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 JUNE 3,2021
PRI-200142

Jeffrey Martell
Digitally signed by Jeffrey Martell
Date: 2021.06.07 15:55:01 -04'00'

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

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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 is 6.529 acres (including areas within the public right-of-way), and 1.139 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 drains to one point of interest located within Hollow Brook where the Brook crosses Asbury Avenue.

For purposes of this report the onsite flow to the point of interest is broken up into two areas. The first area contains all constructed site improvements. The second area will be reforested in accordance with NJDEP specifications.

TABLE 1: EXISTING DRAINAGE AREAS

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
POI 1 (Ex. Areas 1A and 1B)	Drainage area to Hollow Brook culvert crossing Asbury Avenue (Construction)	289,872 SF	155,960 SF	20.1 Minutes
POI 2	Drainage area to Hollow Brook culvert crossing Asbury Avenue (Reforestation)	53,278 SF	0	6 Minutes*

***The minimum time of concentration was utilized as the time of concentration will not change in proposed conditions.**

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
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 Consulting on May 20, 2019. 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. 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% (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 site drains to one point of interest located within Hollow Brook where the Brook crosses Asbury Avenue.

Under proposed conditions, the existing drainage patterns and point of interest will be maintained. The drainage area which contains all constructed improvements will include stormwater bmps's such as porous pavement, manufactured treatment devices, rain gardens and underground basins.

TABLE 3: PROPOSED DRAINAGE AREAS

Drainage Area	Description	Area Extents	Impervious Area	Time of Concentration
POI 1 (Area1)	Drainage area to Hollow Brook culvert crossing Asbury Avenue	289,872 SF	204,694 SF	6.0 Minutes*
POI 2	Drainage area to Hollow Brook culvert crossing Asbury Avenue (Reforestation)	53,278 SF	0	6 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.**

**** The minimum time of concentration was utilized as the time of concentration will not change in proposed conditions.**

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. All proposed stormwater facilities meet or exceed the minimum separation depth from seasonal high groundwater. 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

Underground detention basins are proposed beneath the off-site parking area and driveway. These basins will attenuate peak stormwater runoff rates for the drainage area which contains the constructed improvements. In addition to the detention basins rain gardens and dry wells are proposed in order to infiltrate enough stormwater runoff volume as to reduce the volume of runoff from the site.

The reforested area will see a natural reduction in runoff volume and peak flow by the planting of trees to create a wooded area where one does not exist today. This area will meet the stormwater regulations by producing a proposed hydrograph that at no point in time exceeded the existing hydrograph.

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 AND VOLUMES

Drainage Area	2-Year Flow Rate / Volume	10-Year Flow Rate / Volume	100-Year Flow Rate / Volume
Drainage Area 1	11.31 CFS / 60,714 CF	18.60 CFS / 103,761 CF	33.49 CFS / 193,747 CF
Drainage Area 2	2.13 CFS / 8,252 CF	4.03 CFS / 15,790 CF	7.92 CFS / 31,995 CF

TABLE 8: SUMMARY OF PROPOSED DRAINAGE AREA FLOW RATES AND VOLUMES

Drainage Area	2-Year Flow Rate / Volume	10-Year Flow Rate / Volume	100-Year Flow Rate / Volume
Drainage Area 1	5.19 CFS / 55,148 CF	9.29 CFS / 97,225 CF	25.63 CFS / 186,050 CF
Drainage Area 2	1.62 CFS / 6,351 CF	3.41 CFS / 13,222 CF	7.27 CFS / 28,682 CF

The table below outlines the peak flow reductions required and achieved by way of the underground basins, dry wells and rain gardens:

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	11.31 CFS	50%	5.66 CFS	5.19 CFS	54.1%
10-Year Storm	18.60 CFS	25%	13.95 CFS	9.29 CFS	50.0 %
100-Year Storm	33.49 CFS	20%	26.79 CFS	25.63 CFS	23.5 %

The proposed underground basins, dry wells, and rain gardens provide sufficient flow rate attenuation and volume infiltration 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.

Manufactured treatment devices (MTD's), specifically the Stormwater Management StormFilter (Stormfilter) by Contech Engineered Solutions LLC, will be installed downstream of the underground basin. The drainage area to each MTD is designed to be less than 2.5 acres. The basins 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%.

In addition to the MTD's rain gardens and porous pavement areas are proposed on site. These BMP's are also approved by the NJDEP for 80% TSS removal. These BMP's will drain to the detention basin and will ultimately be treated by the MTD's for a treatment train TSS removal efficiency of 96%. The total TSS removal rate for the site is 85.9%.

TABLE 10: STORMWATER BMP TSS REMOVAL EFFICIENCIES

Stormwater BMP Facility	NJDEP Certified Removal Efficiency	Motor Vehicle Area Treated	Treatment Train Removal Efficiency
Rain Garden	80%	0.27 Acres	96%
Porous Pavement	80%	1.79 Acres	96%
Manufactured Treatment Device	80%	3.84 Acres	80%
Total Site			85.9%

A copy of the NJDEP certification as well as a design summary for the MTD's 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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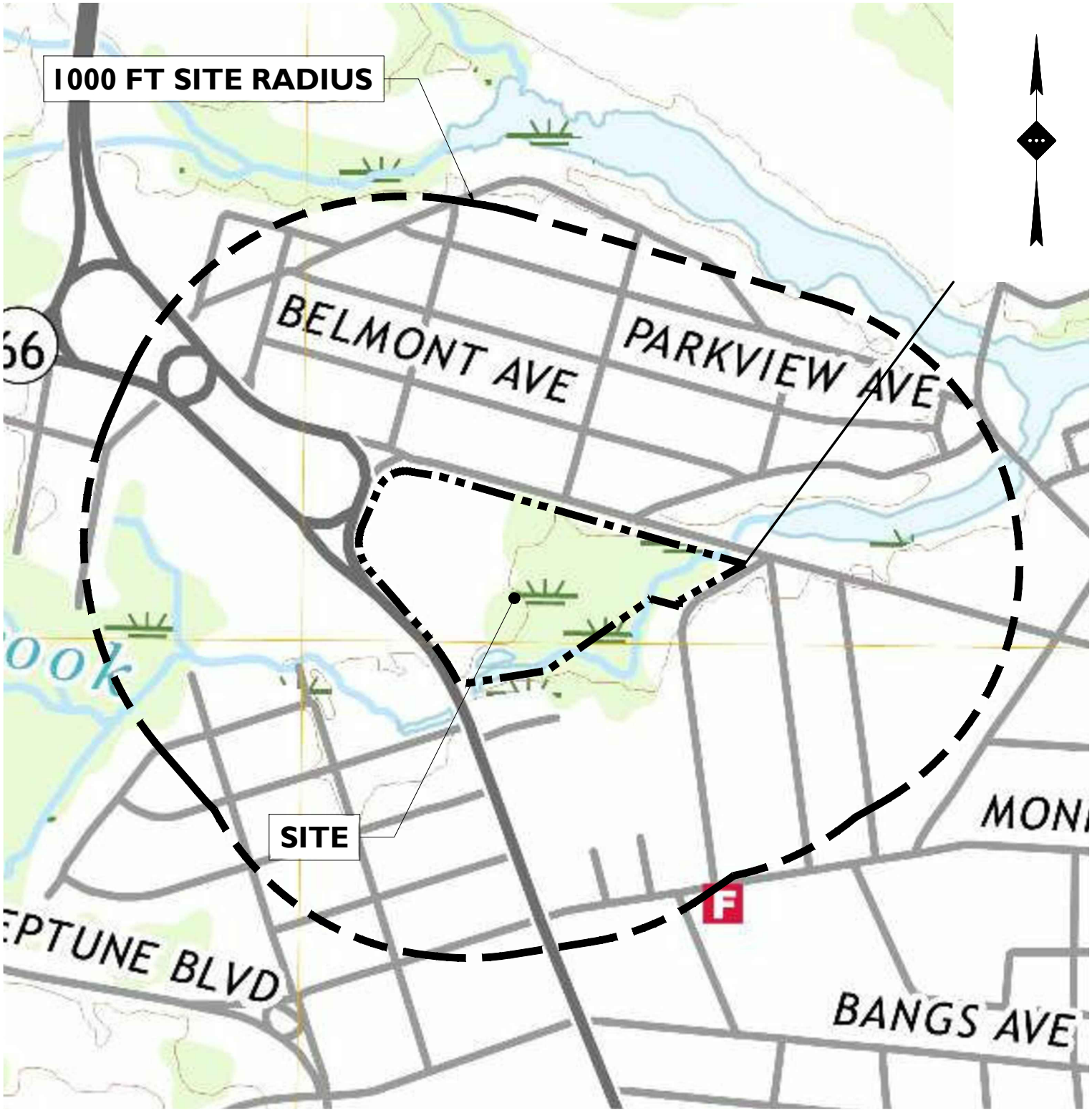

USGS QUADRANGLE MAP

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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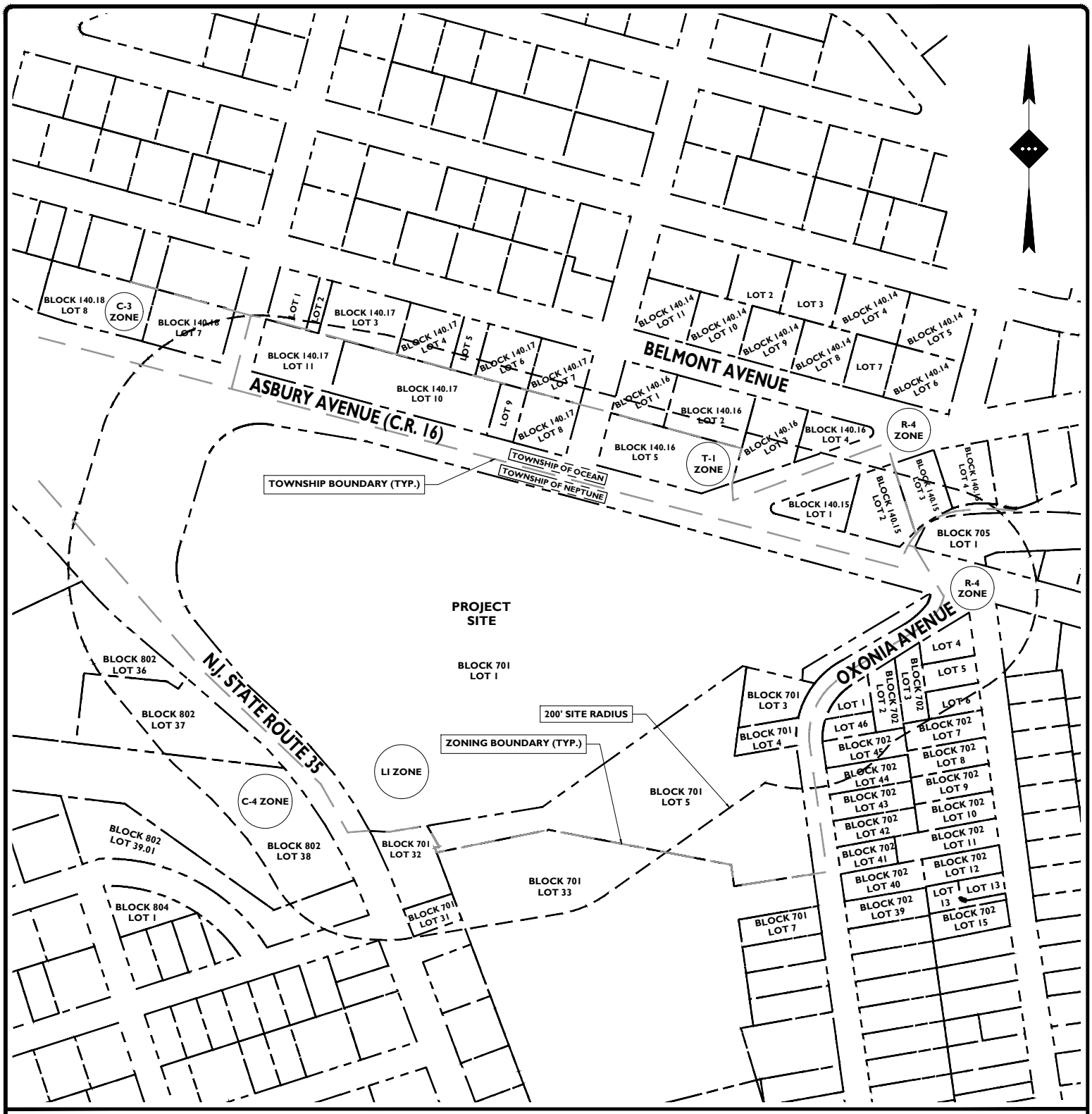

TAX AND ZONING MAP

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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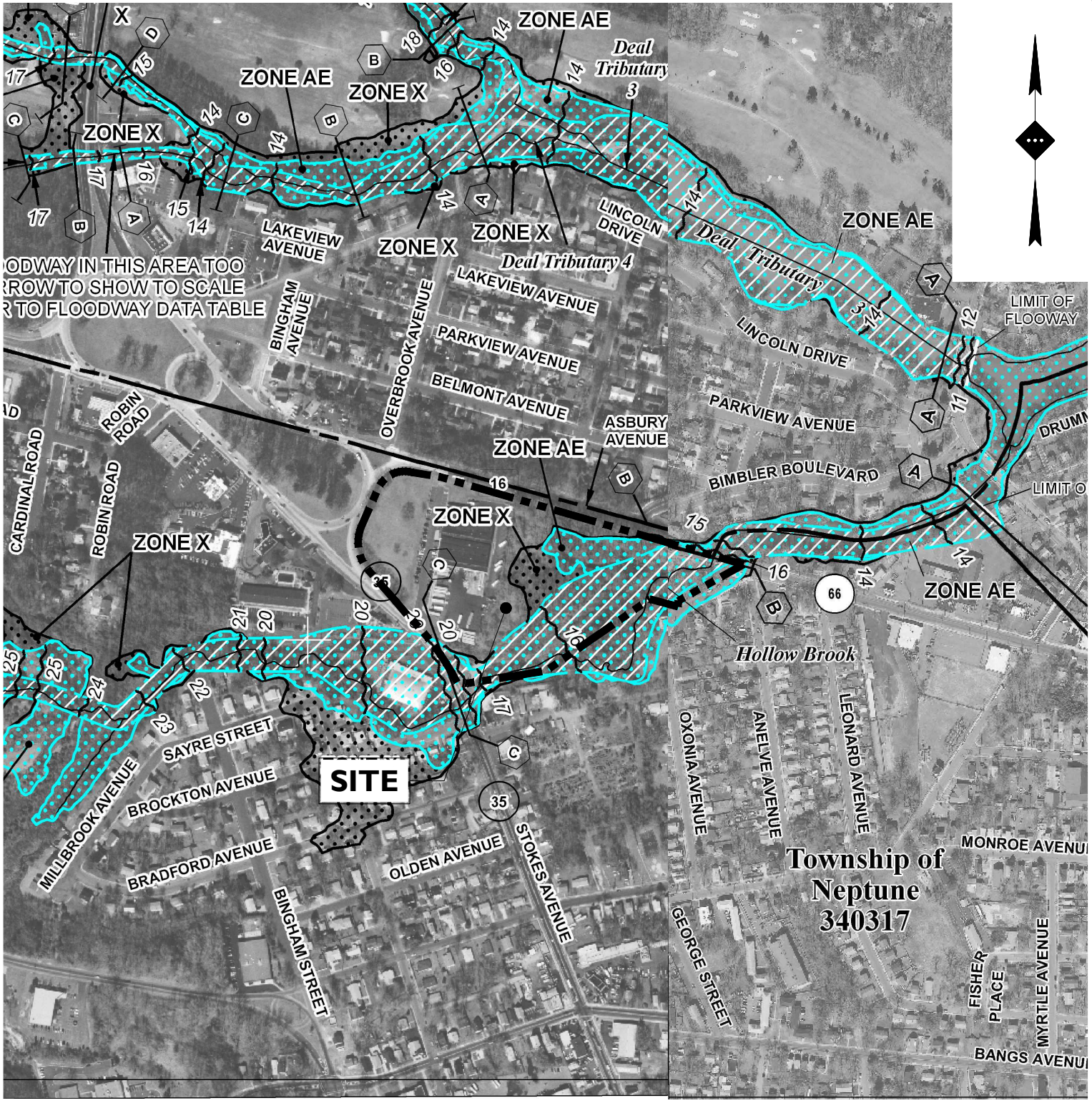

FEMA FLOOD RATE INSURANCE MAP

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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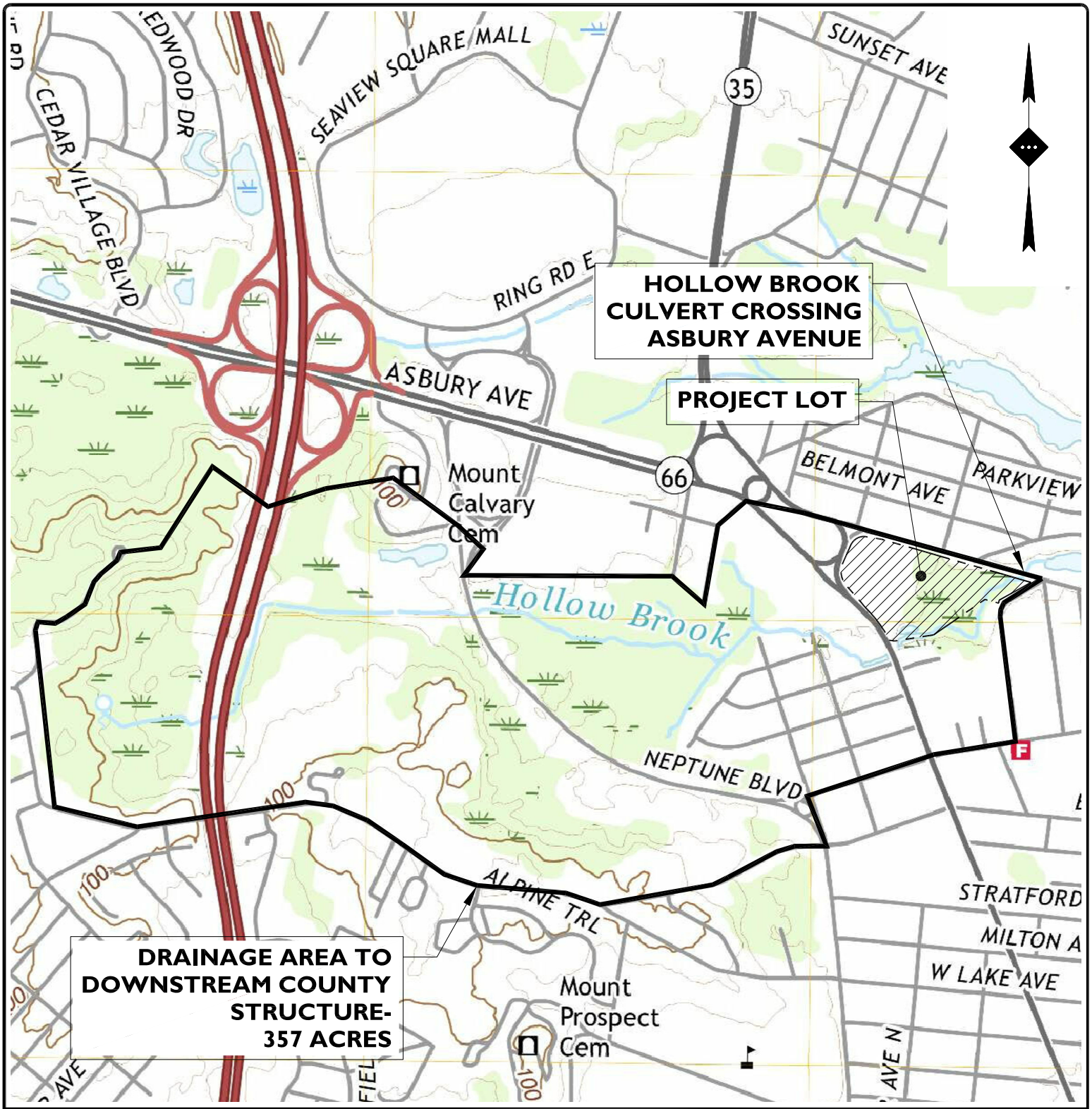

DRAINAGE AREA TO DOWNSTREAM COUNTY STRUCTURE EXHIBIT

1000' 0' 1000' 2000'

GRAPHIC SCALE IN FEET

1" = 1000'

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

M & M NEPTUNE, LLC

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

DRAWN BY:	PAC
CHECKED BY:	PDM
DATE:	1/29/21
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

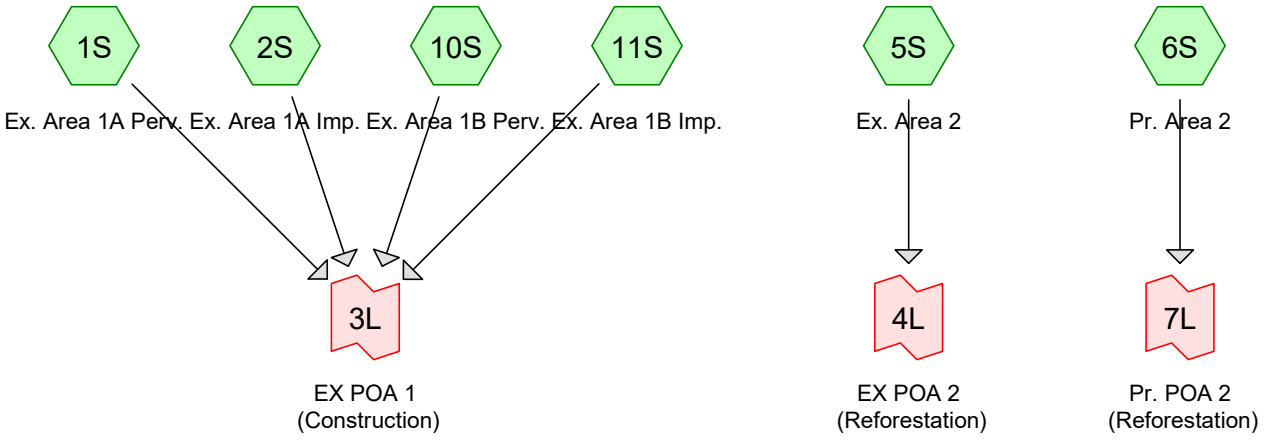
Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

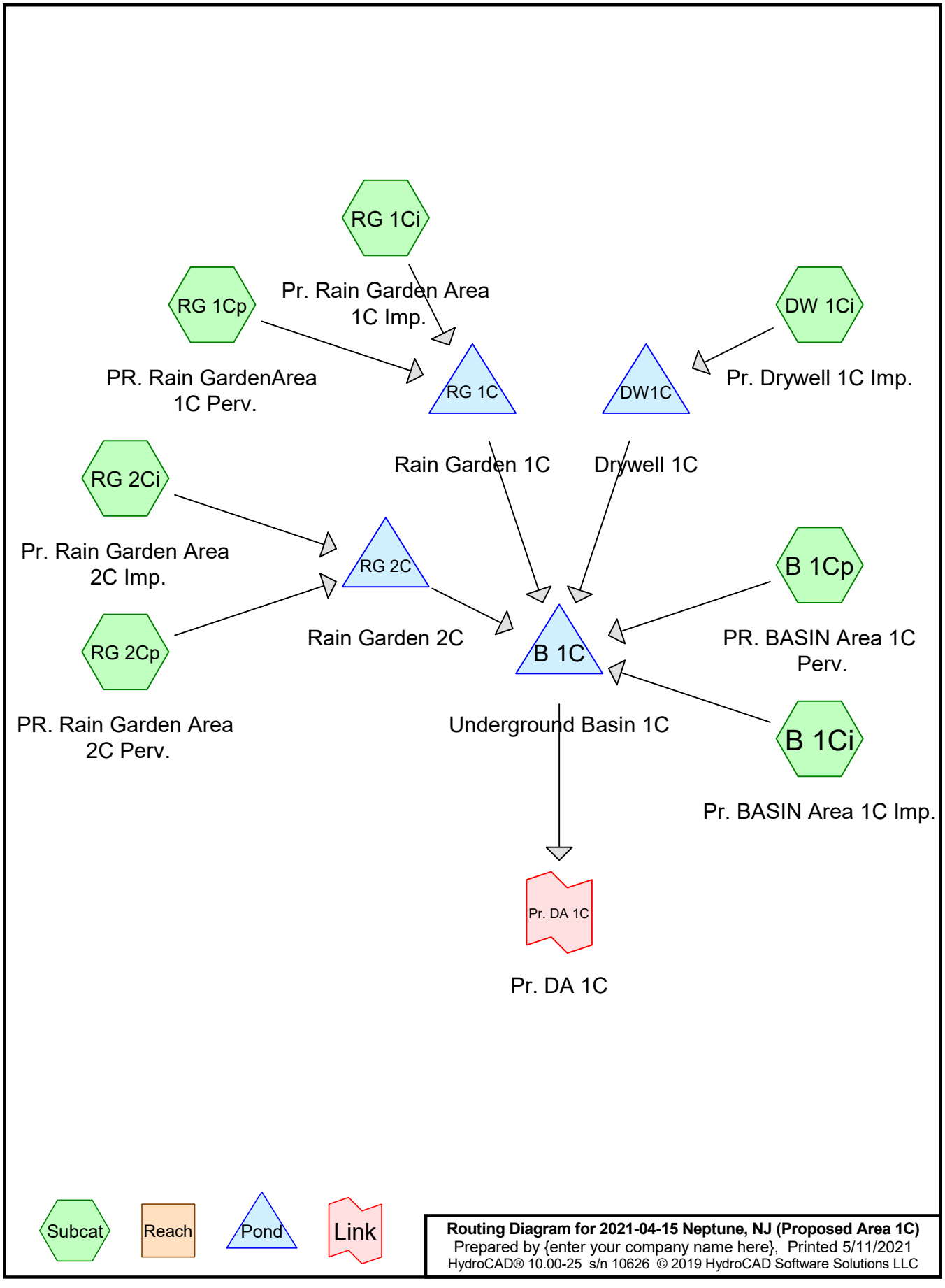
APPENDIX C
DESIGN CALCULATIONS & DIAGRAMS

