.00	0.00	6,960	113.42	0.49	0.49	0.00
27.25	0.00	6,525	113.38	0.48	0.48	0.00
27.50	0.00	6,098	113.34	0.47	0.47	0.00
27.75	0.00	5,673	113.30	0.47	0.47	0.00
28.00	0.00	5,248	113.26	0.47	0.47	0.00
28.25	0.00	4,824	113.22	0.47	0.47	0.00
28.50	0.00	4,399	113.18	0.47	0.47	0.00
28.75	0.00	3,975	113.14	0.47	0.47	0.00
29.00	0.00	3,551	113.10	0.47	0.47	0.00
29.25	0.00	3,127	113.06	0.47	0.47	0.00
29.50	0.00	2,704	113.02	0.47	0.47	0.00
29.75	0.00	2,280	112.97	0.47	0.47	0.00
30.00	0.00	1,857	112.93	0.47	0.47	0.00
30.25	0.00	1,434	112.89	0.47	0.47	0.00
30.50	0.00	1,011	112.85	0.47	0.47	0.00
30.75	0.00	588	112.81	0.47	0.47	0.00
31.00	0.00	165	112.77	0.47	0.47	0.00
31.25	0.00	0	112.75	0.00	0.00	0.00
31.50	0.00	0	112.75	0.00	0.00	0.00
31.75	0.00	0	112.75	0.00	0.00	0.00
32.00	0.00	0	112.75	0.00	0.00	0.00
32.25	0.00	0	112.75	0.00	0.00	0.00
32.50	0.00	0	112.75	0.00	0.00	0.00
32.75	0.00	0	112.75	0.00	0.00	0.00
33.00	0.00	0	112.75	0.00	0.00	0.00
33.25	0.00	0	112.75	0.00	0.00	0.00
33.50	0.00	0	112.75	0.00	0.00	0.00
33.75	0.00	0	112.75	0.00	0.00	0.00
34.00	0.00	0	112.75	0.00	0.00	0.00
34.25	0.00	0	112.75	0.00	0.00	0.00
34.50	0.00	0	112.75	0.00	0.00	0.00
34.75	0.00	0	112.75	0.00	0.00	0.00
35.00	0.00	0	112.75	0.00	0.00	0.00
35.25	0.00	0	112.75	0.00	0.00	0.00
35.50	0.00	0	112.75	0.00	0.00	0.00
35.75	0.00	0	112.75	0.00	0.00	0.00
36.00	0.00	0	112.75	0.00	0.00	0.00
36.25	0.00	0	112.75	0.00	0.00	0.00
36.50	0.00	0	112.75	0.00	0.00	0.00
36.75	0.00	0	112.75	0.00	0.00	0.00
37.00	0.00	0	112.75	0.00	0.00	0.00
37.25	0.00	0	112.75	0.00	0.00	0.00
37.50	0.00	0	112.75	0.00	0.00	0.00
37.75	0.00	0	112.75	0.00	0.00	0.00
38.00	0.00	0	112.75	0.00	0.00	0.00
38.25	0.00	0	112.75	0.00	0.00	0.00
38.50	0.00	0	112.75	0.00	0.00	0.00
38.75	0.00	0	112.75	0.00	0.00	0.00
39.00	0.00	0	112.75	0.00	0.00	0.00
39.25	0.00	0	112.75	0.00	0.00	0.00
39.50	0.00	0	112.75	0.00	0.00	0.00

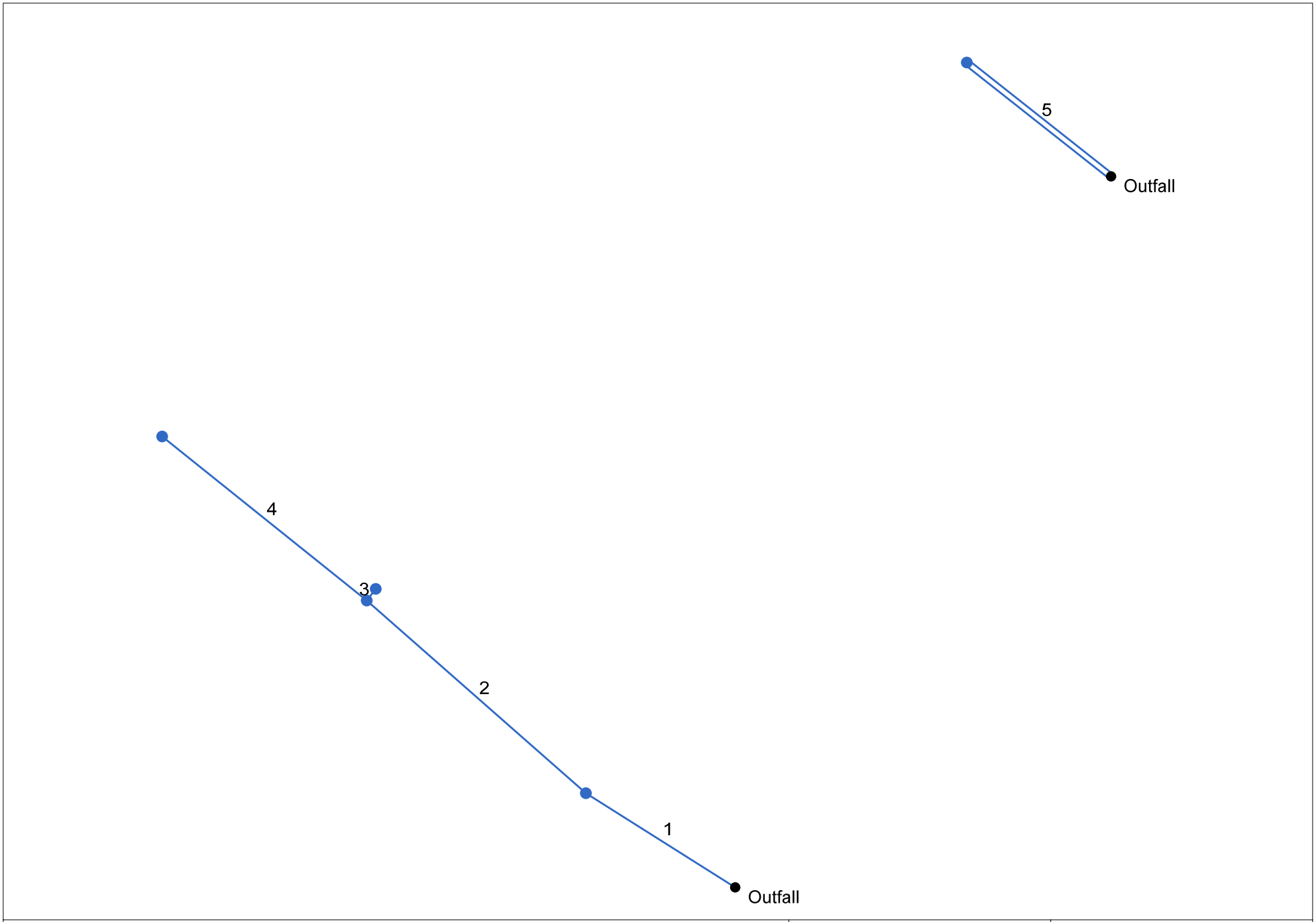
31.25 - 12.25 = 19.00 HOURS < 72 HOURS. THEREFORE, OK

Hydrograph for Pond 33P: Bioretention

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	112.75	0.00	0.00	**0.00**
0.25	0.00	0	112.75	0.00	0.00	0.00
0.50	0.18	0	112.75	0.18	0.18	0.00
0.75	0.56	16	112.75	0.47	0.47	0.00
1.00	**4.60**	1,068	112.86	0.47	0.47	0.00
1.25	**2.16**	5,053	113.24	0.47	0.47	0.00
1.50	0.87	5,707	113.31	0.47	0.47	0.00
1.75	0.66	**5,939**	**113.33**	**0.47**	**0.47**	0.00
2.00	0.22	**5,844**	**113.32**	**0.47**	**0.47**	0.00
2.25	0.00	5,484	113.28	0.47	0.47	0.00
2.50	0.00	5,059	113.24	0.47	0.47	0.00
2.75	0.00	4,635	113.20	0.47	0.47	0.00
3.00	0.00	4,211	113.16	0.47	0.47	0.00
3.25	0.00	3,787	113.12	0.47	0.47	0.00
3.50	0.00	3,363	113.08	0.47	0.47	0.00
3.75	0.00	2,939	113.04	0.47	0.47	0.00
4.00	0.00	2,515	113.00	0.47	0.47	0.00
4.25	0.00	2,092	112.96	0.47	0.47	0.00
4.50	0.00	1,668	112.91	0.47	0.47	0.00
4.75	0.00	1,245	112.87	0.47	0.47	0.00
5.00	0.00	822	112.83	0.47	0.47	0.00
5.25	0.00	400	112.79	0.47	0.47	0.00
5.50	0.00	0	112.75	0.21	0.21	0.00
5.75	0.00	0	112.75	0.00	0.00	0.00
6.00	0.00	0	112.75	0.00	0.00	0.00
6.25	0.00	0	112.75	0.00	0.00	0.00
6.50	0.00	0	112.75	0.00	0.00	0.00
6.75	0.00	0	112.75	0.00	0.00	0.00
7.00	0.00	0	112.75	0.00	0.00	0.00
7.25	0.00	0	112.75	0.00	0.00	0.00
7.50	0.00	0	112.75	0.00	0.00	0.00
7.75	0.00	0	112.75	0.00	0.00	0.00
8.00	0.00	0	112.75	0.00	0.00	0.00
8.25	0.00	0	112.75	0.00	0.00	0.00
8.50	0.00	0	112.75	0.00	0.00	0.00
8.75	0.00	0	112.75	0.00	0.00	0.00
9.00	0.00	0	112.75	0.00	0.00	0.00
9.25	0.00	0	112.75	0.00	0.00	0.00
9.50	0.00	0	112.75	0.00	0.00	0.00
9.75	0.00	0	112.75	0.00	0.00	0.00
10.00	0.00	0	112.75	0.00	0.00	0.00
10.25	0.00	0	112.75	0.00	0.00	0.00
10.50	0.00	0	112.75	0.00	0.00	0.00
10.75	0.00	0	112.75	0.00	0.00	0.00
11.00	0.00	0	112.75	0.00	0.00	0.00
11.25	0.00	0	112.75	0.00	0.00	0.00
11.50	0.00	0	112.75	0.00	0.00	0.00
11.75	0.00	0	112.75	0.00	0.00	0.00
12.00	0.00	0	112.75	0.00	0.00	0.00
12.25	0.00	0	112.75	0.00	0.00	0.00
12.50	0.00	0	112.75	0.00	0.00	0.00
12.75	0.00	0	112.75	0.00	0.00	0.00
13.00	0.00	0	112.75	0.00	0.00	0.00

5.75 - 1.75 = 4.00 HOURS < 72 HOURS. THEREFORE, OK

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Pipe Sizing.stm	Number of lines: 5	Date: 11/17/2021

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	72.000	0.00	1.45	0.00	0.00	1.40	6.0	6.9	7.2	10.13	4.26	5.74	18	0.10	110.84	110.91	112.34	112.74	115.15	117.07	10F-10D
2	1	119.000	0.00	1.45	0.00	0.00	1.40	6.0	6.5	7.3	10.27	9.61	5.81	18	0.50	110.91	111.50	112.83	113.51	117.07	116.69	10G-10F
3	2	6.000	1.07	1.07	0.99	1.06	1.06	6.0	6.0	7.5	7.93	3.27	10.10	12	0.50	113.72	113.75	114.72	114.90	116.69	117.22	BLD-10G
4	2	107.000	0.38	0.38	0.90	0.34	0.34	6.0	6.0	7.5	2.56	3.26	3.26	12	0.50	111.50	112.03	114.03	114.36	116.69	116.03	FILT-10G
5	End	75.000	1.62	1.62	0.99	1.60	1.60	6.0	6.0	7.5	12.01	2.83	7.64	12(2b)	0.09	113.09	113.16	114.67	115.93	118.10	118.50	BLD-PP

Project File: Pipe Sizing.stm

Number of lines: 5

Run Date: 11/17/2021

NOTES:Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99; Return period =Yrs. 25 ; c = cir e = ellip b = box

New Jersey Stormwater Best Management Practices Manual

February 2004

A P P E N D I X A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: North Arlington

County: Middlesex County Date: 08/09/2021

Review board or agency: Planning Board

Proposed land development name: 1980 US HWY 1, LLC

Lot(s): 148 Block(s): 34, 35.01 & 36

Project or application number: J200616

Applicant's name: 1980 US HWY 1, LLC

Applicant's address: 801 Grand Avenue, Des Moines, IA 50392-1370

Telephone: (515) 235-1727 Fax:

Email address:

Designer's name: Bradford Bohler

Designer's address: 40 Independence Blvd, Suite 200, Warren, NJ 07059

Telephone: (908) 668-8300 Fax: (908) 754-4401

Email address: bbohler@bohlereng.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

The proposed site incorporates a number of non-structural strategies which includes minimal use of lawn areas and preservation of large naturally vegetated areas. Areas that are proposed to be planted utilize native and non-invasive species. Additionally, impervious areas have been proposed to the least extent feasible for the project including parking stalls that are the minimum dimension per the township code.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

N.J.A.C. 7:8 STORMWATER MANAGEMENT

Do regulations include nonstructural requirements? Yes: X No: _____

If yes, briefly describe: _____

List LID-BMPs prohibited by local regulations: None

Pre-design meeting held? Yes: _____ Date: _____ No: X

Meeting held with: _____

Pre-design site walk held? Yes: _____ Date: _____ No: X

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: NJDOT

Required approval: Major Access Permit

Name: NJDEP

Required approval: GP-10, Wetland Transition Area Waiver

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: X No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: X No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: X No: _____ If yes, specify % of site: 32.74

Native ground cover? Yes: X No: _____ If yes, specify % of site: 46.44

Vegetated buffers? Yes: X No: _____ If yes, specify % of site: 22.63

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: X If yes, specify % of site: _____

Native ground cover? Yes: _____ No: X If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: X If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: X No: _____

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: X

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: X

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: X No: _____

If yes, were these inventories factors in the site's layout and design? Yes: X No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: X No: _____

If yes, how: Existing wetland areas on site are to be deed restricted

Restrict temporary site disturbance during construction? Yes: X No: _____

If yes, how: Areas outside the limit of proposed improvements have been specified as areas to not disturb

Consider soils and slopes in selecting disturbance limits? Yes: _____ No: X

If yes, how: _____

C. Specify percentage of site to be cleared: 58.85% Regraded: 58.85%

D. Specify percentage of cleared areas done so for buildings: 26.00%

For driveways and parking: 32.85% For roadways: 0%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

Reduce the building size

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: _____ HSG C: 13.13% HSG D: 86.87%

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: _____ HSG C: 7.96% HSG D: 45.60%

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

Majority of the site is type D soils and the area that is type C soils is improved in the existing conditions.

I. Does the site include Karst topography? Yes: _____ No: X

If yes, discuss measures taken to limit Karst impacts:

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 49.85% Proposed: 53.56%

B. Specify maximum site impervious coverage allowed by regulations: 80%

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity	N/A	N/A
Residential access – medium intensity	N/A	N/A
Residential access – high intensity with parking	N/A	N/A
Residential access – high intensity without parking	N/A	N/A
Neighborhood	N/A	N/A
Minor collector – low intensity without parking	25'	25'
Minor collector – with one parking lane	25'	25'
Minor collector – with two parking lanes	25'	25'
Minor collector – without parking	N/A	N/A
Major collector	N/A	N/A

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: 9' x 18' Regulations: 9' x 18'

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: 166 spaces Regulations: 105 spaces

F. Specify percentage of total site impervious cover created by buildings: 26%

By driveways and parking: 27.56% By roadways: 0%

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

Reduce the building size

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 11.70% Buildings: 0% Driveways and parking: 11.70% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: 0%

L. Specify percentage of total parking located within multi-level parking deck: 0%

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 100% Vegetated swale: 0% Natural channel: 0%

Stormwater management facility: 100% Other: 0%

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

Remove parking along building frontage to provide a swale along property line

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: Overland flow slopes are at the minimum for majority of the site

Increase overland flow roughness:

Remove parking along building frontage to provide a swale along property line

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: 1 trash enclosure

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: 1 Regulations: 1

B. Pet Waste Stations

Specify the number of pet waste stations provided: N/A

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: N/A Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: 6 months Regulations: N/A

Litter collection: Proposed: Daily Regulations: N/A

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Trash racks on the outlet control structures for all basins and porous pavement areas

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: TSS Location: Parking areas, treated by porous pavement areas

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: _____ Location: _____

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.		X
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

Difficult to make invert elevations work for open channel conveyance given required measures that were taken to provide water quality by green infrastructure.

