STONEFIELD

STORMWATER MANAGEMENT REPORT

PROPOSED COMMERCIAL DEVELOPMENT
BLOCK 701, LOT 1
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

PREPARED FOR:

M & M NEPTUNE, LLC

PREPARED BY:

STONEFIELD ENGINEERING & DESIGN, LLC
DECEMBER 29, 2020
REVISED MARCH 10, 2021
PRI-200142

JEFFREY A. MARTELL, PE
NJ PROFESSIONAL ENGINEER LICENSE # 47290

REPORT CONTENTS

APPENDICIES

1.0 PROJECT DESCRIPTION

M&M at Neptune, LLC is proposing to redevelop Block 701 Lot 1 to accommodate with a supermarket, retail store, fast food restaurant and a convenience store/gas station. The improvements include a total of 36,042 SF of building cover. Additional improvements include off-street parking, lighting, landscaping, and stormwater management facilities.

The project site is bound to the north by Asbury Avenue (County Route 16), to the south by NJ State Highway Route 35, a connection road to the west, and the Hollow Brook along the eastern property line and is assumed to have a 50 ft riparian zone. The site contains two intermediate resource value wetland areas located in the easterly portion of the lot. Generally, the vicinity of the project is developed with residential to the north and east, and commercial to the south and west. The project site itself currently contains a vacant warehouse and parking lot and woods occupying the eastern portion of the site where the wetlands and riparian zone are located.

The project site is 13.577 acres, the extent of land disturbance for construction is 6.529 acres (including areas within the public right-of-way), and 1.119 acres of new impervious surfaces will be created by the project.

This Stormwater Management Report has been prepared to analyze the potential stormwater runoff impacts of the proposed project and discuss the measures proposed to conform to the stormwater management requirements set forth by the Township of Neptune, Freehold Soil Conservation District, Monmouth County Planning Board and the New Jersey Department of Environmental Protection (NJDEP).

2.0 EXISTING CONDITIONS

The project site fronts on two roadways, to the north Asbury Avenue (County Route 16), to the south by NJ State Highway Route 35, and a connection road to the west. The project site historically has contained the existing vacant structure and parking lot. The existing development on site will be removed entirely as part of the proposed redevelopment. Aerial Maps depicting the site from 1979 as well as the existing site conditions can be found in **APPENDIX A**.

2.1 EXISTING DRAINAGE AREAS

Under existing conditions the site is comprised of [4] drainage areas.

The project site currently contains four drainage areas. Drainage area one is the largest and contains all portions of the site which drain to the existing storm sewer. This storm sewer involves catch basins within the existing parking area and lawn inlets to the north of the existing building. It discharges to an existing drainage chamber located in the wetland buffer area. Drainage area two includes a portion of the existing drive and undeveloped area which drains overland through wetlands and north within the Hollow Brook located to the east. The Point of Interest for Area Two is the culvert which drains the Hollow Brook under Asbury Avenue. Drainage area three includes a portion of the existing drive and flows to the southeast into an existing pond. Drainage area four drains overland to the south onto Route 35.

TABLE 1: EXISTING DRAINAGE AREAS

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
POI 1 (Area1)	Drainage area to existing on site catch basins.	209,142 SF	100,505 SF	13.0 Minutes
POI 2 (Area 2)	Drainage area to culvert under Asbury Ave.	62,623 SF	10,175 SF	17.6 Minutes
POI 3 (Area 3)	Drainage area to pond located in the south east.	42,025 SF	25,359 SF	6.0 Minutes
POI 4 (Area 4)	Existing Drainage to Route 35 ROW	24,982 SF	19,921 SF	6.0 Minutes

Detailed information regarding each drainage area can be found on the Existing Drainage Area Map in **Appendix E** of this Report.

2.2 PROJECT SOILS

Per the National Resource Conservation Service (NRCS) data, the soil underlying the project site consists of:

TABLE 2: NRCS PROJECT SOILS

Soil Unit Code	Soil Description	Approximate Project Coverage	Drainage Class	Hydrologic Soil Group per Infiltration Evaluation
EkaAr	Elkton loam, 0 to 2% slopes	13.6%	Poorly drained	D
EvuB	Evesboro-Urban land complex, 0% to 5% slopes	31.5%	Poorly drained	D

The Report of Infiltration Evaluation for the site can be found in Appendix D. This report was conducted by Maser Consultanting on May 20, 2019. It was the conclusion of ths report that based on the criteria set forth by the NJDEP BMP manual the soils on site are HSG D. Therefore, this was the HSG classification utilized for the stormwater analysis.

3.0 PROPOSED CONDITIONS

The proposed development will consist of the four commercial buildings (36,042 SF total) These building include a supermarket, retail store, fast food restaurant and a convenience store/gas station. Additional improvements include an off-street parking lot (242 parking spaces), landscaping, lighting and stormwater management facilities. The total proposed impervious coverage on site is 34.6% (204,694 SF). Access to the site will be provided via two full movement access drives on Asbury Avenue and Route 35.

3.1 PROPOSED DRAINAGE AREAS

Under proposed conditions the site is comprised of [4] drainage areas.

Under proposed conditions, the general drainage patterns and ultimate points of interest will be maintained. The intent behind the proposed delineations is to reduce the direct runoff for all areas of undetained flow. The detained runoff will be routed to an underground basin where the peak discharge will be controlled via an outlet control structure. See below for a short summary of each area.

TABLE 3: PROPOSED DRAINAGE AREAS

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
POI 1 (Area1)	Drainage area to existing on site catch basins.	247,415 SF	198,238 SF	6.0 Minutes*
POI 2 (Area 2)	Drainage area to culvert under Asbury Ave.	55,219 SF	1,676 SF	6.0 Minutes
POI 3 (Area 3)	Drainage area to pond located in the south east.	14,198 SF	0 SF	6.0 Minutes
POI 4 (Area 4)	Existing Drainage to Route 35 ROW	21,942 SF	4,780 SF	6.0 Minutes

***The minimum time of concentration was utilized for all drainage areas due to the high level of impervious coverage / land disturbance and proximity to existing and proposed stormwater pipe conveyance system.**

All proposed drainage areas were delineated based on the proposed grading design overlain on field survey data. Hydrologic calculations and parameters for each drainage area can be found in **APPENDIX C**; specific drainage area delineations and land cover can be found in **APPENDIX E.**

4.0 ANALYSIS METHODOLOGY & DESIGN PARAMETERS

4.1 HYDROLOGIC & HYDRAULIC ANALYSES

The analysis program "HydroCAD" Version 10.0 by HydroCAD Software Solutions was utilized to calculate and plot the runoff hydrographs. The program incorporates the time of concentration, C values, rainfall data, and project drainage areas to calculate the runoff characteristics. The existing and proposed drainage areas have been analyzed utilizing Intensity-Duration-Frequency data was obtained from NOAA for the project area; specifics of the rainfall distribution can be found in **Appendix C**. Additional key variables utilized in the analysis include:

TABLE 4: HYDROCAD DESIGN VARIABLES

Variable	**Input**	**Variable**	**Input**
Runoff Calculation Method	SCS TR-20	NRCS Rainfall Frequency Data Set	Middlesex
Pervious/Impervious CN Calculations	Separate	Storm Intervals (Year Events)	2, 10, 25, 100
Stage-Storage Relationship	Dynamic	Storm Duration	24 Hours
Minimum time of concentration	6 minutes	Storm Curve	NOAA D

Additional information regarding the hydrologic calculations can be found in **APPENIDX C**.

HYDRAULIC METHODOLOGY

The analysis program "HydraFlow Storm Sewers" Version 2018 by Autodesk was utilized to generate hydraulic grade lines through the proposed conveyance system model based on various pipe / junction losses and the runoff tributary to each inlet or discharge structure. Additional key variables utilized in the analysis include:

TABLE 5: HYDRAFLOW DESIGN VARIABLES

Variable	Input	Variable	Input
Runoff Calculation Method	Rational	Pipe Conveyance Method	Std. Step
C-value for impervious surfaces	0.98	Initial Hydraulic Grade Line	Normalized
C-value for pervious surfaces	0.25/0.65	Inlet Drainage Area Delineation	Surveyed
Minimum time of concentration	6 minutes	Inlet Geometry & Capacity	NJDOT Std.

Additional information regarding the hydrologic calculations can be found in **APPENDIX C**.

4.2 NEW JERSEY STORMWATER DESIGN PARAMETERS

The extent of redevelopment proposes to disturb more than one acre of land and add more than one-quarter acre of new impervious surfaces; as such, it is considered a Major Development as defined in the Township Ordinances and NJAC 7:8-1.2. A Major Development is subject to stormwater runoff quantity, quality, and groundwater recharge requirements. See below for a summary of each design parameter and compliance requirements:

TABLE 6: PROJECT STORMWATER DESIGN INTENT SUMMARY TABLE

Design Parameter	Design Target for Compliance
Stormwater Runoff Quantity	Design stormwater management measures so that the post-construction peak runoff rates for the two, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed
Stormwater Runoff Quality	Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from impervious coverage.
Groundwater Recharge	The project is **exempt** from groundwater recharge requirements as the project site is located within State Planning Area PA-1 (Metropolitan).

4.3 SUBSURFACE STORMWATER INVESTIGATION

A subsurface stormwater investigation was conducted by Maser Consulting on May 20th 2020. A total of [7] tests were performed in compliance with the soil testing standards outlined within Appendix E of the NJDEP Best Management Practices (BMP) Manual. It was the conclusion of this report that based on the criteria set forth by

the NJDEP BMP manual the soils on site are HSG D. The full investigation report and testing results can be found in **Appendix D** of this Report.

5.0 PROJECT ANALYSIS RESULTS

5.1 STORMWATER QUANTITY CONTROL

An underground detention basin is proposed beneath the off-site parking area south of the proposed supermarket. This basin will attenuate peak stormwater runoff rates to the mandated regulatory levels. The tables below summarize the various drainage areas in relation to flow rates and runoff volume during regulatory storm events:

TABLE 7: SUMMARY OF EXISTING DRAINAGE AREA FLOW RATES

Drainage Area	2-Year Flow Rate	10-Year Flow Rate	100-Year Flow Rate
Drainage Area 1	8.07 CFS	13.68 CFS	25.22 CFS
Drainage Area 2	1.28 CFS	2.53 CFS	5.23 CFS
Drainage Area 3	2.01 CFS	3.41 CFS	6.26 CFS
Drainage Area 4	1.36 CFS	2.19 CFS	3.88 CFS

TABLE 8: SUMMARY OF PROPOSED DRAINAGE AREA FLOW RATES

Drainage Area	2-Year Flow Rate	10-Year Flow Rate	100-Year Flow Rate
Drainage Area 1	2.48 CFS	6.82 CFS	13.98 CFS
Drainage Area 2	1.01 CFS	2.11 CFS	4.49 CFS
Drainage Area 3	0.42 CFS	0.89 CFS	1.88 CFS
Drainage Area 4	0.85 CFS	1.58 CFS	3.11 CFS

Under post-development conditions the runoff flow rates and volumes are reduced for the undetained drainage areas (Drainage Areas 2-4). Drainage Area 1 is diverted to the on-site stormwater management system for runoff attenuation and water quality treatment. The table below outlines the regulatory compliance parameters for runoff quantity on the project site:

TABLE 9: STORMWATER RUNOFF QUANTITY COMPLIANCE SUMMARY AT POINT OF INTEREST 1

Rainfall Event	Existing Flow Rate	Required % Reduction	Required Flow Rate	Proposed Flow Rate	Proposed % Reduction
2-Year Storm	8.07 CFS	50%	4.03 CFS	2.48 CFS	69.27%
10-Year Storm	13.68 CFS	25%	10.26 CFS	6.82 CFS	50.15%
100-Year Storm	25.22 CFS	20%	20.17 CFS	13.98 CFS	44.57%

The proposed underground basin provides sufficient flow rate attenuation to ensure that no adverse impacts are anticipated downstream of the project site. Detailed hydrologic calculations for each drainage area can be found in **APPENDIX C**.

5.2 GROUNDWATER RECHARGE

As indicated in the Township Ordinances and NJAC 7:8-5.4, the project site is exempt from groundwater recharge requirements as the site is located within the Metropolitan Planning Area (PA-1) per the State Plan Policy Map and thus qualifies as an Urban Redevelopment Area (which is exempt from groundwater recharge requirements for all developed areas). The soils on-site area classified as HSG D per "The Report of Infiltration Evaluation" found in Appendix D of this report. Groundwater recharge is not required for the portion of the site that is within the area of prior tree removal due to no infiltration in existing conditions.

5.3 STORMWATER QUALITY CONTROL

As a Major Development, all proposed impervious vehicular travel surfaces are subject stormwater runoff quality requirements. More specifically, existing impervious areas proposed to be redeveloped shall be required to remove 50% of total suspended solids and all new impervious vehicular travel surfaces shall be required to remove 80% of total suspended solids. Non-vehicular travel surfaces (building roofs, plaza/amenity areas, sidewalks, etc.) are not subject to runoff quality regulations.

A manufactured treatment device (MTD), specifically the Stormwater Management StormFilter (Stormfilter) by Contech Engineered Solutions LLC, will be installed downstream of the underground basin. The basin will be lined with an impervious liner as to prevent any infiltration of untreated runoff. Per the MTD Lab Certification issued by the NJDEP on December 14, 2016 the StormFilter has been certified to provide a TSS removal rate of 80%. A copy of this certification as well as a design summary for the device and its operation and maintenance can be found in **APPENDIX F**.

TABLE 10: STORMWATER BMP TSS REMOVAL EFFICIENCIES

Stormwater BMP Facility	NJDEP Certified Removal Efficiency	Treatment Train Removal Efficiency
Manufactured Treatment Device	80%	80%

A copy of the NJDEP certification as well as a design summary for the device and its operation and maintenance can be found in **APPENDIX D**.

5.4 STORMWATER CONVEYANCE SYSTEMS

The stormwater conveyance system has been sized for the 25-year storm and is able to safely convey runoff to stormwater management facilities without overflowing. A summary of the pipe network and pipe profiles can be found in Appendix C of the Report.

5.5 SOIL EROSION & SEDIMENT CONTROL

A Soil Erosion & Sediment Control Plan has been prepared in accordance with the latest edition of the Standards for Soil Erosion and Sediment Control in New Jersey. Proposed temporary measures during construction include silt fencing, tree protection fences, stabilized construction entrances, inlet filters, and cover for soil stabilization. Permanent post-construction measures include conduit outlet projection and native vegetation. No land disturbance will occur until a permit has been obtained from the Freehold Soil Conservation District.

5.6 STORMWATER OPERATIONS & MAINTENANCE

A Stormwater Operations & Maintenance Manual will be submitted for approval to the Township of Neptune prior to the start construction. Any required easements or covenants associated with the stormwater improvements will be recorded prior to the start of construction.

6.0 OFFSITE DRAINAGE AREA AND DEAL LAKE IMPACT ANALYSIS

The project site will discharge into the Hollow Brook section of Deal Lake. The total drainage area to Deal Lake is approximately 4,130 acres (see Appendix E for Deal Lake Drainage Area Exhibit). The land cover within the drainage area is mostly residential and commercial developments. The project lot, 13.60 acres, makes up a very small part of this drainage area. The limit of disturbance for this project is approximately 6.53 acres and accounts for 0.16 percent of the total drainage area to Deal Lake.

Currently the lot contains an abandoned building and parking lot which provide no environmental benefit to Deal Lake. The proposed project will involve reforestation to the onsite wetlands buffer. This reforestation will help restore the vegetated buffer between Hollow Brook and the developed area of the lot. An underground detention basin is also proposed which will reduce peak flows discharged from the project lot. The basin discharge will be treated by a manufactured treatment device certified by the NJDEP to treat stormwater runoff for eighty percent total suspended solids removal.

The manufactured treatment device will provide some phosphorus removal from the settling of solids and the organic and inorganic phosphorus associated with solids. The fertilizer specified for use on site is LESCO 16-0-8 NPK. The fertilizer is organic, contains no phosphorus and no animal or human waste. There will be no pesticides used on the proposed vegetation. Proposed reforestation will be greater than 85 feet from the top of Hollow Brook, while landscaping for the developed portion of the site will be greater than 150 feet.

The proposed project will not result in any increase in fecal coliform load to Deal Lake. The proposed vegetation will not result in any habitable area for geese. Geese prefer open grassy areas near water. The project will reforest existing open space with woods, the wooded area adjacent to the water way will not be disturbed. The developed portion of the lot will contain driveways, parking lots, and buildings with vegetation in the green spaces. The proposed use is not conducive to bird habitat due to the noise associated with cars and people. The proposed uses of grocery store, retail store, fast food restaurant and convenience store will not result in any pet waste. All trash will be confined to on site trash enclosure as well as trash containers spaced evenly throughout the site. The property will be maintained to prevent litter, this will help ensure no increase in wildlife on site or pollution entering Hollow Brook.

The project will improve stormwater runoff to Deal Lake by reducing stormwater peak flow rates to Hollow Brook and will provide a manufactured treatment device to improve stormwater runoff quality. Vegetation on site will be improved by way of reforestation of open space and proposed landscaping. Fertilizer used on site will not

contain any phosphorus or waste. No suitable goose habitat will be created by the project and all trash will be confined to containers. As such the proposed project will be a benefit to Hollow Brook and Deal Lake.

7.0 CONCLUSIONS

The increase in runoff flow rate and volume generated by the proposed redevelopment will be satisfactorily mitigated by the introduction of an underground detention basin and on-site stormwater conveyance system. Runoff water quality will be impacted by the increase in vehicular travel surfaces and a manufactured treatment device will provide treatment to remove total suspended solids to a satisfactory regulatory level.

The proposed project complies with all applicable stormwater management regulations and standards. As such, the project is not anticipated to have any adverse drainage impacts on neighboring properties, downstream watercourses, or adjoining conveyance systems.

APPENDIX A
PROJECT FIGURES

INVENTORY

AERIAL MAP

USGS MAP

TAX MAP

FEMA FLOOD RATE MAP

DRAINAGE AREA TO DOWNSTREAM COUNTY STRUCTURE EXHIBIT

AERIAL MAP

200' 0' 200' 400'

GRAPHIC SCALE IN FEET

1" = 200'

SOURCE: GOOGLE EARTH PRO 10/19/2020

M & M NEPTUNE, LLC

PROPOSED IMPROVEMENTS

BLOCK 701, LOT 1
704 NJ STATE ROUTE 35
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NEW JERSEY

DRAWN BY:	AMB
CHECKED BY:	PDM
DATE:	12/14/2020
SCALE:	1" = 200'
PROJECT ID:	PRI-200142

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15 Spring Street, Princeton, NJ 08542
Phone 609.362.6900

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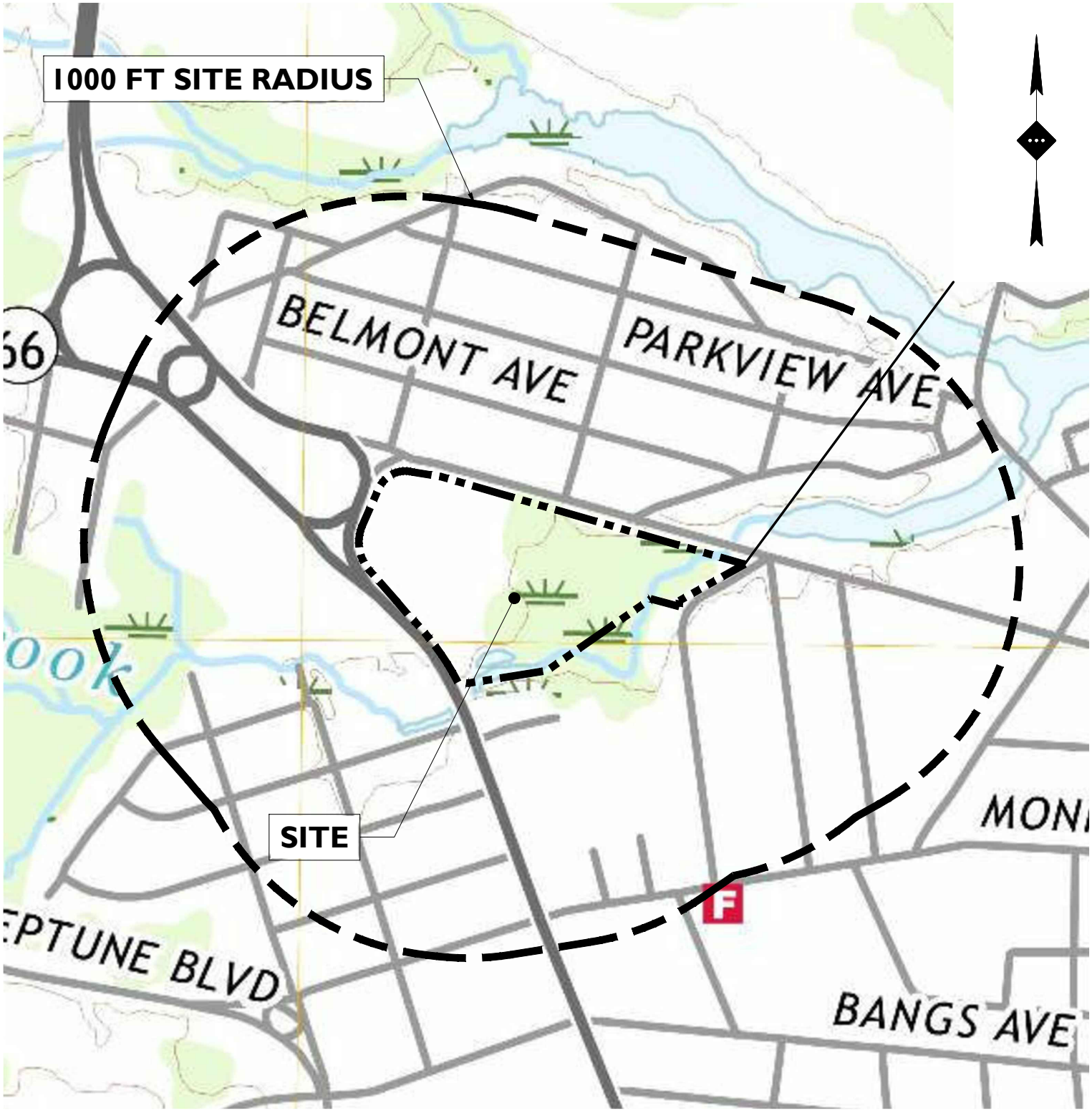

USGS QUADRANGLE MAP

500' 0' 500' 1,000'

GRAPHIC SCALE IN FEET

1" = 1000'

SOURCE: USGS ASBURY PARK QUADRANGLE, NEW JERSEY 7.5 MINUTE SERIES DATED 2019

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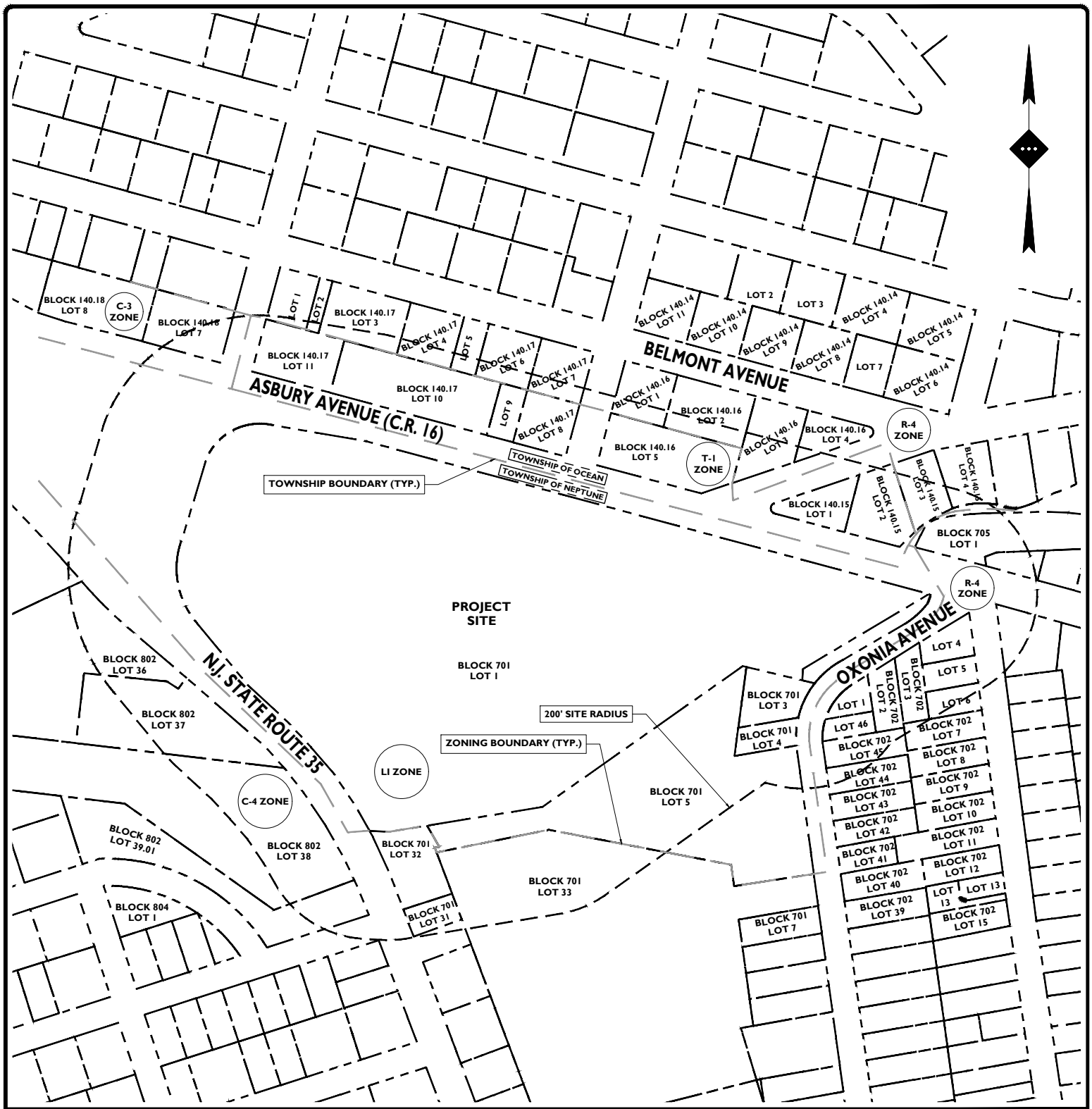

TAX AND ZONING MAP

250' 0' 250' 500'

GRAPHIC SCALE IN FEET

1"= 250'

SOURCE: TOWNSHIP OF NEPTUNE TAX MAP SHEET 7 & 8; TOWNSHIP OF OCEAN TAX MAP SHEET 52; TOWNSHIP OF NEPTUNE ZONING MAP; TOWNSHIP OCEAN ZONING MAP

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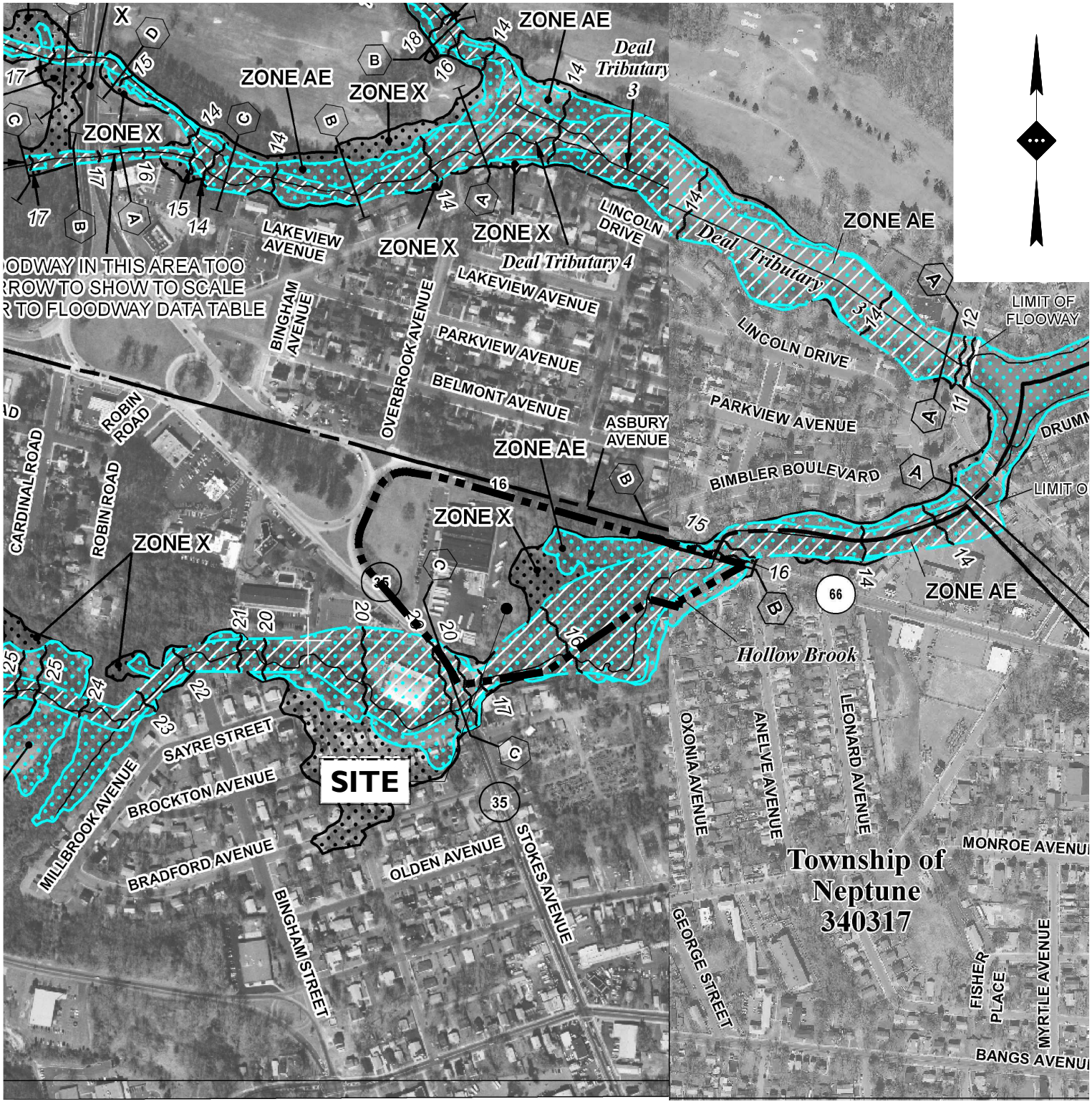

FEMA FLOOD RATE INSURANCE MAP

500' 0' 500' 1000'

GRAPHIC SCALE IN FEET

1" = 500'

SOURCE: FEMA FLOOD INSURANCE RATE MAP (FIRM), MONMOUTH COUNTY MAP NUMBER 34025C0332G & 34025C0331F

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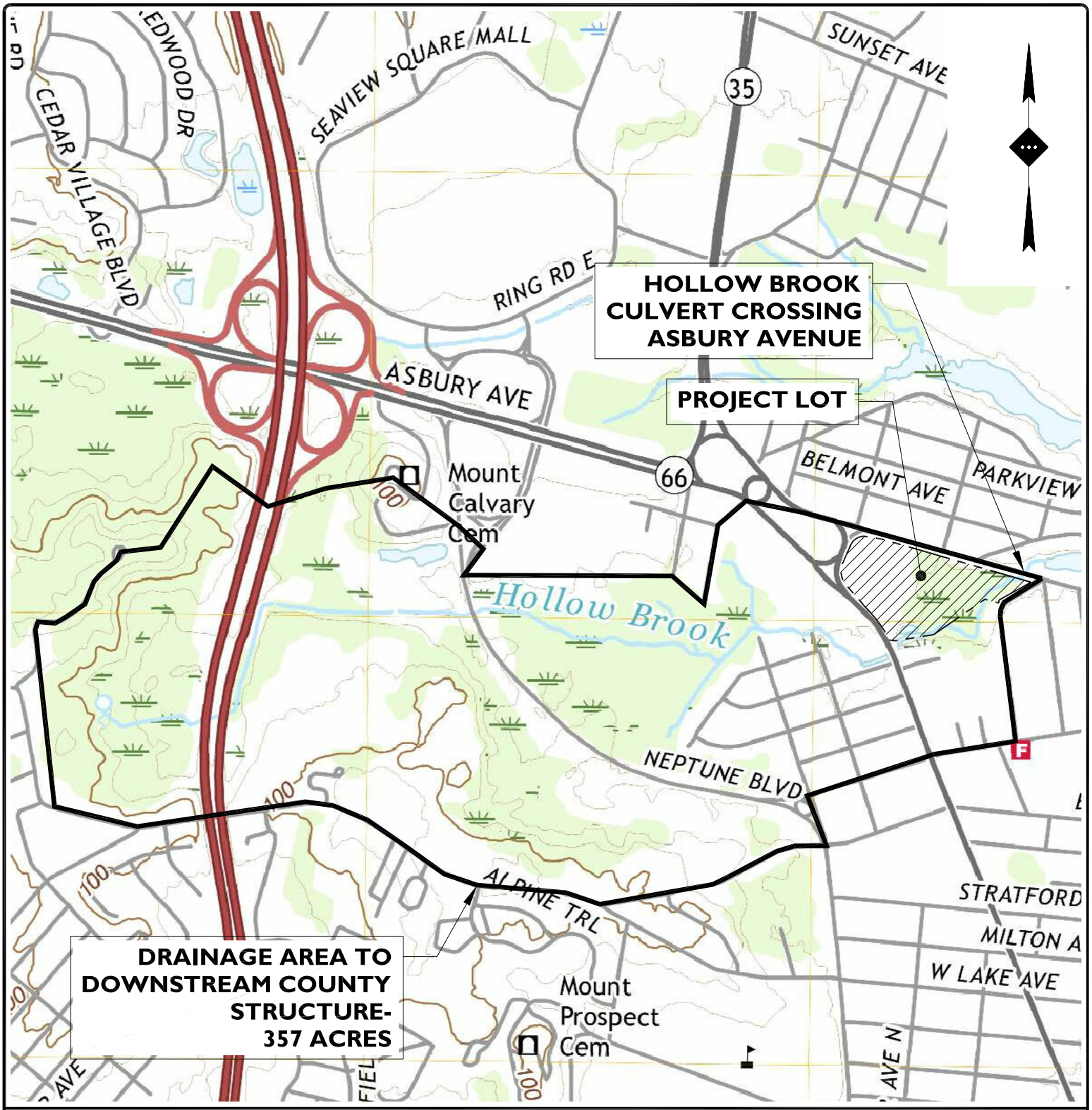

DRAINAGE AREA TO DOWNSTREAM COUNTY STRUCTURE EXHIBIT

1000' 0' 1000' 2000'

GRAPHIC SCALE IN FEET

1" = 1000'

SOURCE: USGS ASBURY PARK QUADRANGLE, NEW JERSEY 7.5 MINUTE SERIES DATED 2019

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704 NJ STATE ROUTE 35
TOWNSHIP OF NEPTUNE, MONMOUTH COUNTY, NEW JERSEY

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CHECKED BY:	PDM
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SCALE:	1" = 1000'
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APPENDIX B
NRCS COUNTY SOIL SURVEY

Map Scale: 1:2,430 if printed on A landscape (11" x 8.5") sheet.

N

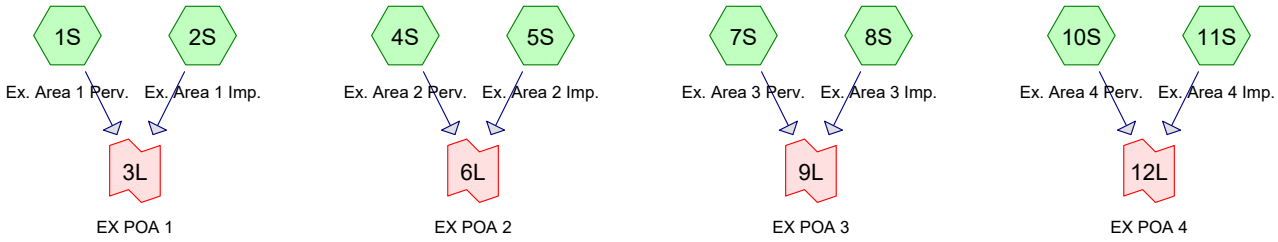
Meters: 0 35 70 140 210

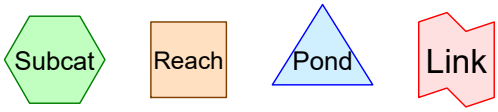
Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

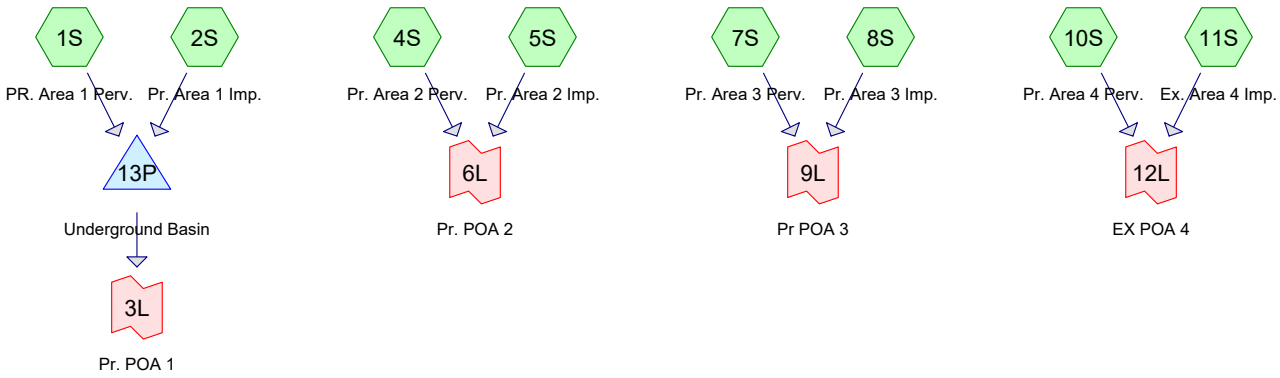
APPENDIX C
DESIGN CALCULATIONS & DIAGRAMS

APPENDIX C-1
HydroCAD Routing Diagram





Routing Diagram for 2020-11-2 Neptune, NJ (Existing)
Prepared by {enter your company name here}, Printed 12/18/2020
HydroCAD® 10.00-22 s/n 10626 © 2018 HydroCAD Software Solutions LLC



Subcat Reach Pond Link

Routing Diagram for 2020-11-2 Neptune, NJ (Proposed)
Prepared by {enter your company name here}, Printed 12/18/2020
HydroCAD® 10.00-22 s/n 10626 © 2018 HydroCAD Software Solutions LLC

APPENDIX C-2
2-YEAR STORM EVENT HYDROGRAPHS

Summary for Subcatchment 1S: Ex. Area 1 Perv.

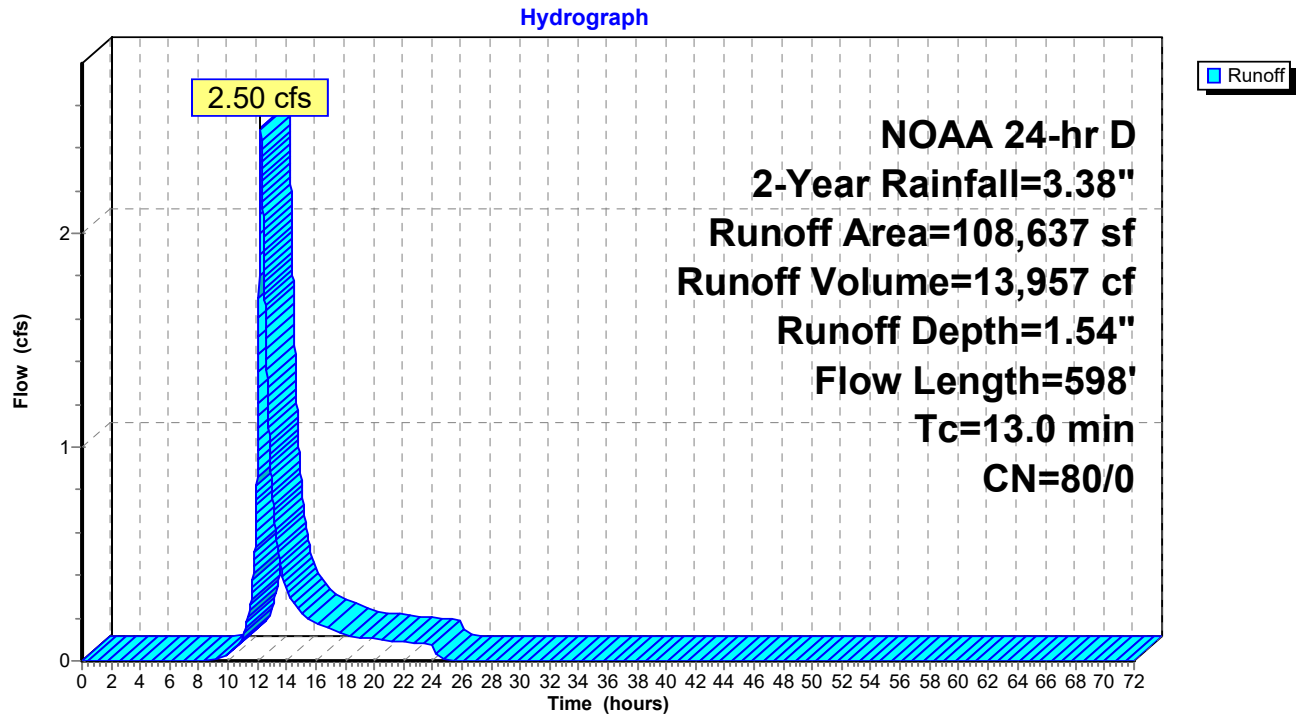
Runoff = 2.50 cfs @ 12.23 hrs, Volume= 13,957 cf, Depth= 1.54"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
108,637	80	>75% Grass cover, Good, HSG D
108,637	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0600	0.19		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
0.5	75	0.0270	2.65		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.5	423		2.00		**Direct Entry, Channel Flow**
13.0	598	Total			

Subcatchment 1S: Ex. Area 1 Perv.



Summary for Subcatchment 2S: Ex. Area 1 Imp.

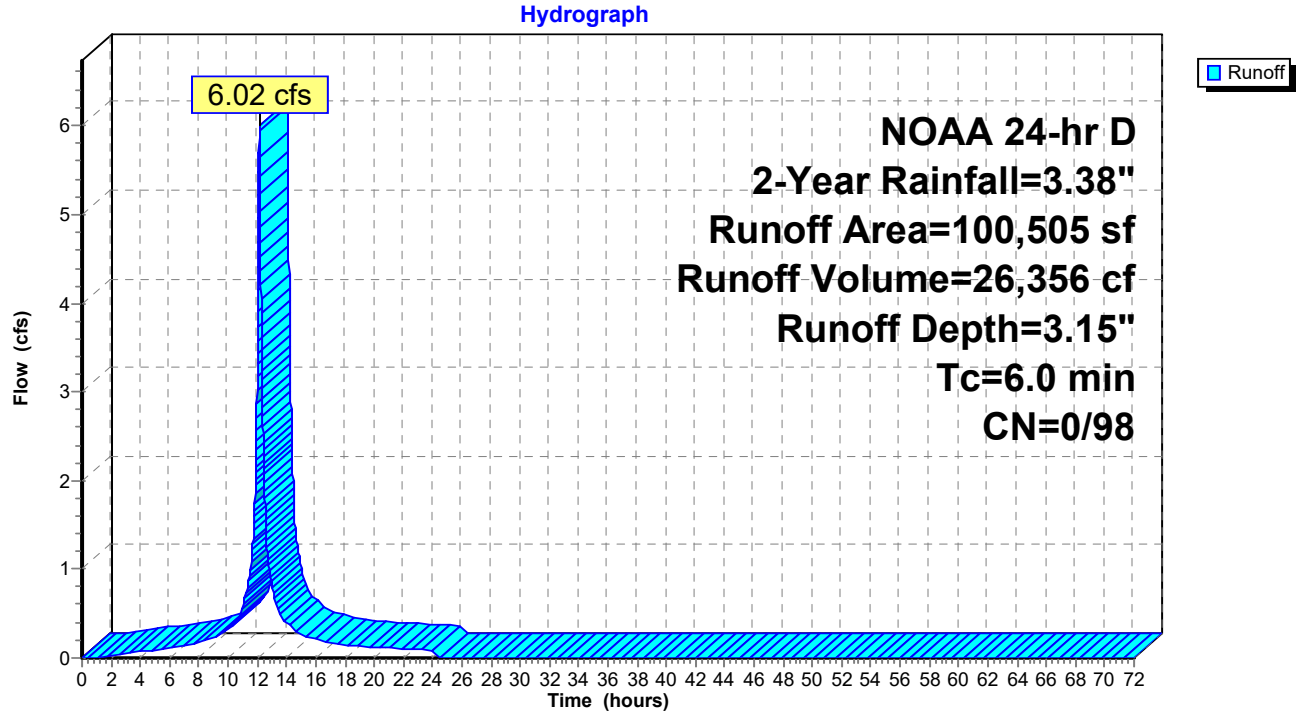
Runoff = 6.02 cfs @ 12.14 hrs, Volume= 26,356 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
100,505	98	Paved parking, HSG D
100,505	98	100.00% Impervious Area

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

Subcatchment 2S: Ex. Area 1 Imp.



Summary for Subcatchment 4S: Ex. Area 2 Perv.

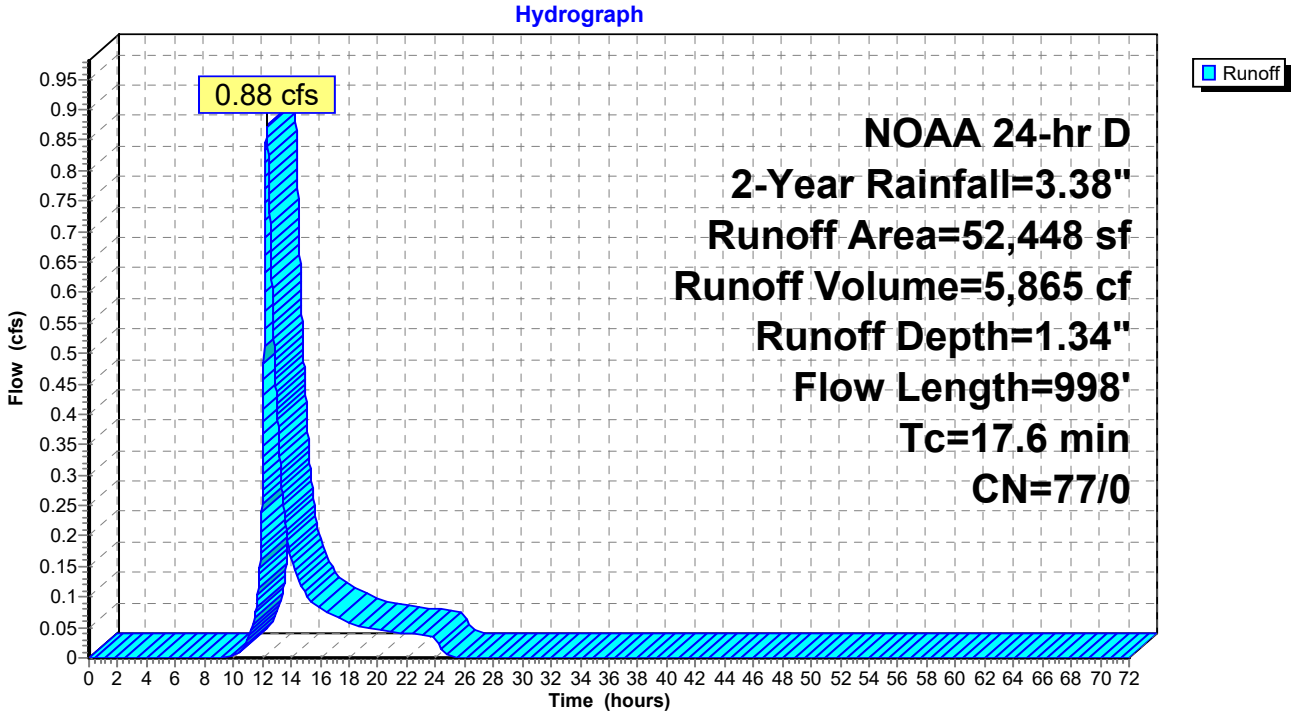
Runoff = 0.88 cfs @ 12.31 hrs, Volume= 5,865 cf, Depth= 1.34"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
50,644	77	Woods, Good, HSG D
1,804	80	>75% Grass cover, Good, HSG D
52,448	77	Weighted Average
52,448	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Ex. Area 2 Perv.



Summary for Subcatchment 5S: Ex. Area 2 Imp.

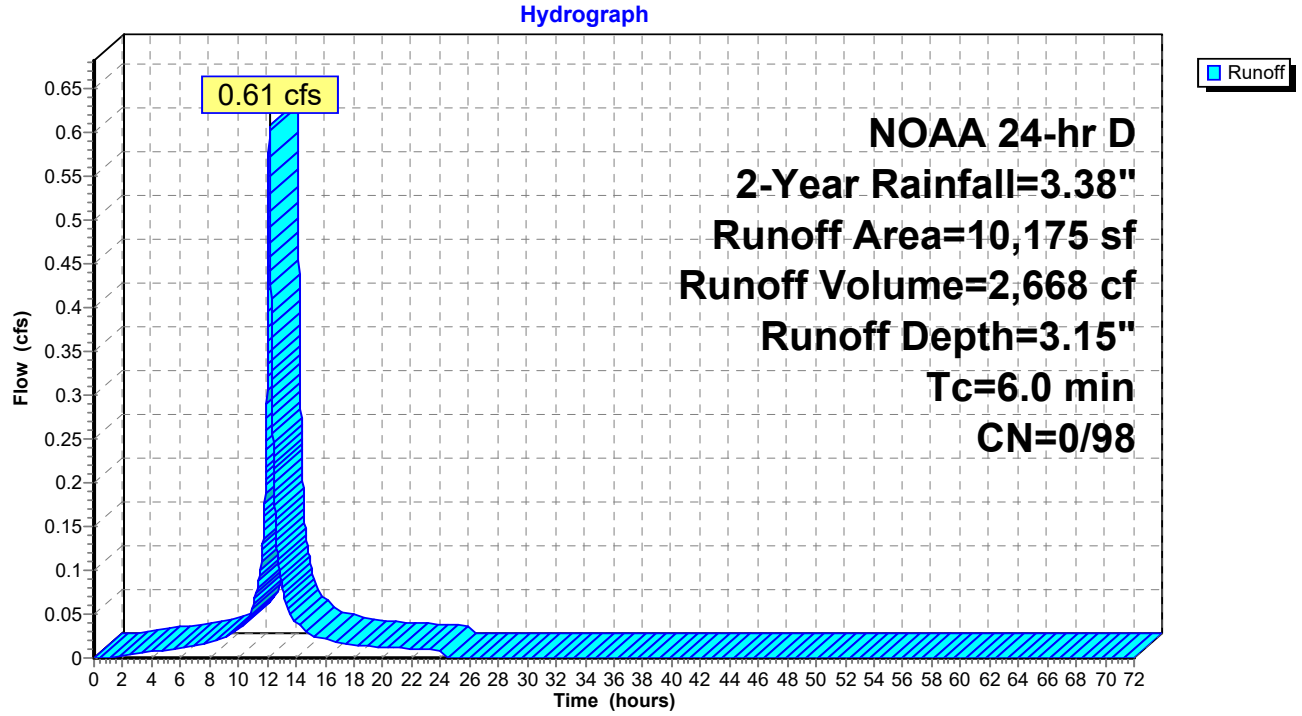
Runoff = 0.61 cfs @ 12.14 hrs, Volume= 2,668 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
10,175	98	Paved parking, HSG D
10,175	98	100.00% Impervious Area

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

Subcatchment 5S: Ex. Area 2 Imp.



Summary for Subcatchment 7S: Ex. Area 3 Perv.

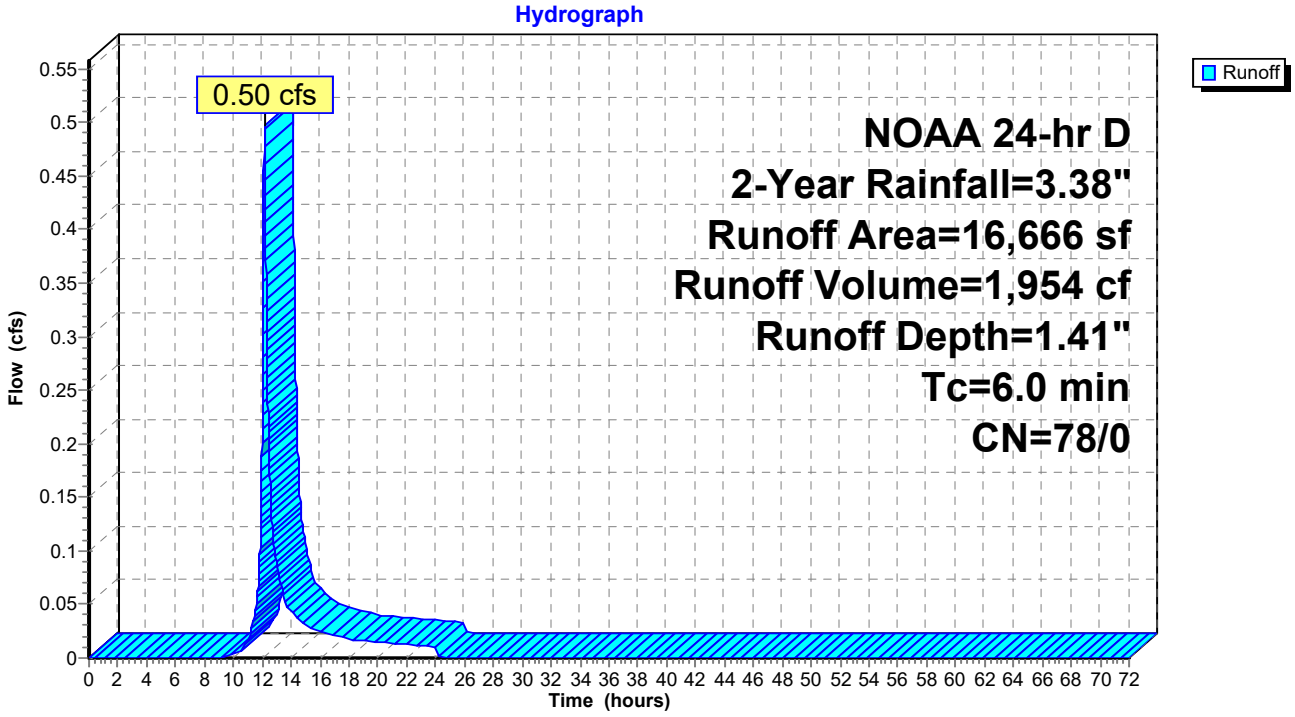
Runoff = 0.50 cfs @ 12.15 hrs, Volume= 1,954 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
11,841	77	Woods, Good, HSG D
4,825	80	>75% Grass cover, Good, HSG D
16,666	78	Weighted Average
16,666	78	100.00% Pervious Area

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

Subcatchment 7S: Ex. Area 3 Perv.



Summary for Subcatchment 8S: Ex. Area 3 Imp.

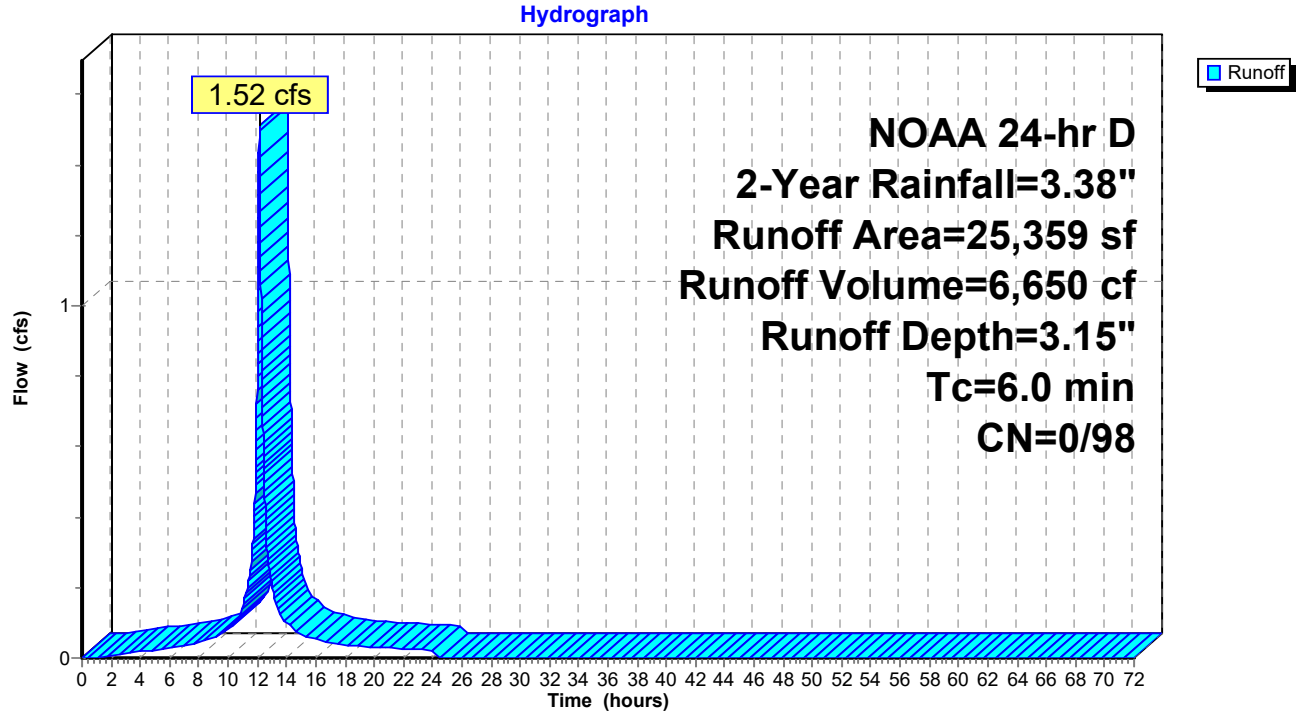
Runoff = 1.52 cfs @ 12.14 hrs, Volume= 6,650 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
25,359	98	Paved parking, HSG D
25,359	98	100.00% Impervious Area

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

Subcatchment 8S: Ex. Area 3 Imp.



Summary for Subcatchment 10S: Ex. Area 4 Perv.

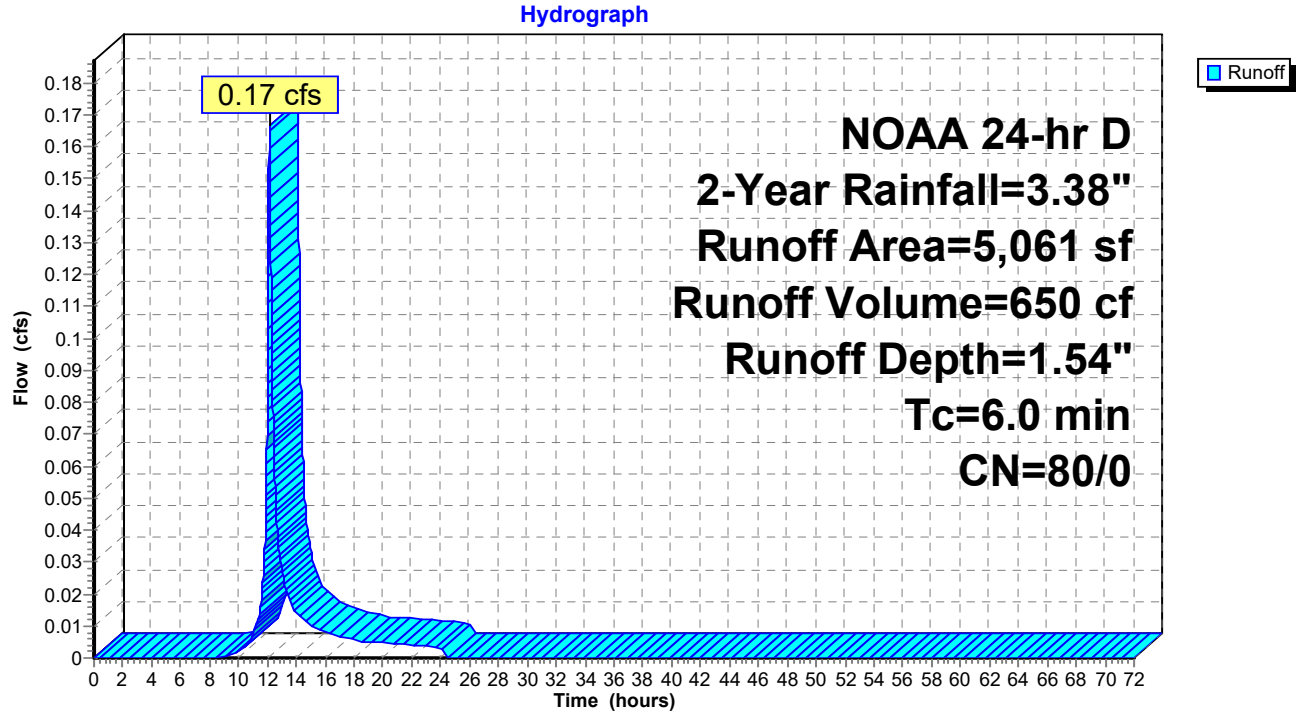
Runoff = 0.17 cfs @ 12.14 hrs, Volume= 650 cf, Depth= 1.54"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
5,061	80	>75% Grass cover, Good, HSG D
5,061	80	100.00% Pervious Area

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

Subcatchment 10S: Ex. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

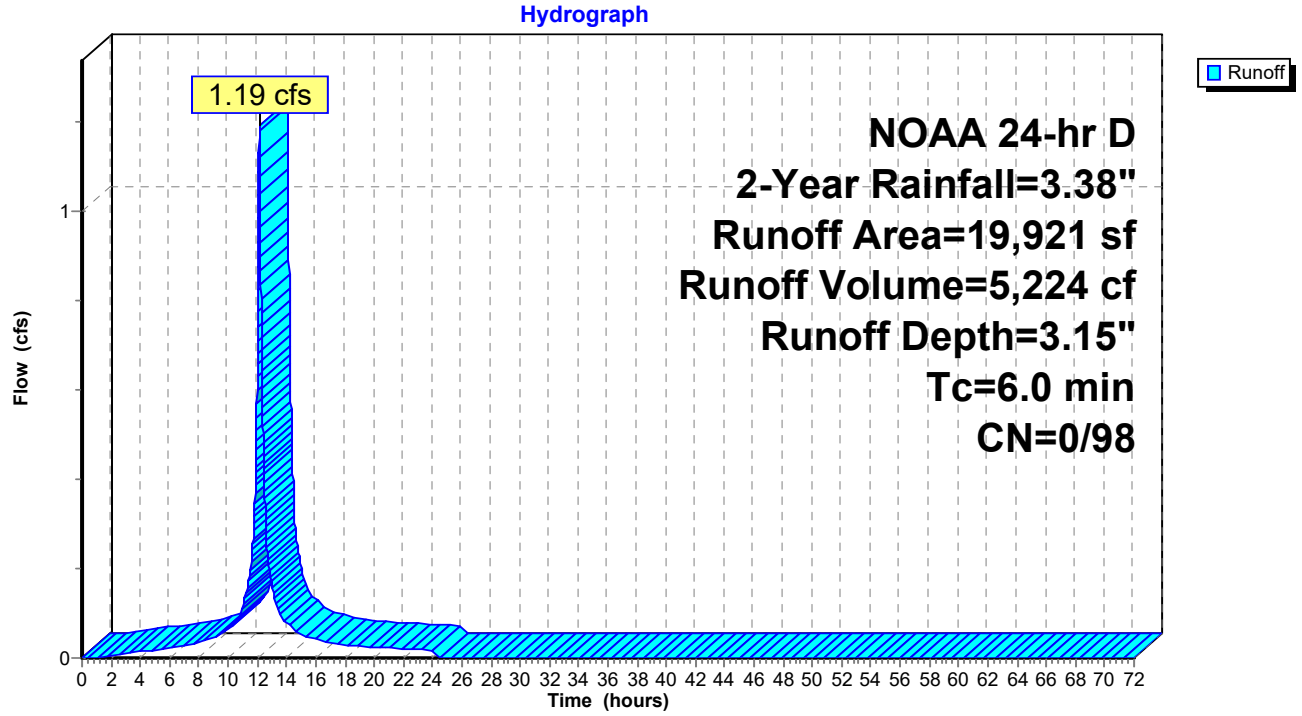
Runoff = 1.19 cfs @ 12.14 hrs, Volume= 5,224 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
19,921	98	Paved parking, HSG D
19,921	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.