APPENDIX C-1
HydroCAD Routing Diagram

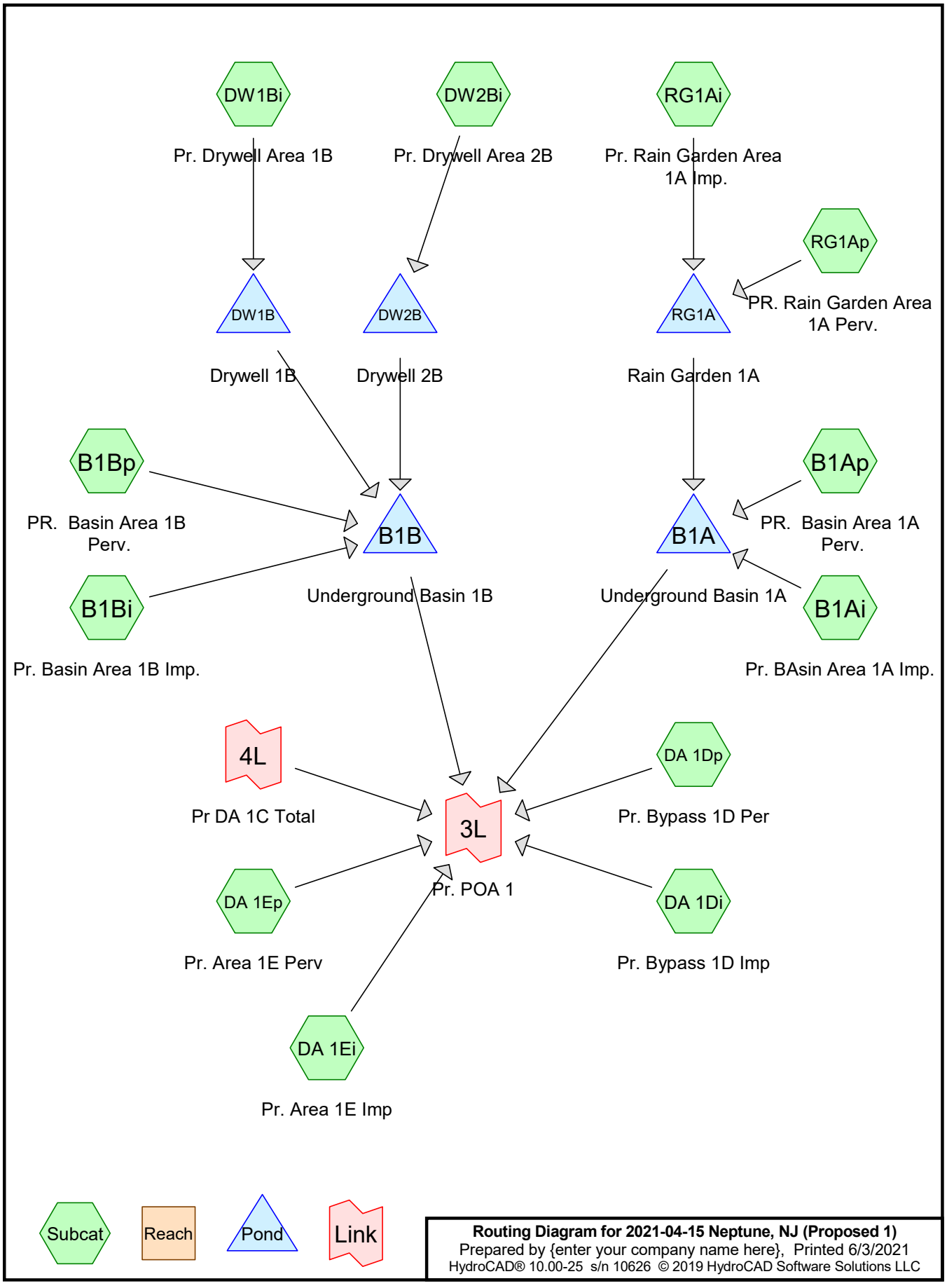


Subcat Reach Pond Link

Routing Diagram for 2021-04-15 Neptune, NJ (Existing)
Prepared by {enter your company name here}, Printed 5/11/2021



Routing Diagram for 2021-04-15 Neptune, NJ (Proposed Area 1C)
Prepared by {enter your company name here}, Printed 5/11/2021



Routing Diagram for 2021-04-15 Neptune, NJ (Proposed 1)
Prepared by {enter your company name here}, Printed 6/3/2021

APPENDIX C-2
2-YEAR STORM EVENT HYDROGRAPHS

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

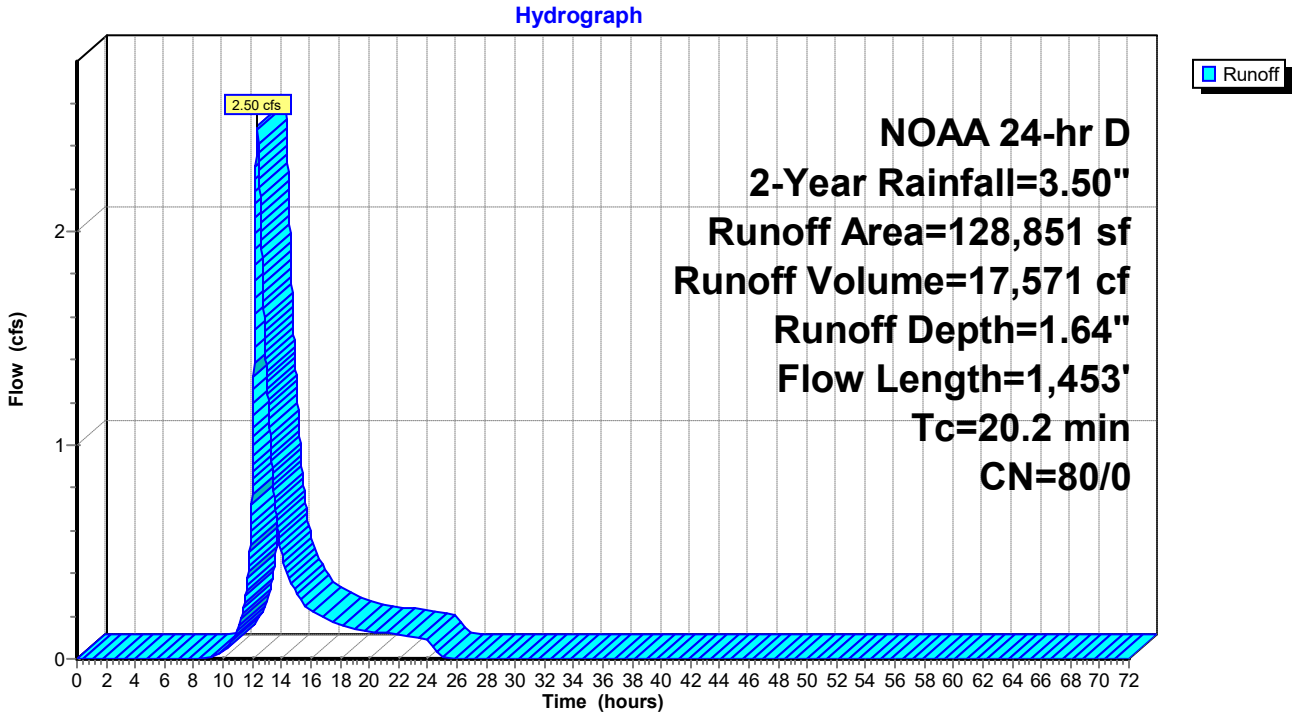
Runoff = 2.50 cfs @ 12.34 hrs, Volume= 17,571 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
115,266	80	>75% Grass cover, Good, HSG D
13,585	77	Woods, Good, HSG D
128,851	80	Weighted Average
128,851	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
10.6	1,278		2.00		**Direct Entry, Channel Flow**
20.2	1,453	Total			

Subcatchment 1S: Ex. Area 1A Perv.



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

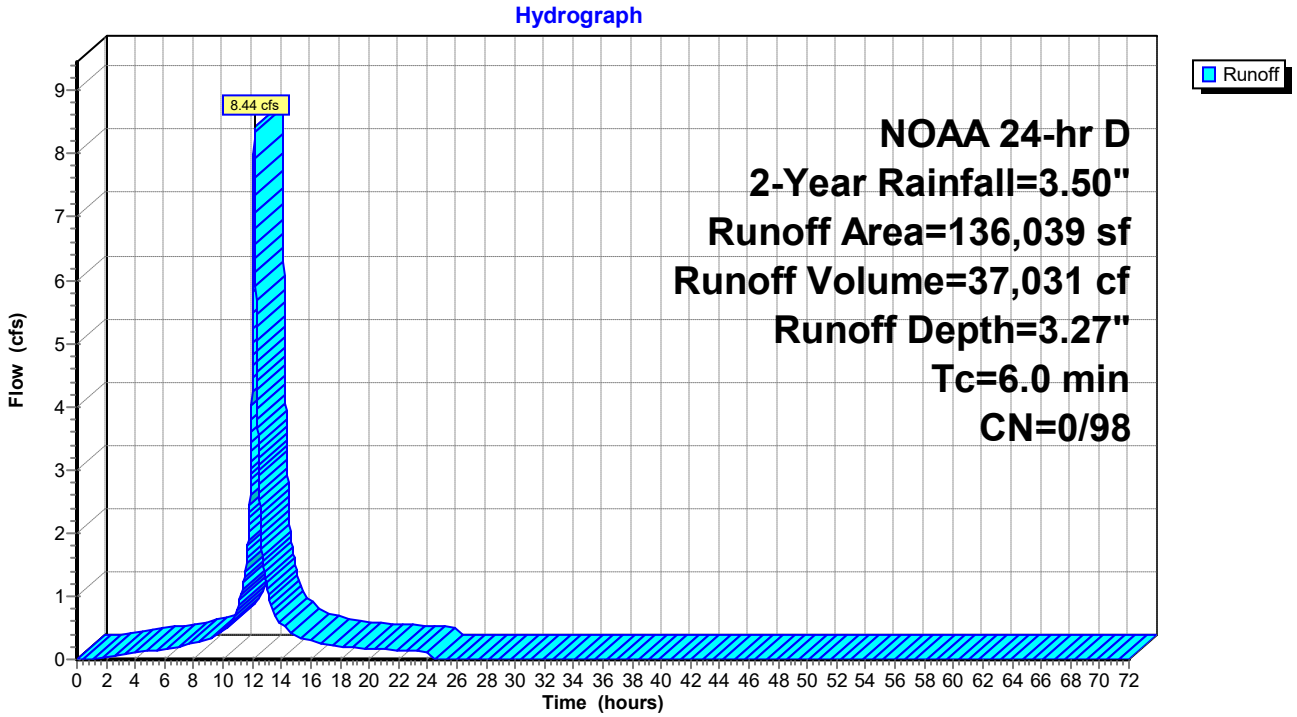
Runoff = 8.44 cfs @ 12.14 hrs, Volume= 37,031 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
136,039	98	Paved parking, HSG D
136,039	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 1A Imp.



Summary for Subcatchment 5S: Ex. Area 2

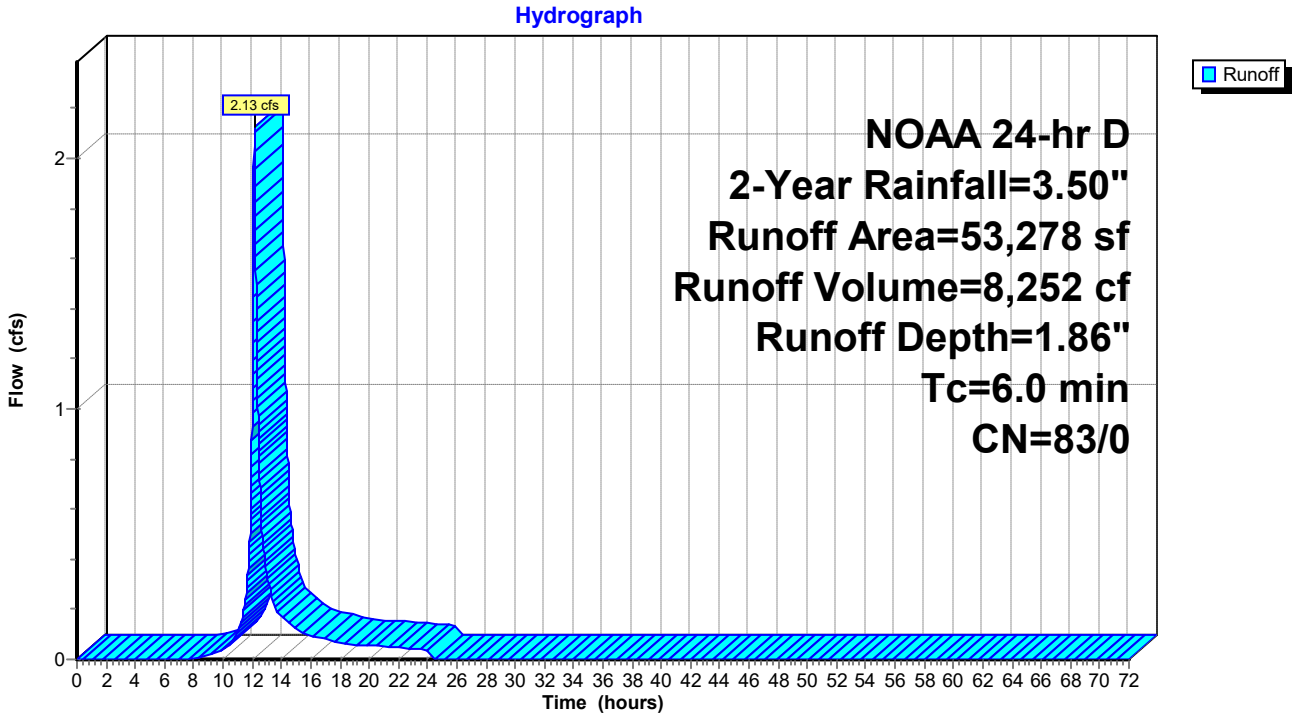
Runoff = 2.13 cfs @ 12.14 hrs, Volume= 8,252 cf, Depth= 1.86"

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=3.50"

Area (sf)	CN	Description
53,278	83	Woods, Poor, HSG D
53,278	83	100.00% Pervious Area

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

Subcatchment 5S: Ex. Area 2



Summary for Subcatchment 6S: Pr. Area 2

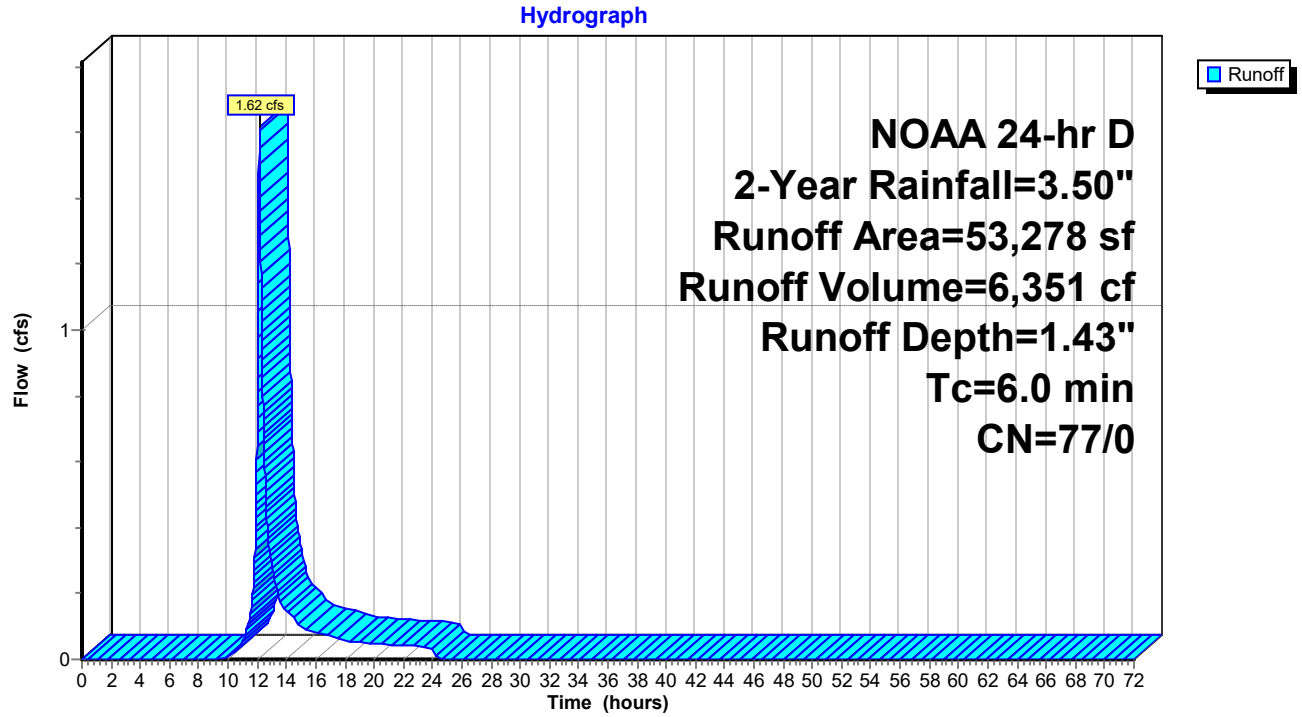
Runoff = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf, Depth= 1.43"

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=3.50"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2



Summary for Subcatchment 10S: Ex. Area 1B Perv.

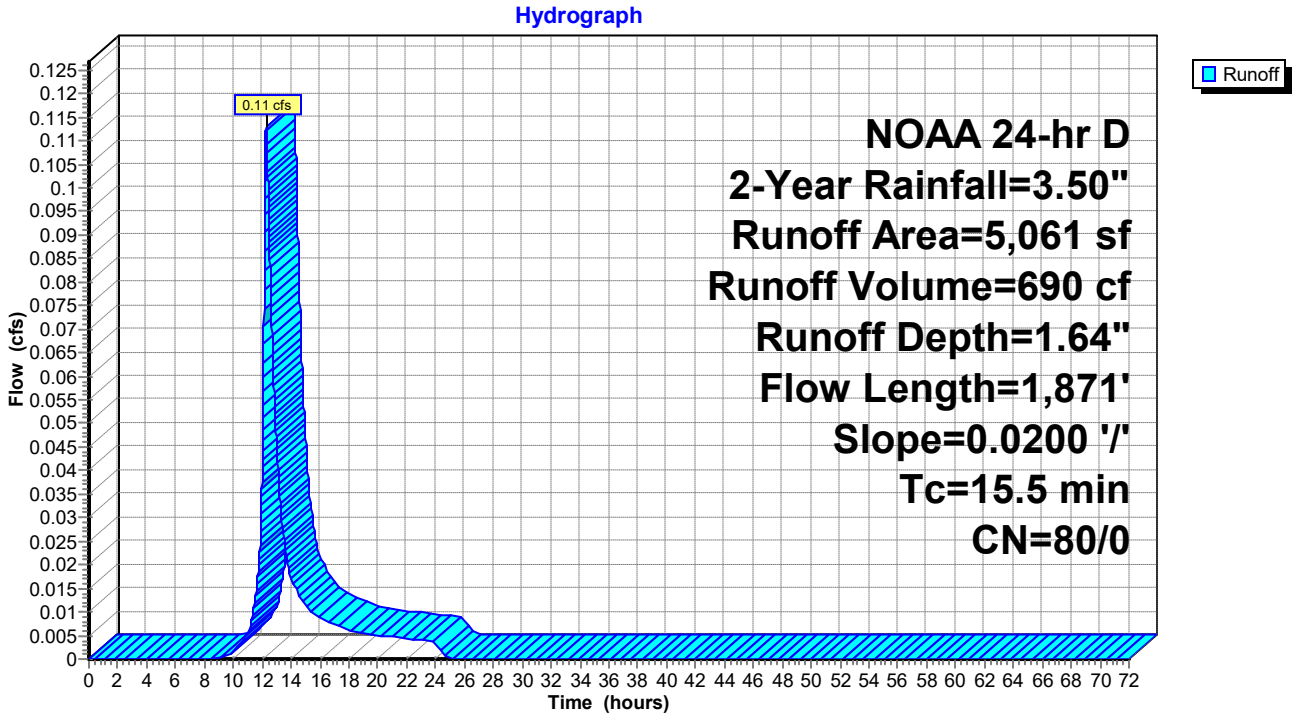
Runoff = 0.11 cfs @ 12.26 hrs, Volume= 690 cf, Depth= 1.64"

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=3.50"

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
1.2	100	0.0200	1.41		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
1.1	184	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.2	1,587		2.00		**Direct Entry,**
15.5	1,871	Total			

Subcatchment 10S: Ex. Area 1B Perv.



Summary for Subcatchment 11S: Ex. Area 1B Imp.

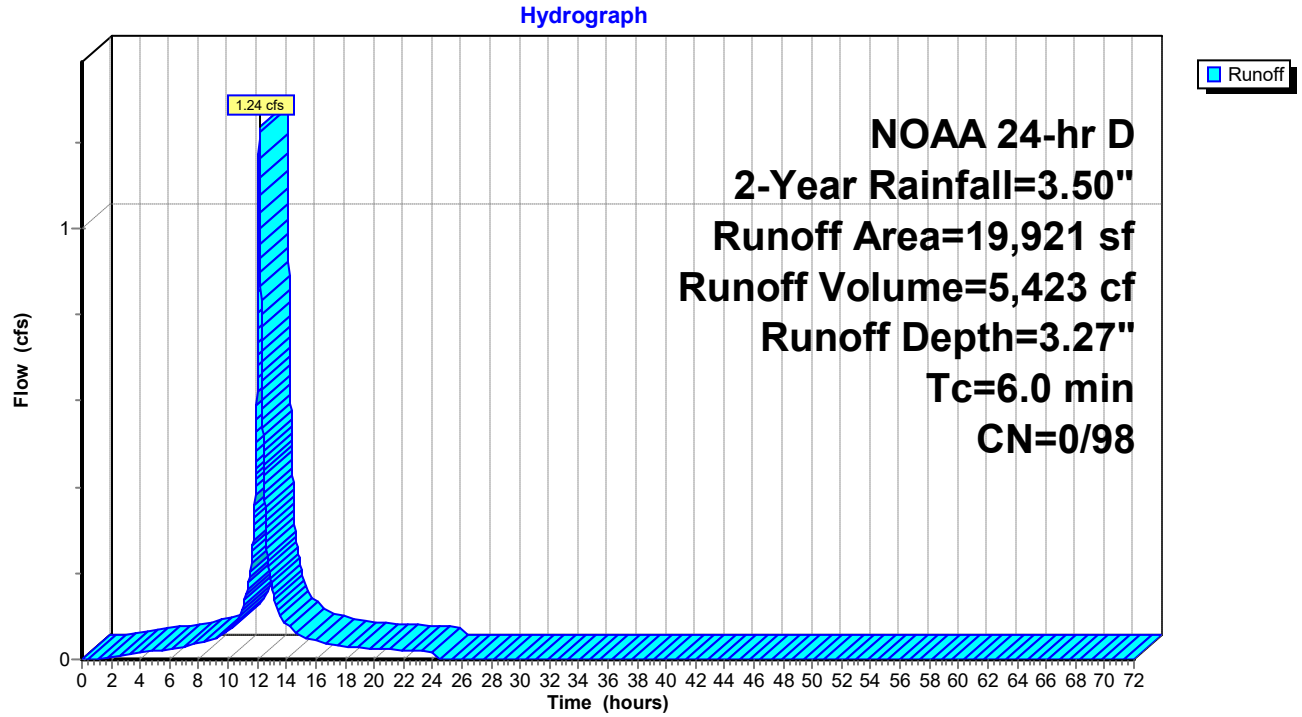
Runoff = 1.24 cfs @ 12.14 hrs, Volume= 5,423 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

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 1B Imp.