NJDEP Nonstructural Strategies Points System (NSPS)

Version: January 31, 2006

Note: Input Values in Yellow Cells Only

Project: 1980 US HWY 1, LLC

Date: November 19, 2021

User: Anthony Rotondo

Notes:

Step 1 - Provide Basic Major Development Site Information

A. Specify Total Area in Acres of Development Site Described in Steps 2 and 3 = 17.1 **Acres**

B. Specify by Percent the Various Planning Areas Located within the Development Site:

State Plan Planning Area:	PA-1	PA-2	PA-3	PA-4	PA-4B	PA-5	Total % Area
Percent of Each Planning Area within Site:	100.0%						100.0%

Note: See User's Guide for Equivalent Zones within Designated Centers and the NJ Meadowlands, Pinelands, and Highlands Districts

Step 2 - Describe Existing or Pre-Developed Site Conditions

A. Specify Existing Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG: HSG A	HSG B	HSG C	HSG D	Use/Cover Subtotals	Points
1	Wetlands and Undisturbed Stream Buffers				3.5	3.5	67
2	Lawn and Open Space			0.9	3.9	4.8	53
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving					0.0	0
13	Directly Connected Impervious			1.3	7.5	8.8	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.0	2.3	14.9	**Total Area:**	17.1
	HSG Subtotals (%):	0.0%	0.0%	13.2%	86.8%	**Total % Area:**	100.0%

Points Subtotal: 121

Total Existing Site Points: 121

Step 3 - Describe Proposed or Post-Developed Site Conditions

A. Specify Proposed Land Use/Land Cover Descriptions and Areas:

Site Segment	Land Use/Land Cover Description	Specify Land Use/Land Cover in Acres for Each HSG: HSG A	HSG B	HSG C	HSG D	Use/Cover Subtotals	Points
1	Wetlands and Undisturbed Stream Buffers				3.5	3.5	67
2	Lawn and Open Space			1.0	3.5	4.5	50
3	Brush and Shrub					0.0	0
4	Meadow, Pasture, Grassland, or Range					0.0	0
5	Row Crop					0.0	0
6	Small Grain and Legumes					0.0	0
7	Woods - Indigenous					0.0	0
8	Woods - Planted					0.0	0
9	Woods and Grass Combination					0.0	0
10	Ponds, Lakes, and Other Open Water					0.0	0
11	Gravel and Dirt					0.0	0
12	Porous and Permeable Paving			0.5	1.5	2.0	23
13	Directly Connected Impervious			0.8	6.3	7.2	0
14	Unconnected Impervious with Small D/S Pervious					0.0	0
15	Unconnected Impervious with Large D/S Pervious					0.0	0
	HSG Subtotals (Acres):	0.0	0.0	2.3	14.9	**Total Area:**	17.1
	HSG Subtotals (%):	0.0%	0.0%	13.2%	86.8%	**Total % Area:**	100.0%

Points Subtotal: **140**

B. Compare Proposed Impervious Coverage with Maximum Allowable Impervious Coverage:

Total Directly Connected Impervious Coverage =	42%	% of Site
Total Unconnected Impervious Coverage with Small D/S Pervious =	0%	% of Site
Total Unconnected Impervious Coverage with Large D/S Pervious =	0%	% of Site
Total Site Impervious Coverage =	42%	% of Site
Effective Site Impervious Coverage =	42%	% of Site
Specify Source of Maximum Allowable Impervious Coverage:	Table	(None or Table)
Allowable Site Impervious Cover from Maximum Impervious Cover Table:	72%	

Note: See Maximum Impervious Cover Table Worksheet for Details

Points Subtotal: **16**

C. Compare Proposed Site Disturbance with Maximum Allowable Site Disturbance:

Total Proposed Site Disturbance =	54%	% of Site
Maximum Allowable Site Disturbance by Municipal Ordinance =	80%	% of Site

Points Subtotal: **12**

D. Describe Proposed Runoff Conveyance System:

Total Length of Runoff Conveyance System =	2290	Feet
Length of Vegetated Runoff Conveyance System =	0	Feet
% of Total Runoff Conveyance System That is Vegetated =	0%	

Points Subtotal: **0**

E. Residential Lot Clustering:

Percent of Total Site Area that will be Clustered =	0%	% of Site
Minimum Standard Lot Size as Per Zoning (Note: 1/2 Acre or Greater) =	0.000	Acres
Maximum Proposed Cluster Lot Size (Note:1/4 Acre or Less) =	0.000	Acres
Percent of Clustered Portion of Site to be Preserved as Vegetated Open Space =	0%	% of Clustered Site Portion

Points Subtotal: **0**

F. Will the Following be Utilized to Minimize Soil Compaction?

Proposed Lawn Areas will be Graded with Lightweight Construction Equipment:	No	(Yes or No)
Percent of Proposed Lawn Areas to be Graded with Such Equipment:	0%	% of Lawn Areas

Points Subtotal: 0

G. Are Any of the Following Stormwater Management Standards Met Using Only Nonstructural Strategies and Measures?

Groundwater Recharge Standards (NJAC 7:8-5.4-a-2):	No	(Yes or No)
Stormwater Runoff Quality Standards (NJAC 7:8-5.5):	No	(Yes or No)
Stormwater Runoff Quantity Standards (NJAC 7:8-5.4-a-3):	No	(Yes or No)

Points Subtotal: 0

Note: If the Answers to All Three Questions at G Above are "Yes", Adequate Nonstructural Measures have been Utilized.

Total Proposed Site Points: 168

Ratio of Proposed to Existing Site Points: 139%

Required Site Points Ratio: 80%

Nonstructural Point System Results: Proposed Nonstructural Measures are Adequate

Principal Warehouse Facility
North Brunswick, NJ
7/26/21

Sizing Basis:
Filterra High Capacity biofiltration system has received final certification from the NJDEP for 80% TSS removal. Per the NJDEP, Filterra HC is considered a Green Infrastructure (GI) MTD. The sizing for the Filterra HC system under NJDEP regulations is based on the methodology outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS method is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the parameters below were assumed.

Design Parameters:

Design Storm =	NJDEP Water Quality Design Storm (1.25-inch/2-hour storm event)
Filterra Media Flow Rate =	300 inches/hour
Total Drainage Area =	0.139 ac
Percent Impervious =	92.09%
Time of Concentration =	6 minutes
Allowable Ponding in Filterra =	9”
Filterra Model Analyzed =	6’x8’/8’x6’ Offline Filterra HC

Design Summary:
Utilizing NRCS Method and HydroCAD software, a hydrograph can be derived to represent the design storm. The WQ flow rate for the total drainage area is 0.37cfs (Figure 1). This storm can then be routed through an appropriately sized Filterra unit, in this case a 6’x8’ Offline Filterra HC. Since the Filterra system can provide up to 9” of ponding, some flow attenuation is possible. The Filterra system is able to accommodate a portion of the water quality volume in the head space above the media and release it at the system’s design flow rate. The hydrograph in Figure 2 illustrates this concept. In this example, the 6 cf stored represents the upper portion of the hydrograph between 0.37cfs and 0.33cfs.

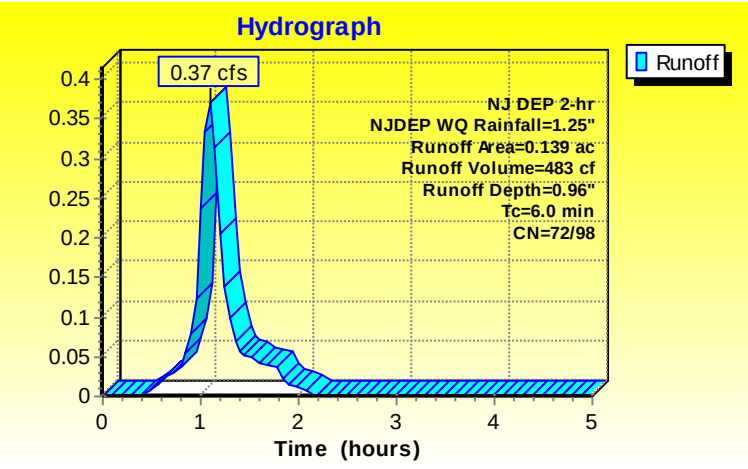


Figure 1. Inflow rate during the WQDS event

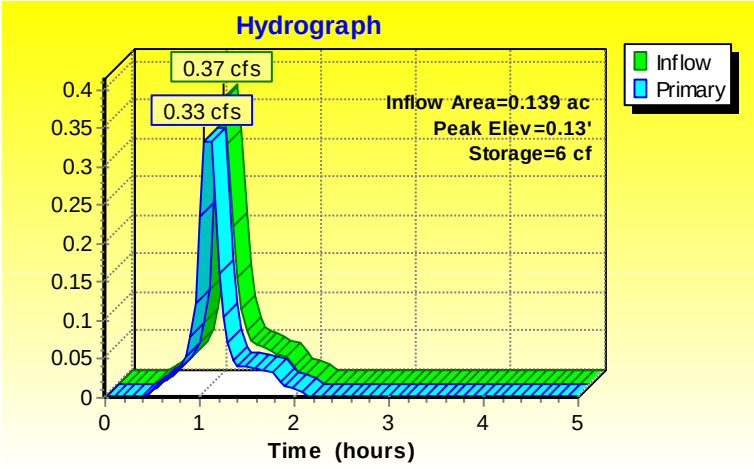
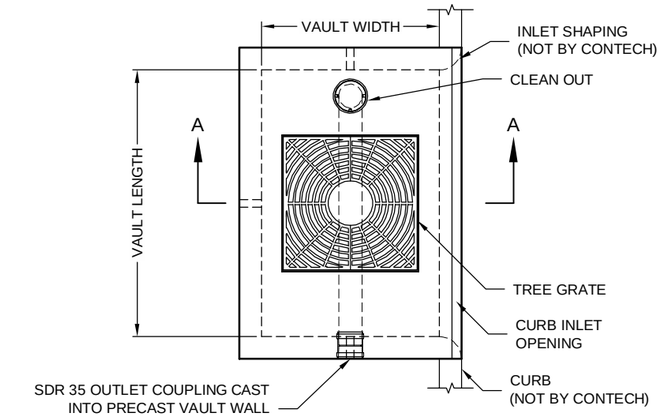


Figure 2. Inflow rate during WQDS event and Filterra outflow rate

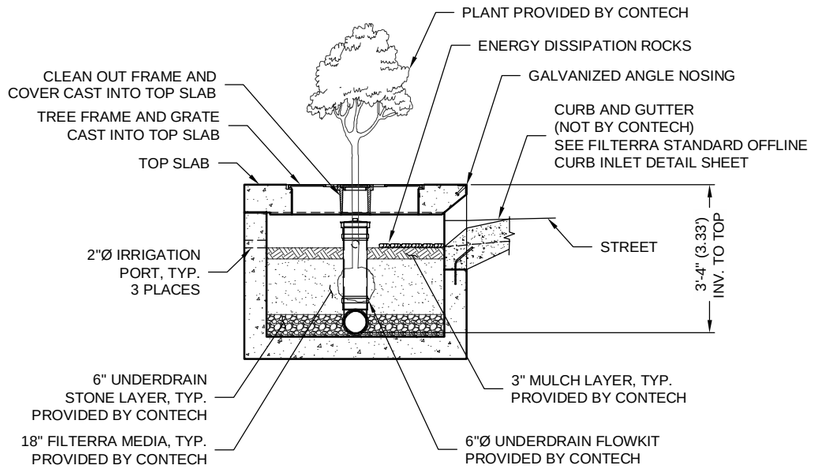
Thank you for the opportunity to present this to you and your client. Please do not hesitate to contact me should you have any additional questions.

Sincerely,

Taylor Murdock
Storm Water Design Engineer
Contech Engineered Solutions, LLC.



PLAN VIEW



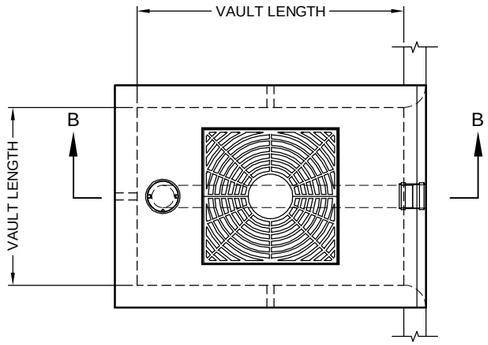
SECTION A-A

FT-HC LONG SIDE INLET CONFIGURATION

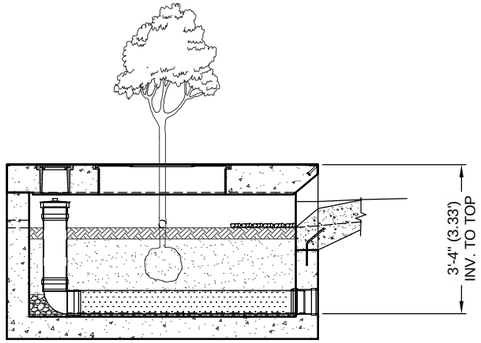
DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604-HC	N/A CA	6 x 4	6 x 4	6" SDR 35	(1) 3' x 3'
FT06504-HC	CA ONLY	6.5 x 4	6.5 x 4	6" SDR 35	(1) 3' x 3'
FT078045-HC	DE, MD, NJ, PA, VA, WV ONLY	7.83 x 4.5	7.83 x 4.5	6" SDR 35	(1) 3' x 3'
FT0804-HC	N/A DE, MD, NJ, PA, VA, WV	8 x 4	8 x 4	6" SDR 35	(1) 3' x 3'
FT0806-HC	ALL	8 x 6	8 x 6	6" SDR 35	(1) 4' x 4'
FT1006-HC	ALL	10 x 6	10 x 6	6" SDR 35	(1) 4' x 4'
FT1206-HC	ALL	12 x 6	12 x 6	6" SDR 35	(2) 4' x 4'
FT1307-HC	ALL	13 x 7	13 x 7	6" SDR 35	(2) 4' x 4'
FT1408-HC	CALL CONTECH	14 x 8	14 x 8	6" SDR 35	(2) 4' x 4'
FT1509-HC	CALL CONTECH	15 x 9	15 x 9	6" SDR 35	(2) 4' x 4'
FT1608-HC	CALL CONTECH	16 x 8	16 x 8	6" SDR 35	(2) 4' x 4'
FT1808-HC	CALL CONTECH	18 x 8	18 x 8	6" SDR 35	(2) 4' x 4'
FT2008-HC	CALL CONTECH	20 x 8	20 x 8	6" SDR 35	(3) 4' x 4'
FT2208-HC	CALL CONTECH	22 x 8	22 x 8	6" SDR 35	(3) 4' x 4'

N/A = NOT AVAILABLE

INTERNAL PIPE CONFIGURATION MAY VARY DEPENDING UPON OUTLET LOCATION.