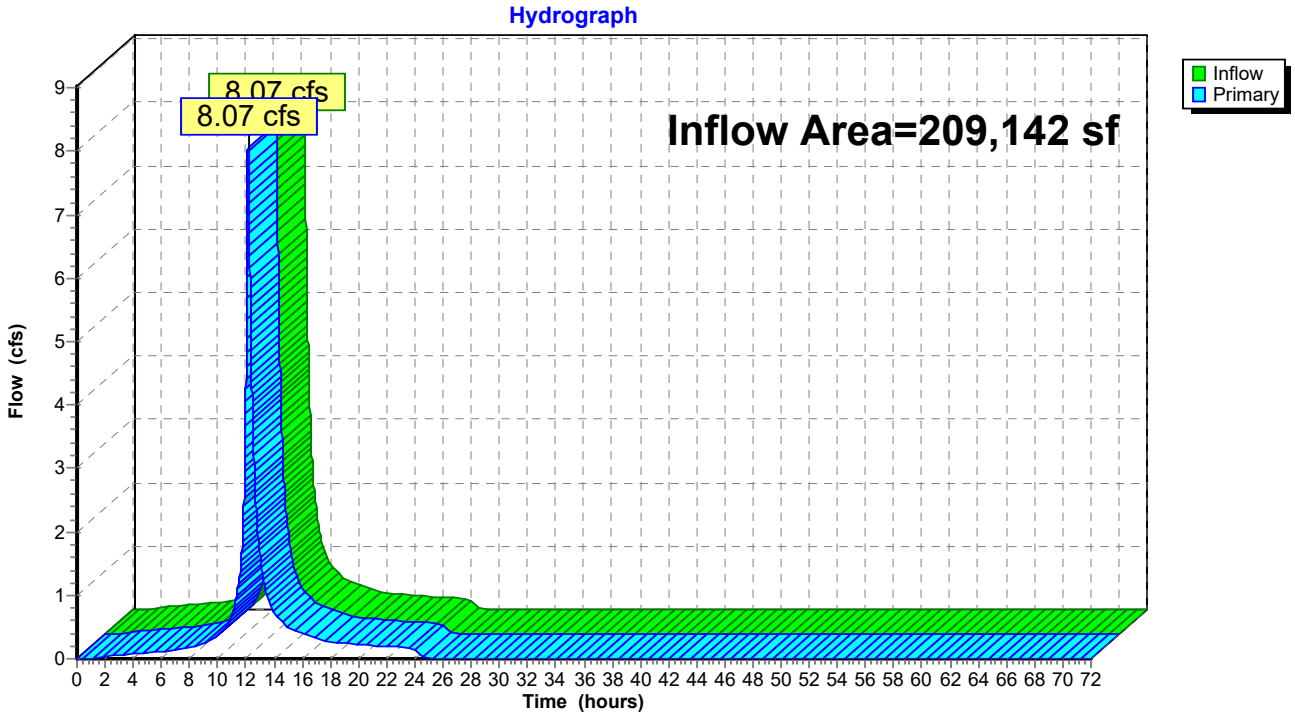


Summary for Link 3L: EX POA 1

Inflow Area = 209,142 sf, 48.06% Impervious, Inflow Depth = 2.31" for 2-Year event
Inflow = 8.07 cfs @ 12.15 hrs, Volume= 40,313 cf
Primary = 8.07 cfs @ 12.15 hrs, Volume= 40,313 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: EX POA 1

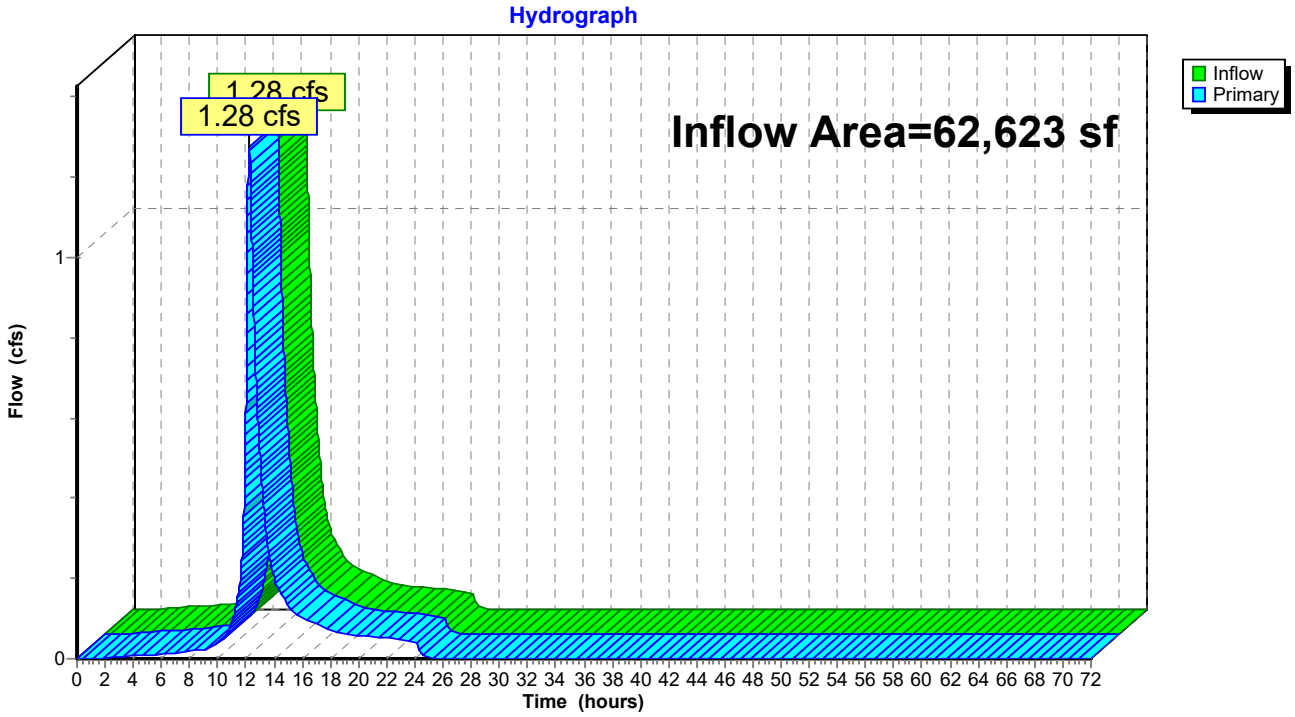


Summary for Link 6L: EX POA 2

Inflow Area = 62,623 sf, 16.25% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 1.28 cfs @ 12.24 hrs, Volume= 8,534 cf
Primary = 1.28 cfs @ 12.24 hrs, Volume= 8,534 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: EX POA 2

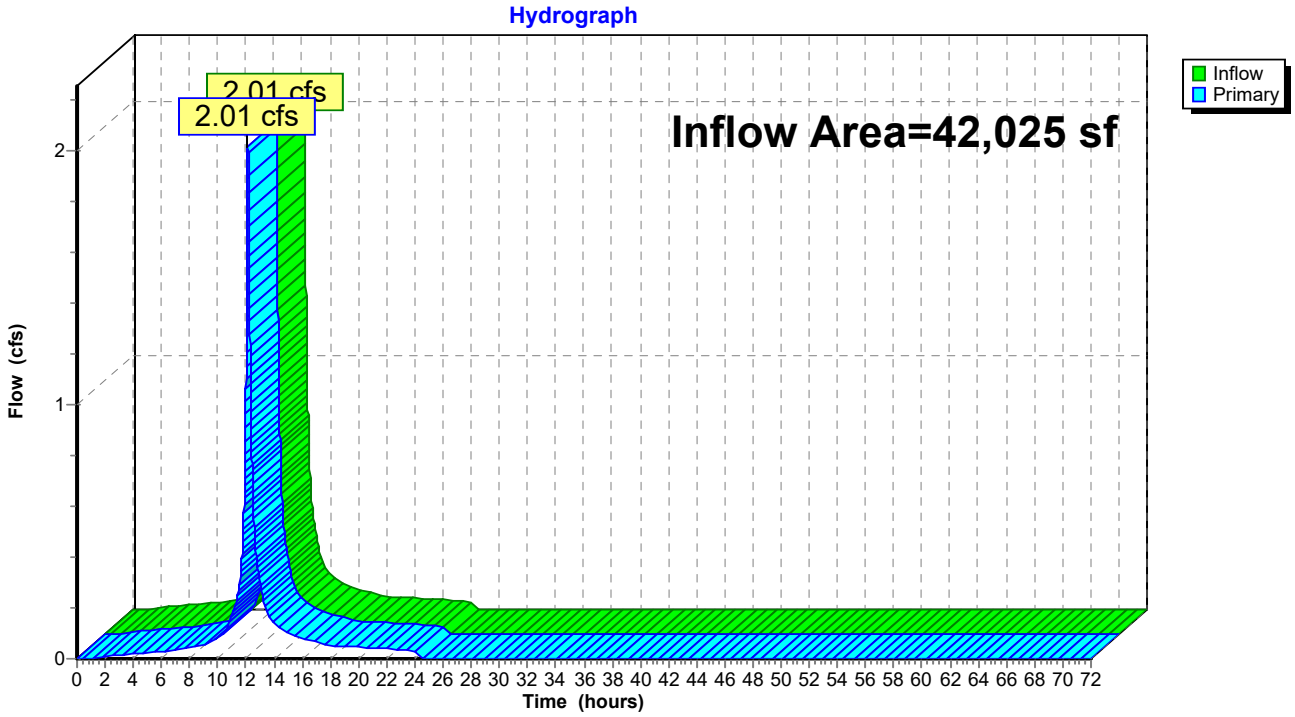


Summary for Link 9L: EX POA 3

Inflow Area = 42,025 sf, 60.34% Impervious, Inflow Depth = 2.46" for 2-Year event
Inflow = 2.01 cfs @ 12.14 hrs, Volume= 8,604 cf
Primary = 2.01 cfs @ 12.14 hrs, Volume= 8,604 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: EX POA 3

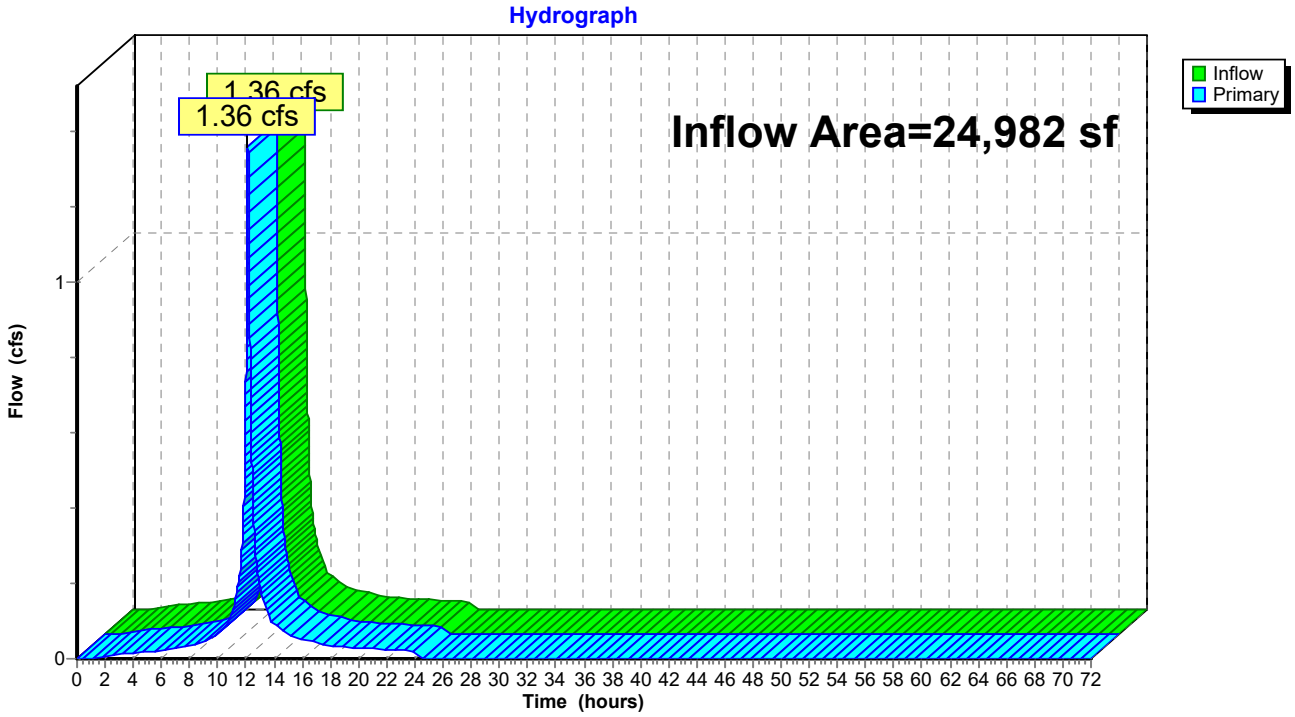


Summary for Link 12L: EX POA 4

Inflow Area = 24,982 sf, 79.74% Impervious, Inflow Depth = 2.82" for 2-Year event
Inflow = 1.36 cfs @ 12.14 hrs, Volume= 5,874 cf
Primary = 1.36 cfs @ 12.14 hrs, Volume= 5,874 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



Summary for Subcatchment 1S: PR. Area 1 Perv.

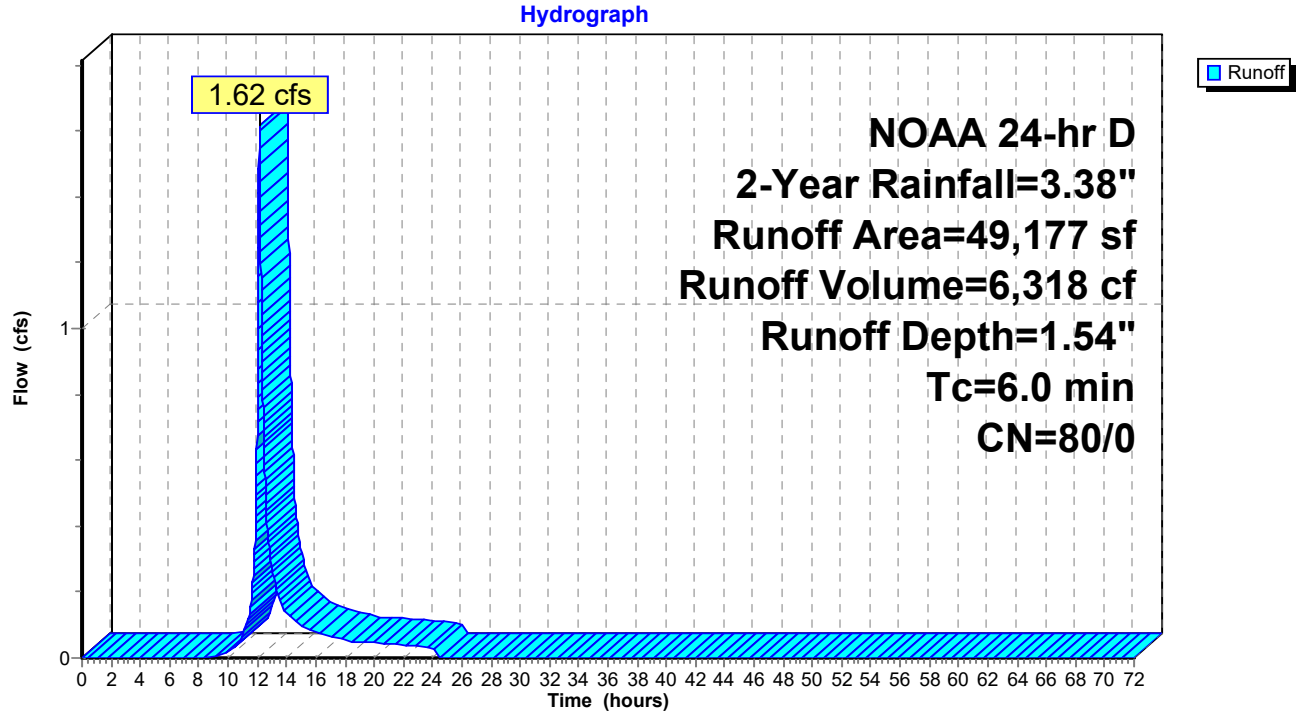
Runoff = 1.62 cfs @ 12.14 hrs, Volume= 6,318 cf, Depth= 1.54"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
49,177	80	>75% Grass cover, Good, HSG D
49,177	80	100.00% Pervious Area

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

Subcatchment 1S: PR. Area 1 Perv.



Summary for Subcatchment 2S: Pr. Area 1 Imp.

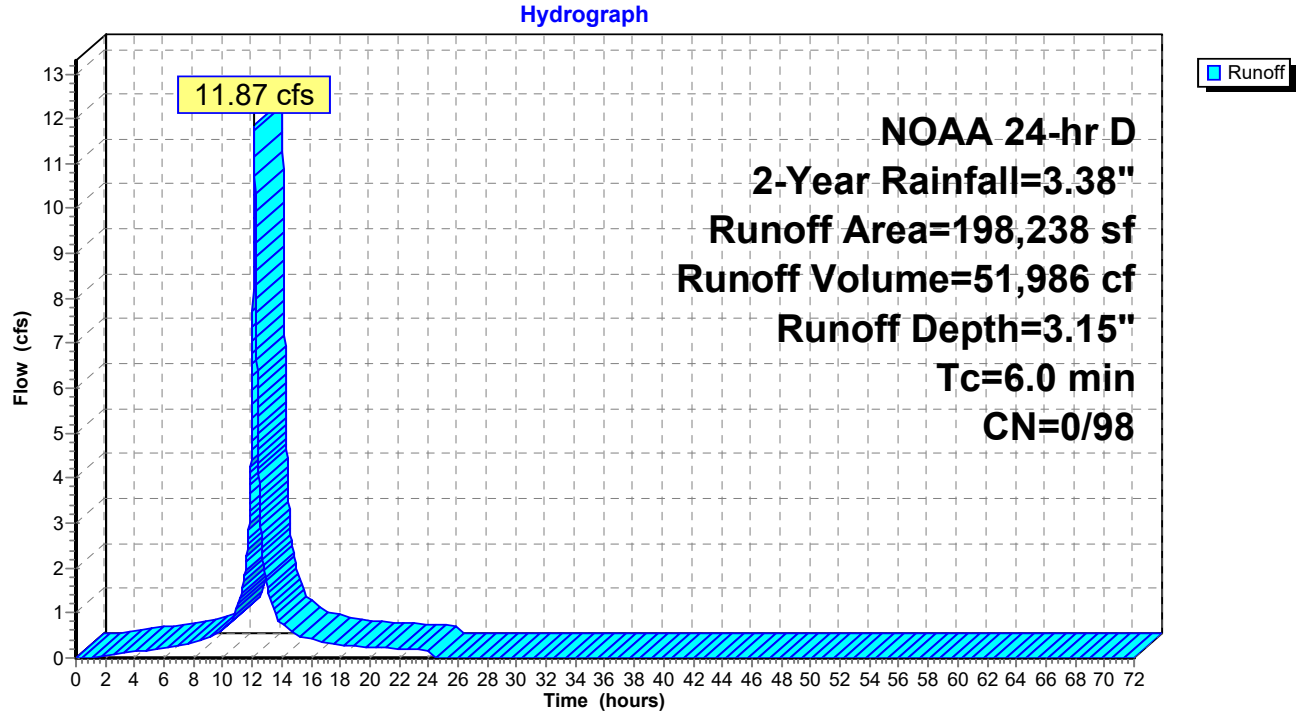
Runoff = 11.87 cfs @ 12.14 hrs, Volume= 51,986 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
198,238	98	Paved parking, HSG D
198,238	98	100.00% Impervious Area

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

Subcatchment 2S: Pr. Area 1 Imp.



Summary for Subcatchment 4S: Pr. Area 2 Perv.

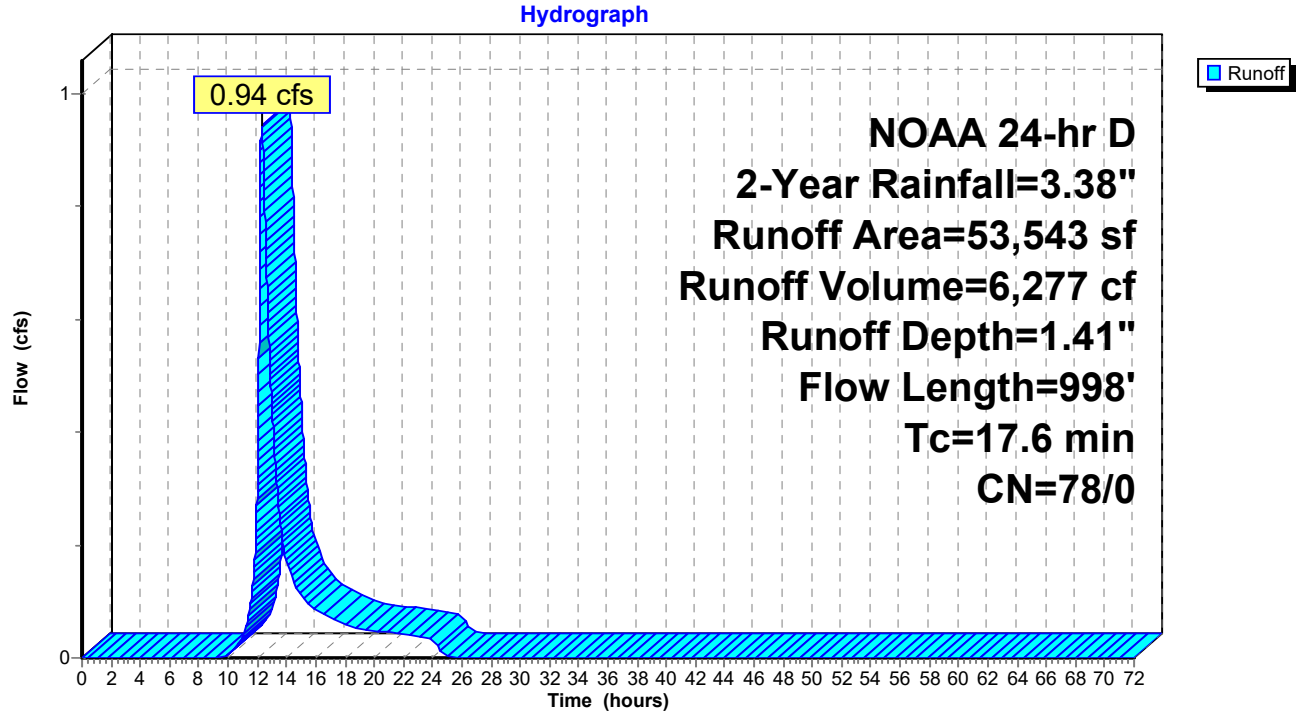
Runoff = 0.94 cfs @ 12.29 hrs, Volume= 6,277 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
42,271	77	Woods, Good, HSG D
11,272	80	>75% Grass cover, Good, HSG D
53,543	78	Weighted Average
53,543	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Pr. Area 2 Perv.



Summary for Subcatchment 5S: Pr. Area 2 Imp.

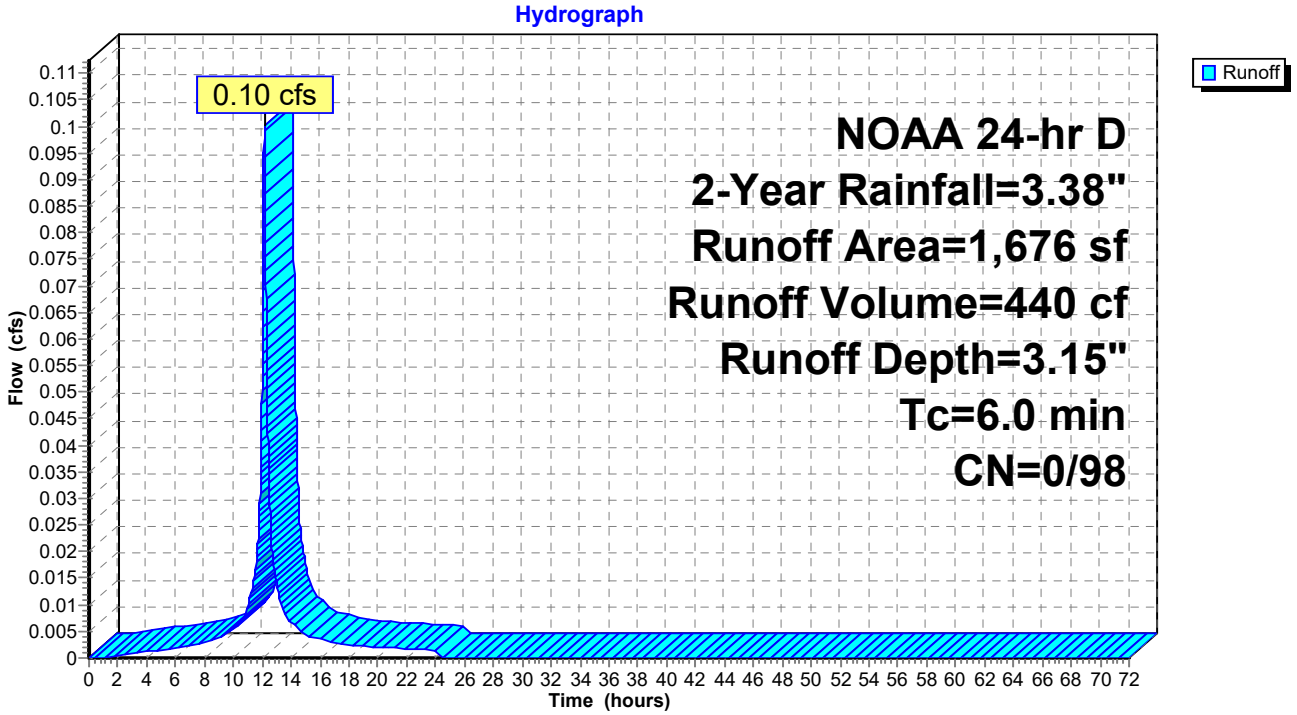
Runoff = 0.10 cfs @ 12.14 hrs, Volume= 440 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
1,676	98	Paved parking, HSG D
1,676	98	100.00% Impervious Area

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

Subcatchment 5S: Pr. Area 2 Imp.



Summary for Subcatchment 7S: Pr. Area 3 Perv.

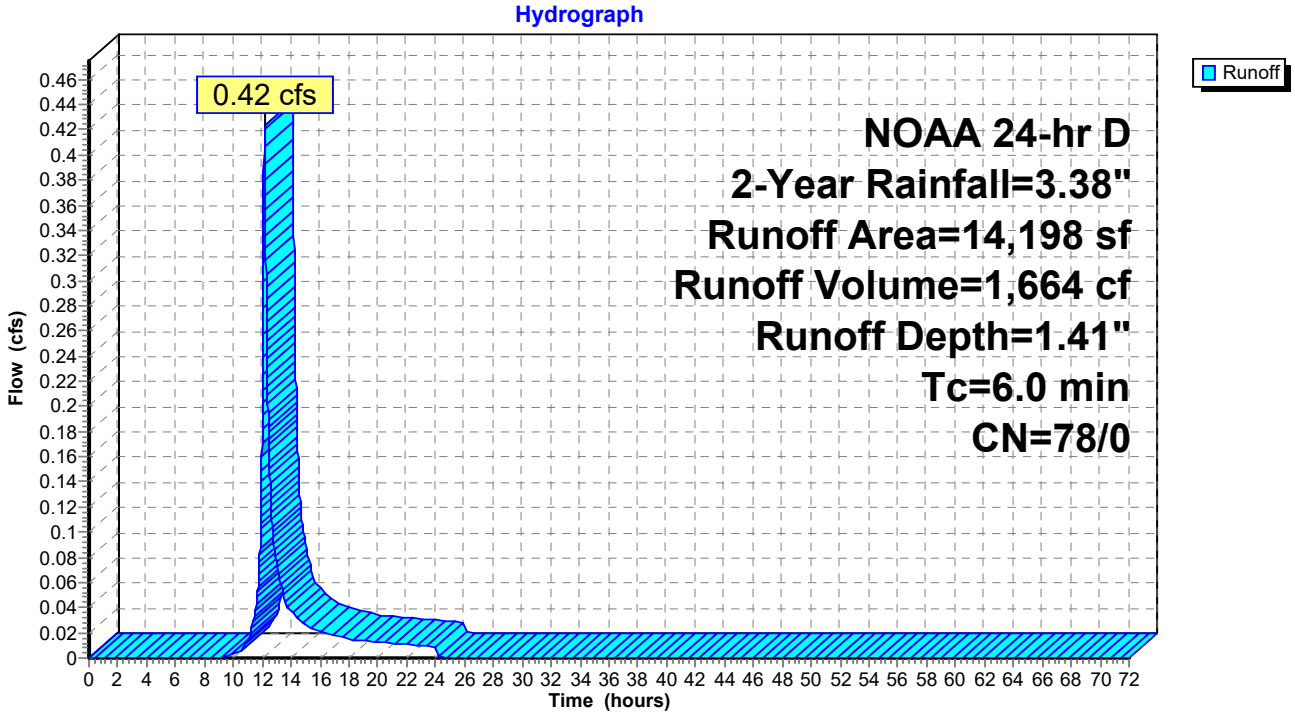
Runoff = 0.42 cfs @ 12.15 hrs, Volume= 1,664 cf, Depth= 1.41"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
11,461	77	Woods, Good, HSG D
2,737	80	>75% Grass cover, Good, HSG D
14,198	78	Weighted Average
14,198	78	100.00% Pervious Area

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

Subcatchment 7S: Pr. Area 3 Perv.



Summary for Subcatchment 8S: Pr. Area 3 Imp.

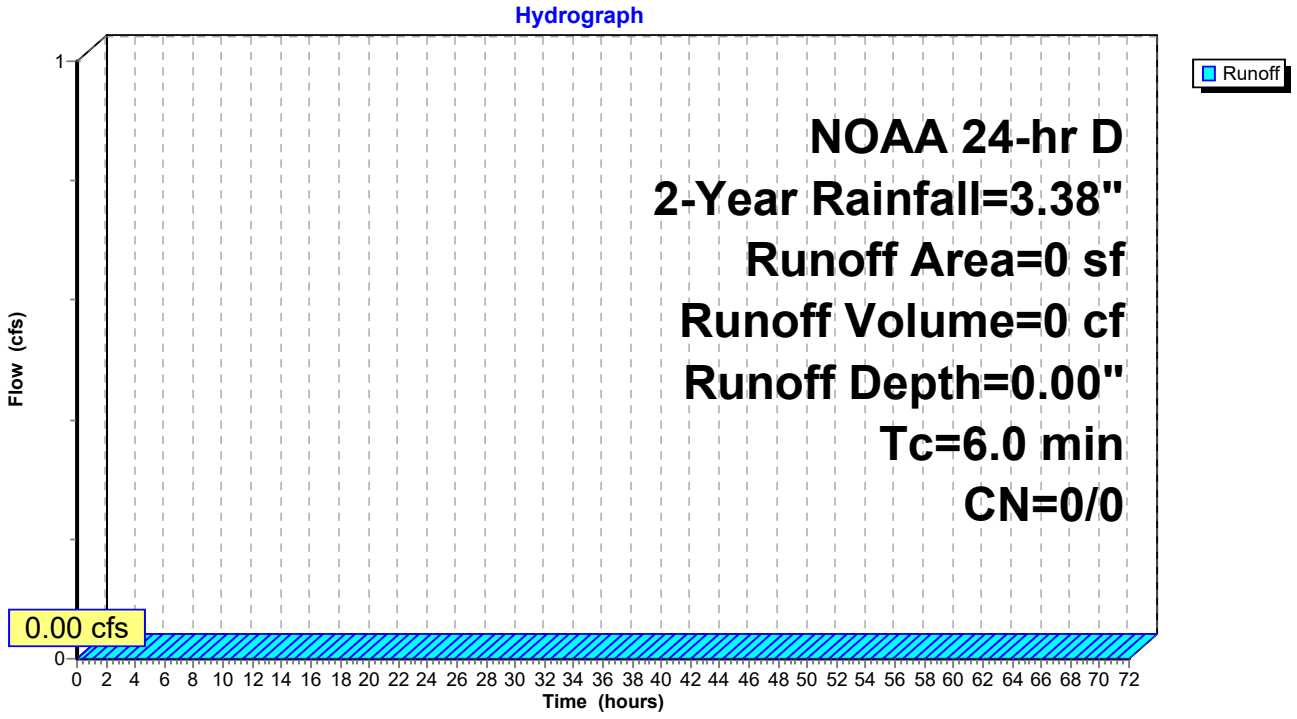
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
0	98	Paved parking, HSG D

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

Subcatchment 8S: Pr. Area 3 Imp.



Summary for Subcatchment 10S: Pr. Area 4 Perv.

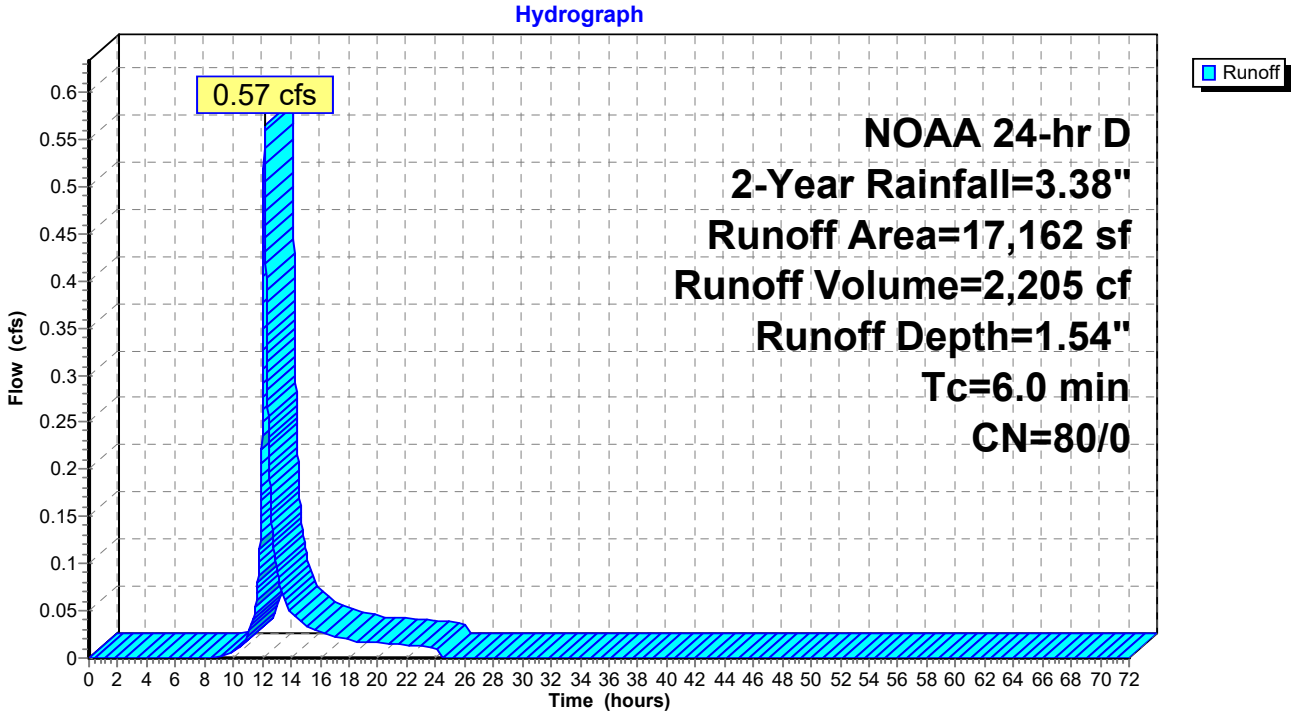
Runoff = 0.57 cfs @ 12.14 hrs, Volume= 2,205 cf, Depth= 1.54"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
0	77	Woods, Good, HSG D
17,162	80	>75% Grass cover, Good, HSG D
17,162	80	Weighted Average
17,162	80	100.00% Pervious Area

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

Subcatchment 10S: Pr. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

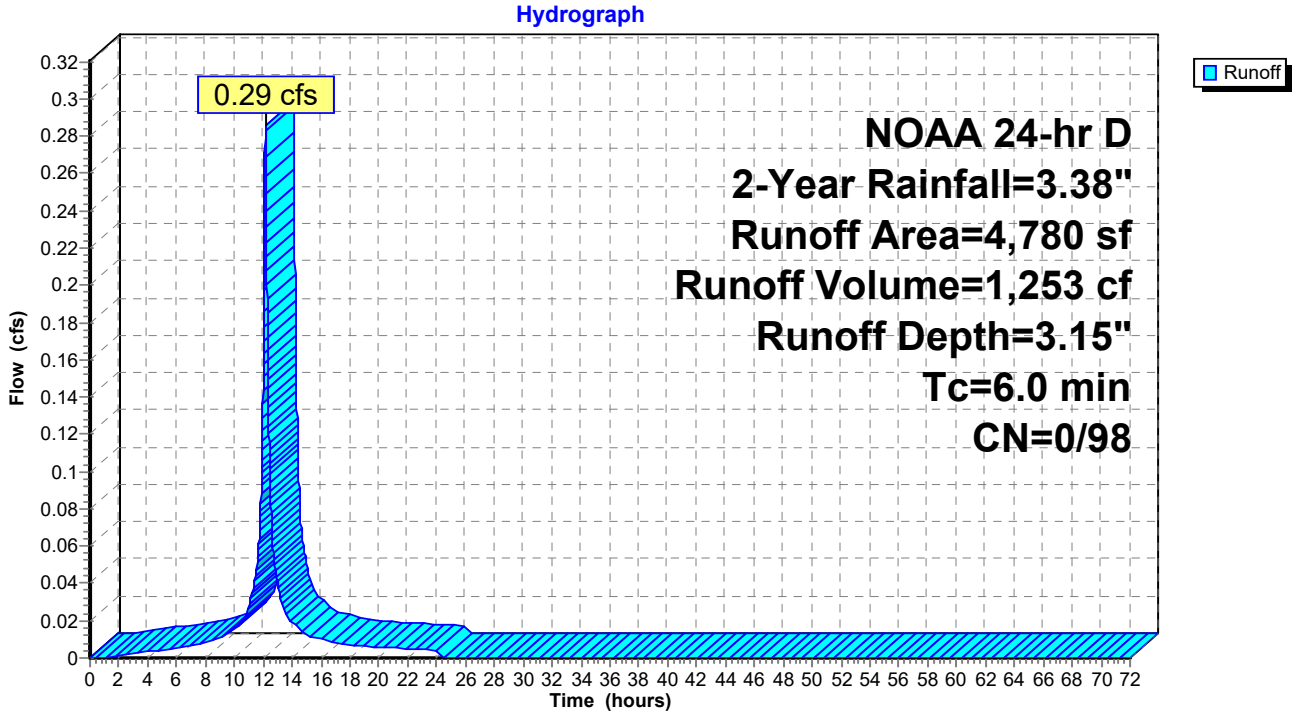
Runoff = 0.29 cfs @ 12.14 hrs, Volume= 1,253 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 2-Year Rainfall=3.38"

Area (sf)	CN	Description
4,780	98	Paved parking, HSG D
4,780	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 2.83" for 2-Year event
Inflow = 13.49 cfs @ 12.14 hrs, Volume= 58,304 cf
Outflow = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf, Atten= 82%, Lag= 36.5 min
Primary = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.41' @ 12.75 hrs Surf.Area= 25,205 sf Storage= 22,719 cf

Plug-Flow detention time= 145.2 min calculated for 58,155 cf (100% of inflow)
Center-of-Mass det. time= 143.9 min (914.9 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.48 cfs @ 12.75 hrs HW=20.41' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 2.48 cfs of 5.44 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 2.48 cfs @ 4.54 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 13P: Underground Basin - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx 2016 (Contech® ChamberMaxx® capped at 47.2cf for air pocket)
Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf
Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Row Length Adjustment= +0.32' x 6.63 sf x 26 rows

51.4" Wide + 5.6" Spacing = 57.0" C-C Row Spacing

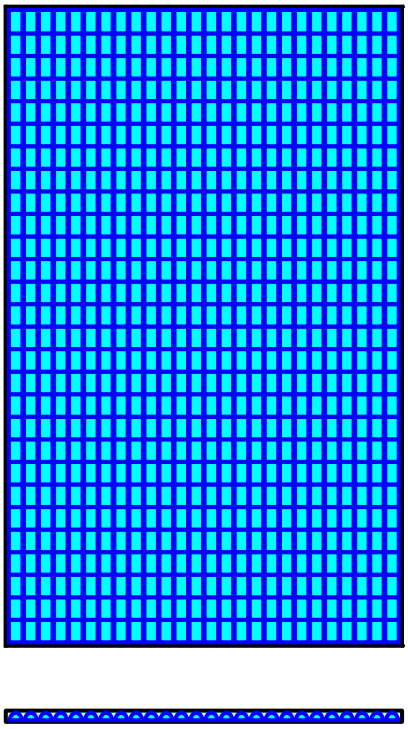
28 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 199.58' Row Length +12.0" End Stone x 2 = 201.58' Base Length
26 Rows x 51.4" Wide + 5.6" Spacing x 25 + 12.0" Side Stone x 2 = 125.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

728 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 26 Rows = 34,411.5 cf Chamber Storage
728 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 26 Rows = 35,916.2 cf Displacement

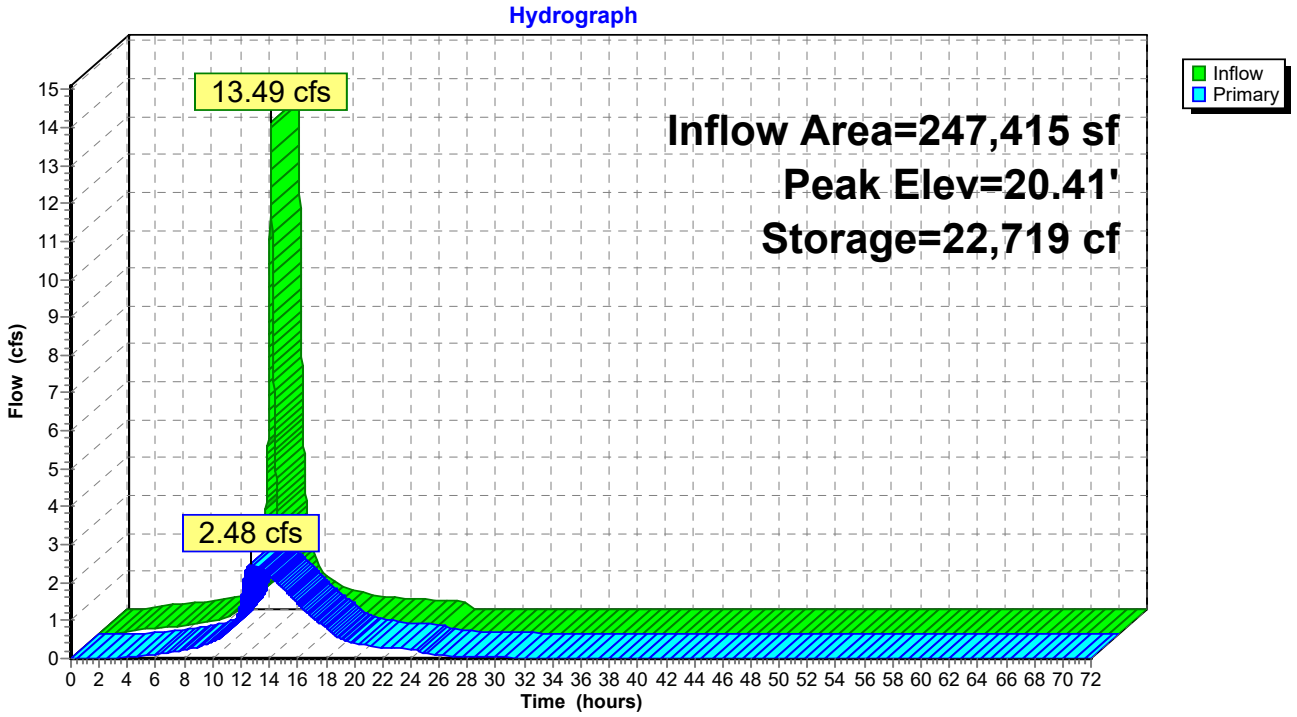
88,846.3 cf Field - 35,916.2 cf Chambers = 52,930.2 cf Stone x 40.0% Voids = 21,172.1 cf Stone Storage

Chamber Storage + Stone Storage = 55,583.6 cf = 1.276 af
Overall Storage Efficiency = 62.6%
Overall System Size = 201.58' x 125.03' x 3.52'

728 Chambers
3,290.6 cy Field
1,960.4 cy Stone



Pond 13P: Underground Basin

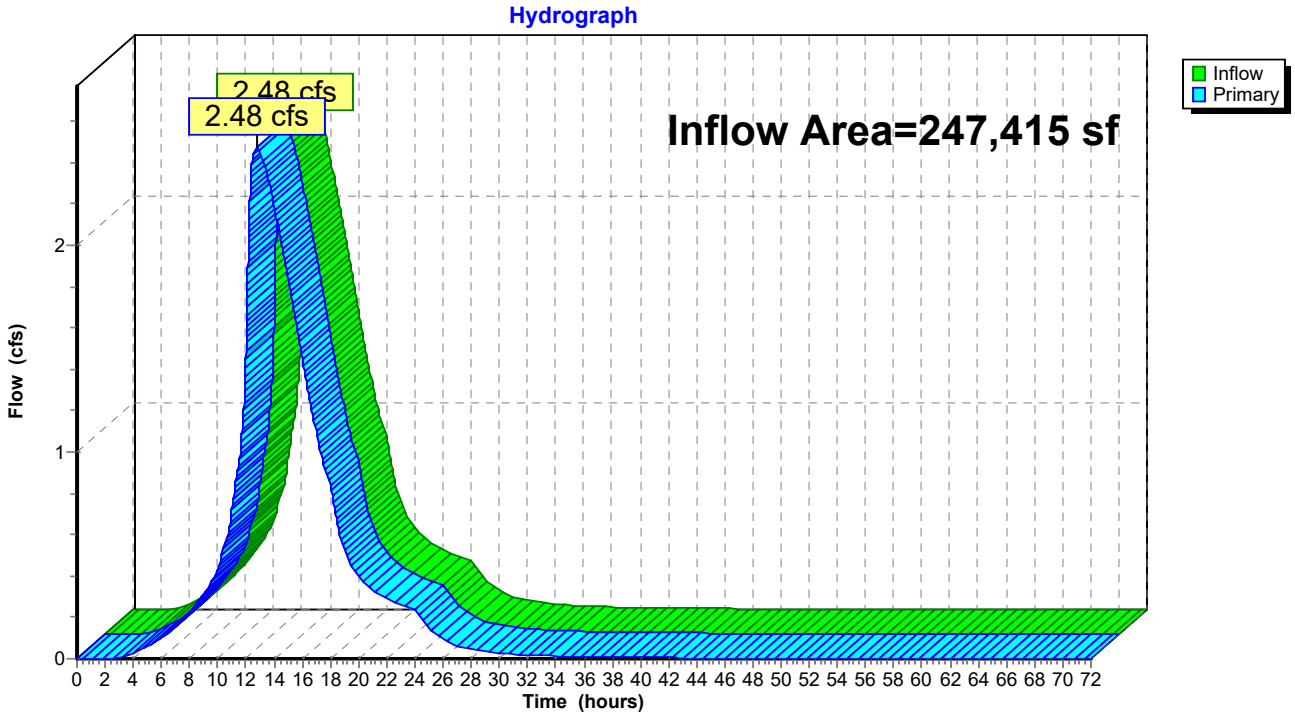


Summary for Link 3L: Pr. POA 1

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth > 2.82" for 2-Year event
Inflow = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf
Primary = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: Pr. POA 1

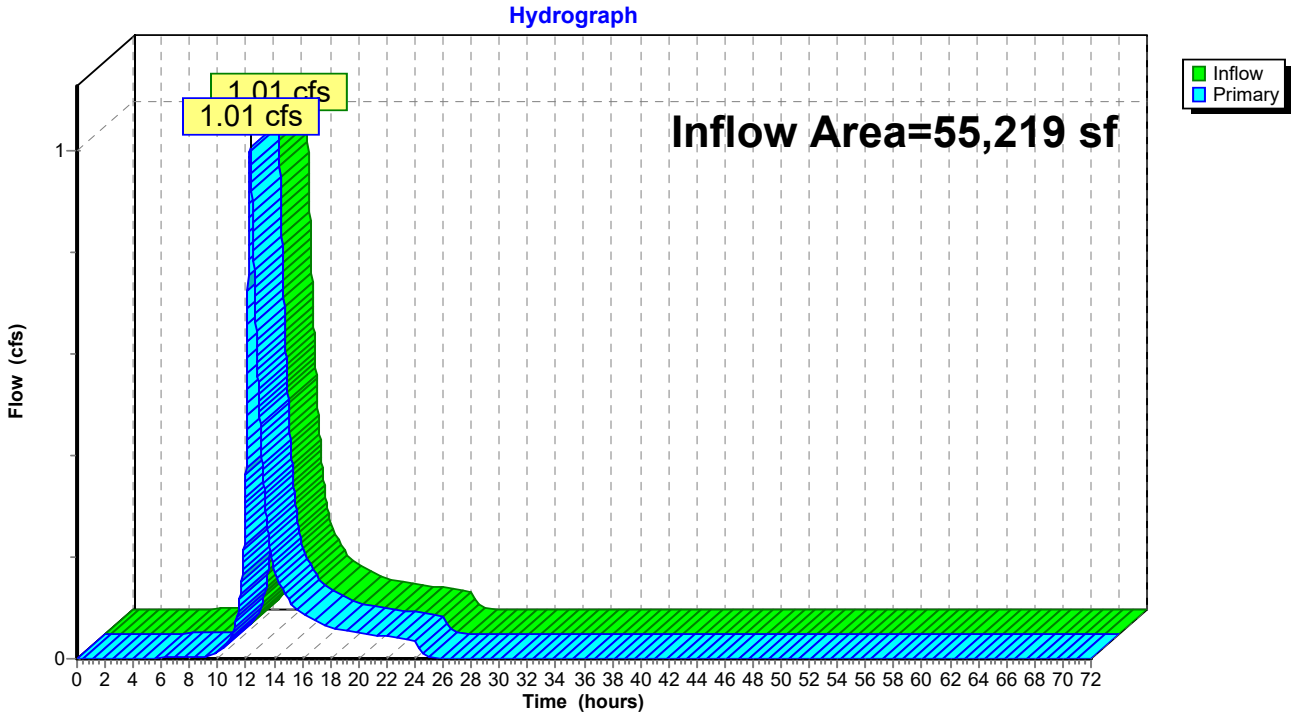


Summary for Link 6L: Pr. POA 2

Inflow Area = 55,219 sf, 3.04% Impervious, Inflow Depth = 1.46" for 2-Year event
Inflow = 1.01 cfs @ 12.28 hrs, Volume= 6,717 cf
Primary = 1.01 cfs @ 12.28 hrs, Volume= 6,717 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: Pr. POA 2

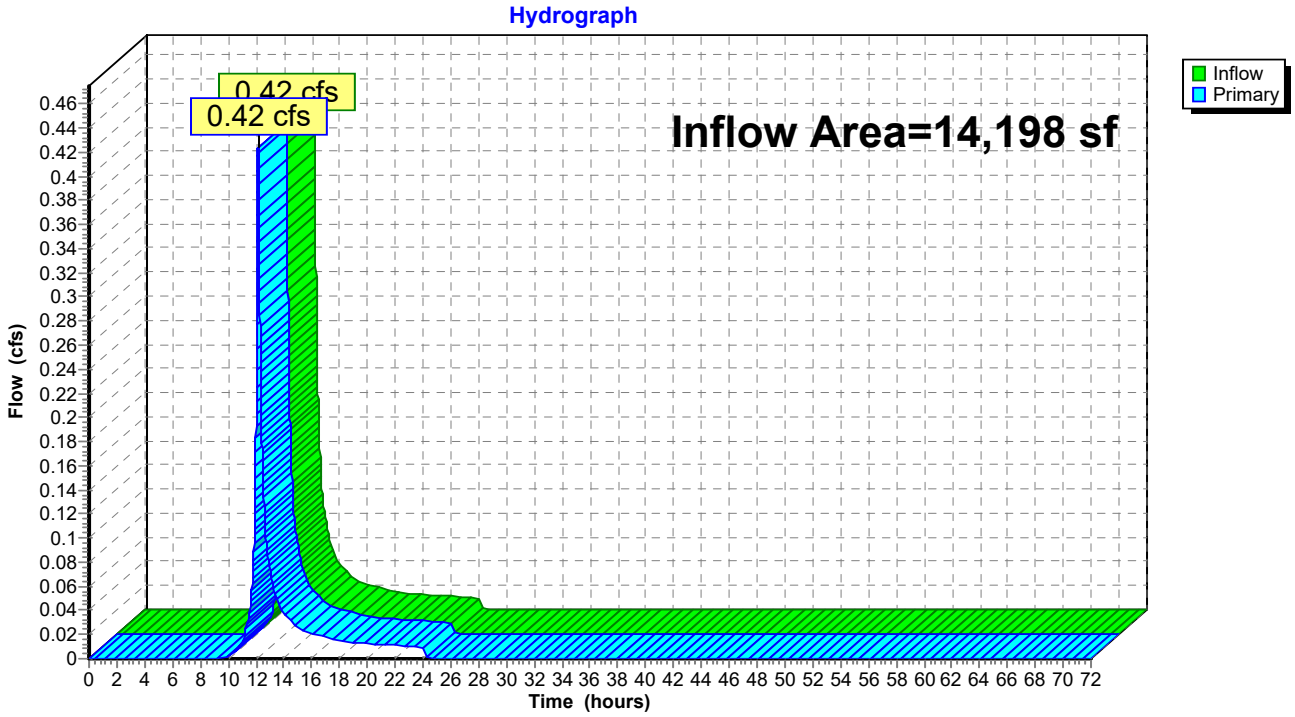


Summary for Link 9L: Pr POA 3

Inflow Area = 14,198 sf, 0.00% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 0.42 cfs @ 12.15 hrs, Volume= 1,664 cf
Primary = 0.42 cfs @ 12.15 hrs, Volume= 1,664 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: Pr POA 3

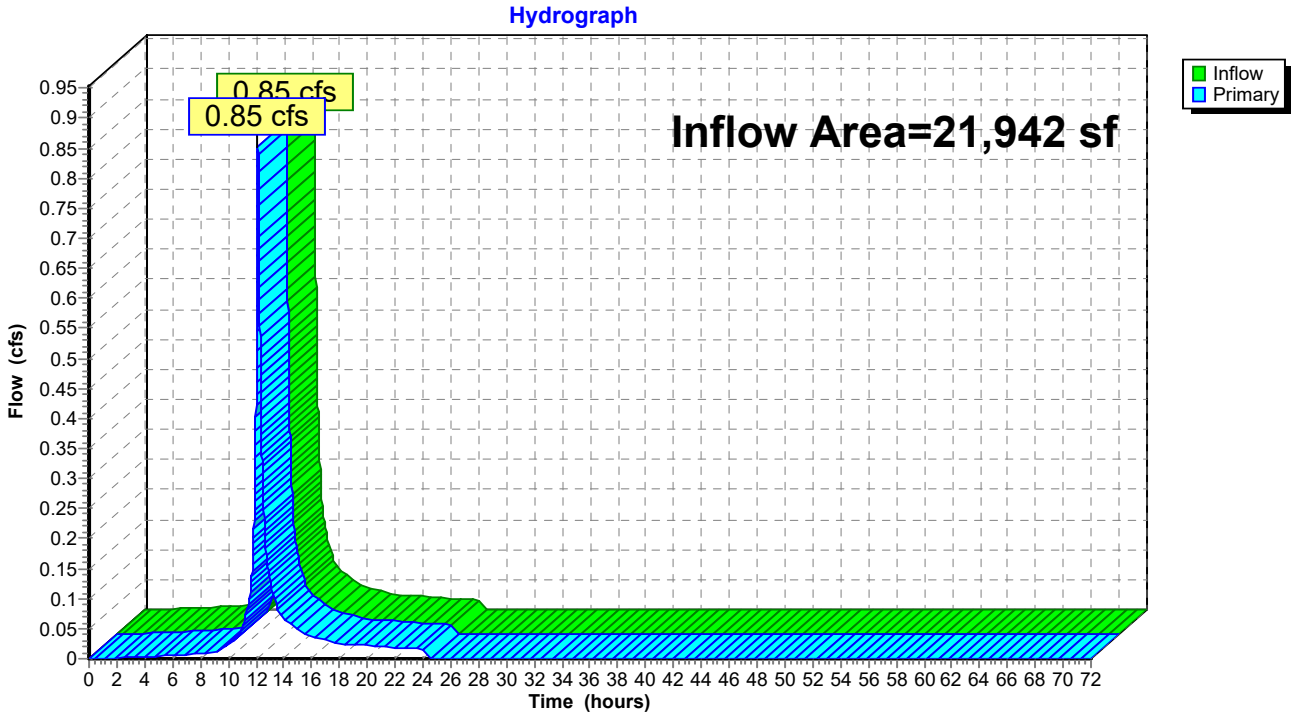


Summary for Link 12L: EX POA 4

Inflow Area = 21,942 sf, 21.78% Impervious, Inflow Depth = 1.89" for 2-Year event
Inflow = 0.85 cfs @ 12.14 hrs, Volume= 3,458 cf
Primary = 0.85 cfs @ 12.14 hrs, Volume= 3,458 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



APPENDIX C-3
10-YEAR STORM EVENT HYDROGRAPHS

Summary for Subcatchment 1S: Ex. Area 1 Perv.

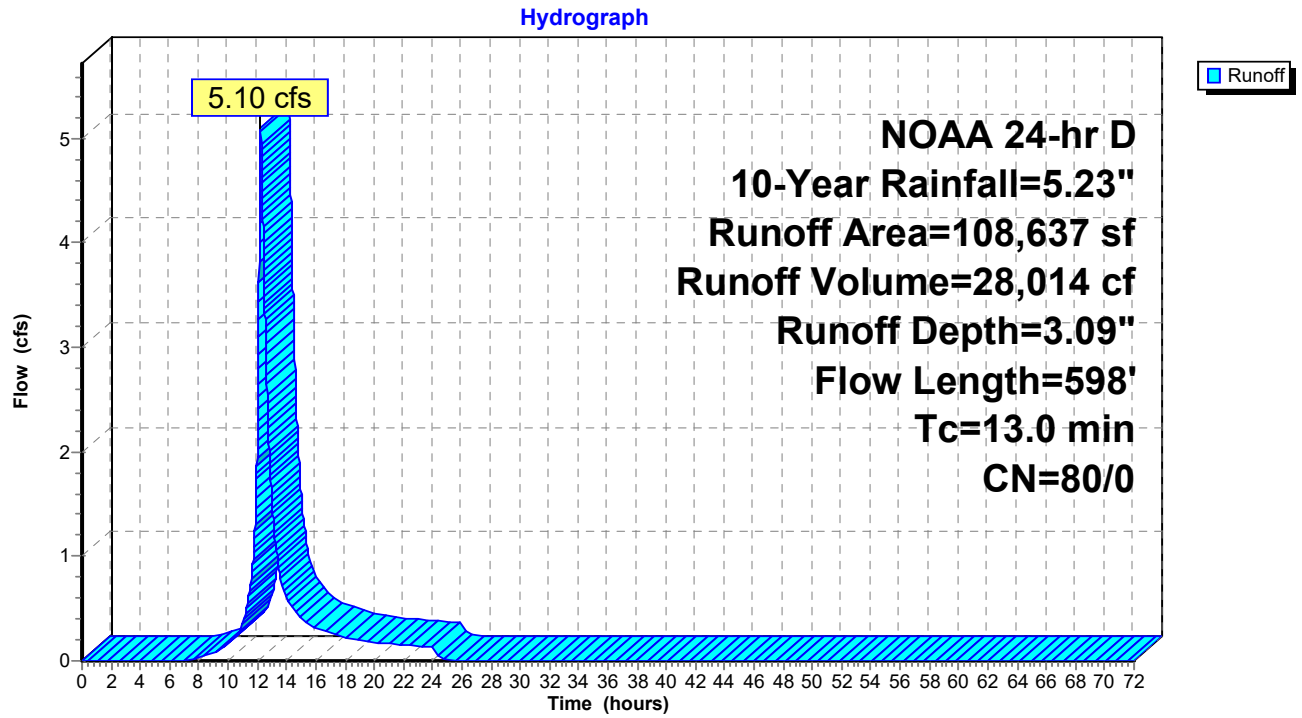
Runoff = 5.10 cfs @ 12.22 hrs, Volume= 28,014 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
108,637	80	>75% Grass cover, Good, HSG D
108,637	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0600	0.19		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
0.5	75	0.0270	2.65		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.5	423		2.00		**Direct Entry, Channel Flow**
13.0	598	Total			

Subcatchment 1S: Ex. Area 1 Perv.



Summary for Subcatchment 2S: Ex. Area 1 Imp.

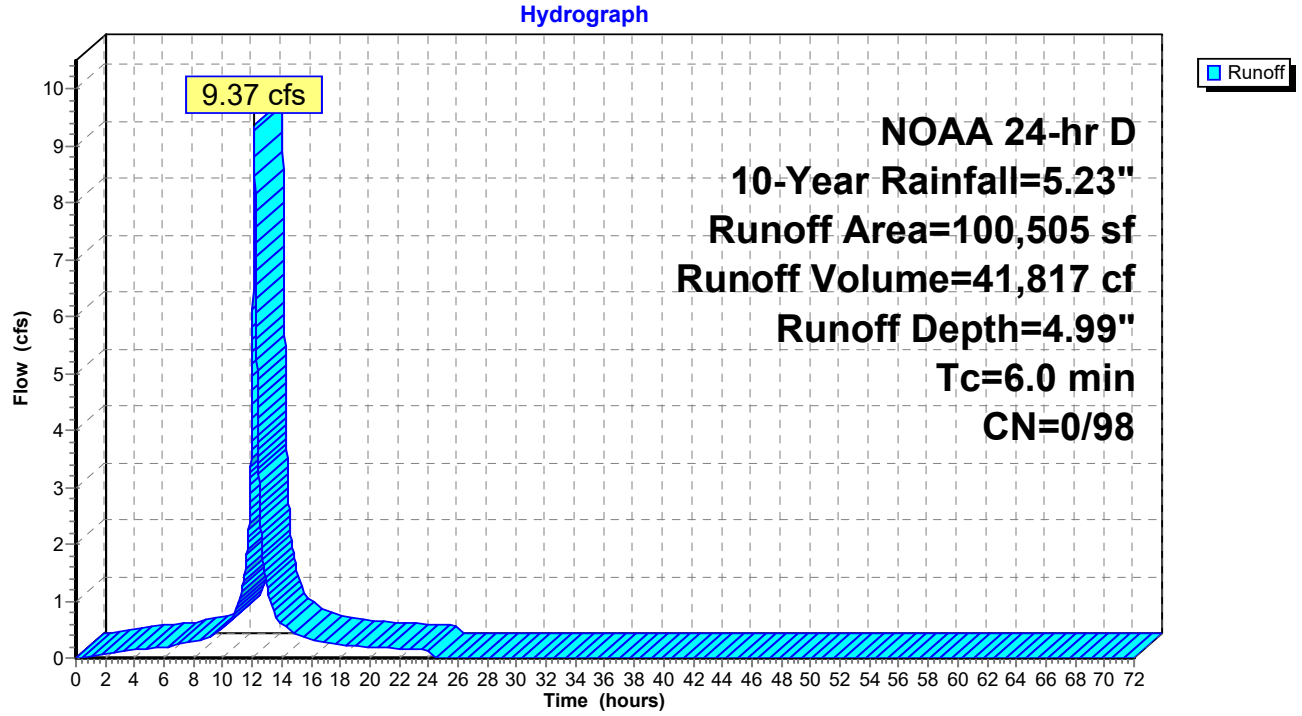
Runoff = 9.37 cfs @ 12.14 hrs, Volume= 41,817 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
100,505	98	Paved parking, HSG D
100,505	98	100.00% Impervious Area

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

Subcatchment 2S: Ex. Area 1 Imp.



Summary for Subcatchment 4S: Ex. Area 2 Perv.

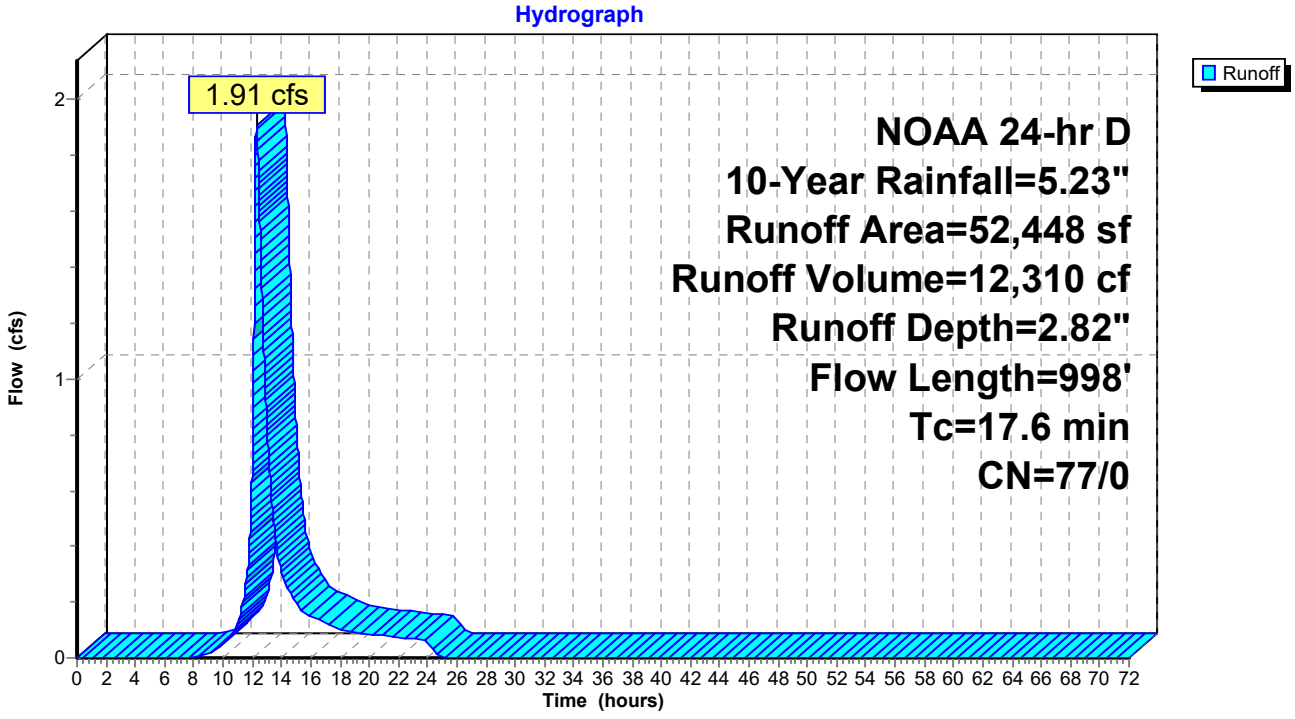
Runoff = 1.91 cfs @ 12.28 hrs, Volume= 12,310 cf, Depth= 2.82"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
50,644	77	Woods, Good, HSG D
1,804	80	>75% Grass cover, Good, HSG D
52,448	77	Weighted Average
52,448	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Ex. Area 2 Perv.



Summary for Subcatchment 5S: Ex. Area 2 Imp.

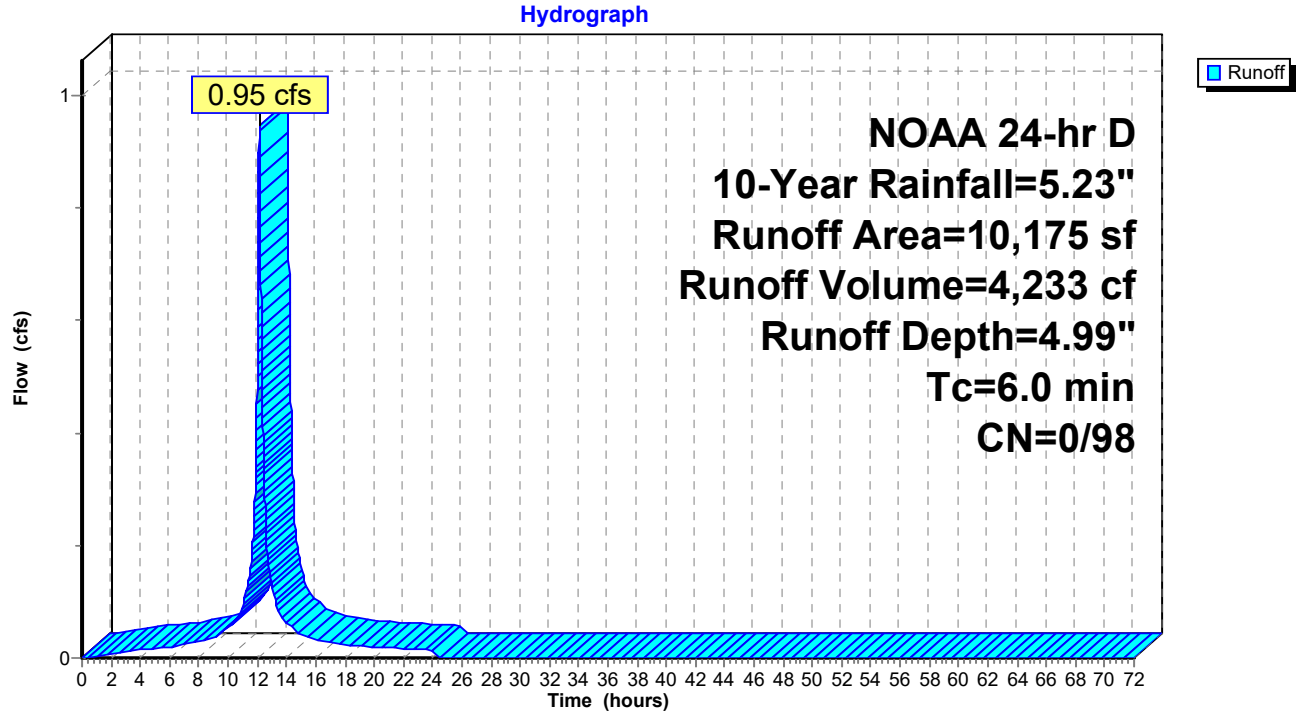
Runoff = 0.95 cfs @ 12.14 hrs, Volume= 4,233 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
10,175	98	Paved parking, HSG D
10,175	98	100.00% Impervious Area

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

Subcatchment 5S: Ex. Area 2 Imp.



Summary for Subcatchment 7S: Ex. Area 3 Perv.

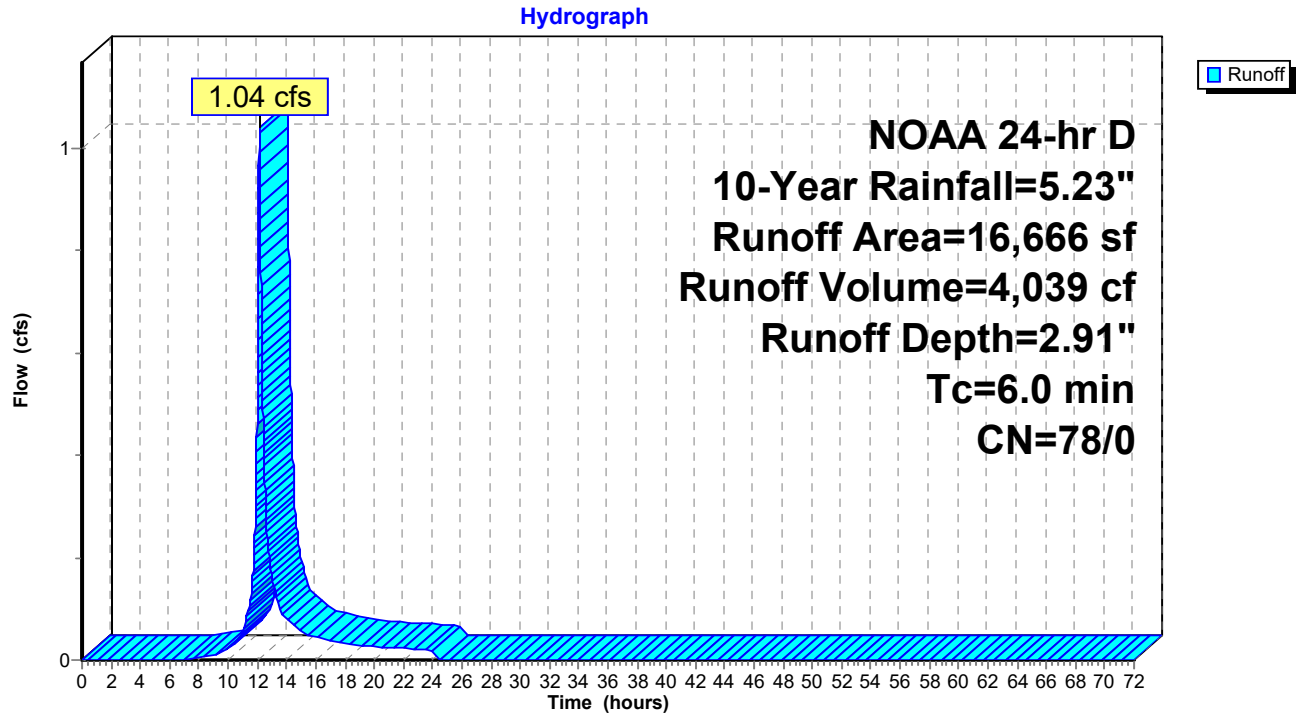
Runoff = 1.04 cfs @ 12.14 hrs, Volume= 4,039 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
11,841	77	Woods, Good, HSG D
4,825	80	>75% Grass cover, Good, HSG D
16,666	78	Weighted Average
16,666	78	100.00% Pervious Area

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

Subcatchment 7S: Ex. Area 3 Perv.



Summary for Subcatchment 8S: Ex. Area 3 Imp.