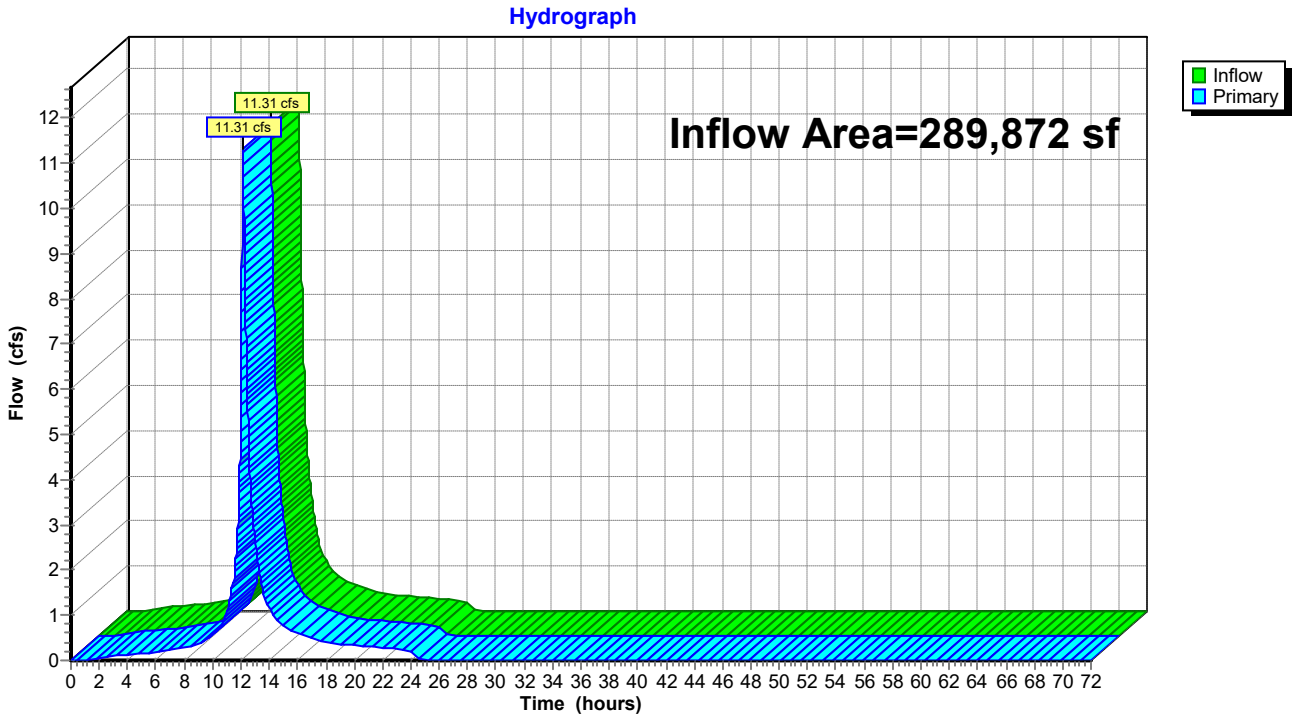


Summary for Link 3L: EX POA 1 (Construction)

Inflow Area = 289,872 sf, 53.80% Impervious, Inflow Depth = 2.51" for 2-Year event
Inflow = 11.31 cfs @ 12.15 hrs, Volume= 60,714 cf
Primary = 11.31 cfs @ 12.15 hrs, Volume= 60,714 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 (Construction)

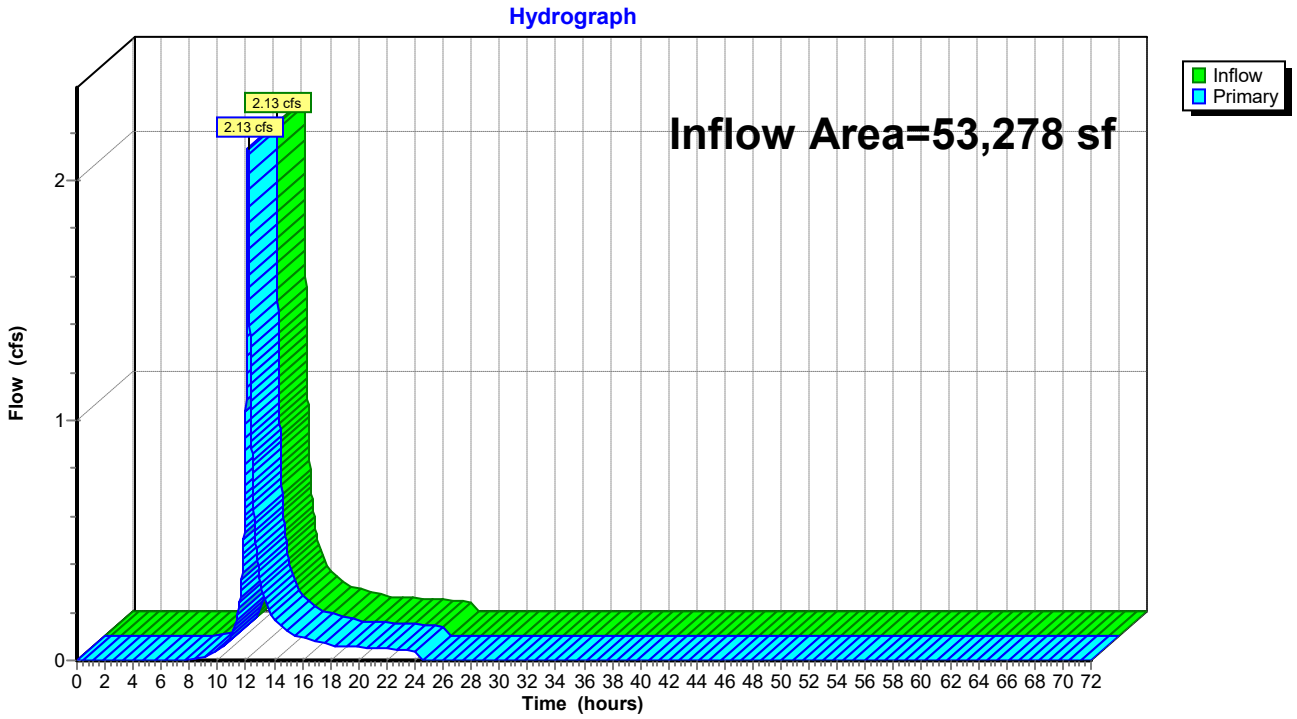


Summary for Link 4L: EX POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 1.86" for 2-Year event
Inflow = 2.13 cfs @ 12.14 hrs, Volume= 8,252 cf
Primary = 2.13 cfs @ 12.14 hrs, Volume= 8,252 cf, Atten= 0%, Lag= 0.0 min

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

Link 4L: EX POA 2 (Reforestation)

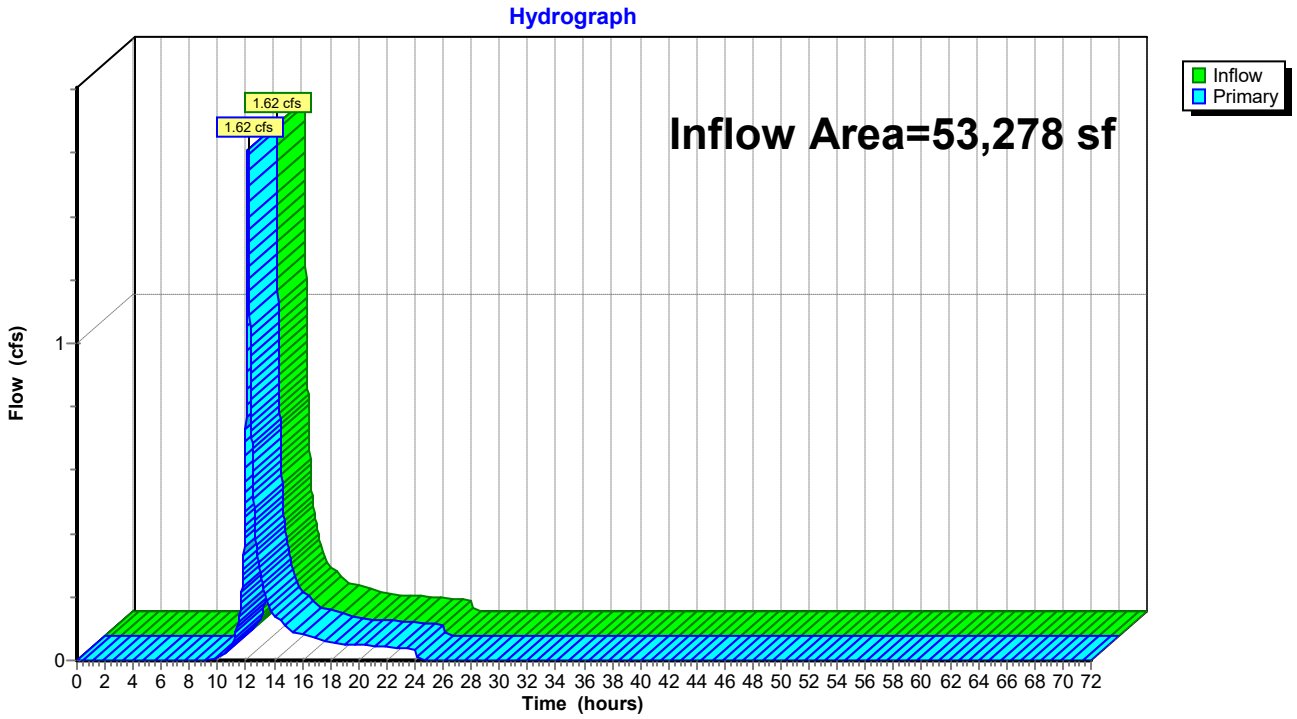


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 1.43" for 2-Year event
Inflow = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf
Primary = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



Summary for Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.

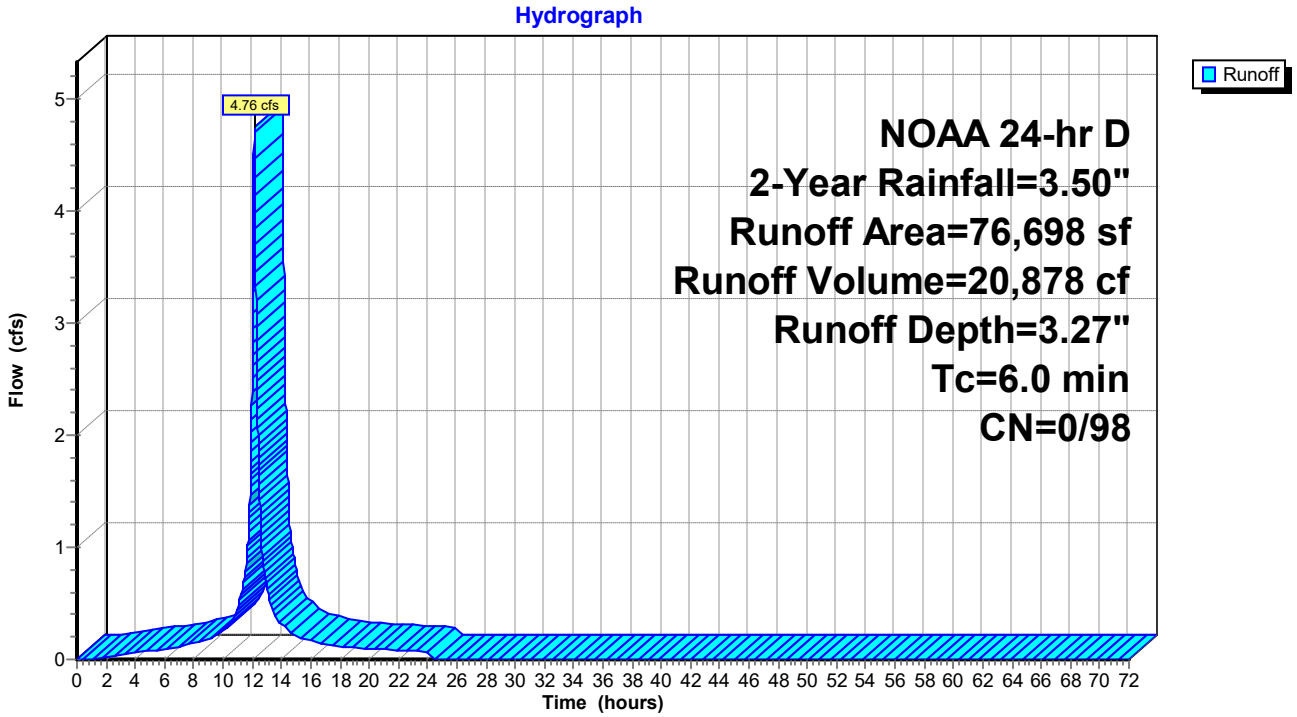
Runoff = 4.76 cfs @ 12.14 hrs, Volume= 20,878 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
76,698	98	Paved parking, HSG D
76,698	98	100.00% Impervious Area

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

Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.



Summary for Subcatchment B 1Cp: PR. BASIN Area 1C Perv.

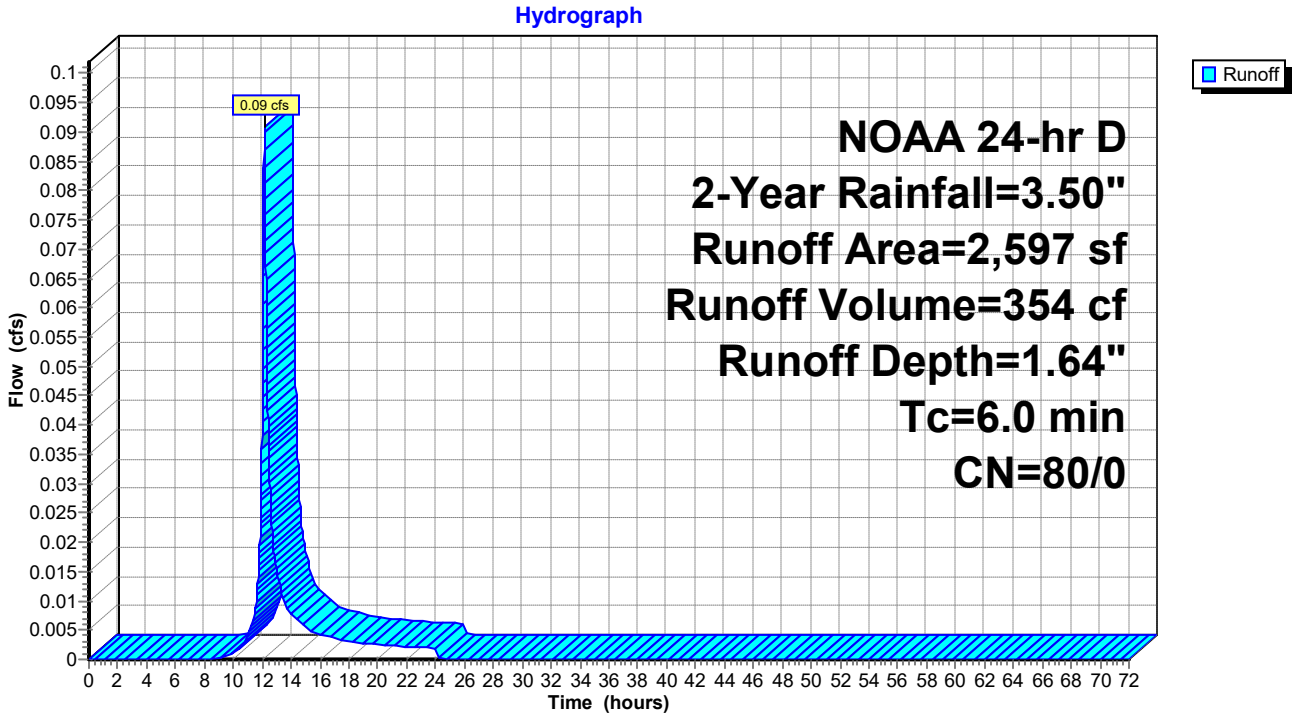
Runoff = 0.09 cfs @ 12.14 hrs, Volume= 354 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
2,597	80	>75% Grass cover, Good, HSG D
2,597	80	100.00% Pervious Area

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

Subcatchment B 1Cp: PR. BASIN Area 1C Perv.



Summary for Subcatchment DW 1Ci: Pr. Drywell 1C Imp.

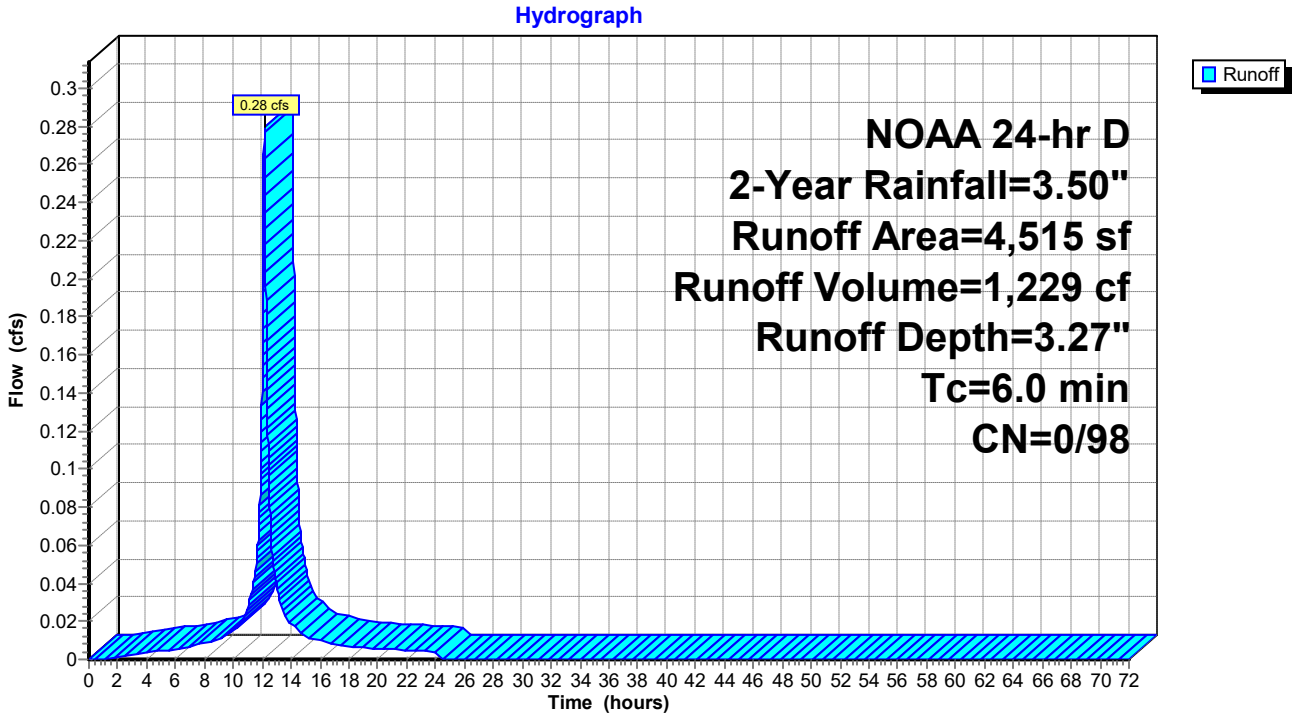
Runoff = 0.28 cfs @ 12.14 hrs, Volume= 1,229 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
4,515	98	Paved parking, HSG D
4,515	98	100.00% Impervious Area

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

Subcatchment DW 1Ci: Pr. Drywell 1C Imp.



Summary for Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.

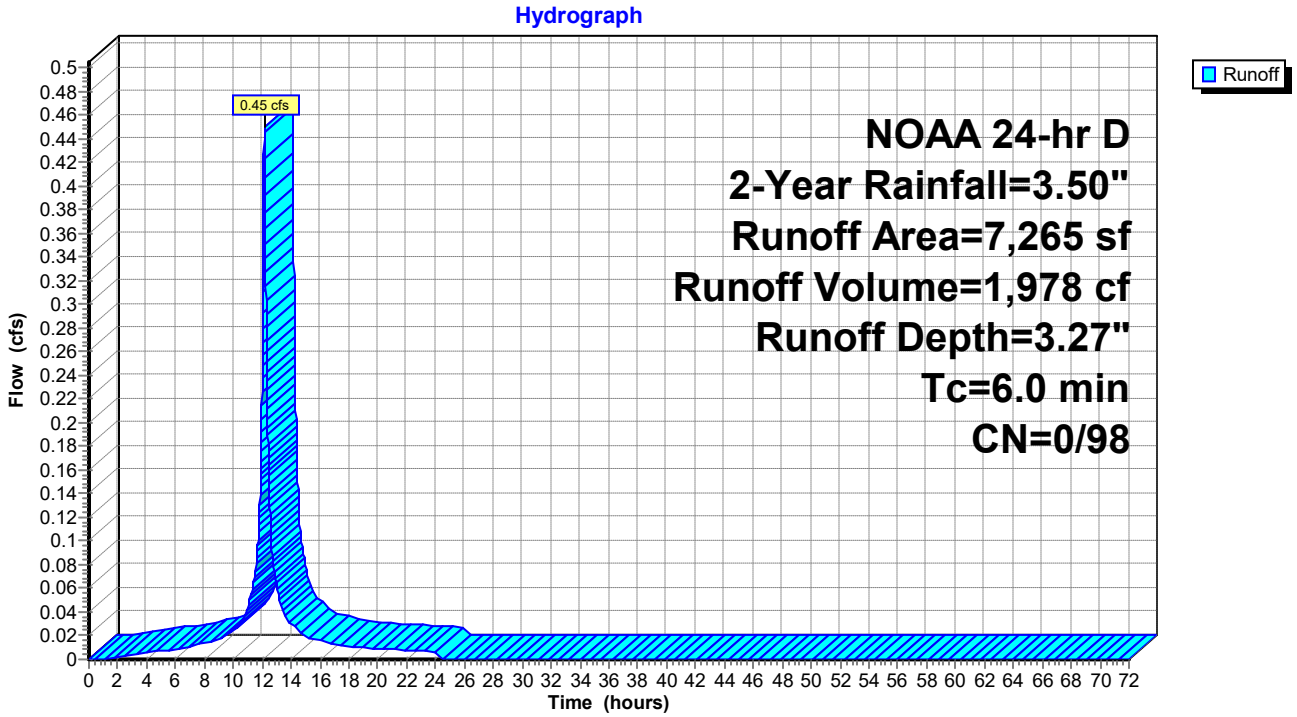
Runoff = 0.45 cfs @ 12.14 hrs, Volume= 1,978 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
7,265	98	Paved parking, HSG D
7,265	98	100.00% Impervious Area

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

Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.



Summary for Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.

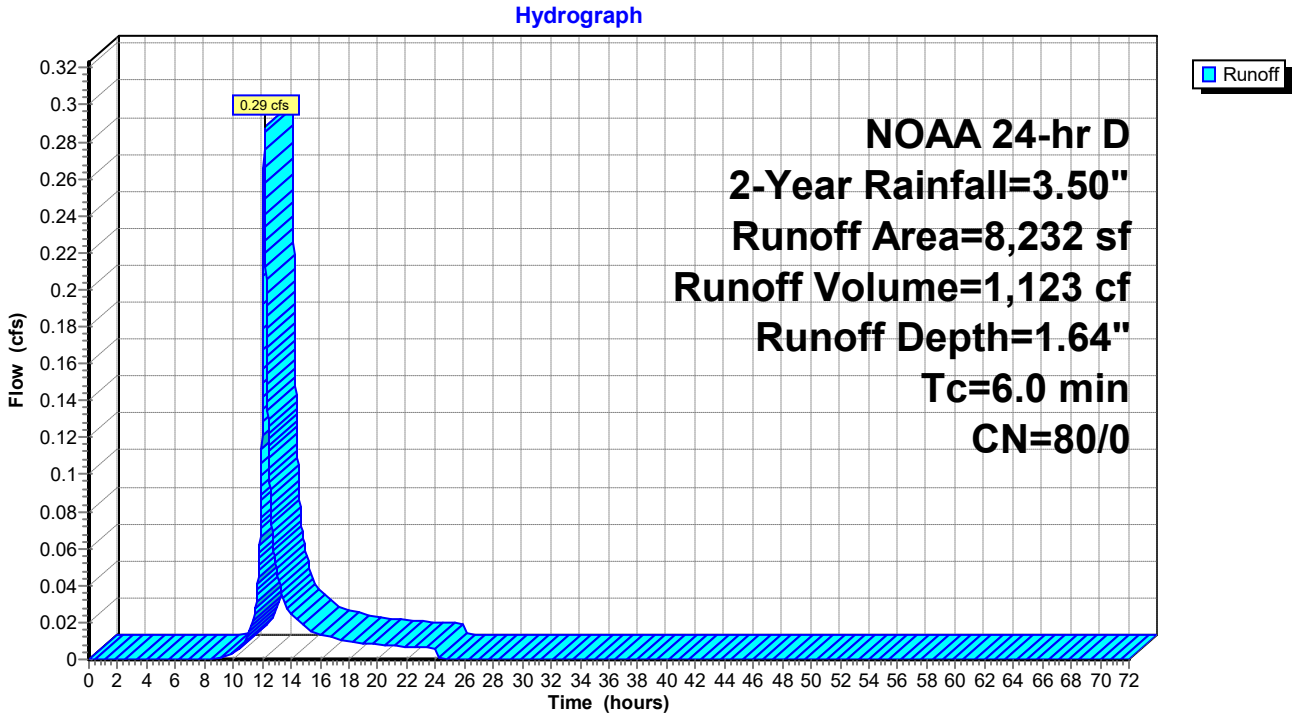
Runoff = 0.29 cfs @ 12.14 hrs, Volume= 1,123 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
8,232	80	>75% Grass cover, Good, HSG D
8,232	80	100.00% Pervious Area

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

Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.