PLAN VIEW

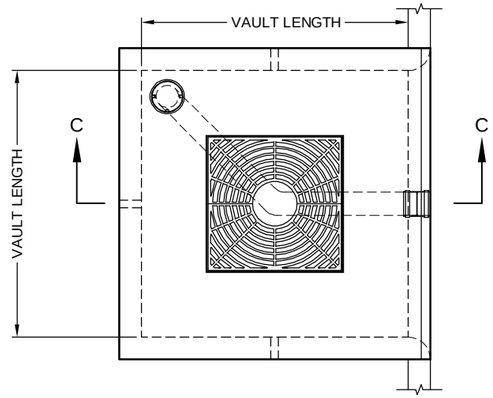


SECTION B-B

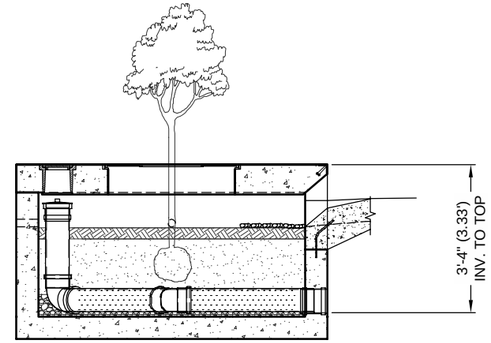
FT-HC SHORT SIDE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406-HC	N/A CA	4 x 6	4 x 6	6" SDR 35	(1) 3' x 3'
FT04065-HC	CA ONLY	4 x 6.5	4 x 6.5	6" SDR 35	(1) 3' x 3'
FT0408-HC	N/A DE, MD, NJ, PA, VA, WV	4 x 8	4 x 8	6" SDR 35	(1) 3' x 3'
FT045078-HC	DE, MD, NJ, PA, VA, WV ONLY	4.5 x 7.83	4.5 x 7.83	6" SDR 35	(1) 3' x 3'
FT0608-HC	ALL	6 x 8	6 x 8	6" SDR 35	(1) 4' x 4'
FT0610-HC	ALL	6 x 10	6 x 10	6" SDR 35	(1) 4' x 4'
FT0612-HC	ALL	6 x 12	6 x 12	6" SDR 35	(2) 4' x 4'
FT0713-HC	ALL	7 x 13	7 x 13	6" SDR 35	(2) 4' x 4'

N/A = NOT AVAILABLE



PLAN VIEW



SECTION C-C

FT-HC SQUARE INLET CONFIGURATION

DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404-HC	ALL	4 x 4	4 x 4	6" SDR 35	(1) 3' x 3'
FT0606-HC	ALL	6 x 6	6 x 6	6" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

filterra

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 8,277,274; 6,585,321; 7,625,485; 7,425,261; 7,833,412; RELATED FOREIGN PATENTS.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

FILTERRA HC OFFLINE (FT-HC) CONFIGURATION DETAIL

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2020

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

   The example below demonstrates the sizing procedure for the Filterra® HC:

   Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c = 0.99 (runoff coefficient for impervious)
   $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

   Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

Principal Warehouse Facility (South Filterra)
North Brunswick, NJ
8/4/21

Sizing Basis:
Filterra High Capacity biofiltration system has received final certification from the NJDEP for 80% TSS removal. Per the NJDEP, Filterra HC is considered a Green Infrastructure (GI) MTD. The sizing for the Filterra HC system under NJDEP regulations is based on the methodology outlined in Chapter 5 of the NJDEP BMP Manual. The NRCS method is utilized to determine a water quality flow rate for the drainage area in question. To validate the sizing, the parameters below were assumed.

Design Parameters:

Design Storm =	NJDEP Water Quality Design Storm (1.25-inch/2-hour storm event)
Filterra Media Flow Rate =	300 inches/hour
Total Drainage Area =	0.382 ac
Percent Impervious =	73.78%
Time of Concentration =	6 minutes
Allowable Ponding in Filterra =	9”
Filterra Model Analyzed =	6’x16’ Offline Filterra HC

Design Summary:
Utilizing NRCS Method and HydroCAD software, a hydrograph can be derived to represent the design storm. The WQ flow rate for the total drainage area is 0.82cfs (Figure 1). This storm can then be routed to an appropriately sized Filterra unit, in this case a 6’x16’ Offline Filterra HC. Since the Filterra system can provide up to 9” of ponding, some flow attenuation is possible. The Filterra system is able to accommodate a portion of the water quality volume in the head space above the media and release it at the system’s NJDEP certified maximum treatment flow rate. The hydrograph in Figure 2 illustrates this concept. In this example, the 41 cf stored represents the upper portion of the hydrograph between 0.82cfs and 0.67cfs.

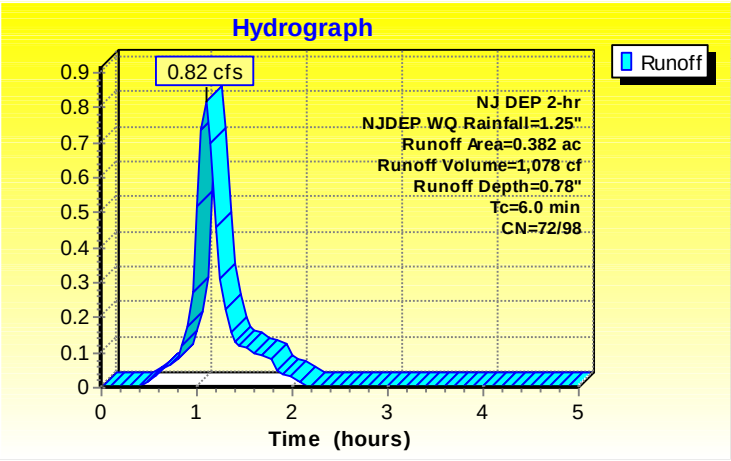


Figure 1. Inflow rate during the WQDS event

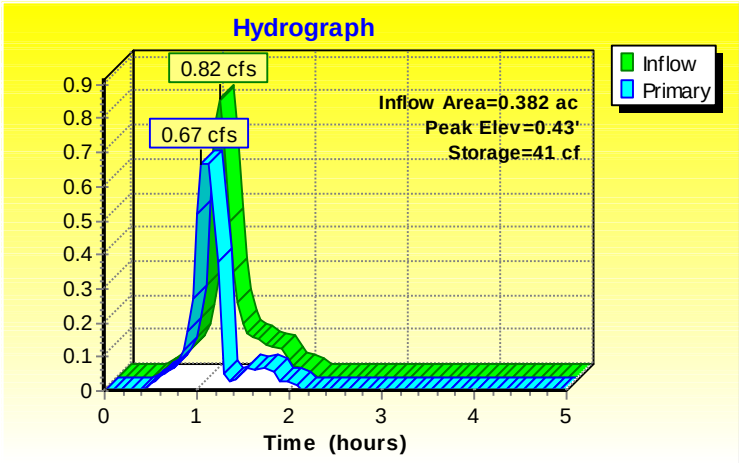


Figure 2. Inflow rate during WQDS event and Filterra outflow rate

Thank you for the opportunity to present this to you and your client. Please do not hesitate to contact me should you have any additional questions.

Sincerely,

Taylor Murdock
Storm Water Design Engineer
Contech Engineered Solutions, LLC.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER QUALITY
Bureau of Stormwater Permitting
401 East State Street
P.O. Box 420 Mail Code 401-02B
Trenton, NJ 08625-0420
Tel. (609) 633-7021 • Fax (609) 777-0432
www.nj.gov/dep/dwq/bnpc_home.htm

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Acting Commissioner

February 12, 2020

Derek M. Berg
Director – Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Lab Certification
Filterra® HC Bioretention System
Off-line Installation Approved

TSS Removal Rate 80%

Dear Mr. Berg:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Contech Engineered Solutions LLC has requested a Laboratory Certification for the Filterra® HC Bioretention System (Filterra® HC.)

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated January 2021) for this device is published online at http://www.njcat.org/uploads/newDocs/NJCATFilterraTechnologyVerificationReportFinal._.pdf.

The NJDEP certifies the use of the Filterra® HC stormwater treatment unit by Contech Engineered Solutions LLC at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 3.12 gpm/ft^2 of effective filtration treatment area.

2. The Filterra® HC stormwater treatment unit shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 7 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Filterra® HC. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/Portals/0/Documents/Maintenance%20Guides/Filterra%20HC%20OM%20Packet.pdf for any changes to the maintenance requirements.

6. For an MTD to be considered "green infrastructure" (GI) in accordance with the March 2, 2020 amendments to the Stormwater Management rules at N.J.A.C. 7:8, the MTD must meet the GI definition noted at amended N.J.A.C. 7:8-1.2. Specifically, the MTD shall (1) treat stormwater runoff through infiltration into subsoil; and/or (2) treat stormwater runoff through filtration by vegetation or soil; or (3) store stormwater runoff for reuse.

   The Filterra® HC filters stormwater runoff through an engineered biofiltration soil media and, thus, meets the definition of GI. Filterra® HC can be configured with or without a precast vault. Installations that will not include a precast vault will additionally need to comply the NJDEP Stormwater BMP Manual conditions regarding separation from the seasonal high water table and, if infiltration is proposed as an outlet, minimum vertical saturated hydraulic conductivity of the subsoil. Installations without a precast vault that do not rely on infiltration are required to maintain at least a one-foot separation from the seasonal high water table measured from the lowest point of the system. Installations without a precast vault that utilize infiltration are required to have the most hydraulically restrictive soil layer below the MTD meet the minimum tested vertical saturated hydraulic conductivity of one inch per hour and have at least two feet of separation from the seasonal high water table measured from the lowest point of the system.

7. Sizing Requirement:

   The example below demonstrates the sizing procedure for the Filterra® HC:

   Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using the Filterra® HC. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   The selection of the appropriate model of Filterra® HC is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the Filterra® HC in this example is 0.25 acres. Included in Table 1 below, all of the Filterra® HC models are designed with a maximum allowable drainage area greater than 0.25 acres. Specifically, the Filterra® HC with a 4'x4' media bay and a maximum allowable drainage area of 0.40 acres would be the smallest model able to treat runoff without exceeding the maximum allowable drainage area.

   Maximum Treatment Flow Rate (MTFR) Evaluation:

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i = 3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c = 0.99 (runoff coefficient for impervious)
   $Q = ciA = 0.99 \times 3.2 \times 0.25 = 0.79$ cfs

   Given the site runoff is 0.79 cfs and based on the MTFR's listed in Table 1 below, the Filterra® HC with a 16'x8' media bay and an MTFR of 0.889 cfs would be the smallest model that could be used to treat the impervious area without exceeding the MTFR. If using more than one unit for treating runoff, the units should be configured such that the flowrate to each unit does not exceed the design MTFR for each unit and ensuring the entire 0.25 acre area is treated.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below:

Table 1. Filterra® HC MTFRs and Maximum Allowable Drainage Areas

	Available Filterra® Media Bay Sizes (feet)	Effective Filtration Treatment Area (ft^2)	Treatment Flow Rate (cfs)	Maximum Allowable Drainage Area (ac)
Standard Configuration Filterra and Filterra Biosape Vaults	4x4	16	0.111	0.40
	4x6 or 6x4	24	0.167	0.60
	4.5x7.83 or 7.83x4.5 (Nominal 4x8/8x4)	35.24	0.245	0.89
	6x6	36	0.250	0.91
	6x8 or 8x6	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	6x12 or 12x6	72	0.500	1.81
	7x13 or 13x7	91	0.632	2.29
	14x8	112	0.778	2.82
	16x8	128	0.889	3.22
	18x8	144	1.000	3.62
	20x8	160	1.111	4.03
	22x8	176	1.222	4.43
Peak Diversion Filterra Vaults	4x4	16	0.111	0.40
	4.5x5.83 (Nominal 4x6)	26.24	0.182	0.66
	6x4	24	0.167	0.60
	6x6	36	0.250	0.91
	6x8	48	0.333	1.21
	6x10 or 10x6	60	0.417	1.51
	7x10	70	0.486	1.76
	8x10.5	84	0.583	2.11
	8x12.5	100	0.694	2.52
	Custom and/or Filterra Bioscape	Media Area in ft^2	0.00694 * (Media Area in ft^2)	0.0252 * (Media Area in ft^2)

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact me at (609) 633-7021.

Sincerely,

Gabriel Mahon, Chief
Bureau of Stormwater Permitting

Attachment: Maintenance Plan
cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP – Water & Land Management
Nancy Kempel, NJDEP– BSTP
Keith Stampfel, NJDEP – DLRP
Dennis Contois, NJDEP – DLRP

WHITESTONE
ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

June 9, 2021

via email

1980 US HWY 1, LLC
c/o PRINCIPAL REAL ESTATE INVESTORS, LLC
711 High Street
Des Moines, IA 50392

Attention: Mr. Kevin Stubbs
Director Architecture & Engineering

Regarding: PRELIMINARY GEOTECHNICAL INVESTIGATION &
STORMWATER MANAGEMENT AREA EVALUATION
PROPOSED WAREHOUSE FACILITY
1980 U.S. HIGHWAY 1
BLOCK 148, LOTS 34, 35.01 & 36
NORTH BRUNSWICK, MIDDLESEX COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GJ2117917.000

Dear Mr. Stubbs:

Whitestone Associates, Inc. (Whitestone) has completed a preliminary geotechnical investigation and stormwater management (SWM) area evaluation at the above referenced site. The results of the limited evaluation and preliminary recommendations presented below are based on the soil conditions disclosed from a limited number of subsurface tests conducted during Whitestone's field investigation. Recommendations for further investigation also are included herein.

The purpose of the preliminary subsurface soils investigation was to assess anticipated geologic features, shallow groundwater and/or rock, refusal depths, existing fill, and the potential feasibility of shallow foundations and/or expected earthwork requirements. While the scope of this preliminary investigation will not be sufficient to formulate detailed design recommendations and a more comprehensive geotechnical investigation ultimately will be required, this preliminary investigation may be used to assess potentially development impactive geotechnical issues to support preliminary studies regarding the feasibility of developing the property.

1.0 SUMMARY OF FINDINGS

In general, the subsurface conditions preliminarily indicate conditions suitable for shallow foundation design. The exploration indicated the presence of moderately to highly moisture-sensitive soils throughout the site that will impact the planned construction. Based on past experience with similar soils, earthwork activities will require stringent soil moisture control efforts. Depending on the time of year of construction, site work should anticipate overexcavation of moisture sensitive soils in structural areas, using mechanical and/or chemical subgrade stabilization techniques, and exercising detailed attention to construction methods while maintaining strict moisture control. In addition, existing fill containing

variable amounts of debris was encountered to a depth of up to four feet below ground surface (fbgs) that will require overexcavation below proposed foundations, if encountered at or below proposed foundation bearing elevations. Limited overexavation of existing fill may be anticipated for proposed floor slab and pavement areas as well. In addition, weathered rock and rock were encountered at variable depths that will present excavation difficulties.

2.0 PROJECT DESCRIPTION

2.1 Site Location and Existing Conditions

The subject property located at 1980 U.S. Highway 1 in North Brunswick, Middlesex County, New Jersey currently houses a single-story office/warehouse building with a loading dock, wooded area, pavements, landscaping, and utilities. At the time of Whitestone's investigation, the existing structure was observed to be in relatively fair structural condition. The existing pavements were observed to be in fair to poor structural condition with multiple areas of variable cracking.

2.2 Site Geology

The site is located within the Piedmont Physiographic Providence of New Jersey. Specifically, the subject site is underlain by the Lower Jurassic-aged and Upper Triassic-age Siltsone, Sandstone, and Shale members of the Passaic Formation, which is part of the Brunswick Group. These members generally consist of reddish-brown to brownish-purple and grayish-red siltstone, sandstone, and shale. The overburden materials at the site include weathered shale, mudstone, and sandstone. Overburden materials also include glacial deposits and man-made fill associated with past and present development of the subject site.

2.3 Proposed Construction

Based on the January 20, 2021 (last revised) *Concept Plan 'A'* prepared by Bohler Engineering NJ, LLC (Bohler), the proposed redevelopment is anticipated to include demolishing the existing site structure and constructing an approximately 190,600-square feet (maximum footprint), single-story warehouse facility with a maximum height of 40 feet, loading dock area, truck trailer parking, pavements, landscaping, utilities, and SWM facilities potentially including an aboveground bioretention basin and porous pavements. The proposed building is not anticipated to include a basement or crawl space. No new retaining walls, with the exception of the below-grade walls for the loading dock area, are anticipated for redevelopment.

Detailed grading or structural loading information have not been finalized. Whitestone assumes the site will be redeveloped at or near existing site grades with maximum cut and fill on the order of one foot to five feet. Based on Whitestone's experience with similar structures, the maximum design loads are anticipated to be less than the following: column load - 150 kips, wall load - 2.0 kips/foot, and floor load - 150 pounds per square foot.