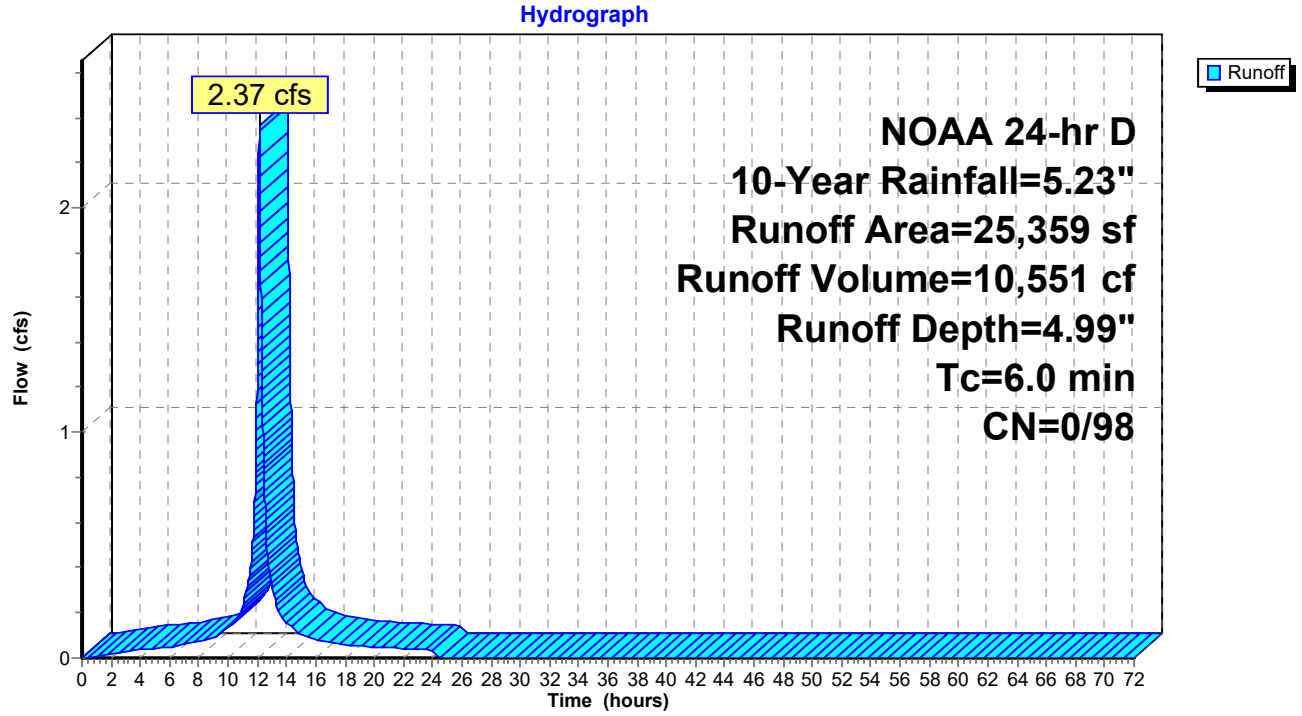
Runoff = 2.37 cfs @ 12.14 hrs, Volume= 10,551 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
25,359	98	Paved parking, HSG D
25,359	98	100.00% Impervious Area

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

Subcatchment 8S: Ex. Area 3 Imp.



Summary for Subcatchment 10S: Ex. Area 4 Perv.

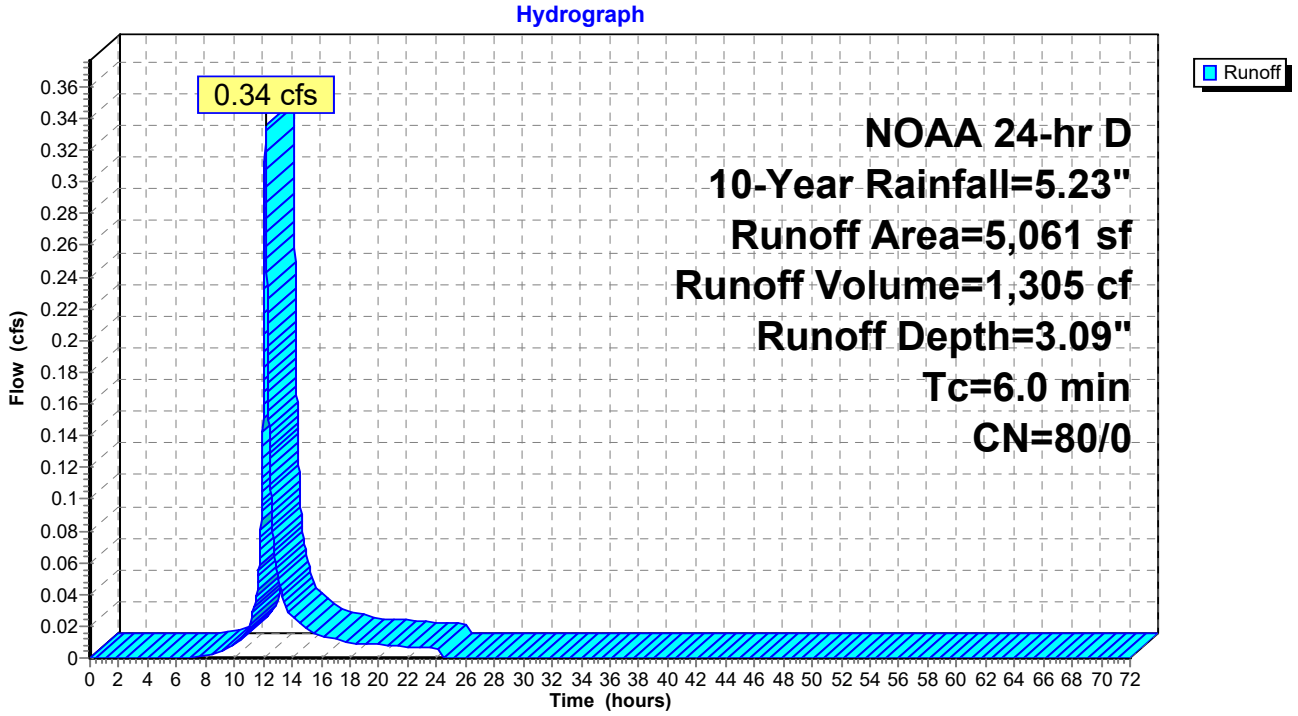
Runoff = 0.34 cfs @ 12.14 hrs, Volume= 1,305 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
5,061	80	>75% Grass cover, Good, HSG D
5,061	80	100.00% Pervious Area

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

Subcatchment 10S: Ex. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

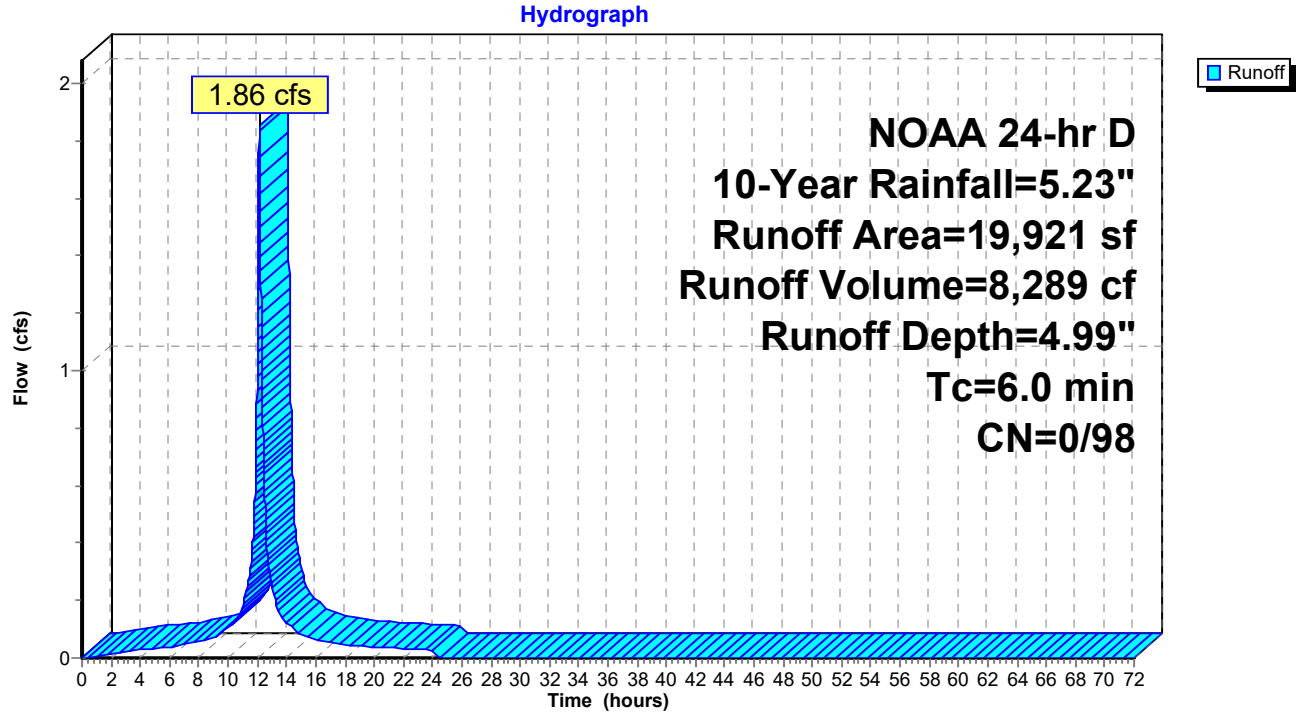
Runoff = 1.86 cfs @ 12.14 hrs, Volume= 8,289 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
19,921	98	Paved parking, HSG D
19,921	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.

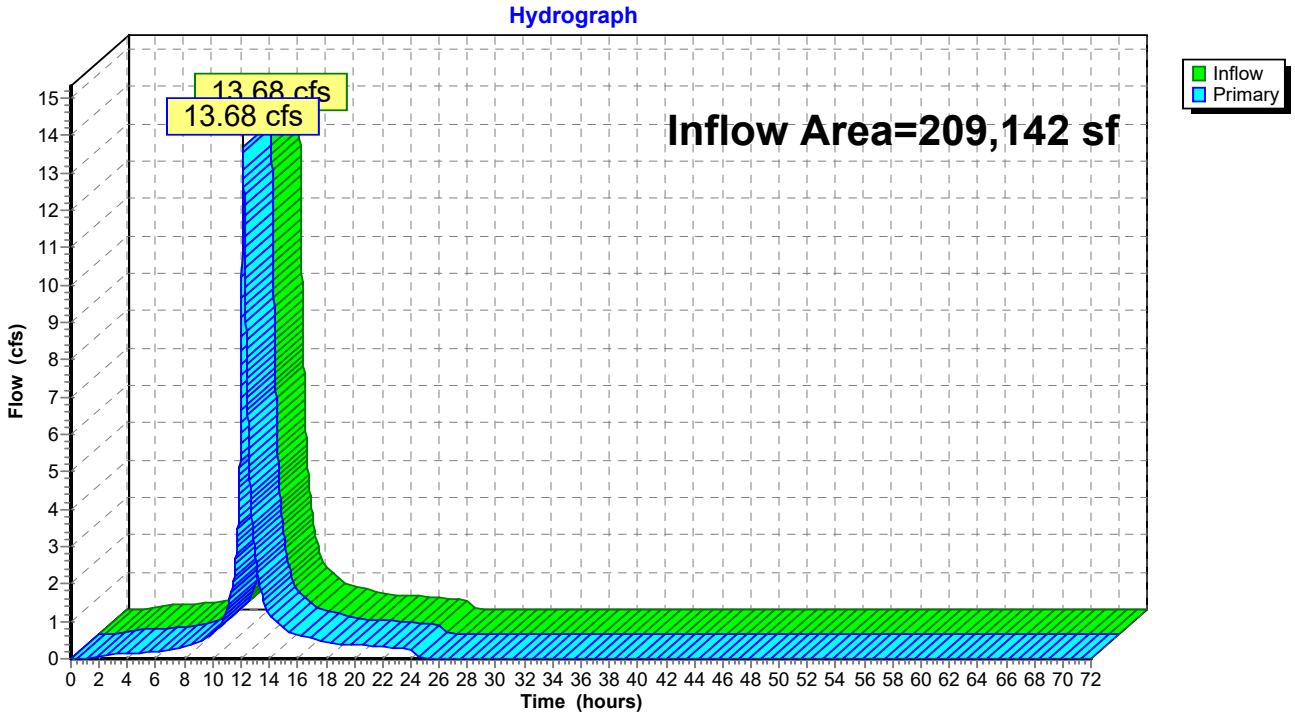


Summary for Link 3L: EX POA 1

Inflow Area = 209,142 sf, 48.06% Impervious, Inflow Depth = 4.01" for 10-Year event
Inflow = 13.68 cfs @ 12.15 hrs, Volume= 69,831 cf
Primary = 13.68 cfs @ 12.15 hrs, Volume= 69,831 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: EX POA 1

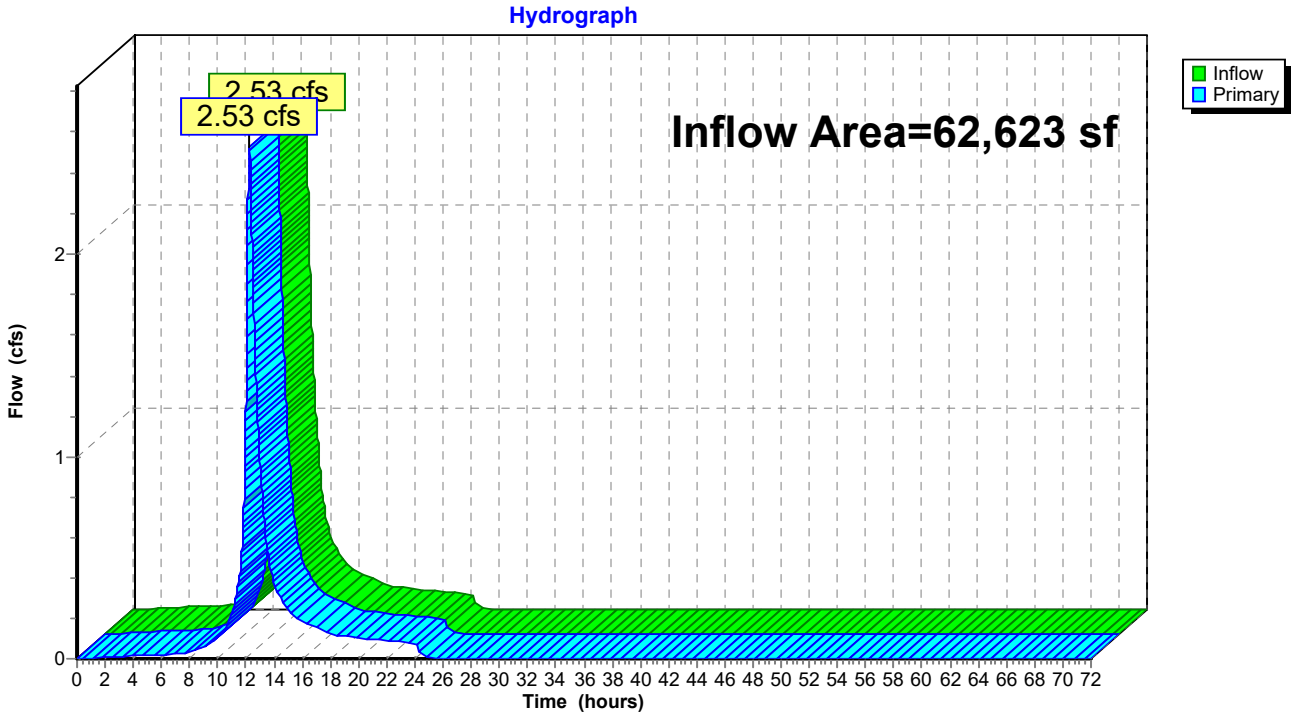


Summary for Link 6L: EX POA 2

Inflow Area = 62,623 sf, 16.25% Impervious, Inflow Depth = 3.17" for 10-Year event
Inflow = 2.53 cfs @ 12.24 hrs, Volume= 16,544 cf
Primary = 2.53 cfs @ 12.24 hrs, Volume= 16,544 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: EX POA 2

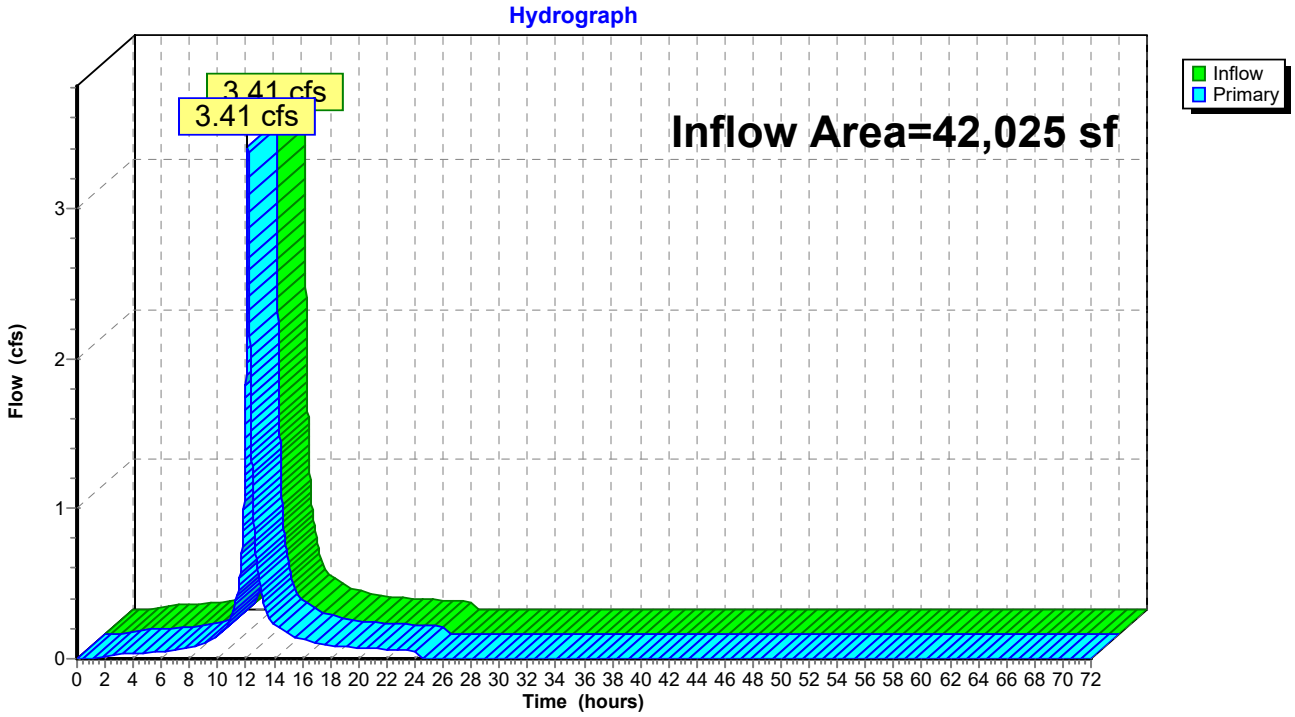


Summary for Link 9L: EX POA 3

Inflow Area = 42,025 sf, 60.34% Impervious, Inflow Depth = 4.17" for 10-Year event
Inflow = 3.41 cfs @ 12.14 hrs, Volume= 14,590 cf
Primary = 3.41 cfs @ 12.14 hrs, Volume= 14,590 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: EX POA 3

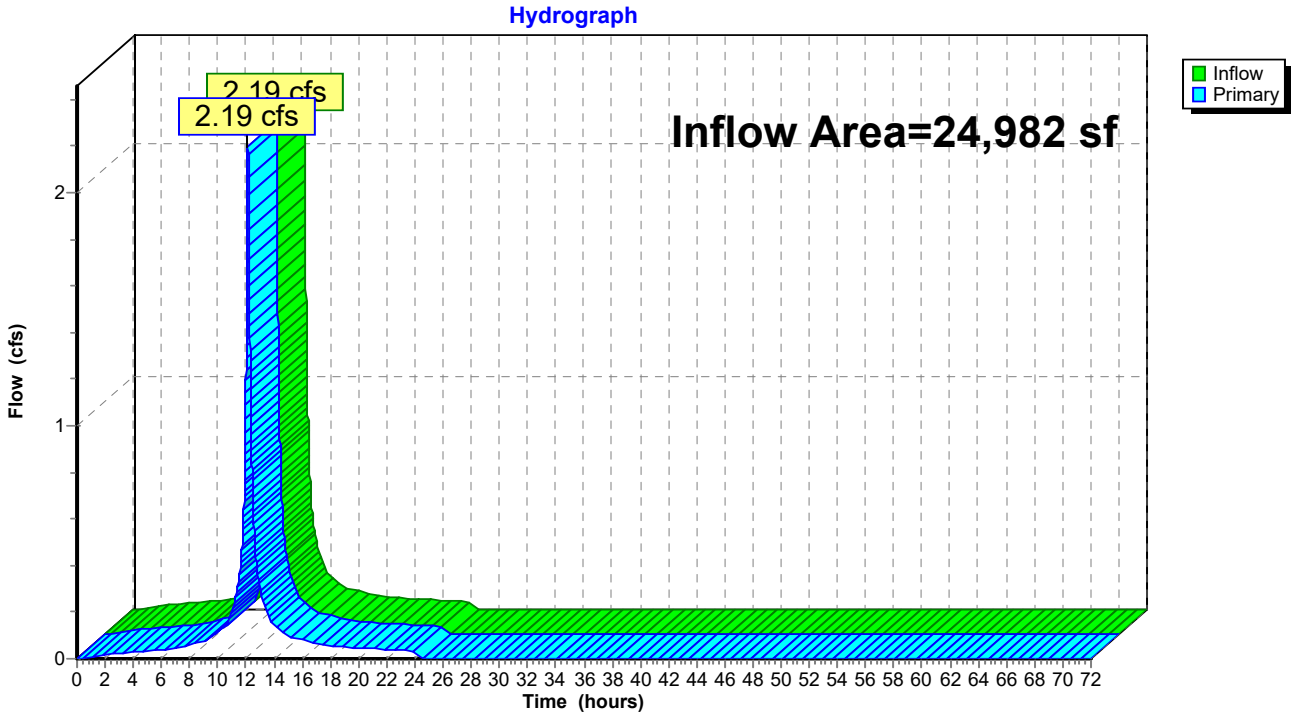


Summary for Link 12L: EX POA 4

Inflow Area = 24,982 sf, 79.74% Impervious, Inflow Depth = 4.61" for 10-Year event
Inflow = 2.19 cfs @ 12.14 hrs, Volume= 9,594 cf
Primary = 2.19 cfs @ 12.14 hrs, Volume= 9,594 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



Summary for Subcatchment 1S: PR. Area 1 Perv.

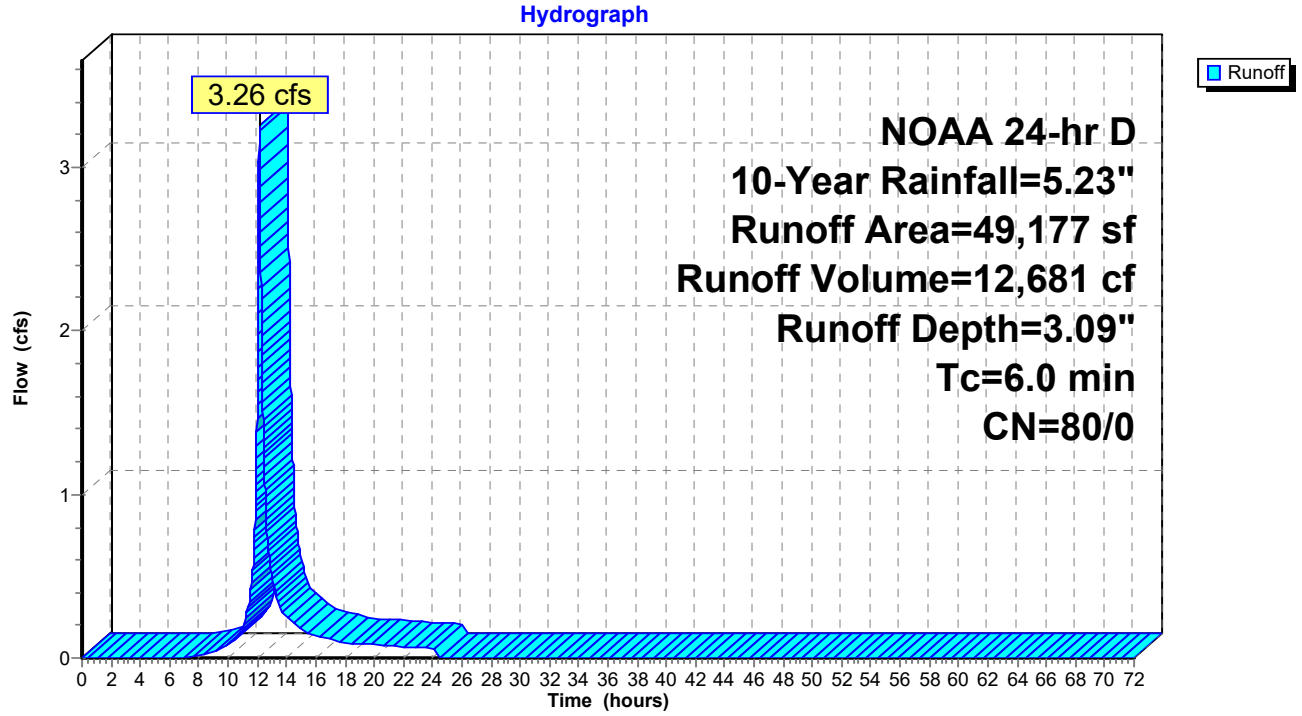
Runoff = 3.26 cfs @ 12.14 hrs, Volume= 12,681 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
49,177	80	>75% Grass cover, Good, HSG D
49,177	80	100.00% Pervious Area

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

Subcatchment 1S: PR. Area 1 Perv.



Summary for Subcatchment 2S: Pr. Area 1 Imp.

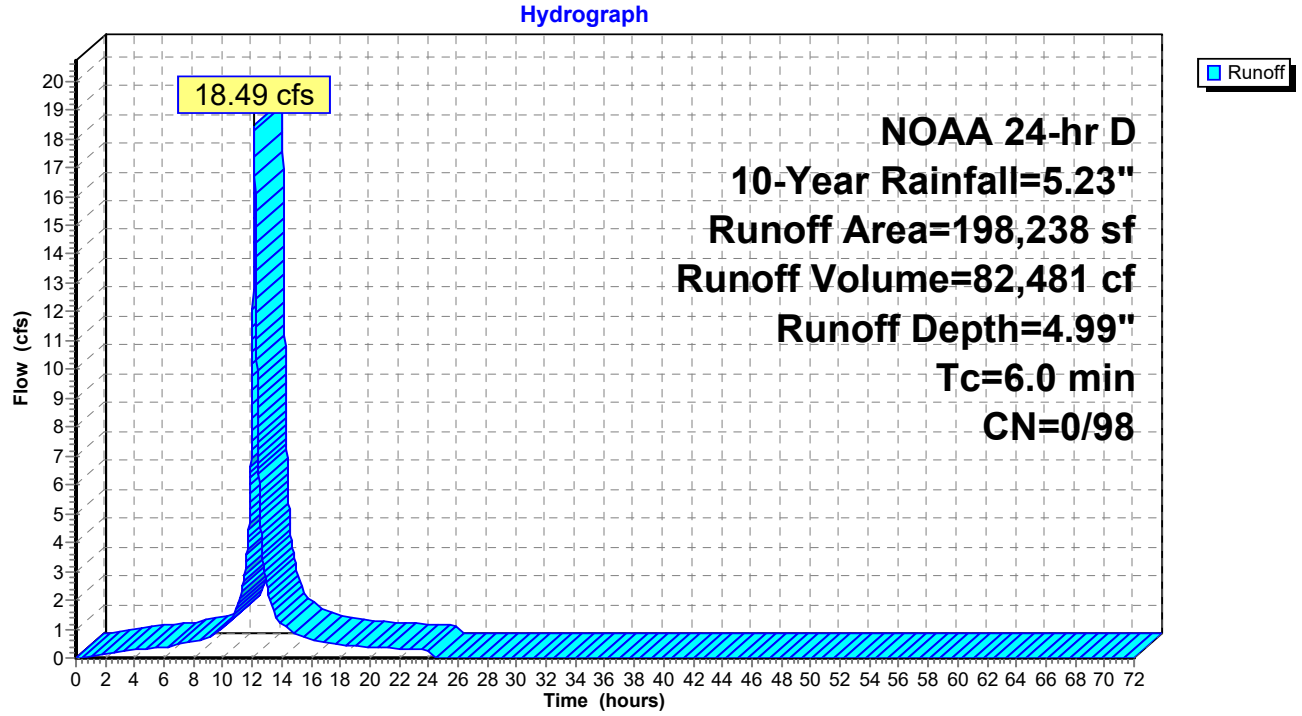
Runoff = 18.49 cfs @ 12.14 hrs, Volume= 82,481 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
198,238	98	Paved parking, HSG D
198,238	98	100.00% Impervious Area

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

Subcatchment 2S: Pr. Area 1 Imp.



Summary for Subcatchment 4S: Pr. Area 2 Perv.

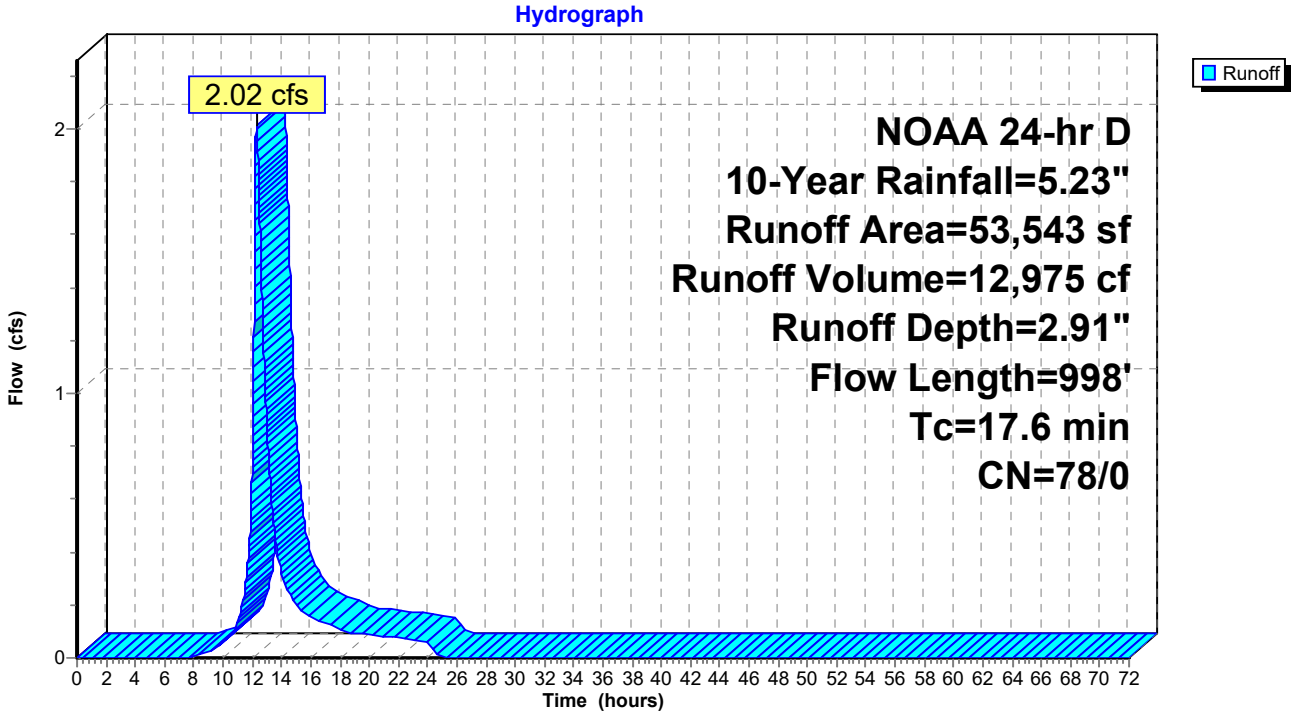
Runoff = 2.02 cfs @ 12.28 hrs, Volume= 12,975 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
42,271	77	Woods, Good, HSG D
11,272	80	>75% Grass cover, Good, HSG D
53,543	78	Weighted Average
53,543	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Pr. Area 2 Perv.



Summary for Subcatchment 5S: Pr. Area 2 Imp.

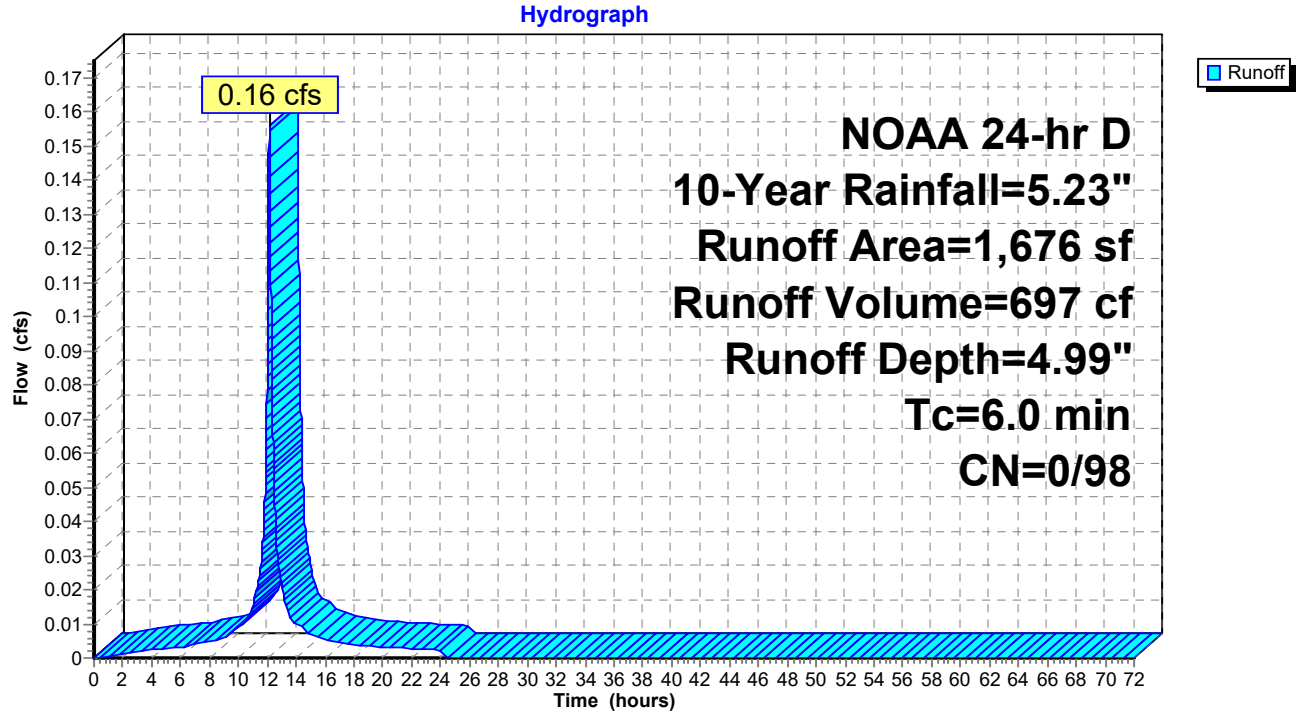
Runoff = 0.16 cfs @ 12.14 hrs, Volume= 697 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
1,676	98	Paved parking, HSG D
1,676	98	100.00% Impervious Area

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

Subcatchment 5S: Pr. Area 2 Imp.



Summary for Subcatchment 7S: Pr. Area 3 Perv.

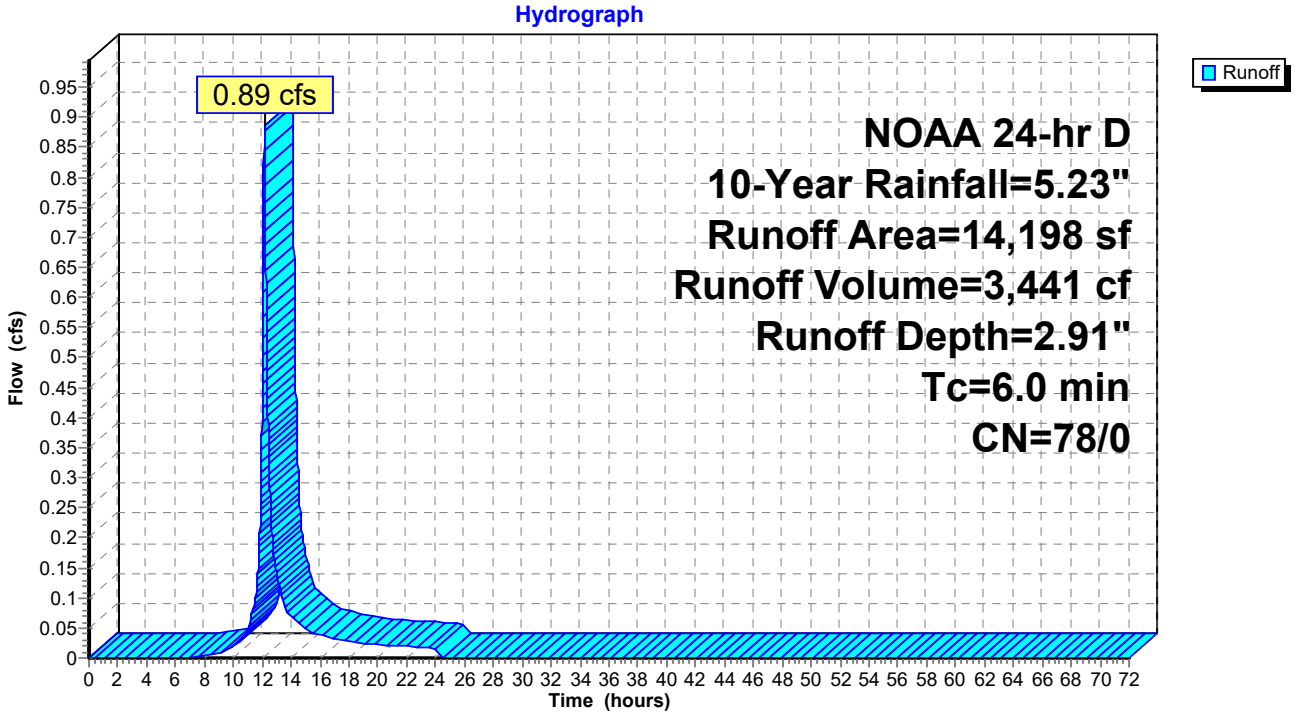
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 3,441 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
11,461	77	Woods, Good, HSG D
2,737	80	>75% Grass cover, Good, HSG D
14,198	78	Weighted Average
14,198	78	100.00% Pervious Area

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

Subcatchment 7S: Pr. Area 3 Perv.



Summary for Subcatchment 8S: Pr. Area 3 Imp.

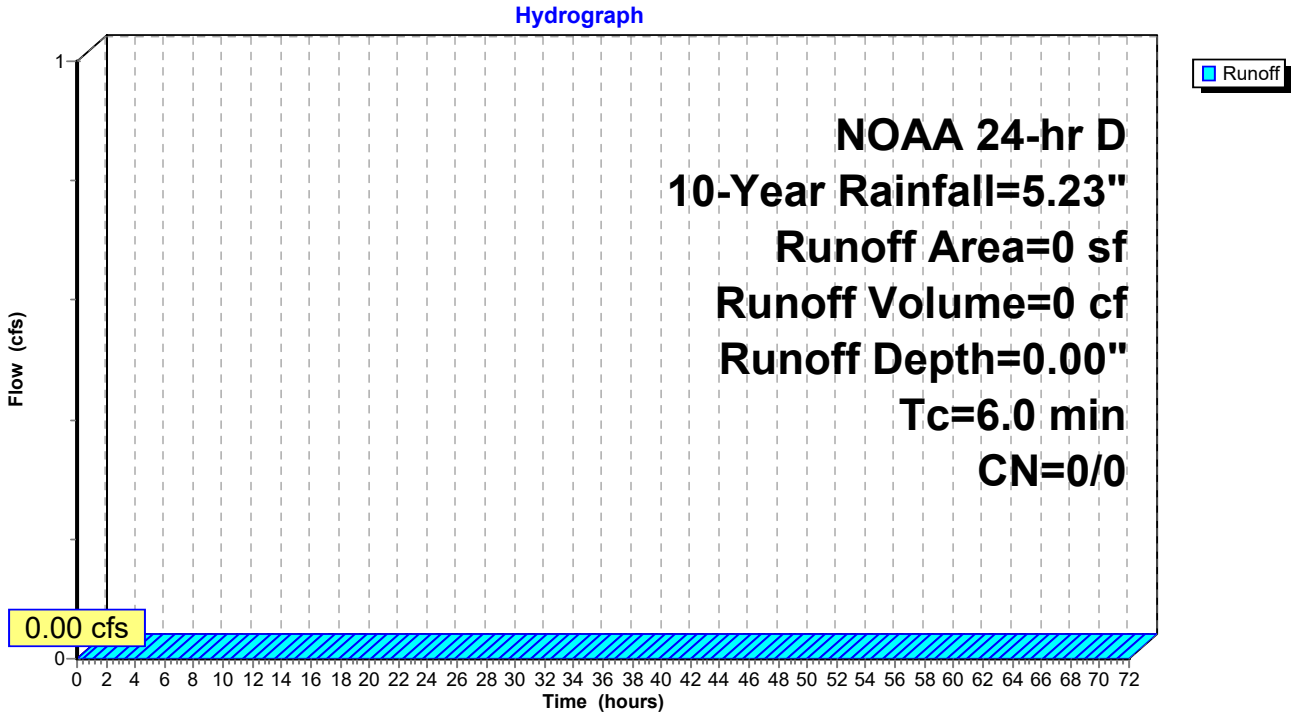
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
0	98	Paved parking, HSG D

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

Subcatchment 8S: Pr. Area 3 Imp.



Summary for Subcatchment 10S: Pr. Area 4 Perv.

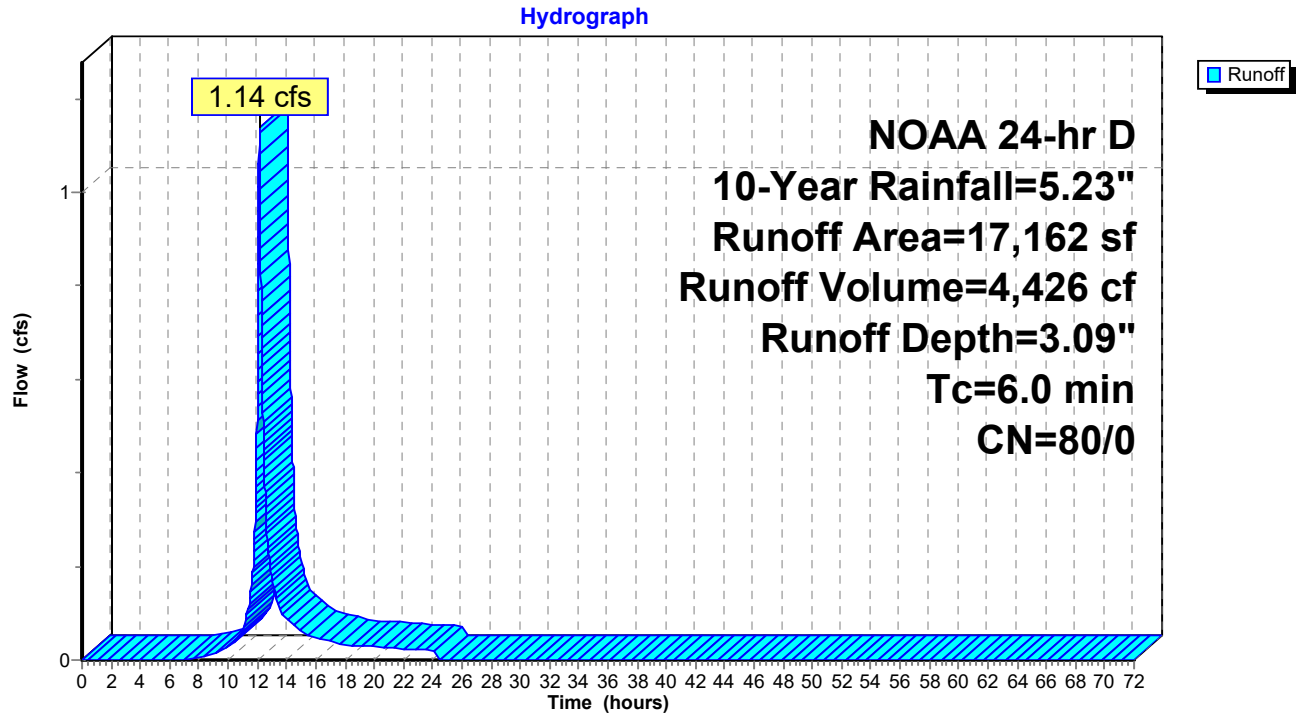
Runoff = 1.14 cfs @ 12.14 hrs, Volume= 4,426 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
0	77	Woods, Good, HSG D
17,162	80	>75% Grass cover, Good, HSG D
17,162	80	Weighted Average
17,162	80	100.00% Pervious Area

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

Subcatchment 10S: Pr. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

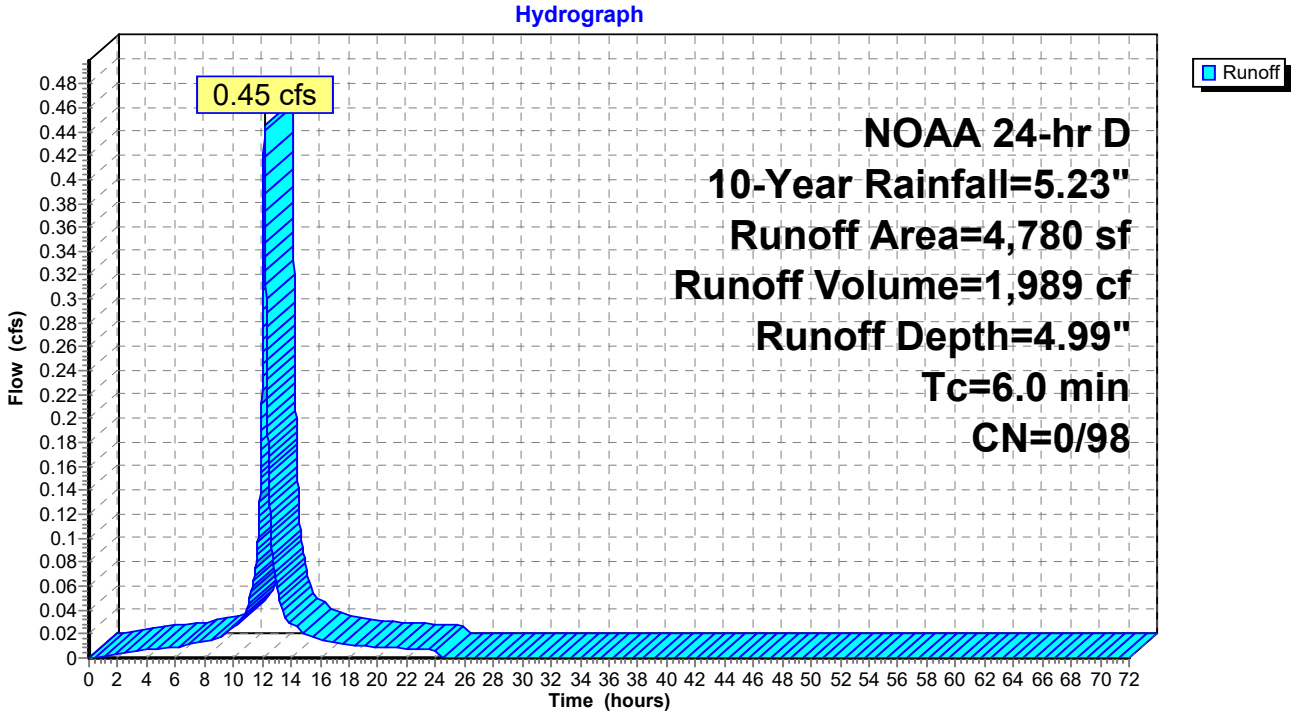
Runoff = 0.45 cfs @ 12.14 hrs, Volume= 1,989 cf, Depth= 4.99"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 10-Year Rainfall=5.23"

Area (sf)	CN	Description
4,780	98	Paved parking, HSG D
4,780	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 4.62" for 10-Year event
Inflow = 21.75 cfs @ 12.14 hrs, Volume= 95,162 cf
Outflow = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf, Atten= 69%, Lag= 21.0 min
Primary = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.96' @ 12.49 hrs Surf.Area= 25,205 sf Storage= 33,819 cf

Plug-Flow detention time= 129.1 min calculated for 95,007 cf (100% of inflow)
Center-of-Mass det. time= 128.5 min (891.3 - 762.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.82 cfs @ 12.49 hrs HW=20.96' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 6.82 cfs of 8.48 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 5.78 fps)
3=Broad-Crested Rectangular Weir (Weir Controls 3.67 cfs @ 2.00 fps)

Pond 13P: Underground Basin - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx 2016 (Contech® ChamberMaxx® capped at 47.2cf for air pocket)
Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf
Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Row Length Adjustment= +0.32' x 6.63 sf x 26 rows

51.4" Wide + 5.6" Spacing = 57.0" C-C Row Spacing

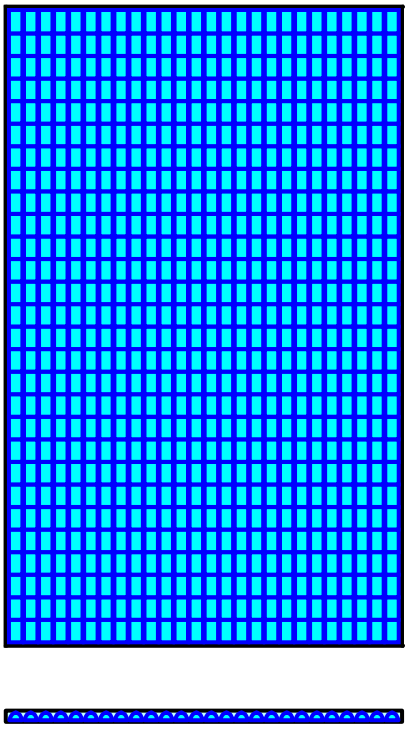
28 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 199.58' Row Length +12.0" End Stone x 2 = 201.58' Base Length
26 Rows x 51.4" Wide + 5.6" Spacing x 25 + 12.0" Side Stone x 2 = 125.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

728 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 26 Rows = 34,411.5 cf Chamber Storage
728 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 26 Rows = 35,916.2 cf Displacement

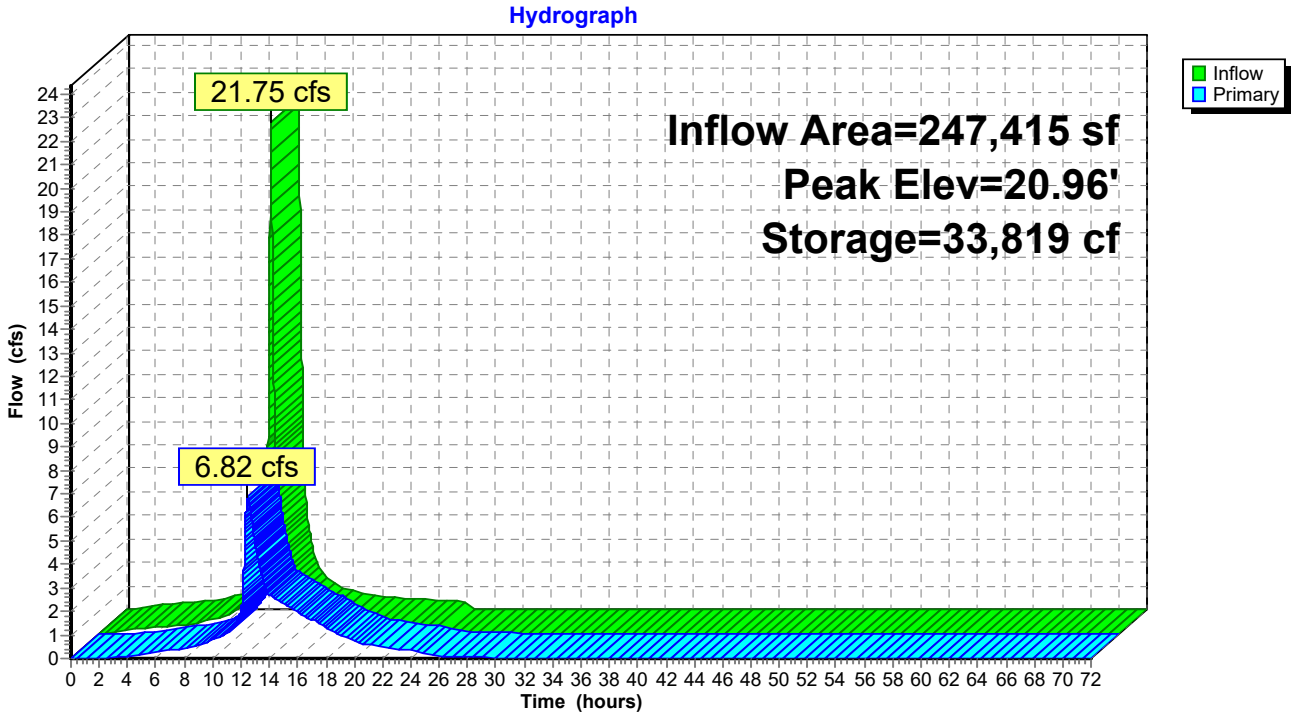
88,846.3 cf Field - 35,916.2 cf Chambers = 52,930.2 cf Stone x 40.0% Voids = 21,172.1 cf Stone Storage

Chamber Storage + Stone Storage = 55,583.6 cf = 1.276 af
Overall Storage Efficiency = 62.6%
Overall System Size = 201.58' x 125.03' x 3.52'

728 Chambers
3,290.6 cy Field
1,960.4 cy Stone



Pond 13P: Underground Basin

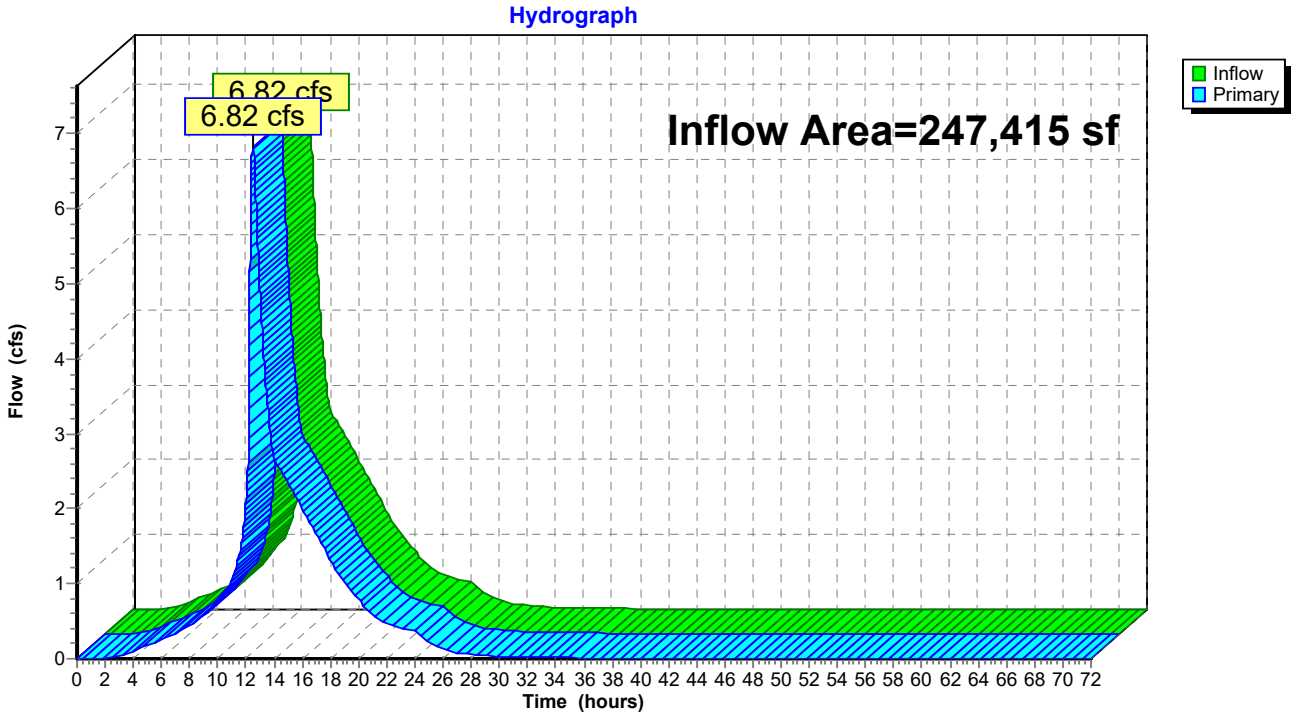


Summary for Link 3L: Pr. POA 1

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth > 4.61" for 10-Year event
Inflow = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf
Primary = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: Pr. POA 1

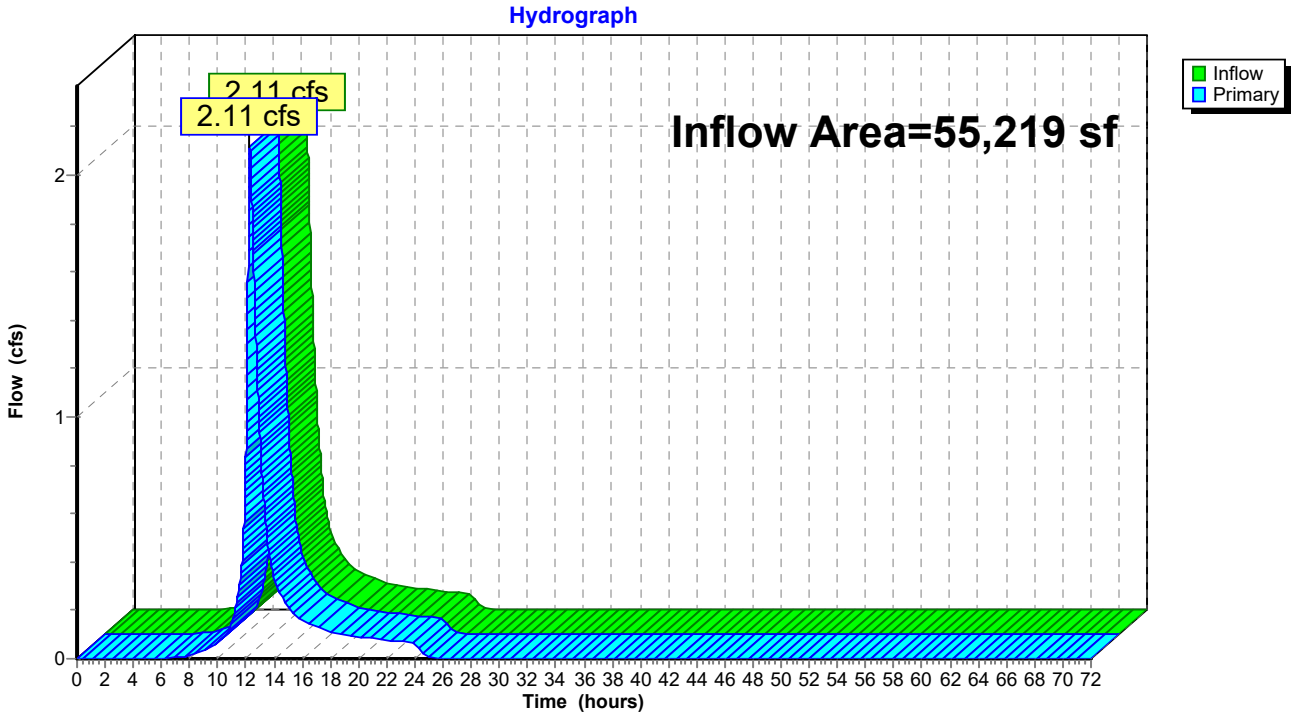


Summary for Link 6L: Pr. POA 2

Inflow Area = 55,219 sf, 3.04% Impervious, Inflow Depth = 2.97" for 10-Year event
Inflow = 2.11 cfs @ 12.28 hrs, Volume= 13,673 cf
Primary = 2.11 cfs @ 12.28 hrs, Volume= 13,673 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: Pr. POA 2

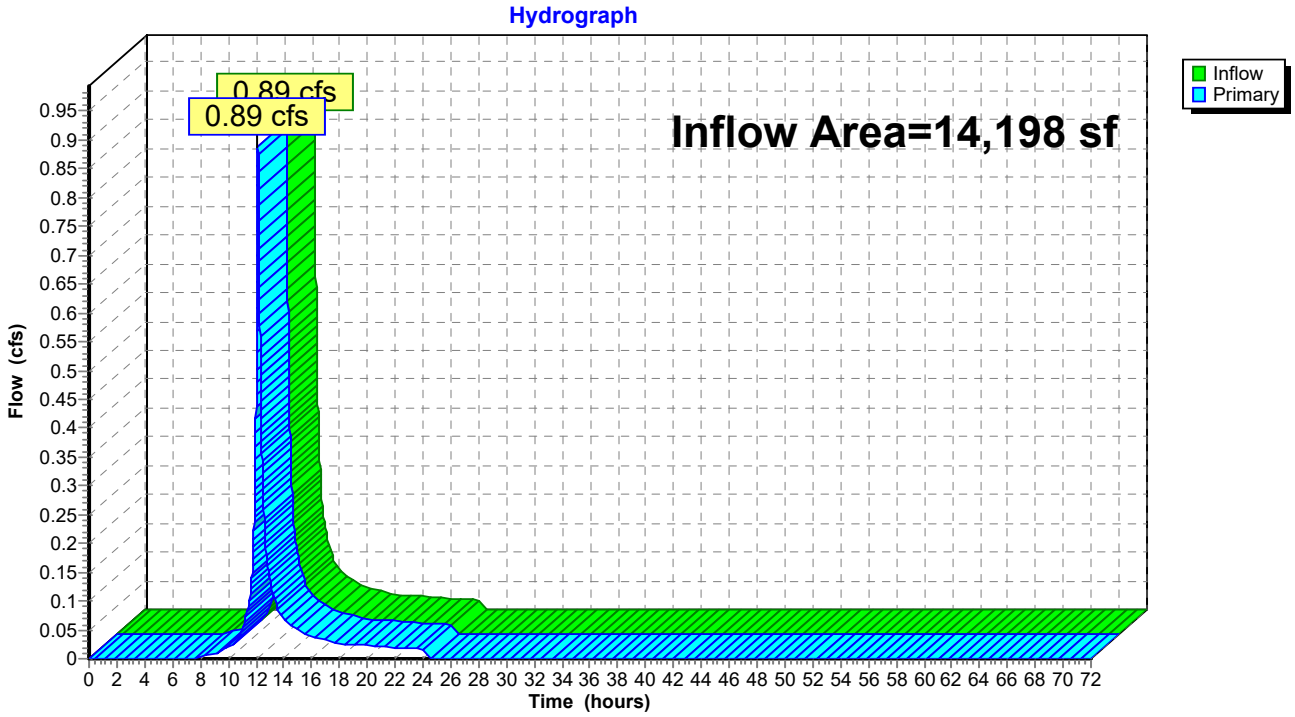


Summary for Link 9L: Pr POA 3

Inflow Area = 14,198 sf, 0.00% Impervious, Inflow Depth = 2.91" for 10-Year event
Inflow = 0.89 cfs @ 12.14 hrs, Volume= 3,441 cf
Primary = 0.89 cfs @ 12.14 hrs, Volume= 3,441 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: Pr POA 3

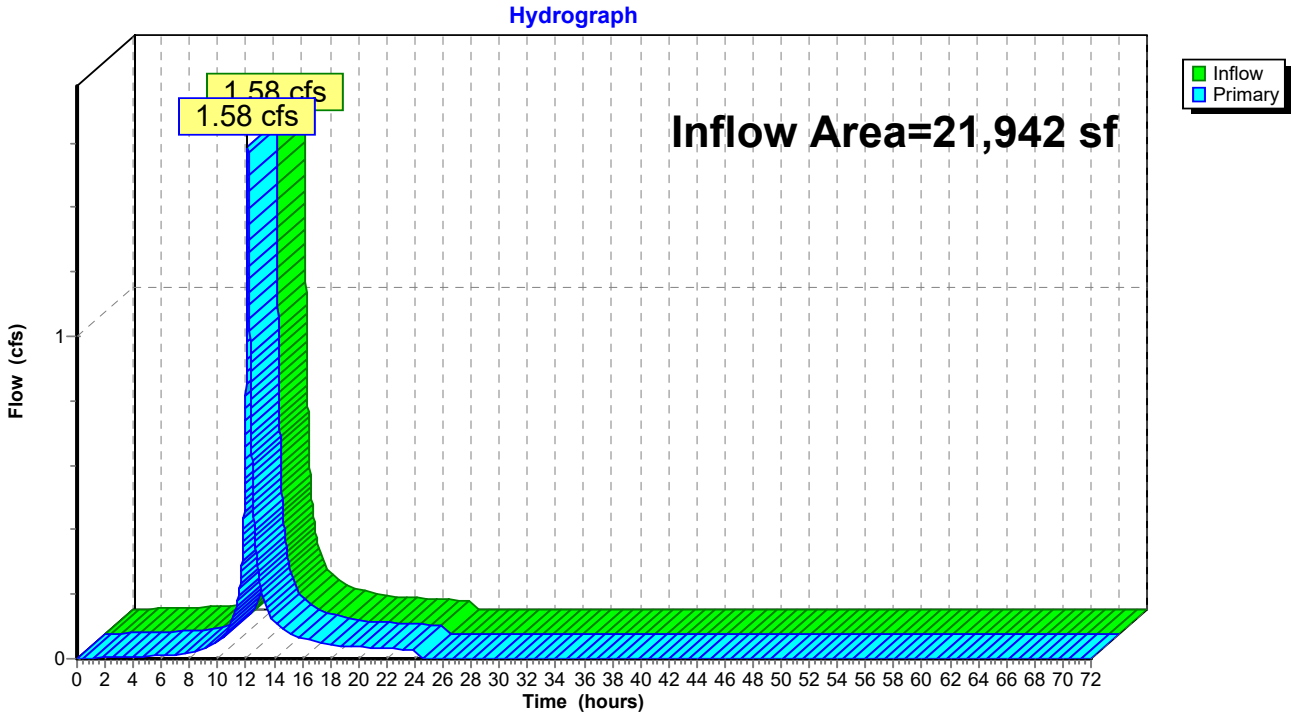


Summary for Link 12L: EX POA 4

Inflow Area = 21,942 sf, 21.78% Impervious, Inflow Depth = 3.51" for 10-Year event
Inflow = 1.58 cfs @ 12.14 hrs, Volume= 6,414 cf
Primary = 1.58 cfs @ 12.14 hrs, Volume= 6,414 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



APPENDIX C-3A
25-YEAR STORM EVENT HYDROGRAPHS

Summary for Subcatchment 1S: Ex. Area 1 Perv.

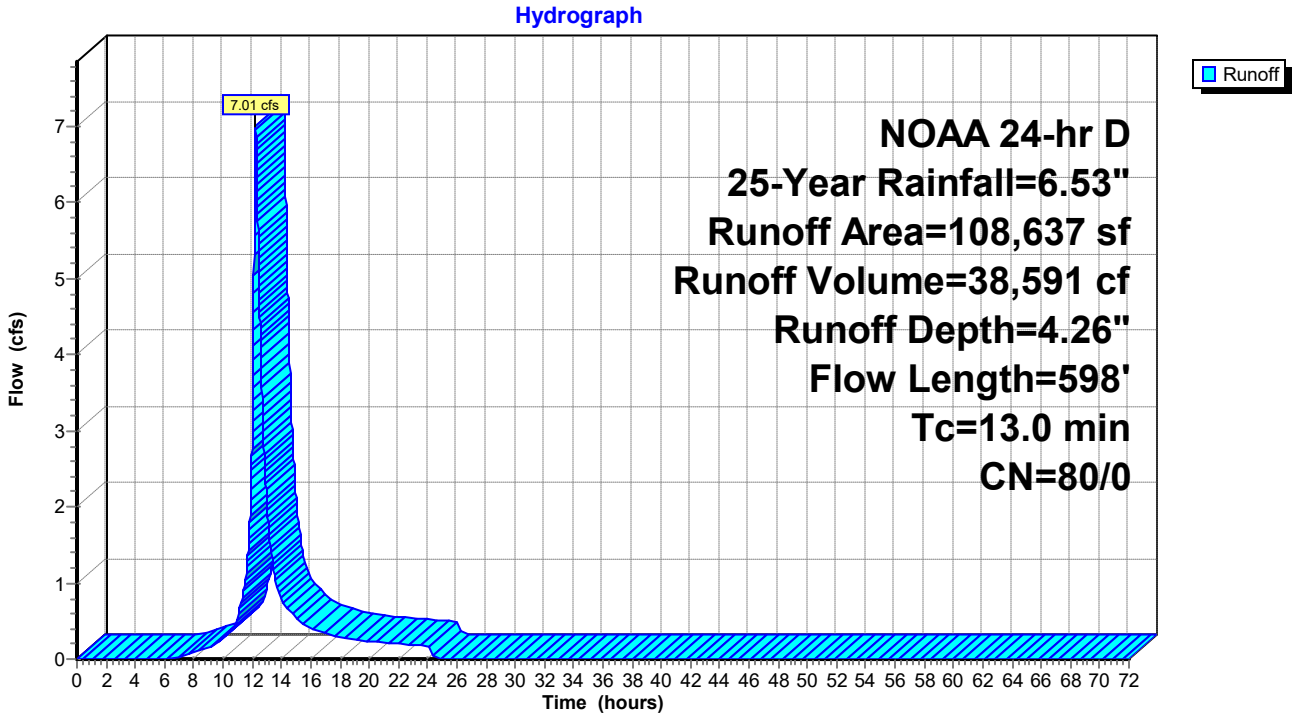
Runoff = 7.01 cfs @ 12.22 hrs, Volume= 38,591 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
108,637	80	>75% Grass cover, Good, HSG D
108,637	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0600	0.19		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
0.5	75	0.0270	2.65		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.5	423		2.00		**Direct Entry, Channel Flow**
13.0	598	Total			

Subcatchment 1S: Ex. Area 1 Perv.