Summary for Pond B 1C: Underground Basin 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 2.65" for 2-Year event
Inflow = 4.85 cfs @ 12.14 hrs, Volume= 21,955 cf
Outflow = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf, Atten= 62%, Lag= 19.9 min
Primary = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.00' @ 12.47 hrs Surf.Area= 10,459 sf Storage= 5,753 cf

Plug-Flow detention time= 71.5 min calculated for 21,925 cf (100% of inflow)
Center-of-Mass det. time= 71.0 min (832.7 - 761.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	8,886 cf	**53.78'W x 194.47'L x 3.52'H Field A** 36,868 cf Overall - 14,653 cf Embedded = 22,215 cf x 40.0% Voids
#2A	19.60'	14,040 cf	**Contech ChamberMaxx 2016** x 297 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 11 rows
		22,925 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.82 cfs @ 12.47 hrs HW=20.00' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.82 cfs of 3.00 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.82 cfs @ 3.34 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B 1C: Underground Basin 1C - 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 11 rows

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

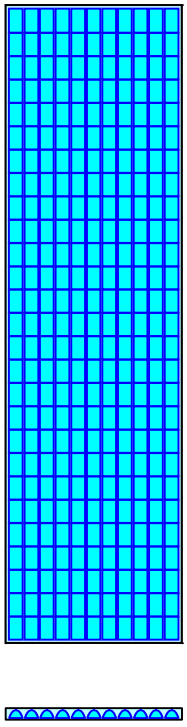
27 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 192.47' Row Length +12.0" End Stone x 2 = 194.47' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

297 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 14,039.6 cf Chamber Storage
297 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 14,653.5 cf Displacement

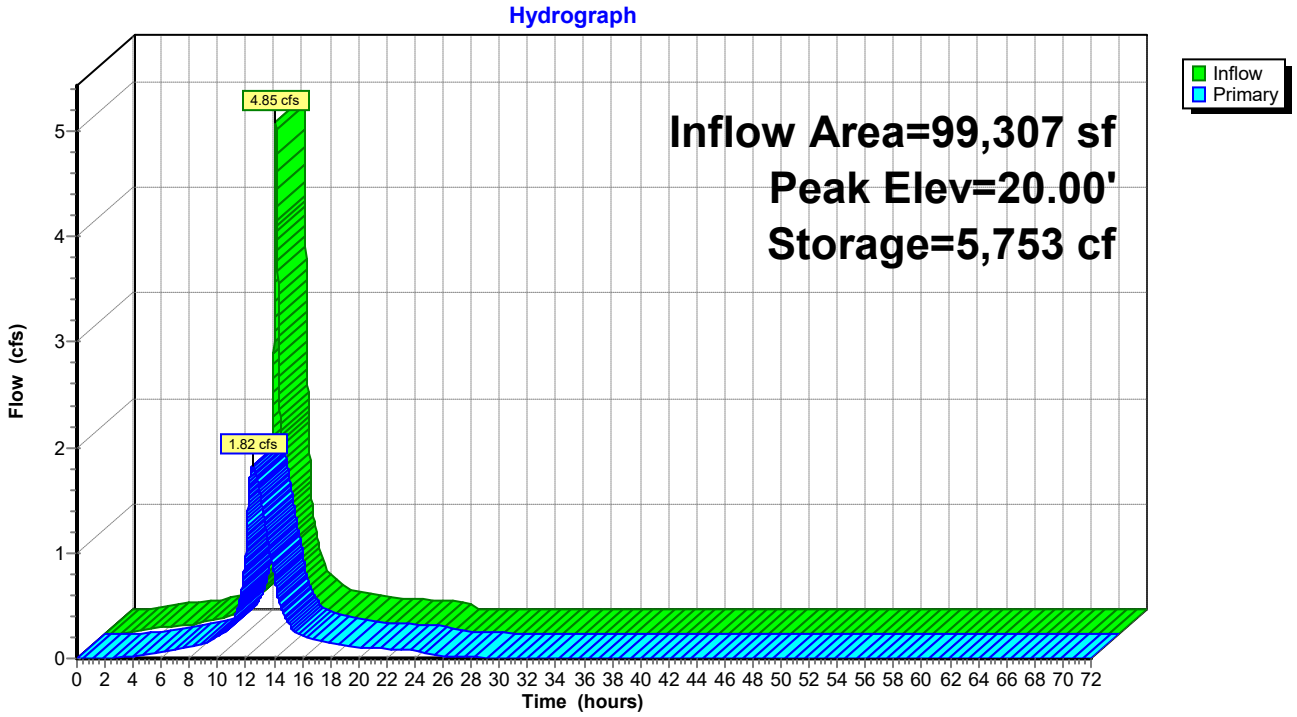
36,868.2 cf Field - 14,653.5 cf Chambers = 22,214.7 cf Stone x 40.0% Voids = 8,885.9 cf Stone Storage

Chamber Storage + Stone Storage = 22,925.5 cf = 0.526 af
Overall Storage Efficiency = 62.2%
Overall System Size = 194.47' x 53.78' x 3.52'

297 Chambers
1,365.5 cy Field
822.8 cy Stone



Pond B 1C: Underground Basin 1C



Summary for Pond DW1C: Drywell 1C

Inflow Area = 4,515 sf,100.00% Impervious, Inflow Depth = 3.27" for 2-Year event
Inflow = 0.28 cfs @ 12.14 hrs, Volume= 1,229 cf
Outflow = 0.01 cfs @ 14.79 hrs, Volume= 1,229 cf, Atten= 95%, Lag= 159.1 min
Discarded = 0.01 cfs @ 14.79 hrs, Volume= 1,229 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.34' @ 14.79 hrs Surf.Area= 497 sf Storage= 613 cf

Plug-Flow detention time= 399.5 min calculated for 1,229 cf (100% of inflow)
Center-of-Mass det. time= 399.5 min (1,159.5 - 760.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.40'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.40' / 21.00' S= 0.0304 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 14.79 hrs HW=22.34' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.50' TW=19.10' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond DW1C: Drywell 1C - 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 2 rows

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

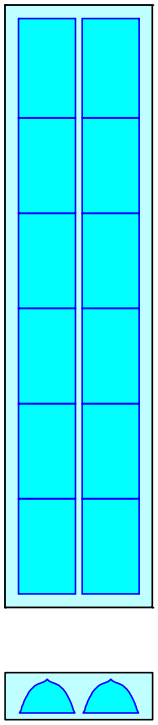
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

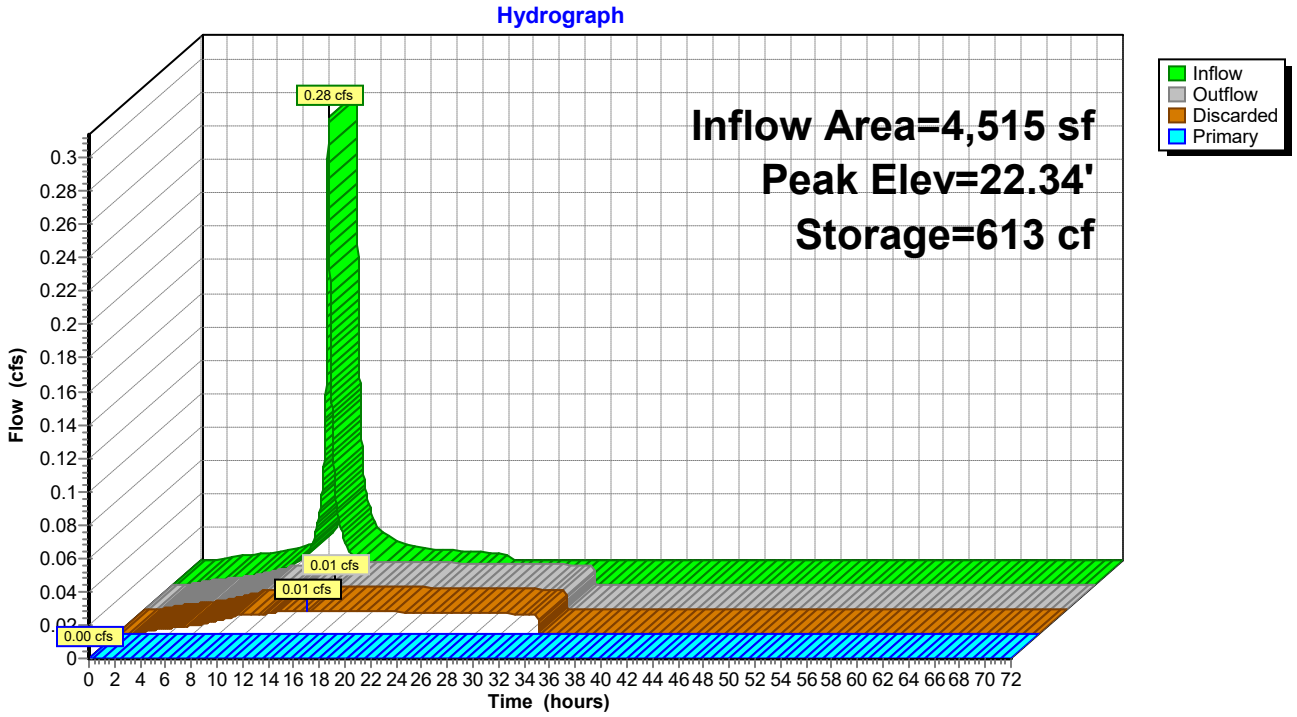
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1C: Drywell 1C



Summary for Pond RG 1C: Rain Garden 1C

Inflow Area = 15,497 sf, 46.88% Impervious, Inflow Depth = 2.40" for 2-Year event
Inflow = 0.74 cfs @ 12.14 hrs, Volume= 3,100 cf
Outflow = 0.46 cfs @ 12.29 hrs, Volume= 3,100 cf, Atten= 38%, Lag= 9.0 min
Discarded = 0.04 cfs @ 12.29 hrs, Volume= 2,377 cf
Primary = 0.42 cfs @ 12.29 hrs, Volume= 723 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.89' @ 12.29 hrs Surf.Area= 1,617 sf Storage= 1,095 cf

Plug-Flow detention time= 271.8 min calculated for 3,100 cf (100% of inflow)
Center-of-Mass det. time= 271.9 min (1,065.5 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	1,282 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

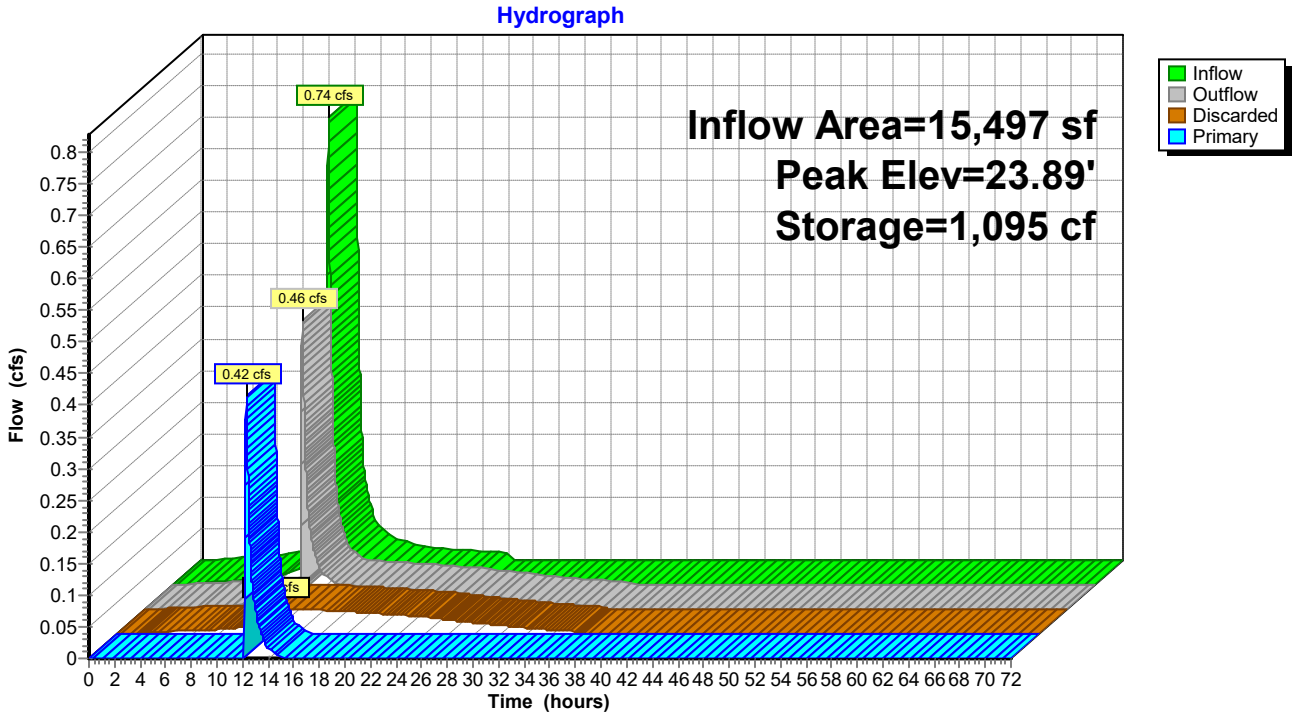
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
22.50	160	58.0	0	0	160
23.00	556	109.0	169	169	839
24.00	1,787	204.0	1,113	1,282	3,210

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Culvert** L= 37.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 20.25' S= 0.0054 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	23.85'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	22.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.29 hrs HW=23.89' (Free Discharge)
└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=0.42 cfs @ 12.29 hrs HW=23.89' TW=19.95' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.42 cfs of 9.90 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.42 cfs @ 0.65 fps)

Pond RG 1C: Rain Garden 1C

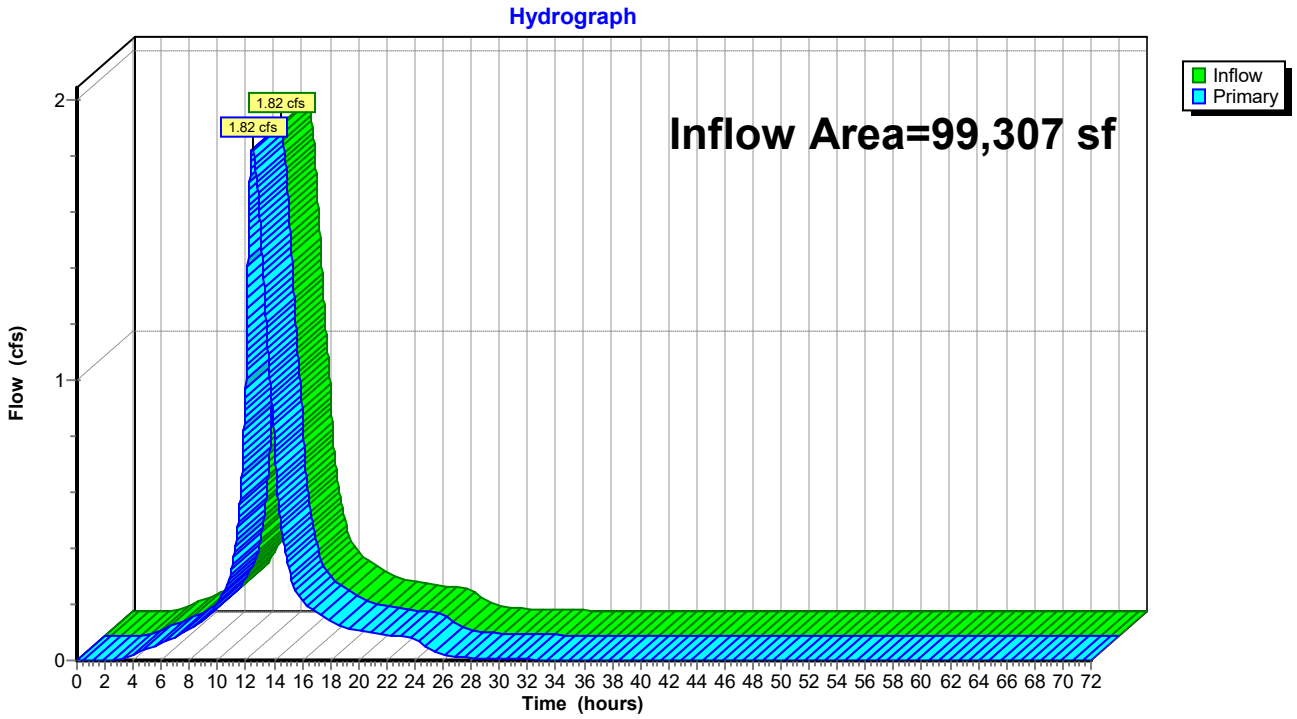


Summary for Link Pr. DA 1C: Pr. DA 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 2.65" for 2-Year event
Inflow = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf
Primary = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf, Atten= 0%, Lag= 0.0 min

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

Link Pr. DA 1C: Pr. DA 1C



Summary for Subcatchment B1Ai: Pr. BAsin Area 1A Imp.

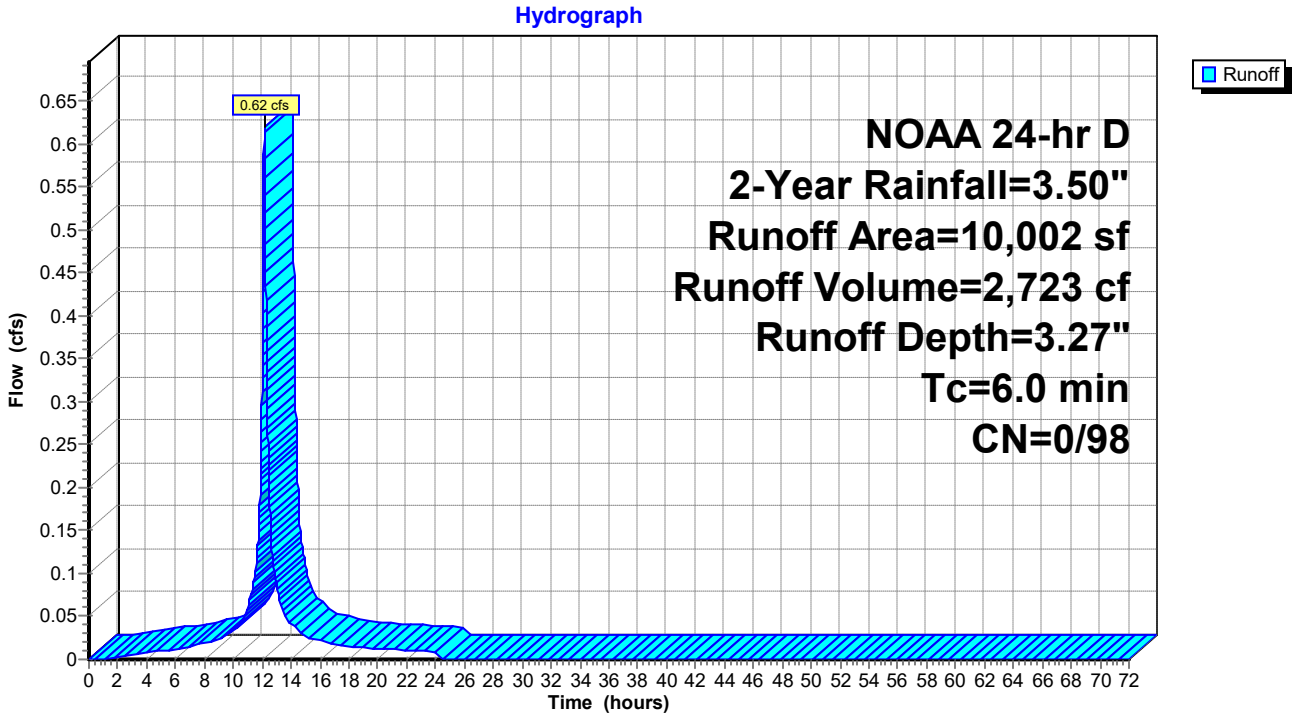
Runoff = 0.62 cfs @ 12.14 hrs, Volume= 2,723 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
10,002	98	Paved parking, HSG D
10,002	98	100.00% Impervious Area

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

Subcatchment B1Ai: Pr. BAsin Area 1A Imp.



Summary for Subcatchment B1Ap: PR. Basin Area 1A Perv.

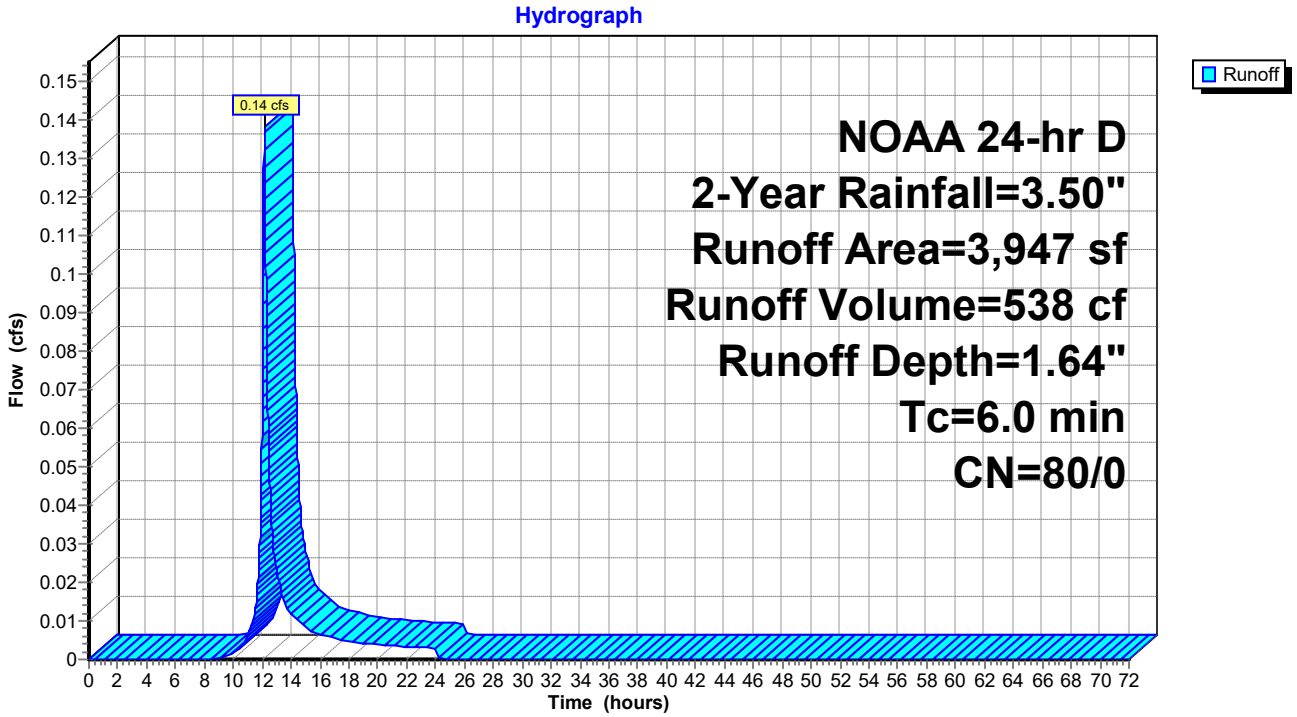
Runoff = 0.14 cfs @ 12.14 hrs, Volume= 538 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
3,947	80	>75% Grass cover, Good, HSG D
3,947	80	100.00% Pervious Area

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

Subcatchment B1Ap: PR. Basin Area 1A Perv.



Summary for Subcatchment B1Bi: Pr. Basin Area 1B Imp.

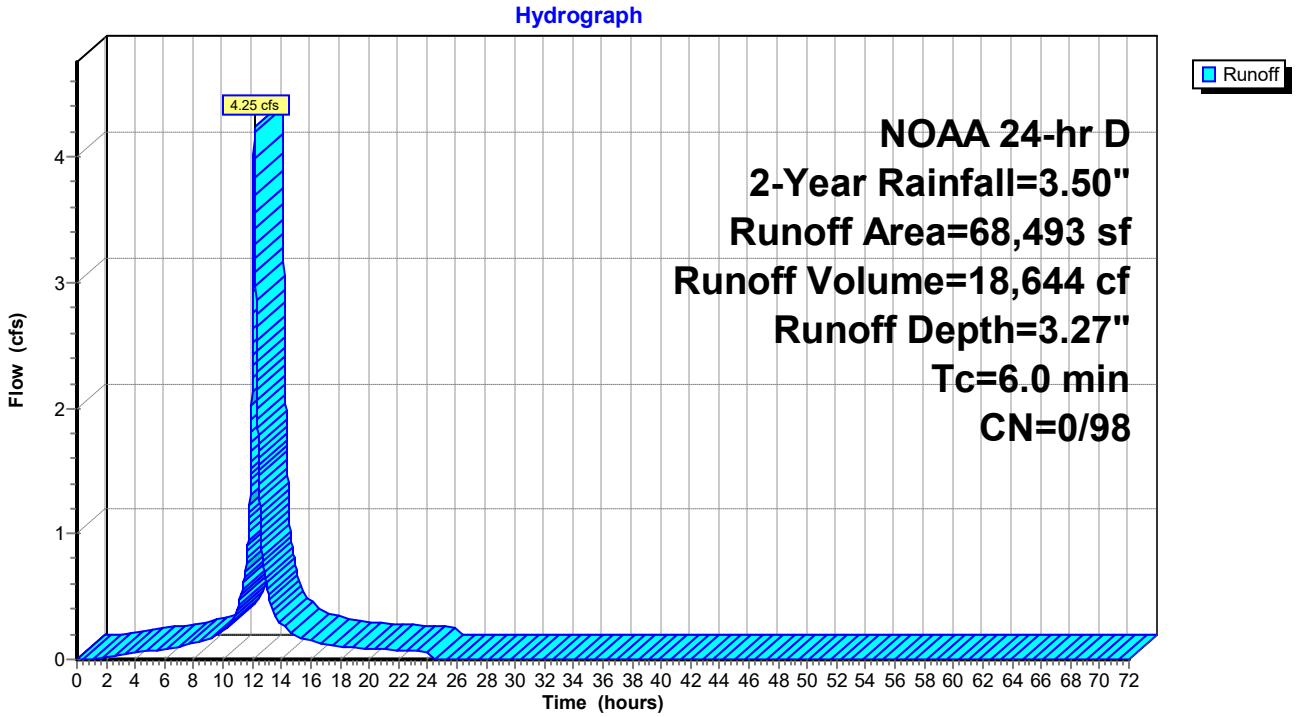
Runoff = 4.25 cfs @ 12.14 hrs, Volume= 18,644 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
68,493	98	Paved parking, HSG D
68,493	98	100.00% Impervious Area

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

Subcatchment B1Bi: Pr. Basin Area 1B Imp.



Summary for Subcatchment B1Bp: PR. Basin Area 1B Perv.

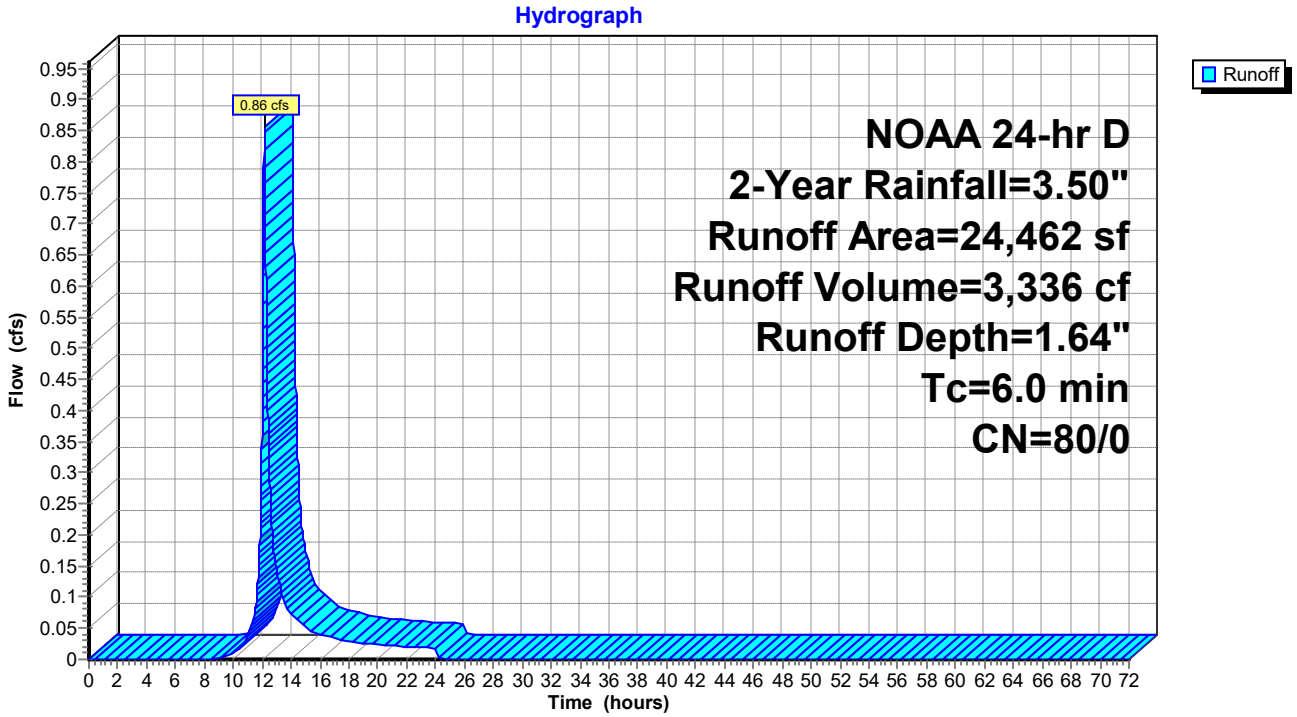
Runoff = 0.86 cfs @ 12.14 hrs, Volume= 3,336 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
24,462	80	>75% Grass cover, Good, HSG D
24,462	80	100.00% Pervious Area

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

Subcatchment B1Bp: PR. Basin Area 1B Perv.