3.0 FIELD INVESTIGATION & LABORATORY TESTING

3.1 Field Exploration

Field exploration at the project site was completed by means of five soil borings (identified as B-1 through B-4 and offset B-1A) conducted with a truck-mounted drill rig using hollow stem augers and

split-spoon sampling techniques and eight soil profile pits (identified as SPP-1 through SPP-8) with a track-mounted excavator. The borings were conducted within accessible portions of the proposed building footprint and pavement areas to depths ranging from approximately one fbgs (offset conducted) to 13.3 fbgs. The profile pits were conducted within the proposed SWM facilities to depths ranging from approximately eight fbgs to nine fbgs. The subsurface tests were backfilled to the surface with excavated soils from the investigation and borings within existing paved areas were surficially restored with asphaltic pavement cold patch, as necessary. The locations of the subsurface tests are shown on the *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A.

The subsurface tests were conducted in the presence of a Whitestone engineer who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

3.2 Laboratory Program

A representative sample of a selected strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216) and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil stratum tested was classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring	**Sample**	**Depth (fbgs)**	**% Passing No. 200 Sieve**	**Moisture Content (%)**	**Liquid Limit (%)**	**Plastic Index (%)**	**USCS Classification**
B-2	S-3	4.0 - 6.0	92.6	27.1	56	36	CH

4.0 SUBSURFACE CONDITIONS

The subsurface soil conditions encountered within the subsurface tests consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Materials: The subsurface tests were conducted within either existing paved areas, gravel-covered areas, or grass-covered areas. The borings within existing paved areas encountered approximately 1.5 inches to 2.5 inches of asphaltic concrete pavement at the surface underlain by approximately two inches to five inches of stone subbase materials. The test within an existing gravel-covered area encountered approximately four inches of gravel at the surface. The tests within existing grass-covered areas encountered approximately four inches to six inches of topsoil at the surface.

Existing Fill: Beneath the surface cover, the majority of subsurface tests encountered existing fill that generally consisted of silty sand with variable amounts of debris. The debris encountered consisted of concrete, brick, metal, and cinderblock fragments. Borings B-1 and B-4 were terminated within the existing fill at depths of approximately four fbgs and one fbgs, respectively. Within the remaining tests, the existing fill, where encountered, extended to depths ranging from approximately one fbgs to two fbgs. SPT N-values within the existing fill ranged between four blows per foot (bpf) and refusal (refusal defined as greater than 50 blows per six inches of split-spoon sampler advancement).

Glacial Deposits: Underlying the surface cover and/or existing fill, the majority of the tests encountered natural glacial deposits generally consisting of silty sand (USCS: SM) with variable amounts of gravel, poorly graded sand with silt (USCS: SP-SM), lean clay (USCS: CL) with variable amounts of sand and gravel, and/or fat clay (USCS: CH). Where encountered, the glacial deposits extended to depths ranging from approximately four fbgs to eight fbgs. SPT N-values within coarse-grained portions of this stratum ranged between 10 bpf and 24 bpf, generally indicating medium dense relative density and averaging approximately 17 bpf. Pocket penetrometer tests within fine-grained portions of this stratum resulted in unconfined compressive strengths ranging between approximately 0.5 ton per square foot (tsf) and 1.5 tsf, generally indicating medium stiff to stiff consistency.

Residual Soils: Underlying the glacial deposits, a portion of the tests encountered natural residual soils generally consisting of silty sand (USCS: SM) with variable amounts of gravel and/or silt (USCS: ML) with gravel. Borings B-4A was terminated within the residual soils at a depth of approximately 10 fbgs. Within the remaining tests, the residual soils, where encountered, extended to depths ranging from approximately six fbgs to 13 fbgs. SPT N-values within coarse-grained portions of this stratum ranged between 14 bpf and 41 bpf, generally indicating medium dense to dense relative density and averaging approximately 22 bpf.

Weathered Rock/Bedrock: Beneath the glacial deposits and/or residual soils, the majority of the tests encountered weathered rock materials. The top of weathered rock was encountered at depths ranging from approximately four fbgs to 13 fbgs. The above tests were terminated within the weathered rock materials or weathered rock/bedrock interface at depths ranging from approximately eight fbgs to 13.3 fbgs. SPT N-values within this stratum generally were in the refusal range.

Groundwater: Static groundwater was encountered within the majority of the tests at depths ranging from approximately two fbgs to eight fbgs. Additionally, indications of seasonal high groundwater were encountered within the soil profile pits at the depths indicated in Section 6.0. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater level.

5.0 CONCLUSIONS AND PRELIMINARY RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered during Whitestone's limited subsurface investigation for the proposed redevelopment and is intended to provide general characteristics of the subsurface conditions for preliminary planning purposes and should not be utilized for final design

of structural foundations, floor slabs, or pavements. These preliminary considerations and site development options should be confirmed or revised upon development of the final project design concept and completion of a site-specific subsurface investigation and engineering analyses.

Foundations: Whitestone preliminarily anticipates that the structures may be supported on conventional spread and continuous wall footings designed to bear either within the underlying natural materials and/or controlled structural fill materials that are properly evaluated, placed, compacted, and prepared in order to control their moisture content. Existing fill should be overexcavated where encountered at or below proposed foundation bearing elevations and the resulting excavation should be restored with controlled structural backfill. Foundations bearing within the above materials may be preliminarily designed to impart a maximum allowable net bearing pressure in the range of 2,000 pounds per square foot (psf) to 4,000 psf, depending on final design column and wall loading, column spacing, settlement tolerances, and the final geotechnical investigation. Reuse of the existing fill for foundation support will be contingent upon supplemental evaluation, as recommended herein. The fat clay (USCS: CH) sporadically encountered should be overexcavated if encountered at or within 24 inches of foundation bearing elevations and resulting excavations should be restored with approved, controlled structural fill materials.

Floor Slabs and Pavements: Whitestone preliminarily anticipates that the properly evaluated, prepared and approved existing fill, natural site subgrade soils, and/or controlled structural imported fill will be suitable for support of the proposed floor slabs and pavements. At least limited overexcavation of existing fill may be required due to the variability that exists within existing fill, evidenced by the debris encountered. Subgrade stabilization and protection may also be necessary during wet conditions to obtain a stable surface. Subgrade stabilization may be achieved through the use of separation geotextiles, geogrids, and/or the addition of lime-cement to the subgrade. Fat clays (USCS: CH), if encountered at the proposed floor slab or pavement subgrades, should be overexcavated to a minimum depth of 12 inches below proposed subgrade elevation and resulting excavations should be restored with approved, controlled structural fill materials.

On-Site Soil Reusability: Whitestone preliminarily anticipates that the majority of the existing fill and natural site soils situated above the groundwater table will be suitable for selective reuse as structural fill and/or backfill where free of debris and moisture contents are controlled within two percent of the optimum and the soils are placed during favorable weather conditions. Fat clay soils (USCS: CH), where encountered, should not be used as structural backfill materials due to their moisture sensitivity and expansion potential. Reuse of the existing fill will be contingent on careful inspection in the field by the owner's geotechnical engineer by visual observation and/or test pit excavations during construction as recommended herein. Soils located at or near the existing groundwater table will require extensive drying prior to reuse.

Based on the conditions disclosed by the subsurface exploration and the results of the laboratory test results, portions of the on-site natural soils contain an appreciable amount of fines and are not anticipated to be immediately suitable for reuse as structural fill and/or backfill due to high moisture content characteristics. Disturbance of these soils should be minimized. The on-site moisture sensitive soils, while stable and often hard when in a dry natural state, will degrade when wetted or disturbed. Whitestone anticipates that the sandy and/or less plastic site soils, where encountered, may be suitable for reuse as structural fill and/or backfill provided moisture contents are controlled within two percent of the optimum only during favorable weather conditions. Due to moisture sensitivity, use of portions of the on-site soils should expect mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. These materials will become increasingly difficult to reuse and compact where wetted beyond the optimum moisture content. Materials that become exceedingly wet likely will require discing and aerating and extended time to dry during favorable weather.

Cobble- and boulder-sized weathered rock/bedrock materials or similarly sized materials greater than three inches in diameter will need to be separated from on-site soils to be placed as structural fill or backfill. Cobble-sized materials between three inches to 12 inches may be crushed or individually placed in structural fill or backfill layers deeper than two feet below proposed foundation and pavement subgraded levels. Care must be taken to individually seat any large particles and to compact soil around large particles with hand operated equipment to minimize risk of void formation. Boulder-sized greater than 12 inches in diameter need to be crushed prior to replacement as structural fill materials. Materials greater than three inches in size should be placed a minimum of three feet from utilities.

Excavation Difficulties: Weathered rock and bedrock were encountered across the subject property at variable depths that can present difficult excavation. Removal of weathered rock and potentially limited bedrock may be required within portions of the proposed site foundations and utilities, depending on final grading. Heavy excavating equipment with ripping tools will typically be effective in removing dense/hard weathered soils, transition materials, and cobble/boulder-sized rock fragments during site mass grading. The speed and ease of excavation will depend on the type of grading equipment, the skill of the equipment operators, and the geologic structure of the material itself, such as the direction of planes of weakness and spacing between discontinuities. Planned excavation in confined excavations, such as for footing and utility trenches, may require ripping tools, pneumatic hammers, pre-spitting and/or expansive grout.

Groundwater Control: Static groundwater was encountered at depths as shallow as two fbgs. Additionally, perched/trapped groundwater may be encountered within the existing fill, at the existing fill /natural soil interface, within fine-grained portions of the natural materials, and at the natural soil/weathered rock interface, especially following precipitation events. As such, construction phase dewatering of static and perched/trapped groundwater through the use of gravity fed sump pumps should be anticipated during excavation activities for this site. Additionally, permanent groundwater control including perimeter drains for proposed foundations may be required, depending on final grades.

Supplemental Borings: A supplemental subsurface investigation designed to address site-specific conditions for proposed construction should be conducted following demolition of the existing site structure and the finalization of the design concept, grading, and general site layout. The final subsurface investigation and geotechnical evaluation should be conducted to obtain subsurface information across the site at more closely spaced intervals within the proposed building, pavements, and utility alignments, etc.

6.0 PRELIMINARY SWM AREA EVALUATION

General: Soil profile pits SPP-1 through SPP-8 were conducted within accessible areas of the SWM facility locations provided by Bohler. The soil profile pits within the SWM areas were terminated at depths ranging between approximately eight fbgs to nine fbgs.

Estimated Seasonal High Groundwater Levels: The methods used in determining the seasonal high groundwater level include evaluating the soil morphology within a test excavation and identifying irregular spots or blotches of different colors or minerals unlike that of the surrounding soil (mottles). A summary of the estimated seasonal high groundwater observations as well as infiltration test results are included in the following table.

INFILTRATION TEST SUMMARY					
Profile Pit #	Surface Elevation (feet*)	ESHGW (fbgs/feet*)	USDA Classification @ Test	Infiltration Test	
				Depth (fbgs/feet*)	Rate (in/hour)
SPP-1	110.5	2.0/108.5	Clay	2.0/108.5	< 0.2
SPP-2	112.0	2.0/110.0	Clay	2.0/110.0	< 0.2
SPP-3	109.5	2.0/107.5	Clay	2.0/107.5	< 0.2
SPP-4	110.5	2.0/108.5	Clay	2.0/108.5	< 0.2
SPP-5	113.0	1.5/111.5	Clay	1.5/111.5	< 0.2
SPP-6	112.0	1.5/110.5	Clay	1.5/110.5	< 0.2
SPP-7	113.0	1.5/111.5	Clay	1.5/111.5	< 0.2
SPP-8	114.0	2.0/112.0	Clay	2.0/112.0	< 0.2

* above NAVD 88

Soil Infiltration Rates: An in-situ infiltration test was conducted within the proposed SWM area at soil profile pit SPP-1. Infiltration testing was conducted using the single-ring infiltration test method per the *New Jersey Stormwater Best Practices Manual*. The test resulted in an infiltration rate of less than 0.2 inches per hour (iph). Infiltration test results are provided in Appendix C, Soil Profile Pit Logs are included in Appendix A. Representative samples within the remaining profile pits were subjected to tube permeameter analysis as detailed in *New Jersey Stormwater Best Practices Manual.* Laboratory tube permeameter testing resulted in a permeability rate of less than 0.2 iph. Individual tube permeameter test results are provided in Appendix B.

Conclusions and Recommendations: The results of the subsurface investigation and infiltration testing indicate that the tested site soils consist predominantly of clay materials that are relatively impermeable and not conducive for SWM infiltration. Additionally, indications of seasonal high groundwater were observed as shallow as 1.5 fbgs. Based on the findings of this investigation, Whitestone recommends using BMPs that are not reliant upon subsurface infiltration.

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to 1980 US Hwy 1, LLC and Principal Real Estate Investors, LLC. Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein. Please contact us at (908) 668-7777 with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Mudar Khantamr, P.E.
Project Manager

Laurence W. Keller, P.E.
Principal, Geotechnical Services

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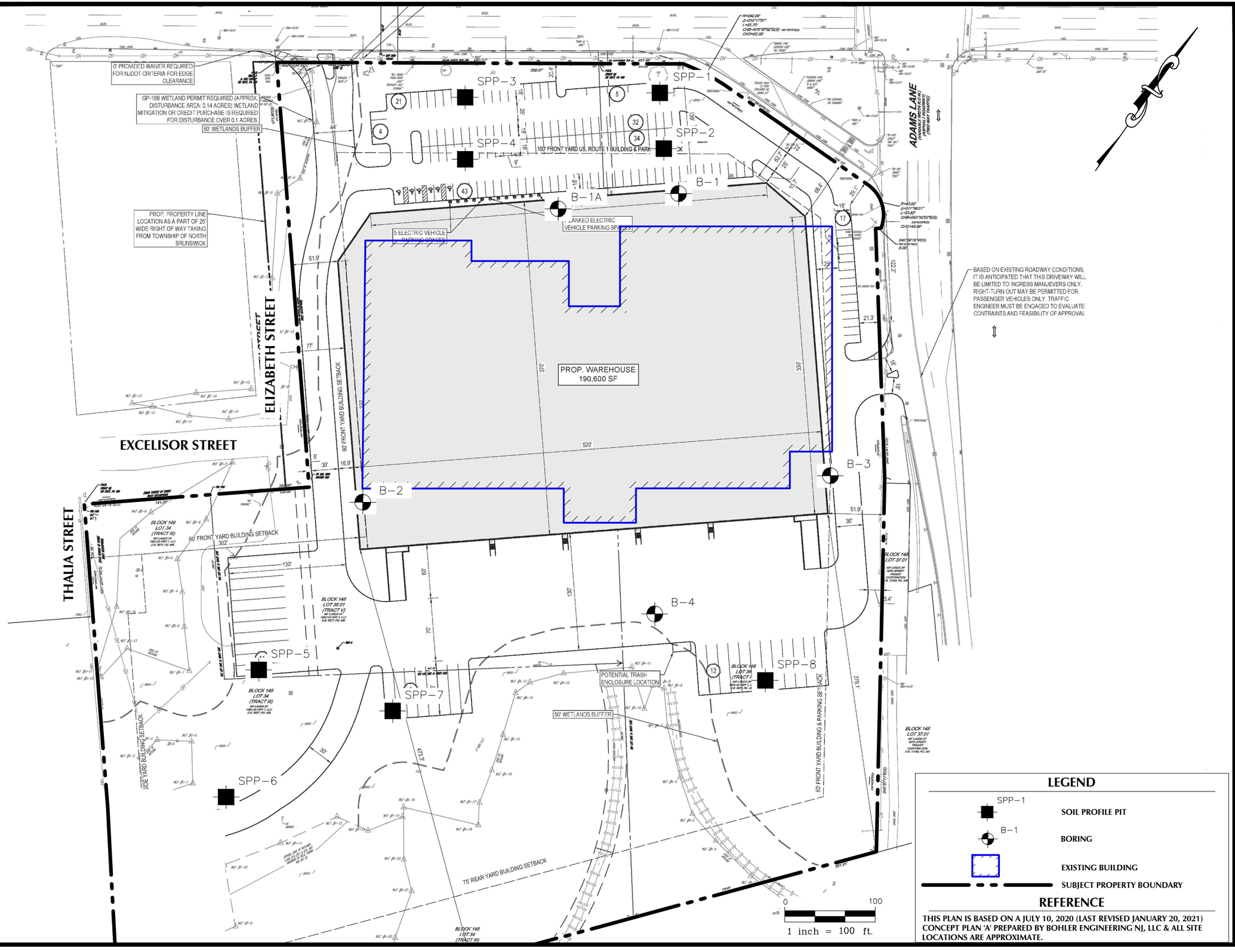
Enclosures
Copy: Danielle Loeffler, Avison Young
Katie Sherman, Avison Young

WHITESTONE
ASSOCIATES, INC.