Summary for Subcatchment 2S: Ex. Area 1 Imp.

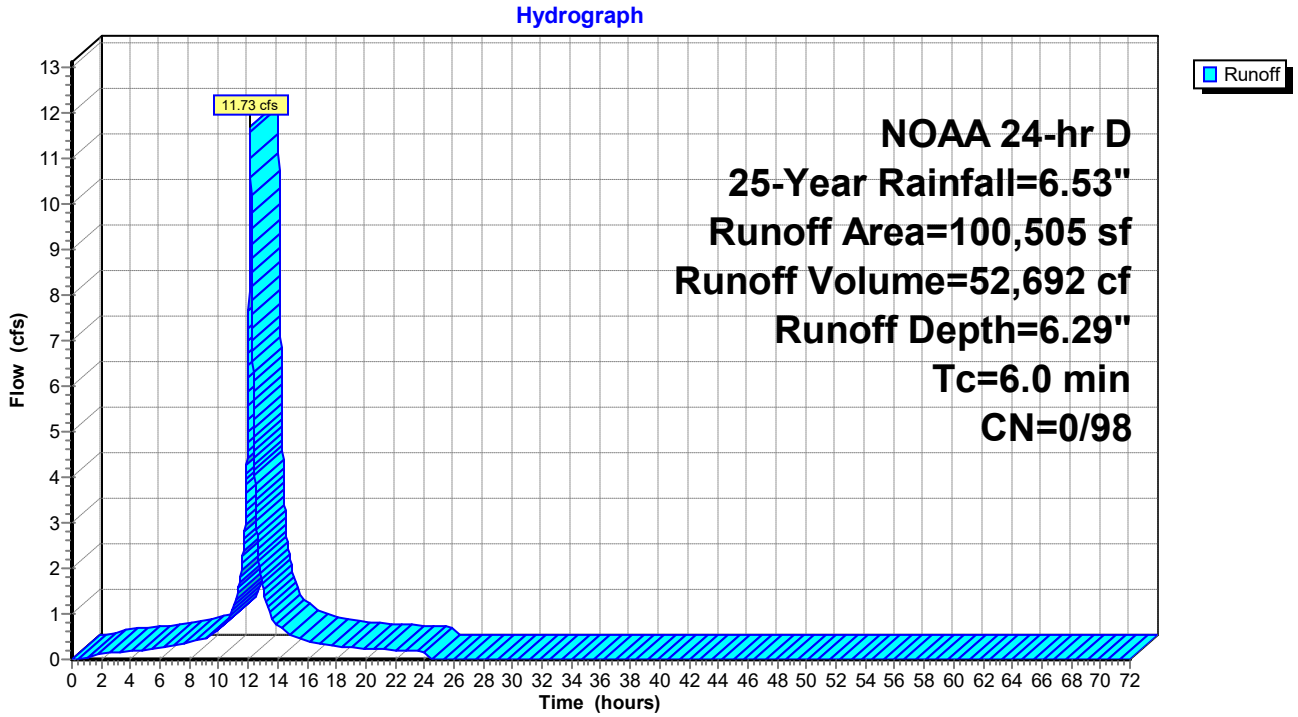
Runoff = 11.73 cfs @ 12.14 hrs, Volume= 52,692 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
100,505	98	Paved parking, HSG D
100,505	98	100.00% Impervious Area

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

Subcatchment 2S: Ex. Area 1 Imp.



Summary for Subcatchment 4S: Ex. Area 2 Perv.

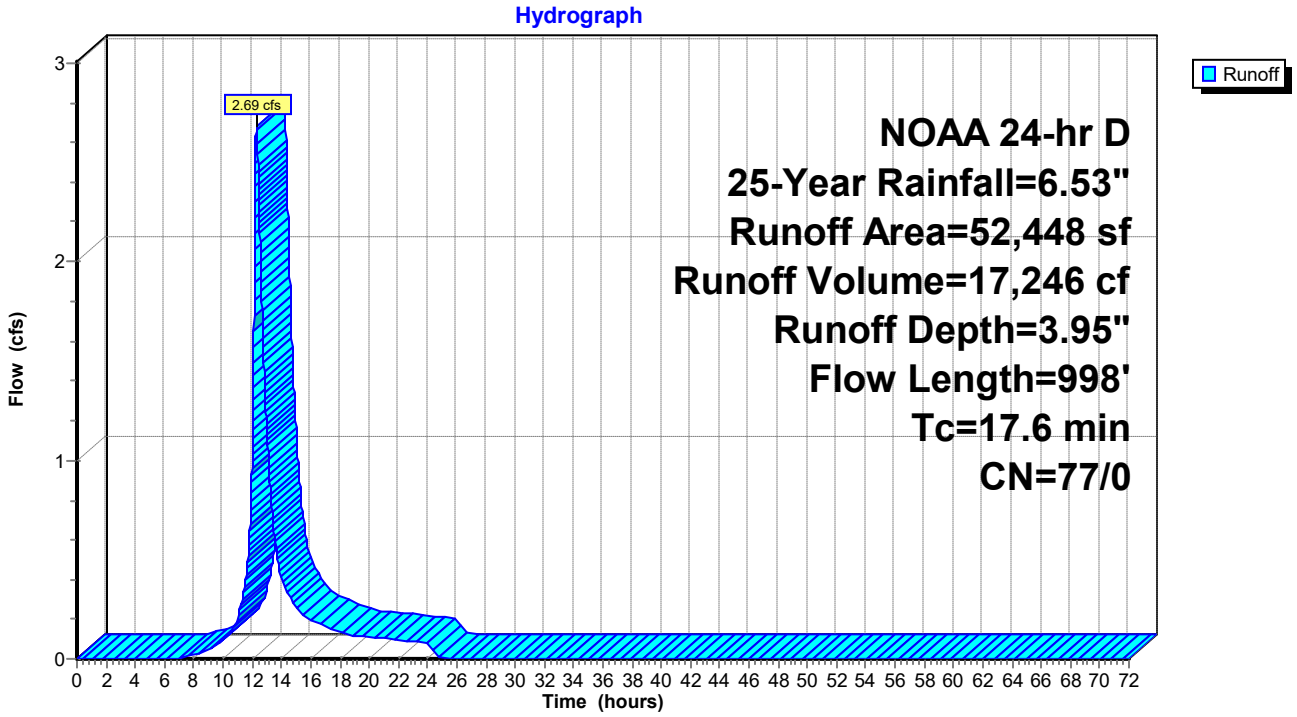
Runoff = 2.69 cfs @ 12.28 hrs, Volume= 17,246 cf, Depth= 3.95"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
50,644	77	Woods, Good, HSG D
1,804	80	>75% Grass cover, Good, HSG D
52,448	77	Weighted Average
52,448	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Ex. Area 2 Perv.



Summary for Subcatchment 5S: Ex. Area 2 Imp.

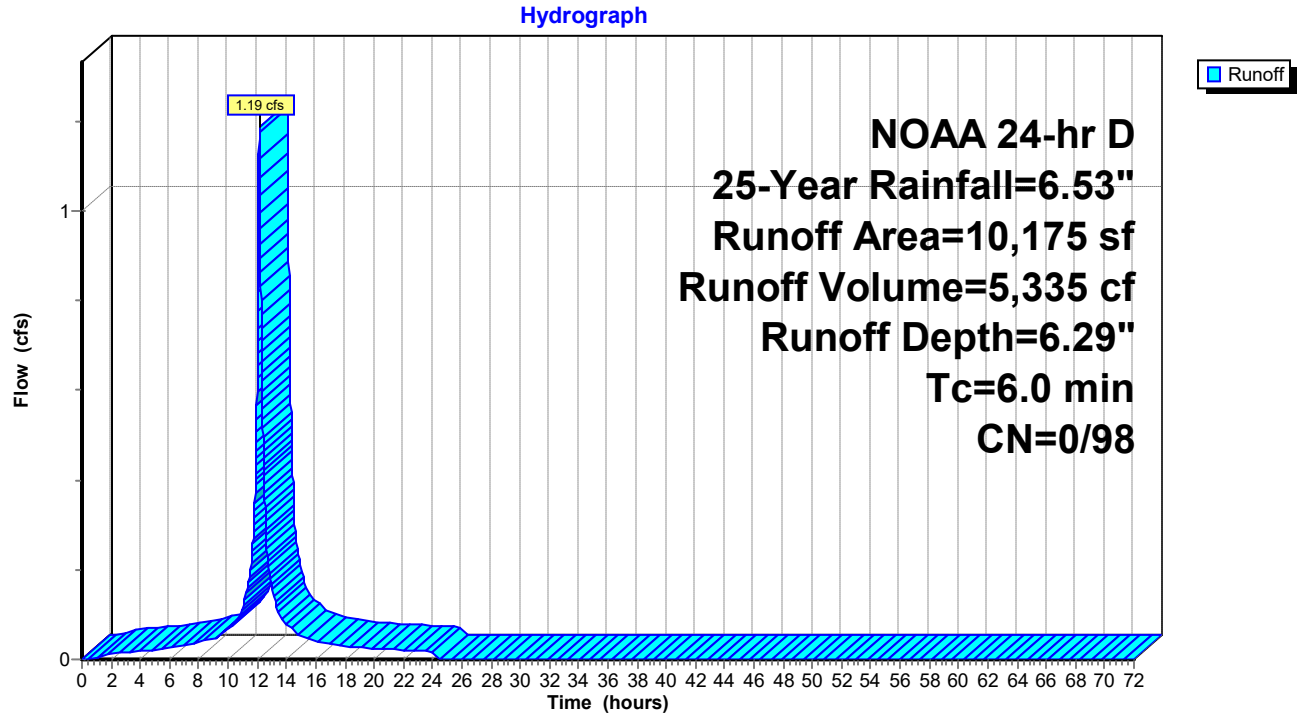
Runoff = 1.19 cfs @ 12.14 hrs, Volume= 5,335 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
10,175	98	Paved parking, HSG D
10,175	98	100.00% Impervious Area

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

Subcatchment 5S: Ex. Area 2 Imp.



Summary for Subcatchment 7S: Ex. Area 3 Perv.

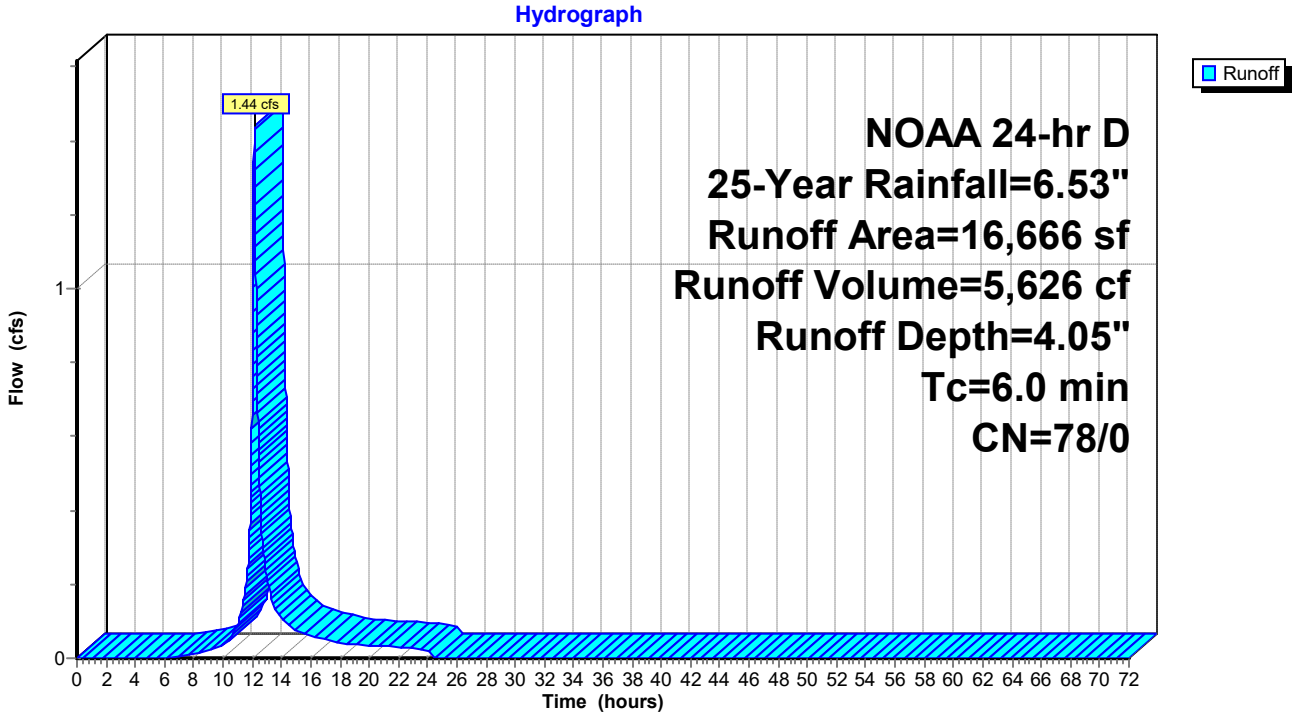
Runoff = 1.44 cfs @ 12.14 hrs, Volume= 5,626 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
11,841	77	Woods, Good, HSG D
4,825	80	>75% Grass cover, Good, HSG D
16,666	78	Weighted Average
16,666	78	100.00% Pervious Area

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

Subcatchment 7S: Ex. Area 3 Perv.



Summary for Subcatchment 8S: Ex. Area 3 Imp.

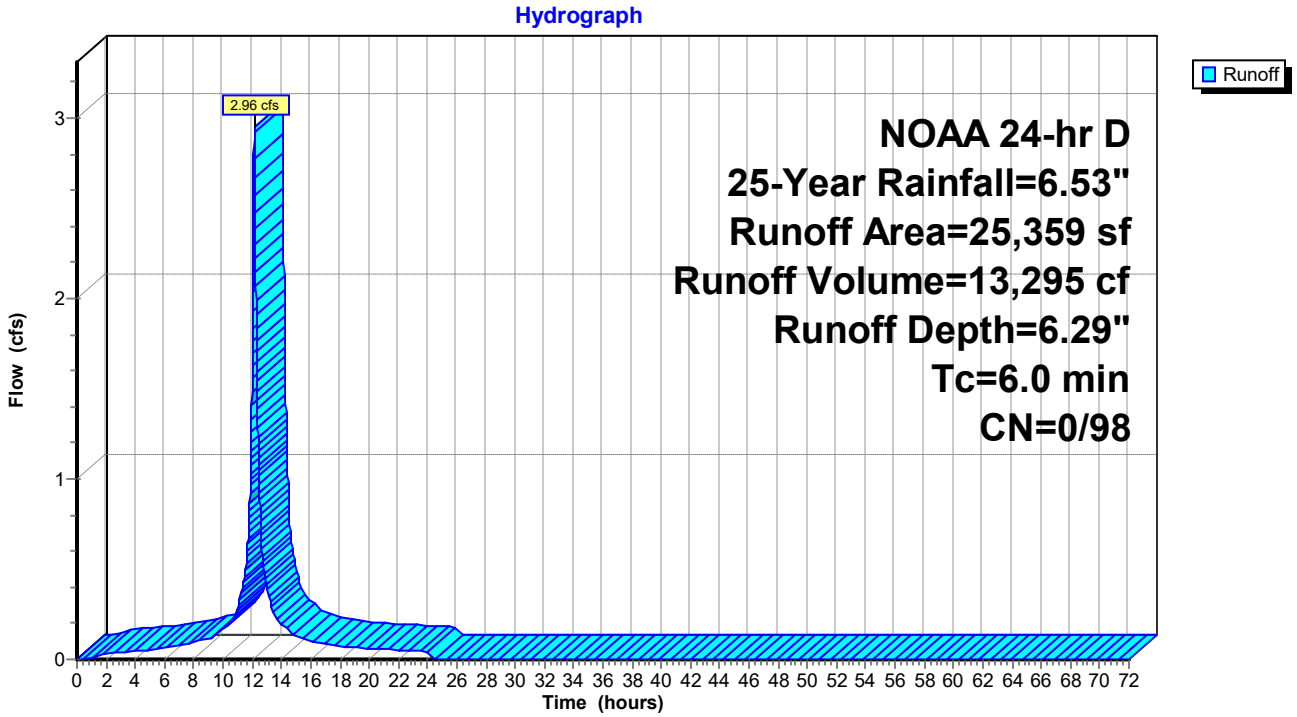
Runoff = 2.96 cfs @ 12.14 hrs, Volume= 13,295 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
25,359	98	Paved parking, HSG D
25,359	98	100.00% Impervious Area

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

Subcatchment 8S: Ex. Area 3 Imp.



Summary for Subcatchment 10S: Ex. Area 4 Perv.

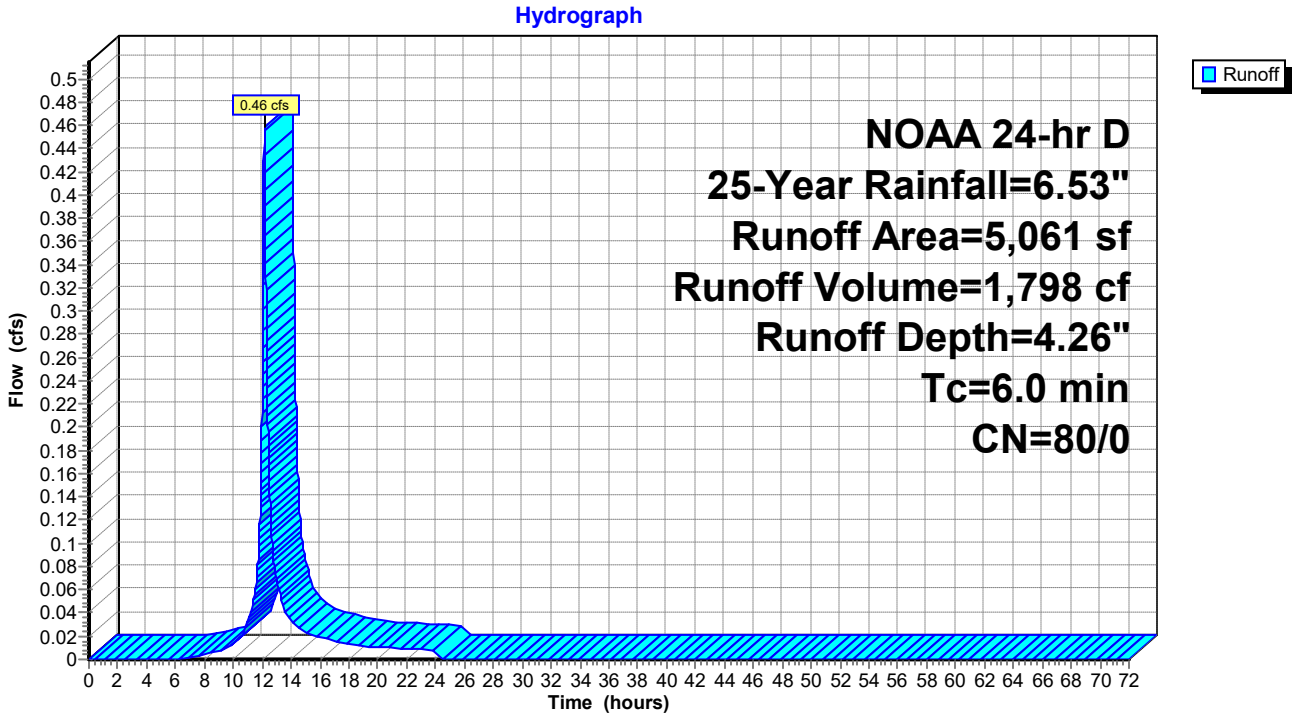
Runoff = 0.46 cfs @ 12.14 hrs, Volume= 1,798 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
5,061	80	>75% Grass cover, Good, HSG D
5,061	80	100.00% Pervious Area

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

Subcatchment 10S: Ex. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

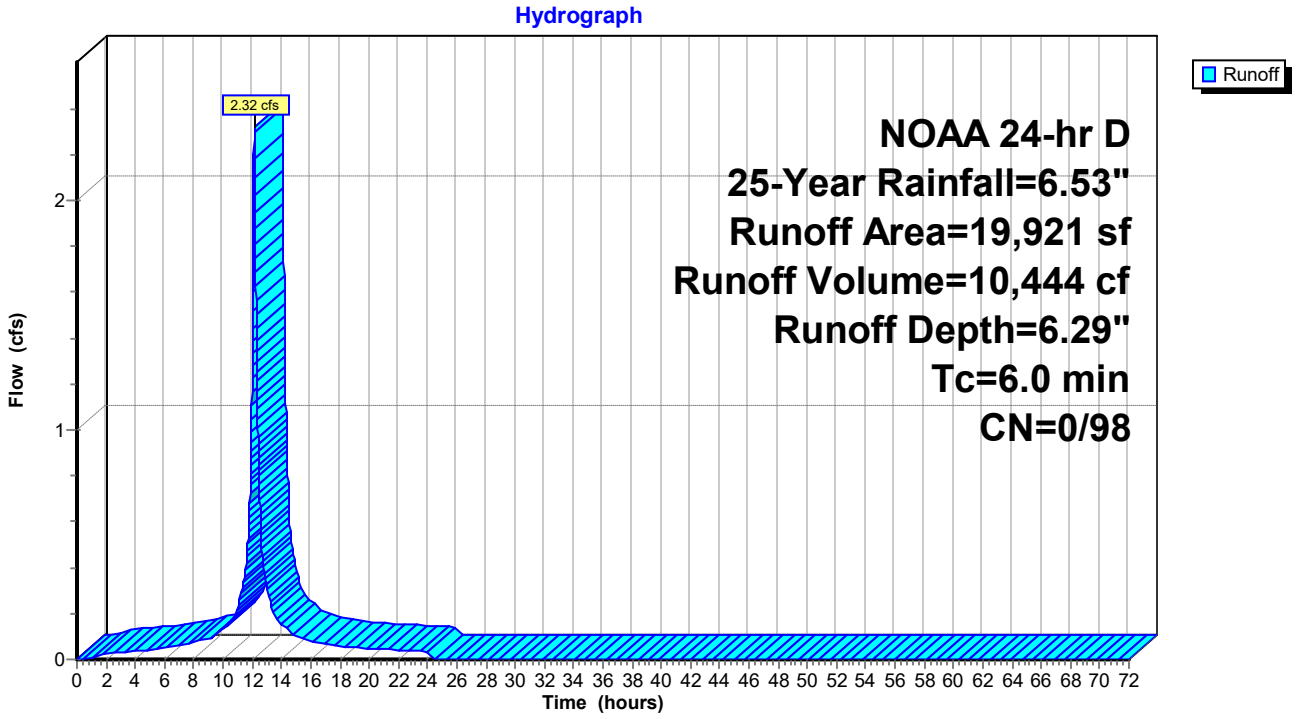
Runoff = 2.32 cfs @ 12.14 hrs, Volume= 10,444 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
19,921	98	Paved parking, HSG D
19,921	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.

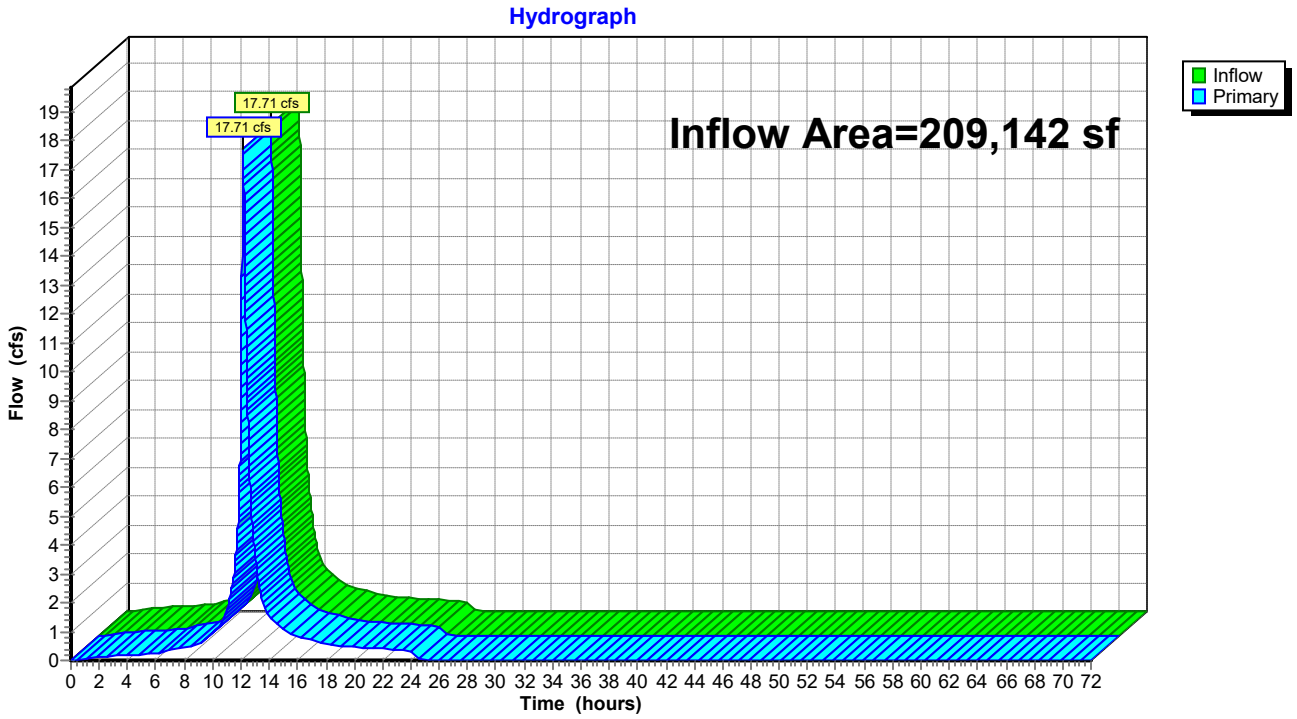


Summary for Link 3L: EX POA 1

Inflow Area = 209,142 sf, 48.06% Impervious, Inflow Depth = 5.24" for 25-Year event
Inflow = 17.71 cfs @ 12.15 hrs, Volume= 91,283 cf
Primary = 17.71 cfs @ 12.15 hrs, Volume= 91,283 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: EX POA 1

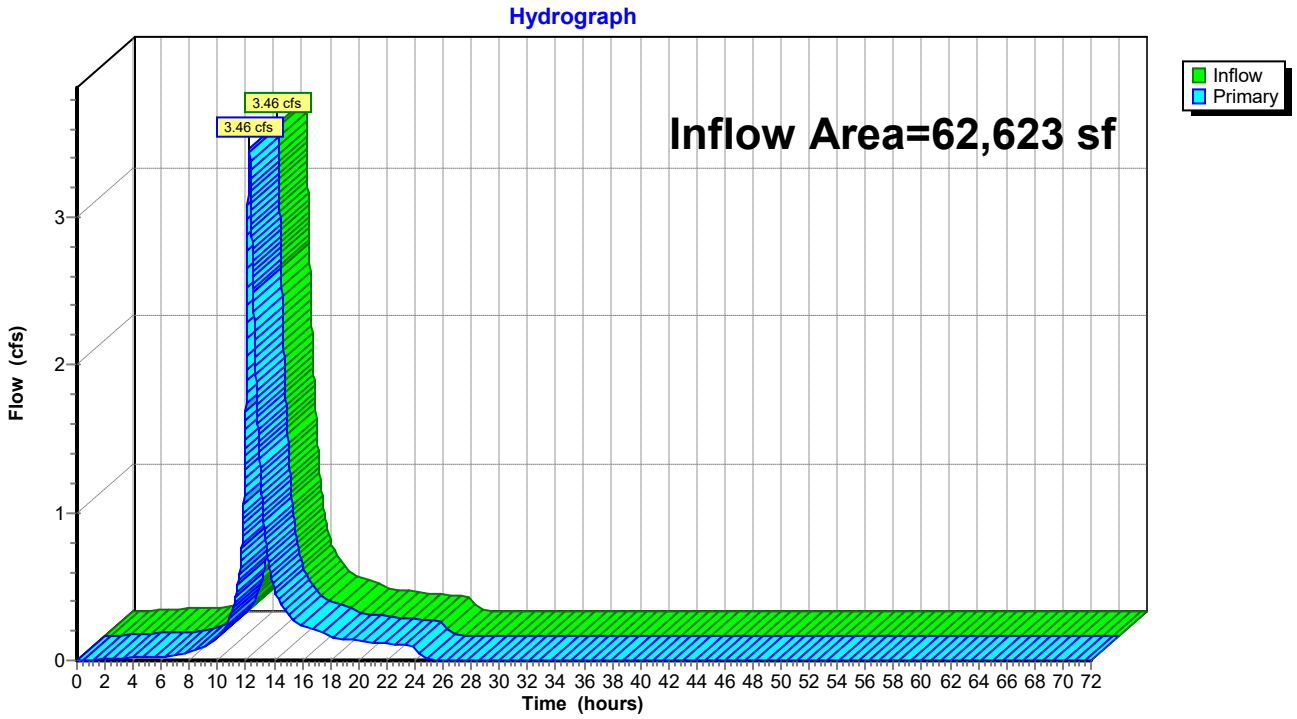


Summary for Link 6L: EX POA 2

Inflow Area = 62,623 sf, 16.25% Impervious, Inflow Depth = 4.33" for 25-Year event
Inflow = 3.46 cfs @ 12.24 hrs, Volume= 22,581 cf
Primary = 3.46 cfs @ 12.24 hrs, Volume= 22,581 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: EX POA 2

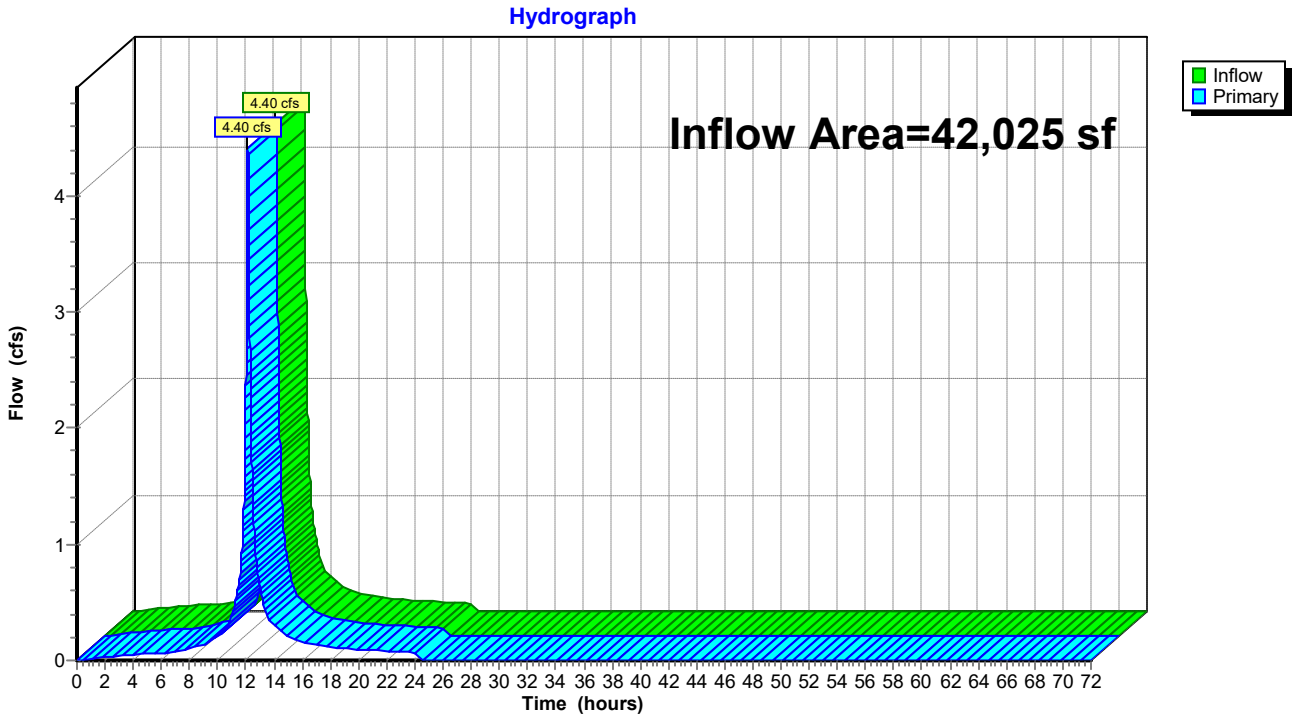


Summary for Link 9L: EX POA 3

Inflow Area = 42,025 sf, 60.34% Impervious, Inflow Depth = 5.40" for 25-Year event
Inflow = 4.40 cfs @ 12.14 hrs, Volume= 18,921 cf
Primary = 4.40 cfs @ 12.14 hrs, Volume= 18,921 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: EX POA 3

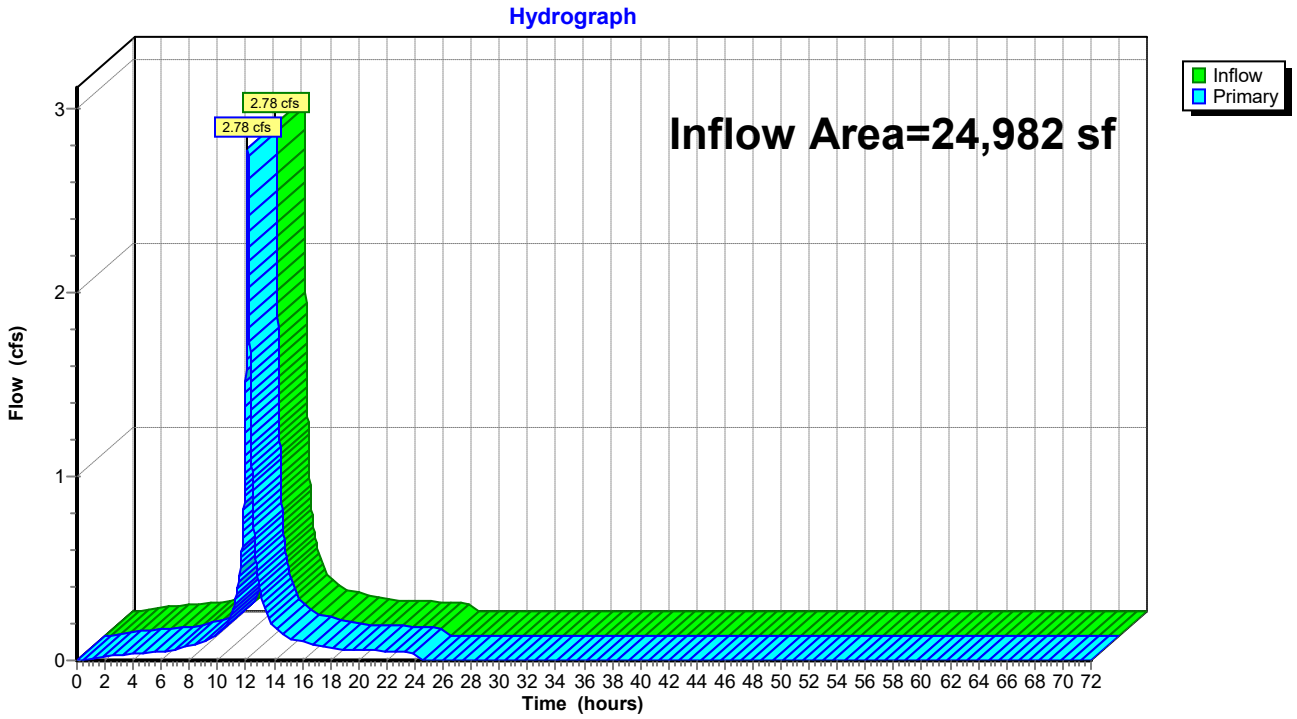


Summary for Link 12L: EX POA 4

Inflow Area = 24,982 sf, 79.74% Impervious, Inflow Depth = 5.88" for 25-Year event
Inflow = 2.78 cfs @ 12.14 hrs, Volume= 12,242 cf
Primary = 2.78 cfs @ 12.14 hrs, Volume= 12,242 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



Summary for Subcatchment 1S: PR. Area 1 Perv.

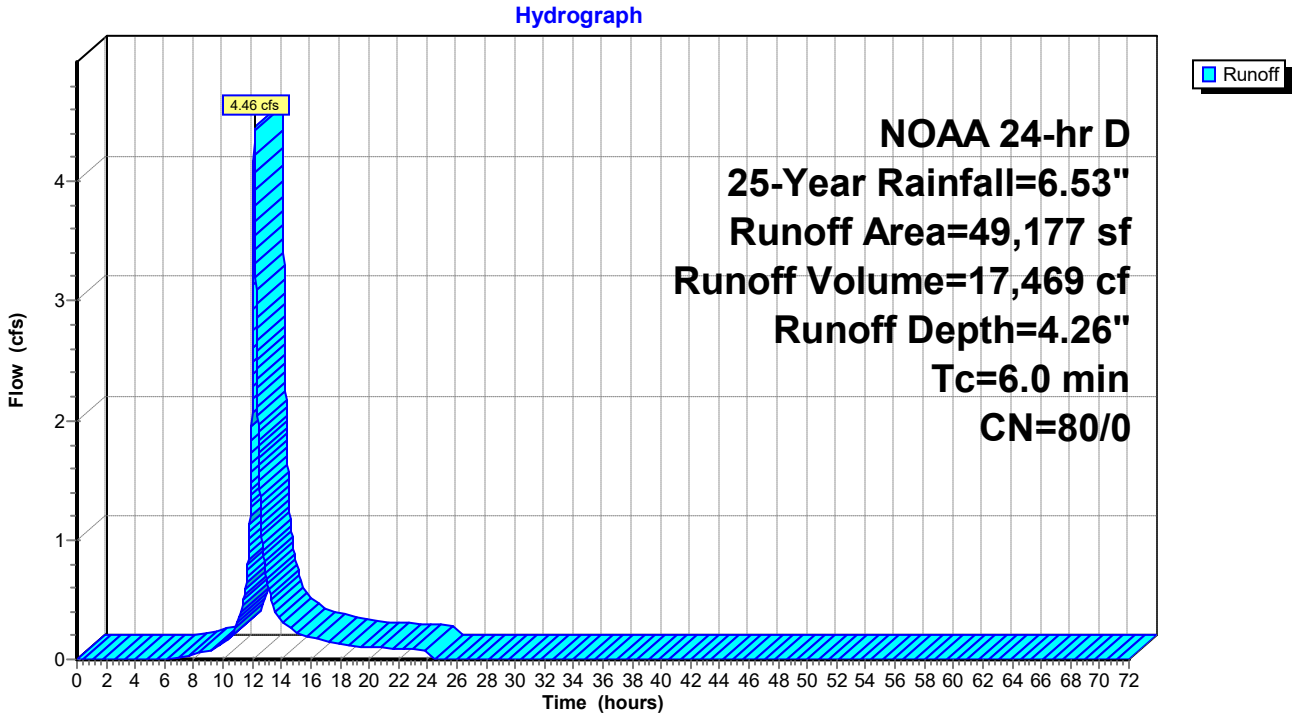
Runoff = 4.46 cfs @ 12.14 hrs, Volume= 17,469 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
49,177	80	>75% Grass cover, Good, HSG D
49,177	80	100.00% Pervious Area

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

Subcatchment 1S: PR. Area 1 Perv.



Summary for Subcatchment 2S: Pr. Area 1 Imp.

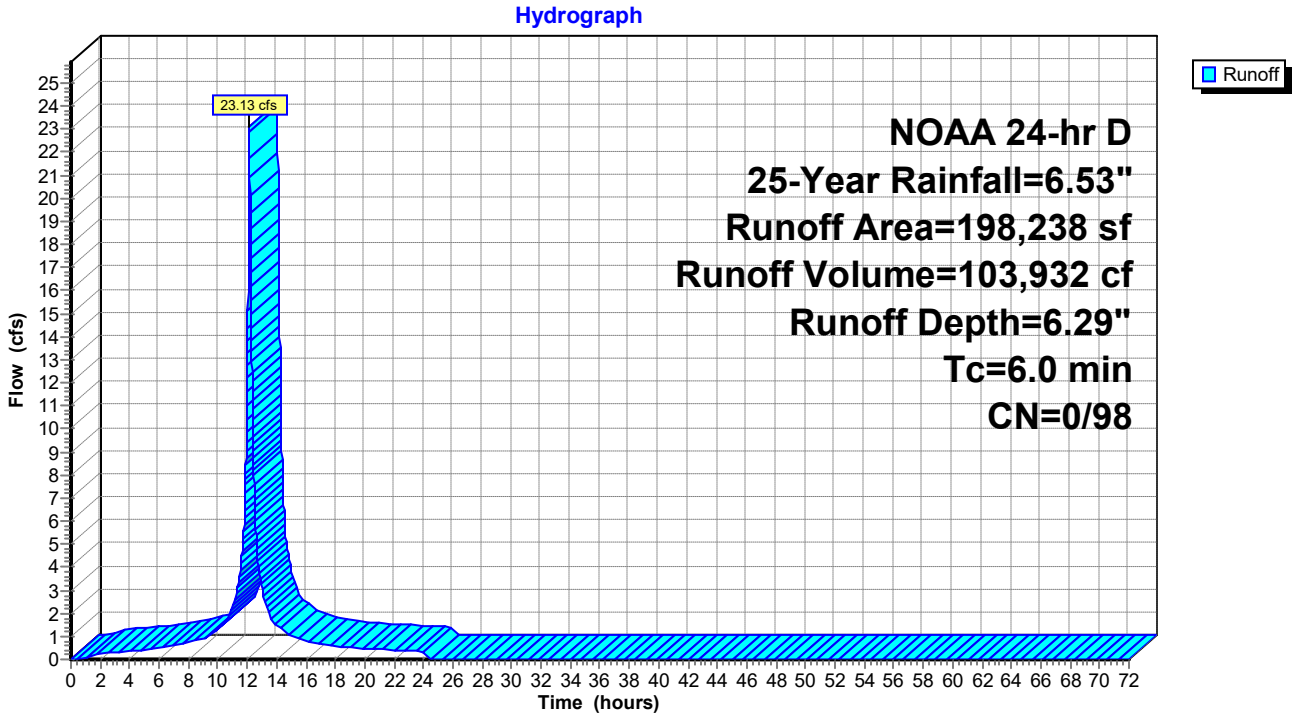
Runoff = 23.13 cfs @ 12.14 hrs, Volume= 103,932 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
198,238	98	Paved parking, HSG D
198,238	98	100.00% Impervious Area

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

Subcatchment 2S: Pr. Area 1 Imp.



Summary for Subcatchment 4S: Pr. Area 2 Perv.

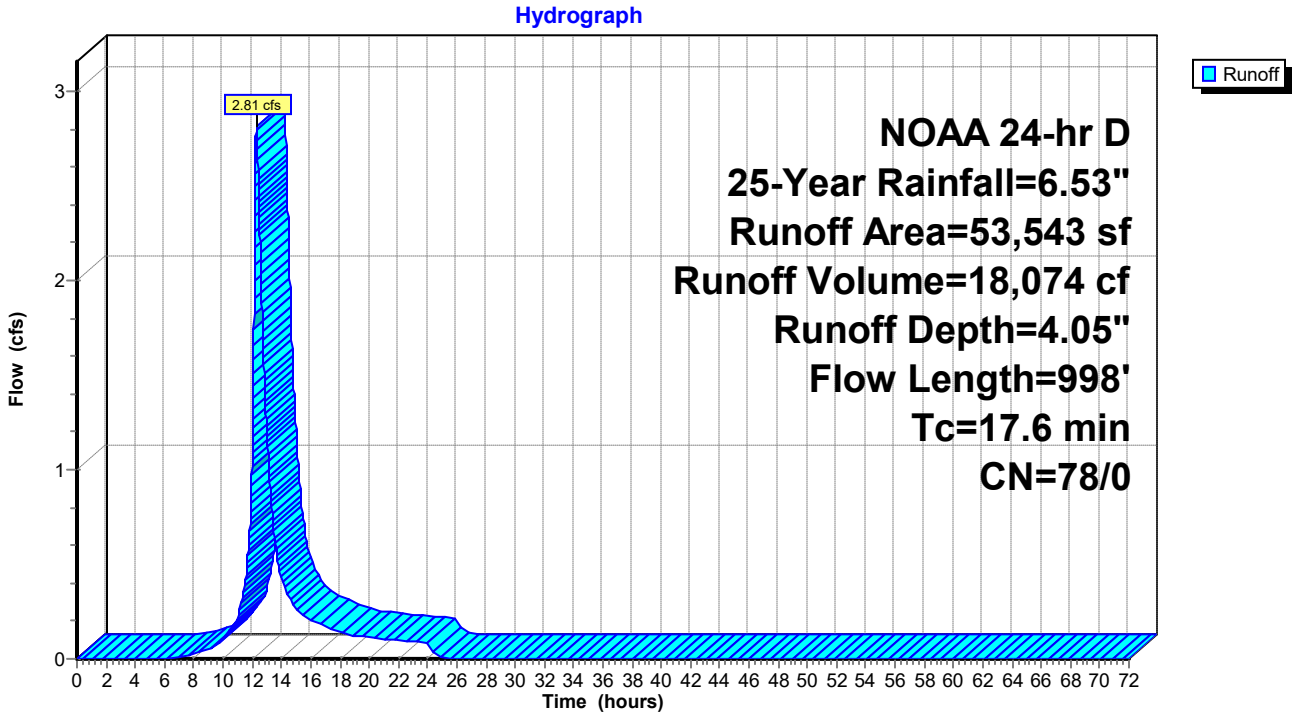
Runoff = 2.81 cfs @ 12.28 hrs, Volume= 18,074 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
42,271	77	Woods, Good, HSG D
11,272	80	>75% Grass cover, Good, HSG D
53,543	78	Weighted Average
53,543	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Pr. Area 2 Perv.



Summary for Subcatchment 5S: Pr. Area 2 Imp.

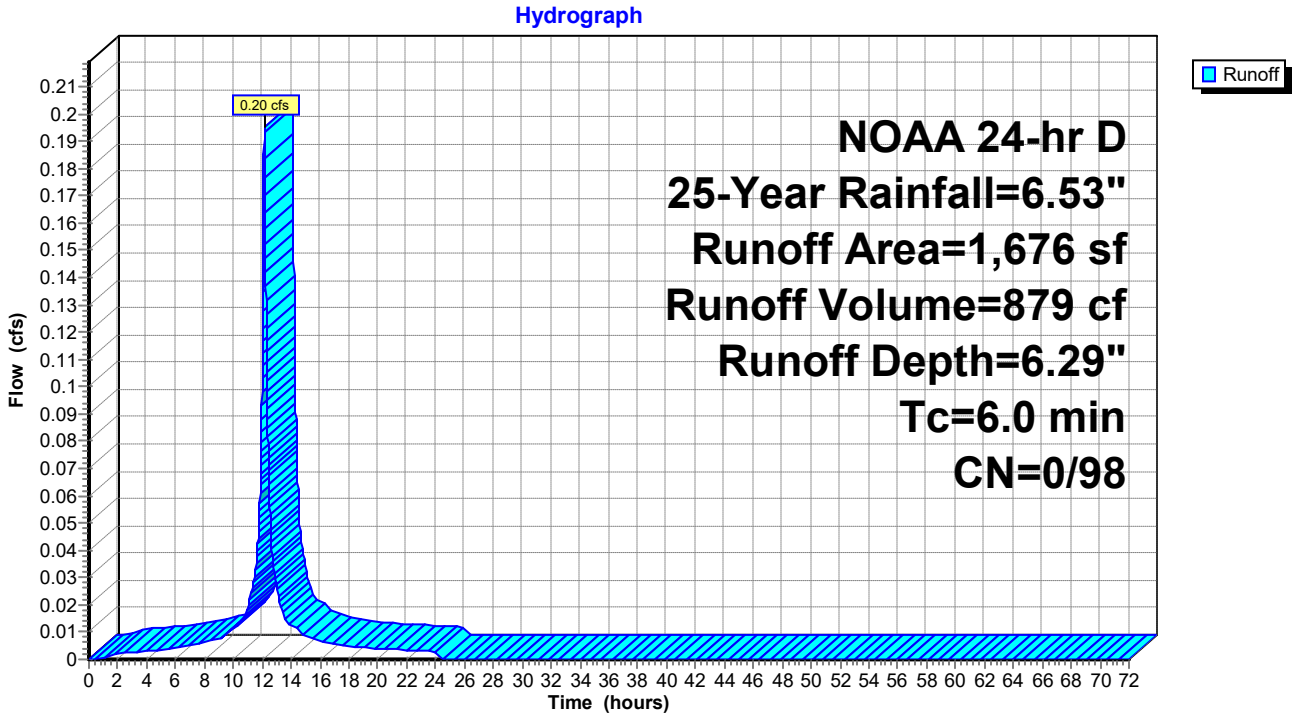
Runoff = 0.20 cfs @ 12.14 hrs, Volume= 879 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
1,676	98	Paved parking, HSG D
1,676	98	100.00% Impervious Area

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

Subcatchment 5S: Pr. Area 2 Imp.



Summary for Subcatchment 7S: Pr. Area 3 Perv.

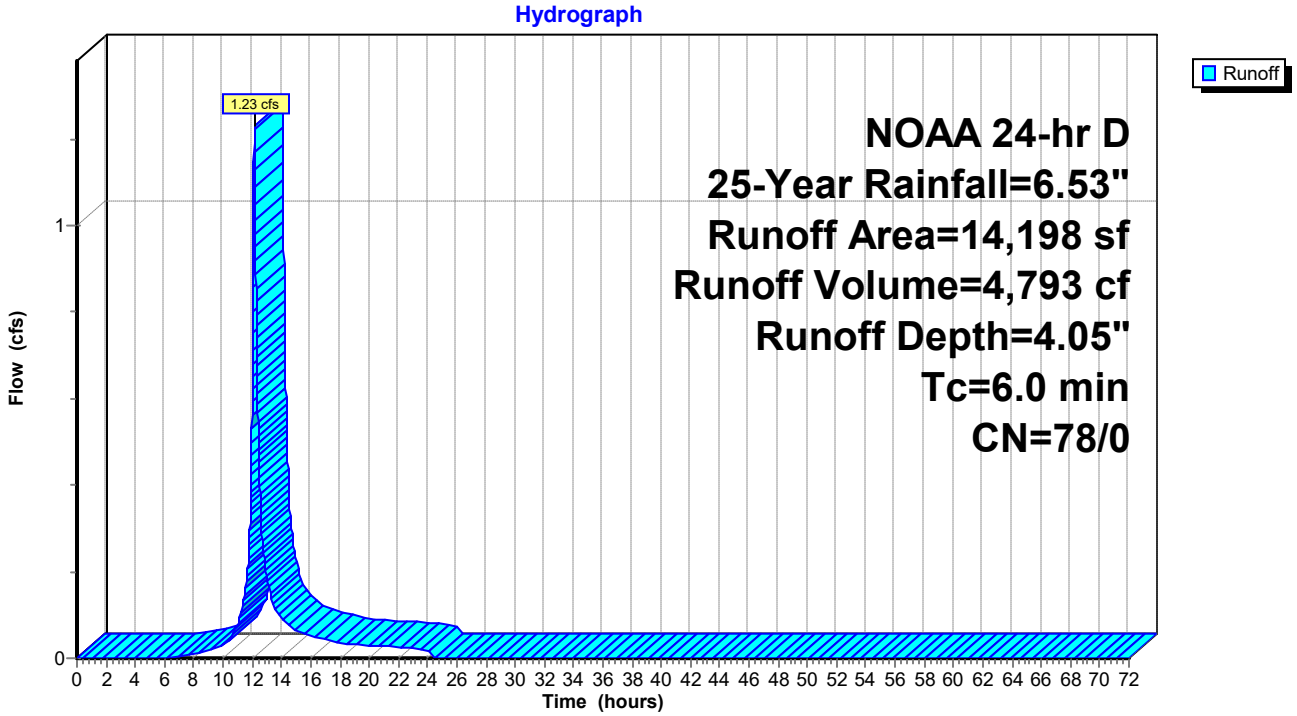
Runoff = 1.23 cfs @ 12.14 hrs, Volume= 4,793 cf, Depth= 4.05"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
11,461	77	Woods, Good, HSG D
2,737	80	>75% Grass cover, Good, HSG D
14,198	78	Weighted Average
14,198	78	100.00% Pervious Area

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

Subcatchment 7S: Pr. Area 3 Perv.



Summary for Subcatchment 8S: Pr. Area 3 Imp.

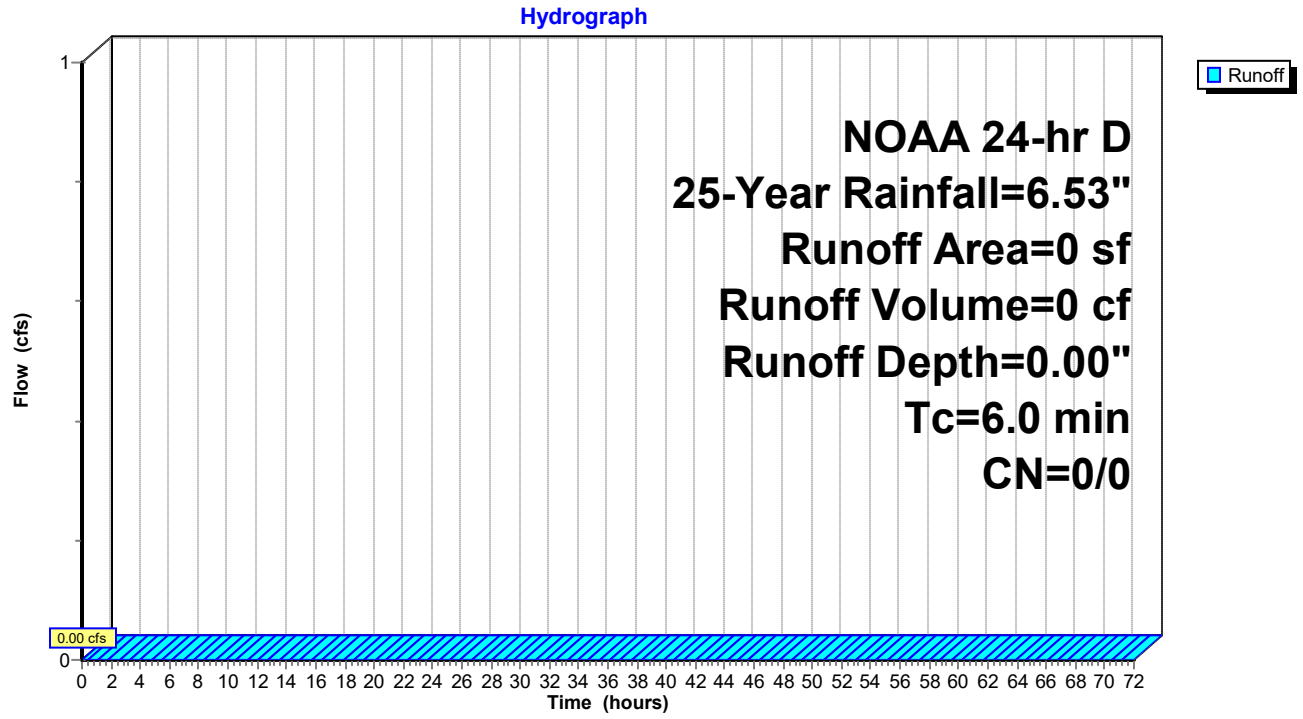
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
0	98	Paved parking, HSG D

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

Subcatchment 8S: Pr. Area 3 Imp.



Summary for Subcatchment 10S: Pr. Area 4 Perv.

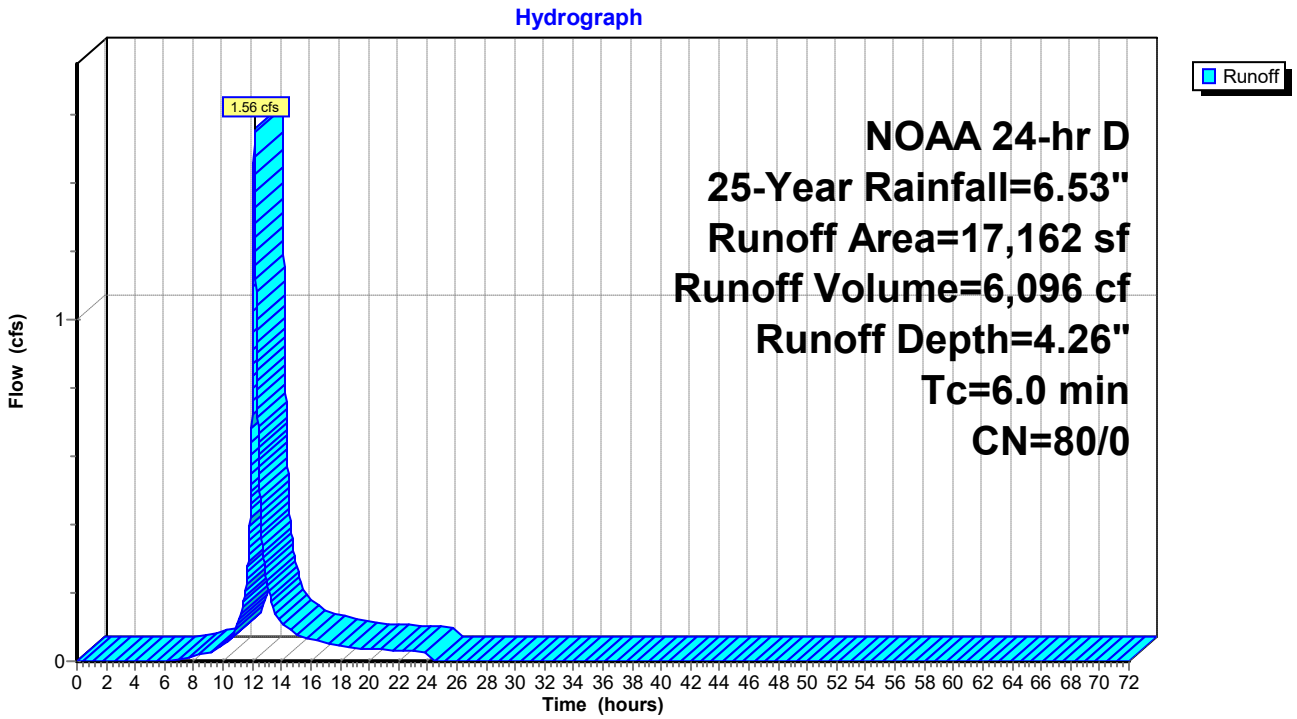
Runoff = 1.56 cfs @ 12.14 hrs, Volume= 6,096 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
0	77	Woods, Good, HSG D
17,162	80	>75% Grass cover, Good, HSG D
17,162	80	Weighted Average
17,162	80	100.00% Pervious Area

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

Subcatchment 10S: Pr. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

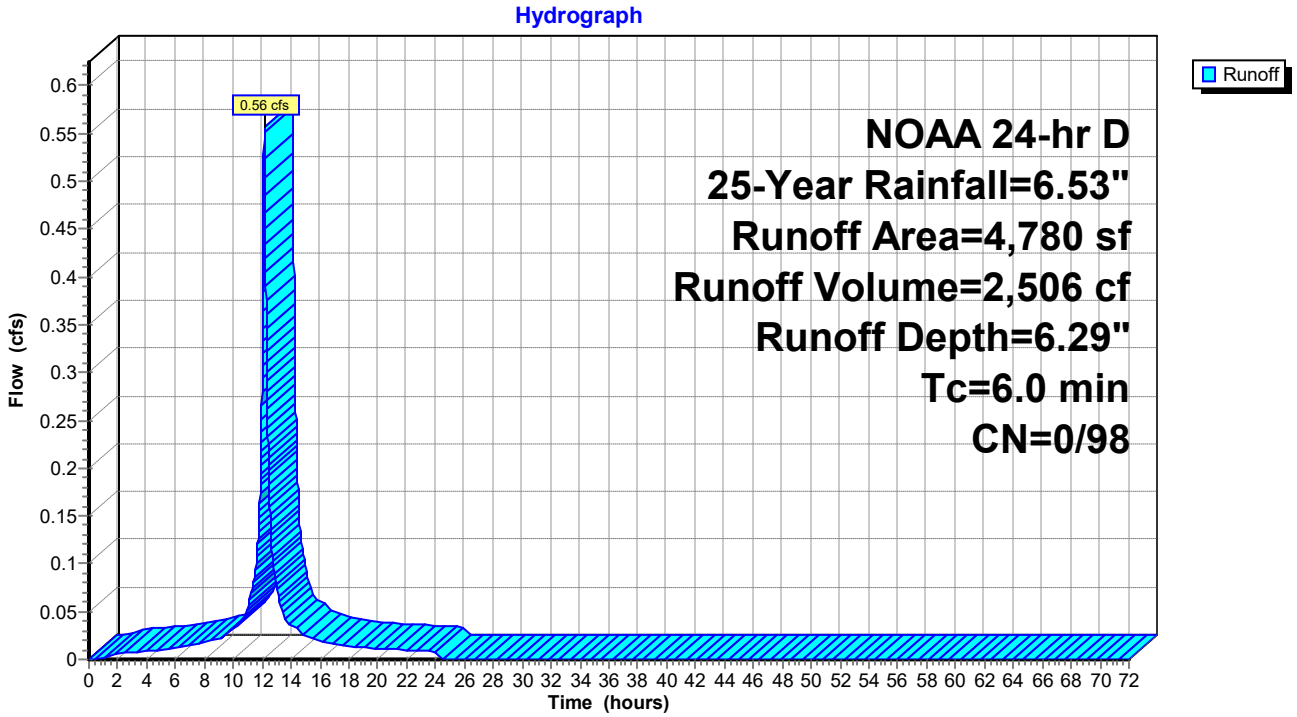
Runoff = 0.56 cfs @ 12.14 hrs, Volume= 2,506 cf, Depth= 6.29"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 25-Year Rainfall=6.53"

Area (sf)	CN	Description
4,780	98	Paved parking, HSG D
4,780	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 5.89" for 25-Year event
Inflow = 27.59 cfs @ 12.14 hrs, Volume= 121,401 cf
Outflow = 9.96 cfs @ 12.44 hrs, Volume= 121,258 cf, Atten= 64%, Lag= 17.9 min
Primary = 9.96 cfs @ 12.44 hrs, Volume= 121,258 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.32' @ 12.44 hrs Surf.Area= 25,205 sf Storage= 40,472 cf

Plug-Flow detention time= 117.9 min calculated for 121,258 cf (100% of inflow)
Center-of-Mass det. time= 117.1 min (876.2 - 759.2)

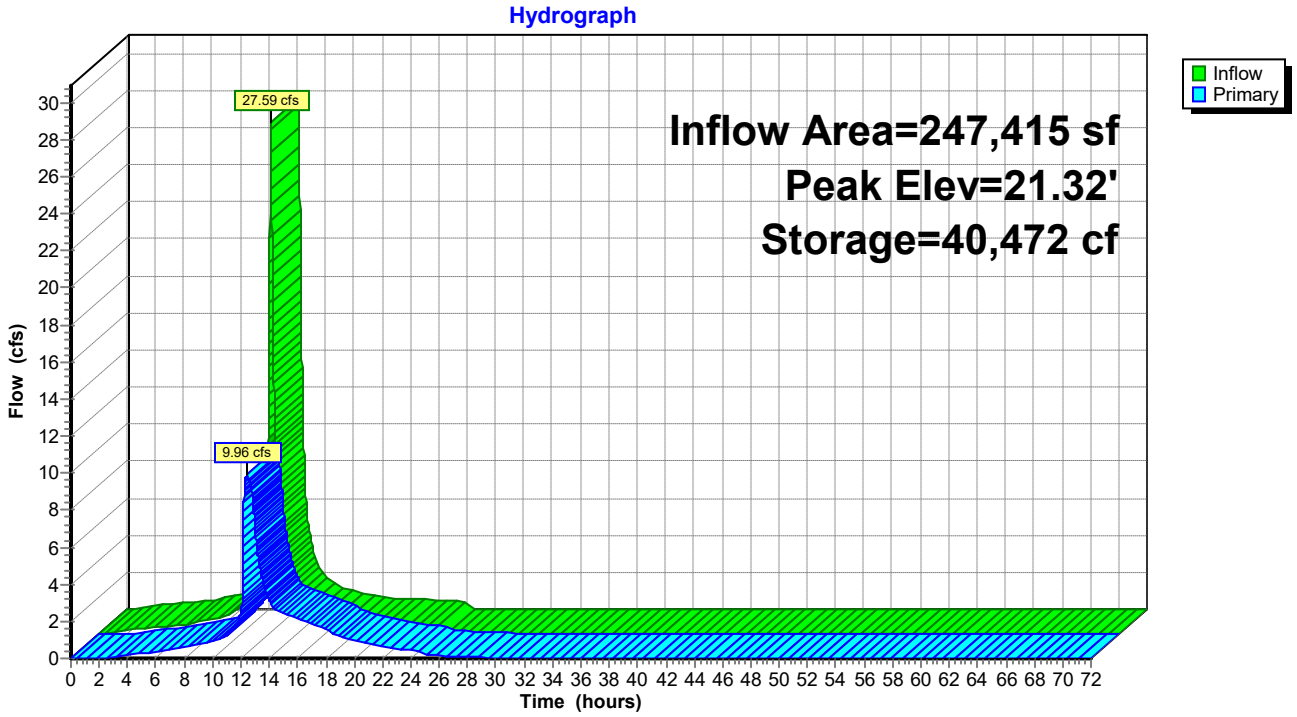
Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=9.96 cfs @ 12.44 hrs HW=21.32' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 9.96 cfs @ 5.64 fps)
  ├─**2=Orifice/Grate** (Passes < 3.52 cfs potential flow)
  └─**3=Broad-Crested Rectangular Weir** (Passes < 9.72 cfs potential flow)

Pond 13P: Underground Basin

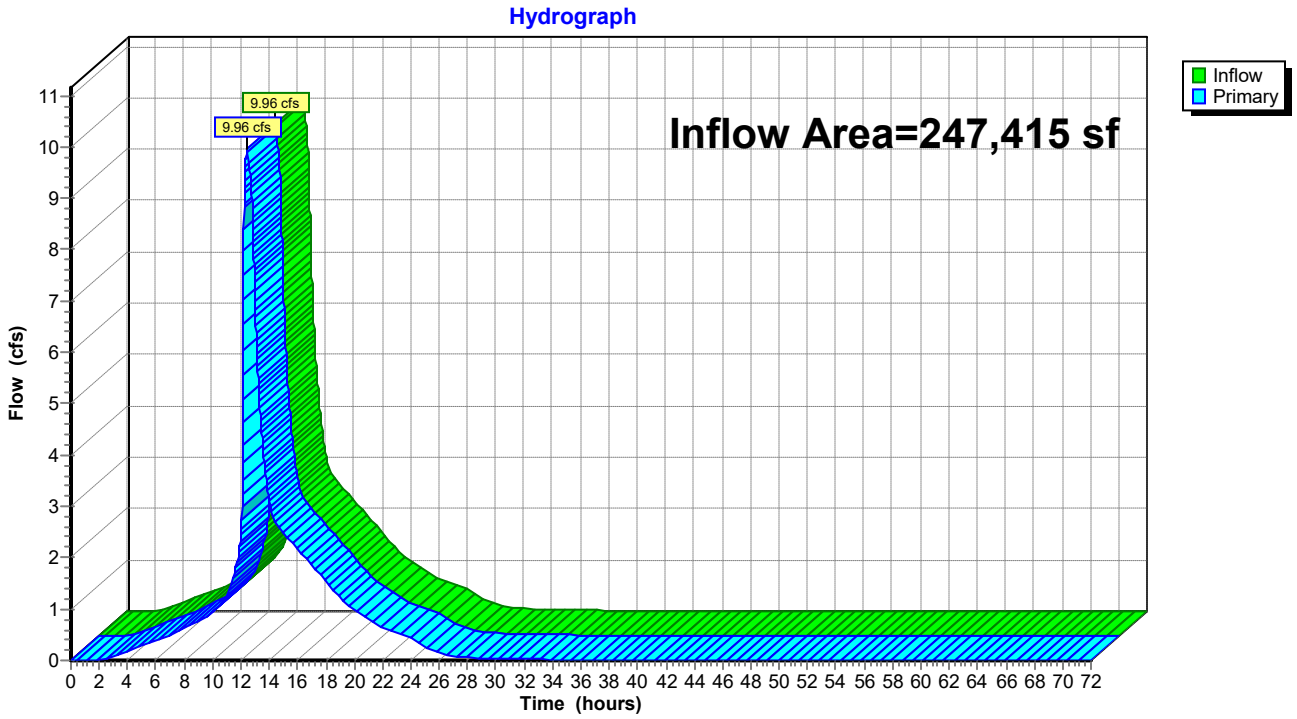


Summary for Link 3L: Pr. POA 1

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 5.88" for 25-Year event
Inflow = 9.96 cfs @ 12.44 hrs, Volume= 121,258 cf
Primary = 9.96 cfs @ 12.44 hrs, Volume= 121,258 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: Pr. POA 1

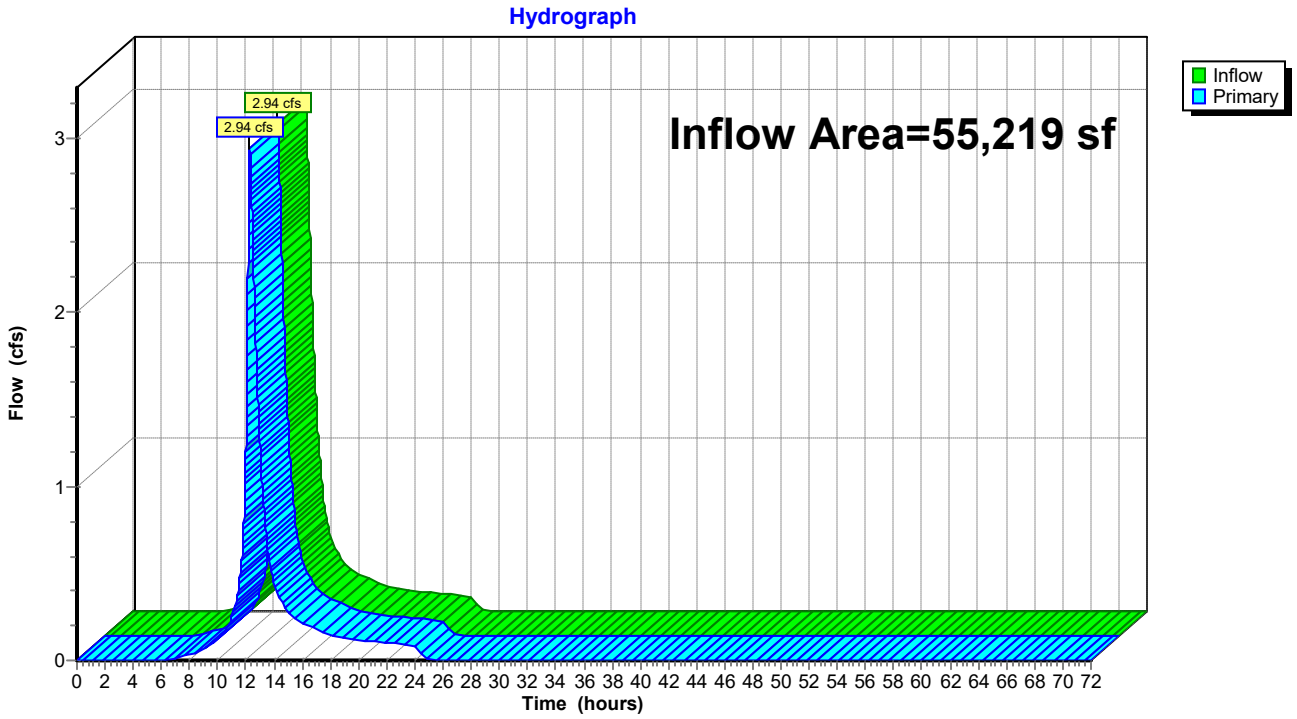


Summary for Link 6L: Pr. POA 2

Inflow Area = 55,219 sf, 3.04% Impervious, Inflow Depth = 4.12" for 25-Year event
Inflow = 2.94 cfs @ 12.28 hrs, Volume= 18,953 cf
Primary = 2.94 cfs @ 12.28 hrs, Volume= 18,953 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: Pr. POA 2

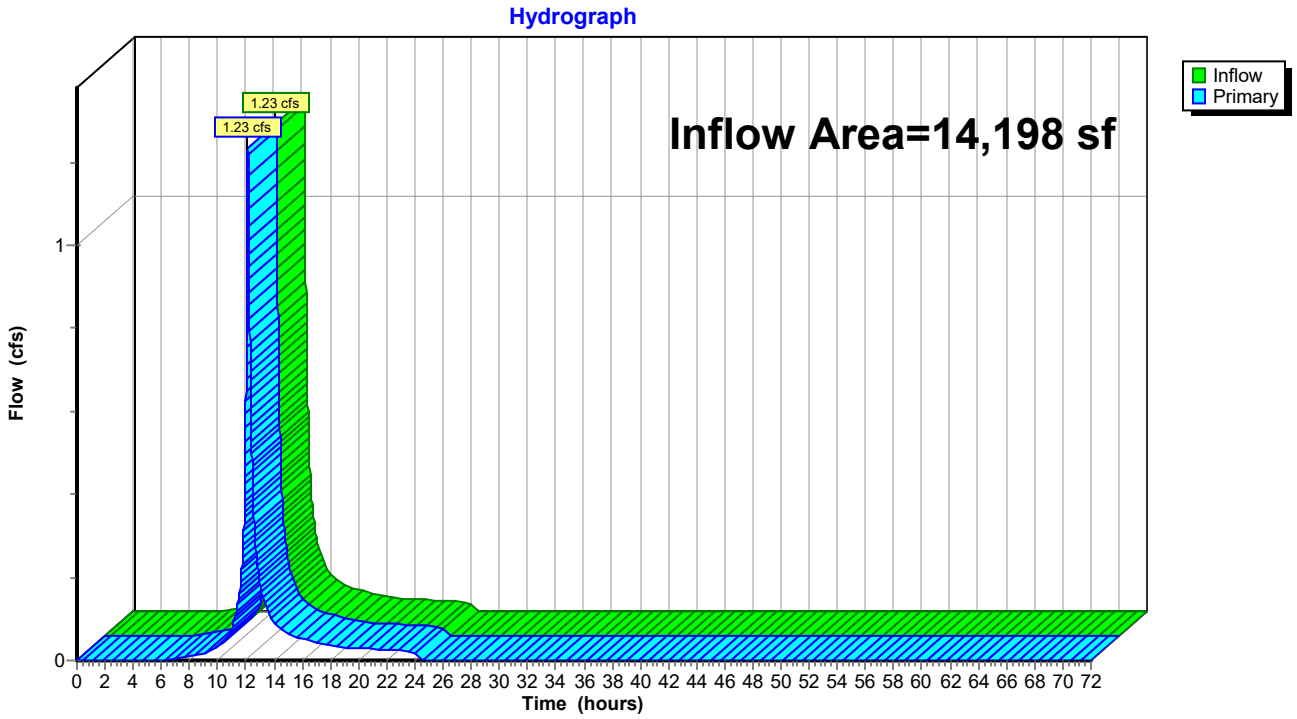


Summary for Link 9L: Pr POA 3

Inflow Area = 14,198 sf, 0.00% Impervious, Inflow Depth = 4.05" for 25-Year event
Inflow = 1.23 cfs @ 12.14 hrs, Volume= 4,793 cf
Primary = 1.23 cfs @ 12.14 hrs, Volume= 4,793 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: Pr POA 3

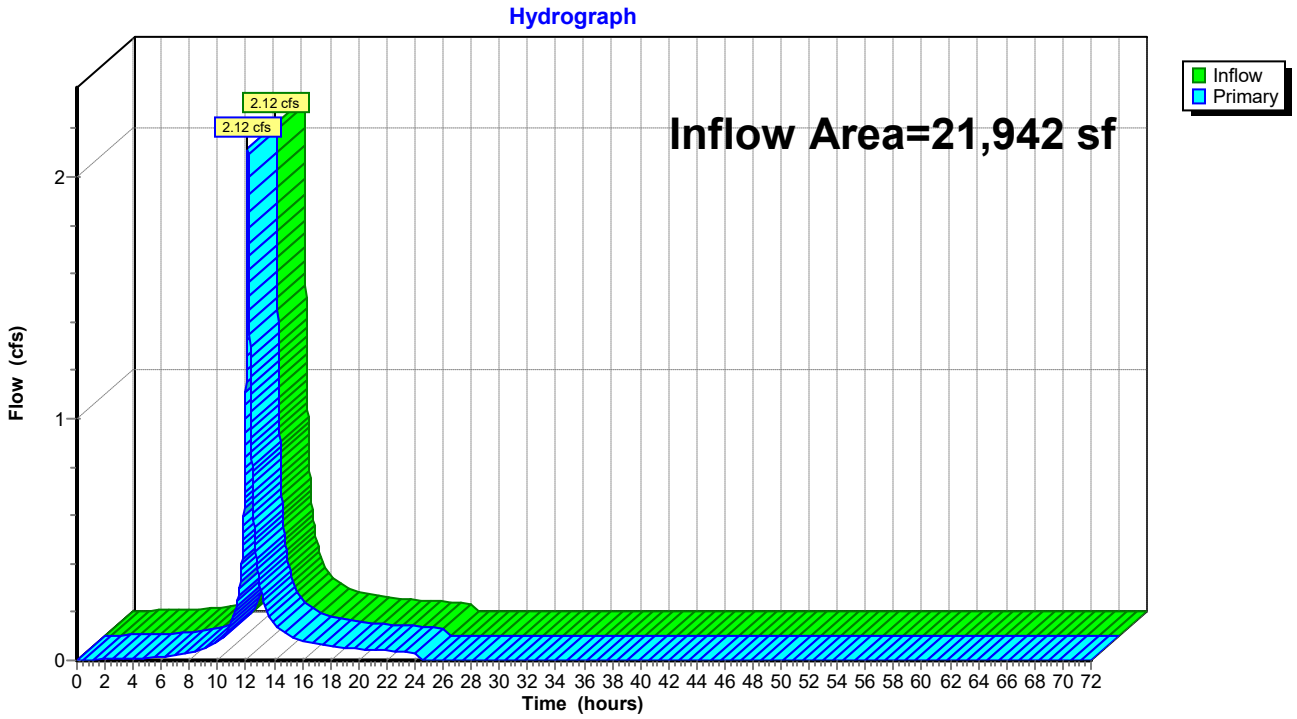


Summary for Link 12L: PR POA 4

Inflow Area = 21,942 sf, 21.78% Impervious, Inflow Depth = 4.70" for 25-Year event
Inflow = 2.12 cfs @ 12.14 hrs, Volume= 8,602 cf
Primary = 2.12 cfs @ 12.14 hrs, Volume= 8,602 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: PR POA 4



APPENDIX C-4
100-YEAR STORM EVENT HYDROGRAPHS

Summary for Subcatchment 1S: Ex. Area 1 Perv.