Summary for Subcatchment DA 1Di: Pr. Bypass 1D Imp

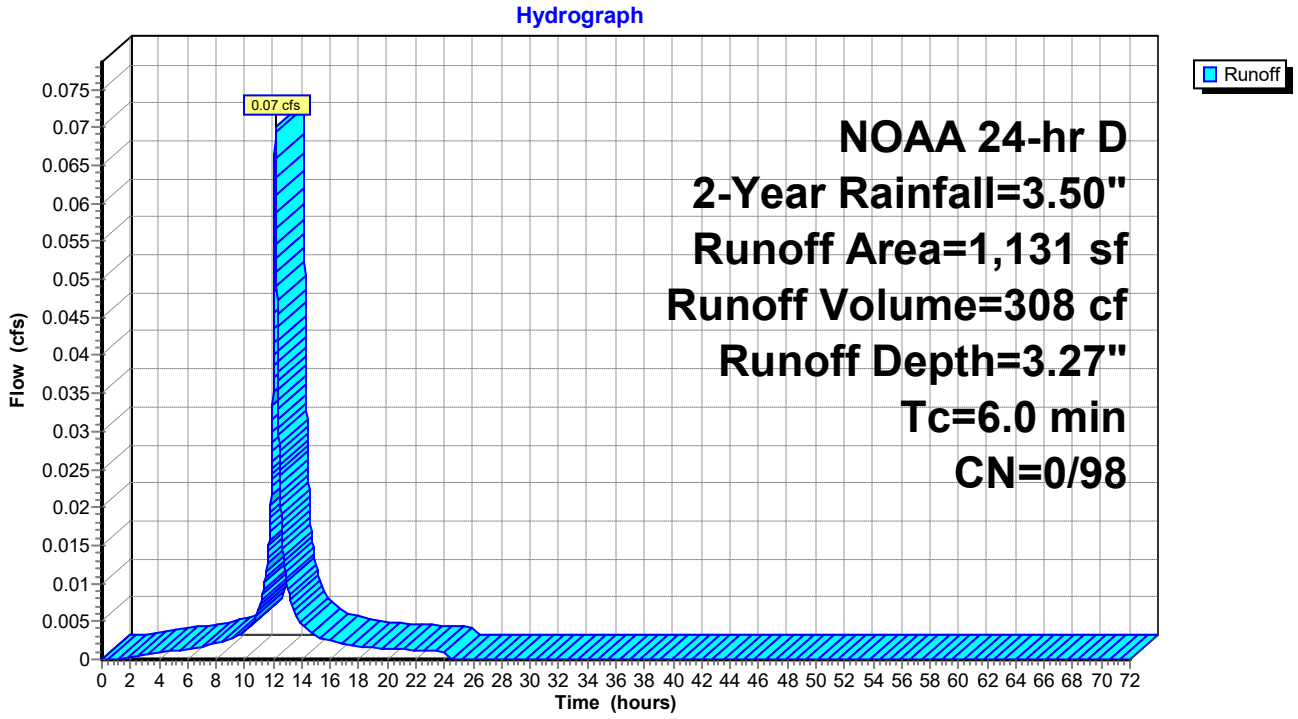
Runoff = 0.07 cfs @ 12.14 hrs, Volume= 308 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
1,131	98	Paved parking, HSG D
1,131	98	100.00% Impervious Area

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

Subcatchment DA 1Di: Pr. Bypass 1D Imp



Summary for Subcatchment DA 1Dp: Pr. Bypass 1D Per

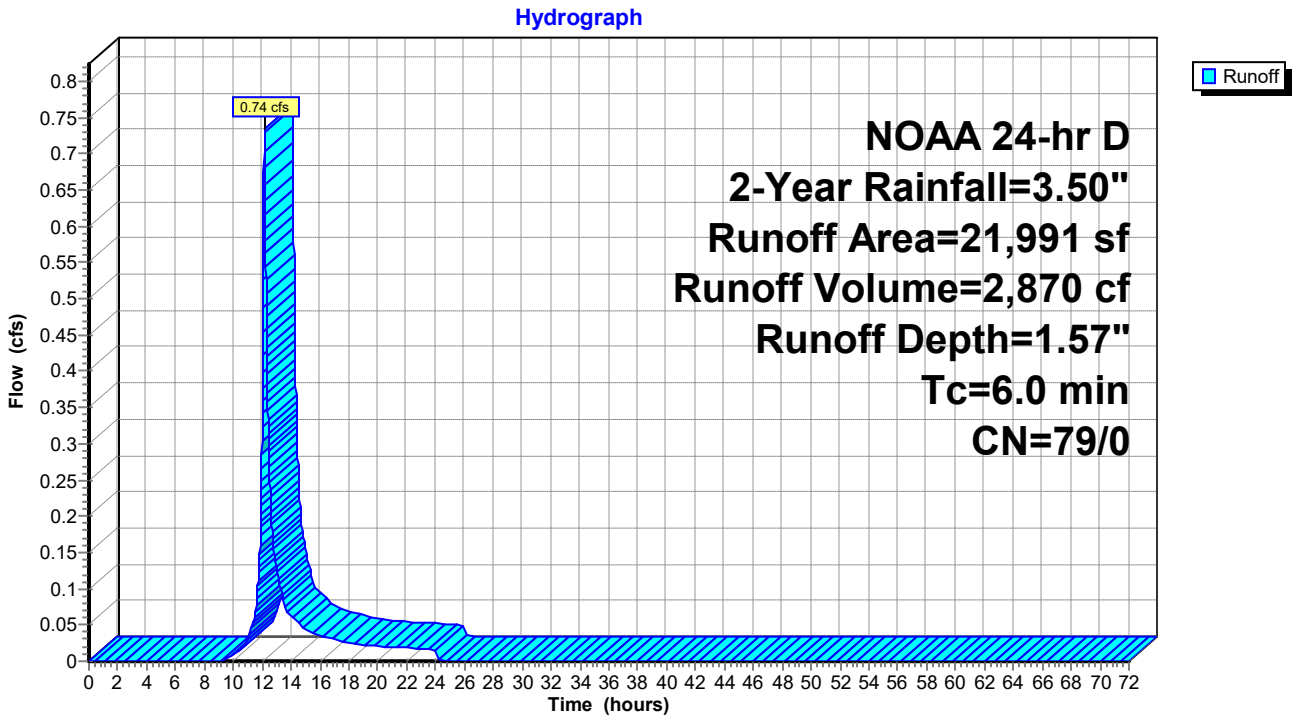
Runoff = 0.74 cfs @ 12.14 hrs, Volume= 2,870 cf, Depth= 1.57"

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=3.50"

Area (sf)	CN	Description
7,982	77	Woods, Good, HSG D
14,009	80	>75% Grass cover, Good, HSG D
21,991	79	Weighted Average
21,991	79	100.00% Pervious Area

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

Subcatchment DA 1Dp: Pr. Bypass 1D Per



Summary for Subcatchment DA 1Ei: Pr. Area 1E Imp

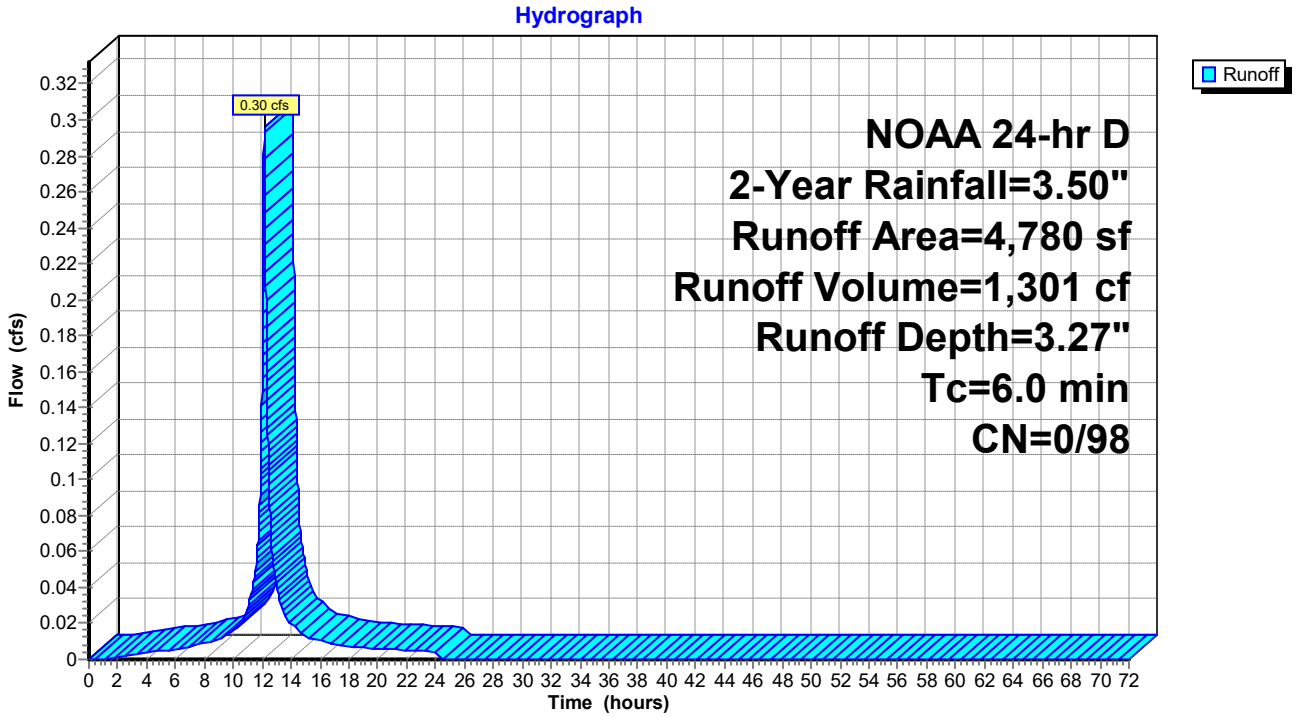
Runoff = 0.30 cfs @ 12.14 hrs, Volume= 1,301 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

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 DA 1Ei: Pr. Area 1E Imp



Summary for Subcatchment DA 1Ep: Pr. Area 1E Perv

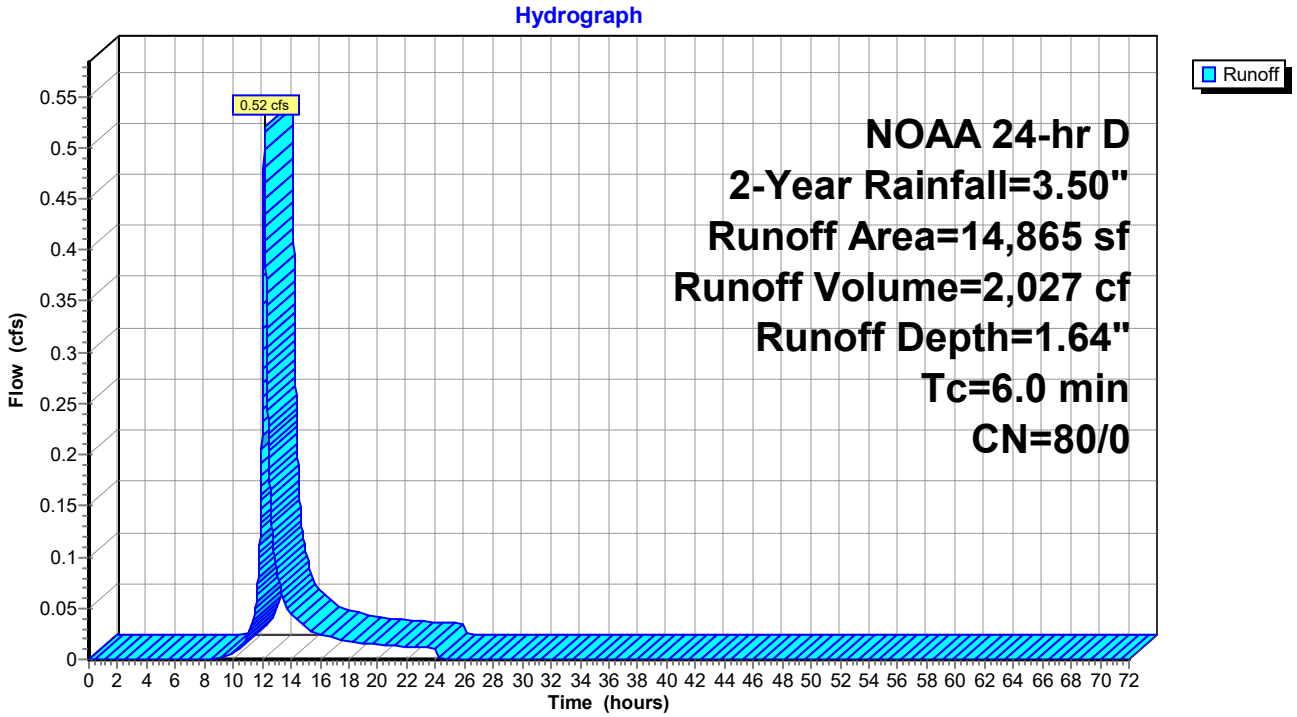
Runoff = 0.52 cfs @ 12.14 hrs, Volume= 2,027 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
14,865	80	>75% Grass cover, Good, HSG D
14,865	80	100.00% Pervious Area

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

Subcatchment DA 1Ep: Pr. Area 1E Perv



Summary for Subcatchment DW1Bi: Pr. Drywell Area 1B

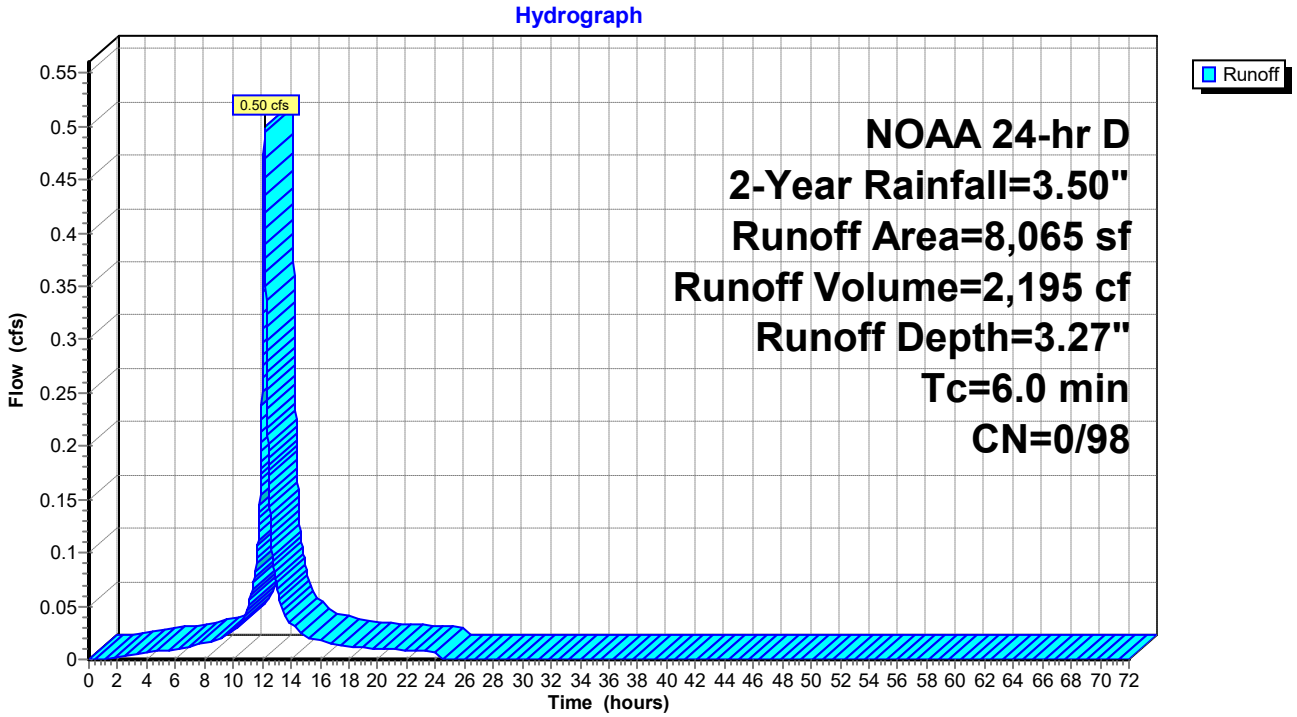
Runoff = 0.50 cfs @ 12.14 hrs, Volume= 2,195 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
8,065	98	Paved parking, HSG D
8,065	98	100.00% Impervious Area

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

Subcatchment DW1Bi: Pr. Drywell Area 1B



Summary for Subcatchment DW2Bi: Pr. Drywell Area 2B

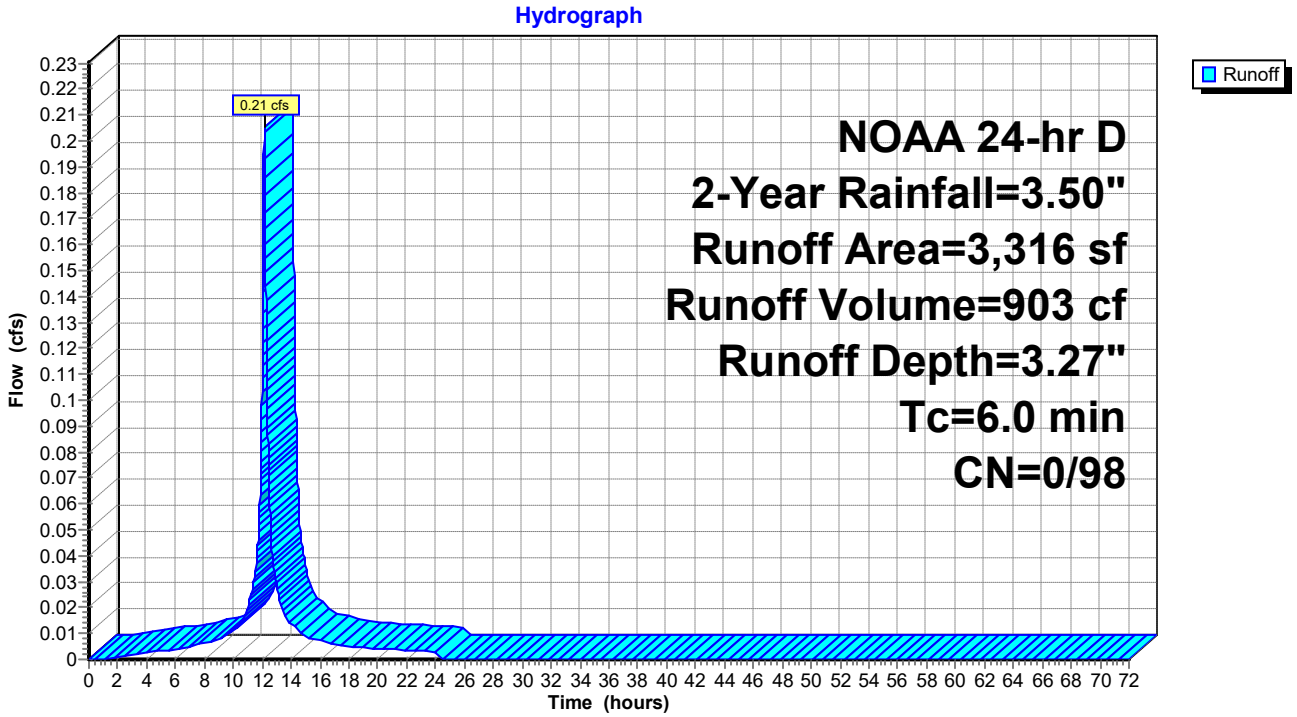
Runoff = 0.21 cfs @ 12.14 hrs, Volume= 903 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
3,316	98	Paved parking, HSG D
3,316	98	100.00% Impervious Area

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

Subcatchment DW2Bi: Pr. Drywell Area 2B



Summary for Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.

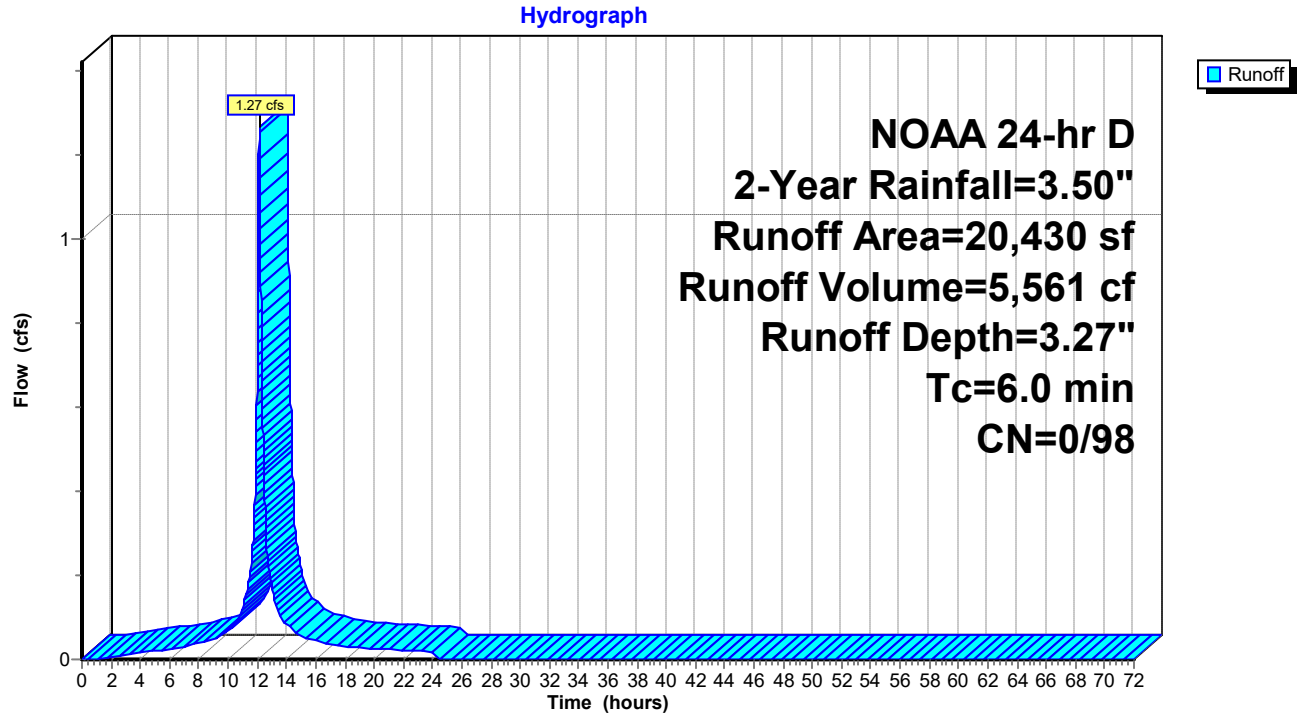
Runoff = 1.27 cfs @ 12.14 hrs, Volume= 5,561 cf, Depth= 3.27"

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 2-Year Rainfall=3.50"

Area (sf)	CN	Description
20,430	98	Paved parking, HSG D
20,430	98	100.00% Impervious Area

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

Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.



Summary for Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.

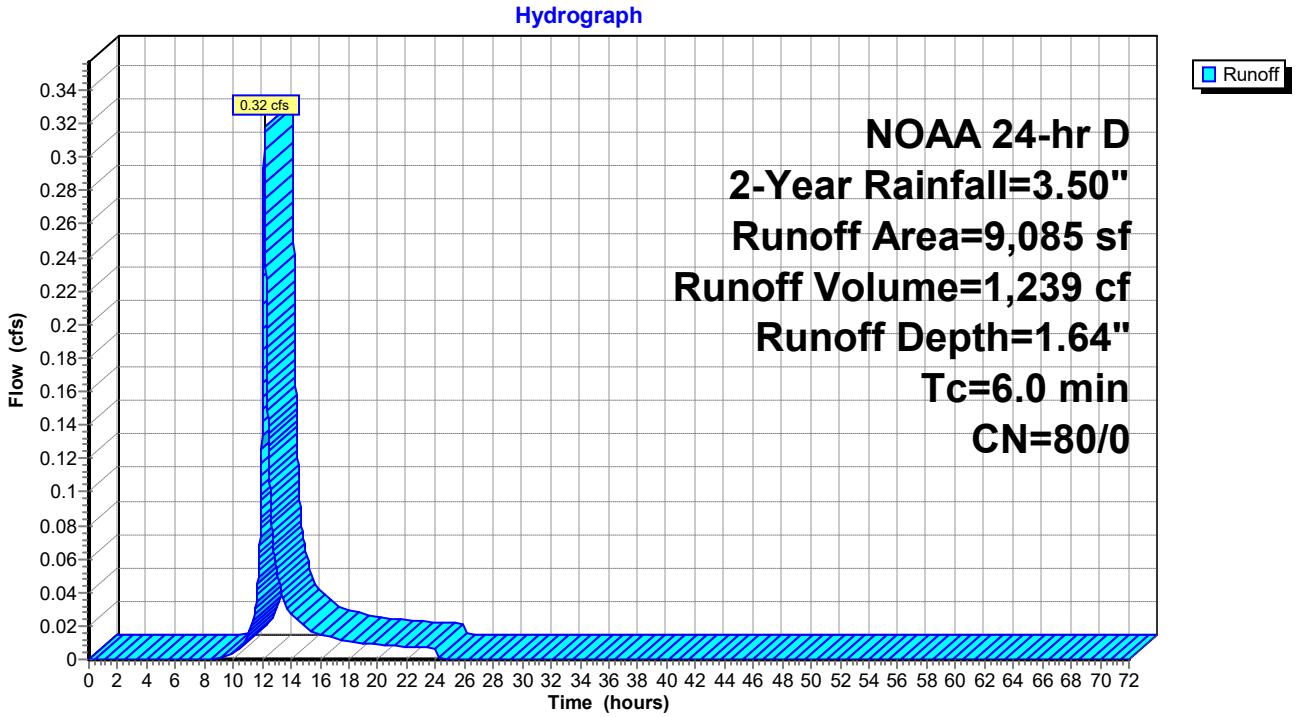
Runoff = 0.32 cfs @ 12.14 hrs, Volume= 1,239 cf, Depth= 1.64"

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=3.50"

Area (sf)	CN	Description
9,085	80	>75% Grass cover, Good, HSG D
9,085	80	100.00% Pervious Area

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

Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.