FIGURE 1
Test Location Plan



LEGEND

- SPP-1 — SOIL PROFILE PIT
- B-1 — BORING
- EXISTING BUILDING
- SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON A JULY 10, 2020 (LAST REVISED JANUARY 20, 2021) CONCEPT PLAN 'A' PREPARED BY BOHLER ENGINEERING NJ, LLC & ALL SITE LOCATIONS ARE APPROXIMATE.

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants
30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **1980 US HWY 1, LLC c/o PRINCIPAL REAL ESTATE INVESTORS, LLC**

PROJECT: **PROPOSED WAREHOUSE FACILITY**
1980 U.S. HIGHWAY 1
NORTH BRUNSWICK, MIDDLESEX COUNTY, NJ

PROJECT #: GJ2117917.000	
DESIGNED BY: GR	PROJ. MGR.: MK
DATE: 6/8/21	FIGURE: 1
SCALE: 1" = 100'	

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WHITESTONE ASSOCIATES, INC.

APPENDIX A
Records of Subsurface Exploration

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 113.0 feet	**Date Started:**	5/20/2021		
Termination Depth:	4.0 feet bgs	**Date Completed:**	5/20/2021		
Proposed Location:	Building	**Logged By:**	MH	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AD	**At Completion:** NE | ---	**At Completion:** --- | ---
		Equipment:	CME-55	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.5	PAVEMENT		2" Asphalt, 4" Subbase Stone	
0.5 - 2	S-1		3 - 3 - 2	10	5		FILL		Dark Reddish-Brown Silty Sand, Moist (FILL)	
2 - 4	S-2		1 - 2 - 2 - 3	3	4	4.0			Low Recovery, Presumed As Above (FILL)	
						5.0			Boring Log B-1 Terminated at a Depth of 4.0 Feet Below Ground Surface Due to Existing Utility; Offset to B-1A	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1A

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC
Surface Elevation:	± 113.0 feet	**Date Started:**	5/20/2021
Termination Depth:	11.0 feet bgs	**Date Completed:**	5/20/2021
Proposed Location:	Building	**Logged By:**	MH
Drill / Test Method:	HSA / SPT	**Contractor:**	AD
		Equipment:	CME-55

Water Depth (feet bgs)	Elevation (feet)	Cave-In Depth (feet bgs)	Elevation (feet)
During: 2.0	111.0		
At Completion: 4.0	109.0	**At Completion:** ---	---
24 Hours: ---	---	**24 Hours:** ---	---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.4	PAVEMENT		2.5" Asphalt, 2.0" Subbase Stone	B-1 Offset
0.5 - 2	S-1	X	7 - 5 - 5	16	10		GLACIAL DEPOSITS		Brown Silty Sand with Gravel, Very Moist, Medium Dense (SM)	
2 - 4	S-2	X	7 - 8 - 9 - 8	16	17				As Above, Wet (SM)	
						4.0				
4 - 6	S-3	X	5 - 3 - 3 - 3	20	6	5.0			Gray Sandy Lean Clay with Gravel, Wet, Medium Stiff (CL)	
						6.0				
6 - 8	S-4	X	4 - 6 - 8 - 13	18	14		RESIDUAL		Reddish-Brown Silty Sand with Gravel, Wet, Medium Dense (SM)	
						8.0				
8 - 9.9	S-5	X	10 - 15 - 36 - 50/5"	16	51		WEATHERED ROCK		Reddish-Brown Weathered Rock, Very Dense (WR)	
						10.0				
						11.0				
									Boring Log B-1A Terminated at a Depth of 11.0 Feet Below Ground Surface Due to Auger Refusal	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC
Surface Elevation:	± 112.0 feet	**Date Started:**	5/20/2021
Termination Depth:	13.3 feet bgs	**Date Completed:**	5/20/2021
Proposed Location:	Building	**Logged By:**	MH
Drill / Test Method:	HSA / SPT	**Contractor:**	AD
	Auto Hammer	**Equipment:**	CME-55

Water Depth | Elevation (feet bgs) | (feet)		Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	2.0 | 110.0		
At Completion:	4.0 | 108.0	**At Completion:**	--- | ---
24 Hours:	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)			
						0.0	PAVEMENT	2" Asphalt, 5" Stone Subbase	
0.5 - 2	S-1		3 - 9 - 15	18	24	0.6	GLACIAL DEPOSITS	Reddish-Brown Poorly Graded Sand with Silt, Moist, Medium Dense (SP-SM)	
2 - 4	S-2		4 - 6 - 8 - 4	22	14	3.0		As Above, Wet (SP-SM)	
4 - 6	S-3		3 - 3 - 5 - 5	22	8	5.0		Gray Fat Clay, Wet, Stiff (CH)	Qu = 1.5 tsf
6 - 8	S-4		6 - 6 - 9 - 11	18	15	8.0		As Above (CH)	LL = 56, PI = 36
8 - 10	S-5		5 - 8 - 15 - 14	20	23	10.0	RESIDUAL	Reddish-Brown Silt with Gravel, Wet, Very Stiff (ML)	
						13.0	WR	Reddish-Brown Weathered Rock, Wet, Very Dense (WR)	
13 - 13.3	S-6		19 - 50/3"	8	50/3"	13.3		Boring Log B-2 Terminated at a Depth of 13.3 Feet Below Ground Surface Due to Auger Refusal	
						15.0			
						20.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 112.0 feet	**Date Started:**	5/20/2021		
Termination Depth:	12.0 feet bgs	**Date Completed:**	5/20/2021		
Proposed Location:	Building	**Logged By:**	MH	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AD	**At Completion:** NE | ---	**At Completion:** --- | ---
		Equipment:	CME-55	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
						0.5	PAVEMENT		2" Asphalt, 4" Subbase Stone	
0.5 - 2	S-1		5 - 4 - 6	16	10		GLACIAL DEPOSITS		Gray Lean Clay, Moist, Stiff (CL)	
2 - 4	S-2		4 - 4 - 10 - 7	12	14				As Above, Gravel, Very Stiff (CL)	
4 - 6	S-3		10 - 7 - 7 - 10	20	14	5.0			As Above (CL)	
							RESIDUAL		Reddish-Brown Silty Sand with Gravel, Moist, Medium Dense (SM)	Highly Weathered Rock
6 - 8	S-4		12 - 20 - 21 - 20	20	41				As Above, Dense (SM)	
						8.0				
8 - 8.9	S-5		38 - 50/5"	10	50/5"		WEATHERED ROCK		Reddish-Brown Weathered Rock, Very Dense (WR)	
						10.0				
						12.0				
									Boring Log B-3 Terminated at a Depth of 12.0 Feet Below Ground Surface Due to Auger Refusal	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± 113.0 feet	**Date Started:**	5/20/2021		
Termination Depth:	1.0 feet bgs	**Date Completed:**	5/20/2021		
Proposed Location:	Pavement	**Logged By:**	MH	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AD	**At Completion:** NE | ---	**At Completion:** --- | ---
		Equipment:	CME-55	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	PAVEMENT		1.5" Asphalt, 3" Subbase Stone	
						0.3	FILL			
0.5 - 0.8	S-1	X	50/3"	2	50/3"	1.0			Gray Concrete, Moist (FILL)	
									Boring Log B-4 Terminated at a Depth of 1.0 Feet Below Ground Surface; See Offset B-4A	
						5.0				
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4A

Page 1 of 1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC c/o Principal Real Estate Investors, LLC
Surface Elevation:	± 113.0 feet	**Date Started:**	5/20/2021
Termination Depth:	10.0 feet bgs	**Date Completed:**	5/20/2021
Proposed Location:	Pavement	**Logged By:**	MH
Drill / Test Method:	HSA / SPT	**Contractor:**	AD
		Equipment:	CME-55

Water Depth | Elevation (feet bgs) | (feet)		Cave-In Depth | Elevation (feet bgs) | (feet)	
During:	NE | ---		
At Completion:	NE | ---	**At Completion:**	--- | ---
24 Hours:	--- | ---	**24 Hours:**	--- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0			Offset B-3A 4.0' South Augering to 2.0 fbgs	
						2.0	GLACIAL DEPOSITS			
2 - 4	S-1		2 - 2 - 3 - 3	12	5				Gray Lean Clay, Moist, Medium Stiff (CL)	Qu = 0.5 tsf
4 - 6	S-2		3 - 3 - 7 - 10	20	10	5.0			As Above, Stiff (CL)	Qu = 1.5 tsf
6 - 8	S-3		7 - 10 - 10 - 13	20	20				As Above, Very Stiff (CL)	Some Sand
						8.0	RESIDUAL			
8 - 10	S-4		8 - 10 - 10 - 18	20	20	10.0			Reddish-Brown Silty Sand with Gravel, Very Moist, Medium Dense (SM)	
									Boring Log B-4A Terminated at a Depth of 10.0 Feet Below Ground Surface	
						15.0				
						20.0				
						25.0				

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WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-1

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 110.5 feet	**Date Started:**	5/20/2021				
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	Porous Pavement	**Logged By:**	MH	**During:** 8.0	102.5		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:** 9.0	101.5	**At Completion:** 2.0	108.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:** ---	---		

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	TOPSOIL	6" Topsoil	
			0.5 - 2	FILL	Reddish-Brown LOAM; Granular Structure; Moist; Loose; 10% Roots; No Mottles; Clear Boundary; Debris	Debris: Metal
			1.0			
			2.0			
			2 - 5.5	GLACIAL DEPOSITS	Gray to Brown CLAY; Massive Structure; <5% Roots; Common <15MM Mottles; Clear Boundary	
			3.0			
			4.0			
			5.0			
			5.5 - 7	RESIDUAL	Reddish-Brown LOAM; Single Grain Structure; Moist; Stiff; No Roots; Mottles; Clear Boundary	
			6.0			
			7.0			
			7 - 9	WEATHERED ROCK	Reddish-Brown Weathered Rock; Moist to Wet	
			8.0 ▼			Wet @ 8.0 fbgs
			9.0 ▽			
					Soil Profile Pit SPP-1 Terminated at a Depth of 9.0 Feet Below Ground Surface Due to Bucket Refusal	
			10.0			
			11.0			
			12.0			
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-2

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

Surface Elevation:	± 112.0 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	8.0 feet bgs	**Date Completed:**	5/20/2021	**During:**	7.0	105.0	
Proposed Location:	Porous Pavement	**Logged By:**	MH	**At Completion:**	8.0	104.0	**At Completion:** 2.0 / 110.0
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**24 Hours:**	---	---	
Test Method:	Visual Observation	**Rig Type:**	Komatsu				

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	TOPSOIL	6" Topsoil	
			0.5 - 2	FILL	Reddish-Brown LOAM; Granular Structure; Moist; Loose; 10% Roots; No Mottles; Clear Boundary; Debris	
			1.0			
			2.0			
2.0	T-1A/B	TUBES	2 - 4	GLACIAL DEPOSITS	Gray to Brown CLAY; Massive Structure; <5% Roots; Common <15MM Mottles; Clear Boundary	
			3.0			
			4.0			
			4 - 8	WEATHERED ROCK	Reddish-Brown Weathered Rock; Moist to Wet	
			5.0			
			6.0			
			7.0 ▼			Wet @ 7.0 fbgs
			8.0 ▽			
			9.0		Soil Profile Pit SPP-2 Terminated at a Depth of 8.0 Feet Below Ground Surface Due to Bucket Refusal	
			10.0			
			11.0			
			12.0			
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-3

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 109.5 feet	**Date Started:**	5/20/2021				
Termination Depth:	8.5 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	Porous Pavement	**Logged By:**	MH	**During:** 6.0	103.5		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:** 6.0	103.5	**At Completion:** 2.0	107.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:** ---	---		

SAMPLE INFORMATION			DEPTH (feet)	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type				
			0.0			
			0 - 0.5	TOPSOIL	6" Topsoil	
			0.5 - 2	FILL	Reddish-Brown LOAM; Granular Structure; Moist; Loose; 10% Roots; No Mottles; Clear Boundary; Debris	
2.0	T-1A/B	TUBES	2 - 4	GLACIAL DEPOSITS	Gray to Brown CLAY; Massive Structure; <5% Roots; Common <15MM Mottles; Clear Boundary	
			4 - 8.5	WEATHERED ROCK	Reddish-Brown Weathered Rock; Moist to Wet	Wet @ 6.0 fbgs
			9.0		Soil Profile Pit SPP-3 Terminated at a Depth of 8.5 Feet Below Ground Surface Due to Bucket Refusal	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-4

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

Surface Elevation:	± 110.5 feet	**Date Started:**	5/20/2021		**Water Depth (feet bgs)**	**Elevation (feet)**	**Estimated Seasonal High Groundwater Depth (feet bgs)** / **Elevation (feet)**
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/20/2021				
Proposed Location:	Porous Pavement	**Logged By:**	MH	**During:**	8.0	102.5	
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	8.0	102.5	**At Completion:** 2.0 / 108.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:**	---	---	

SAMPLE INFORMATION			DEPTH (feet)		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type					
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
			1.0	0.5 - 2	FILL	Reddish-Brown LOAM; Granular Structure; Moist; Loose; 10% Roots; No Mottles; Clear Boundary; Debris	
2.0	T-1A/B	TUBES	2.0	2 - 4	GLACIAL DEPOSITS	Gray to Brown CLAY; Massive Structure; <5% Roots; Common <15MM Mottles; Clear Boundary	
			3.0				
			4.0	4 - 9	WEATHERED ROCK	Reddish-Brown Weathered Rock; Moist to Wet	
			5.0				
			6.0				
			7.0				
			8.0 ▽▼				Wet @ 8.0 fbgs
			9.0				
						Soil Profile Pit SPP-4 Terminated at a Depth of 9.0 Feet Below Ground Surface Due to Bucket Refusal	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-5

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

Surface Elevation:	± 113.0 feet	**Date Started:**	5/21/2021	**Water Depth (feet bgs) | Elevation (feet)**		**Estimated Seasonal High Groundwater Depth (feet bgs) | Elevation (feet)**
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/21/2021			
Proposed Location:	Porous Pavement	**Logged By:**	MK	**During:**	7.0 | 106.0 ▽	
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	8.5 | 104.5 ▽	**At Completion:** 1.5 | 111.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:**	--- | --- ▼	

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.3	TOPSOIL	4" Topsoil	
			0.3 - 1.5	FILL	Gray Silty Sand with Gravel, Moist (FILL)	
			1.0			
			1 - 1.5	GLACIAL DEPOSITS	Orange Brown SANDY LOAM; Trace Gravel; Moderate, Medium Structure; Moist; No Roots; No Mottles	
1.5	T-1A/B	TUBES	1.5 - 6		Light Gray CLAY; Fine Structure; Moist; Stiff; No Roots; Many Orange Brown Mottles (>15MM)	
			2.0			
			3.0			
			4.0			
			5.0			
			6.0			
			6 - 8	RESIDUAL	Reddish-Brown CLAY LOAM; Moist to Wet; No Roots; Faint Mottles	
			7.0 ▼			Wet @ 7.0 fbgs
			8.0			
			8 - 9	WEATHERED ROCK	Reddish- Brown Weathered Rock; Wet	
			9.0			
			10.0		Soil Profile Pit SPP-5 Terminated at a Depth of 9.0 Feet Below Ground Surface Due to Bucket Refusal	
			11.0			
			12.0			
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-6

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

				Water Depth (feet bgs) | Elevation (feet)	
Surface Elevation:	± 112.0 feet	**Date Started:**	5/21/2021		
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/21/2021		
Proposed Location:	SWM	**Logged By:**	MK	**During:**	6.0 | 106.0
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:**	8.0 | 104.0
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:**	--- | ---