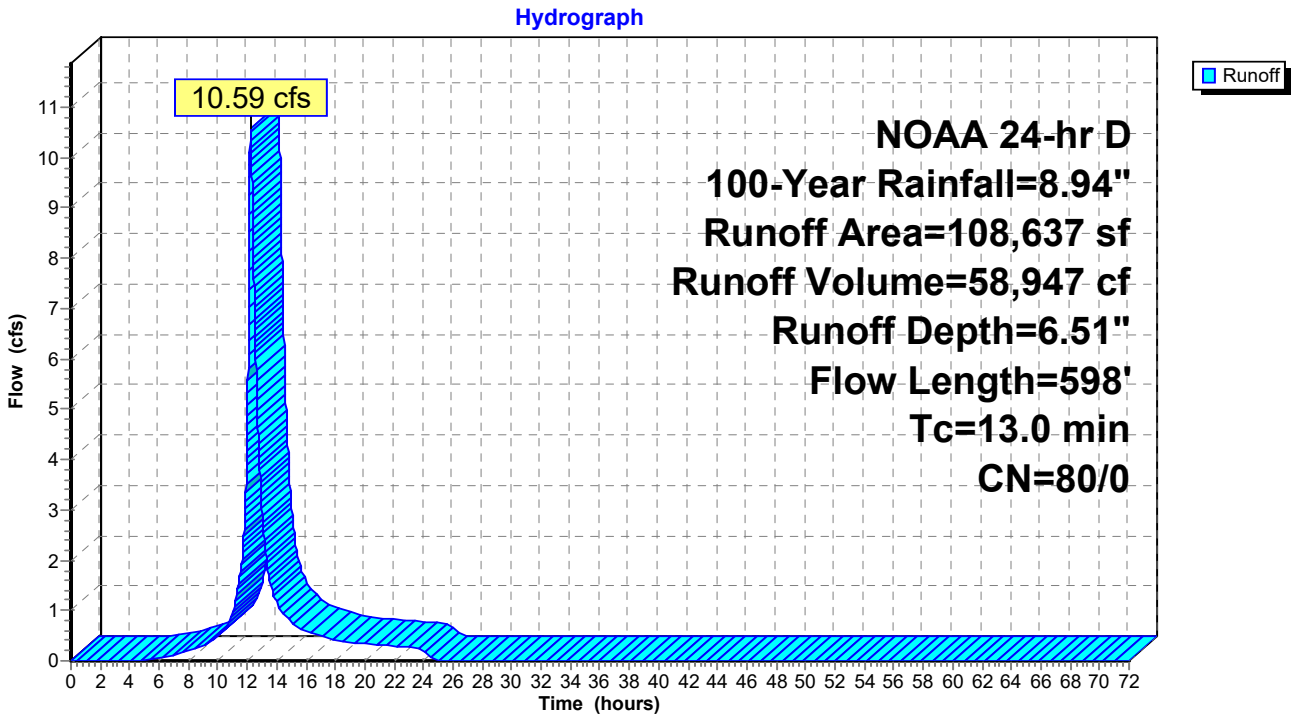
Runoff = 10.59 cfs @ 12.22 hrs, Volume= 58,947 cf, Depth= 6.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
108,637	80	>75% Grass cover, Good, HSG D
108,637	80	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0	100	0.0600	0.19		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
0.5	75	0.0270	2.65		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.5	423		2.00		**Direct Entry, Channel Flow**
13.0	598	Total			

Subcatchment 1S: Ex. Area 1 Perv.



Summary for Subcatchment 2S: Ex. Area 1 Imp.

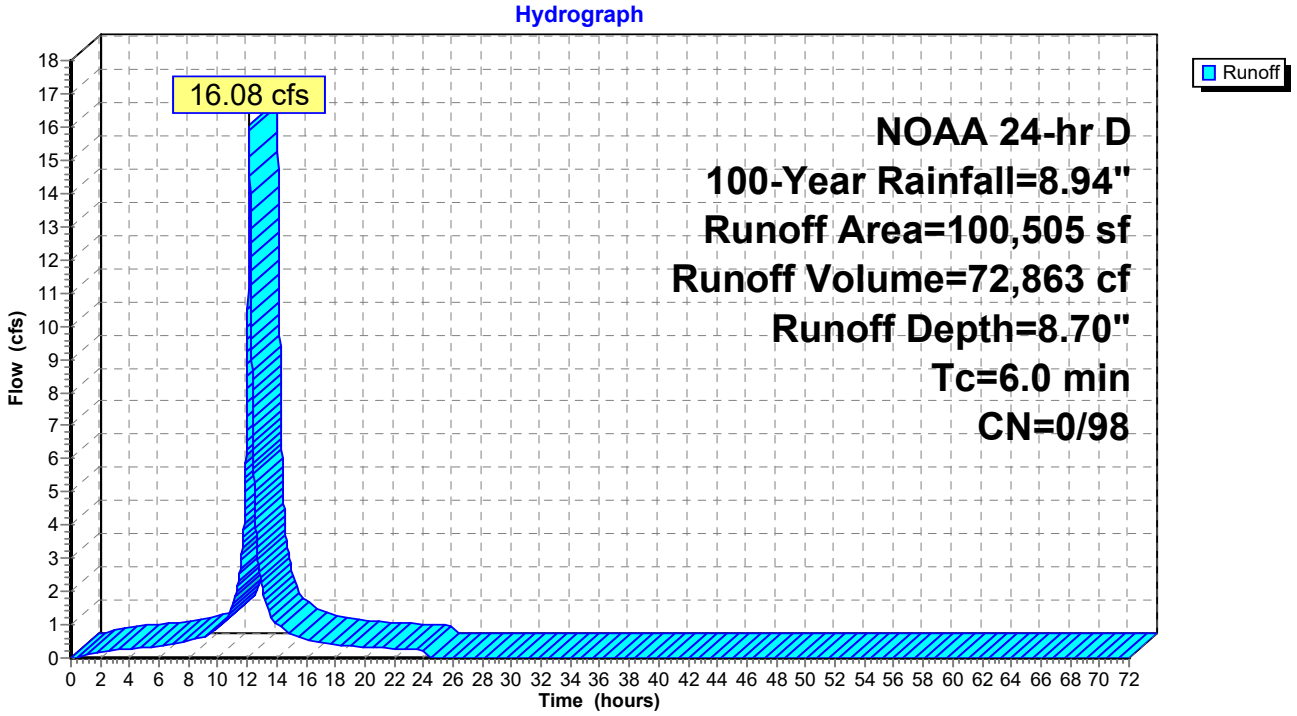
Runoff = 16.08 cfs @ 12.14 hrs, Volume= 72,863 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
100,505	98	Paved parking, HSG D
100,505	98	100.00% Impervious Area

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

Subcatchment 2S: Ex. Area 1 Imp.



Summary for Subcatchment 4S: Ex. Area 2 Perv.

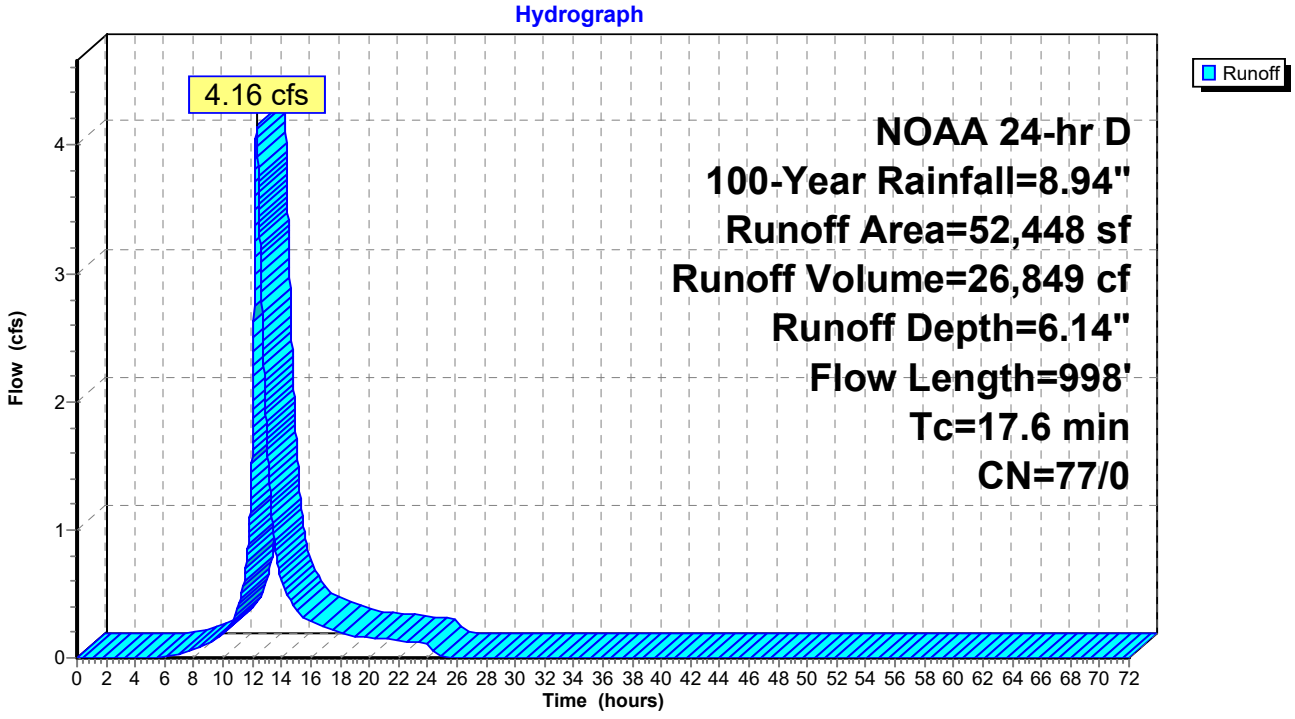
Runoff = 4.16 cfs @ 12.28 hrs, Volume= 26,849 cf, Depth= 6.14"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
50,644	77	Woods, Good, HSG D
1,804	80	>75% Grass cover, Good, HSG D
52,448	77	Weighted Average
52,448	77	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow, Shallow Concentrated** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Ex. Area 2 Perv.



Summary for Subcatchment 5S: Ex. Area 2 Imp.

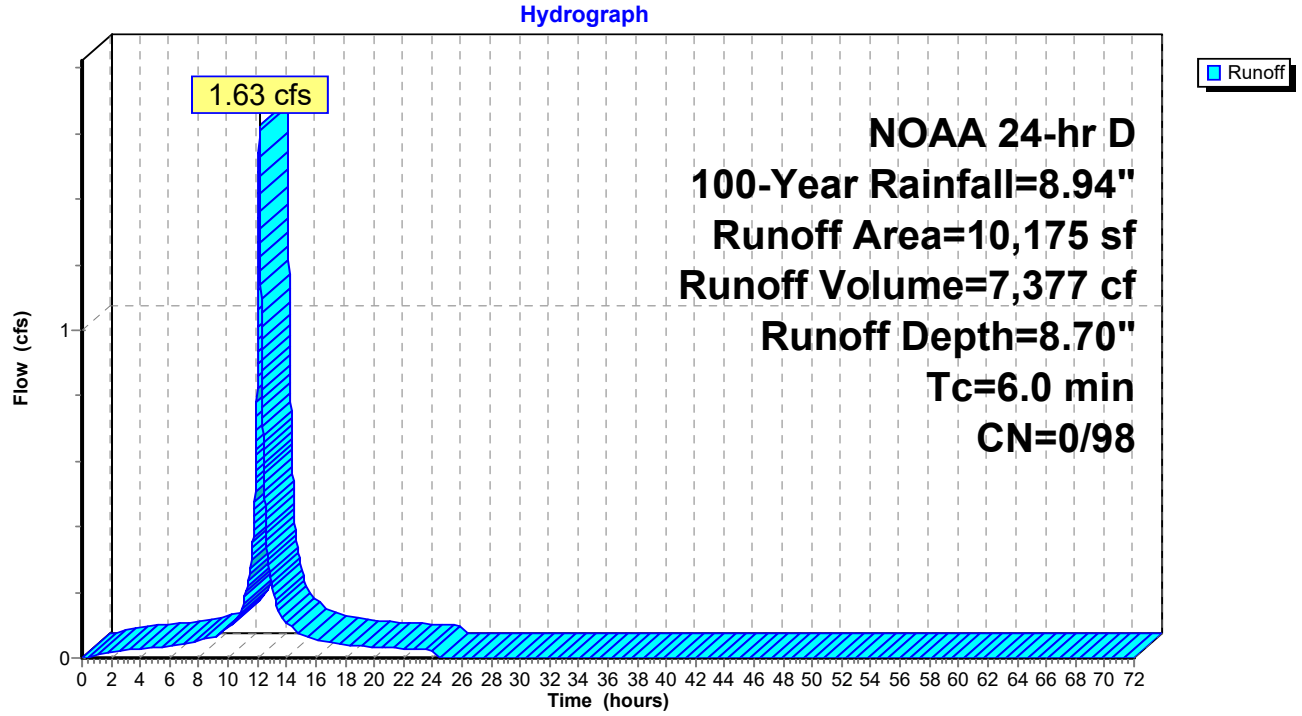
Runoff = 1.63 cfs @ 12.14 hrs, Volume= 7,377 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
10,175	98	Paved parking, HSG D
10,175	98	100.00% Impervious Area

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

Subcatchment 5S: Ex. Area 2 Imp.



Summary for Subcatchment 7S: Ex. Area 3 Perv.

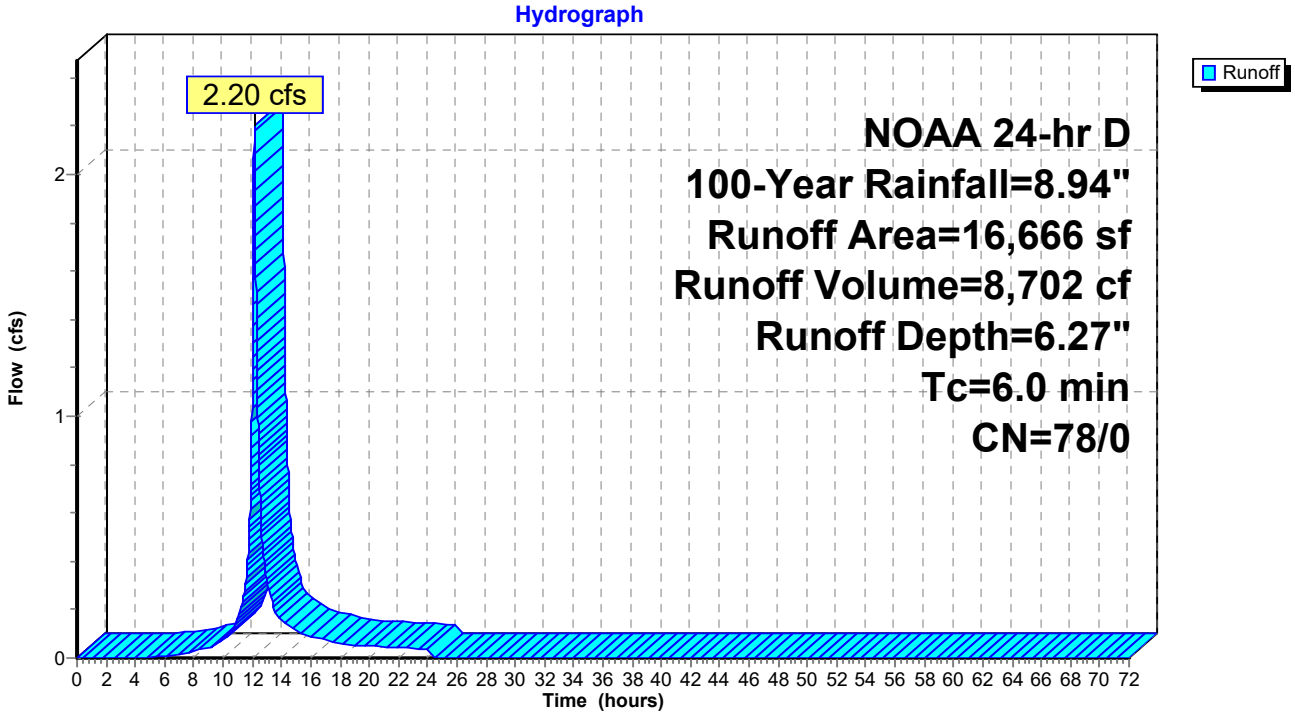
Runoff = 2.20 cfs @ 12.14 hrs, Volume= 8,702 cf, Depth= 6.27"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
11,841	77	Woods, Good, HSG D
4,825	80	>75% Grass cover, Good, HSG D
16,666	78	Weighted Average
16,666	78	100.00% Pervious Area

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

Subcatchment 7S: Ex. Area 3 Perv.



Summary for Subcatchment 8S: Ex. Area 3 Imp.

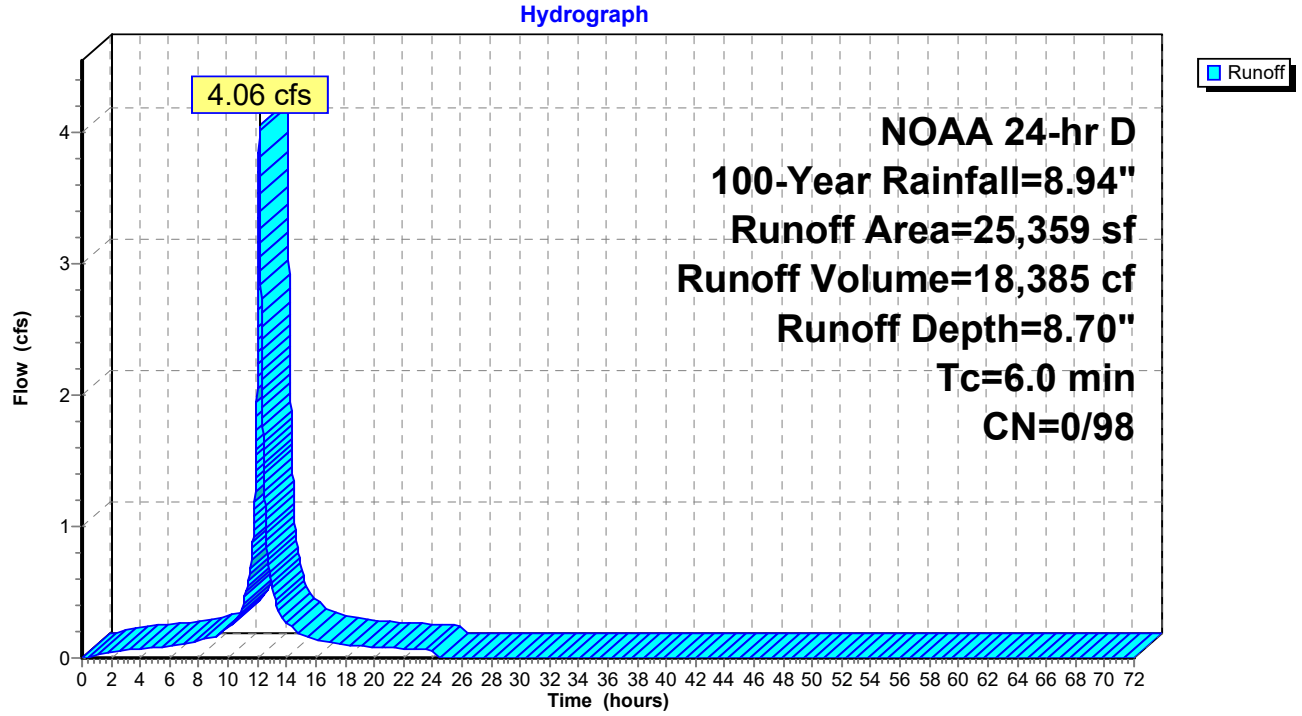
Runoff = 4.06 cfs @ 12.14 hrs, Volume= 18,385 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
25,359	98	Paved parking, HSG D
25,359	98	100.00% Impervious Area

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

Subcatchment 8S: Ex. Area 3 Imp.



Summary for Subcatchment 10S: Ex. Area 4 Perv.

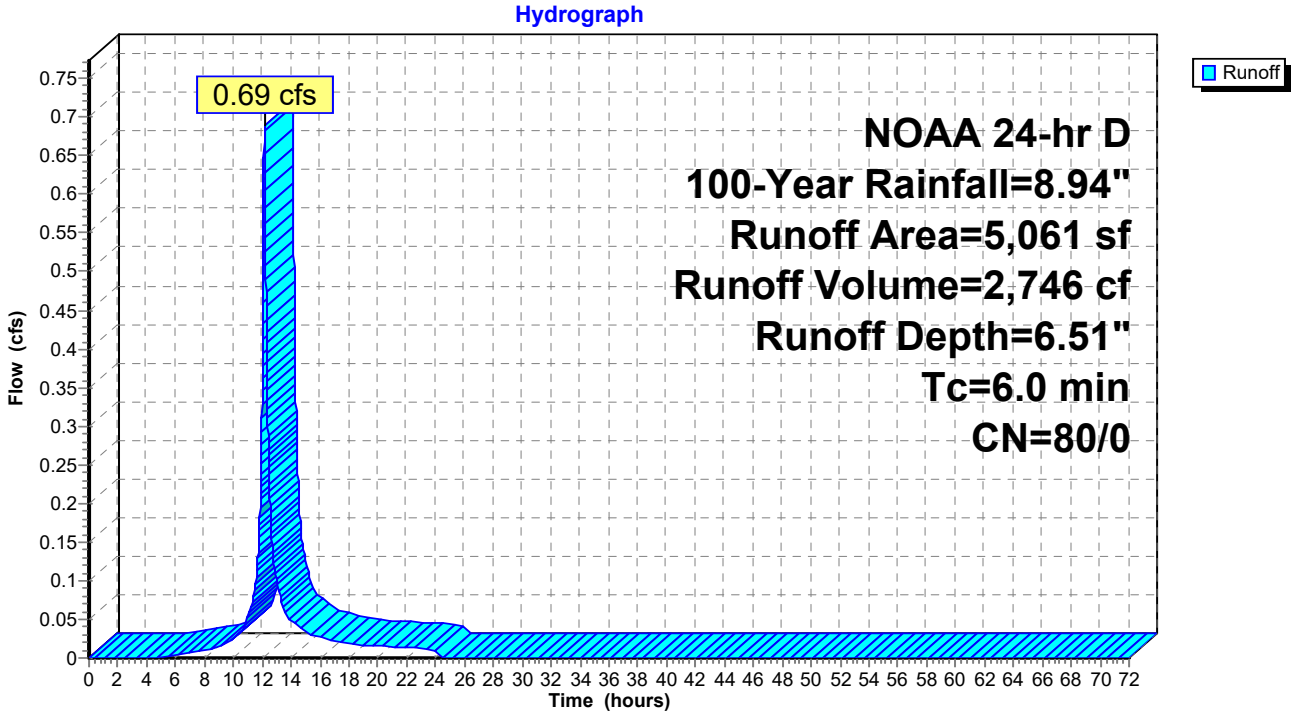
Runoff = 0.69 cfs @ 12.14 hrs, Volume= 2,746 cf, Depth= 6.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
5,061	80	>75% Grass cover, Good, HSG D
5,061	80	100.00% Pervious Area

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

Subcatchment 10S: Ex. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

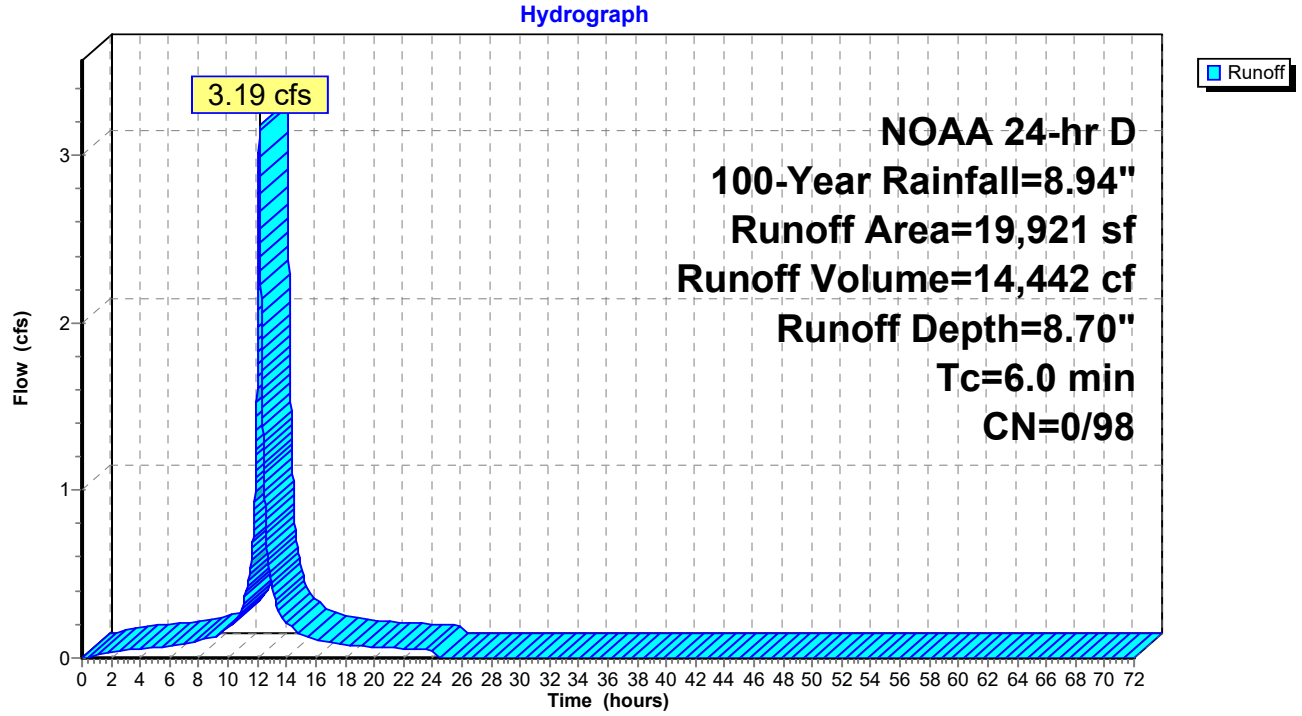
Runoff = 3.19 cfs @ 12.14 hrs, Volume= 14,442 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
19,921	98	Paved parking, HSG D
19,921	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.

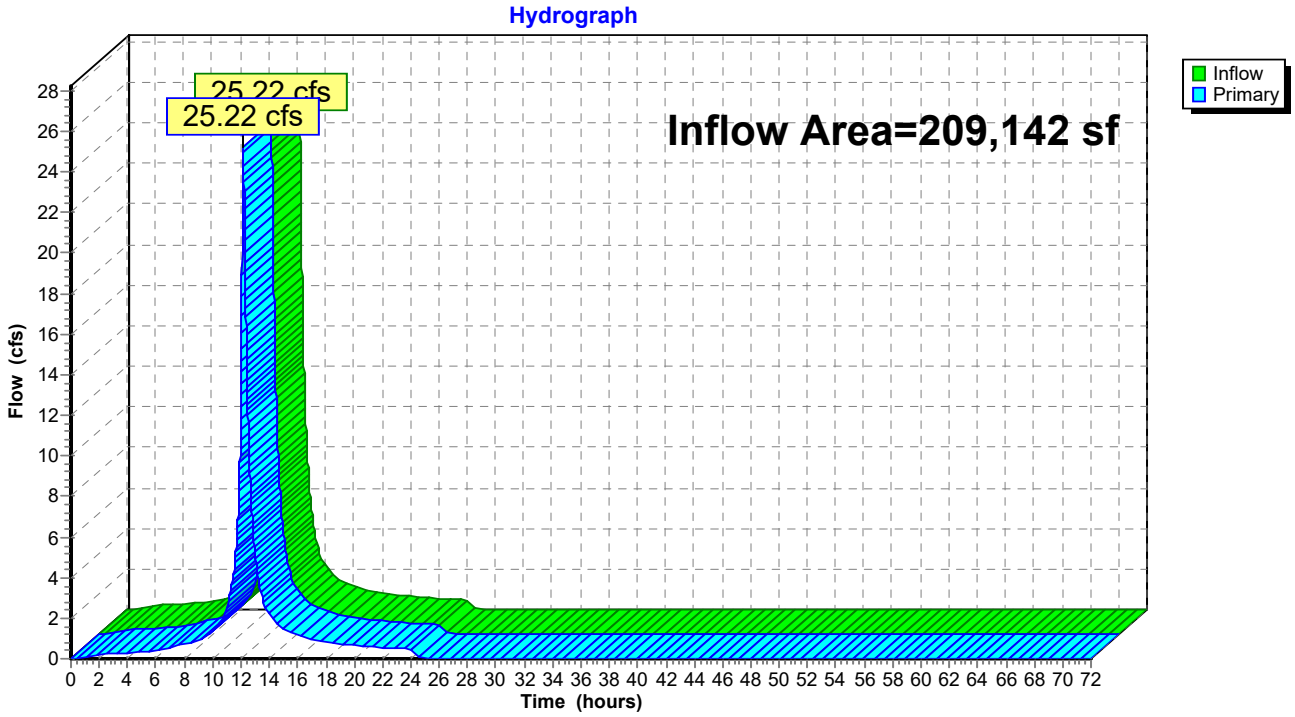


Summary for Link 3L: EX POA 1

Inflow Area = 209,142 sf, 48.06% Impervious, Inflow Depth = 7.56" for 100-Year event
Inflow = 25.22 cfs @ 12.16 hrs, Volume= 131,811 cf
Primary = 25.22 cfs @ 12.16 hrs, Volume= 131,811 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: EX POA 1

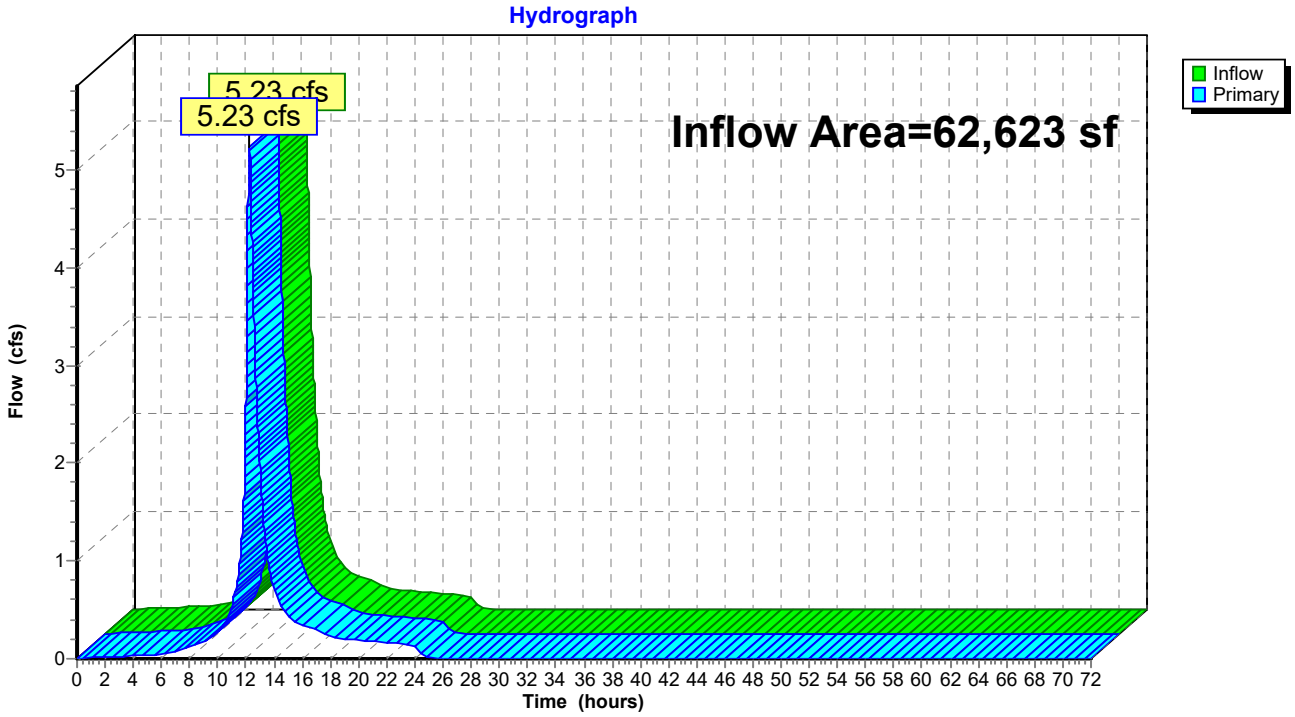


Summary for Link 6L: EX POA 2

Inflow Area = 62,623 sf, 16.25% Impervious, Inflow Depth = 6.56" for 100-Year event
Inflow = 5.23 cfs @ 12.24 hrs, Volume= 34,226 cf
Primary = 5.23 cfs @ 12.24 hrs, Volume= 34,226 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: EX POA 2

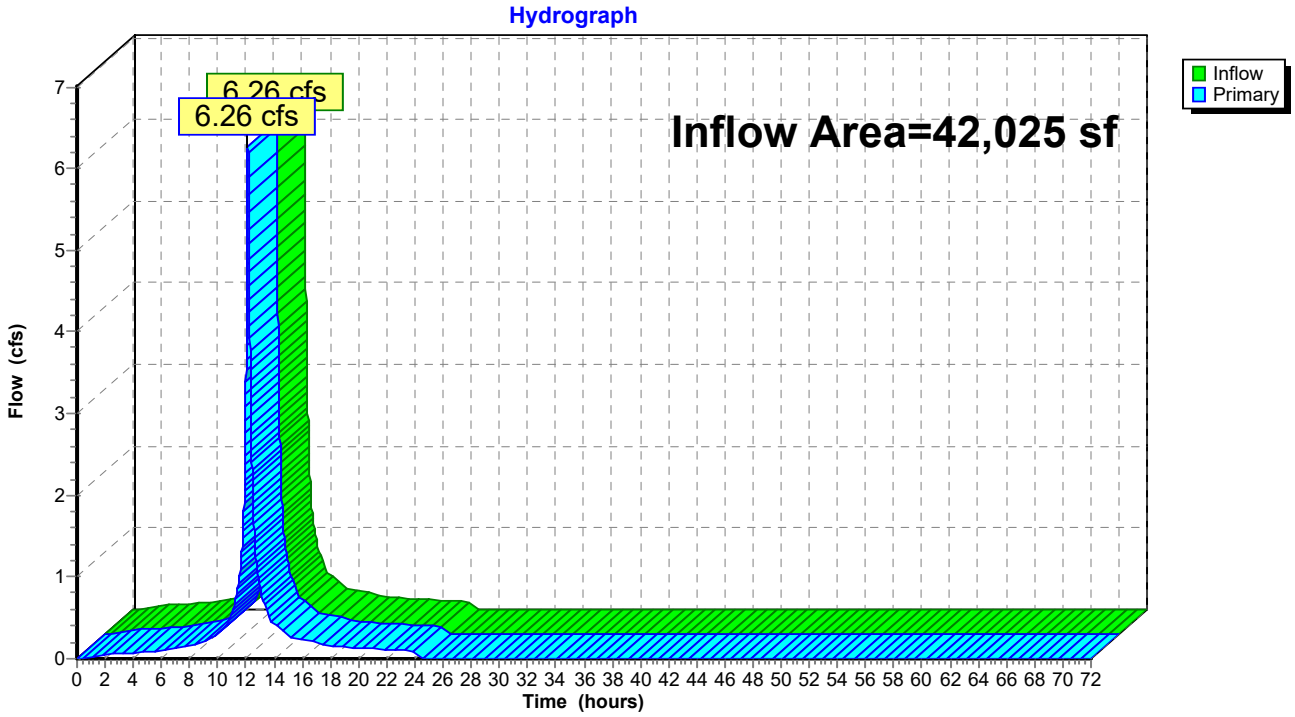


Summary for Link 9L: EX POA 3

Inflow Area = 42,025 sf, 60.34% Impervious, Inflow Depth = 7.73" for 100-Year event
Inflow = 6.26 cfs @ 12.14 hrs, Volume= 27,087 cf
Primary = 6.26 cfs @ 12.14 hrs, Volume= 27,087 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: EX POA 3

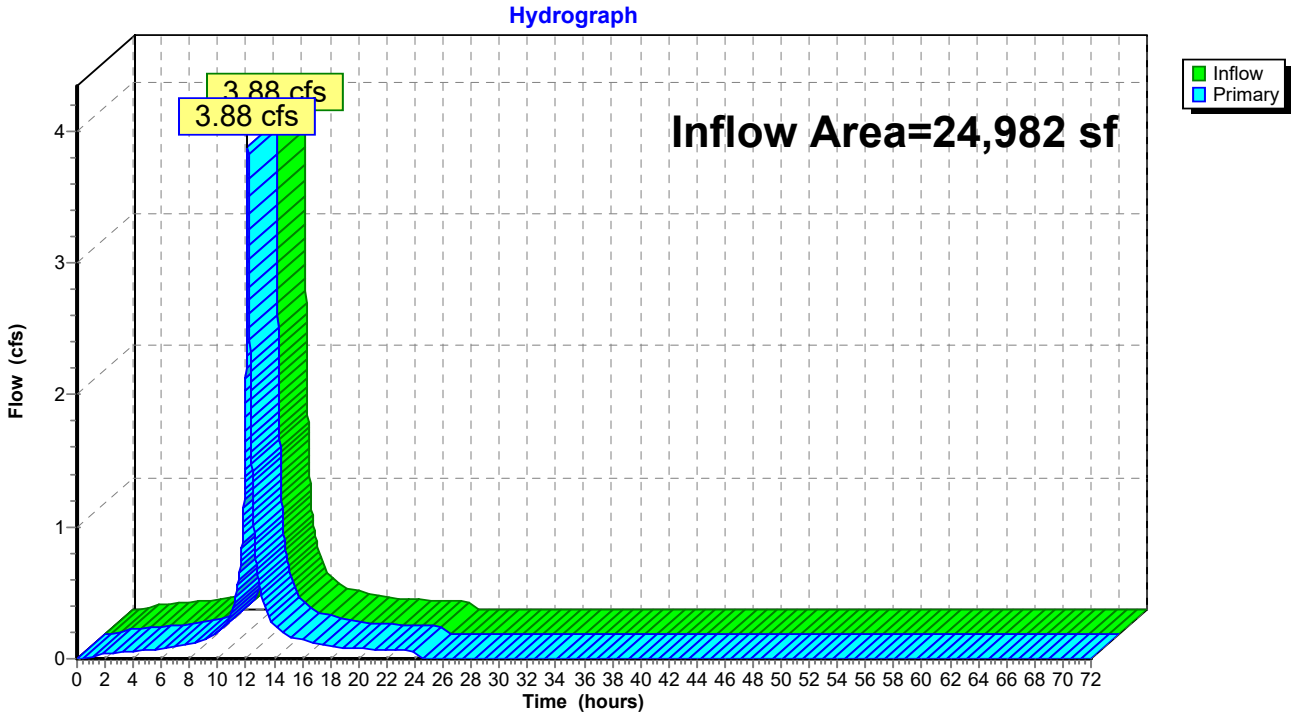


Summary for Link 12L: EX POA 4

Inflow Area = 24,982 sf, 79.74% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 3.88 cfs @ 12.14 hrs, Volume= 17,188 cf
Primary = 3.88 cfs @ 12.14 hrs, Volume= 17,188 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



Summary for Subcatchment 1S: PR. Area 1 Perv.

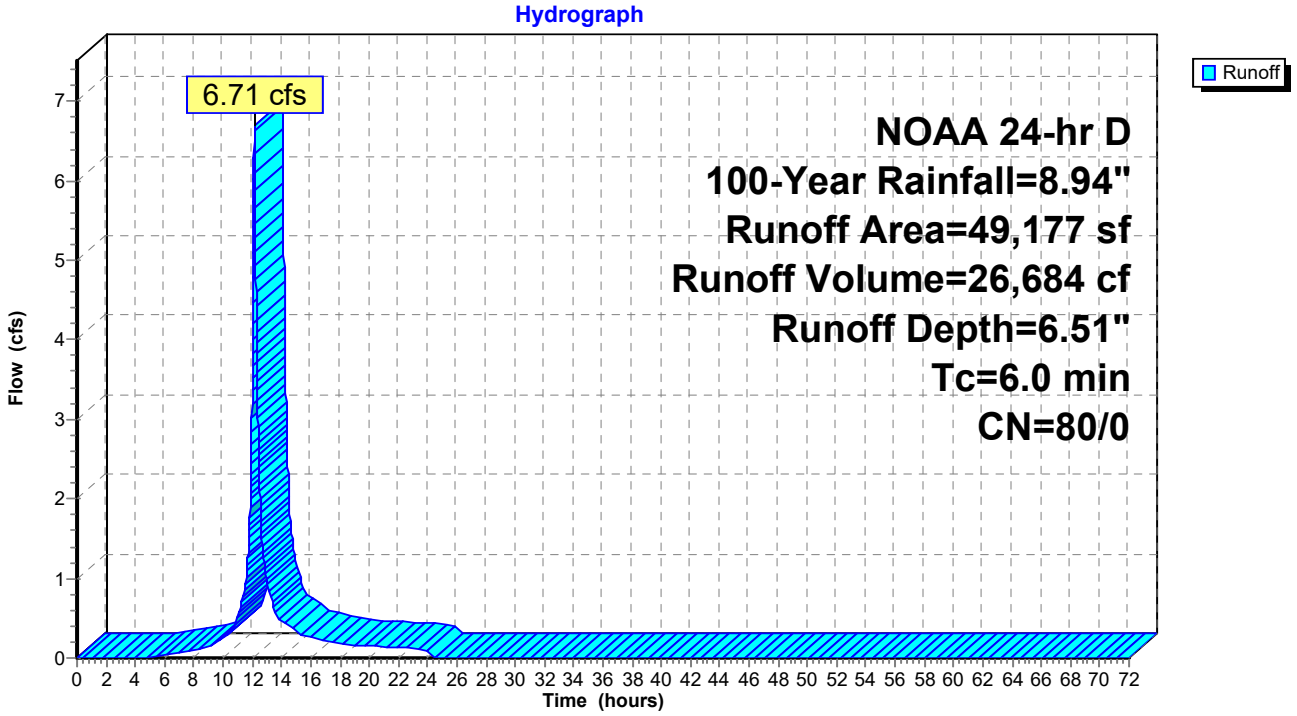
Runoff = 6.71 cfs @ 12.14 hrs, Volume= 26,684 cf, Depth= 6.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
49,177	80	>75% Grass cover, Good, HSG D
49,177	80	100.00% Pervious Area

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

Subcatchment 1S: PR. Area 1 Perv.



Summary for Subcatchment 2S: Pr. Area 1 Imp.

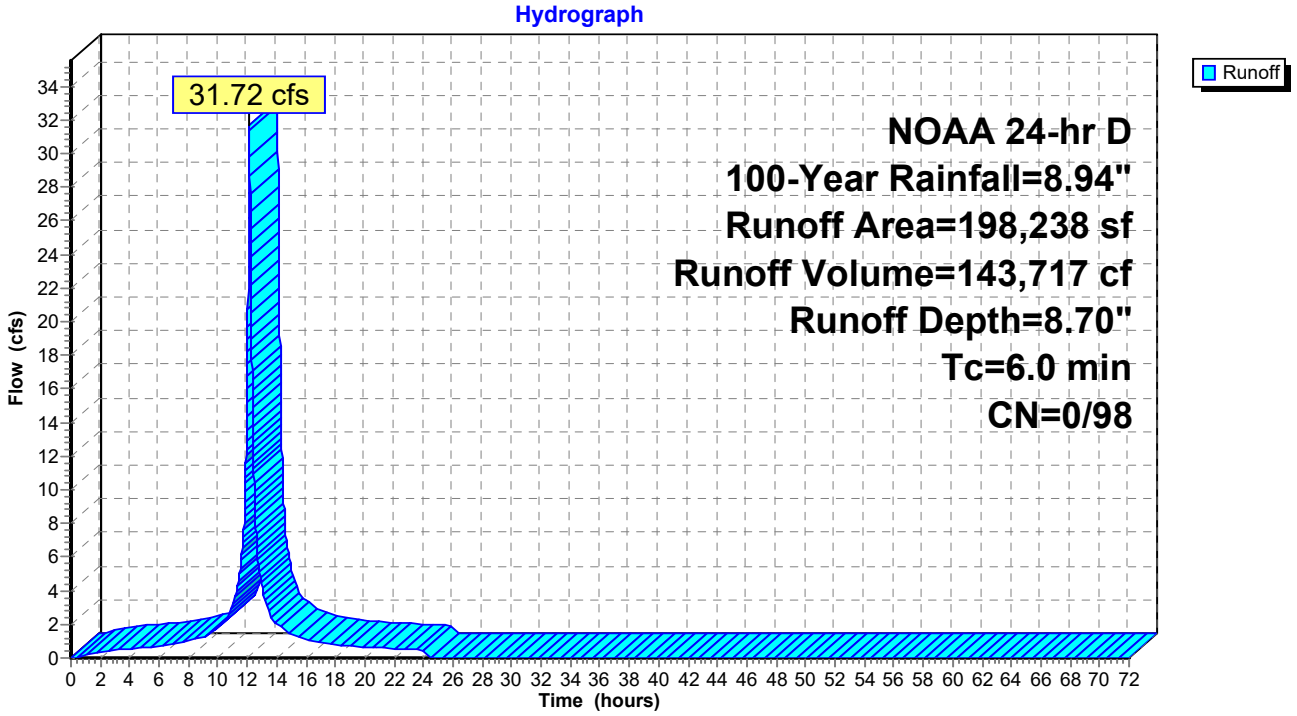
Runoff = 31.72 cfs @ 12.14 hrs, Volume= 143,717 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
198,238	98	Paved parking, HSG D
198,238	98	100.00% Impervious Area

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

Subcatchment 2S: Pr. Area 1 Imp.



Summary for Subcatchment 4S: Pr. Area 2 Perv.

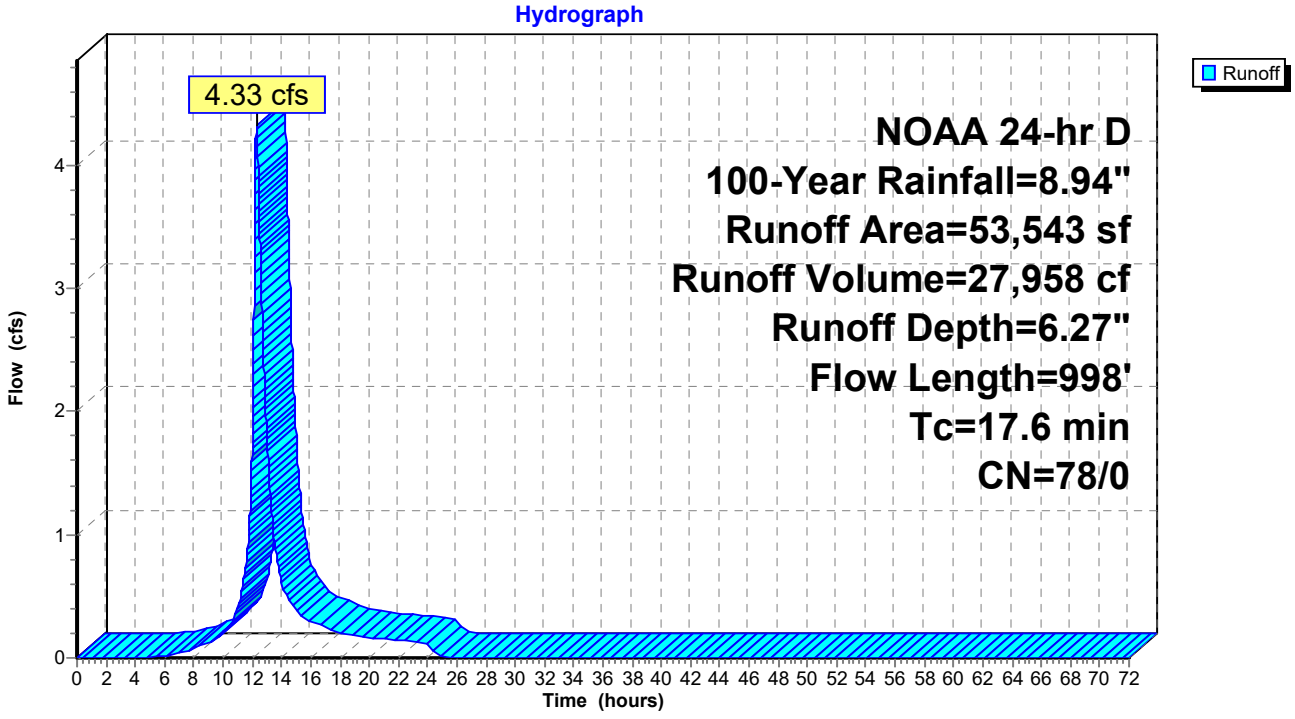
Runoff = 4.33 cfs @ 12.28 hrs, Volume= 27,958 cf, Depth= 6.27"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
42,271	77	Woods, Good, HSG D
11,272	80	>75% Grass cover, Good, HSG D
53,543	78	Weighted Average
53,543	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0550	0.18		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.34"
5.2	528	0.0110	1.69		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
3.1	370		2.00		**Direct Entry, Concentrated Stream**
17.6	998	Total			

Subcatchment 4S: Pr. Area 2 Perv.



Summary for Subcatchment 5S: Pr. Area 2 Imp.

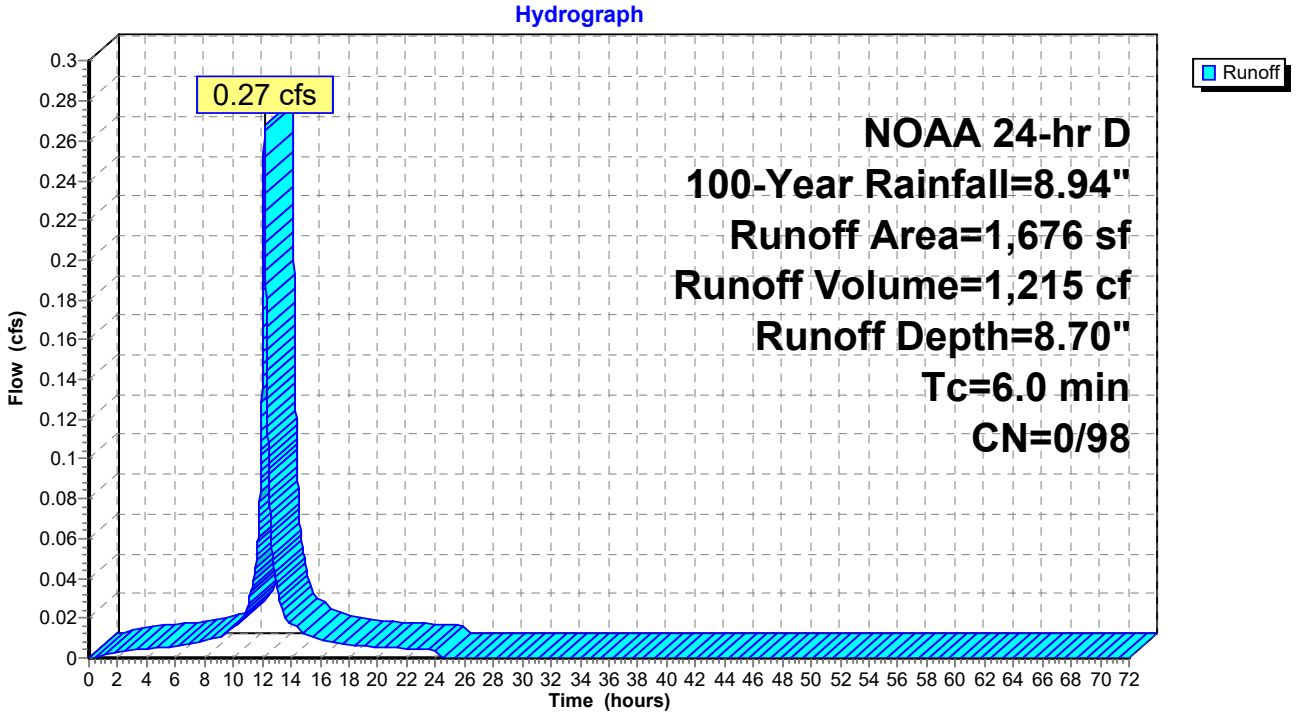
Runoff = 0.27 cfs @ 12.14 hrs, Volume= 1,215 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,676	98	Paved parking, HSG D
1,676	98	100.00% Impervious Area

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

Subcatchment 5S: Pr. Area 2 Imp.



Summary for Subcatchment 7S: Pr. Area 3 Perv.

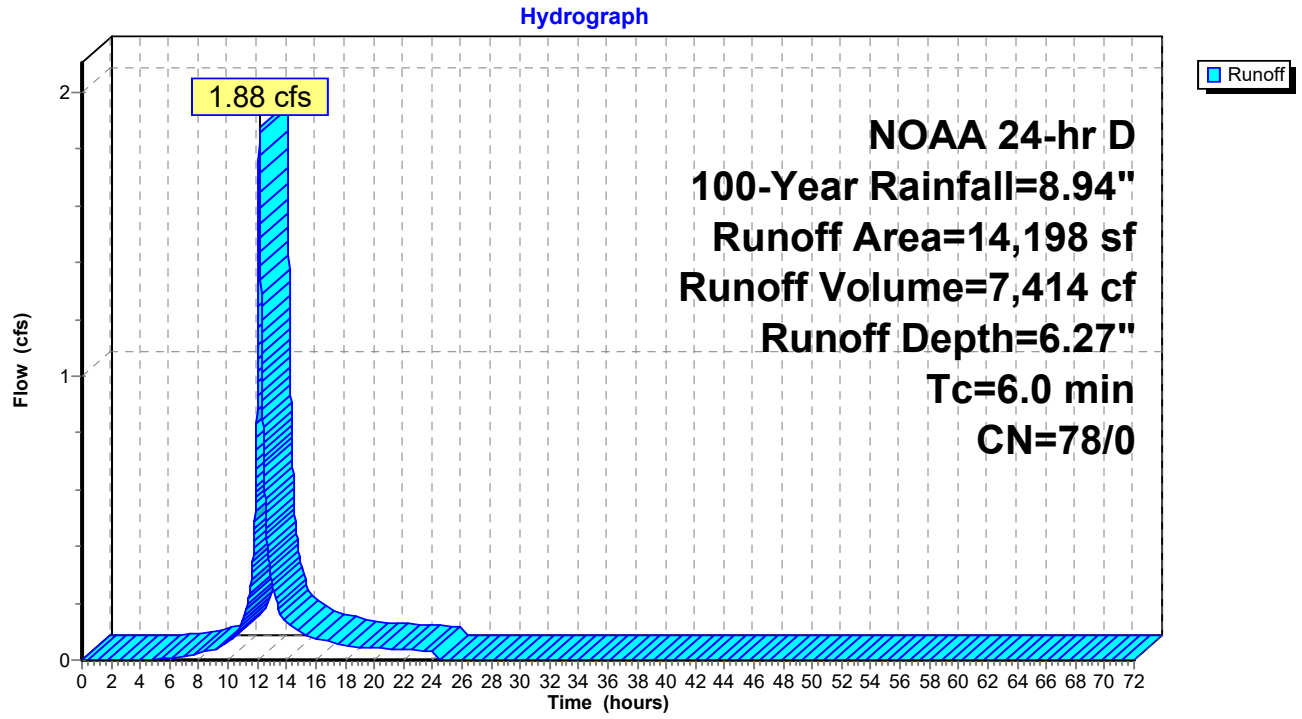
Runoff = 1.88 cfs @ 12.14 hrs, Volume= 7,414 cf, Depth= 6.27"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
11,461	77	Woods, Good, HSG D
2,737	80	>75% Grass cover, Good, HSG D
14,198	78	Weighted Average
14,198	78	100.00% Pervious Area

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

Subcatchment 7S: Pr. Area 3 Perv.



Summary for Subcatchment 8S: Pr. Area 3 Imp.

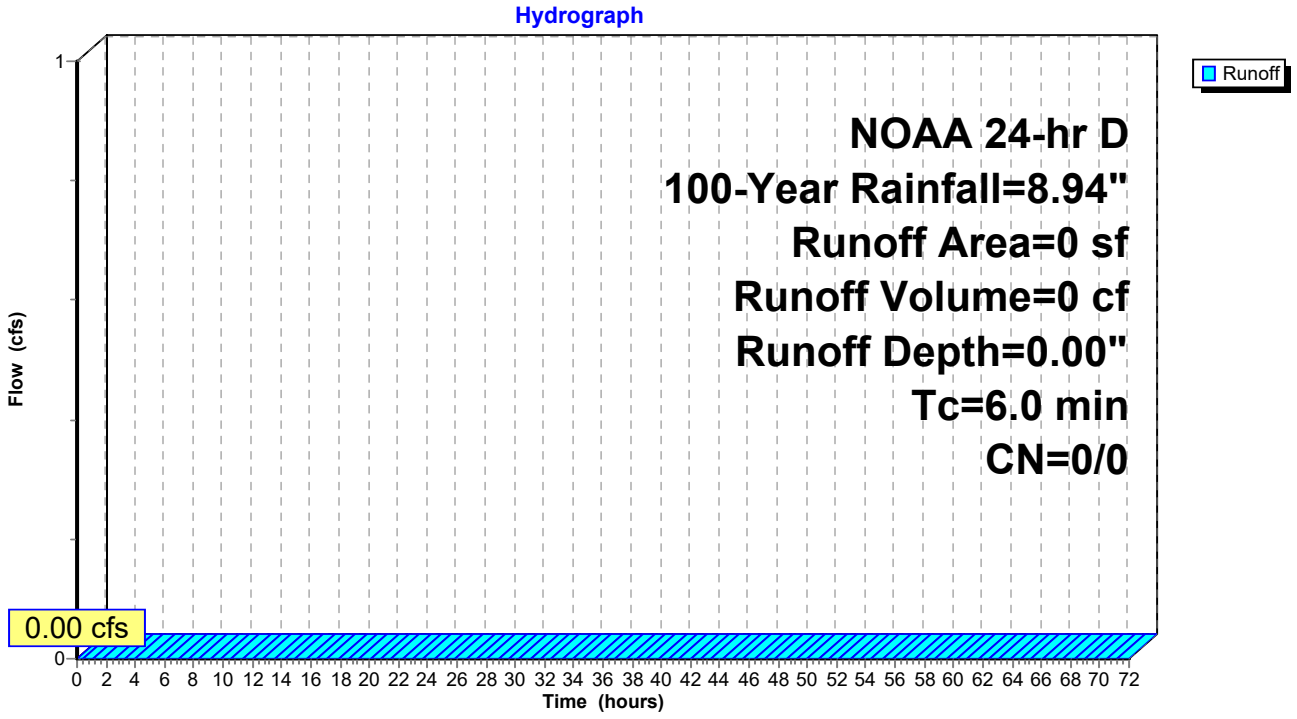
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
0	98	Paved parking, HSG D

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

Subcatchment 8S: Pr. Area 3 Imp.



Summary for Subcatchment 10S: Pr. Area 4 Perv.