Summary for Pond B1A: Underground Basin 1A

Inflow Area = 43,464 sf, 70.02% Impervious, Inflow Depth = 1.16" for 2-Year event
Inflow = 0.76 cfs @ 12.14 hrs, Volume= 4,219 cf
Outflow = 0.46 cfs @ 12.67 hrs, Volume= 4,218 cf, Atten= 39%, Lag= 31.6 min
Primary = 0.46 cfs @ 12.67 hrs, Volume= 4,218 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 19.80' @ 12.67 hrs Surf.Area= 1,439 sf Storage= 533 cf

Plug-Flow detention time= 24.9 min calculated for 4,218 cf (100% of inflow)
Center-of-Mass det. time= 25.0 min (801.7 - 776.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	1,318 cf	**11.03'W x 130.42'L x 3.52'H Field A** 5,072 cf Overall - 1,778 cf Embedded = 3,295 cf x 40.0% Voids
#2A	19.60'	1,703 cf	**Contech ChamberMaxx 2016** x 36 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 2 rows
		3,021 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'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	21.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.46 cfs @ 12.67 hrs HW=19.80' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.46 cfs of 1.99 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.46 cfs @ 3.39 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1A: Underground Basin 1A - 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 2 rows

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

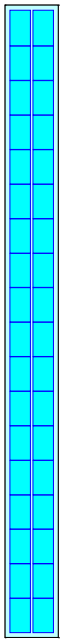
18 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 128.42' Row Length +12.0" End Stone x 2 = 130.42' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

36 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 1,703.2 cf Chamber Storage
36 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 1,777.6 cf Displacement

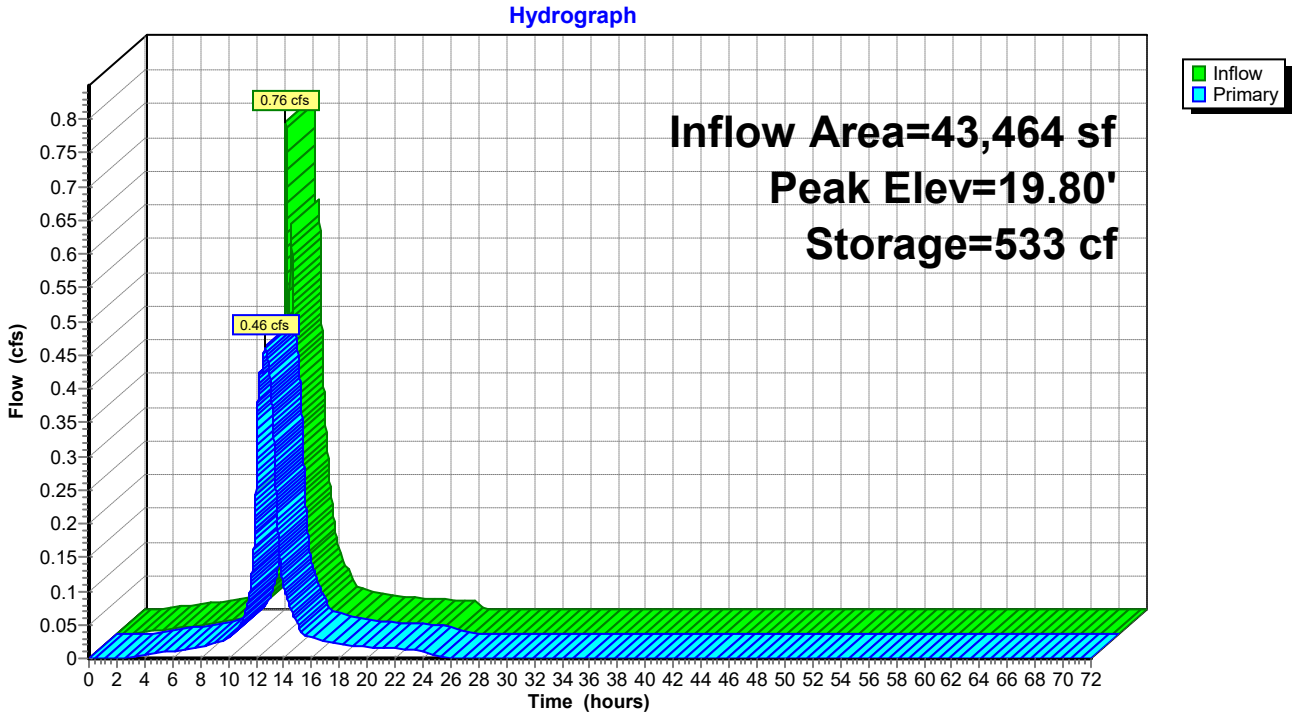
5,072.2 cf Field - 1,777.6 cf Chambers = 3,294.6 cf Stone x 40.0% Voids = 1,317.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,021.0 cf = 0.069 af
Overall Storage Efficiency = 59.6%
Overall System Size = 130.42' x 11.03' x 3.52'

36 Chambers
187.9 cy Field
122.0 cy Stone



Pond B1A: Underground Basin 1A



Summary for Pond B1B: Underground Basin 1B

Inflow Area = 104,336 sf, 76.55% Impervious, Inflow Depth = 2.59" for 2-Year event
Inflow = 5.11 cfs @ 12.14 hrs, Volume= 22,511 cf
Outflow = 2.05 cfs @ 12.44 hrs, Volume= 22,496 cf, Atten= 60%, Lag= 17.9 min
Primary = 2.05 cfs @ 12.44 hrs, Volume= 22,496 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.12' @ 12.44 hrs Surf.Area= 7,780 sf Storage= 5,110 cf

Plug-Flow detention time= 53.3 min calculated for 22,496 cf (100% of inflow)
Center-of-Mass det. time= 52.8 min (827.2 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	6,625 cf	**53.78'W x 144.65'L x 3.52'H Field A** 27,424 cf Overall - 10,861 cf Embedded = 16,563 cf x 40.0% Voids
#2A	19.60'	10,406 cf	**Contech ChamberMaxx 2016** x 220 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 11 rows
		17,031 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.05 cfs @ 12.44 hrs HW=20.12' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.05 cfs of 3.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.05 cfs @ 3.75 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1B: Underground Basin 1B - 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 11 rows

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

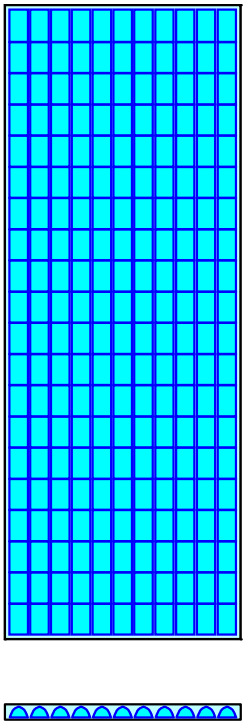
20 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 142.65' Row Length +12.0" End Stone x 2 = 144.65' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

220 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 10,405.7 cf Chamber Storage
220 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 10,860.7 cf Displacement

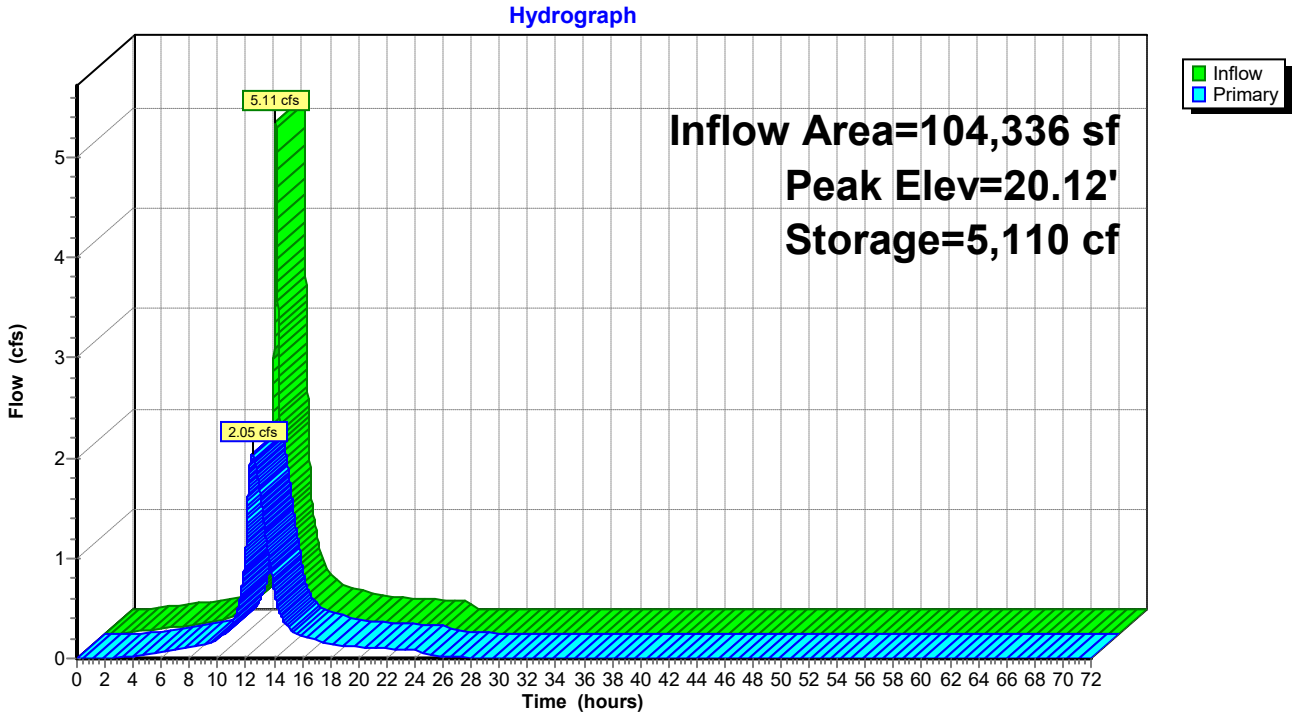
27,423.7 cf Field - 10,860.7 cf Chambers = 16,563.0 cf Stone x 40.0% Voids = 6,625.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,030.9 cf = 0.391 af
Overall Storage Efficiency = 62.1%
Overall System Size = 144.65' x 53.78' x 3.52'

220 Chambers
1,015.7 cy Field
613.4 cy Stone



Pond B1B: Underground Basin 1B



Summary for Pond DW1B: Drywell 1B

Inflow Area = 8,065 sf,100.00% Impervious, Inflow Depth = 3.27" for 2-Year event
Inflow = 0.50 cfs @ 12.14 hrs, Volume= 2,195 cf
Outflow = 0.25 cfs @ 12.35 hrs, Volume= 2,195 cf, Atten= 51%, Lag= 12.5 min
Discarded = 0.01 cfs @ 12.35 hrs, Volume= 1,665 cf
Primary = 0.23 cfs @ 12.35 hrs, Volume= 530 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 24.12' @ 12.35 hrs Surf.Area= 497 sf Storage= 862 cf

Plug-Flow detention time= 404.1 min calculated for 2,195 cf (100% of inflow)
Center-of-Mass det. time= 404.1 min (1,164.1 - 760.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	21.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	22.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.90'	**15.0" Round Culvert** L= 67.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 23.90' / 21.00' S= 0.0433 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	21.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 12.75' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.35 hrs HW=24.12' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.23 cfs @ 12.35 hrs HW=24.12' TW=20.11' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.23 cfs @ 1.59 fps)

Pond DW1B: Drywell 1B - 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 2 rows

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

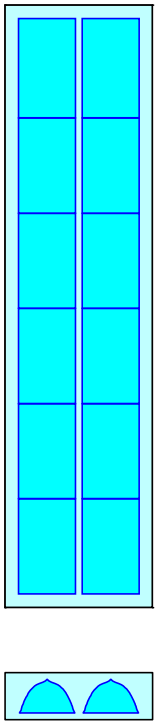
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

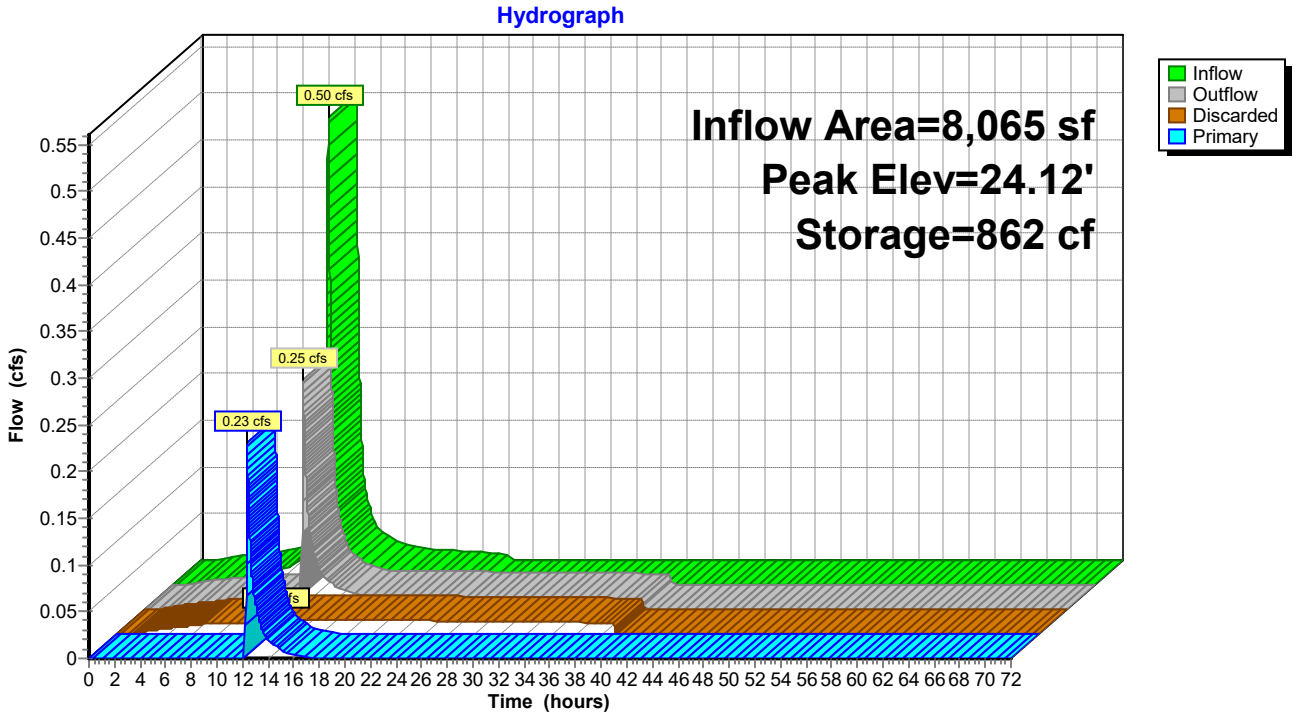
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1B: Drywell 1B



Summary for Pond DW2B: Drywell 2B

Inflow Area = 3,316 sf,100.00% Impervious, Inflow Depth = 3.27" for 2-Year event
Inflow = 0.21 cfs @ 12.14 hrs, Volume= 903 cf
Outflow = 0.01 cfs @ 14.05 hrs, Volume= 903 cf, Atten= 94%, Lag= 114.5 min
Discarded = 0.01 cfs @ 14.05 hrs, Volume= 902 cf
Primary = 0.00 cfs @ 14.05 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.76' @ 14.05 hrs Surf.Area= 497 sf Storage= 399 cf

Plug-Flow detention time= 258.5 min calculated for 903 cf (100% of inflow)
Center-of-Mass det. time= 258.5 min (1,018.5 - 760.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.75'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.75' / 21.00' S= 0.0163 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 14.05 hrs HW=21.76' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 14.05 hrs HW=21.76' TW=19.53' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.00 cfs @ 0.35 fps)

Pond DW2B: Drywell 2B - 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 2 rows

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

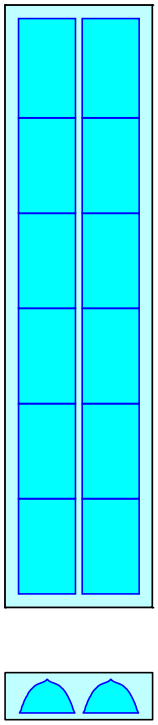
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

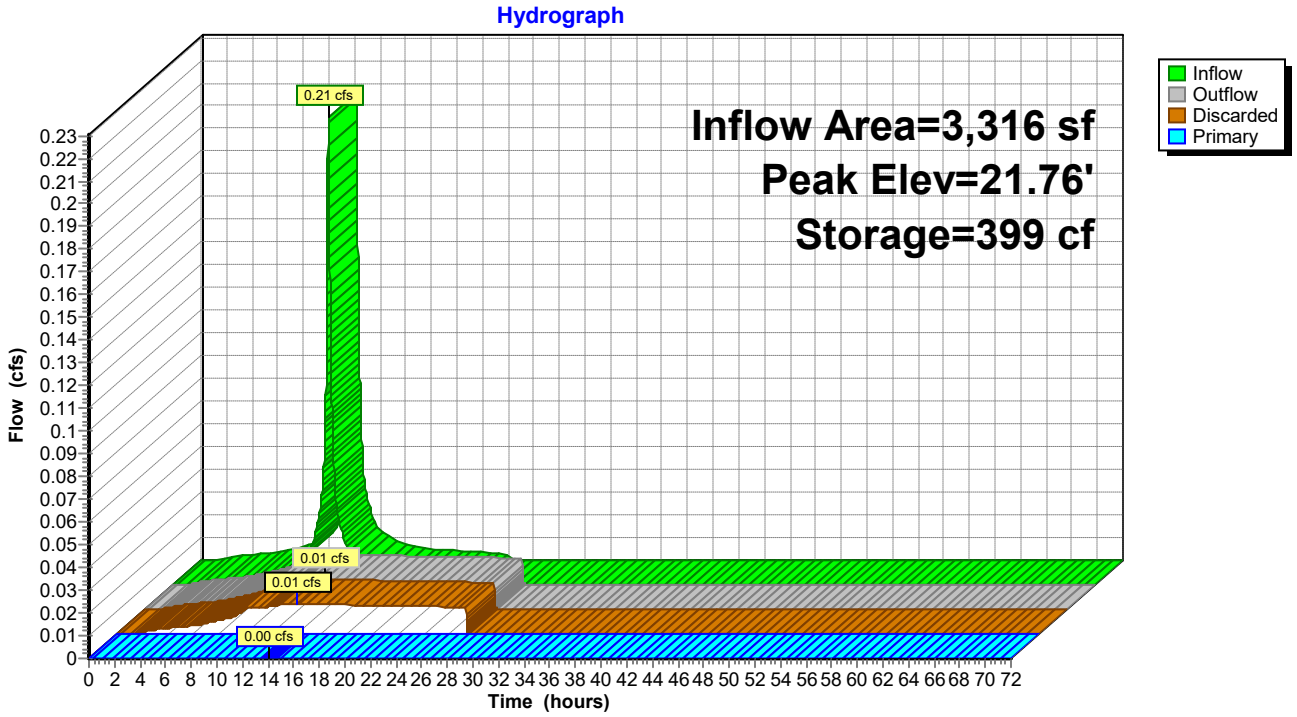
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW2B: Drywell 2B



Summary for Pond RG1A: Rain Garden 1A

Inflow Area = 29,515 sf, 69.22% Impervious, Inflow Depth = 2.76" for 2-Year event
Inflow = 1.59 cfs @ 12.14 hrs, Volume= 6,800 cf
Outflow = 0.47 cfs @ 12.53 hrs, Volume= 6,800 cf, Atten= 71%, Lag= 23.2 min
Discarded = 0.08 cfs @ 12.53 hrs, Volume= 5,842 cf
Primary = 0.39 cfs @ 12.53 hrs, Volume= 958 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.84' @ 12.53 hrs Surf.Area= 3,191 sf Storage= 3,146 cf

Plug-Flow detention time= 418.3 min calculated for 6,800 cf (100% of inflow)
Center-of-Mass det. time= 418.3 min (1,195.1 - 776.9)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,688 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

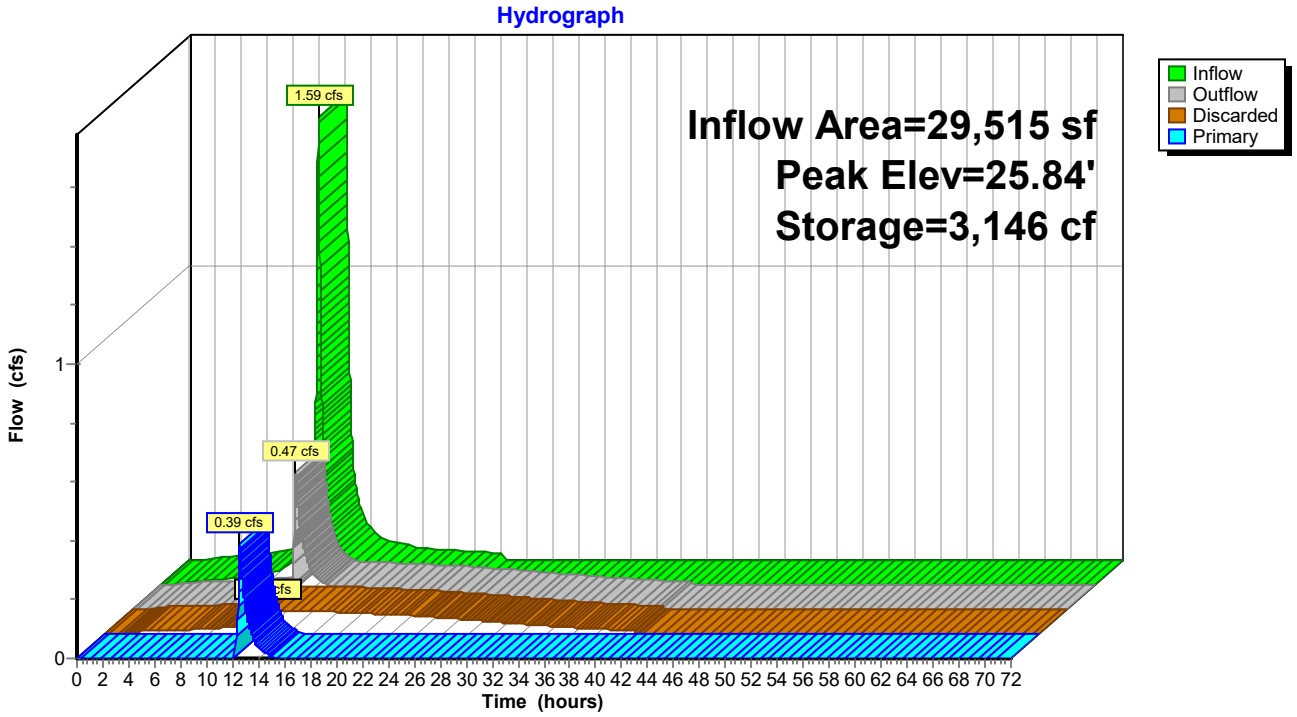
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	461	161.0	0	0	461
25.00	1,829	216.0	1,069	1,069	2,122
26.00	3,498	260.0	2,619	3,688	3,805

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 27.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 19.60' S= 0.0889 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	25.80'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	24.00'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.80' Phase-In= 0.01'

Discarded OutFlow Max=0.08 cfs @ 12.53 hrs HW=25.84' (Free Discharge)
└**3=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=0.39 cfs @ 12.53 hrs HW=25.84' TW=19.77' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.39 cfs of 10.59 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.39 cfs @ 0.64 fps)

Pond RG1A: Rain Garden 1A

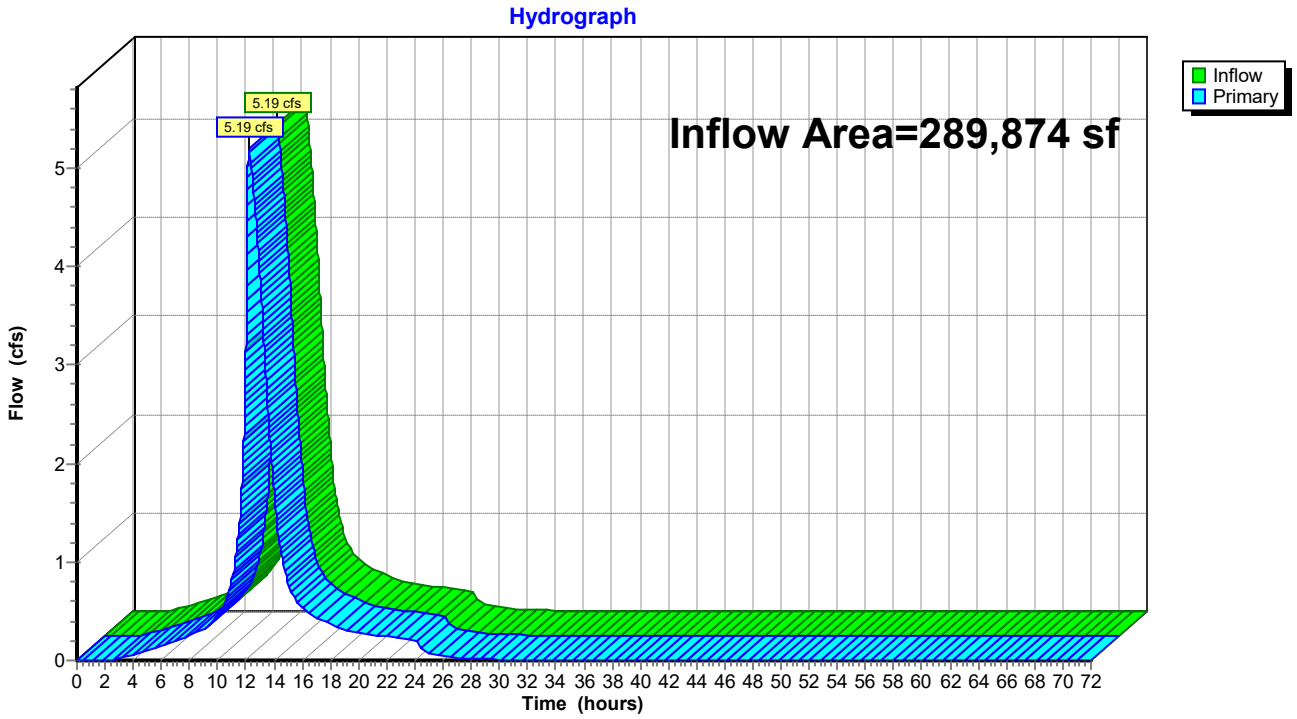


Summary for Link 3L: Pr. POA 1

Inflow Area = 289,874 sf, 70.62% Impervious, Inflow Depth = 2.28" for 2-Year event
Inflow = 5.19 cfs @ 12.23 hrs, Volume= 55,148 cf
Primary = 5.19 cfs @ 12.23 hrs, Volume= 55,148 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