Estimated Seasonal High Groundwater Depth (feet bgs) \| Elevation (feet)

At Completion: 1.5 \| 110.5

SAMPLE INFORMATION			DEPTH		HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet				
			0.0				
				0 - 0.5	TOPSOIL	6" Topsoil	
			1.0	0.5 - 1.5	FILL	Gray Silty Sand with Gravel, Moist (FILL)	
1.5	T-1A/B	TUBES		1.5 - 4	GLACIAL DEPOSITS	Light Gray CLAY; Fine Structure; Moist; Stiff; No Roots; Many Orange Brown Mottles (>15MM)	
			2.0				
			3.0				
			4.0				
				4 - 6	RESIDUAL	Reddish-Brown CLAY LOAM; Moist; No Roots; Faint Mottles	
			5.0				
			6.0 ▽				
				6 - 9	WEATHERED ROCK	Reddish- Brown Weathered Rock; Wet	
			7.0				
			8.0 ▽				
			9.0				
						Soil Profile Pit SPP-6 Terminated at a Depth of 9.0 Feet Below Ground Surface Due to Bucket Refusal	
			10.0				
			11.0				
			12.0				
			13.0				
			14.0				
			15.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-7

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 113.0 feet	**Date Started:**	5/21/2021				
Termination Depth:	8.0 feet bgs	**Date Completed:**	5/21/2021				
Proposed Location:	Porous Pavement	**Logged By:**	MK	**During:** 6.0	107.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:** 7.5	105.5	**At Completion:** 1.5	111.5
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:** ---	---		

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.3	GRAVEL	4" Gravel	
			0.3 - 1.5	FILL	Brown to Gray Silty Sand with Debris; Moist (FILL)	Debris: Concrete (~12" Diameter Fragments)
			1.0			
1.5	T-1A/B	TUBES	1.5 - 4	GLACIAL DEPOSITS	Light Gray CLAY; Fine Structure; Moist; Stiff; No Roots; Many Orange Brown Mottles (>15MM)	
			2.0			
			3.0			
			4.0			
			4 - 6	RESIDUAL	Reddish-Brown CLAY LOAM; Moist; No Roots; Faint Mottles	
			5.0			
			6.0 ▼			
			6 - 8	WEATHERED ROCK	Reddish- Brown Weathered Rock; Wet	
			7.0			
			8.0 ▽			
			9.0		Soil Profile Pit SPP-7 Terminated at a Depth of 8.0 Feet Below Ground Surface Due to Bucket Refusal	
			10.0			
			11.0			
			12.0			
			13.0			
			14.0			
			15.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

RECORD OF SUBSURFACE EXPLORATION

Soil Profile Pit No.: SPP-8

Project:	Proposed Warehouse Facility	**WAI Project No.:**	GJ2117917.000
Location:	1980 U.S. Highway 1; North Brunswick, Middlesex County, NJ	**Client:**	1980 US Highway 1, LLC

				Water Depth (feet bgs)	Elevation (feet)	Estimated Seasonal High Groundwater Depth (feet bgs)	Elevation (feet)
Surface Elevation:	± 114.0 feet	**Date Started:**	5/21/2021				
Termination Depth:	8.0 feet bgs	**Date Completed:**	5/21/2021				
Proposed Location:	Porous Pavement	**Logged By:**	MK	**During:** 6.0	108.0		
Excavating Method:	Test Pit Excavation	**Contractor:**	TS	**At Completion:** 8.0	106.0	**At Completion:** 2.0	112.0
Test Method:	Visual Observation	**Rig Type:**	Komatsu	**24 Hours:** ---	---		

SAMPLE INFORMATION			DEPTH	HORIZON	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	Number	Type	feet			
			0.0			
			0 - 0.5	TOPSOIL	6" Topsoil	
			0.5 - 2	FILL	Dark Gray Silty Sand with Debris, Moist (FILL)	Debris: Concrete, Cinderblock & Brick
2.0	T-1A/B	TUBES	2 - 6	GLACIAL DEPOSITS	Gray CLAY; Fine Structure; Moist; Stiff; No Roots; Many Orange Brown Mottles (>15MM)	
			6 - 8	WEATHERED ROCK	Reddish-Brown Weathered Rock; Wet	
			8.0		Soil Profile Pit SPP-8 Terminated at a Depth of 8.0 Feet Below Ground Surface Due to Bucket Refusal	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE ASSOCIATES, INC.

INFILTRATION TEST

Client:	1980 US Highway 1, LLC	**Test Hole No.:**	SPP-1
Project:	Proposed Warehouse Facility	**Date:**	5/20/2021
Location:	North Brunswick, NJ	**Weather:**	Sunny, 75°
File No.	GJ2117917.000	**Field Engineer:**	MH
Surf. Elev.	110.5	**Test Depth Ft. | Elev.:**	2.0 | 108.50

Reading No.	Time		Water Level Reading (inches)		Water Level Fall (Inches)	Time Interval (Hours)	Rate of Flow (Inches/Hour)
	Start	Finish	Start	Finish			
PS	10:15	11:15	3.0	2.875	0.125	1.0	< 0.2

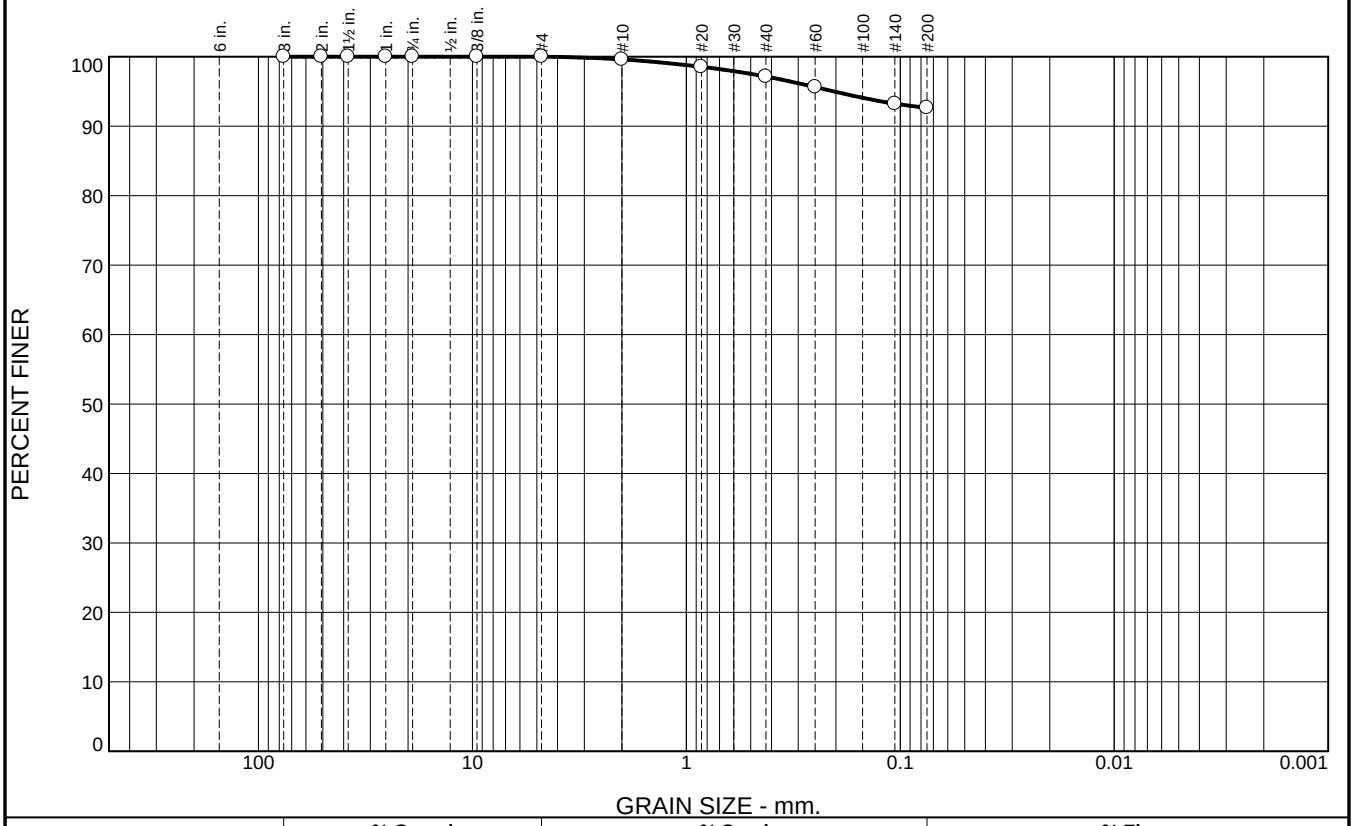
Field *i* = < 0.2 in/hr

NOTES: PS = Pre Soak; NS = Not Surveyed

WHITESTONE ASSOCIATES, INC.

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	2.5	4.5	92.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.6		
#20	98.5		
#40	97.1		
#60	95.6		
#140	93.2		
#200	92.6		

* (no specification provided)

Material Description

Fat Clay

Atterberg Limits

PL= 20 LL= 56 PI= 36

Coefficients

D_{90}= D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CH AASHTO= A-7-6(37)

Remarks

W_n = 27.1 %

Source of Sample: B-2 **Depth:** 4.0' - 6.0'
Sample Number: S-3

Date: 05/28/2021

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: 1980 US Hwy 1, LLC c/o Principal Real Estate Investors, LLC
Project: Proposed Warehouse Facility
1980 U.S. Highway 1, North Brunswick, Middlesex County, NJ
Project No: GJ2117917.000 **Figure**

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-2 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-3 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

Wt. of Tube Containing Sample _____
Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1 5.00
At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-3 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 2.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 72.36

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-4 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.25

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 94.07

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-4 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-5 **Sample No.:** T-1 **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 101.30

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** **SPP-5** **Sample No.:** **T-1** **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** **SPP-6** **Sample No.:** **T-1** **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1	5.00
At the End of Each Test Interval, H2	5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** **SPP-6** **Sample No.:** **T-1** **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.25

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 94.07

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1	5.00
At the End of Each Test Interval, H2	5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-7 **Sample No.:** T-1 **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-7 **Sample No.:** T-1 **Depth:** 1.5'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.50

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 101.30

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** **SPP-8** **Sample No.:** **T-1** **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) A Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

At the Beginning of Each Test Interval, H1	5.00
At the End of Each Test Interval, H2	5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

Tube Permeameter Test Data

Job Number: GJ2117917.000
Project: Proposed Warehouse Facility
Client: Principal Real Estate Investors, LLC
Lab Tech: TJ

Sample ID: **Profile Pit No.:** SPP-8 **Sample No.:** T-1 **Depth:** 2.0'

COUNTY/MUNICIPALITY North Brunswick, NJ BLOCK _____ LOT _____

1. Test Number 1 Replicate (letter) B Date Collected _____

2. Material Tested: _____ Fill X Test in Native Soil

3. Type of Sample: X Undisturbed _____ Disturbed

4. Sample Dimensions: Inside Radius of Sample Tube, R, in cm 1.91
   Length of Sample, L, in inches 3.00

5. Bulk Density Determination (Disturbed Samples Only): N/A

6. Sample Weight (Wt. Tube Containing Sample-Wt. of Empty Tube), grams 0.00

   Wt. of Tube Containing Sample _____
   Wt. of Empty Tube _____

7. Sample Volume (L x 2.54 cm./inch x 3.14R2), cc. 86.83

8. Bulk Density (Sample Wt./Sample Volume), grams/cc. 0 > 1.2

9. Standpipe Used: X No _____ Yes, Indicate Internal Radius, cm. N/A

10. Height of Water Level Above Rim of Test Basin, in inches:

    At the Beginning of Each Test Interval, H1 5.00
    At the End of Each Test Interval, H2 5.00

11. Rate of Water Level Drop (Add additional lines if needed):

Time, Start of Test Interval, T1	Time End of Test Interval T2	Length of Test Interval, T, Minutes
		120.00

12. Calculation of Permeability: K, (in/hr) = 60 min/hr x r2/R2 x L(in)/T(min) x ln (H1/H2) T= 120.00

    K (in/hr) = 0.00 **Classification:** **K0**

13. Defects in the Sample (Check appropriate items):

_____ None

_____ Soil/Tube Contact _____ Large Gravel _____ Large Roots

_____ Dry Soil _____ Smearing _____ Compaction

_____ Other - Specify _____

WHITESTONE ASSOCIATES, INC.

APPENDIX C
Supplemental Information (USCS, Terms and Symbols)

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Other Office Locations:

CHALFONT, PA 215.712.2700
SOUTHBOROUGH, MA 508.485.0755
ROCKY HILL, CT 860.726.7889
WALL, NJ 732.592.2101
PHILADELPHIA, PA 215.848.2323

WHITESTONE ASSOCIATES, INC.
Environmental & Geotechnical Engineers & Consultants

30 INDEPENDENCE BOULEVARD
SUITE 250
WARREN, NJ 07059
908.668.7777
whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