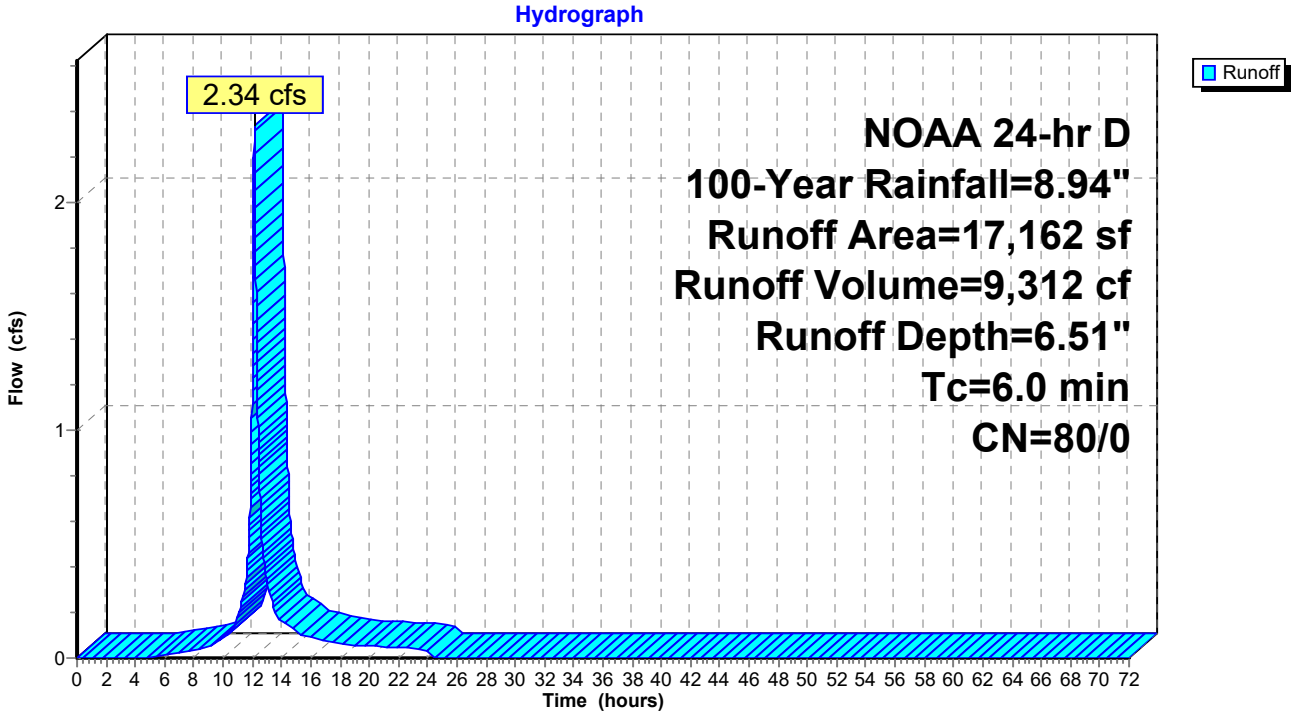
Runoff = 2.34 cfs @ 12.14 hrs, Volume= 9,312 cf, Depth= 6.51"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
0	77	Woods, Good, HSG D
17,162	80	>75% Grass cover, Good, HSG D
17,162	80	Weighted Average
17,162	80	100.00% Pervious Area

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

Subcatchment 10S: Pr. Area 4 Perv.



Summary for Subcatchment 11S: Ex. Area 4 Imp.

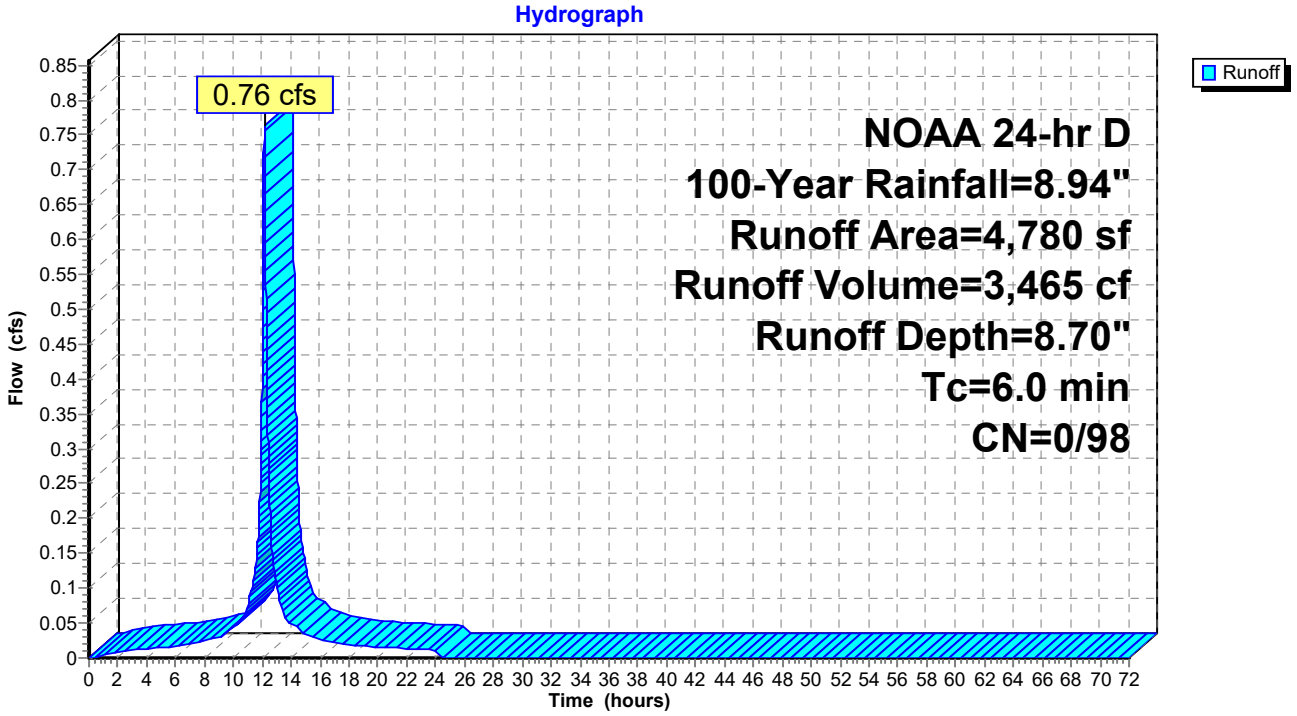
Runoff = 0.76 cfs @ 12.14 hrs, Volume= 3,465 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=Delmarva, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NOAA 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
4,780	98	Paved parking, HSG D
4,780	98	100.00% Impervious Area

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

Subcatchment 11S: Ex. Area 4 Imp.



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 38.43 cfs @ 12.14 hrs, Volume= 170,401 cf
Outflow = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf, Atten= 64%, Lag= 17.7 min
Primary = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.43 hrs Surf.Area= 25,205 sf Storage= 54,805 cf

Plug-Flow detention time= 107.2 min calculated for 170,257 cf (100% of inflow)
Center-of-Mass det. time= 106.6 min (861.0 - 754.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=13.98 cfs @ 12.43 hrs HW=22.55' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 13.98 cfs @ 7.91 fps)
↑**2=Orifice/Grate** (Passes < 4.57 cfs potential flow)
3=Broad-Crested Rectangular Weir (Passes < 38.91 cfs potential flow)

Pond 13P: Underground Basin - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx 2016 (Contech® ChamberMaxx® capped at 47.2cf for air pocket)
Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf
Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Row Length Adjustment= +0.32' x 6.63 sf x 26 rows

51.4" Wide + 5.6" Spacing = 57.0" C-C Row Spacing

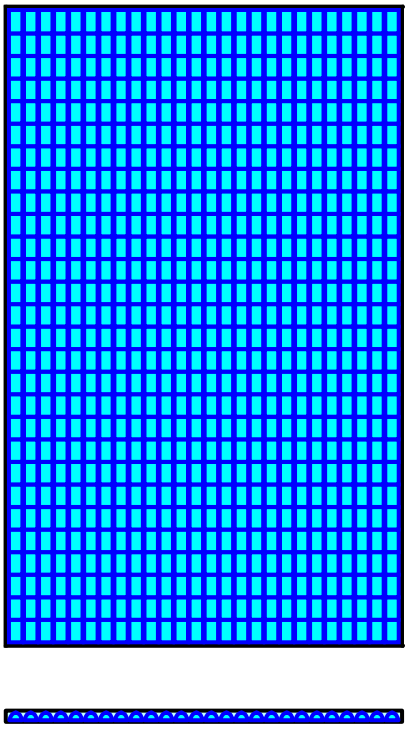
28 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 199.58' Row Length +12.0" End Stone x 2 = 201.58' Base Length
26 Rows x 51.4" Wide + 5.6" Spacing x 25 + 12.0" Side Stone x 2 = 125.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

728 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 26 Rows = 34,411.5 cf Chamber Storage
728 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 26 Rows = 35,916.2 cf Displacement

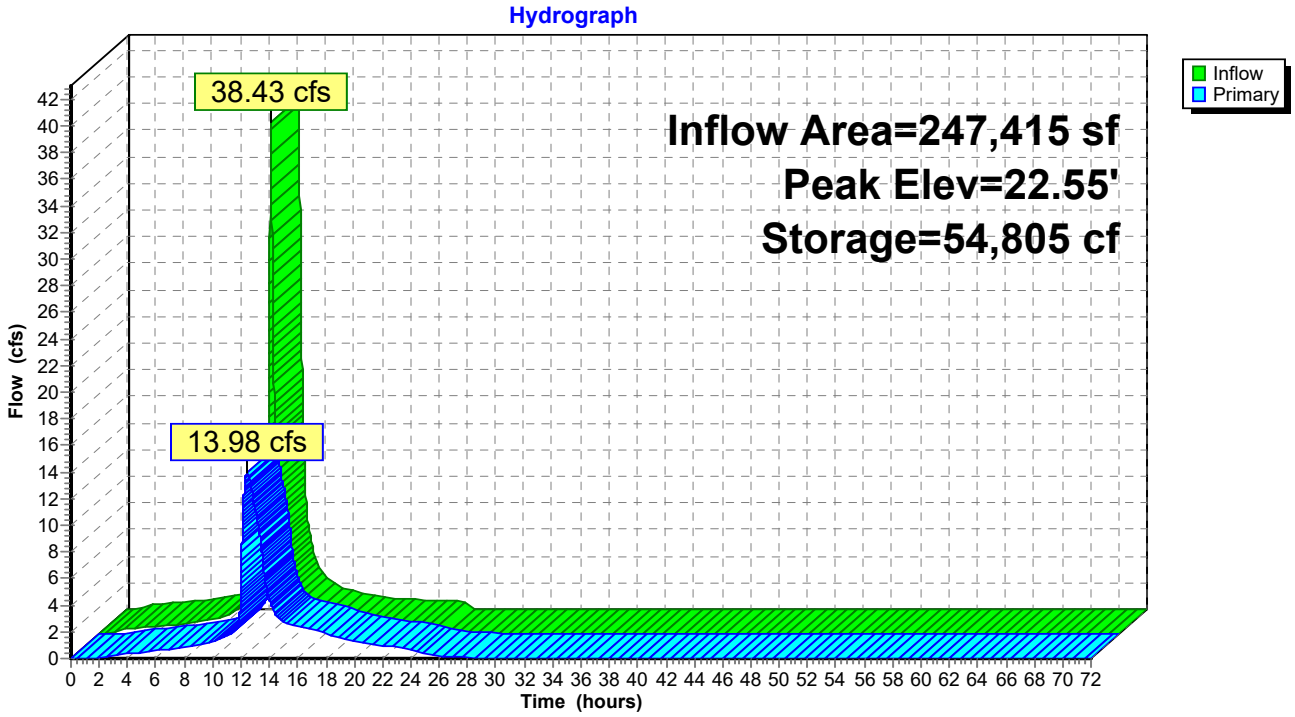
88,846.3 cf Field - 35,916.2 cf Chambers = 52,930.2 cf Stone x 40.0% Voids = 21,172.1 cf Stone Storage

Chamber Storage + Stone Storage = 55,583.6 cf = 1.276 af
Overall Storage Efficiency = 62.6%
Overall System Size = 201.58' x 125.03' x 3.52'

728 Chambers
3,290.6 cy Field
1,960.4 cy Stone



Pond 13P: Underground Basin

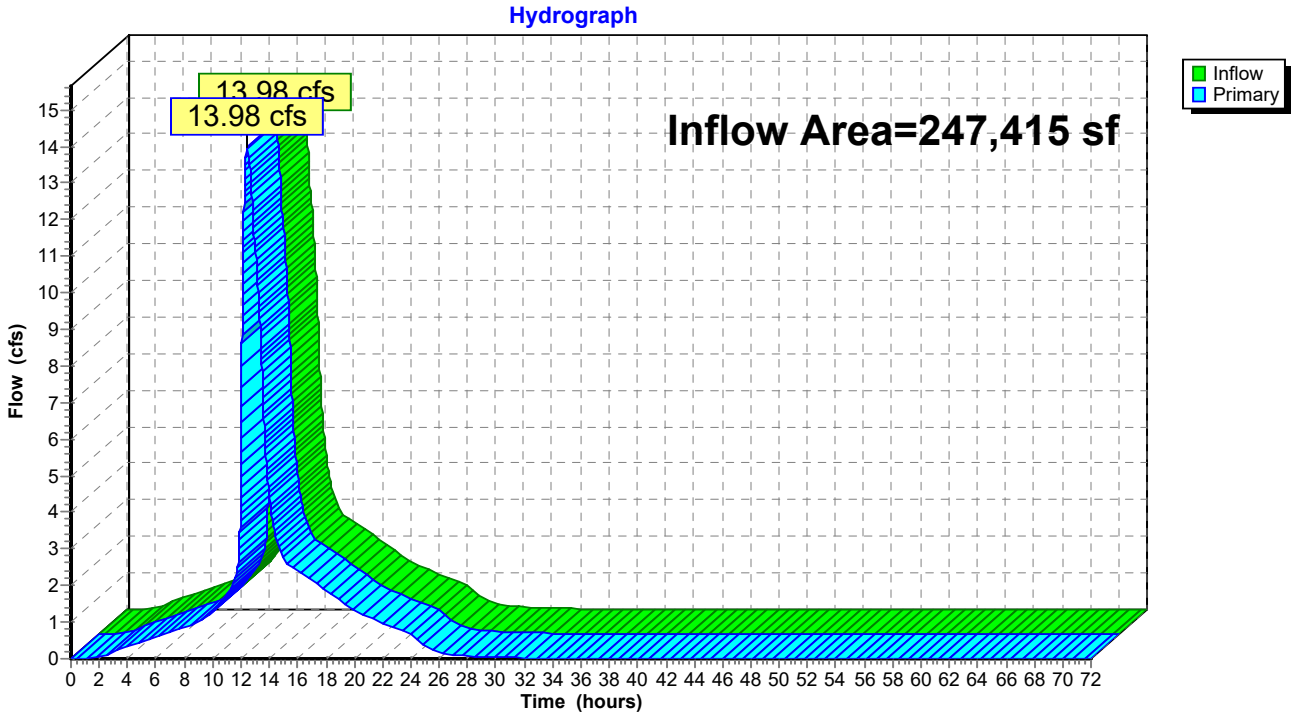


Summary for Link 3L: Pr. POA 1

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf
Primary = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf, Atten= 0%, Lag= 0.0 min

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

Link 3L: Pr. POA 1

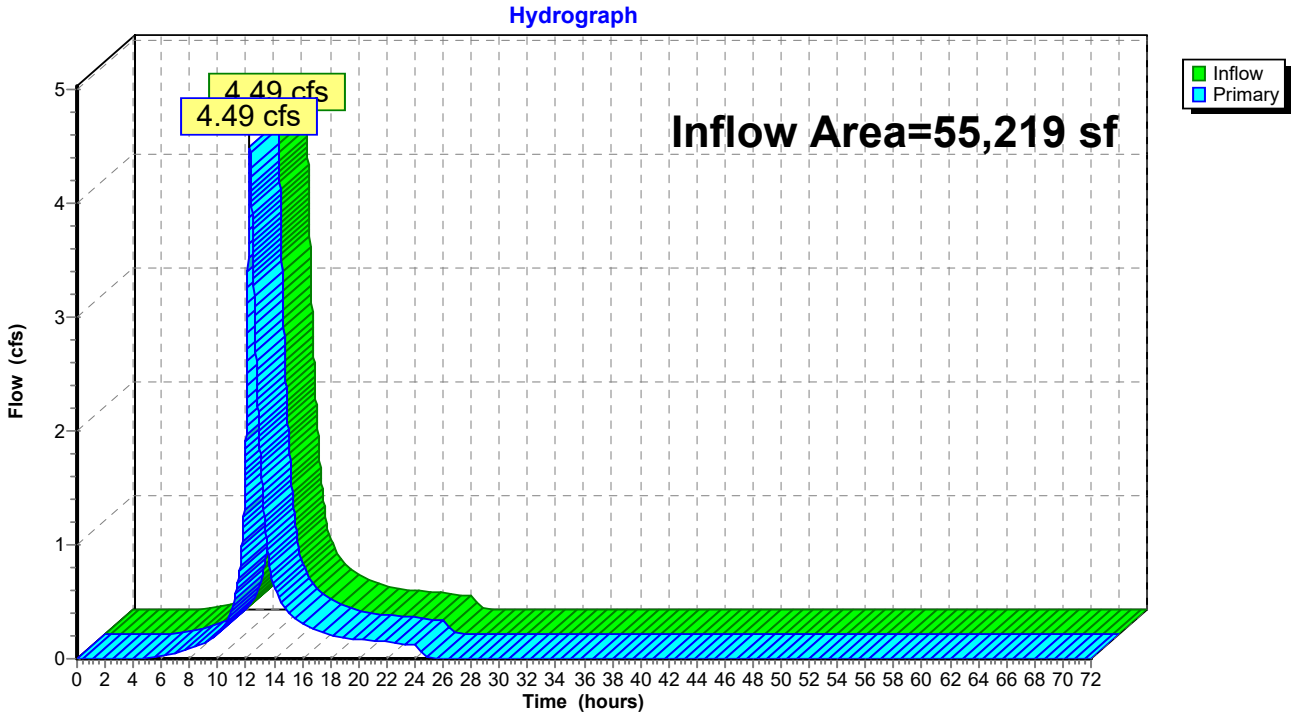


Summary for Link 6L: Pr. POA 2

Inflow Area = 55,219 sf, 3.04% Impervious, Inflow Depth = 6.34" for 100-Year event
Inflow = 4.49 cfs @ 12.28 hrs, Volume= 29,173 cf
Primary = 4.49 cfs @ 12.28 hrs, Volume= 29,173 cf, Atten= 0%, Lag= 0.0 min

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

Link 6L: Pr. POA 2

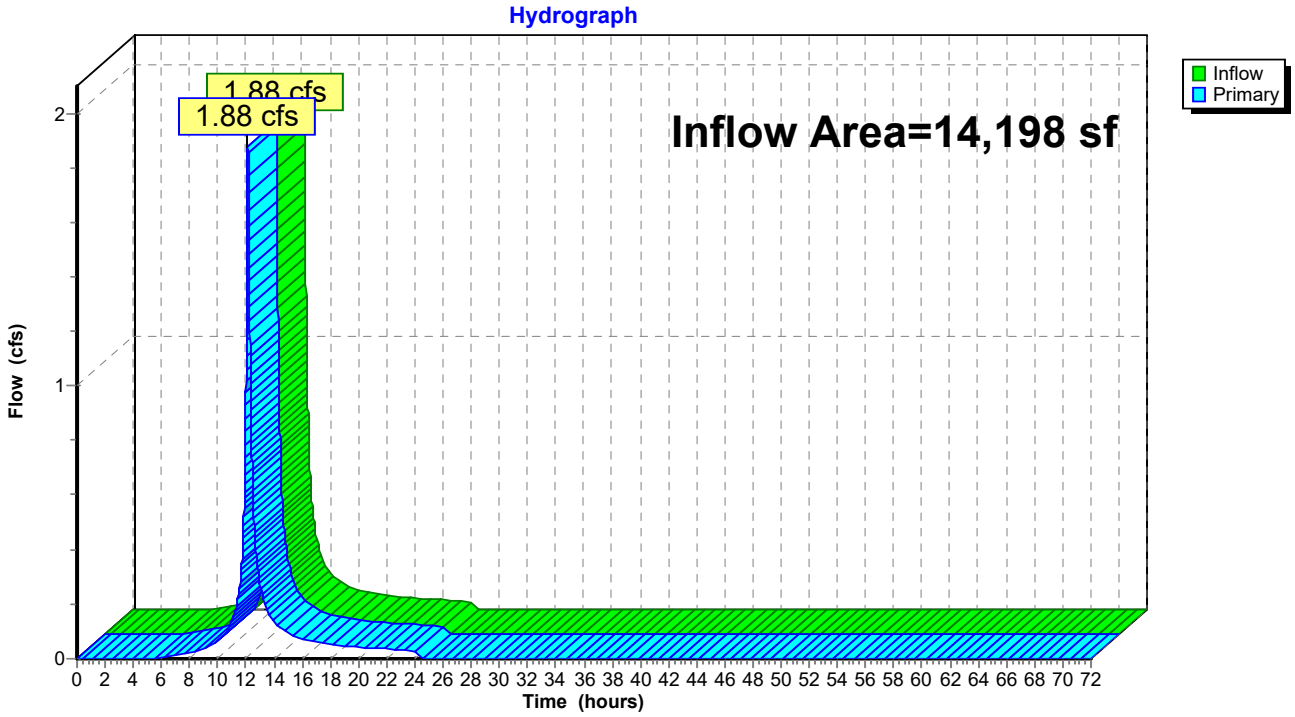


Summary for Link 9L: Pr POA 3

Inflow Area = 14,198 sf, 0.00% Impervious, Inflow Depth = 6.27" for 100-Year event
Inflow = 1.88 cfs @ 12.14 hrs, Volume= 7,414 cf
Primary = 1.88 cfs @ 12.14 hrs, Volume= 7,414 cf, Atten= 0%, Lag= 0.0 min

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

Link 9L: Pr POA 3

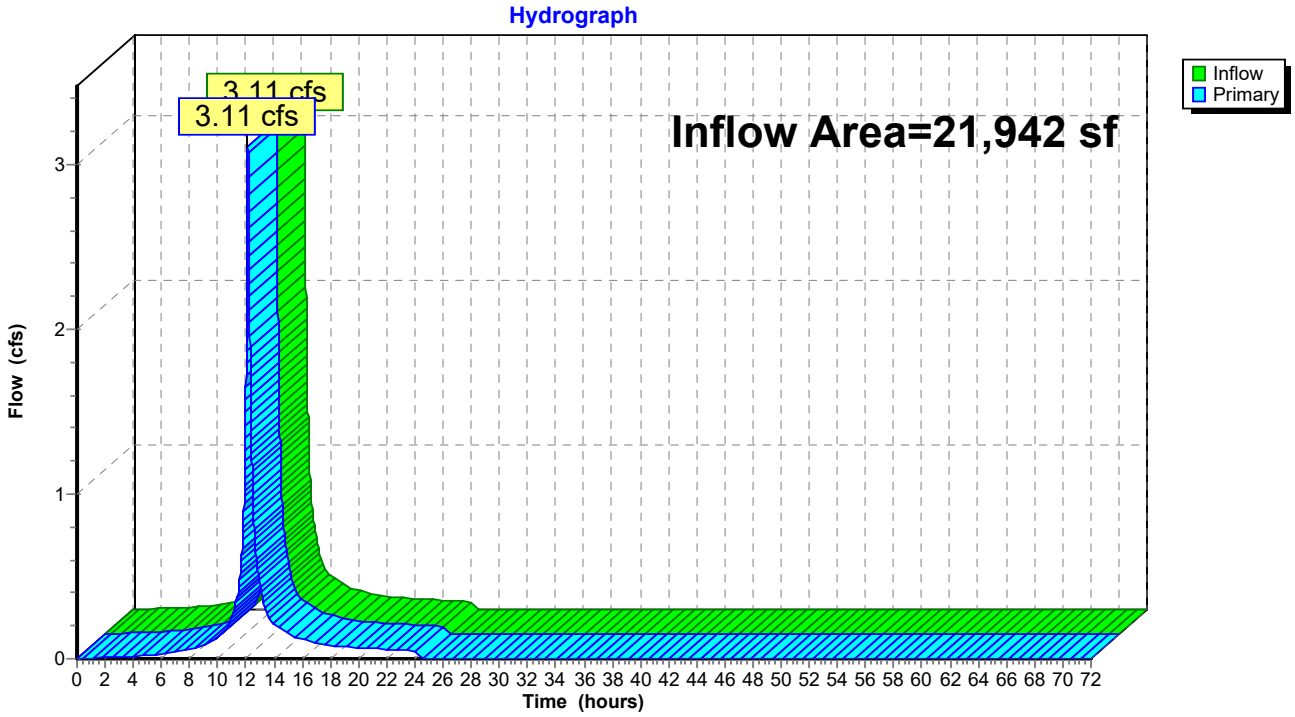


Summary for Link 12L: EX POA 4

Inflow Area = 21,942 sf, 21.78% Impervious, Inflow Depth = 6.99" for 100-Year event
Inflow = 3.11 cfs @ 12.14 hrs, Volume= 12,778 cf
Primary = 3.11 cfs @ 12.14 hrs, Volume= 12,778 cf, Atten= 0%, Lag= 0.0 min

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

Link 12L: EX POA 4



APPENDIX C-5
BMP DISCHARGE & STORAGE TABLES

Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 2.83" for 2-Year event
Inflow = 13.49 cfs @ 12.14 hrs, Volume= 58,304 cf
Outflow = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf, Atten= 82%, Lag= 36.5 min
Primary = 2.48 cfs @ 12.75 hrs, Volume= 58,163 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.41' @ 12.75 hrs Surf.Area= 25,205 sf Storage= 22,719 cf

Plug-Flow detention time= 145.2 min calculated for 58,155 cf (100% of inflow)
Center-of-Mass det. time= 143.9 min (914.9 - 770.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.48 cfs @ 12.75 hrs HW=20.41' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 2.48 cfs of 5.44 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 2.48 cfs @ 4.54 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 13P: Underground Basin - Chamber Wizard Field A

Chamber Model = Contech ChamberMaxx 2016 (Contech® ChamberMaxx® capped at 47.2cf for air pocket)
Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf
Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf
Row Length Adjustment= +0.32' x 6.63 sf x 26 rows

51.4" Wide + 5.6" Spacing = 57.0" C-C Row Spacing

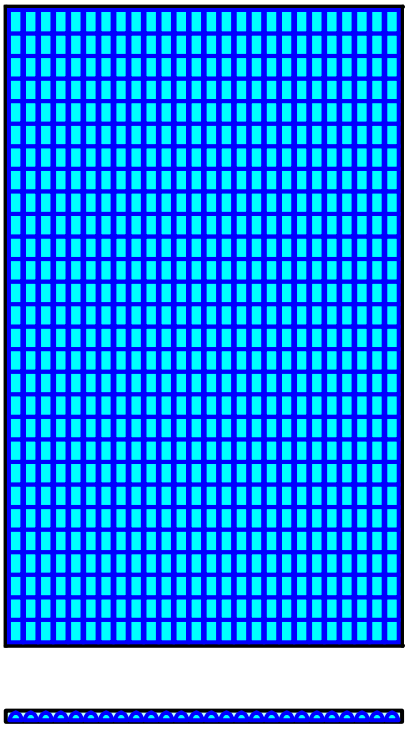
28 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 199.58' Row Length +12.0" End Stone x 2 = 201.58' Base Length
26 Rows x 51.4" Wide + 5.6" Spacing x 25 + 12.0" Side Stone x 2 = 125.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

728 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 26 Rows = 34,411.5 cf Chamber Storage
728 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 26 Rows = 35,916.2 cf Displacement

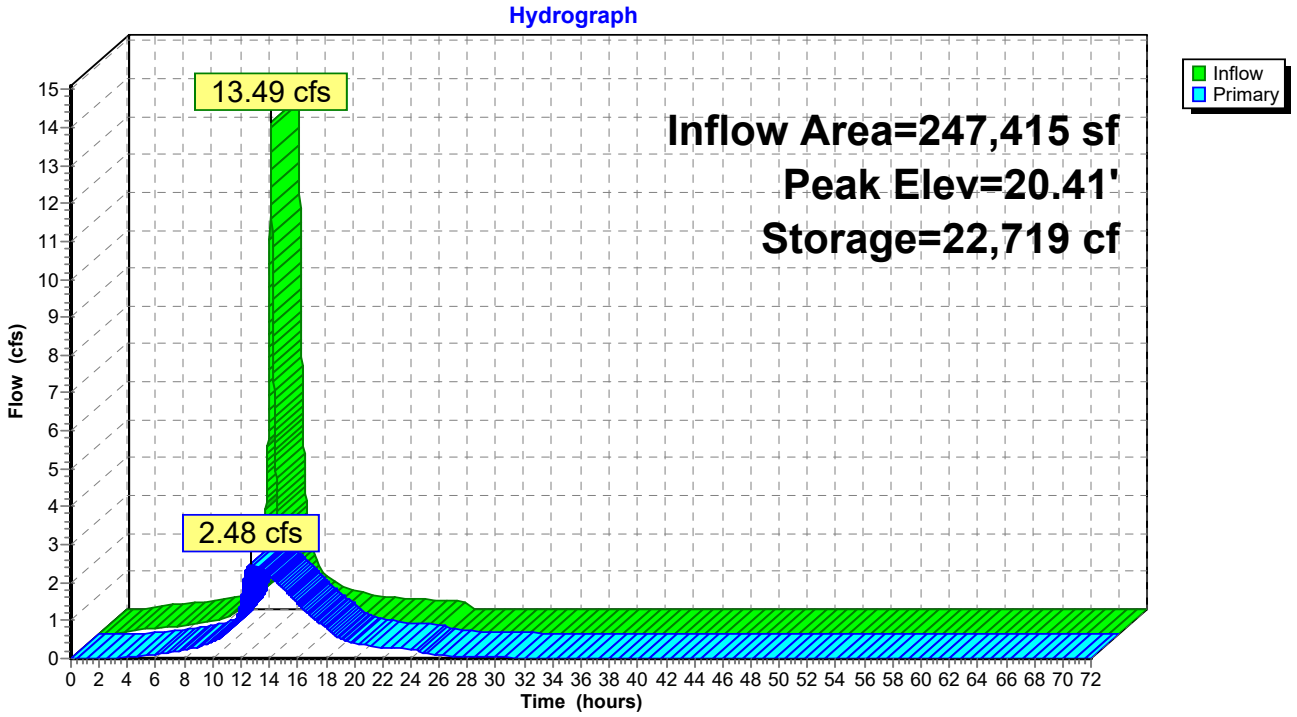
88,846.3 cf Field - 35,916.2 cf Chambers = 52,930.2 cf Stone x 40.0% Voids = 21,172.1 cf Stone Storage

Chamber Storage + Stone Storage = 55,583.6 cf = 1.276 af
Overall Storage Efficiency = 62.6%
Overall System Size = 201.58' x 125.03' x 3.52'

728 Chambers
3,290.6 cy Field
1,960.4 cy Stone



Pond 13P: Underground Basin



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 4.62" for 10-Year event
Inflow = 21.75 cfs @ 12.14 hrs, Volume= 95,162 cf
Outflow = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf, Atten= 69%, Lag= 21.0 min
Primary = 6.82 cfs @ 12.49 hrs, Volume= 95,020 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.96' @ 12.49 hrs Surf.Area= 25,205 sf Storage= 33,819 cf

Plug-Flow detention time= 129.1 min calculated for 95,007 cf (100% of inflow)
Center-of-Mass det. time= 128.5 min (891.3 - 762.8)

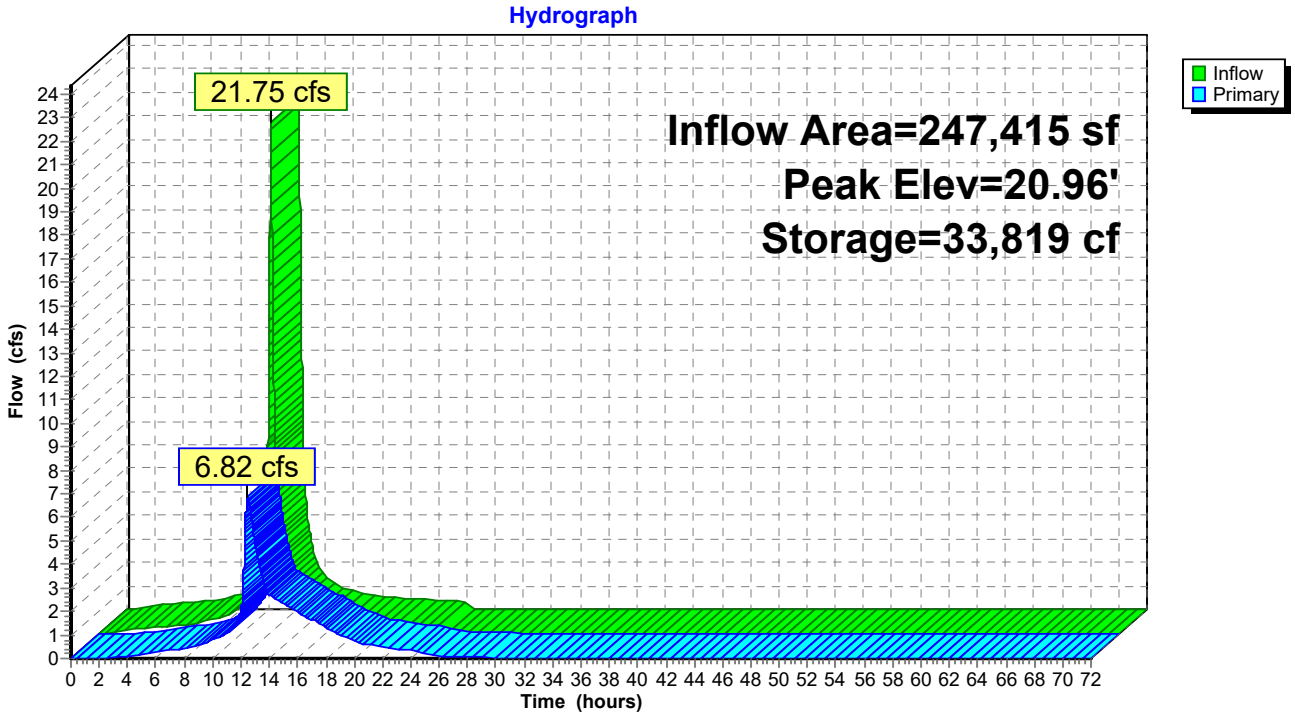
Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.82 cfs @ 12.49 hrs HW=20.96' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 6.82 cfs of 8.48 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 3.15 cfs @ 5.78 fps)
3=Broad-Crested Rectangular Weir (Weir Controls 3.67 cfs @ 2.00 fps)

Pond 13P: Underground Basin



Summary for Pond 13P: Underground Basin

Inflow Area = 247,415 sf, 80.12% Impervious, Inflow Depth = 8.26" for 100-Year event
Inflow = 38.43 cfs @ 12.14 hrs, Volume= 170,401 cf
Outflow = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf, Atten= 64%, Lag= 17.7 min
Primary = 13.98 cfs @ 12.43 hrs, Volume= 170,257 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.55' @ 12.43 hrs Surf.Area= 25,205 sf Storage= 54,805 cf

Plug-Flow detention time= 107.2 min calculated for 170,257 cf (100% of inflow)
Center-of-Mass det. time= 106.6 min (861.0 - 754.4)

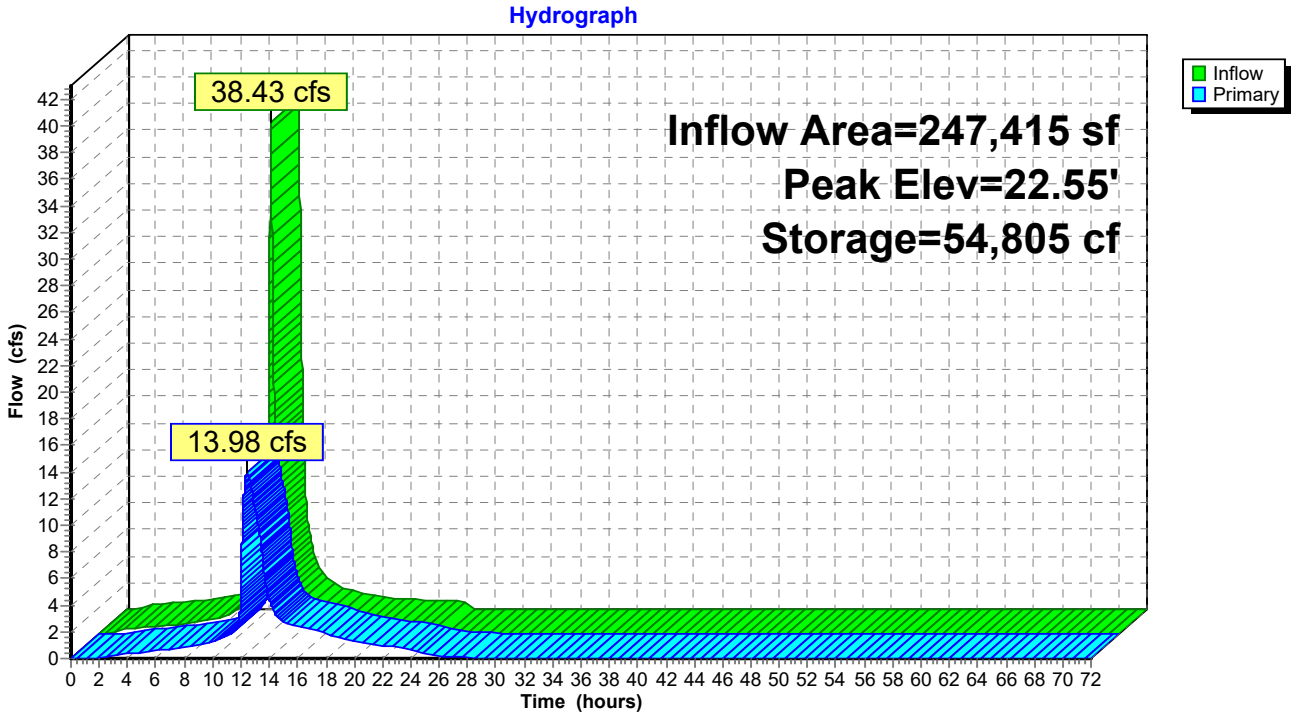
Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	21,172 cf	**125.03'W x 201.58'L x 3.52'H Field A** 88,846 cf Overall - 35,916 cf Embedded = 52,930 cf x 40.0% Voids
#2A	19.60'	34,412 cf	**Contech ChamberMaxx 2016** x 728 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 26 rows
		55,584 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	19.10'	**18.0" Round Culvert** L= 25.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 19.10' / 18.85' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	19.10'	**10.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	20.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=13.98 cfs @ 12.43 hrs HW=22.55' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 13.98 cfs @ 7.91 fps)
↑**2=Orifice/Grate** (Passes < 4.57 cfs potential flow)
3=Broad-Crested Rectangular Weir (Passes < 38.91 cfs potential flow)

Pond 13P: Underground Basin



Hydrograph for Pond 13P: Underground Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	19.10	0.00
0.20	0.00	0	19.10	0.00
0.40	0.00	0	19.10	0.00
0.60	0.03	6	19.10	0.00
0.80	0.09	49	19.10	0.00
1.00	0.16	141	19.11	0.00
1.20	0.21	273	19.13	0.00
1.40	0.26	439	19.14	0.01
1.60	0.30	631	19.16	0.02
1.80	0.33	841	19.18	0.03
2.00	0.36	1,063	19.21	0.04
2.20	0.39	1,293	19.23	0.06
2.40	0.41	1,525	19.25	0.09
2.60	0.43	1,755	19.27	0.12
2.80	0.45	1,979	19.30	0.15
3.00	0.47	2,194	19.32	0.18
3.20	0.49	2,399	19.34	0.21
3.40	0.51	2,592	19.36	0.25
3.60	0.52	2,774	19.38	0.28
3.80	0.54	2,942	19.39	0.31
4.00	0.55	3,098	19.41	0.34
4.20	0.57	3,242	19.42	0.37
4.40	0.58	3,375	19.43	0.40
4.60	0.60	3,499	19.45	0.43
4.80	0.61	3,615	19.46	0.46
5.00	0.63	3,724	19.47	0.48
5.20	0.65	3,827	19.48	0.51
5.40	0.66	3,924	19.49	0.53
5.60	0.68	4,015	19.50	0.55
5.80	0.69	4,102	19.51	0.57
6.00	0.71	4,184	19.52	0.60
6.20	0.74	4,267	19.52	0.62
6.40	0.78	4,360	19.53	0.64
6.60	0.82	4,465	19.54	0.67
6.80	0.86	4,580	19.55	0.70
7.00	0.91	4,704	19.57	0.73
7.20	0.95	4,835	19.58	0.77
7.40	1.00	4,972	19.59	0.80
7.60	1.04	5,116	19.60	0.83
7.80	1.09	5,277	19.61	0.85
8.00	1.13	5,456	19.62	0.87
8.20	1.18	5,652	19.63	0.90
8.40	1.23	5,862	19.64	0.92
8.60	1.27	6,086	19.65	0.95
8.80	1.32	6,323	19.66	0.98
9.00	1.37	6,572	19.67	1.01
9.20	1.47	6,846	19.68	1.05
9.40	1.62	7,186	19.69	1.09
9.60	1.77	7,599	19.71	1.14
9.80	1.92	8,081	19.73	1.21
10.00	2.08	8,628	19.76	1.28
10.20	2.23	9,234	19.79	1.35
10.40	2.39	9,897	19.81	1.43

Hydrograph for Pond 13P: Underground Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.60	2.63	10,625	19.85	1.52
10.80	3.12	11,555	19.89	1.62
11.00	3.68	12,796	19.95	1.72
11.20	4.48	14,420	20.02	1.86
11.40	5.46	16,587	20.12	2.04
11.60	7.14	19,415	20.25	2.25
11.80	10.20	23,751	20.46	2.55
12.00	**21.07**	31,528	20.84	5.30
12.20	**32.19**	47,811	21.83	11.97
12.40	15.59	**54,711**	**22.54**	**13.95**
12.60	9.10	**53,295**	**22.40**	**13.58**
12.80	6.47	49,326	22.00	12.48
13.00	5.25	45,051	21.58	11.20
13.20	4.30	40,804	21.33	10.05
13.40	3.64	36,843	21.12	8.87
13.60	3.05	33,626	20.95	6.68
13.80	2.70	31,434	20.83	5.25
14.00	2.52	29,866	20.76	4.39
14.20	2.36	28,677	20.70	3.83
14.40	2.20	27,711	20.65	3.43
14.60	2.04	26,875	20.61	3.14
14.80	1.88	26,115	20.57	2.90
15.00	1.72	25,389	20.53	2.72
15.20	1.58	24,661	20.50	2.60
15.40	1.52	23,917	20.46	2.56
15.60	1.47	23,170	20.43	2.51
15.80	1.42	22,425	20.39	2.46
16.00	1.38	21,683	20.36	2.41
16.20	1.34	20,946	20.32	2.36
16.40	1.29	20,213	20.29	2.31
16.60	1.24	19,484	20.25	2.25
16.80	1.20	18,760	20.22	2.20
17.00	1.16	18,043	20.19	2.15
17.20	1.11	17,331	20.15	2.10
17.40	1.07	16,626	20.12	2.04
17.60	1.02	15,927	20.09	1.99
17.80	0.98	15,235	20.06	1.93
18.00	0.93	14,553	20.03	1.87
18.20	0.89	13,881	20.00	1.82
18.40	0.88	13,229	19.97	1.76
18.60	0.86	12,609	19.94	1.70
18.80	0.85	12,016	19.91	1.66
19.00	0.84	11,450	19.88	1.61
19.20	0.83	10,915	19.86	1.55
19.40	0.82	10,412	19.84	1.49
19.60	0.81	9,942	19.82	1.44
19.80	0.80	9,503	19.80	1.39
20.00	0.78	9,093	19.78	1.33
20.20	0.77	8,711	19.76	1.29
20.40	0.76	8,354	19.75	1.24
20.60	0.75	8,021	19.73	1.20
20.80	0.74	7,710	19.72	1.16
21.00	0.73	7,418	19.70	1.12

Hydrograph for Pond 13P: Underground Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
21.20	0.72	7,144	19.69	1.09
21.40	0.71	6,886	19.68	1.05
21.60	0.69	6,644	19.67	1.02
21.80	0.68	6,414	19.66	0.99
22.00	0.67	6,198	19.65	0.97
22.20	0.66	5,992	19.64	0.94
22.40	0.65	5,796	19.63	0.92
22.60	0.64	5,609	19.62	0.89
22.80	0.63	5,430	19.62	0.87
23.00	0.62	5,259	19.61	0.85
23.20	0.61	5,095	19.60	0.83
23.40	0.59	4,940	19.59	0.79
23.60	0.58	4,804	19.58	0.76
23.80	0.57	4,686	19.56	0.73
24.00	0.56	4,581	19.55	0.70
24.20	0.14	4,354	19.53	0.64
24.40	0.02	3,975	19.49	0.54
24.60	0.00	3,620	19.46	0.46
24.80	0.00	3,315	19.43	0.39
25.00	0.00	3,054	19.40	0.34
25.20	0.00	2,829	19.38	0.29
25.40	0.00	2,633	19.36	0.25
25.60	0.00	2,461	19.34	0.22
25.80	0.00	2,310	19.33	0.20
26.00	0.00	2,175	19.32	0.18
26.20	0.00	2,054	19.30	0.16
26.40	0.00	1,945	19.29	0.14
26.60	0.00	1,847	19.28	0.13
26.80	0.00	1,758	19.27	0.12
27.00	0.00	1,677	19.27	0.11
27.20	0.00	1,603	19.26	0.10
27.40	0.00	1,535	19.25	0.09
27.60	0.00	1,472	19.25	0.08
27.80	0.00	1,415	19.24	0.08
28.00	0.00	1,361	19.23	0.07
28.20	0.00	1,311	19.23	0.07
28.40	0.00	1,265	19.23	0.06
28.60	0.00	1,221	19.22	0.06
28.80	0.00	1,181	19.22	0.05
29.00	0.00	1,143	19.21	0.05
29.20	0.00	1,107	19.21	0.05
29.40	0.00	1,074	19.21	0.05
29.60	0.00	1,042	19.20	0.04
29.80	0.00	1,012	19.20	0.04
30.00	0.00	984	19.20	0.04
30.20	0.00	958	19.19	0.04
30.40	0.00	932	19.19	0.03
30.60	0.00	908	19.19	0.03
30.80	0.00	885	19.19	0.03
31.00	0.00	864	19.19	0.03
31.20	0.00	843	19.18	0.03
31.40	0.00	823	19.18	0.03
31.60	0.00	804	19.18	0.03

Hydrograph for Pond 13P: Underground Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
31.80	0.00	786	19.18	0.02
32.00	0.00	769	19.18	0.02
32.20	0.00	753	19.17	0.02
32.40	0.00	737	19.17	0.02
32.60	0.00	722	19.17	0.02
32.80	0.00	707	19.17	0.02
33.00	0.00	693	19.17	0.02
33.20	0.00	679	19.17	0.02
33.40	0.00	666	19.17	0.02
33.60	0.00	654	19.16	0.02
33.80	0.00	642	19.16	0.02
34.00	0.00	630	19.16	0.02
34.20	0.00	619	19.16	0.02
34.40	0.00	608	19.16	0.01
34.60	0.00	598	19.16	0.01
34.80	0.00	588	19.16	0.01
35.00	0.00	578	19.16	0.01
35.20	0.00	569	19.16	0.01
35.40	0.00	559	19.16	0.01
35.60	0.00	551	19.15	0.01
35.80	0.00	542	19.15	0.01
36.00	0.00	534	19.15	0.01
36.20	0.00	526	19.15	0.01
36.40	0.00	518	19.15	0.01
36.60	0.00	510	19.15	0.01
36.80	0.00	503	19.15	0.01
37.00	0.00	496	19.15	0.01
37.20	0.00	489	19.15	0.01
37.40	0.00	482	19.15	0.01
37.60	0.00	475	19.15	0.01
37.80	0.00	469	19.15	0.01
38.00	0.00	463	19.15	0.01
38.20	0.00	456	19.15	0.01
38.40	0.00	450	19.14	0.01
38.60	0.00	445	19.14	0.01
38.80	0.00	439	19.14	0.01
39.00	0.00	434	19.14	0.01
39.20	0.00	428	19.14	0.01
39.40	0.00	423	19.14	0.01
39.60	0.00	418	19.14	0.01
39.80	0.00	413	19.14	0.01
40.00	0.00	408	19.14	0.01
40.20	0.00	403	19.14	0.01
40.40	0.00	399	19.14	0.01
40.60	0.00	394	19.14	0.01
40.80	0.00	390	19.14	0.01
41.00	0.00	385	19.14	0.01
41.20	0.00	381	19.14	0.01
41.40	0.00	377	19.14	0.01
41.60	0.00	373	19.14	0.01
41.80	0.00	369	19.14	0.01
42.00	0.00	365	19.14	0.01
42.20	0.00	361	19.14	0.01

Hydrograph for Pond 13P: Underground Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
42.40	0.00	357	19.14	0.01
42.60	0.00	354	19.14	0.01
42.80	0.00	350	19.13	0.00
43.00	0.00	347	19.13	0.00
43.20	0.00	343	19.13	0.00
43.40	0.00	340	19.13	0.00
43.60	0.00	336	19.13	0.00
43.80	0.00	333	19.13	0.00
44.00	0.00	330	19.13	0.00
44.20	0.00	327	19.13	0.00
44.40	0.00	324	19.13	0.00
44.60	0.00	321	19.13	0.00
44.80	0.00	318	19.13	0.00
45.00	0.00	315	19.13	0.00
45.20	0.00	312	19.13	0.00
45.40	0.00	309	19.13	0.00
45.60	0.00	307	19.13	0.00
45.80	0.00	304	19.13	0.00
46.00	0.00	301	19.13	0.00
46.20	0.00	299	19.13	0.00
46.40	0.00	296	19.13	0.00
46.60	0.00	293	19.13	0.00
46.80	0.00	291	19.13	0.00
47.00	0.00	289	19.13	0.00
47.20	0.00	286	19.13	0.00
47.40	0.00	284	19.13	0.00
47.60	0.00	281	19.13	0.00
47.80	0.00	279	19.13	0.00
48.00	0.00	277	19.13	0.00
48.20	0.00	275	19.13	0.00
48.40	0.00	273	19.13	0.00
48.60	0.00	270	19.13	0.00
48.80	0.00	268	19.13	0.00
49.00	0.00	266	19.13	0.00
49.20	0.00	264	19.13	0.00
49.40	0.00	262	19.13	0.00
49.60	0.00	260	19.13	0.00
49.80	0.00	258	19.13	0.00
50.00	0.00	256	19.13	0.00
50.20	0.00	254	19.13	0.00
50.40	0.00	253	19.13	0.00
50.60	0.00	251	19.12	0.00
50.80	0.00	249	19.12	0.00
51.00	0.00	247	19.12	0.00
51.20	0.00	245	19.12	0.00
51.40	0.00	244	19.12	0.00
51.60	0.00	242	19.12	0.00
51.80	0.00	240	19.12	0.00
52.00	0.00	239	19.12	0.00
52.20	0.00	237	19.12	0.00
52.40	0.00	235	19.12	0.00
52.60	0.00	234	19.12	0.00
52.80	0.00	232	19.12	0.00

Hydrograph for Pond 13P: Underground Basin (continued)

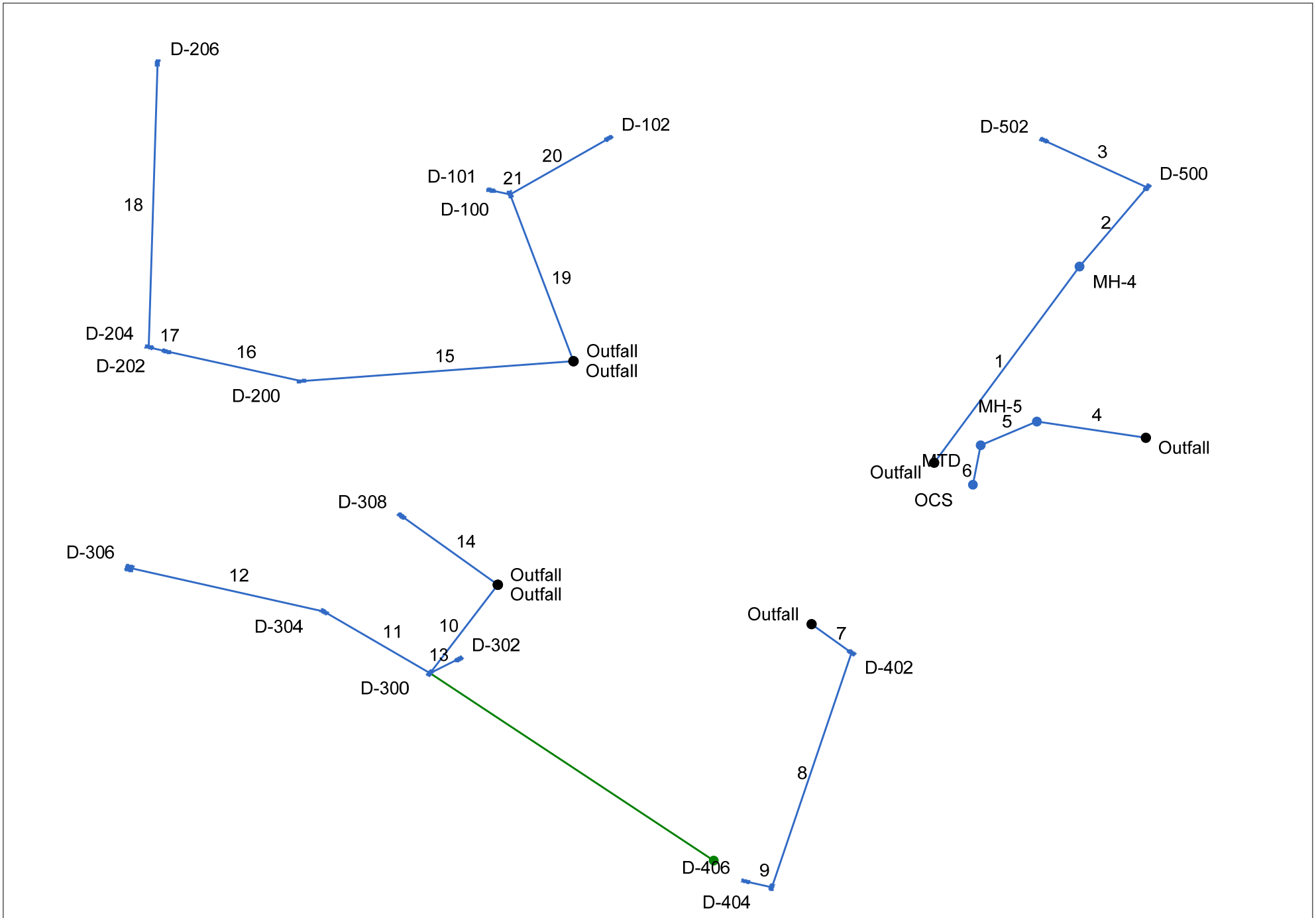
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
53.00	0.00	231	19.12	0.00
53.20	0.00	229	19.12	0.00
53.40	0.00	228	19.12	0.00
53.60	0.00	226	19.12	0.00
53.80	0.00	225	19.12	0.00
54.00	0.00	224	19.12	0.00
54.20	0.00	222	19.12	0.00
54.40	0.00	221	19.12	0.00
54.60	0.00	219	19.12	0.00
54.80	0.00	218	19.12	0.00
55.00	0.00	217	19.12	0.00
55.20	0.00	215	19.12	0.00
55.40	0.00	214	19.12	0.00
55.60	0.00	213	19.12	0.00
55.80	0.00	211	19.12	0.00
56.00	0.00	210	19.12	0.00
56.20	0.00	209	19.12	0.00
56.40	0.00	208	19.12	0.00
56.60	0.00	207	19.12	0.00
56.80	0.00	205	19.12	0.00
57.00	0.00	204	19.12	0.00
57.20	0.00	203	19.12	0.00
57.40	0.00	202	19.12	0.00
57.60	0.00	201	19.12	0.00
57.80	0.00	200	19.12	0.00
58.00	0.00	199	19.12	0.00
58.20	0.00	197	19.12	0.00
58.40	0.00	196	19.12	0.00
58.60	0.00	195	19.12	0.00
58.80	0.00	194	19.12	0.00
59.00	0.00	193	19.12	0.00
59.20	0.00	192	19.12	0.00
59.40	0.00	191	19.12	0.00
59.60	0.00	190	19.12	0.00
59.80	0.00	189	19.12	0.00
60.00	0.00	188	19.12	0.00
60.20	0.00	187	19.12	0.00
60.40	0.00	186	19.12	0.00
60.60	0.00	185	19.12	0.00
60.80	0.00	184	19.12	0.00
61.00	0.00	183	19.12	0.00
61.20	0.00	183	19.12	0.00
61.40	0.00	182	19.12	0.00
61.60	0.00	181	19.12	0.00
61.80	0.00	180	19.12	0.00
62.00	0.00	179	19.12	0.00
62.20	0.00	178	19.12	0.00
62.40	0.00	177	19.12	0.00
62.60	0.00	176	19.12	0.00
62.80	0.00	176	19.12	0.00
63.00	0.00	175	19.12	0.00
63.20	0.00	174	19.12	0.00
63.40	0.00	173	19.12	0.00

Hydrograph for Pond 13P: Underground Basin (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
63.60	0.00	172	19.12	0.00
63.80	0.00	171	19.12	0.00
64.00	0.00	171	19.12	0.00
64.20	0.00	170	19.12	0.00
64.40	0.00	169	19.12	0.00
64.60	0.00	168	19.12	0.00
64.80	0.00	168	19.12	0.00
65.00	0.00	167	19.12	0.00
65.20	0.00	166	19.12	0.00
65.40	0.00	165	19.12	0.00
65.60	0.00	165	19.12	0.00
65.80	0.00	164	19.12	0.00
66.00	0.00	163	19.12	0.00
66.20	0.00	162	19.12	0.00
66.40	0.00	162	19.12	0.00
66.60	0.00	161	19.12	0.00
66.80	0.00	160	19.12	0.00
67.00	0.00	160	19.12	0.00
67.20	0.00	159	19.12	0.00
67.40	0.00	158	19.12	0.00
67.60	0.00	158	19.12	0.00
67.80	0.00	157	19.12	0.00
68.00	0.00	156	19.12	0.00
68.20	0.00	156	19.12	0.00
68.40	0.00	155	19.12	0.00
68.60	0.00	154	19.12	0.00
68.80	0.00	154	19.12	0.00
69.00	0.00	153	19.12	0.00
69.20	0.00	152	19.12	0.00
69.40	0.00	152	19.12	0.00
69.60	0.00	151	19.11	0.00
69.80	0.00	151	19.11	0.00
70.00	0.00	150	19.11	0.00
70.20	0.00	149	19.11	0.00
70.40	0.00	149	19.11	0.00
70.60	0.00	148	19.11	0.00
70.80	0.00	148	19.11	0.00
71.00	0.00	147	19.11	0.00
71.20	0.00	146	19.11	0.00
71.40	0.00	146	19.11	0.00
71.60	0.00	145	19.11	0.00
71.80	0.00	145	19.11	0.00
72.00	0.00	144	19.11	0.00

APPENDIX C-6
HYDRAFLOW ROUTING DIAGRAM

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 2020-12-27_Hydroflow Design.stm	Number of lines: 21	Date: 12/29/2020

APPENDIX C-7
PIPE CONVEYANCE SUMMARY

SED

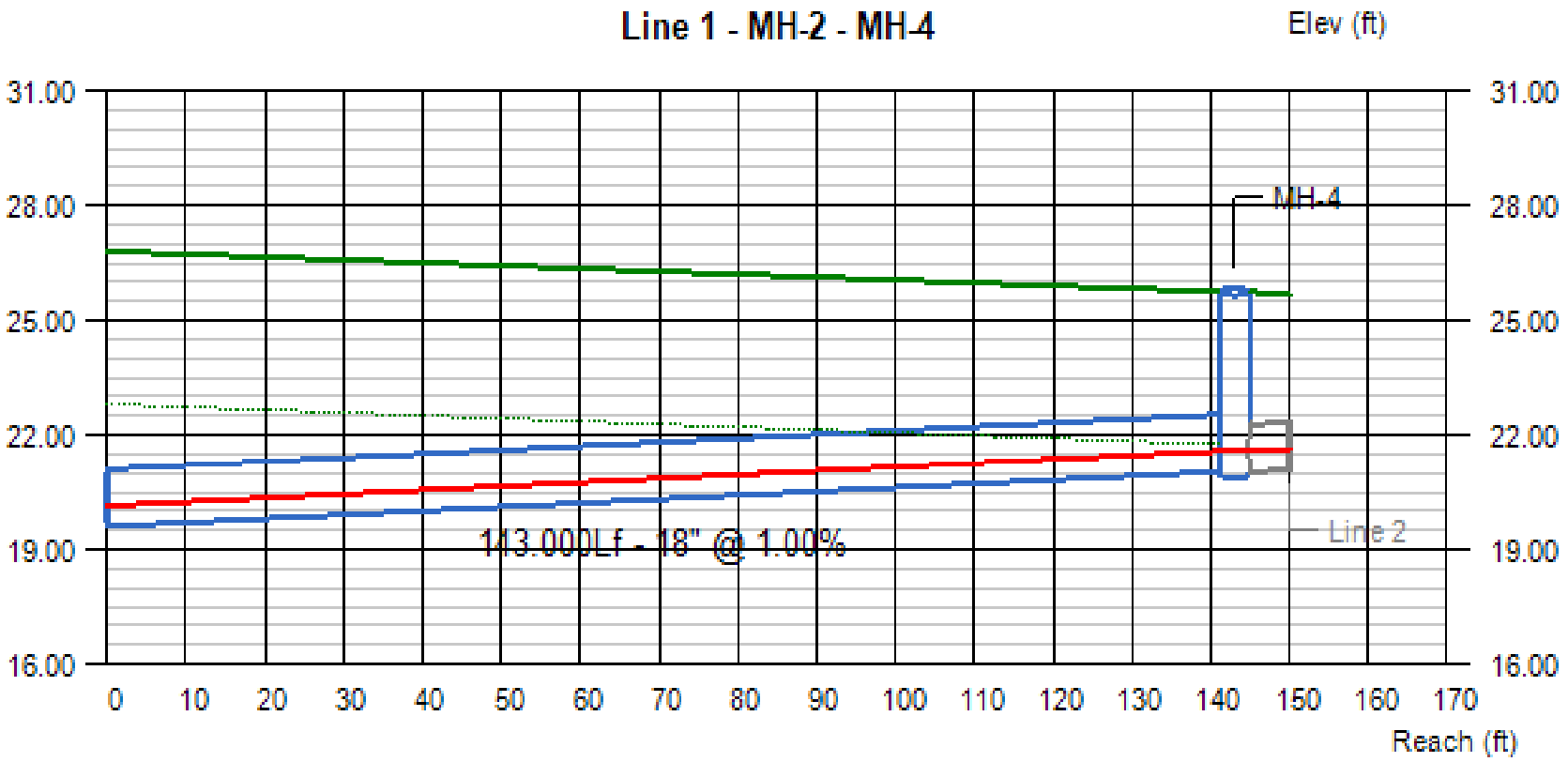
Line No.	Line ID	Gnd/Rim El Dn (ft)	Gnd/Rim El Up (ft)	Invert Dn (ft)	Invert Up (ft)	Line Size (in)	Line Length (ft)	Flow Rate (cfs)	Vel Dn (ft/s)	Capac Full (cfs)	HGL Dn (ft)	HGL Up (ft)	Drng Area (ac)	Runoff Coeff (C)	Tc (min)	i Inlet (in/hr)	n-val Pipe	i Sys (in/hr)
1	MH-2 - MH-4	26.80	25.75	19.60	21.03	18	143.000	2.07	3.61	12.41	20.14	21.57	0.00	0.00	10.6	0.00	0.011	6.33
2	MH-4 - D-500	25.75	24.70	21.03	21.63	15	60.000	2.08	4.09	7.63	21.57	22.21	0.16	0.94	10.4	6.47	0.011	6.38
3	D-500 - D502	24.70	25.25	21.63	22.23	15	60.000	1.14	2.06	7.63	22.21	22.65 j	0.22	0.80	10.0	6.47	0.011	6.47
4	OF - MH-5	14.75	25.75	14.95	15.53	18	56.000	9.96	5.64	12.63	16.44	16.75 j	0.00	0.00	10.1	0.00	0.011	0.00
5	MH-5 - MTD	25.75	26.80	15.53	15.85	18	32.000	9.96	6.49	12.41	16.75	17.07	0.00	0.00	10.1	0.00	0.011	0.00
6	MTD - OCS	26.80	26.25	18.85	19.10	18	25.000	9.96	7.81	12.41	19.87	20.32	0.00	0.00	10.0	0.00	0.011	0.00
7	D-400 - D-402	24.20	24.40	19.60	19.80	18	27.000	1.66	1.03	10.68	20.89	20.28	0.00	0.00	10.8	0.00	0.011	6.30
8	D-402 - D-404	24.40	23.75	19.80	20.95	15	152.000	1.70	3.87	6.64	20.28	21.47	0.14	0.97	10.1	6.47	0.011	6.44
9	D-404 - D-406	23.75	24.25	20.95	21.06	15	14.000	0.82	1.72	6.76	21.47	21.42 j	0.13	0.98	10.0	6.47	0.011	6.47
10	MH-3 - D-300	25.40	23.30	19.60	19.92	15	65.000	5.32	5.32	5.35	20.55	20.96	0.11	0.98	12.2	6.47	0.011	6.01
11	D-300 - D-304	23.30	24.20	19.92	20.25	15	66.000	1.97	1.61	5.40	21.79	21.84	0.12	0.97	11.5	6.47	0.011	6.14
12	D-304 - D-306	24.20	24.65	20.25	20.76	15	102.000	1.32	1.08	5.40	21.86	21.89	0.23	0.89	10.0	6.47	0.011	6.47
13	D-302 - D-300	23.30	22.50	19.92	20.00	15	17.000	2.95	2.40	5.24	21.79	21.82	0.48	0.95	10.0	6.47	0.011	6.47
14	D-308 - MH-3	25.40	24.95	19.60	21.23	15	65.000	1.17	3.12	12.09	20.03	21.66 j	0.19	0.95	10.0	6.47	0.011	6.47
15	MH-1 - D-200	27.00	24.65	19.60	20.98	15	138.000	5.30	5.41	7.63	20.53	21.91	0.31	0.94	11.9	6.47	0.011	6.08
16	D-200 - D-202	24.65	25.05	20.98	21.69	15	71.000	3.56	3.62	7.63	21.91	22.45 j	0.21	0.97	11.6	6.47	0.011	6.14
17	D-202 - D-204	25.05	24.90	21.69	21.79	15	9.000	2.31	2.95	8.04	22.45	22.40 j	0.28	0.96	11.5	6.47	0.011	6.15
18	D-204 - D-206	24.90	26.95	21.79	23.13	15	178.000	0.69	1.17	6.62	22.40	23.45 j	0.12	0.89	10.0	6.47	0.011	6.47
19	MH-1 - D-100	27.00	26.65	21.10	22.83	15	109.000	4.57	5.01	9.61	21.97	23.70 j	0.18	0.98	10.7	6.47	0.011	6.31
20	D-100 - D-102	26.65	27.35	22.83	24.05	15	61.000	0.38	0.42	10.79	23.70	24.29 j	0.07	0.84	10.0	6.47	0.011	6.47
21	D-101 - D-100	26.65	26.10	22.83	23.03	15	10.000	3.16	3.49	10.79	23.70	23.75 j	0.52	0.94	10.0	6.47	0.011	6.47

Project File: 2020-12-27_Hydroflow Design.stm | Number of lines: 21 | Date: 12/29/2020

NOTES: Intensity = 182.59 / (Inlet time + 19.10) ^ 0.99 -- Return period = 25 Yrs. ; ** Critical depth