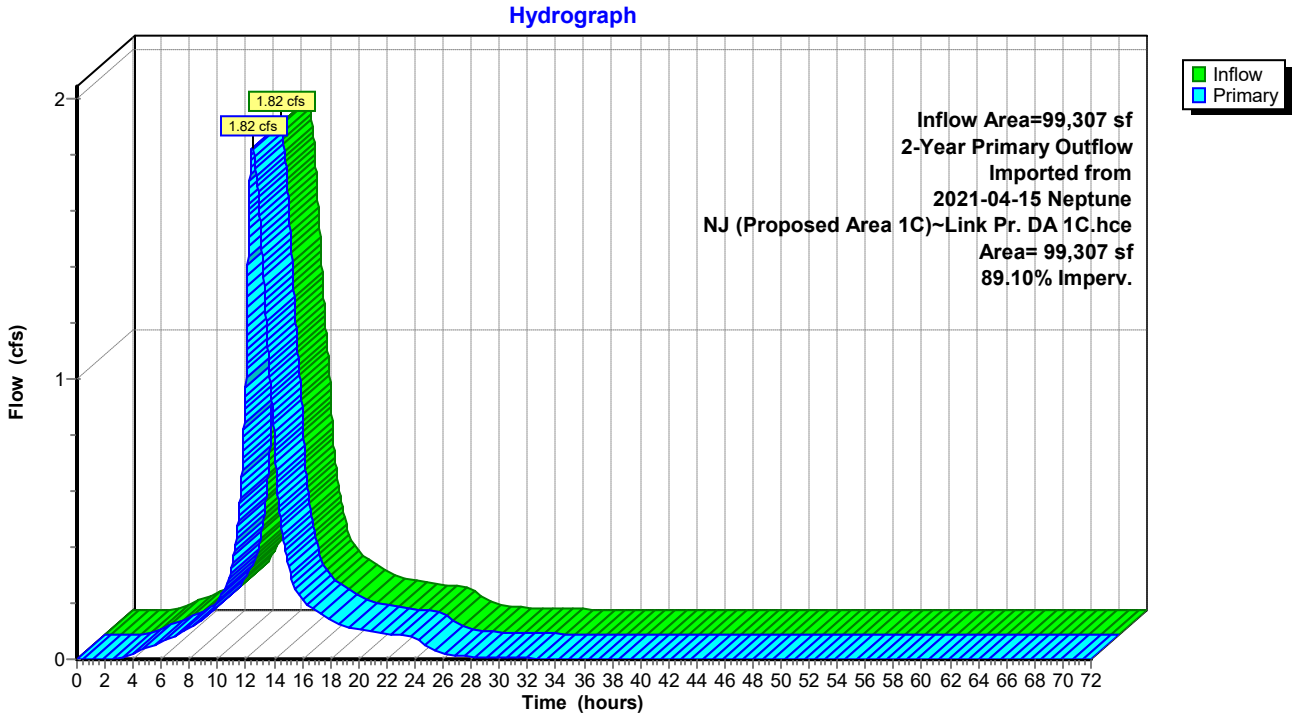
Summary for Link 4L: Pr DA 1C Total

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 2.65" for 2-Year event
Inflow = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf
Primary = 1.82 cfs @ 12.47 hrs, Volume= 21,928 cf, Atten= 0%, Lag= 0.0 min

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

2-Year Primary Outflow Imported from 2021-04-15 Neptune, NJ (Proposed Area 1C)~Link Pr. DA 1C.hce

Link 4L: Pr DA 1C Total



Summary for Subcatchment 6S: Pr. Area 2

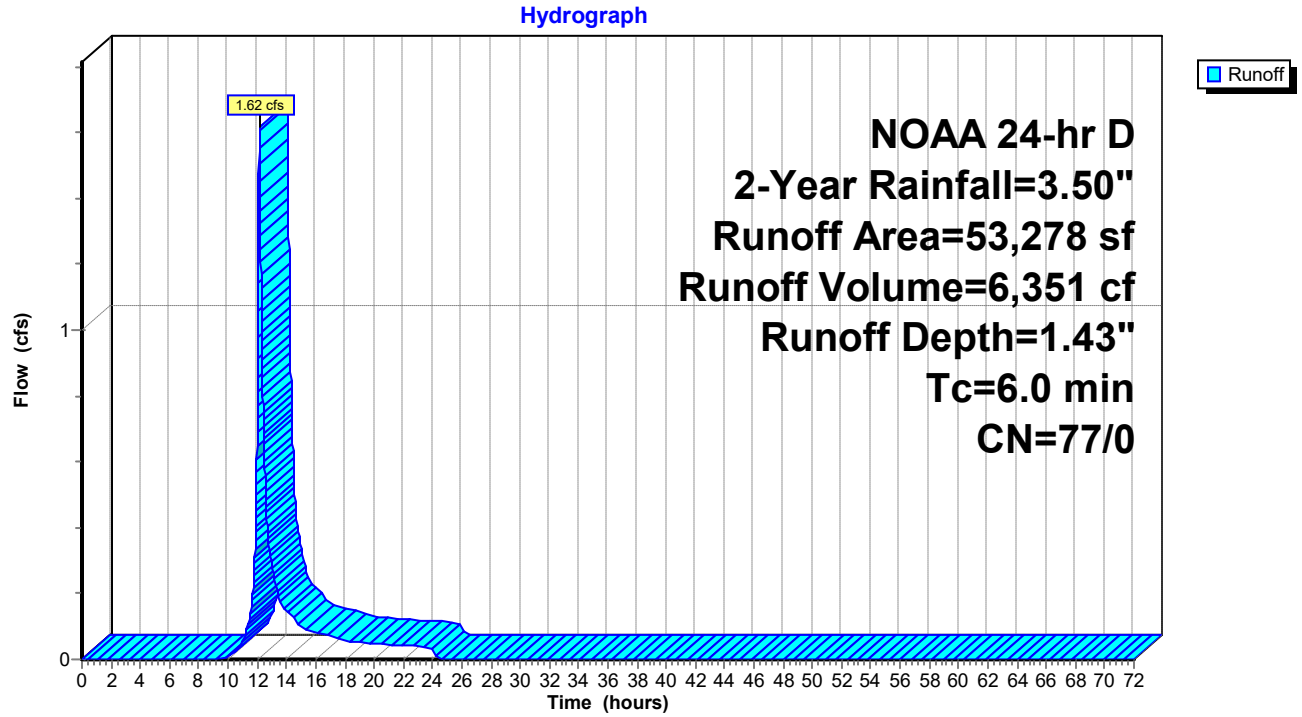
Runoff = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf, Depth= 1.43"

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=3.50"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2

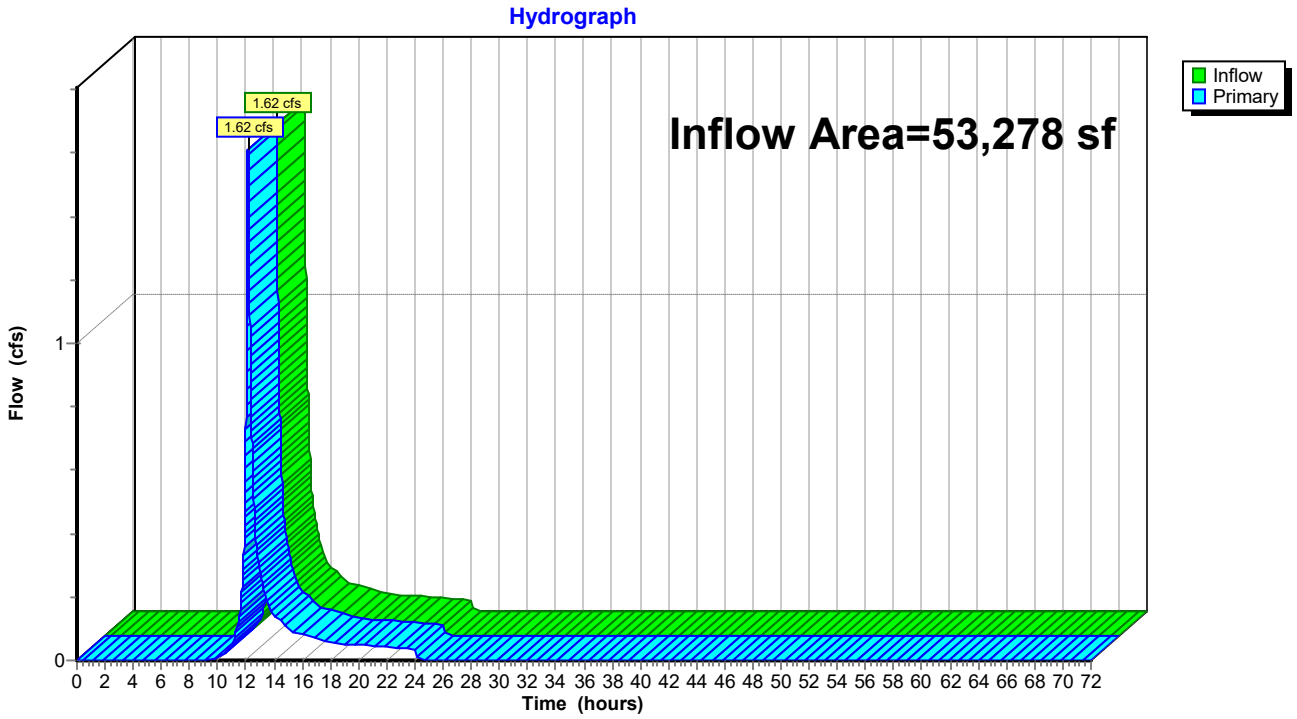


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 1.43" for 2-Year event
Inflow = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf
Primary = 1.62 cfs @ 12.15 hrs, Volume= 6,351 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



APPENDIX C-3
10-YEAR STORM EVENT HYDROGRAPHS

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

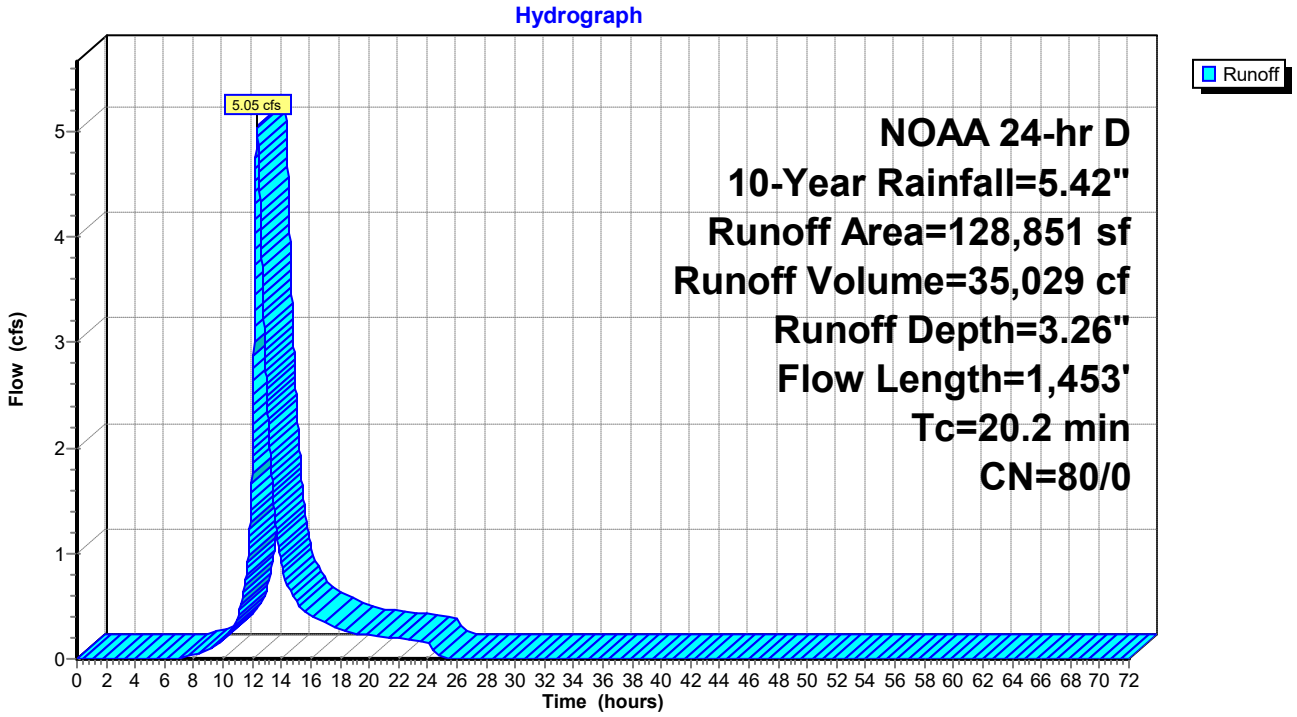
Runoff = 5.05 cfs @ 12.34 hrs, Volume= 35,029 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
115,266	80	>75% Grass cover, Good, HSG D
13,585	77	Woods, Good, HSG D
128,851	80	Weighted Average
128,851	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
10.6	1,278		2.00		**Direct Entry, Channel Flow**
20.2	1,453	Total			

Subcatchment 1S: Ex. Area 1A Perv.



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

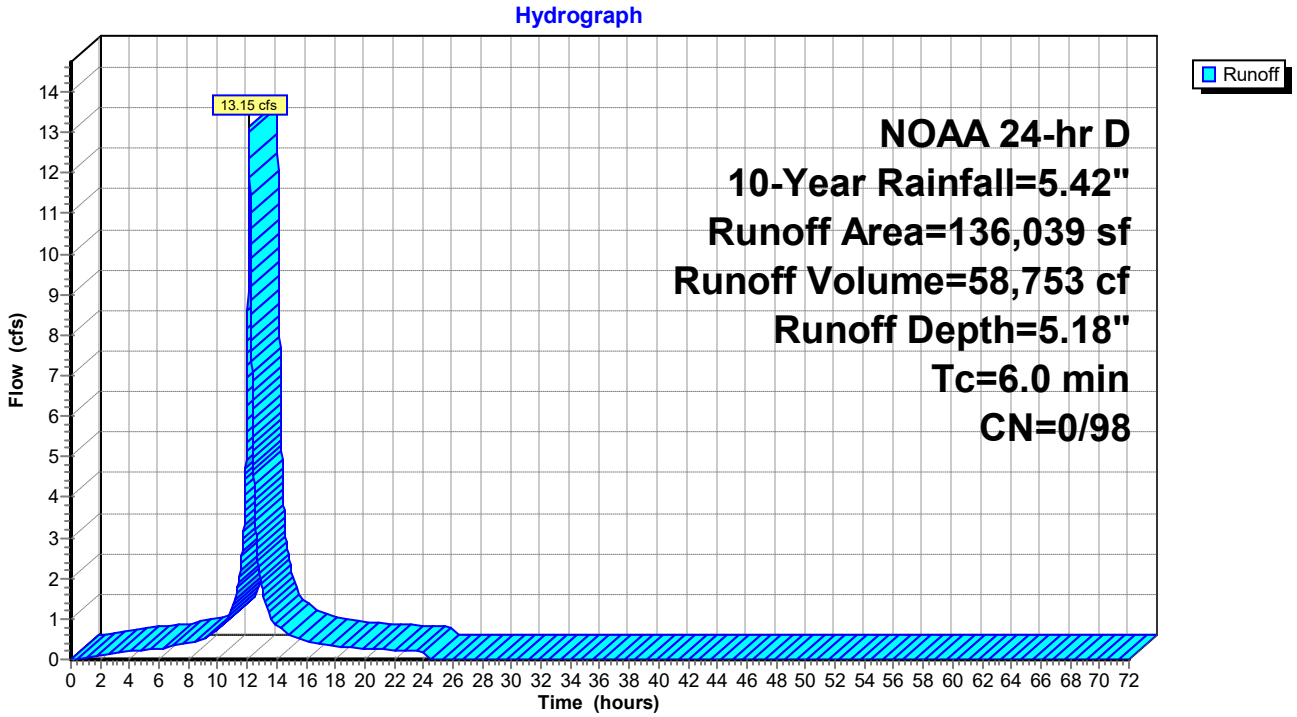
Runoff = 13.15 cfs @ 12.14 hrs, Volume= 58,753 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
136,039	98	Paved parking, HSG D
136,039	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 1A Imp.



Summary for Subcatchment 5S: Ex. Area 2

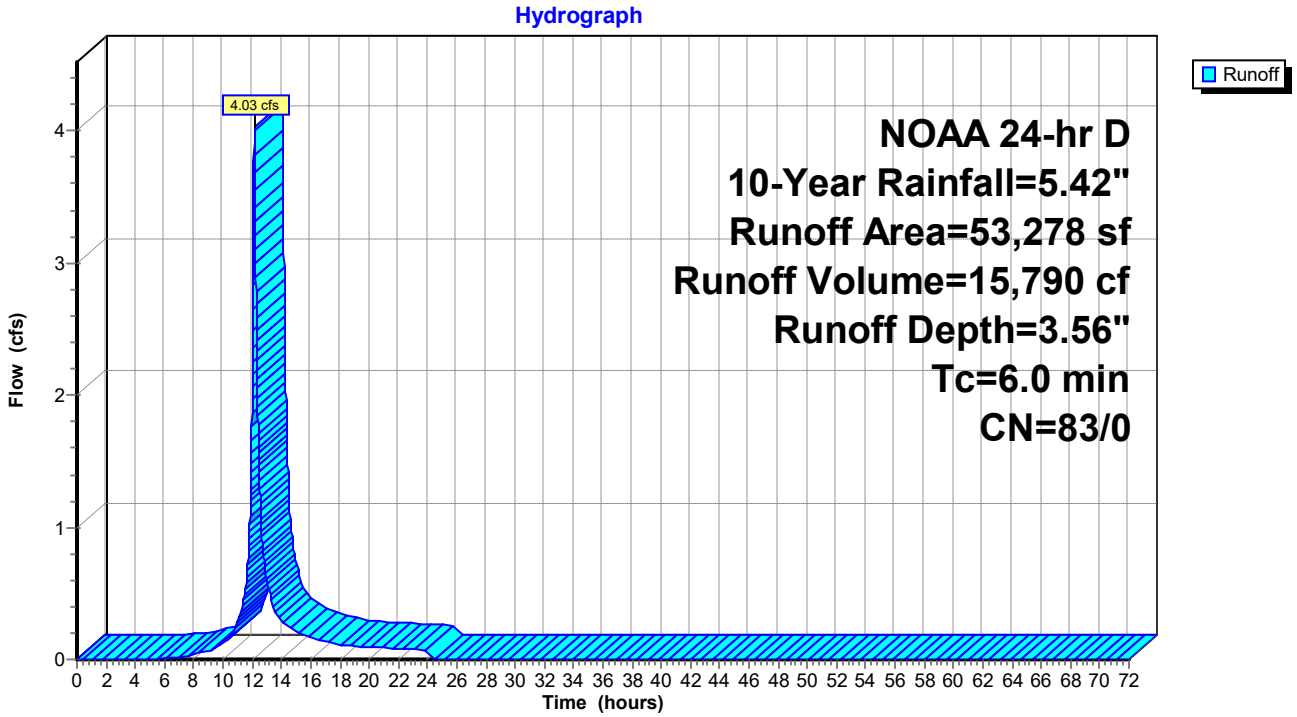
Runoff = 4.03 cfs @ 12.14 hrs, Volume= 15,790 cf, Depth= 3.56"

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=5.42"

Area (sf)	CN	Description
53,278	83	Woods, Poor, HSG D
53,278	83	100.00% Pervious Area

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

Subcatchment 5S: Ex. Area 2



Summary for Subcatchment 6S: Pr. Area 2

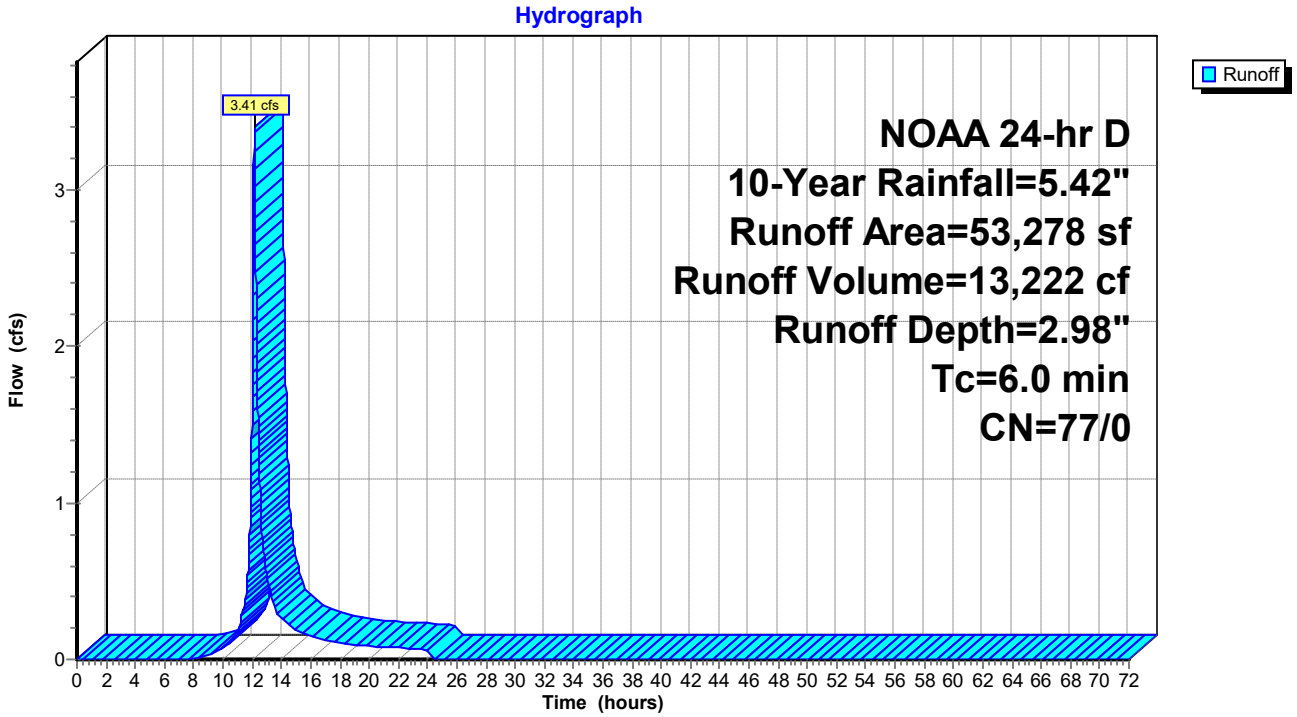
Runoff = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf, Depth= 2.98"

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=5.42"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2



Summary for Subcatchment 10S: Ex. Area 1B Perv.

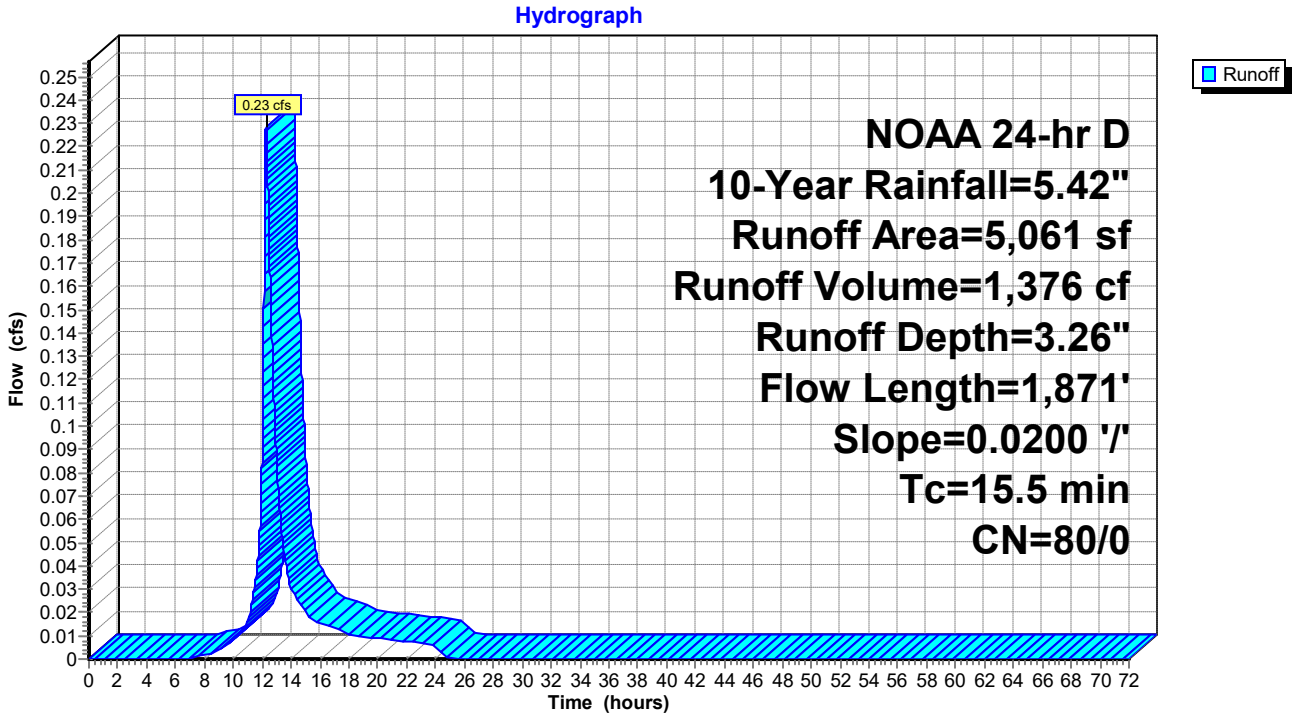
Runoff = 0.23 cfs @ 12.26 hrs, Volume= 1,376 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

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
1.2	100	0.0200	1.41		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
1.1	184	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.2	1,587		2.00		**Direct Entry,**
15.5	1,871	Total			

Subcatchment 10S: Ex. Area 1B Perv.