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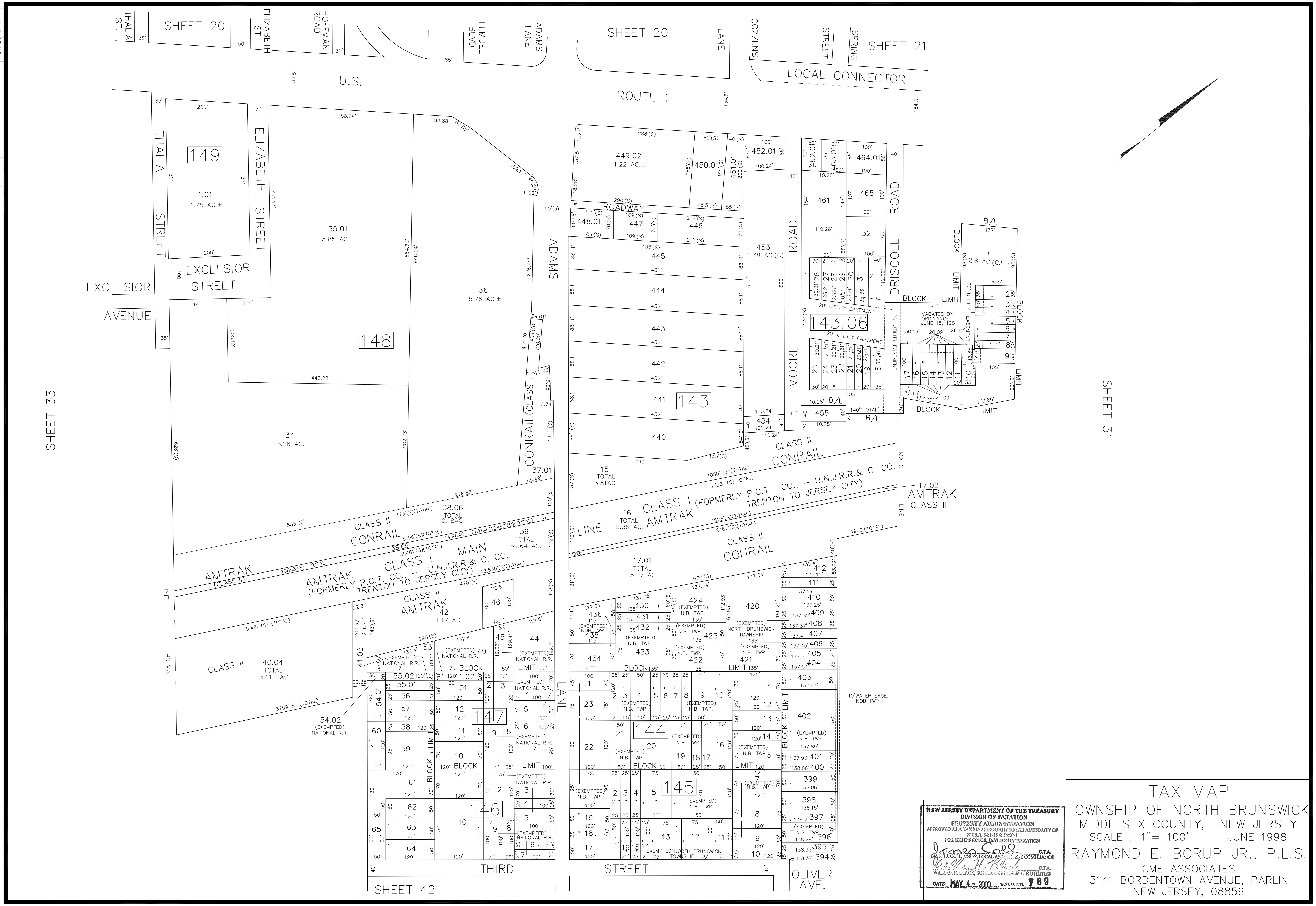
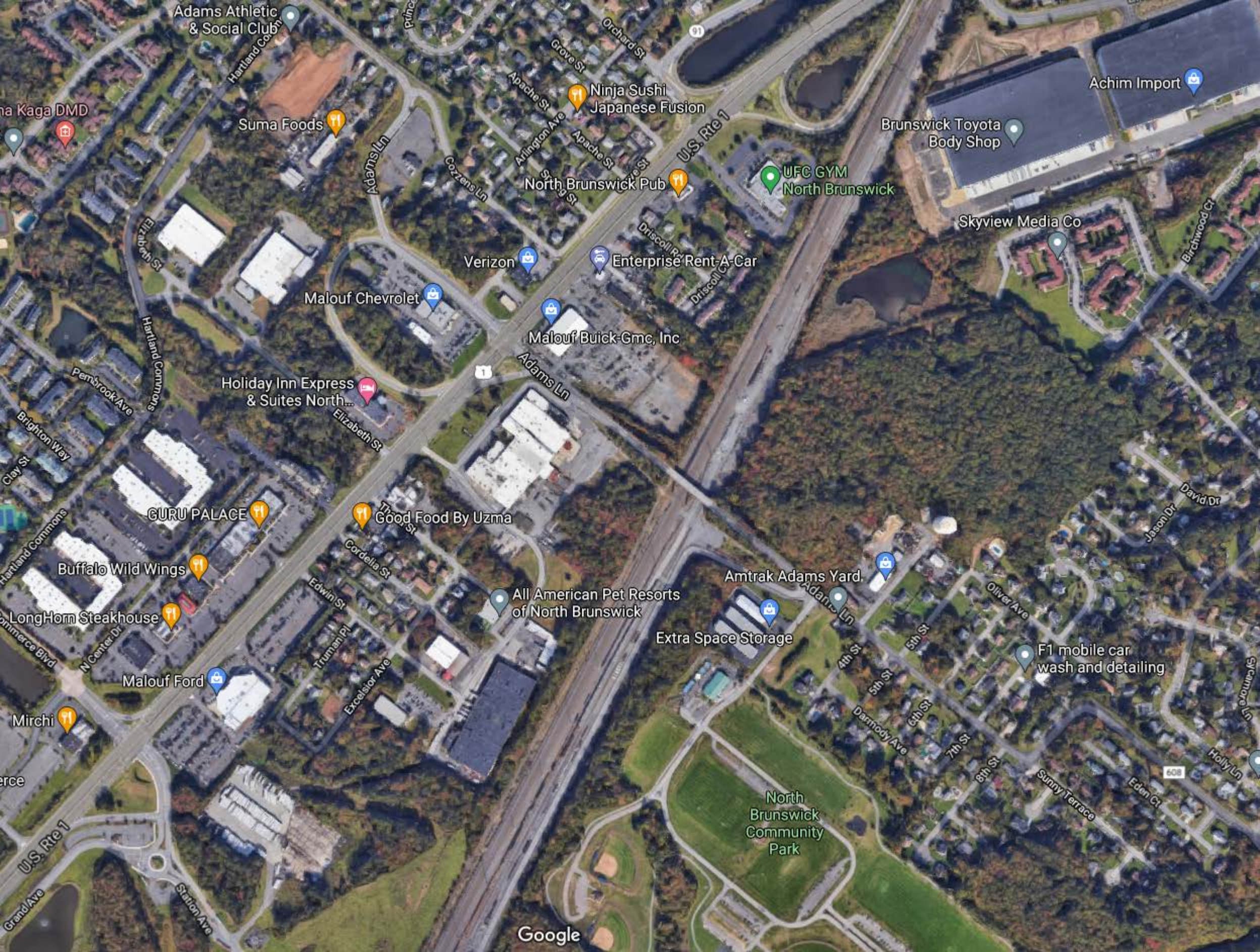
SOUTHBOROUGH, MA 508.485.0755
ROCKY HILL, CT 860.726.7889
WALL, NJ 732.592.2101
PHILADELPHIA, PA 215.848.2323

C. MAPS

- **Tax Map**
- **Aerial Map**
- **Soil Map**
- **State Planning Area Map**
- **USGS Map**
- **HUC14 Map**
- **Drainage Area Maps**
  - **Existing Drainage Area Map**
  - **Proposed Drainage Area Map**
  - **Inlet Area Map**

REVISED	DESCRIPTION	REV. BY	CHK.
2/2016	RR REVISED DUE TO SH33 LAY OUT	R.R.	
2/2015	BL 148 L37 ROW TAKING	R.R.	
4/2013	BL 143 L448,449.01 ROW TAKING	R.R.	
4/2004	EXEMPTED TWP OF NB ADDED TO BLKS 143, 144, 145	R.R.	


SHEET 20
SHEET 21
SHEET 33
SHEET 31
SHEET 42
THALIA ST.
ELIZABETH ST.
HOFFMAN ROAD
LEMUEL BLVD.
ADAMS LANE
COZZENS LANE
SPRING STREET
LOCAL CONNECTOR
U.S. ROUTE 1
THALIA STREET
ELIZABETH STREET
EXCELSIOR STREET
EXCELSIOR AVENUE
ADAMS LANE
MOORE ROAD
DRISCOLL ROAD
ROADWAY
THIRD STREET
OLIVER AVE.
149
148
143
143.06
144
145
146
147
CONRAIL (CLASS II)
AMTRAK CLASS I MAIN LINE (FORMERLY P.C.T. CO., - U.N.J.R.R.& C. CO. TRENTON TO JERSEY CITY)
CLASS II CONRAIL
AMTRAK CLASS II
MATCH LINE
BLOCK LIMIT
20' UTILITY EASEMENT
VACATED BY ORDINANCE JUNE 15, 1981
10' WATER EASE. NOB TWP
(EXEMPTED) NATIONAL R.R.
(EXEMPTED) N.B. TWP.
(EXEMPTED) NORTH BRUNSWICK TOWNSHIP
NEW JERSEY DEPARTMENT OF THE TREASURY
DIVISION OF TAXATION
PROPERTY ADMINISTRATION
DATE MAY 4 - 2000
TAX MAP
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY, NEW JERSEY
SCALE : 1"= 100' JUNE 1998
RAYMOND E. BORUP JR., P.L.S.
CME ASSOCIATES
3141 BORDENTOWN AVENUE, PARLIN
NEW JERSEY, 08859


Adams Athletic & Social Club
Hartland Conn
Princeton Ave
Grove St
Orchard St
91
Apache St
Ninja Sushi Japanese Fusion
Arlington Ave
Apache St
Suma Foods
Adams Ln
Cozzens Ln
Spring St
U.S. Rte 1
Brunswick Toyota Body Shop
Achim Import
UFC GYM North Brunswick
North Brunswick Pub
Skyview Media Co
Birchwood Ct
Driscoll Rd
Driscoll Ct
Verizon
Enterprise Rent-A-Car
Elizabeth St
Malouf Chevrolet
Malouf Buick-Gmc, Inc
Hartland Commons
Pembrook Ave
Brighton Way
Clay St
Holiday Inn Express & Suites North...
Elizabeth St
Adams Ln
1
David Dr
Jason Dr
GURU PALACE
Good Food By Uzma
Cordelia St
Buffalo Wild Wings
Edwin St
All American Pet Resorts of North Brunswick
LongHorn Steakhouse
N Center Dr
Commerce Blvd
Amtrak Adams Yard
Adams Ln
Oliver Ave
Extra Space Storage
4th St
5th St
F1 mobile car wash and detailing
Malouf Ford
Truman Pl
Excelsior Ave
5th St
Darnody Ave
6th St
7th St
8th St
Sunny Terrace
Eden Ct
608
Holly Ln
Mirchi
North Brunswick Community Park
U.S. Rte 1
Grand Ave
Station Ave
Google

Map Scale: 1:4,860 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, New Jersey
Survey Area Data: Version 16, Jun 1, 2020

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

Date(s) aerial images were photographed: Jun 22, 2019—Jul 13, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EkaAr	Elkton loam, 0 to 2 percent slopes, rarely flooded	C/D	17.2	15.8%
FavAr	Fallsington bedrock substratum variant loam, 0 to 2 percent slopes, rarely flooded	B/D	47.0	43.2%
LbuB	Lansdowne-Urban land complex, 0 to 6 percent slopes	C	6.2	5.7%
NkrA	Nixon moderately well drained variant loam, 0 to 2 percent slopes	C	4.2	3.9%
NktB	Nixon moderately well drained variant-Urban land complex, 0 to 5 percent slopes	C	11.4	10.5%
UdcB	Udorthents, clayey substratum, 0 to 8 percent slopes	D	4.8	4.4%
UR	Urban land		18.0	16.5%
Totals for Area of Interest			**108.7**	**100.0%**

Description

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

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

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

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

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

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

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

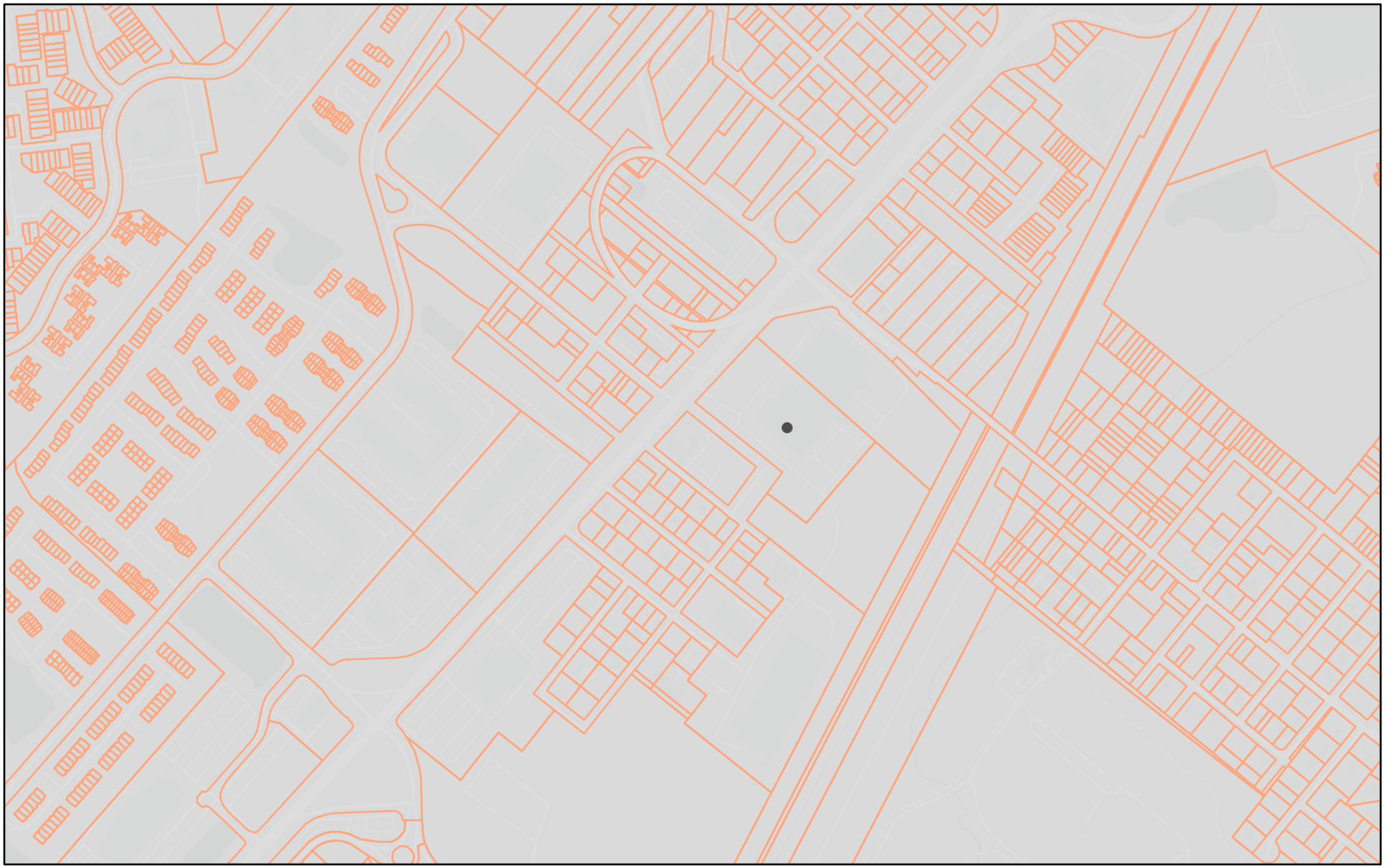
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Planning Areas



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1:9,028

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

State Planning Area Boundaries

Metropolitan Planning Area (PA 1)

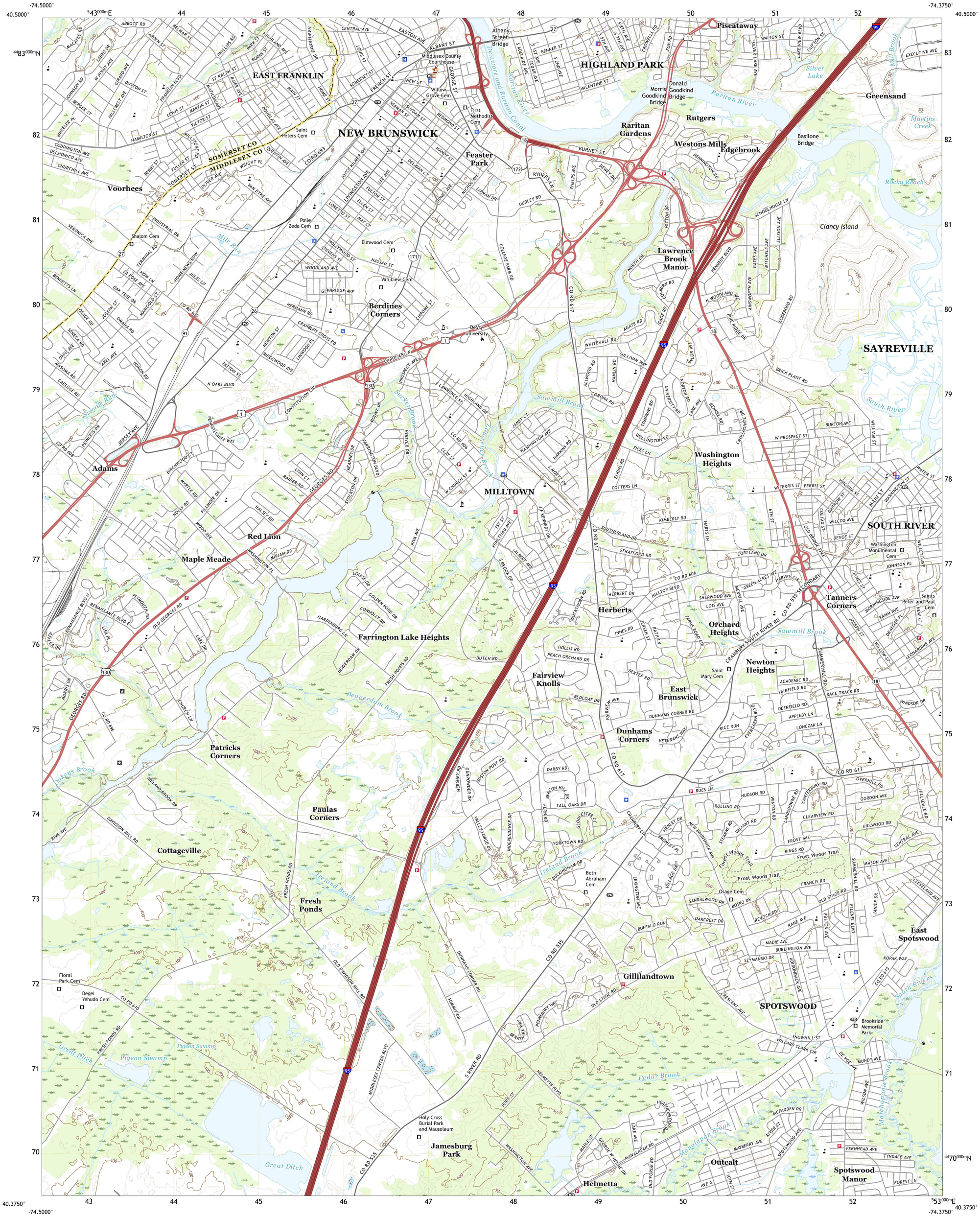
County Boundaries

Parcels Data (Block and Lot)