APPENDIX C-8
PIPE PROFILES

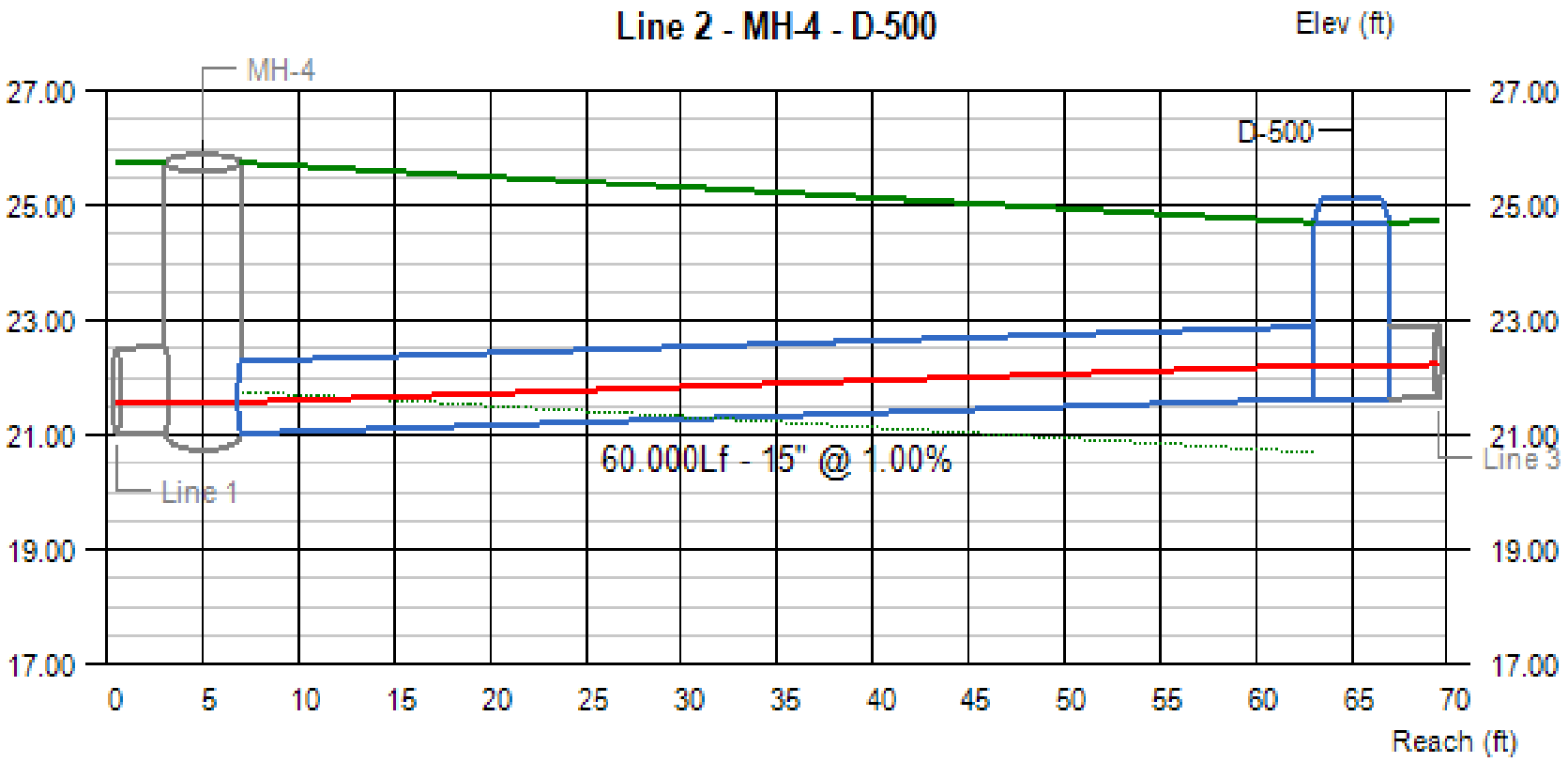
Line Profile (Line 1) - MH-2 - MH-4



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
1	2.07	19.60	21.03	0.54	0.54	0.54	20.14	21.57	21.57	3.61	3.59	5.70	3.22

Project File: | No. Lines: 21 | Run Date: 12/29/2020

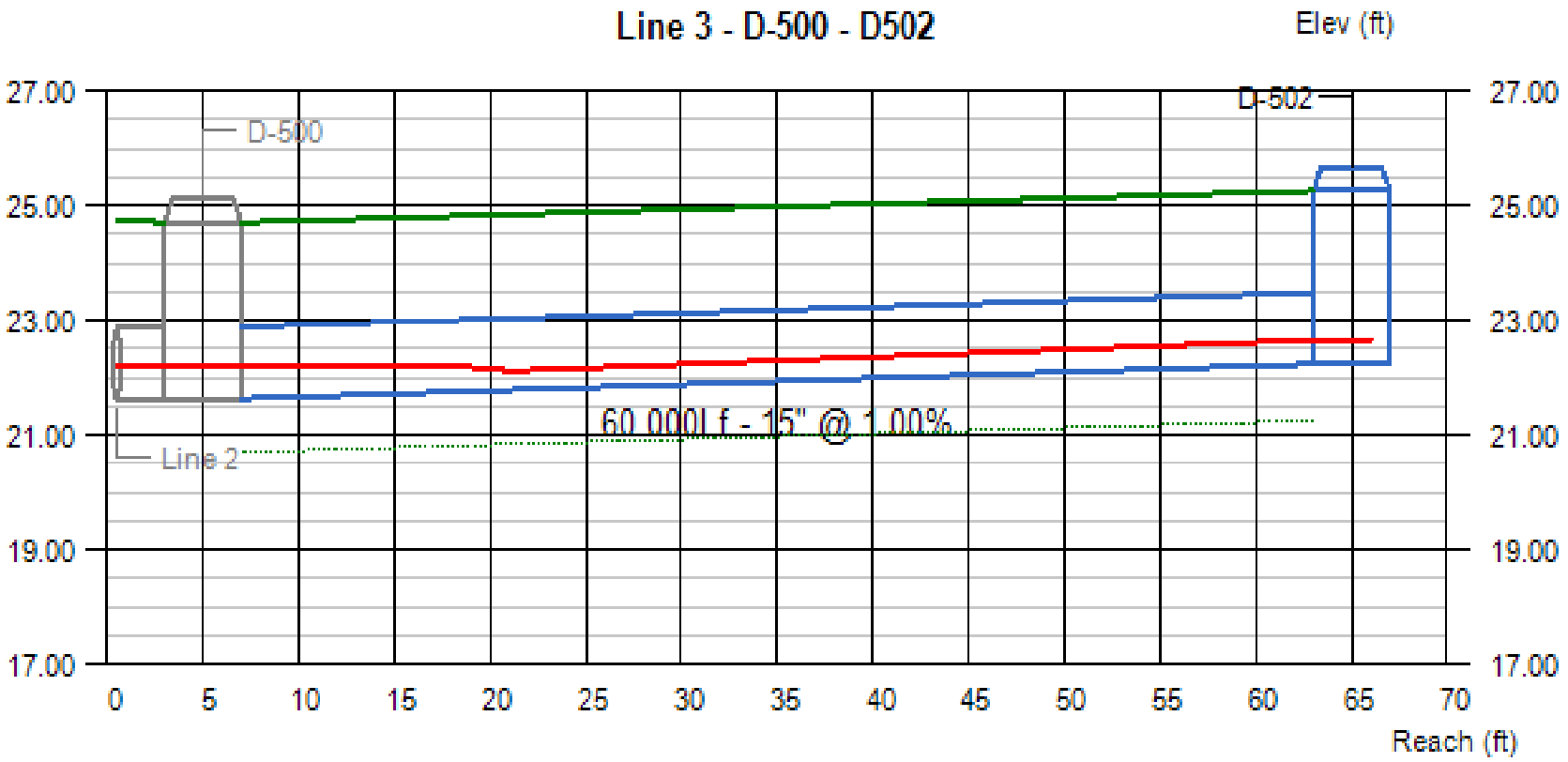
Line Profile (Line 2) - MH-4 - D-500



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
2	2.08	21.03	21.63	0.54	0.58	0.58	21.57	22.21	22.21	4.09	3.78	3.47	1.82

Project File: | No. Lines: 21 | Run Date: 12/29/2020

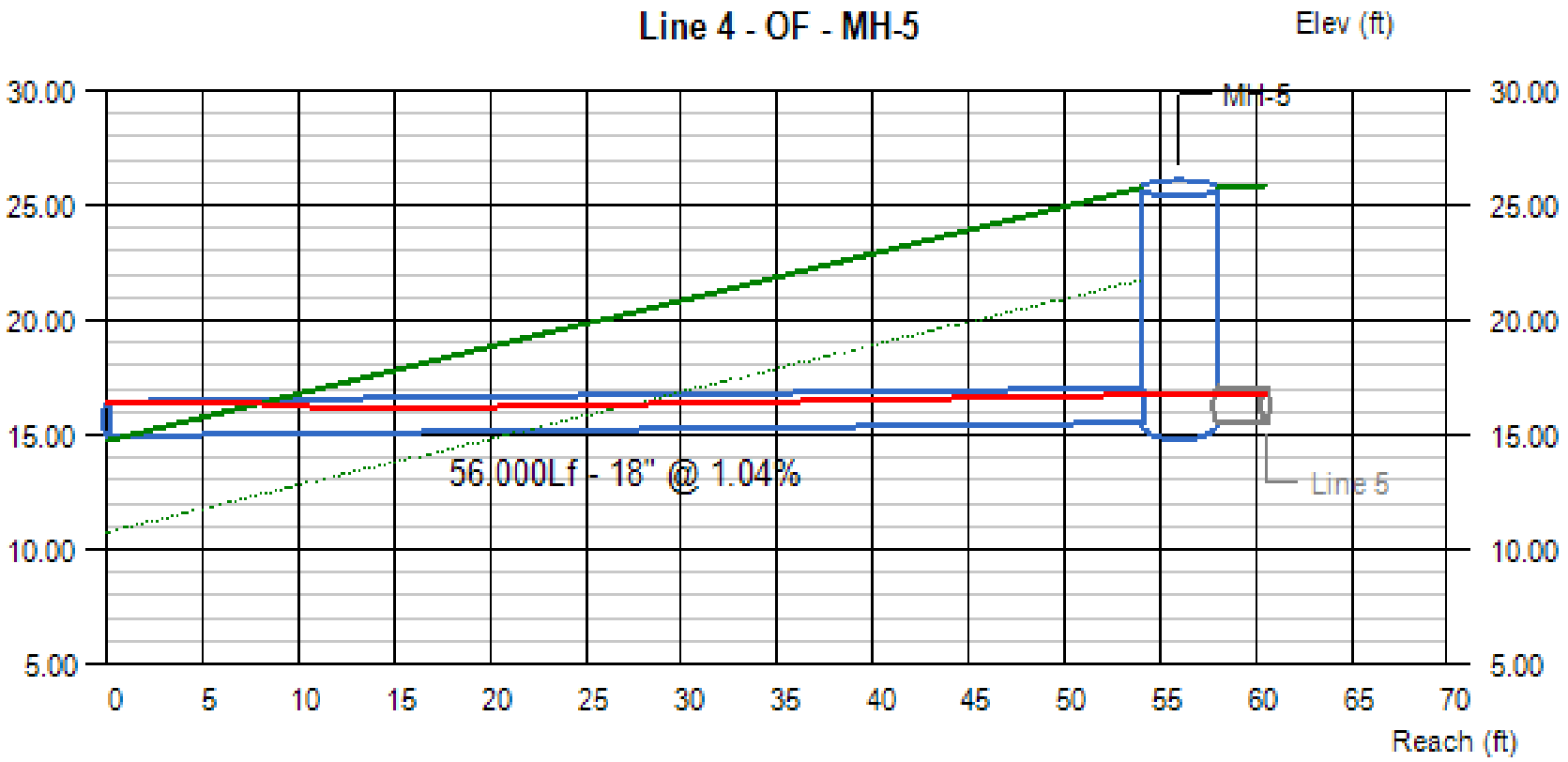
Line Profile (Line 3) - D-500 - D502



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
3	1.14	21.63	22.23	0.58	0.42	0.42	22.21	22.65 j	22.65	2.06	3.14	1.82	1.77

Project File: | No. Lines: 21 | Run Date: 12/29/2020

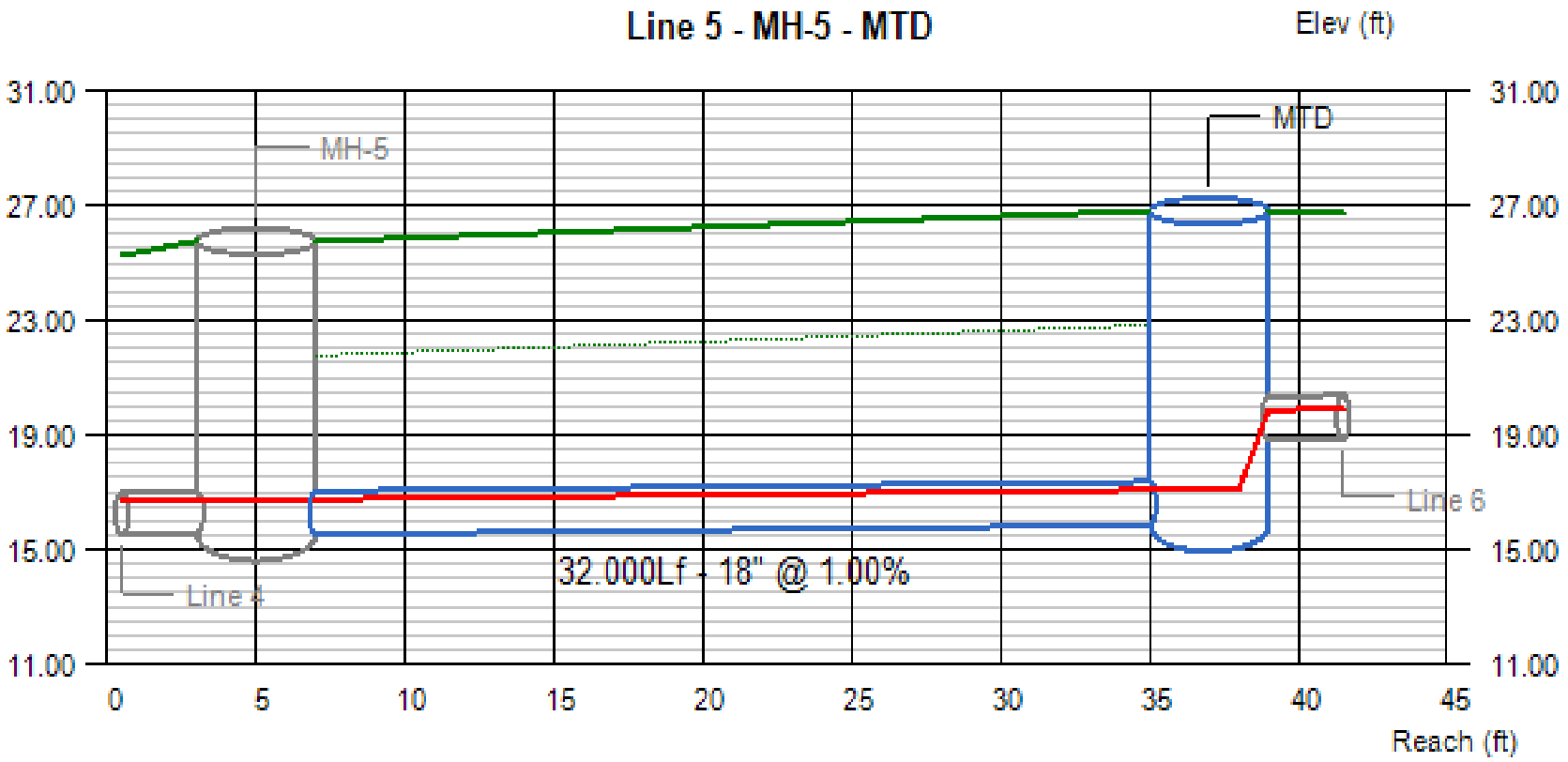
Line Profile (Line 4) - OF - MH-5



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
4	9.96	14.95	15.53	1.49	1.22	1.22	16.44	16.75 j	16.75	5.64	6.49	-1.70	8.72

Project File: | No. Lines: 21 | Run Date: 12/29/2020

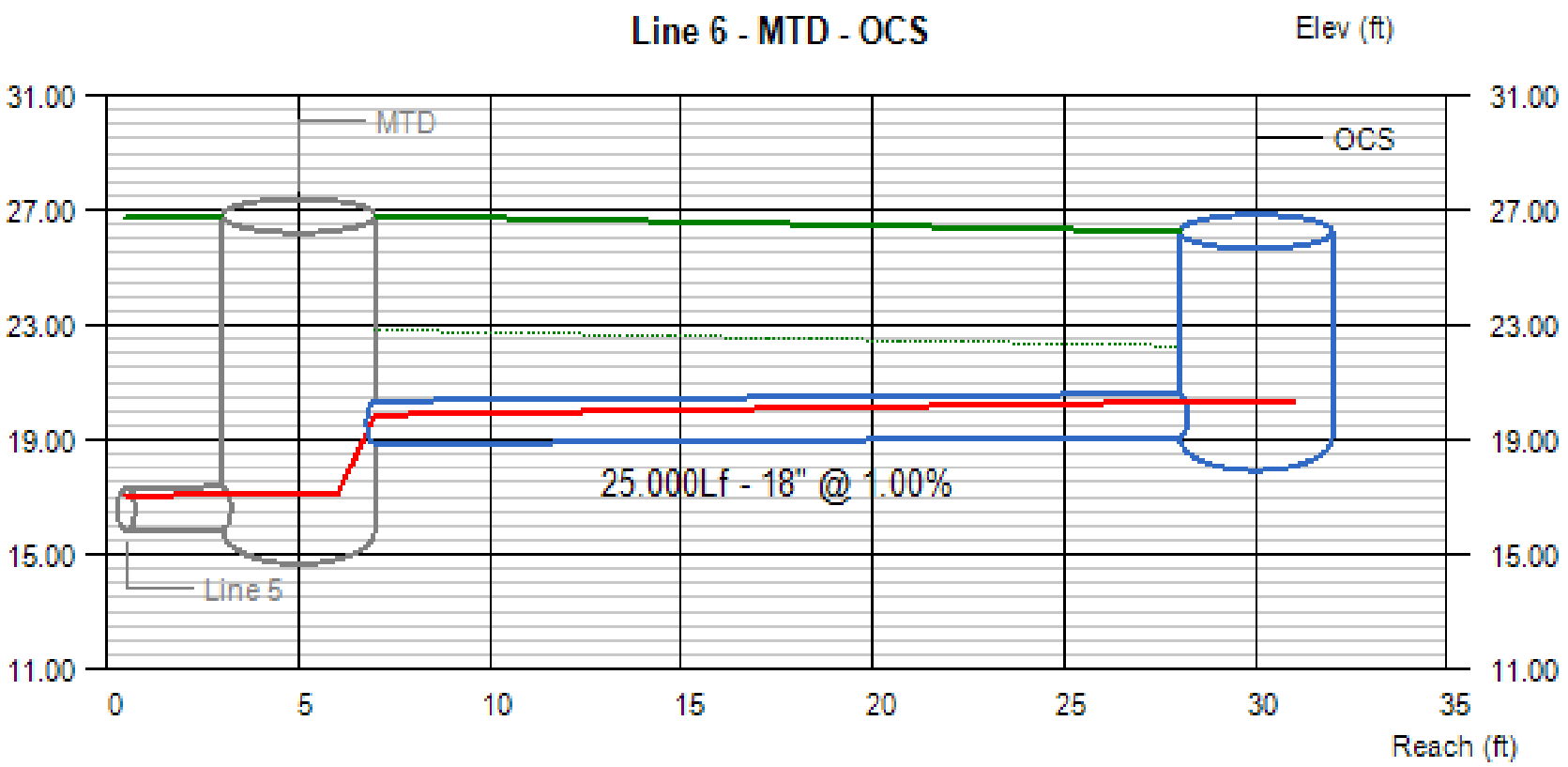
Line Profile (Line 5) - MH-5 - MTD



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
5	9.96	15.53	15.85	1.22	1.22	1.22	16.75	17.07	17.07	6.49	6.49	8.72	9.45

Project File: | No. Lines: 21 | Run Date: 12/29/2020

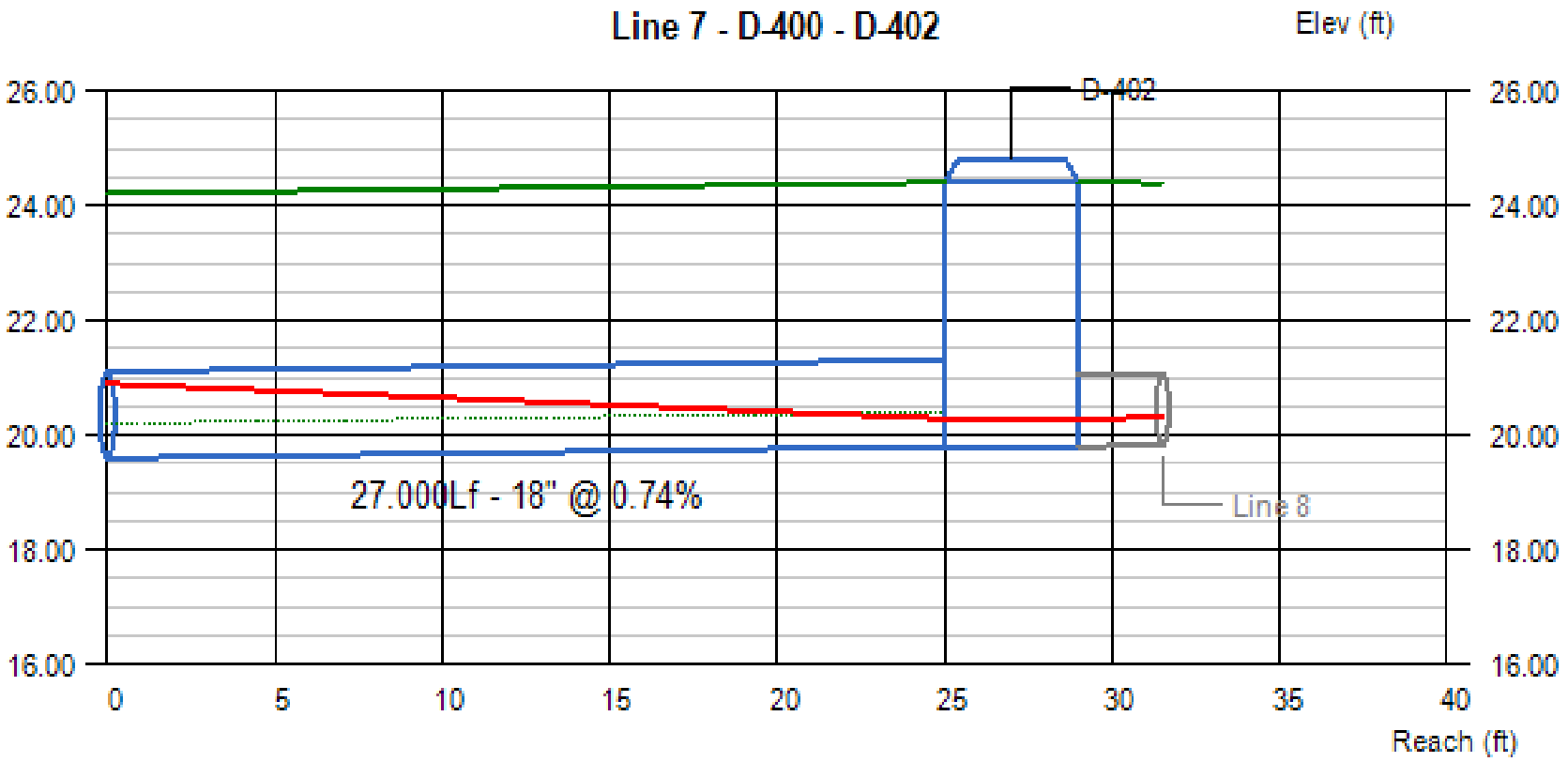
Line Profile (Line 6) - MTD - OCS



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
6	9.96	18.85	19.10	1.02	1.22	1.22	19.87	20.32	20.32	7.81	6.49	6.45	5.65

Project File: | No. Lines: 21 | Run Date: 12/29/2020

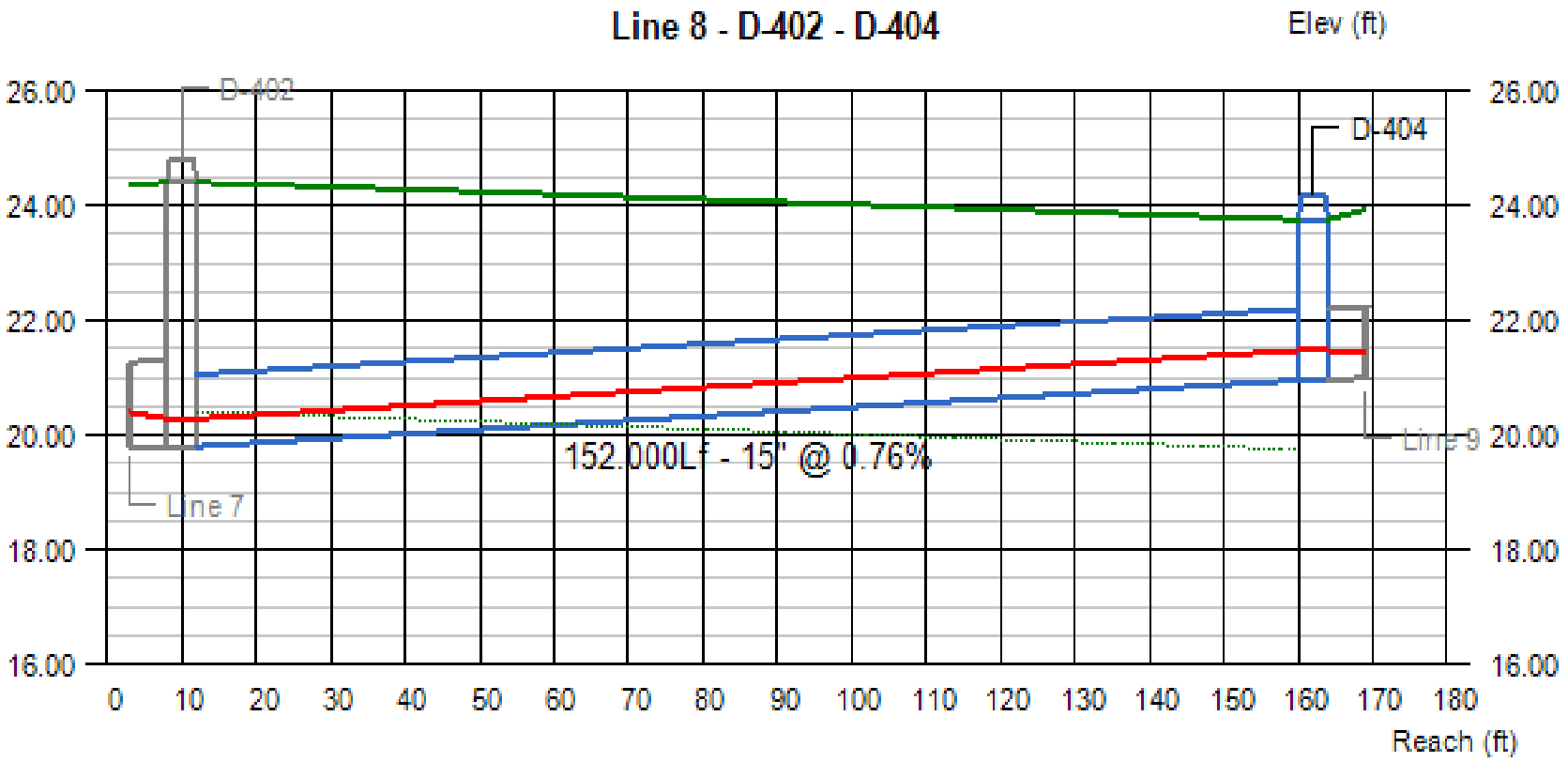
Line Profile (Line 7) - D-400 - D-402



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
7	1.66	19.60	19.80	1.29	0.48	0.48	20.89	20.28	20.28	1.03	3.37	3.10	3.10

Project File: | No. Lines: 21 | Run Date: 12/29/2020

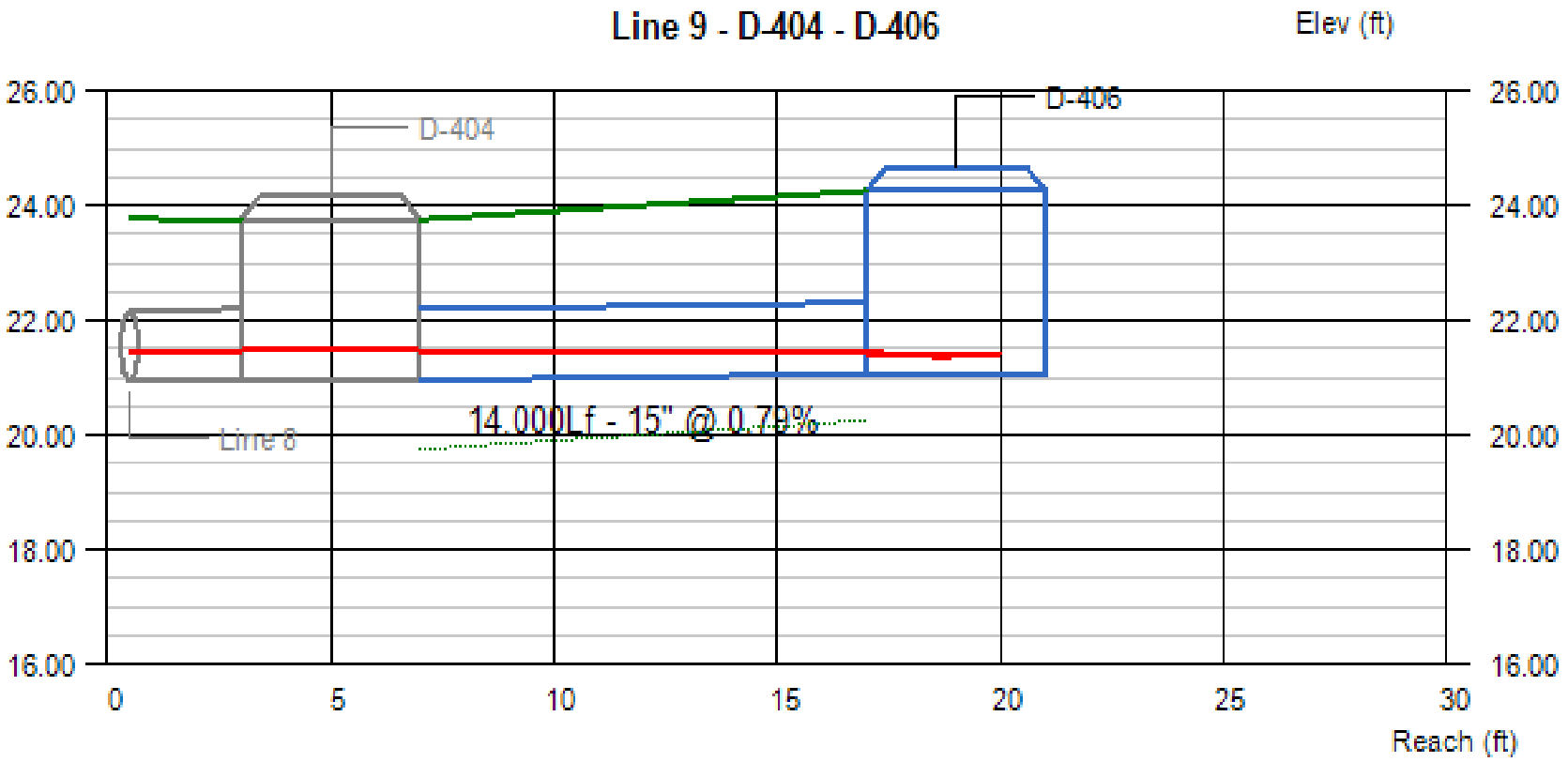
Line Profile (Line 8) - D-402 - D-404



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
8	1.70	19.80	20.95	0.48	0.52	0.52	20.28	21.47	21.47	3.87	3.54	3.35	1.55

Project File: | No. Lines: 21 | Run Date: 12/29/2020

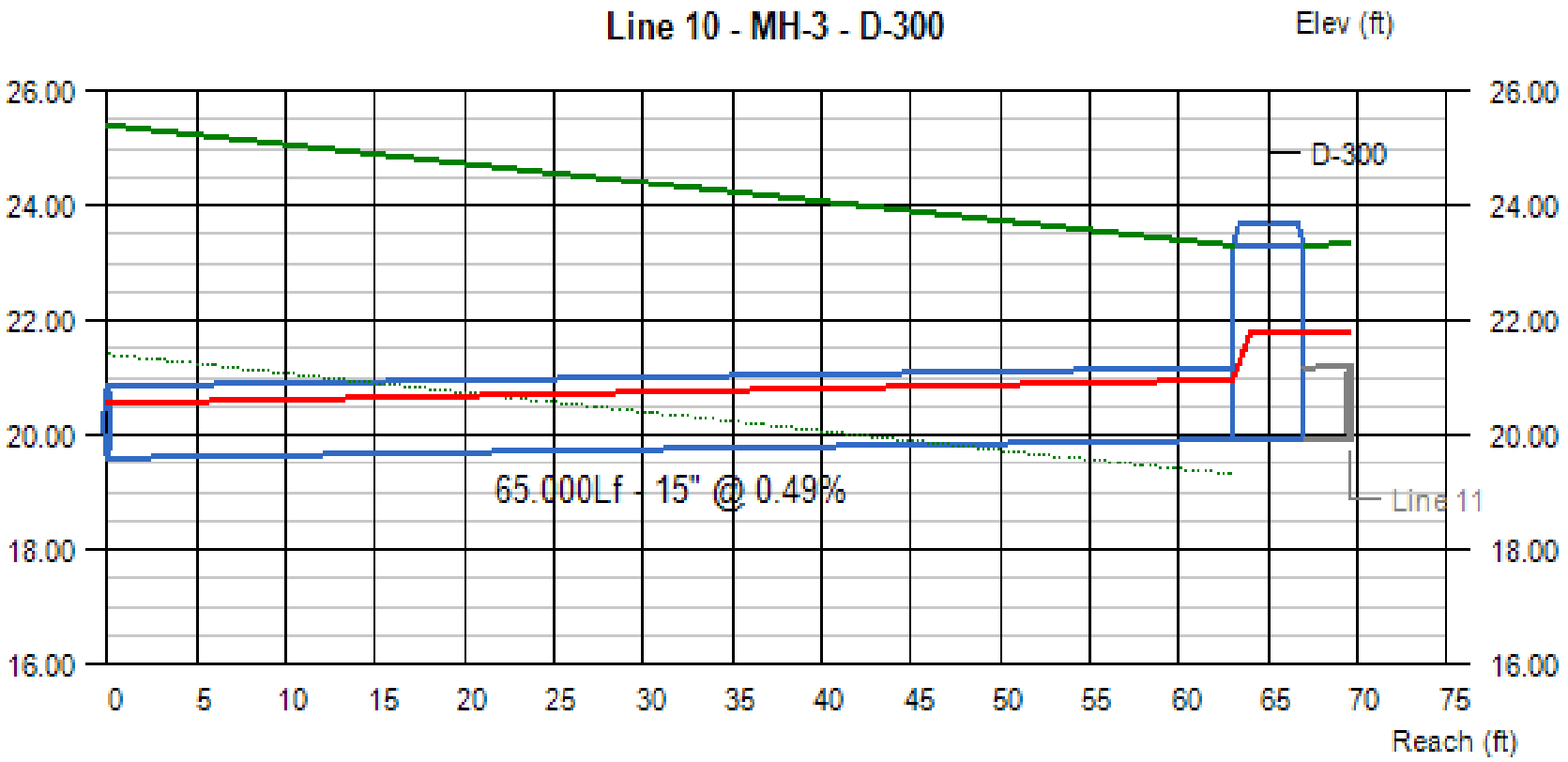
Line Profile (Line 9) - D-404 - D-406



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
9	0.82	20.95	21.06	0.52	0.36	0.36	21.47	21.42 j	21.42	1.72	2.87	1.55	1.94

Project File: | No. Lines: 21 | Run Date: 12/29/2020

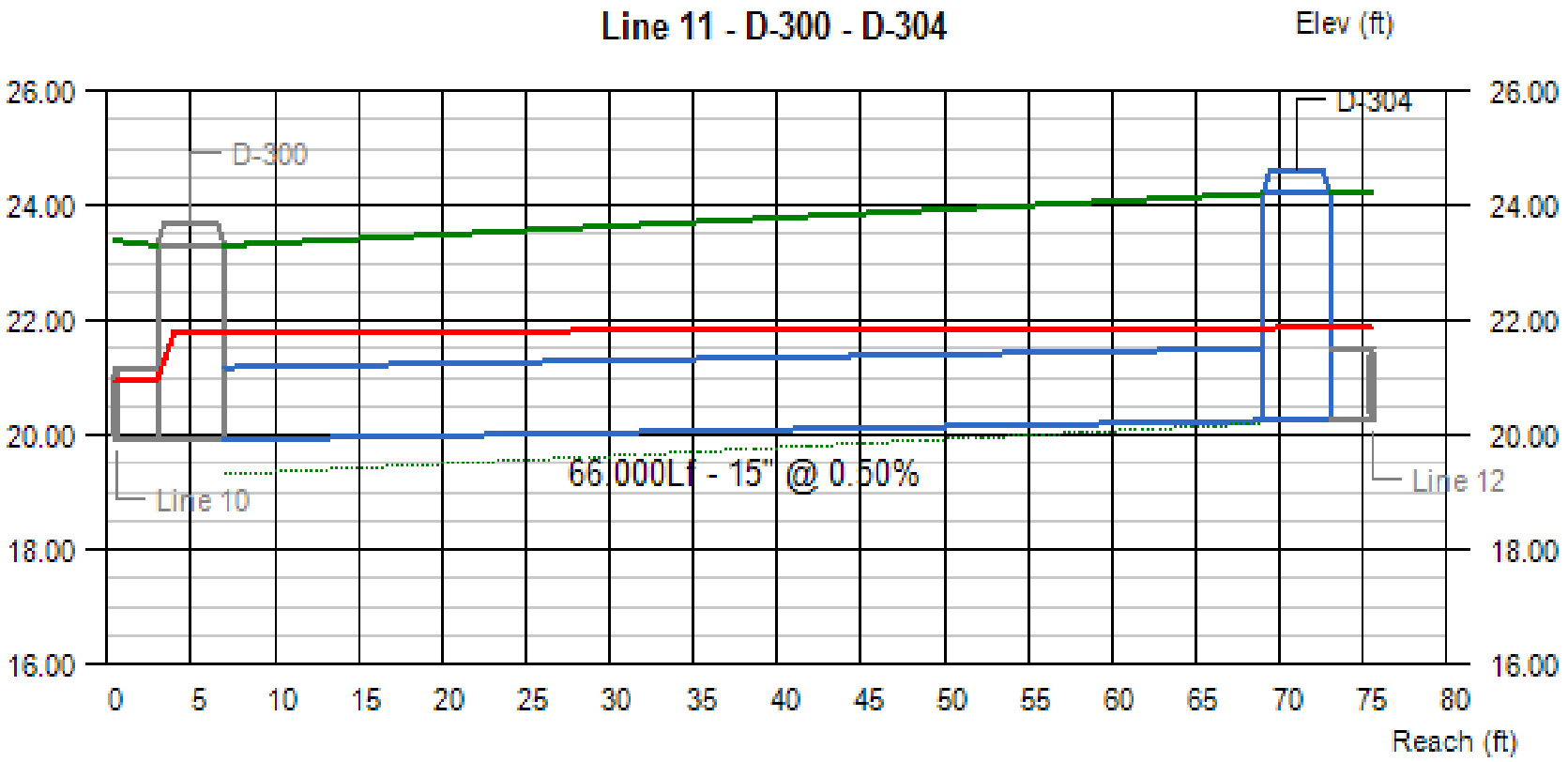
Line Profile (Line 10) - MH-3 - D-300



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
10	5.32	19.60	19.92	0.95	1.04	1.87	20.55	20.96	21.79	5.32	4.89	4.55	2.13

Project File: | No. Lines: 21 | Run Date: 12/29/2020

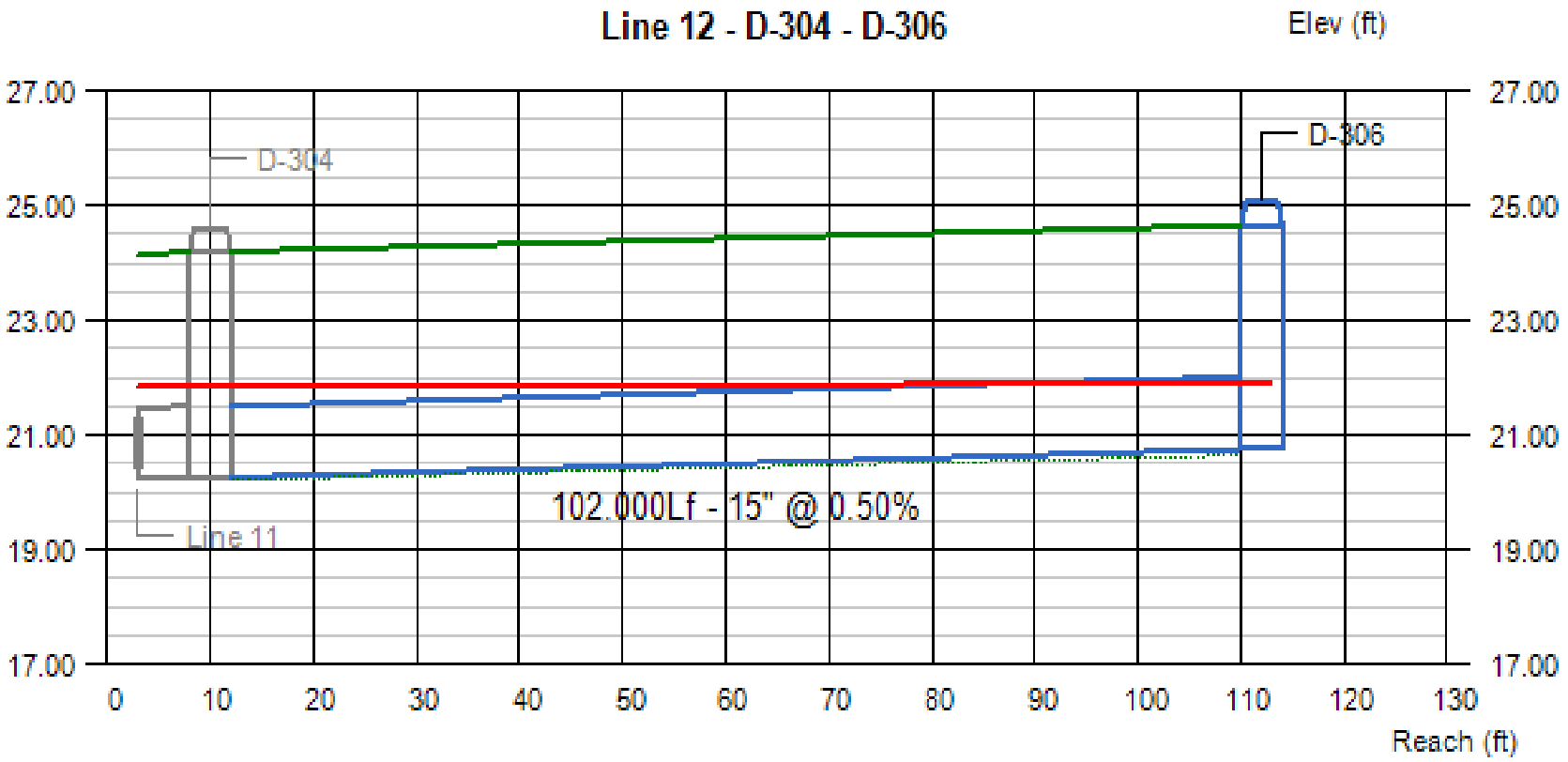
Line Profile (Line 11) - D-300 - D-304



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
11	1.97	19.92	20.25	1.25	1.25	1.61	21.79	21.84	21.86	1.61	1.61	2.13	2.70

Project File: | No. Lines: 21 | Run Date: 12/29/2020

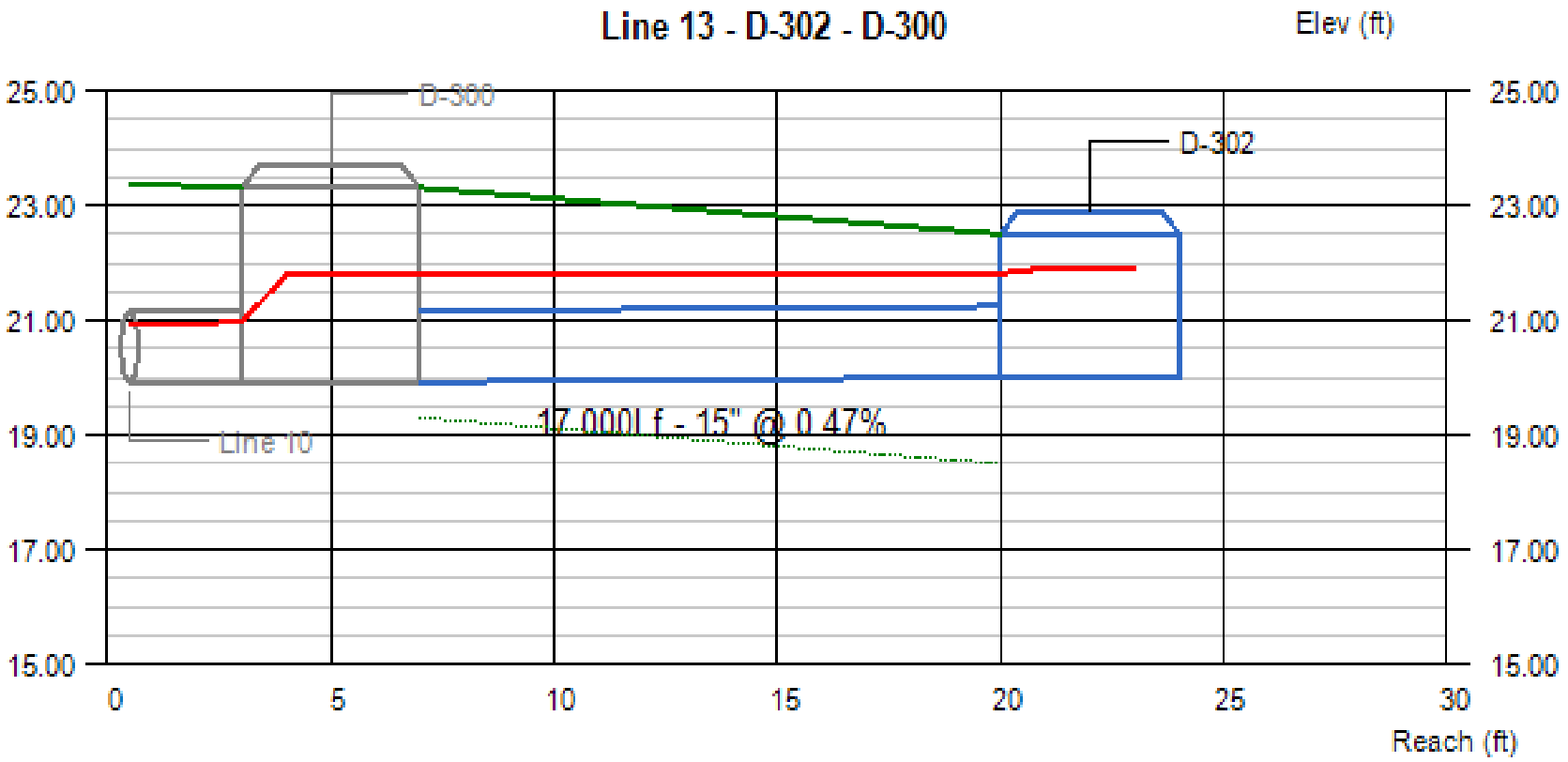
Line Profile (Line 12) - D-304 - D-306



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
12	1.32	20.25	20.76	1.25	1.13	1.15	21.86	21.89	21.91	1.08	1.13	2.70	2.64

Project File: | No. Lines: 21 | Run Date: 12/29/2020

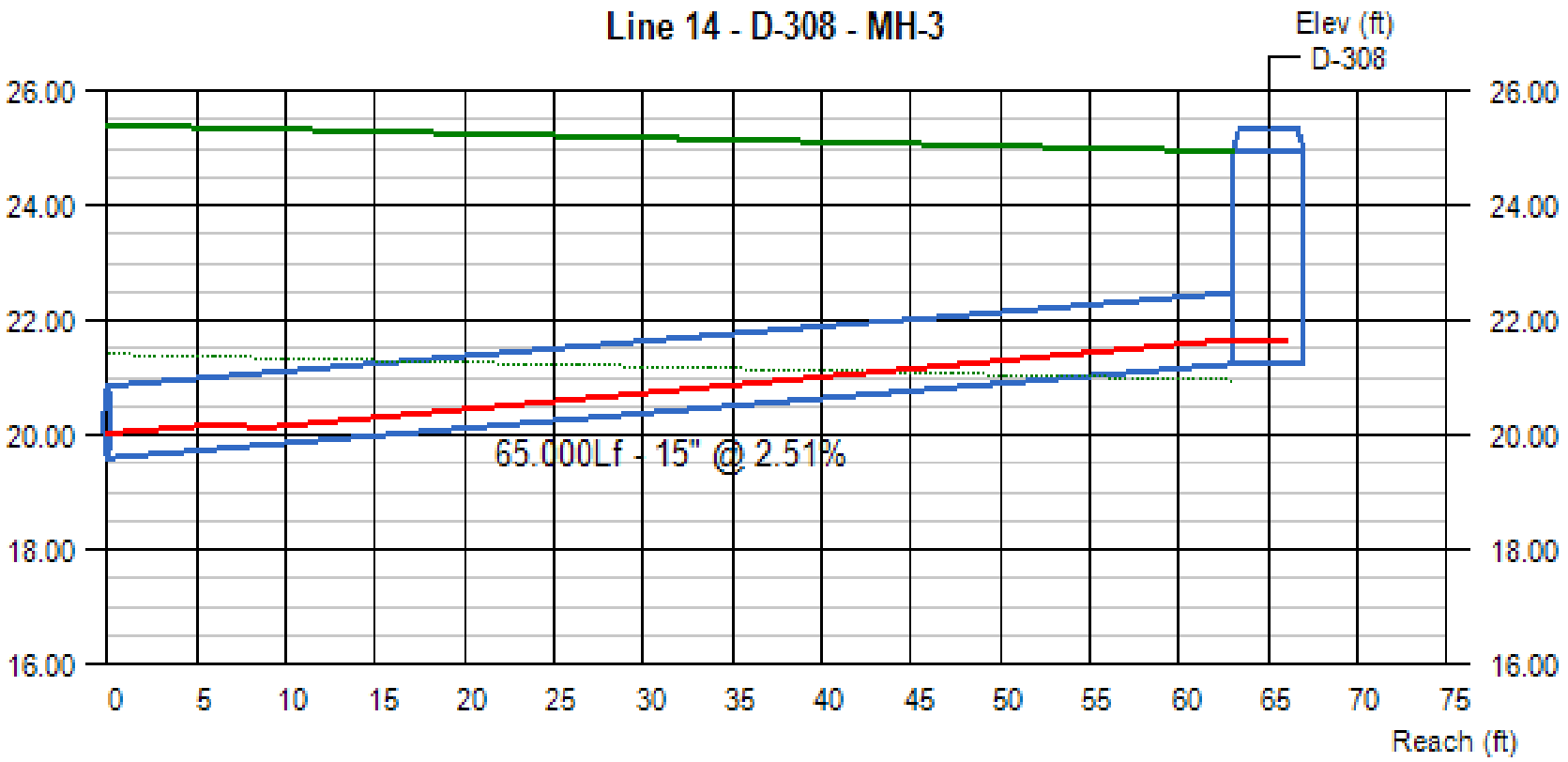
Line Profile (Line 13) - D-302 - D-300



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
13	2.95	19.92	20.00	1.25	1.25	1.91	21.79	21.82	21.91	2.40	2.40	2.13	1.25

Project File: | No. Lines: 21 | Run Date: 12/29/2020

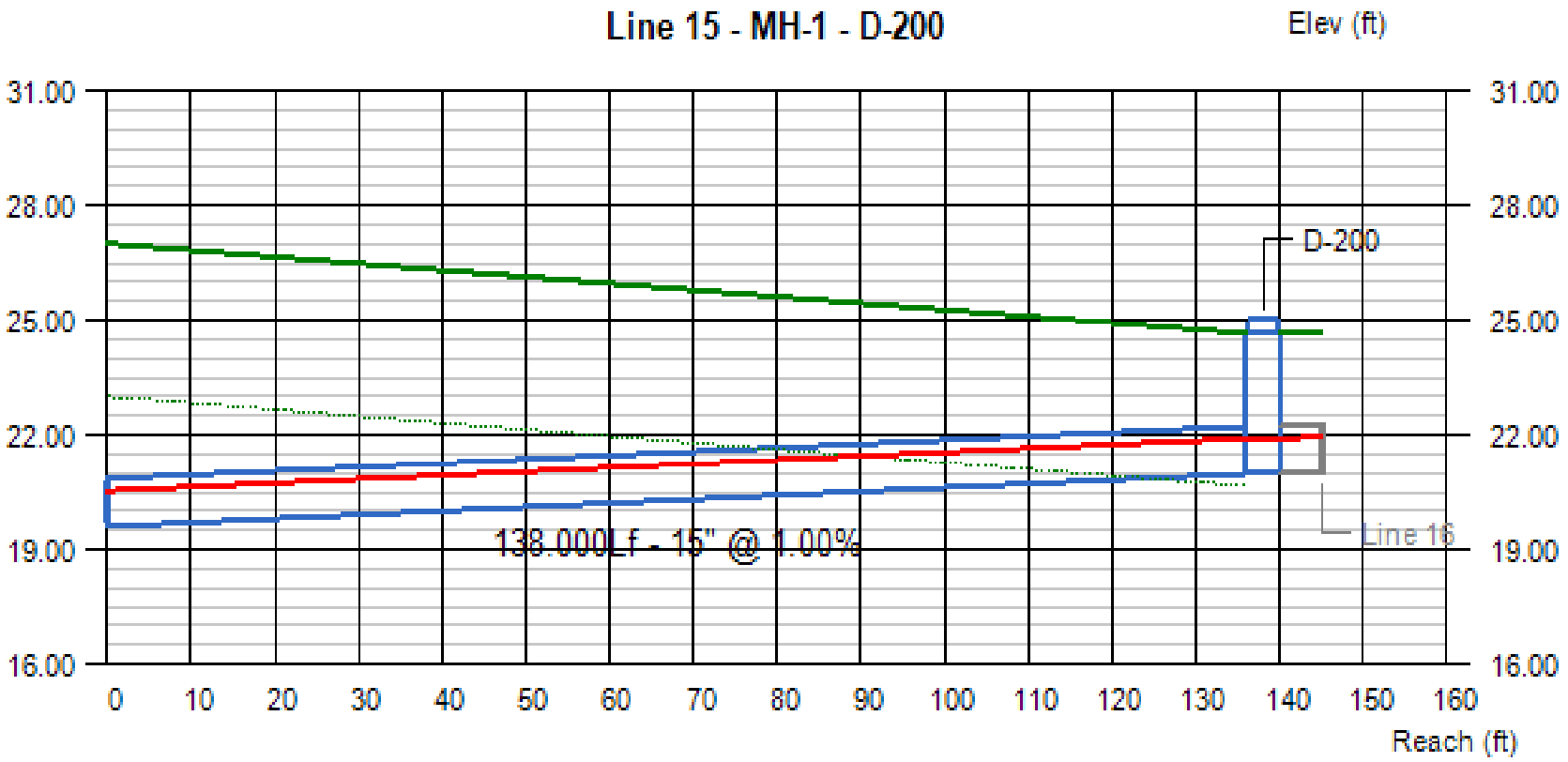
Line Profile (Line 14) - D-308 - MH-3



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
14	1.17	19.60	21.23	0.43	0.43	0.43	20.03	21.66 j	21.66	3.12	3.17	4.55	2.47

Project File: | No. Lines: 21 | Run Date: 12/29/2020

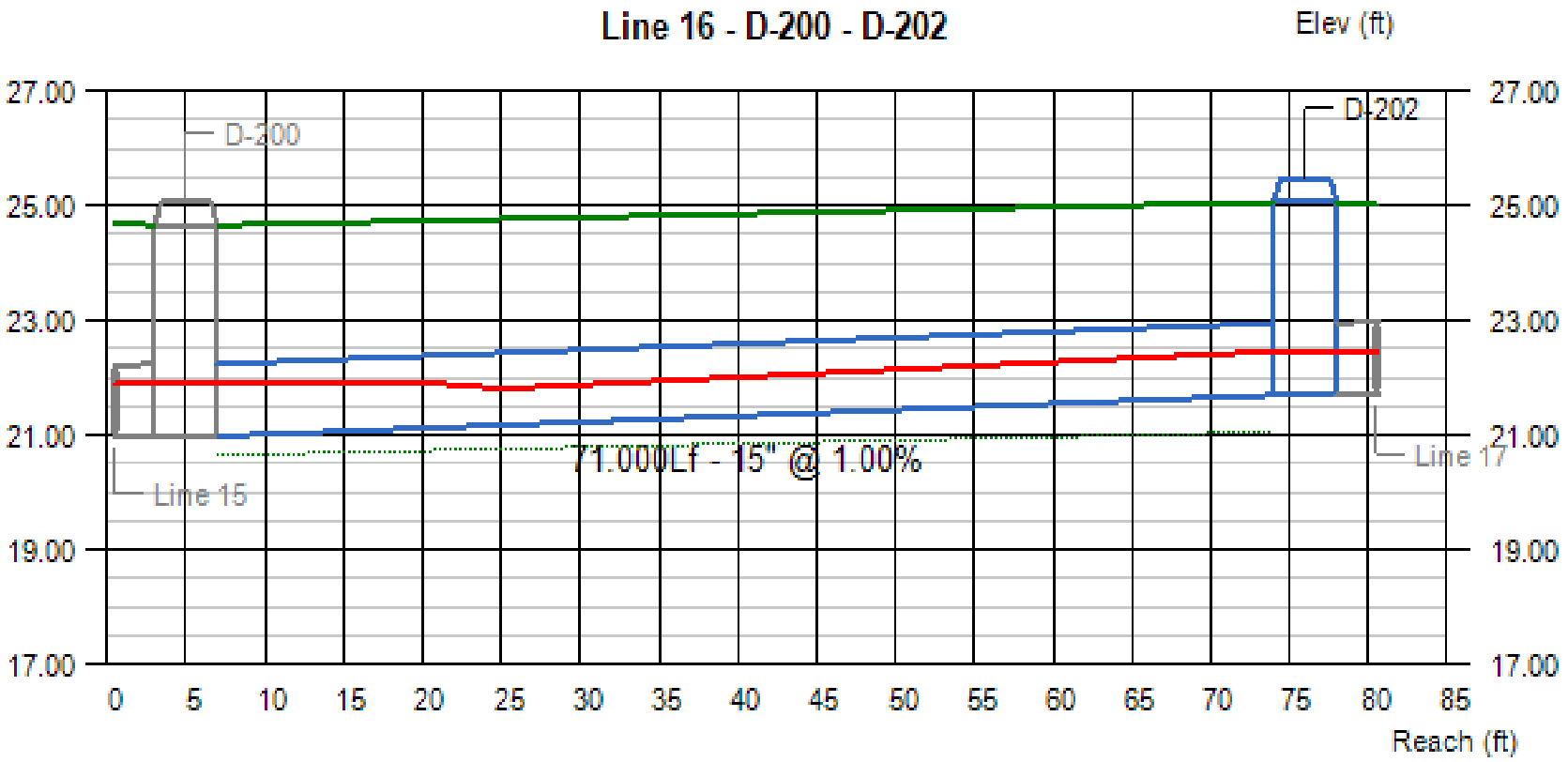
Line Profile (Line 15) - MH-1 - D-200



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
15	5.30	19.60	20.98	0.93	0.93	0.93	20.53	21.91	21.91	5.41	5.40	6.15	2.42

Project File: | No. Lines: 21 | Run Date: 12/29/2020

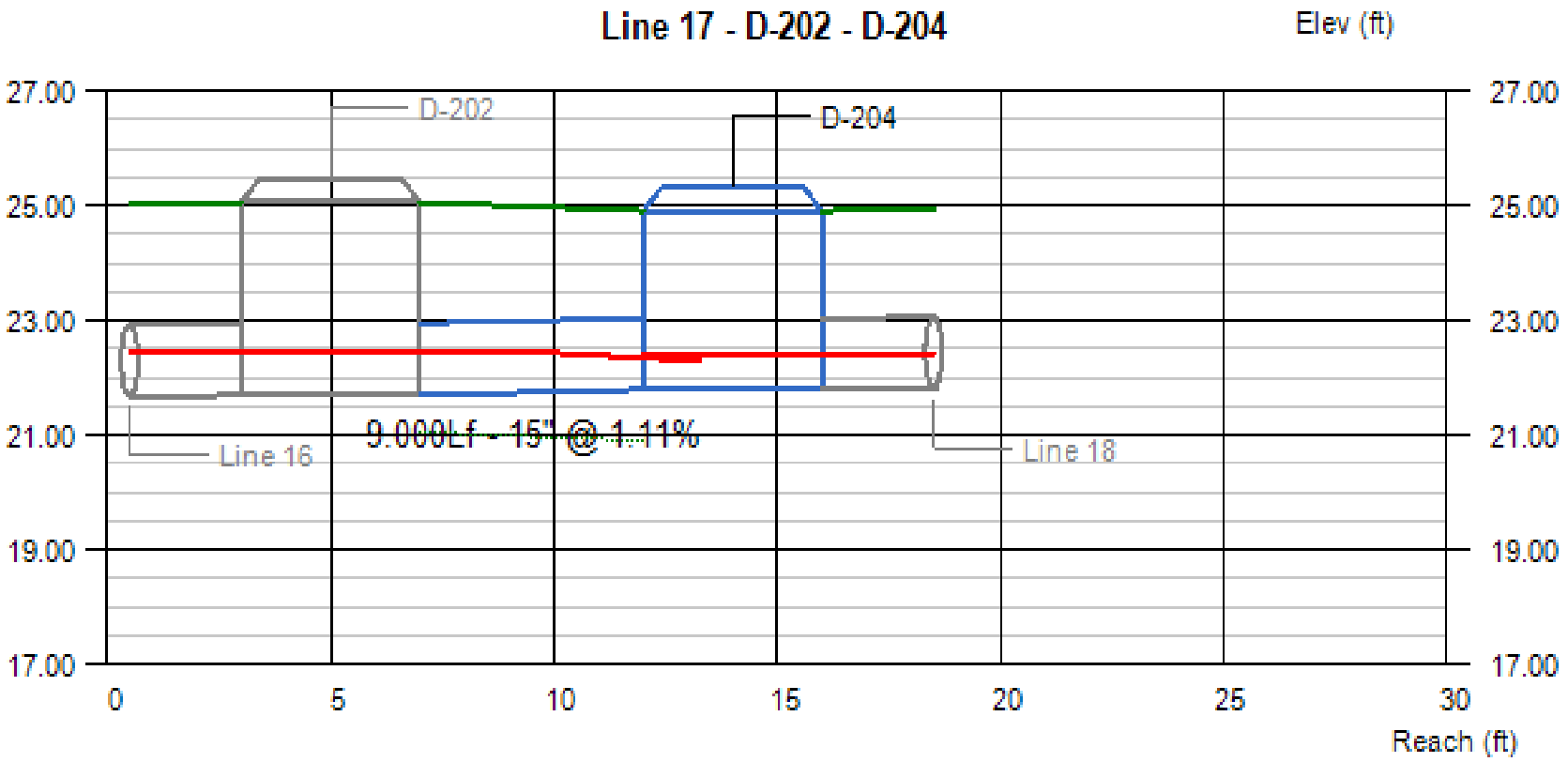
Line Profile (Line 16) - D-200 - D-202



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
16	3.56	20.98	21.69	0.93	0.76	0.76	21.91	22.45 j	22.45	3.62	4.55	2.42	2.11

Project File: | No. Lines: 21 | Run Date: 12/29/2020

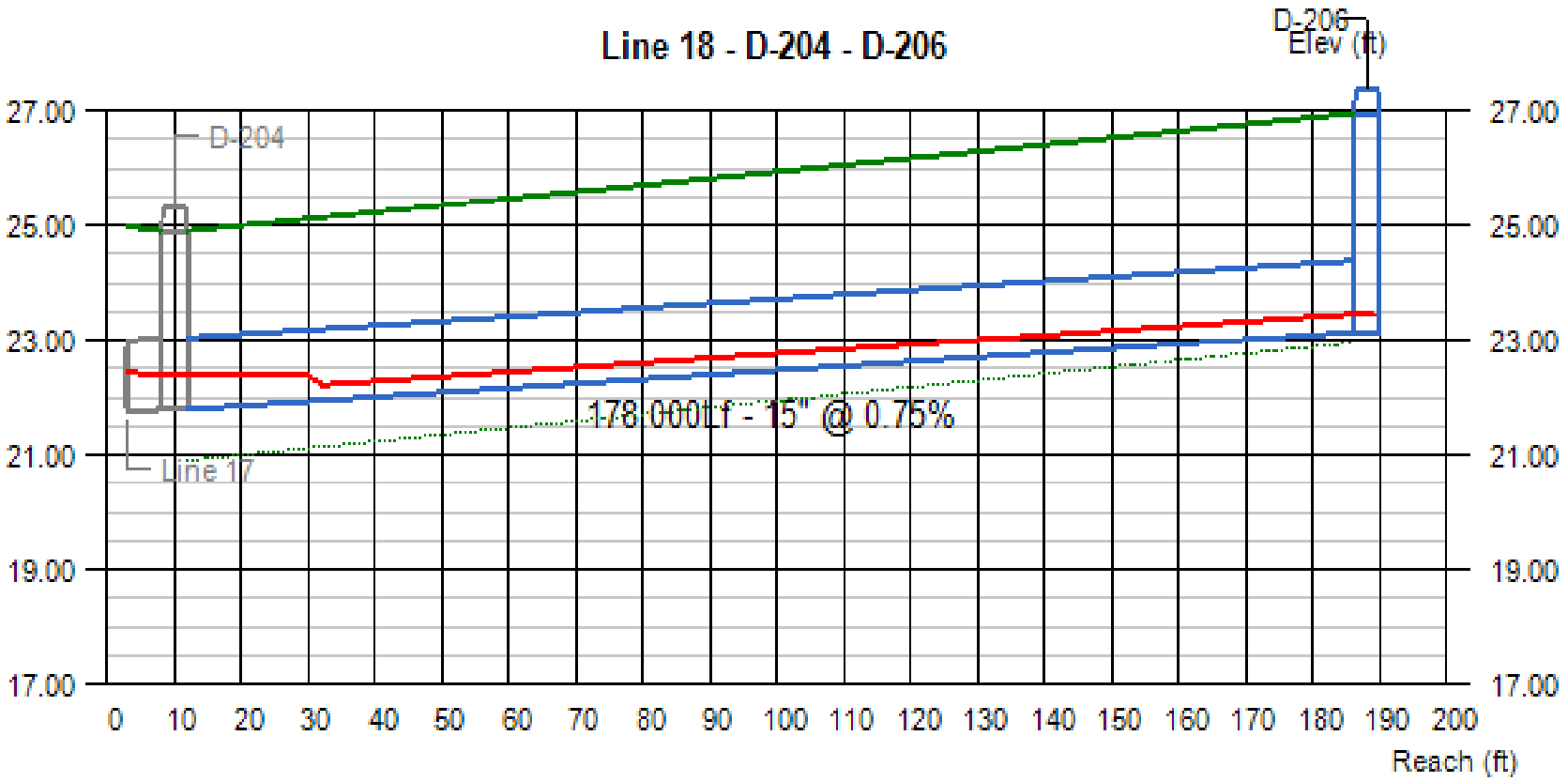
Line Profile (Line 17) - D-202 - D-204



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
17	2.31	21.69	21.79	0.76	0.61	0.61	22.45	22.40 j	22.40	2.95	3.91	2.11	1.86

Project File: | No. Lines: 21 | Run Date: 12/29/2020

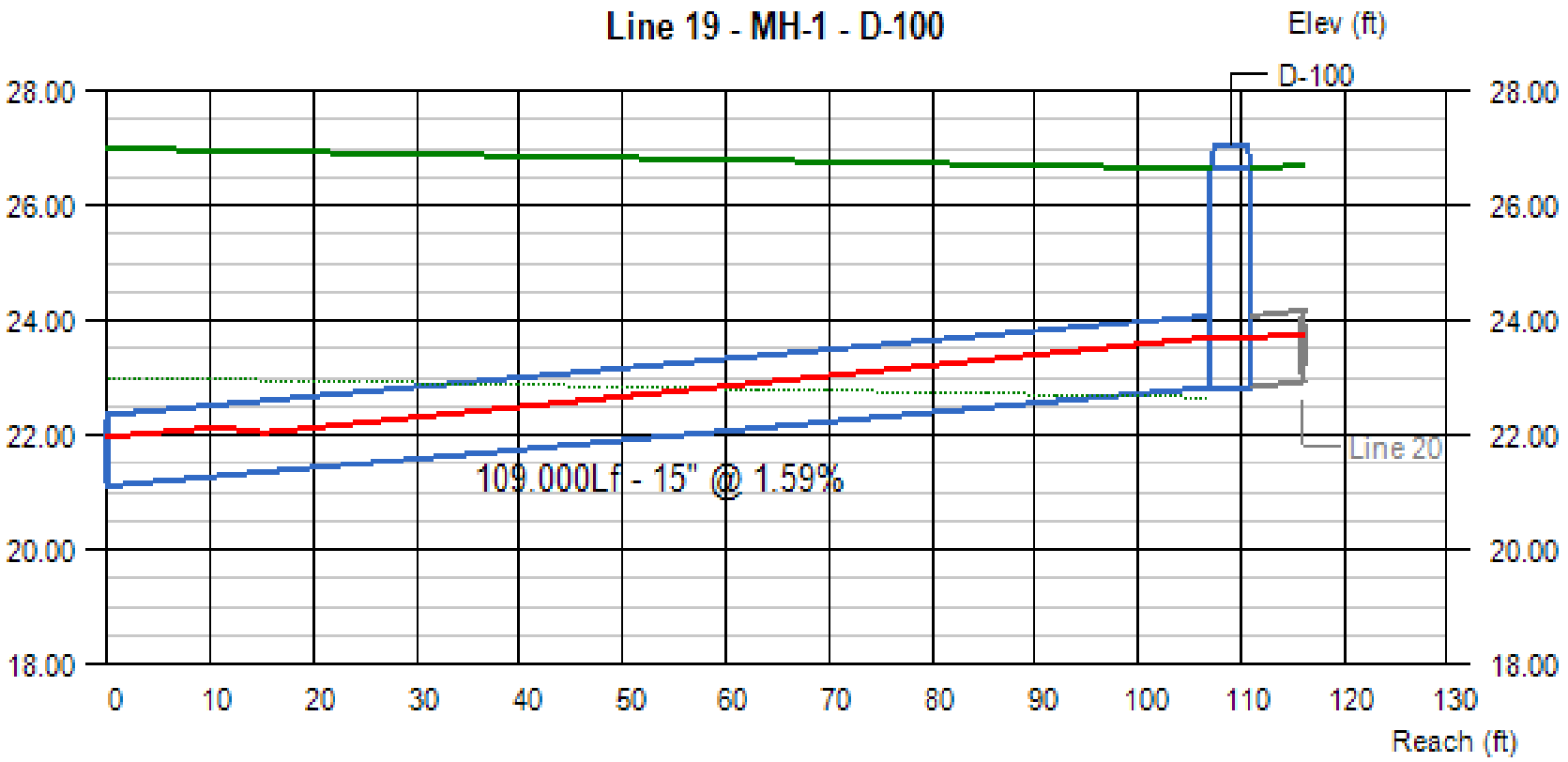
Line Profile (Line 18) - D-204 - D-206



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
18	0.69	21.79	23.13	0.61	0.32	0.32	22.40	23.45 j	23.45	1.17	2.73	1.86	2.57

Project File: | No. Lines: 21 | Run Date: 12/29/2020

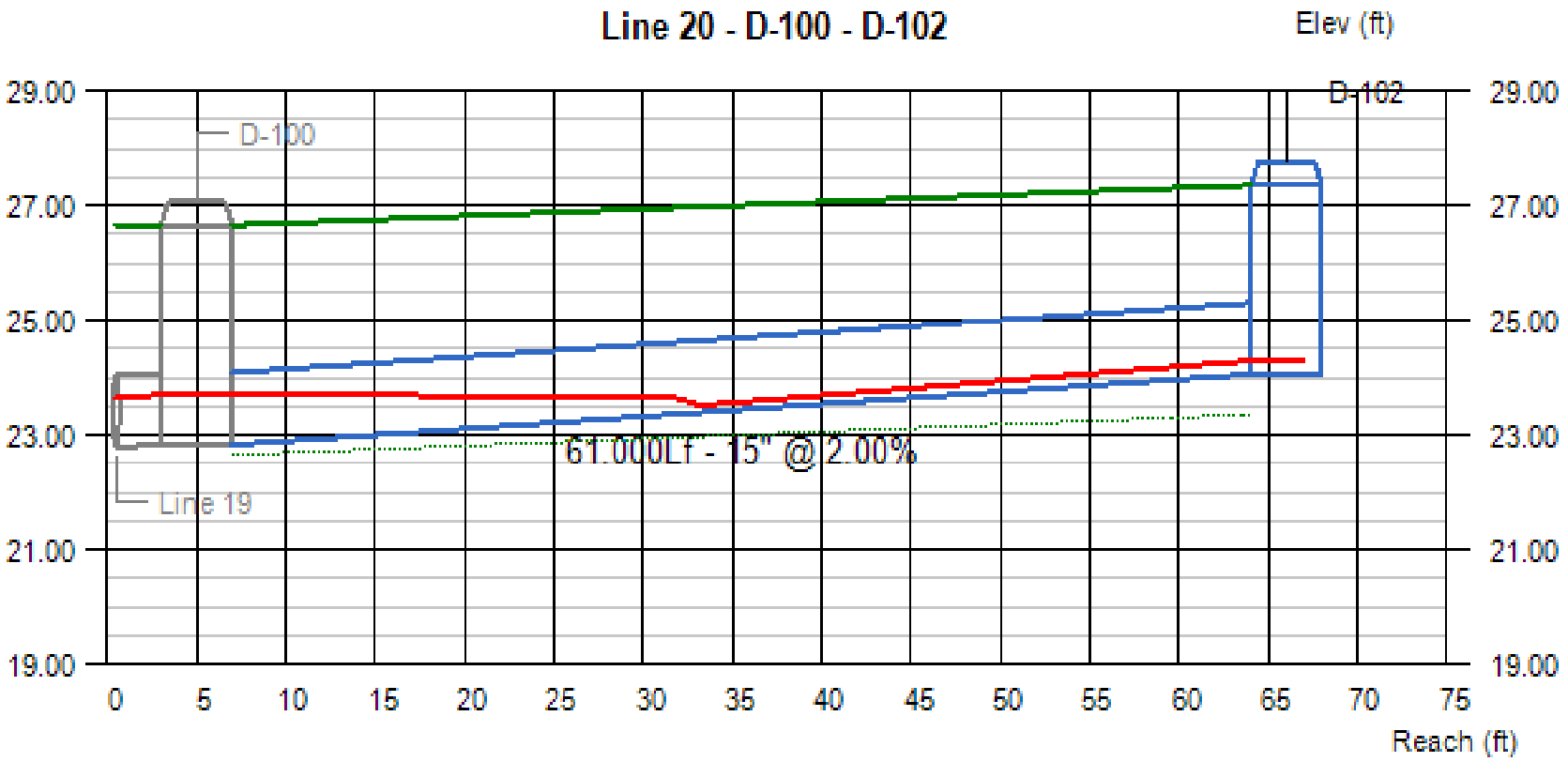
Line Profile (Line 19) - MH-1 - D-100



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
19	4.57	21.10	22.83	0.87	0.87	0.87	21.97	23.70 j	23.70	5.01	5.04	4.65	2.57

Project File: | No. Lines: 21 | Run Date: 12/29/2020

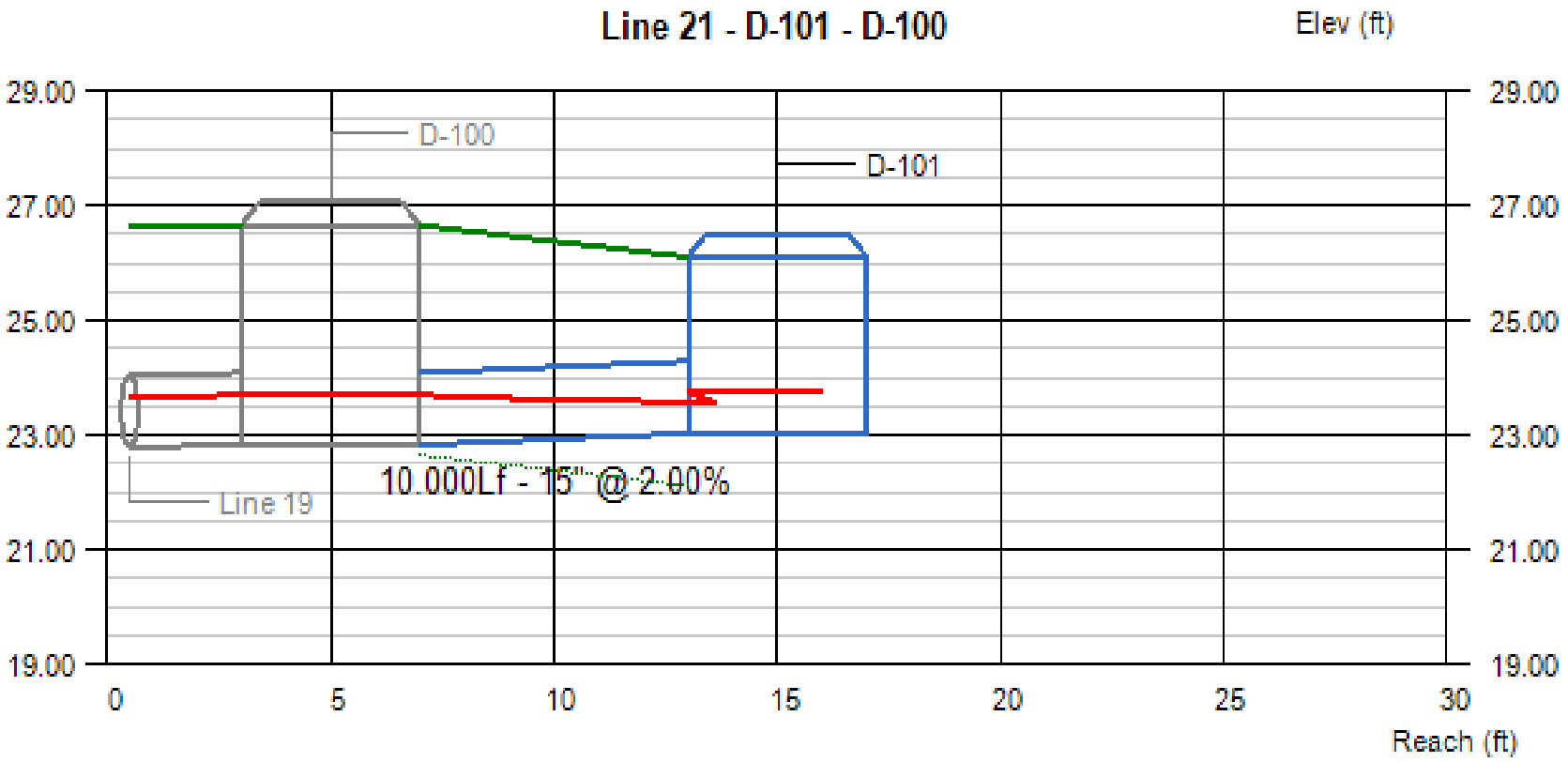
Line Profile (Line 20) - D-100 - D-102



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
20	0.38	22.83	24.05	0.87	0.24	0.24	23.70	24.29 j	24.29	0.42	2.32	2.57	2.05

Project File: | No. Lines: 21 | Run Date: 12/29/2020

Line Profile (Line 21) - D-101 - D-100



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
21	3.16	22.83	23.03	0.87	0.72	0.72	23.70	23.75 j	23.75	3.49	4.35	2.57	1.82

Project File: | No. Lines: 21 | Run Date: 12/29/2020

APPENDIX D
SUBSURFACE STORMWATER INVESTIGATION RESULTS

Engineers Planners Surveyors Landscape Architects Environmental Scientists

MASER CONSULTING P. A.