Esri Community Maps Contributors, Somerset County, NJ, New Jersey Office

New Jersey Department of Environmental Protection

Esri Community Maps Contributors, Somerset County, NJ, New Jersey Office of GIS, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA | NJDEP | NJDEP, Bureau of Energy and Sustainability Edition



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

NEW BRUNSWICK QUADRANGLE
NEW JERSEY
7.5-MINUTE SERIES

Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 18T

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery....................NAIP, July 2015 - September 2015
Roads.................... U.S. Census Bureau, 2016
Names..................................GNIS, 1979 - 2019
Hydrography..............National Hydrography Dataset, 2002 - 2010
Contours....................National Elevation Dataset, 2013
Boundaries.............Multiple sources; see metadata file 2017 - 2018

Wetlands................FWS National Wetlands Inventory 2007

UTM GRID AND 2019 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
WK
Grid Zone Designation 18T

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

1 Bound Brook
2 Plainfield
3 Perth Amboy
4 Monmouth Junction
5 South Amboy
6 Hightstown
7 Jamesburg
8 Freehold

ADJOINING QUADRANGLES

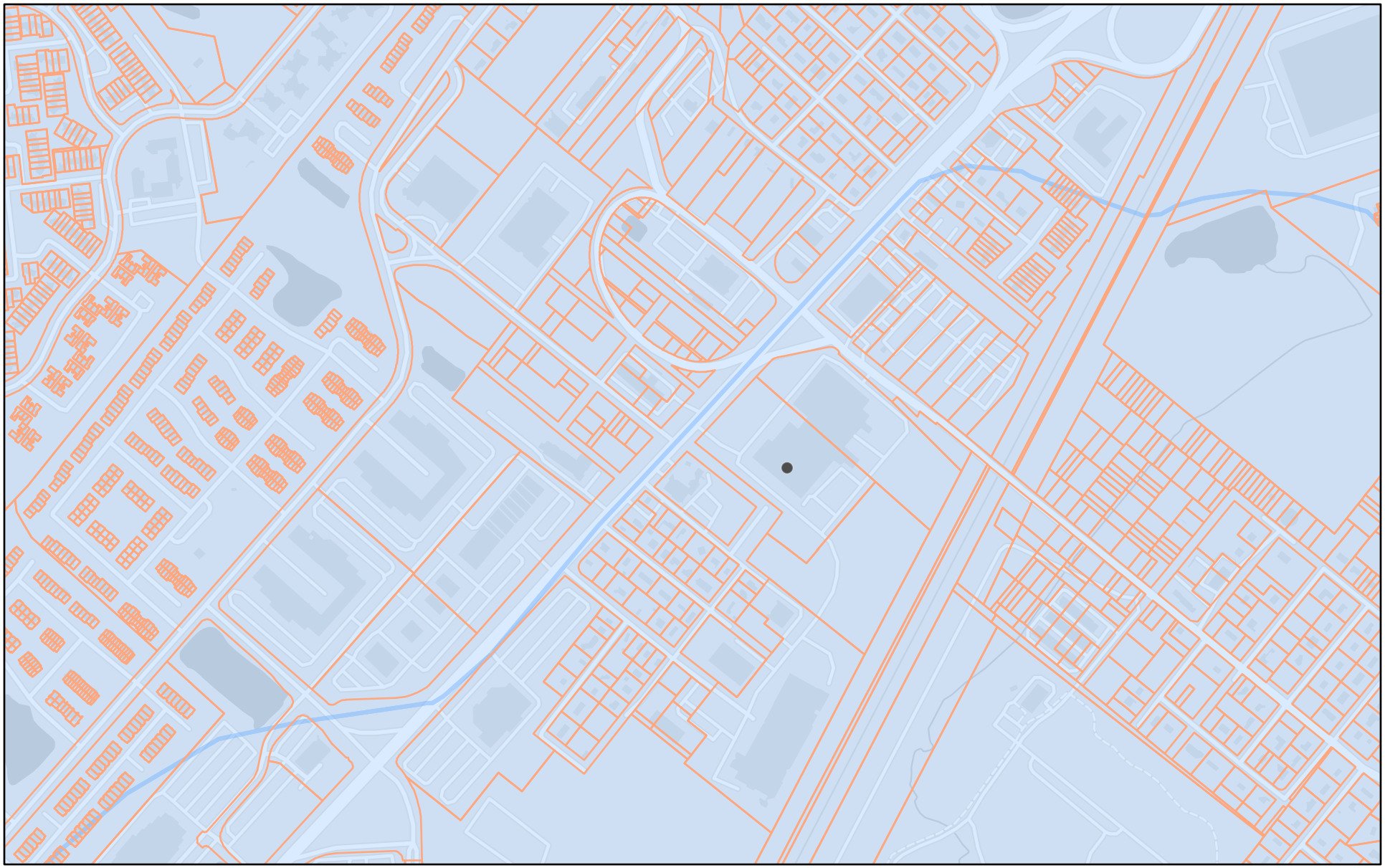
ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

NEW BRUNSWICK, NJ
2019

NSN. 7643016382411
NGA REF NO. USGSX24K31666

HUC-14



8/12/2021, 4:20:59 PM

County Boundaries

Sub-Watersheds (HUC14)

Parcels Data (Block and Lot)

1:9,028

0 0.05 0.1 0.2 mi

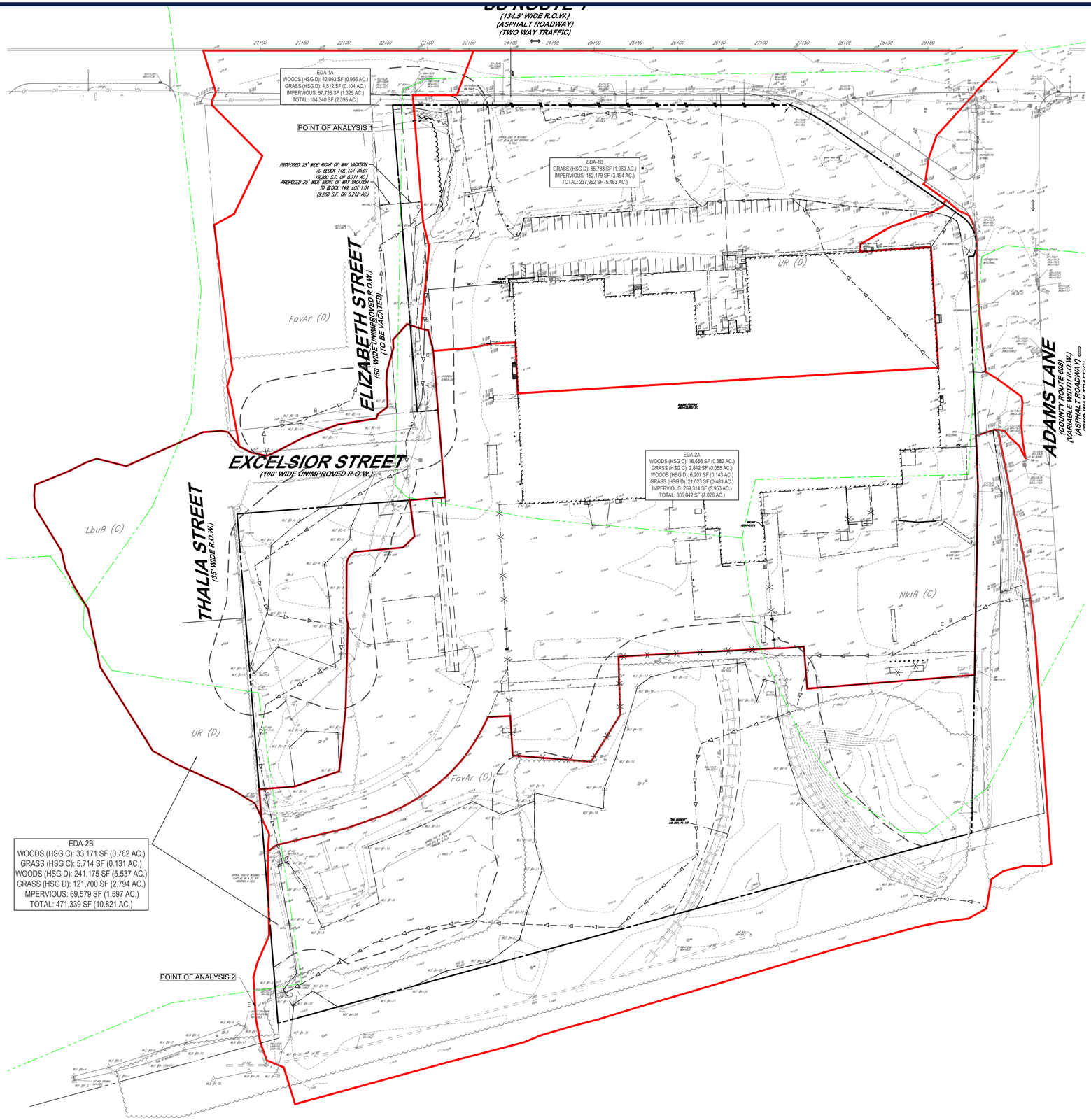
0 0.07 0.15 0.3 km

Esri Community Maps Contributors, Somerset County, NJ, New Jersey Office

New Jersey Department of Environmental Protection

Esri Community Maps Contributors, Somerset County, NJ, New Jersey Office of GIS, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA | NJDEP | NJDEP, Bureau of Energy and Sustainability Edition

NJ83F



BOHLER
SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
ENVIRONMENTAL ENGINEERING
PERMITTING SERVICES
TRANSPORTATION SERVICES

REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY
1	08/25/2021	REV. PER TWP. COMPLETENESS	APR / AS
2	10/27/2021	REV. PER TOWNSHIP COMMENTS	APR / BE
3	11/19/2021	REV. PER TOWNSHIP COMMENTS	APR / BE

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PROJECT No.:	J200616
DRAWN BY:	APR
CHECKED BY:	AS/BAB
DATE:	08/11/2021
CAD I.D.:	J200616-DRN-0A

PROJECT:

PRELIMINARY & FINAL SITE PLAN

FOR

1980 US HWY 1, LLC

PROPOSED WAREHOUSE FACILITY

1980 US HIGHWAY ROUTE 1
BLOCK 148; LOTS 34, 35.01 & 36
TOWNSHIP OF NORTH BRUNSWICK
MIDDLESEX COUNTY, NEW JERSEY
I-2 ZONE; TAX MAP SHEET #32

BOHLER
BOHLER ENGINEERING NJ, LLC
30 INDEPENDENCE BLVD., SUITE 200
WARREN, NJ 07059
Phone: (908) 668-8300
Fax: (908) 754-4401
www.BohlerEngineering.com
NJ CERT. OF AUTHORIZATION NO. 24GA28161700 & MH000122

B.A. BOHLER
PROFESSIONAL ENGINEER
NEW JERSEY LICENSE No. 47421
NEW YORK LICENSE No. 088514-1
PENNSYLVANIA LICENSE No. 077266
CONNECTICUT LICENSE No. 29039
DELAWARE LICENSE No. 17111
OHIO LICENSE No. 74297

SHEET TITLE:

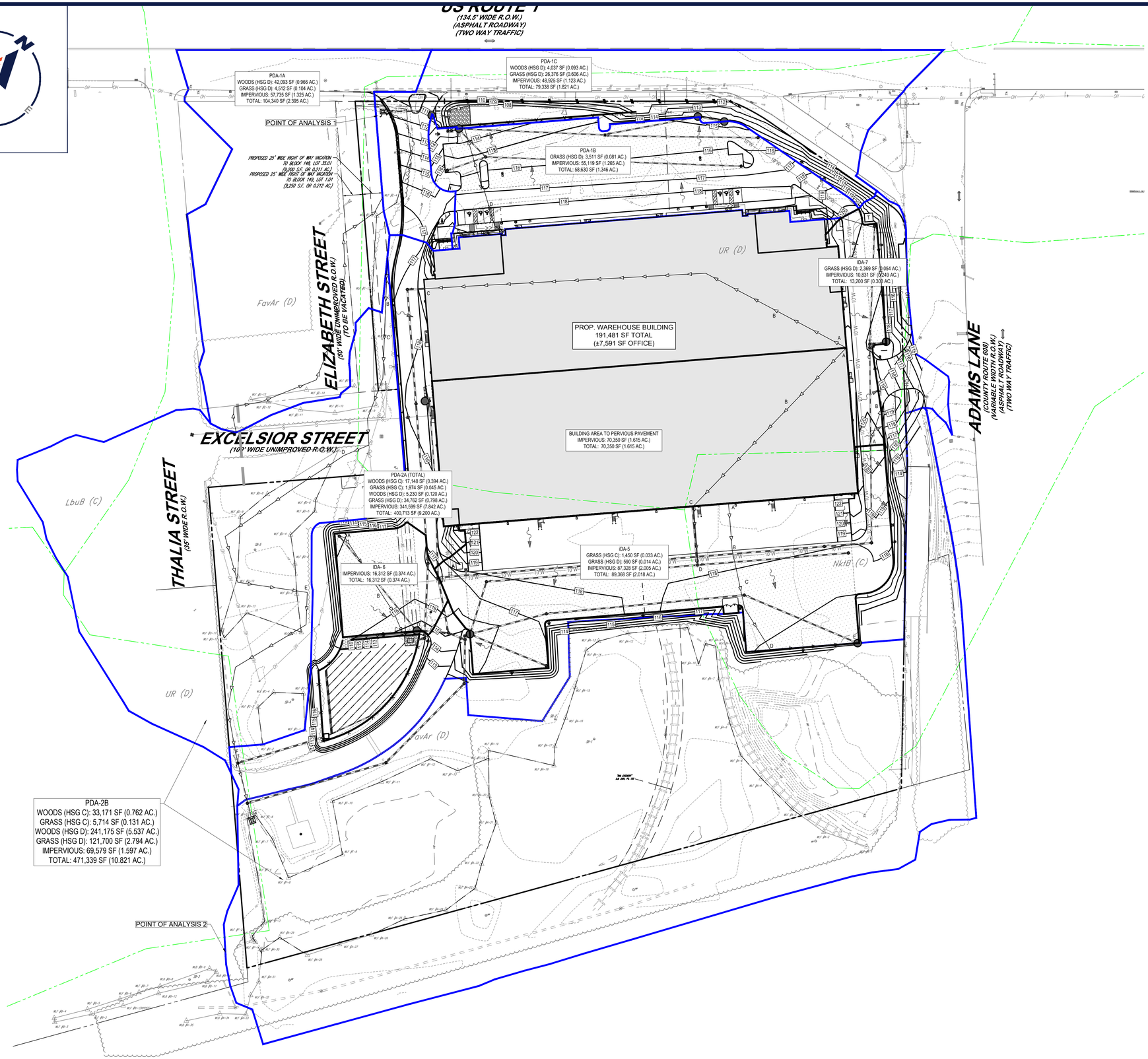
EXISTING DRAINAGE AREA MAP

SHEET NUMBER:

1

REVISION 3 - 11/19/2021

ARCHIVE/PROJECTS/J200616/DRAWINGS/CURRENT EXHIBITS/DRAINAGE/J200616-DRN-0A-----LAYOUT: C-01 EDA



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SITE CIVIL AND CONSULTING ENGINEERING
LAND SURVEYING
PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
SUSTAINABLE DESIGN
PERMITTING SERVICES
TRANSPORTATION SERVICES

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REVISION 3 - 11/19/2021