Report of Infiltration Evaluation

M & M at Neptune, LLC

Block 701, Lot 1
Township of Neptune, Monmouth County, New Jersey

May 20, 2019

Prepared For

Mr. Devon McDonough, PE, LSIT
EP Design Services, LLC
2901 Hamilton Boulevard
South Plainfield, NJ 07080

Prepared By

Maser Consulting P.A.
Corporate Headquarters
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701
732.383.1950

Michael Carnivale, III, P.E.
Senior Project Manager, Geotechnical Services
Professional Engineer
New Jersey License No. 45357

MC Project No. 19000475A

TABLE OF CONTENTS

FIGURES

APPENDICES

1.0 INTRODUCTION

This report presents the results of our geotechnical evaluation performed at the project site with respect to the proposed stormwater management areas and infiltration rates for use in design. A multi-use facility is planned within the currently abandoned property between NJ Route 35 and Asbury Avenue in the Township of Neptune, Monmouth County, New Jersey (Block 701, Lot 1 on the Township of Neptune Tax Maps).

Infiltration rate recommendations provided in this report are based on review of published data, accepted engineering practice, and field observations. Maser Consulting P.A. has evaluated the subsurface conditions at the site, and provides an evaluation of potential infiltration rates for soils encountered at depth within the area of the proposed stormwater management systems and design seasonal high water levels.

2.0 SITE DESCRIPTION

The project site is located on NJ Route 35 at the intersection with Asbury Avenue in Neptune, New Jersey (Figure No. 1) and referred to as Block 701, Lot 1 on the Township of Neptune Tax Maps. The subject site currently holds an abandoned building and associated parking lot at its center, a landscaped lawn on the west end, and an overgrown section that borders wetlands on the eastern end. The site is bounded by residential properties to the north, wetlands to the east, and commercial properties to the west and south. The proposed development consists of a proposed restaurant, retail and convenience store with gasoline service.

3.0 SCOPE OF SERVICES

To evaluate the subsurface soil and groundwater conditions within the influence of the proposed stormwater management areas and to subsequently provide consultation regarding anticipated subsurface infiltration rates and estimated seasonal high-water levels (ESHWL) for design, we performed the following scope of services:

a) Provided full-time technical observation of the excavation contractor, provided by the Client, to excavate test pits for exploration of subsurface soil and groundwater conditions within the proposed stormwater management areas;
b) Obtained representative soil samples encountered within the zone of influence of the proposed stormwater basin construction;
c) Evaluated the field data and prepared test pit logs showing the types of soils observed, depths to encountered groundwater, and depths to estimated seasonal high groundwater;
d) Performed Tube Permeameter tests to evaluate infiltration rates for the subgrade soils in accordance with BMP-E methods; and
e) Provided this *Report of Infiltration Evaluation* that reviews potential soil infiltration rates for design and groundwater considerations for the proposed basin requirements.

4.0 SUBSURFACE EXPLORATION

The subsurface conditions, for the purpose of infiltration evaluation, were explored on April 14, 2019 through the excavation of a total of 7 test pits, labeled TP-1 through TP-7. The test pits were advanced to termination depths between 11 and 12.5 feet below ground surface (bgs) by Edgewood Properties using a CAT 322C trackhoe.

Representatives from Maser Consulting's Geotechnical Department observed the test pit excavations. Soils encountered in the test pits were classified in the field in accordance with N.J.A.C. 7:9A, Subchapter 5.3, Terminology Required for Soil Logs. Representative soil samples of strata encountered were collected and returned to Maser Consulting's Red Bank laboratory facilities for further evaluation and analyses. Details pertaining to the subsurface conditions encountered are presented on the Test Pit Logs in Appendix A.

The depth of groundwater was measured from the ground surface to the point of observed seepage or consistent soil moisture. Groundwater was encountered within all test pits at depths that ranged from approximately 4.5 feet to 11.5 feet bgs. It should be noted that fluctuation in groundwater levels can occur due to several factors, including variations in precipitation, seasonal changes, and site development activities, which can alter surface water drainage paths. It should also be noted

that test pits TP-1 through TP-4 were located near a wetlands boundary on the eastern side of the property.

The subsurface strata were also evaluated with respect to mottling and soil staining to determine if seasonal high groundwater levels extended into the test pit depths. Staining and mottling within a soil stratum can indicate seasonal high-water level fluctuations, but is also found along wormholes, as a result of prior farming practices, or as an indication of geologic depositional factors. Please refer to Table 1 for a summary of depths to the groundwater table and to the estimated seasonal high-water level (ESHWL).

TABLE 1
DEPTH TO GWT AND ESHWL SUMMARY

Test Pit Test Boring ID	Approx. Ground Surface Elev. (ft)	Depth to Groundwater Water Table, GWT (in)	Depth to Estimated Seasonal High-Water Level, ESHWL (in)
TP-1	22.33	138	6 (Perched)
TP-2	20.72	102	8 (Perched)
TP-3	21.05	54	47
TP-4	17.50	132	16 (Perched)
TP-5	21.54	132	20 (Perched)
TP-6	21.82	132	6 (Perched)
TP-7	23.25	126	16 (Perched)

5.0 SUBSURFACE CONDITIONS

The surface cover in the test pits was a brown to dark brown sandy loam layer of topsoil that ranged from 2 to 19 inches in thickness. Test pits TP-1 through TP-4 had layers of varying topsoil thickness and inconsistent boundaries indicating that potential fill exists at the surface layer.

Underlying the surface cover was primarily a brownish yellow to light gray sandy loam to loam that extended to depths ranging from 24 to 108 inches bgs. Under this stratum was a gray clay loam layer in all test pits, except for test pit TP-4 which terminated in a gray sand. This gray sand stratum was encountered under the clay loam layer in the remaining test pits and was very moist to wet in all cases.

As indicated on the test pit logs and in Table 1 on the previous page, indicators of seasonal high water levels (SHWL), in particular, mottling, and light to moderate seepage was encountered at shallow depths within the test pits. Based on our observations in the field, it appears that this is a result of perched conditions due to the gray clay loam layer underlying the soil layers where the mottling and seepage was encountered and not indicative of the true groundwater table which was encountered at depths ranging from 102 to 132 inches below the existing grade. The noted exception was test pit TP-3, where the soil was saturated at a depth of 54 inches below existing grade and may be the result of its proximately to the wetland boundary.

6.0 SOIL INFILTRATION EVALUATION

Selected soil samples were tested by the Maser Consulting Geotechnical Laboratory in Red Bank, New Jersey. The testing consisted of 10 Tube Permeameter Tests performed to estimate the infiltration rate of groundwater through the soils at depth. Tube Permeameter testing was performed in accordance with N.J.A.C. 7:9A-6.2 and New Jersey Stormwater Best Management Practices Manual, Appendix E (BMP-E) requirements. The soil samples were selected based on review of test pit logs by design personnel, the proposed infiltration depths, and comparison to other strata encountered at each test pit location. The tube samples were collected from the soils directly by inserting the sample tube into the ground and retrieving the tube by excavating the soils surrounding it.

Infiltration test results are summarized in Table 2 and Tube Permeameter test results are presented in Appendix B.

TABLE 2 TUBE PERMEAMETER TEST SUMMARY			
Test Pit ID	**Approx. Ground Surface Elev. (ft)**	**Depth below Existing Grade (in)**	**Infiltration Rate (in/hr)**
TP-1	22.33	21	0.12 / 0.00
TP-2	20.72	8	0.00 / 0.00
		24	0.00 / 0.00
TP-3	21.05	19	0.00 / 0.10
		47	0.00 / 0.13
TP-4	17.50	20	0.00 / 0.00
TP-5	21.54	15	0.00 / 0.00
		53	0.79 / 1.25
TP-6	21.82	18	0.00 / 0.00
TP-7	23.25	24	0.00 / 0.00

7.0 DISCUSSION

According to the Natural Resources Conservation Service (NRCS) Web Soil Survey, the soils at the project site are classified as *Elkton loam, (EkaAr),* classified as Hydrologic Soil Group C/D, and *Evesboro-Urban land complex (EvuB),* classified as Hydrologic Soil Group A. Based on the findings of our field exploration, the project site is underlain by several layers of fine-grained soils (loam, sandy loam, and clay loam) with low infiltration characteristics which also result in perched conditions at shallow depths. In accordance with the Addendum to Appendix E of the NJ Stormwater BMP Manual, areas where the SHWL is encountered within the upper 24 inches of the soil profile should be classified as Hydrologic Soil Group (HSG) D. For the purposes of subject property's HSG classification, our professional opinion is that perched water conditions can be considered a restrictive horizon similar to the SHWL, as both of these features will restrict the vertical movement of water. Based on this criteria, we recommend that consideration be given to classifying the property as having HSG D which can result in not having the requirement for groundwater recharge. Additional test pits may be required to meet the NJDEP requirements for HSG reclassification and would be subject to agency review and approval.

In lieu of HSG reclassification, a limited soil exchange program where the fine-grained soils can be removed and replaced with coarse-grained soils (K3 or better soil) which ties into the granular layer encountered near the groundwater level, can be performed.

Excavated soils with high silt and clay contents are unsuitable for use as structural fill throughout the site. Soils containing significant quantities of organic materials may need to be removed from the site and disposed in a manner consistent with local, state, and federal regulations. Stripped topsoil and any cohesive materials may be used to raise site grades in lawn areas but may be difficult to re-handle and place in a manner that will minimize post-construction subsidence. During periods of inclement weather, placing and compaction difficulties will also occur since the materials, in general, will be moisture sensitive. Granular materials encountered during site earthwork operations should be segregated for reuse as general fills for this project.

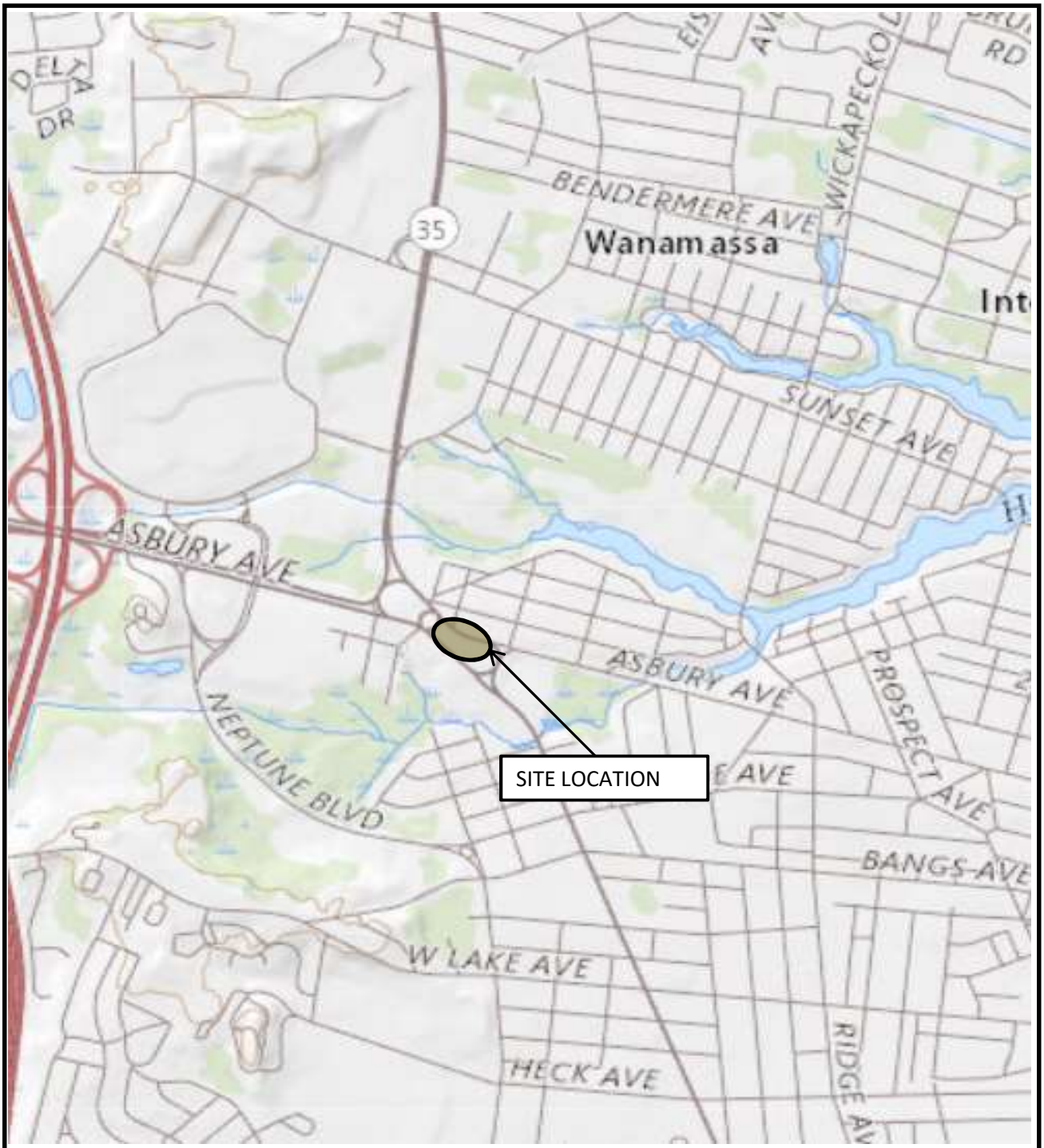
8.0 CLOSING

Successful construction of the project will require competent field observation of the construction operations. Earthwork, including clearing and grubbing, subgrade identification, grading, and fill placement should be observed by a competent individual familiar with the recommendations contained herein. We are available to perform construction observation services, if requested.

The recommendations contained herein are contingent upon the actual field conditions being consistent with those encountered during our field exploration. Should any variation in the anticipated conditions be encountered or site regrading be proposed, Maser Consulting P.A. should be notified immediately to determine what impact the changed conditions may have upon the presented recommendations.

9.0 LIMITATIONS

Services performed by Maser Consulting P.A. during this project have been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in the services provided. This is not an Environmental Assessment.



NOTES:

1.) *SITE MAP OBTAINED FROM USGS TOPOGRAPHIC MAP, ASBURY PARK, NEW JERSEY QUADRANGLE, DATED 2016.

MASER CONSULTING P.A.

Consulting, Municipal & Environmental Engineers
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New Jersey New York Pennsylvania Virginia
Customer Loyalty *through* Client Satisfaction

Title: SITE LOCATION MAP

Project:

M & M AT NEPTUNE, LLC
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

Drawn	MN	Checked By:	MC	Project	19000475A
Scale	N.T.S.	Date	5/7/19	Figure No.:	1

ASBURY AVE (A.K.A. COUNTY ROUTE 16)
(66' WIDE PER RECORD)

PROPOSED RESTAURANT
4,536 S.F.
(50 SEATS)

PROP. RETAIL
CANOPY: 733 S.F.
BUILDING: 22,245 S.F.
TOTAL: 22,978 S.F.

PROP. CONVENIENCE STORE W/GAS
5,486 S.F.
(13 SEATS)

TP #1
EL. 22.33

TP #2
EL. 20.72

TP #3
EL. 21.05

TP #4
EL. 17.50

TP #5
EL. 21.54

TP #6
EL. 21.82

TP #7
EL. 23.25

NJ STATE HIGHWAY ROUTE 35
(WIDTH VARIES)

POND

20' 0 20' 40' 80'

SCALE: 1" = 40'

NO.	REVISIONS	DATE	BY

THIS WORK PREPARED UNDER MY IMMEDIATE SUPERVISION
BRADFORD J. ALLER
PROFESSIONAL ENGINEER
5/22/19
N.J.P.E. LIC. NO. GE 43435 DATE

DRAWN BY: DM	CHECKED BY: BJA
DATE: 5/22/19	SCALE: 1"=40'
APPROVED BY: RCA	ACAD NO.: 201-SB
FIELD BOOK: --- PAGE: ---	PROJECT NO.:
SHEET 1 OF 2	DRAWING NO.: SB-1
	REVISION

EP DESIGN SERVICES, LLC
State of New Jersey Certificate of Authorization #: 24GA28126500
2901 Hamilton Boulevard
South Plainfield, New Jersey 07080
(908) 205-0443 Fax: (908) 755-3272

SOIL BORING LOCATIONS (PROP. OVERLAY)
M & M AT NEPTUNE, LLC
FOR
BLOCK 701, LOT 1
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY NEW JERSEY

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Plotted:05/23/19 - 9:57 AM, By: dmcdonough
File: I:\Engineering\Projects\Commercial\Monmouth\Cox Cole Blvd\03 Reports\01 (Geotechnical)\Test Pit Location Plan.dwg — Layout: SB-1

APPENDIX A

TEST PIT LOGS

MASER CONSULTING P.A.
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Fax (732) 383-1990
E-mail - geotech@maserconsulting.com

TEST PIT No. TP-1

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 22.33

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 4/3) Brown Sandy Loam. Subangular Blocky, Friable. Frequent Roots. (Topsoil, Moist). 4"	
	24	(10YR 6/6) Brownish Yellow Sandy Loam. Subangular Blocky, Friable. (Moist). 6"	
	36, 48	(10YR 7/1) Light Gray f Sandy Loam. Subangular Blocky, Friable. (7.5 YR 5/8) Strong Brown Many, Coarse, Distinct Mottles. (Moist, Seepage at 46"). 46"	
5	60, 72, 84, 96, 108	(10YR 3/2) Very Dark Grayish Brown Clay Loam. Massive, Firm. Micaceous. (Moist to Very Moist with Depth). 138"	
10	120, 132, 144	(7.5YR 6/1) Gray Sand. (Wet).	
	156, 168	**END OF TEST PIT AT 150 INCHES** **MODERATE SEEPAGE AT 28 INCHES** **SEEPAGE AT 46 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	11.5	4/17/19
At Completion (0 hrs.) ▼	11.5	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 6 Inches (Perched)

TEST PIT No. TP-1

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TEST PIT No. TP-2

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 20.72

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 3/3) Dark Brown Sandy Loam. 10% Gravel. Subangular Blocky, Friable. Frequent Roots. (Topsoil, Moist).	
		5"	
	24	(10YR 6/4) Light Yellowish Brown Loam. Subangular Blocky, Friable. (Moist).	
		8"	
	36, 48	(10YR 7/2) Light Gray f Sandy Loam. Subangular Blocky, Friable. Micaceous. (7.5YR 5/8) Strong Brown Common, Fine, Distinct Mottles Throughout. (Moist, Seepage at 20").	
		24"	
5	60, 72, 84, 96, 108	(10YR 3/2) Very Dark Grayish Brown Clay Loam. Massive, Firm. Common (10YR 7/2) Light Gray Loamy Sand Seams & Partings. (Moist Becoming Wet at 102").	
10	120		
		126"	
	132	(7.5YR 6/1) Gray Sand. Single Grain, Loose. (Wet).	
	144, 156, 168	**END OF TEST PIT AT 132 INCHES** **LIGHT SEEPAGE AT AT 20 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	8.5	4/17/19
At Completion (0 hrs.) ▼	8.5	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 8 Inches (Perched)

TEST PIT No. TP-2

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TEST PIT No. TP-3

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 21.05

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 4/3) Brown Sandy Loam. 10% Gravel. Subangular Blocky, Friable. (Possible Fill, Moist).	
	19"		
	24	(10YR 5/6) Yellowish Brown Sandy Loam. 10% Gravel. Subangular Blocky, Friable. (Possible Fill, Moist).	
	29"		
	36, 48	(10YR 2/2) Very Dark Brown Loam. Subangular Blocky, Friable. (10YR 7/1) Light Gray f Loamy Sand Partings. Many Roots. (Possible Fill, Moist, Seepage at 47").	
	47"		
5	60, 72, 84, 96	(10YR 7/1) Light Gray f Sandy Loam. Subangular Blocky, Friable. (7.5YR 5/8) Strong Brown Common, Medium to Fine, Distinct Mottles. (Moist Becoming Wet at 54").	
	108"		
10	120, 132, 144	(10YR 7/1) Light Gray Clay Loam. Massive, Firm. (Wet).	
	156, 168	**END OF TEST PIT AT 144 INCHES** **SEEPAGE AT 47 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	4.5	4/17/19
At Completion (0 hrs.) ▼	4.5	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 47 Inches

TEST PIT No. TP-3

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TEST PIT No. TP-4

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 17.5

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 3/3) Dark Brown Sandy Loam. Subangular Blocky, Friable. 5% Gravel. (Topsoil, Moist).	
		19"	
	24	(10YR 5/6) Yellowish Brown Loamy Sand. Subangular Blocky, Friable. (Fill, Moist).	
		16"	
	36, 48	(10YR 7/1) Light Gray f Sandy Loam. Subangular Blocky, Friable. (7.5YR 5/6) Strong Brown Many, Coarse, Distinct Mottles Throughout. (Moist, Seepage at 47").	
5	60		
		66"	
	72, 84, 96, 108	(10YR 5/1) Gray f Sandy Loam. Subangular Blocky, Friable. (Very Moist).	
10	120		
		132"	
	132, 144	(7.5YR 6/1) Gray Sand. Single Grain, Loose. (Wet).	
	156, 168	**END OF TEST PIT AT 150 INCHES** **SEEPAGE AT 47 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	11.0	4/17/19
At Completion (0 hrs.) ▼	11.0	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 16 Inches (Perched)

TEST PIT No. TP-4

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TEST PIT No. TP-5

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 21.54

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 4/3) Brown Loamy Sand. 5% Gravel. (Topsoil, Possible Fill, Moist).	2"
	24	(10YR 4/3) Brown Loam. Subangular Blocky, Friable. (10YR 6/2) Light Brownish Gray Stratified f Loamy Sand Partings. (Possible Fill, Moist).	18"
	36	(10YR 5/1) Gray f Sandy Loam. Subangular Blocky, Friable. (Possible Fill, Moist, Seepage from 20" to 31").	31"
	48		
5	60		
	72		
	84	(10YR 4/2) Dark Grayish Brown Clay Loam. (Moist to Very Moist with Depth).	
	96		
	108		
10	120		
	132		132"
	144	(7.5YR 6/1) Gray Sand. Single Grain, Loose. (Wet).	
	156	END OF TEST PIT AT 144 INCHES SEEPAGE FROM 20 TO 31 INCHES	
	168		
15	180		
	192		
	204		
	216		
	228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	11.0	4/17/19
At Completion (0 hrs.) ▼	11.0	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 20 Inches (Perched)

TEST PIT No. TP-5

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TEST PIT No. TP-6

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 21.82

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 4/3) Brown Sandy Loam. Subangular Blocky, Friable. Frequent Roots. (Topsoil, Moist). 6"	
	24, 36	(10YR 7/1) Light Gray f Sandy Loam. Subangular Blocky, Friable. (7.5YR 5/8) Strong Brown Many, Coarse, Distinct Mottles. (Moist, Seepage from 37" to 56"). 42"	
5	48, 60, 72, 84, 96, 108	(10YR 3/2) Very Dark Grayish Brown Clay Loam. Massive, Firm to Cemented. (Moist to Very Moist with Depth).	
10	120, 132	(10YR 3/2) Very Dark Grayish Brown Sand. Single Grain, Loose. (Wet). 132"	
	144, 156, 168	**END OF TEST PIT AT 144 INCHES** **SEEPAGE FROM 37 TO 56 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	11.0	4/17/19
At Completion (0 hrs.) ▼	11.0	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 6 Inches (Perched)

TEST PIT No. TP-6

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TEST PIT No. TP-7

DATE EXCAVATED: 4/17/19
SURFACE ELEVATION: 23.25

Project: M & M At Neptune, LLC
Location: Neptune, Monmouth, NJ
Job Number: 19000475A

EXCAVATED BY: Edgewood Properties
EQUIPMENT USED: CAT 322C
INSPECTED BY: Megan Nugent

DEPTH (ft)	DEPTH (in)	DESCRIPTION	REMARKS
0	3, 6, 9, 12	(10YR 4/3) Brown Sandy Loam. Subangular Blocky, Friable. (Topsoil, Fill, Moist).	
		4"	
	24	(10YR 3/3) Dark Brown Loam. Subangular Blocky, Friable. (Possible Fill, Moist).	
		16"	
	36, 48	(10YR 7/1) Light Gray Loam. Subangular Blocky, Friable. (7.5YR 5/8) Strong Brown Many, Coarse, Distinct Mottles. (Moist, Seepage from 28" to 66").	
5	60		
		66"	
	72, 84, 96, 108	(10YR 3/1) Very Dark Gray Clay Loam. Massive, Firm. (Very Moist).	
10	120	(10YR 3/1) Very Dark Gray Sand. Single Grained, Loose. (Wet).	
	132		
	144, 156, 168	**END OF TEST PIT AT 132 INCHES** **SEEPAGE FROM 28 TO 66 INCHES**	
15	180, 192, 204, 216, 228		
20	240		

GROUNDWATER:	DEPTH (ft.)	DATE
First Encountered ▽	10.5	4/17/19
At Completion (0 hrs.) ▼	10.5	4/17/19
After Completion (>24 hrs.) ▼		

ESTIMATED DEPTH TO SEASONAL HIGH GROUNDWATER: 16 Inches (Perched)

TEST PIT No. TP-7

APPENDIX B

TUBE PERMEAMETER TEST RESULTS

MASER CONSULTING P.A.
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One River Centre - Building Two
331 Newman Springs Road, Red Bank, NJ 07701
Tel: 732.383.1950 ▪ Fax: 732.383.1984
www.maserconsulting.com

TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-1	Replicate:	A
Depth of Sample:	21"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.375 in

2. **Measurements** Tube Weight = 365.85 g
   Total Weight = 672.20 g
   tube #: F-6 Soil Weight = 306.35 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 97.68

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.14

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.500 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.125
b.	0:00:00	1:00	60.0	0.125
c.	0:00:00	1:00	60.0	0.125
d.	0:00:00	1:00	60.0	0.125
		av =	60.0	0.125

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.12 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____ License #45357
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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-1	Replicate:	B
Depth of Sample:	21"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.250 in

2. **Measurements** Tube Weight = 354.06 g
   Total Weight = 666.08 g
   tube #: B-100 Soil Weight = 312.02 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 94.07

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.32

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-2	Replicate:	A
Depth of Sample:	8"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.000 in

2. **Measurements** Tube Weight = 357.77 g
   Total Weight = 649.97 g
   tube #: JM-10 Soil Weight = 292.2 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 86.83

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.37

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-2	Replicate:	B
Depth of Sample:	8"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.125 in

2. **Measurements** Tube Weight = 353.09 g
   Total Weight = 677.20 g
   tube #: M-7 Soil Weight = 324.11 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 90.45

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.58

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.750 H_1
   At end of interval: 3.750 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-2	Replicate:	A
Depth of Sample:	24"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.250 in

2. **Measurements** Tube Weight = 360.14 g
   Total Weight = 654.94 g
   tube #: M-1 Soil Weight = 294.8 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 94.07

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.13

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.500 H_1
   At end of interval: 3.500 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-2	Replicate:	B
Depth of Sample:	24"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.250 in

2. **Measurements** Tube Weight = 351.88 g
   Total Weight = 642.78 g
   tube #: BC-6 Soil Weight = 290.9 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 94.07

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.09

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-3	Replicate:	A
Depth of Sample:	19"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.125 in

2. **Measurements** Tube Weight = 366.98 g
   Total Weight = 690.00 g
   tube #: M-3 Soil Weight = 323.02 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 90.45

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.57

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.875 H_1
   At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-3	Replicate:	B
Depth of Sample:	19"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.000 in

2. **Measurements** Tube Weight = 356.98 g
   Total Weight = 669.61 g
   tube #: M-4 Soil Weight = 312.63 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 86.83

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.60

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.750 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.125
b.	0:00:00	1:00	60.0	0.125
c.	0:00:00	1:00	60.0	0.125
d.	0:00:00	1:00	60.0	0.125
		av =	60.0	0.125

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.10 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-3	Replicate:	A
Depth of Sample:	47"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.250 in

2. **Measurements** Tube Weight = 358.17 g
   Total Weight = 683.15 g
   tube #: BM-69 Soil Weight = 324.98 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 94.07

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.45

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.500 H_1
   At end of interval: 3.500 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-3	Replicate:	B
Depth of Sample:	47"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.625 in

2. **Measurements** Tube Weight = 359.14 g
   Total Weight = 682.24 g
   tube #: M-2 Soil Weight = 323.1 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 104.92

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.08

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.500 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.125
b.	0:00:00	1:00	60.0	0.125
c.	0:00:00	1:00	60.0	0.125
d.	0:00:00	1:00	60.0	0.125
		av =	60.0	0.125

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.13 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-4	Replicate:	A
Depth of Sample:	20"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.250 in

2. **Measurements** Tube Weight = 362.51 g
   Total Weight = 697.92 g
   tube #: M-5 Soil Weight = 335.41 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 94.07

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.57

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 4.000 H_1
   At end of interval: 4.000 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-4	Replicate:	B
Depth of Sample:	20"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.125 in

2. **Measurements** Tube Weight = 357.94 g
   Total Weight = 687.22 g
   tube #: M-6 Soil Weight = 329.28 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 90.45

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.64

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.875 H_1
   At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____ License #45357
Michael Carnivale, III, P.E.

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Tel: 732.383.1950 ▪ Fax: 732.383.1984
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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-5	Replicate:	A
Depth of Sample:	15"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.500 in

2. **Measurements** Tube Weight = 349.96 g
   Total Weight = 666.40 g
   tube #: AC-5 Soil Weight = 316.44 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 101.30

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.12

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-5	Replicate:	B
Depth of Sample:	15"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.375 in

2. **Measurements** Tube Weight = 346.53 g
   Total Weight = 654.51 g
   tube #: M-8 Soil Weight = 307.98 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 97.68

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.15

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.500 H_1
   At end of interval: 3.500 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-5	Replicate:	A
Depth of Sample:	53"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.000 in

2. **Measurements** Tube Weight = 358.49 g
   Total Weight = 590.88 g
   tube #: M-9 Soil Weight = 232.39 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 86.83

   Bulk Density = Soil Weight / Volume
   Bulk Density = 2.68

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.875 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	15:00	15.0	0.250
b.	0:00:00	15:15	15.3	0.250
c.	0:00:00	15:22	15.4	0.250
d.	0:00:00	15:21	15.4	0.250
		av =	15.3	0.250

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.79 in/hr = Soil Permeability Class K2

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-5	Replicate:	B
Depth of Sample:	53"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.000 in

2. **Measurements** Tube Weight = 358.77 g
   Total Weight = 602.71 g
   tube #: M-10 Soil Weight = 243.94 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 86.83

   Bulk Density = Soil Weight / Volume
   Bulk Density = 2.81

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.750 H_1
   At end of interval: 3.375 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	15:00	15.0	0.375
b.	0:00:00	15:12	15.2	0.375
c.	0:00:00	15:18	15.3	0.375
d.	0:00:00	15:15	15.3	0.375
		av =	15.2	0.375

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 1.25 in/hr = Soil Permeability Class K2

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-6	Replicate:	A
Depth of Sample:	18"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.375 in

2. **Measurements** Tube Weight = 357.34 g
   Total Weight = 713.85 g
   tube #: BM-65 Soil Weight = 356.51 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 97.68

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.65

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.875 H_1
   At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-6	Replicate:	B
Depth of Sample:	18"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.375 in

2. **Measurements** Tube Weight = 355.68 g
   Total Weight = 712.84 g
   tube #: AC-20 Soil Weight = 357.16 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 97.68

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.66

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.625 H_1
   At end of interval: 3.625 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-7	Replicate:	A
Depth of Sample:	24"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.375 in

2. **Measurements** Tube Weight = 368.57 g
   Total Weight = 712.14 g
   tube #: B-8 Soil Weight = 343.57 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 97.68

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.52

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.875 H_1
   At end of interval: 3.875 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

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TUBE PERMEAMETER TEST DATA

Project Name:	M & M At Neptune	Project Number:	19000475A
Block:	701	Municipality:	Neptune
Lot:	1	County:	Monmouth
Test Number:	1	Date Collected:	4/17/2019
Material Tested:	TP-7	Replicate:	B
Depth of Sample:	24"	Sample Type:	Undisturbed

1. **Sample Dimensions** Radius = 1.905 cm
   Length = 3.125 in

2. **Measurements** Tube Weight = 356.12 g
   Total Weight = 688.36 g
   tube #: M-11 Soil Weight = 332.24 g

   Volume = Length * 2.54 cm/inch * π * Radius²
   Volume = 90.45

   Bulk Density = Soil Weight / Volume
   Bulk Density = 3.67

   Height of Water Level above Rim of Test Basin (inches)

   At beginning of interval: 3.750 H_1
   At end of interval: 3.750 H_2

3. **Test Data**

	Time Begin, T_1	Time End, T_2	Test Length (min)	Δ Height (in)
a.	0:00:00	1:00	60.0	0.000
b.	0:00:00	1:00	60.0	0.000
c.	0:00:00	1:00	60.0	0.000
d.	0:00:00	1:00	60.0	0.000
		av =	60.0	0.000

4. **Permeability Calculation** K (in/hr) = 60 min/hr * r^2/R^2 * L (in)/T (min) * ln (H_1/H_2)

   K = 0.00 in/hr = Soil Permeability Class K0

5. Any **Defects** in Sample: No

6. I hereby certify that the information on Form 3b of this application is true and accurate. I am aware that falsification of data is a violation of the water polution Control Act (NJSA 59:10A-1 et seq.) and is subject to penalties as prescribed in NJAC 7:14-8.

Signature of Professional Engineer _____ License #45357
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APPENDIX E
DRAINAGE AREA MAPS

INVENTORY

EXISTING DRAINAGE AREA MAP

PROPOSED DRAINAGE AREA MAP

PROPOSED INLET DRAINAGE AREA MAP

DRAINAGE AREA TO DEAL LAKE

SYMBOL | **DESCRIPTION**

- EXISTING DRAINAGE AREA
- EXISTING WOODED AREA
- EXISTING GRASSED AREA
- EXISTING TIME OF CONCENTRATION
- SOIL TYPE BOUNDARY

ISSUE	DATE	BY	DESCRIPTION

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DRAINAGE AREA MAPS

EDGEWOOD PROPERTIES
PROPOSED IMPROVEMENTS

BLOCK 701, LOT 1
704 ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47290
LICENSED PROFESSIONAL ENGINEER

NOT APPROVED FOR CONSTRUCTION

SCALE: (H)

PROJECT ID: PRI-200142

STONEFIELD engineering & design

TITLE: EXISTING DRAINAGE AREA MAP

SHEET: 1 OF 3

Z:\Princeton\PRI\2020\PRI-200142 Edgewood Properties - 704 Route 35, Neptune, NJ\CADD\Exhibits\2020-1 | 1-18-Drainage Area Maps.dwg
Z:\Princeton\PRI\2020\PRI-200142 Edgewood Properties - 704 Route 35, Neptune, NJ\CADD\Exhibits\2020-2 | 1-18-Drainage Area Maps.dwg

AREA 1-PROPOSED	
198,238 SF =	IMPERVIOUS AREAS
49,177 SF =	GRASS, GOOD (HSG D)
247,415 SF =	TOTAL AREA

AREA 2-PROPOSED	
1,676 SF =	IMPERVIOUS AREAS
42,271 SF =	WOODS, GOOD (HSG D)
11,272 SF =	GRASS, GOOD (HSG D)
55,219 SF =	TOTAL AREA

AREA 3-PROPOSED	
0 SF =	IMPERVIOUS AREAS
11,461 SF =	WOODS, GOOD (HSG D)
2,737 SF =	GRASS, GOOD (HSG D)
14,198 SF =	TOTAL AREA

AREA 4-PROPOSED	
4,780 SF =	IMPERVIOUS AREAS
0 SF =	WOODS, GOOD (HSG D)
17162 SF =	GRASS, GOOD (HSG D)
21942 SF =	TOTAL AREA

SYMBOL	DESCRIPTION
	PROPOSED DRAINAGE AREA
	PROPOSED WOODED AREA
	PROPOSED GRASSED AREA
	EXISTING TIME OF CONCENTRATION
	SOIL TYPE BOUNDARY

100' 0' 100' 200'

GRAPHIC SCALE IN FEET
1" = 100'

ISSUE	DATE	BY	DESCRIPTION

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DRAINAGE AREA MAPS

EDGEWOOD PROPERTIES
PROPOSED IMPROVEMENTS

BLOCK 701, LOT 1
704 ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47290
LICENSED PROFESSIONAL ENGINEER

NOT APPROVED FOR CONSTRUCTION

SCALE: (H) 1" = 50'

PROJECT ID: PRI-200142

STONEFIELD
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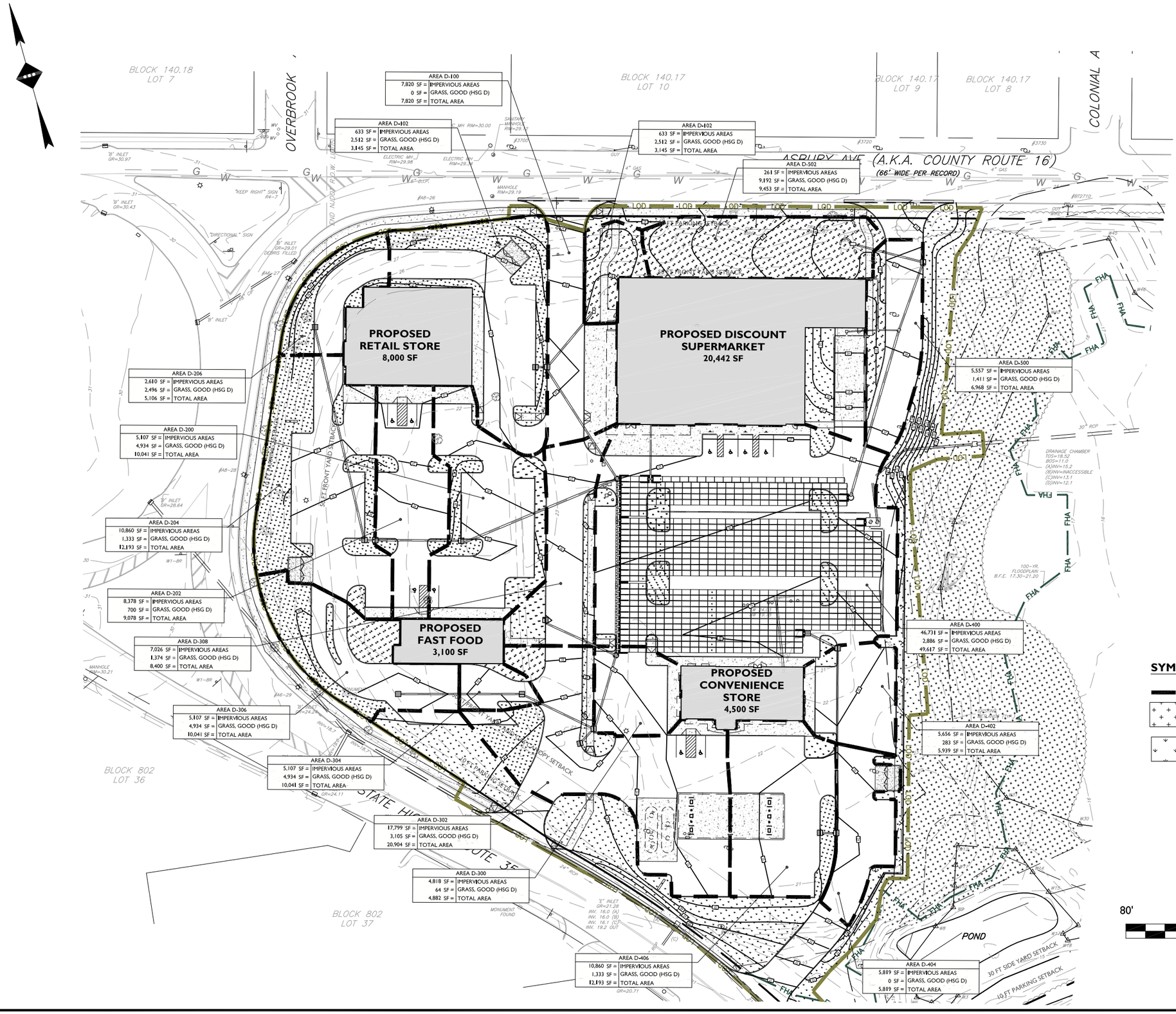
TITLE:
PROPOSED DRAINAGE AREA MAP

SHEET:
2 OF 3



SYMBOL | **DESCRIPTION**

- PROPOSED INLET DRAINAGE AREA
- PROPOSED WOODED AREA
- PROPOSED GRASSED AREA

80' 0' 80' 160'

GRAPHIC SCALE IN FEET
1" = 80'

ISSUE	DATE	BY	DESCRIPTION

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DRAINAGE AREA MAPS

EDGEWOOD PROPERTIES
PROPOSED IMPROVEMENTS

BLOCK 701, LOT 1
704 ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47290
LICENSED PROFESSIONAL ENGINEER

NOT APPROVED FOR CONSTRUCTION

SCALE: (H) 1" = 50'

PROJECT ID: PRI-200142

STONEFIELD engineering & design

TITLE:
INLET DRAINAGE AREA MAP

SHEET:
3 OF 3

Z:\Princeton\PRI\2020\PRI-200142 Edgewood Properties - 704 Route 35, Neptune, NJ\CADD\Exhibits\2020-11-18-Drainage Area Maps.dwg

NO.	ISSUE	DATE	BY	DESCRIPTION
	1	03-10-21	PC	PER TOWNSHIP

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OFFSITE DRAINAGE AREA EXHIBIT

M&M NEPTUNE, LLC

PROP IMPROVEMENTS

BLOCK 70.1, LOT 1 (TAX MAP SHEET 7)
TAX MAP LOCATION
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47290
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 60' | PROJECT ID: PRI-200142

TITLE:

DEAL LAKE DRAINAGE AREA EXHIBIT

DRAWING:

1

APPENDIX F
MANUFACTURED TREATMENT DEVICE SPECIFICATIONS

StormFilter Design Summary

Mixed Use

Neptune, NJ
11/5/20

Information Provided by Engineer (Stonefield):

- Required TSS removal rate = 80%
- Water quality flow rate = 1.67 cfs
- 25-YR peak flow rate = TBD
- Roadway impervious drainage area = 162925 sf (3.74 acres)
- Presiding agency = NJDEP

StormFilter Information and Cartridge Data:

The Stormwater Management StormFilter® is a passive, siphon-actuated, flow-through stormwater filtration system consisting of a precast concrete structure that houses rechargeable, media-filled filter cartridges. The StormFilter works by passing stormwater through the media-filled cartridges, which trap particulates and adsorb pollutants such as dissolved metals, nutrients, and hydrocarbons. **The StormFilter has received final certification from the NJDEP for 80% TSS removal as a stand-alone treatment system.**

- StormFilter cartridge filter media = Perlite
- StormFilter cartridge media height = 27 inches (nominal)
- StormFilter cartridge surface area = 10.61 square feet (nominal)
- StormFilter cartridge specific treatment flow rate = 2.12 gallons/minute per square foot (nominal)
- StormFilter cartridge treatment flow = 22.5 gpm
- **Hydraulic head required: 3.05 feet** (with 27 inch cartridge)
- Minimum physical drop between inlet and outlet pipe = 6 inches

Design Summary:

The StormFilter is sized based on the NJDEP certification, which lists an approved treatment flow rate and maximum impervious acreage limit per cartridge in Table 1. The number of cartridges required based on the impervious drainage area is compared with the number of cartridges required based on the treatment flow rate; the larger number of cartridges governs the sizing.

The StormFilter for this site was sized to provide **34 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends an 8' x 22' precast Peak Diversion StormFilter.

$$N_{cartridges\ hyd.load} = \frac{Q_{treat}\ X\ 449\ {}^{gpm}/_{cfs}}{Q_{cartridge}} = \frac{1.67\ cfs\ X\ 449\ {}^{gpm}/_{cfs}}{22.5\ {}^{gpm}/_{cartridge}} = 33.33\ \Rightarrow\ (34)\ 27"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{3.74\ acre}{0.136\ {}^{acres}/_{cartridge}} = 27.50\ \Rightarrow\ (28)\ 27"\ Cartridges$$

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conteches.com
7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492

StormFilter Design Summary

Maintenance:

Maintenance of Stormwater best management practices is required per the New Jersey Administrative Code 7:8-5.8. Recommendations for maintenance are included in chapters 8 & 9 of the New Jersey Stormwater Best Management Practices Manual. To comply with requirements, CONTECH offers a network of Preferred Service Providers that have the capability to perform all necessary inspections, compliance reporting and cleaning services. CONTECH recommends inspecting the system annually and maintaining the system at the recommendation of the annual inspection. Full maintenance is typically required every 24-36 months. Disposal of material should be handled in accordance with local regulations. Please contact CONTECH's Maintenance Department for all questions regarding maintenance at (503) 258-3157 or visit our website at www.conteches.com/maintenance.

Thank you for the opportunity to present this information to you and your client. If you have any questions, please call me at (443-457-1529).

Sincerely,

Taylor Murdock
Contech Engineered Solutions LLC

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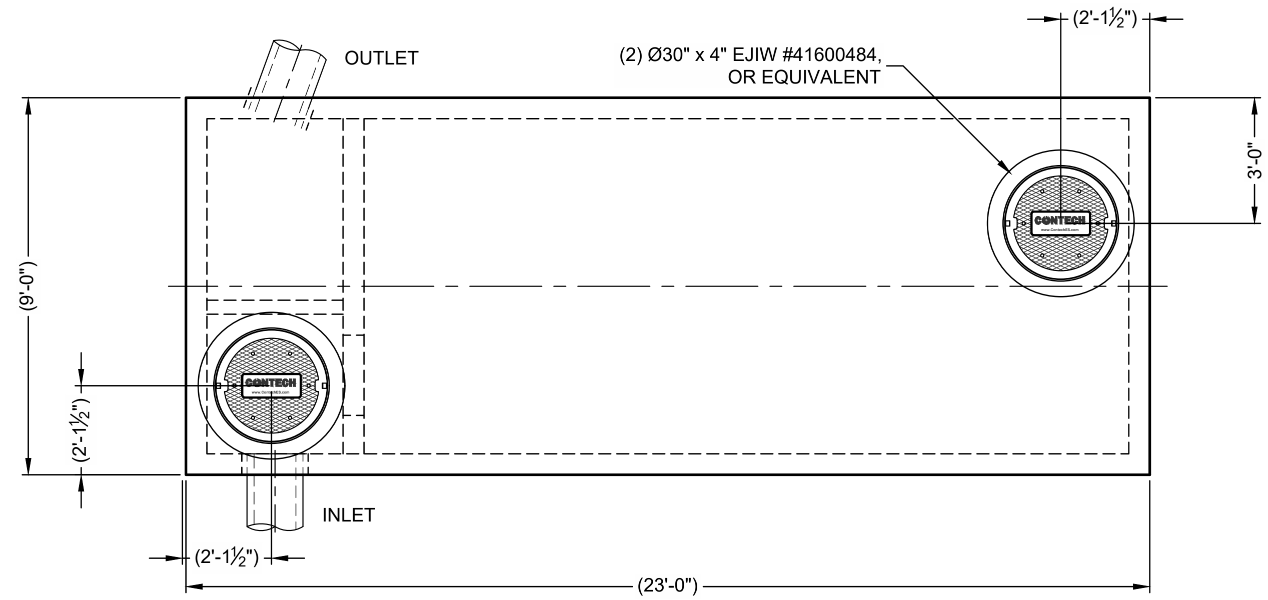
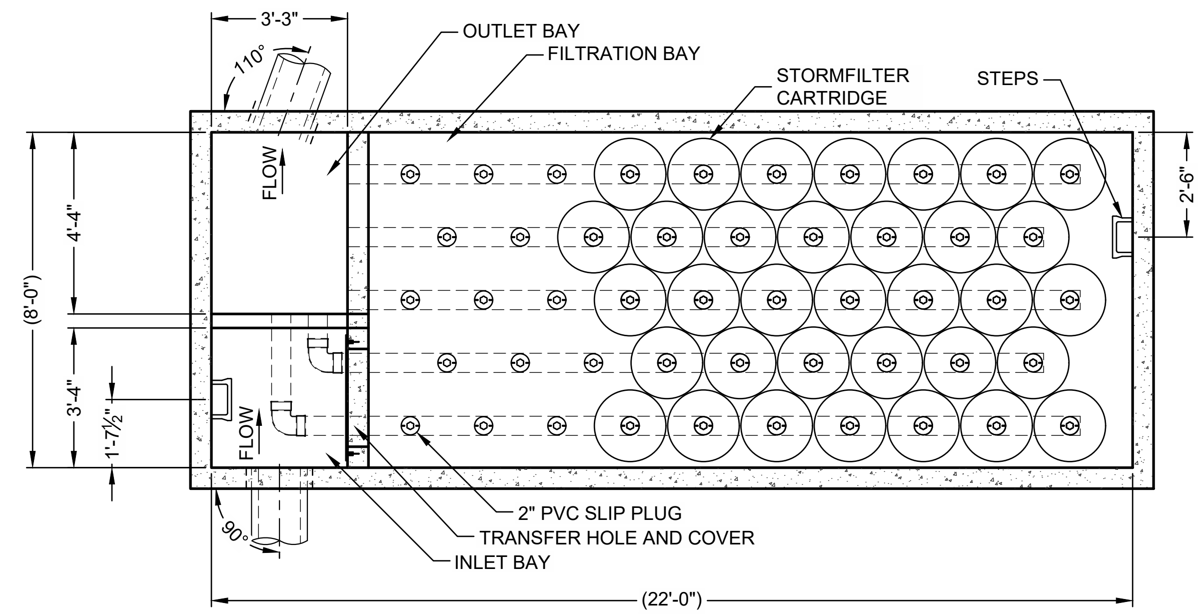
conteches.com

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492

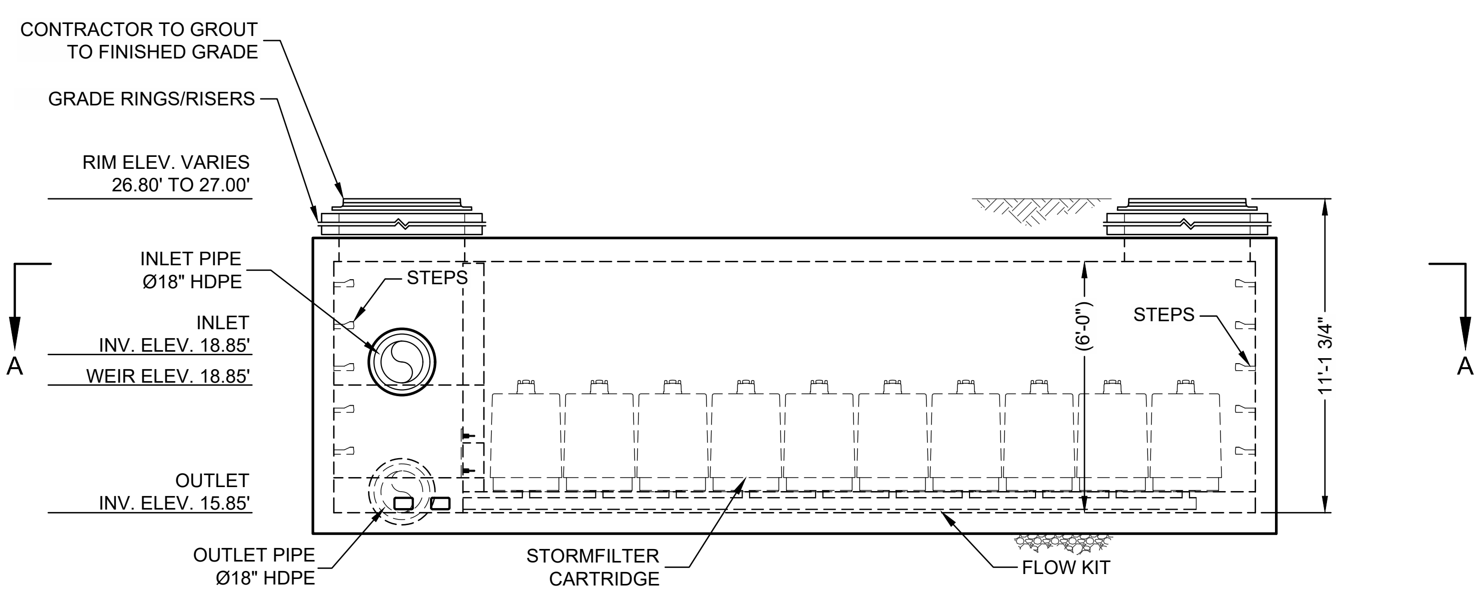


PLAN VIEW



SECTION A-A

VAULT STYLE: 85R----



ELEVATION

MATERIAL LIST - PROVIDED BY CONTECH

COUNT	DESCRIPTION	INSTALLED BY
34	27", PERLITE CARTRIDGE	CONTECH
48	RESTRICTOR DISK (GLD), 22.5 GPM	CONTECH
14	2" PVC SLIP PLUG	CONTECH
1	FLOW KIT (85R----)	CONTECH
1	36" x 14" TRANSFER HOLE COVER	CONTECH
1	JOINT SEALANT	CONTRACTOR
2 PLCS	GRADE RINGS/RISERS	CONTRACTOR
2	Ø30" x 4" EJIW #41600484, OR EQUIVALENT FRAME AND COVER	CONTRACTOR
10	STEPS, P10CTS LANE LADDER, OR EQUIVALENT	CONTECH

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**.
SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM).**

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING WITH ASTM C-857 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

STRUCTURE WEIGHT

APPROXIMATE HEAVIEST PICK = T.B.D. LBS.

CONTECH
PROPOSAL
DRAWING

RS/LS

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

PEAK DIVERSION STORMFILTER
SFPD0822 - 662615-10
MIXED USE
NEPTUNE,NJ

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
11815 NE Glenn Widing Drive, Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,524,576; 5,707,527; 5,985,157; 6,027,639; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

DATE: 10/4/20	
DESIGNED: TKM	DRAWN: TKM
CHECKED:	APPROVED:
PROJECT NUMBER: 662615	
SHEET: 1 OF 1	

\\SPOHHAFILE03.AD.CONTECH-CPI.COM\MERLIN\PROJECT\ACTIVE\662600\662615\662615-10-STORMFILTER\DRAWINGS\PROPOSAL\662615-10-SFPD0822-PRO-A.DWG 11/4/2020 1:10 PM

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Mail Code 401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

December 14, 2016

Derek M. Berg
Director - Stormwater Regulatory Management - East
Contech Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME 04074

Re: MTD Laboratory Certification
Stormwater Management StormFilter® (StormFilter) by Contech Engineered Solutions LLC
Off-line Installation

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 StormFilter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced 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 afore-mentioned 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 for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the StormFilter System 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 subject to 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 2.12 gpm/sf of effective filtration treatment area.

2. The StormFilter System shall be installed using the same configuration as the unit tested by NJCAT, and sized in accordance with the criteria specified in item 6 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 Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the StormFilter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.conteches.com/DesktopModules/Bring2mind/DMX/Download.aspx?EntryId=2813&PortalId=0&DownloadMethod=attachment for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for a StormFilter System.

   Example: A 0.25 acre impervious site is to be treated to 80% TSS removal using a StormFilter System. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The calculation of the minimum number of cartridges for use in the StormFilter System is based upon both the MTFR and the maximum inflow drainage area. It is necessary to calculate the required cartridges using both methods and to rely on the method that results in the highest minimum number of cartridges determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the StormFilter System in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the maximum drainage area:

1. Five (5) 12” cartridges,
2. Three (3) 18” cartridges, or
3. Two (2) 27” cartridges

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined 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=0.99x3.2x0.25=0.79 cfs=0.79x448.83 gpm=354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum number of cartridges are required in a StormFilter System to treat the impervious area without exceeding the MTFR:

1. Thirty-six (36) 12” cartridges,
2. Twenty-four (24) 18” cartridges, or
3. Sixteen (16) 27” cartridges

The MTFR Evaluation results will be used since that method results in the higher minimum number of cartridges determined by the two methods.

The sizing table corresponding to the available system models are noted below:

TABLE 1 STORMFILTER CARTRIDGE HEIGHTS AND NEW JERSEY TREATMENT CAPACITIES

StormFilter Cartridge Heights and New Jersey Treatment Capacities				
StormFilter Cartridge Height	**Filtration Surface Area (sq.ft)**	**MTFR[1] (GPM)**	**Mass Capture Capacity (lbs)**	**Maximum Allowable Inflow Area[2] (acres)**
Low Drop (12")	4.71	10	36.3	0.061
18"	7.07	15	54.5	0.09
27"	10.61	22.5	81.8	0.136

Notes:

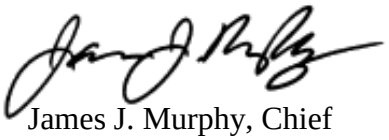
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

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 Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of

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 Shashi Nayak of my office at (609) 633-7021.

Sincerely,



James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

CONTECH®
ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/ maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

Warning: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

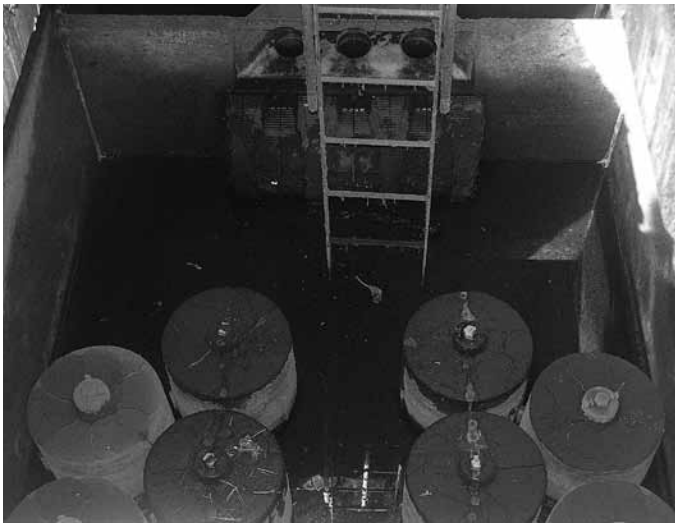
Important: Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to weather or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
   a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
   a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
   a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
   a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
   a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
   a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
   a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.



Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

Important: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

Warning: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

   Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

Important: Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Inspection Report

Date: Personnel:

Location: System Size:

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

Sediment Thickness in Forebay: Date:

Sediment Depth on Vault Floor:

Structural Damage:

Estimated Flow from Drainage Pipes (if available):

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water:

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal:

☐ Minor Structural Repairs:

☐ Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source:

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source:

Erosion of Landscaped Areas: Yes ☐ No ☐ Source:

Items Needing Further Work:

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: _____ Personnel: _____

Location: _____ System Size: _____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other ☐

List Safety Procedures and Equipment Used: _____

_____

_____

System Observations

Months in Service:

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): _____

Sediment Depth on Vault Floor: _____

Structural Damage: _____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: _____

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: _____

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: _____

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: _____

Replace Cartridges: Yes ☐ No ☐ Details: _____

Sediment Removed: Yes ☐ No ☐ Details: _____

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: _____

Residuals (debris, sediment) Disposal Methods: _____

Notes:

_____

_____

_____

_____

_____

_____

_____

RECYCLED PAPER

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ENGINEERED SOLUTIONS

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800-338-1122

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Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit contech-cpi.com or call 800.338.1122.

Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

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