Summary for Subcatchment 11S: Ex. Area 1B Imp.

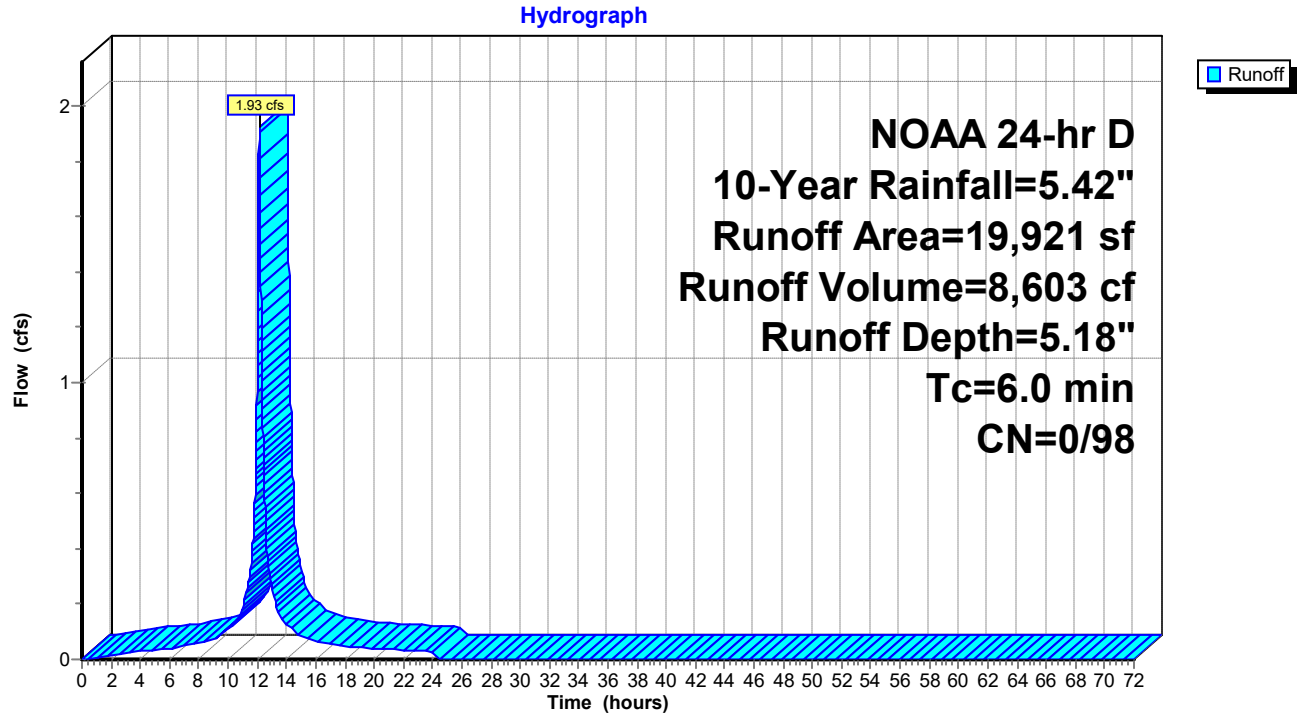
Runoff = 1.93 cfs @ 12.14 hrs, Volume= 8,603 cf, Depth= 5.18"

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=5.42"

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 1B Imp.

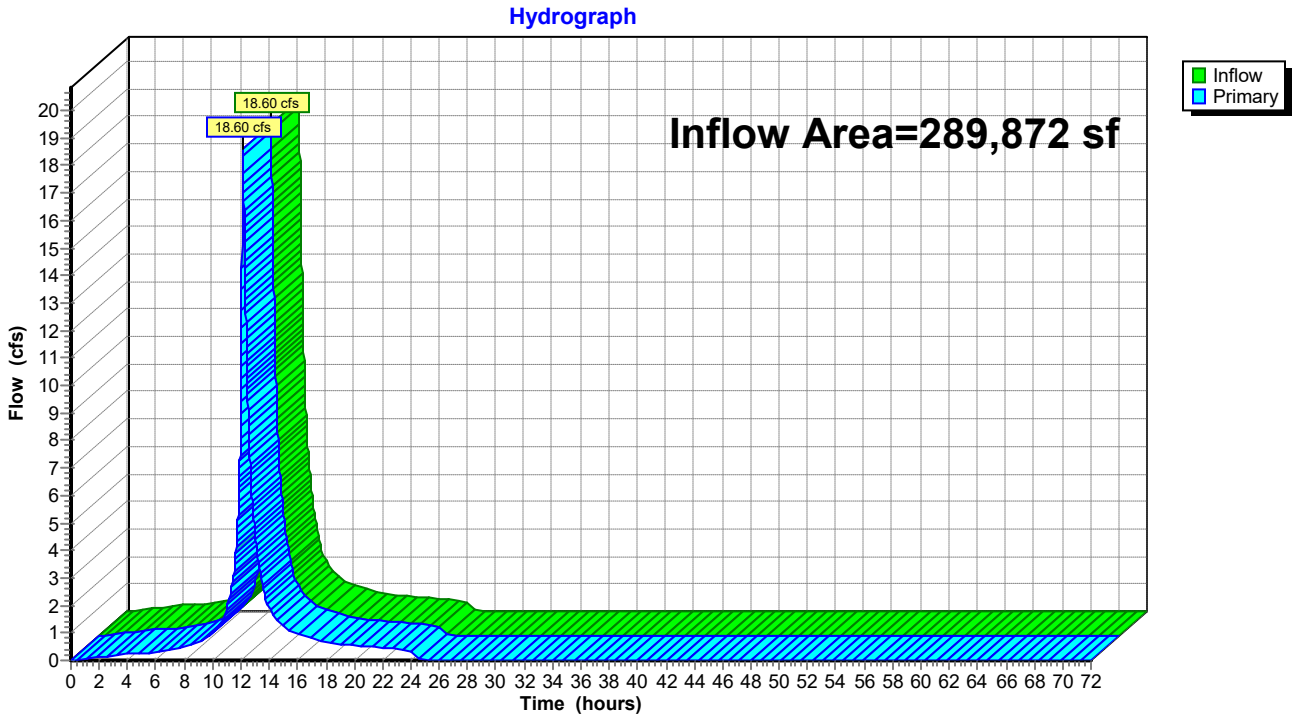


Summary for Link 3L: EX POA 1 (Construction)

Inflow Area = 289,872 sf, 53.80% Impervious, Inflow Depth = 4.30" for 10-Year event
Inflow = 18.60 cfs @ 12.15 hrs, Volume= 103,761 cf
Primary = 18.60 cfs @ 12.15 hrs, Volume= 103,761 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 (Construction)

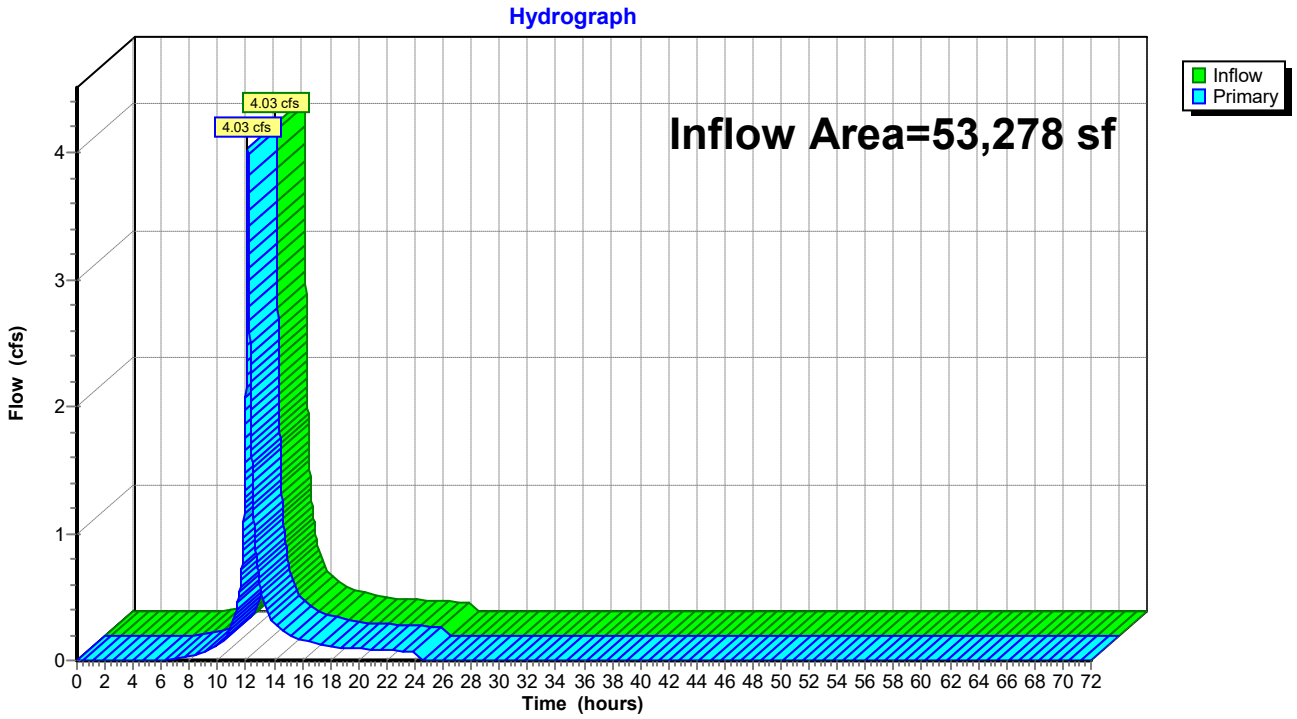


Summary for Link 4L: EX POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 3.56" for 10-Year event
Inflow = 4.03 cfs @ 12.14 hrs, Volume= 15,790 cf
Primary = 4.03 cfs @ 12.14 hrs, Volume= 15,790 cf, Atten= 0%, Lag= 0.0 min

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

Link 4L: EX POA 2 (Reforestation)

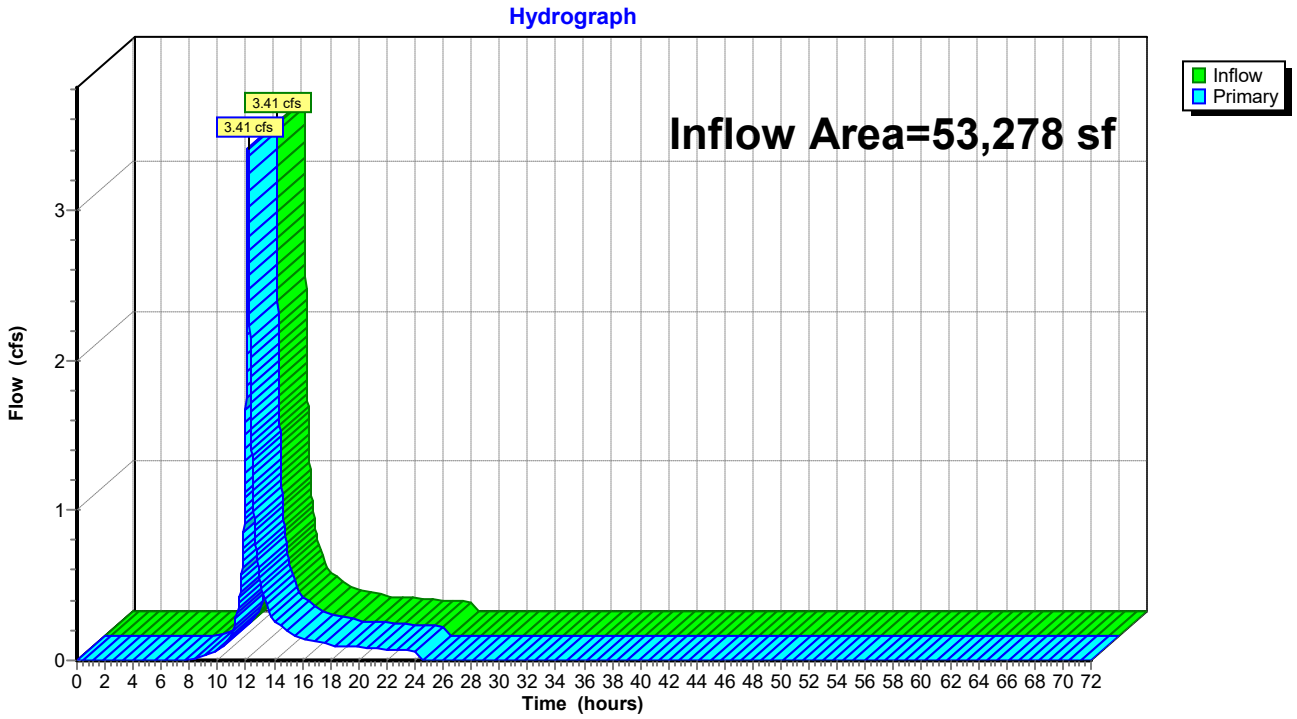


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 2.98" for 10-Year event
Inflow = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf
Primary = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



Summary for Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.

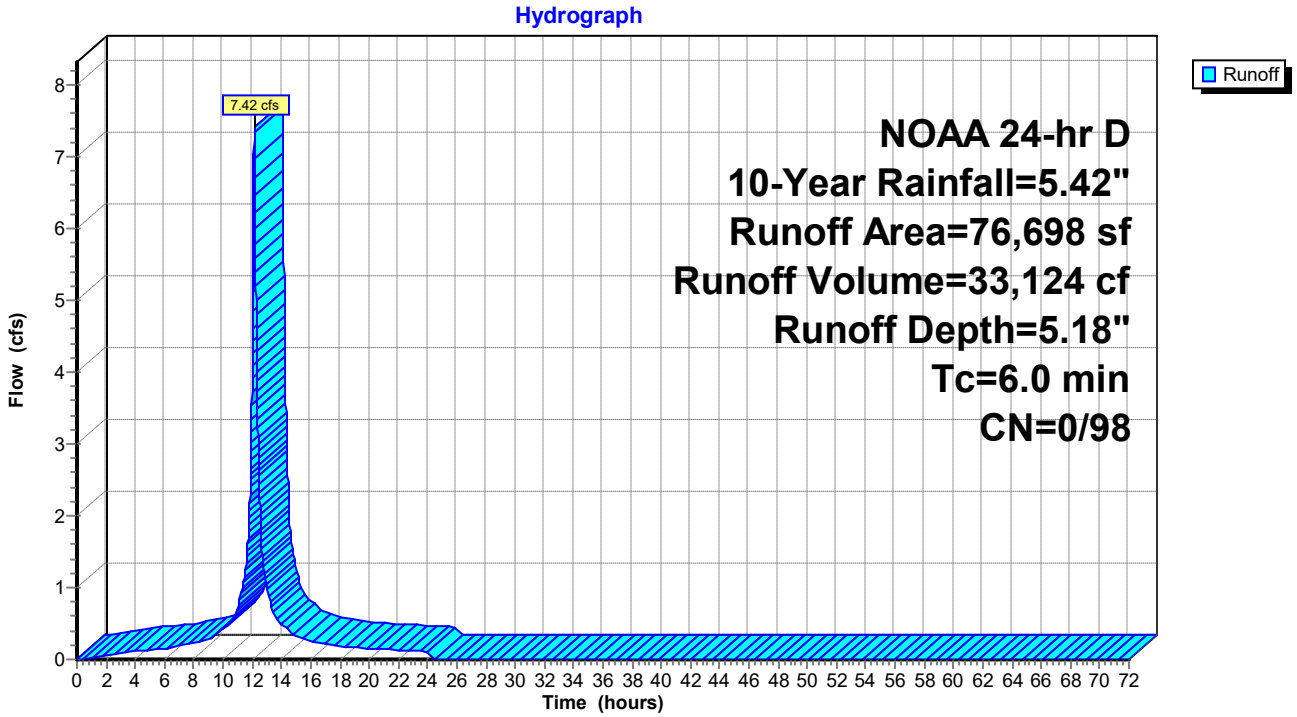
Runoff = 7.42 cfs @ 12.14 hrs, Volume= 33,124 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
76,698	98	Paved parking, HSG D
76,698	98	100.00% Impervious Area

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

Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.



Summary for Subcatchment B 1Cp: PR. BASIN Area 1C Perv.

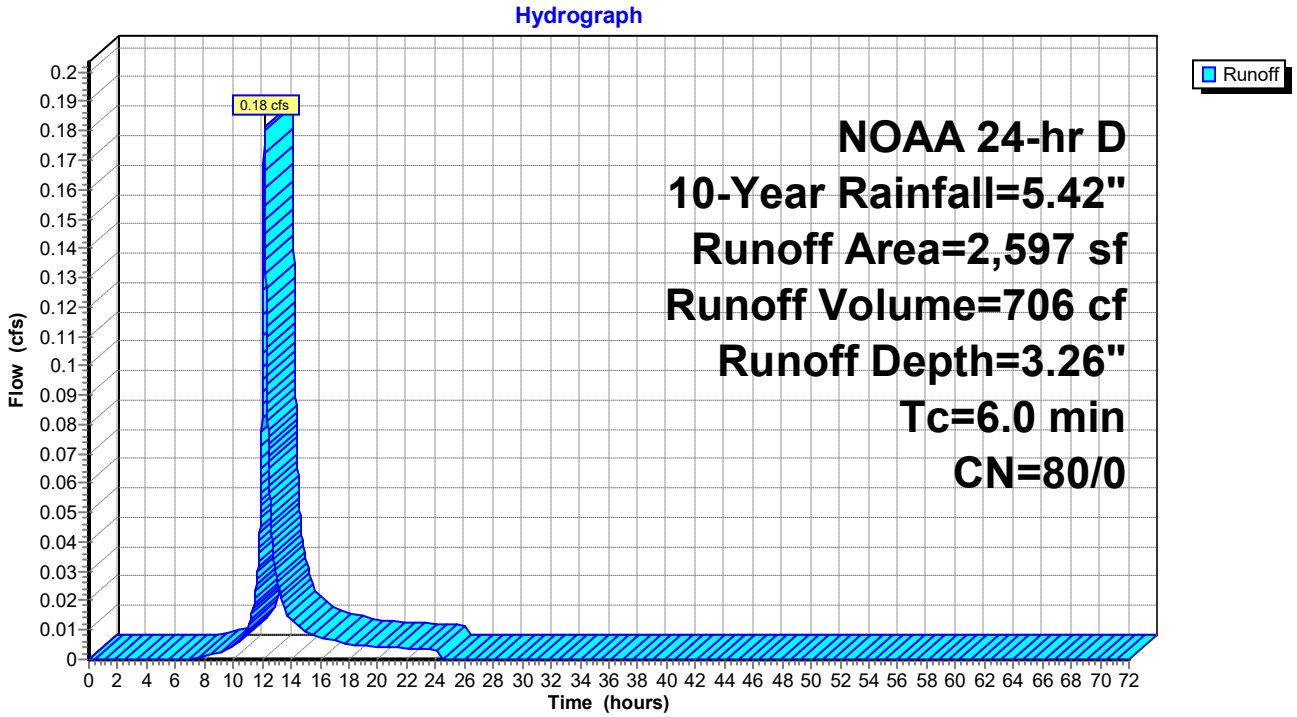
Runoff = 0.18 cfs @ 12.14 hrs, Volume= 706 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
2,597	80	>75% Grass cover, Good, HSG D
2,597	80	100.00% Pervious Area

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

Subcatchment B 1Cp: PR. BASIN Area 1C Perv.



Summary for Subcatchment DW 1Ci: Pr. Drywell 1C Imp.

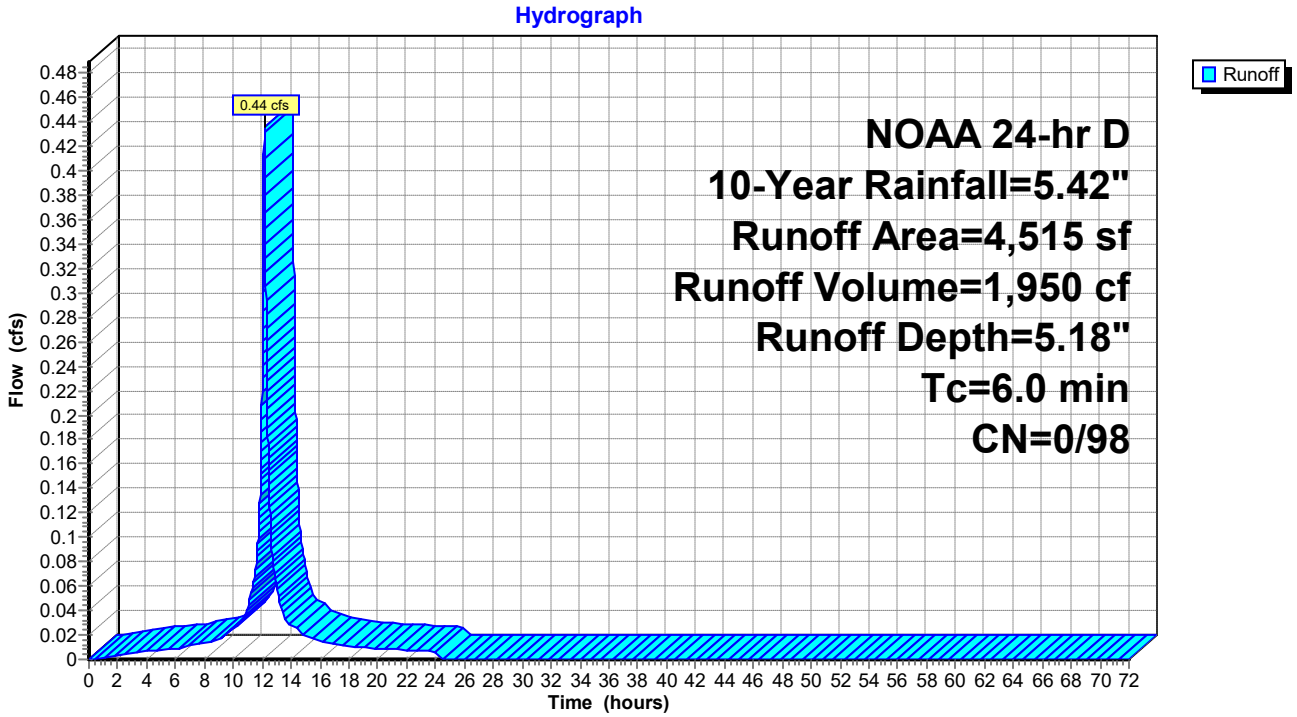
Runoff = 0.44 cfs @ 12.14 hrs, Volume= 1,950 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
4,515	98	Paved parking, HSG D
4,515	98	100.00% Impervious Area

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

Subcatchment DW 1Ci: Pr. Drywell 1C Imp.



Summary for Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.

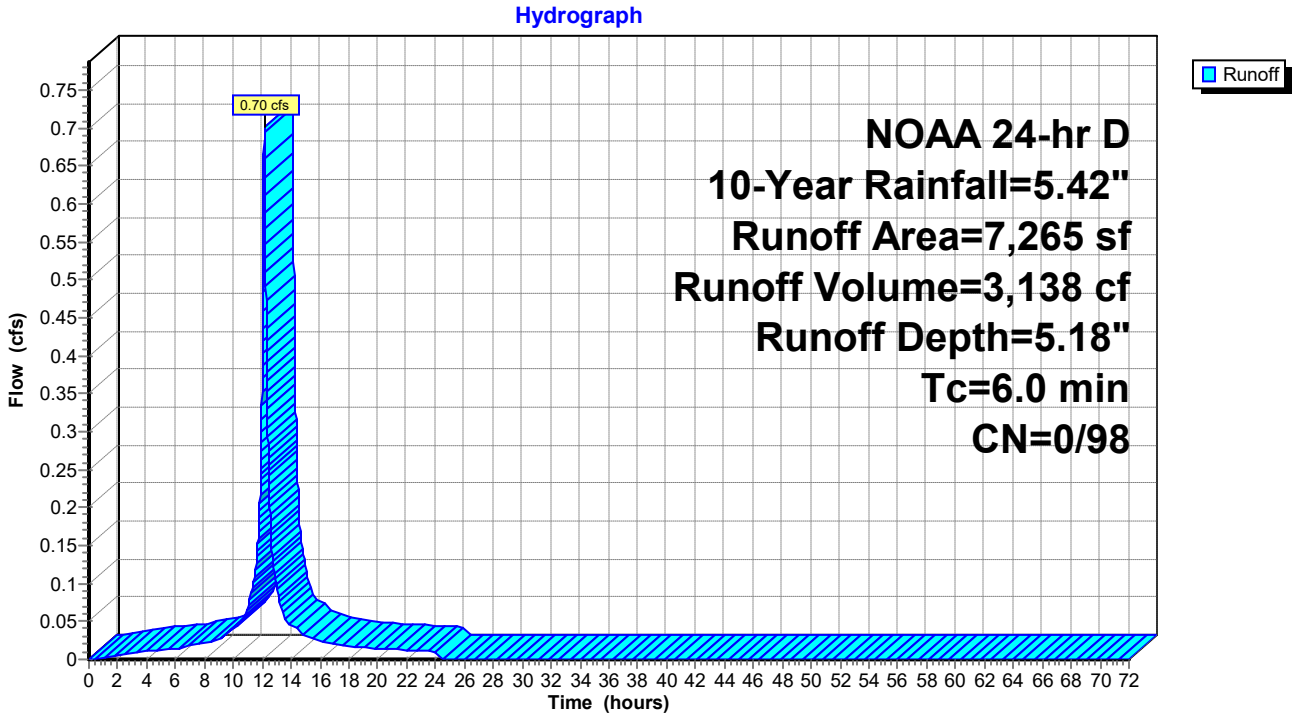
Runoff = 0.70 cfs @ 12.14 hrs, Volume= 3,138 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
7,265	98	Paved parking, HSG D
7,265	98	100.00% Impervious Area

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

Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.



Summary for Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.

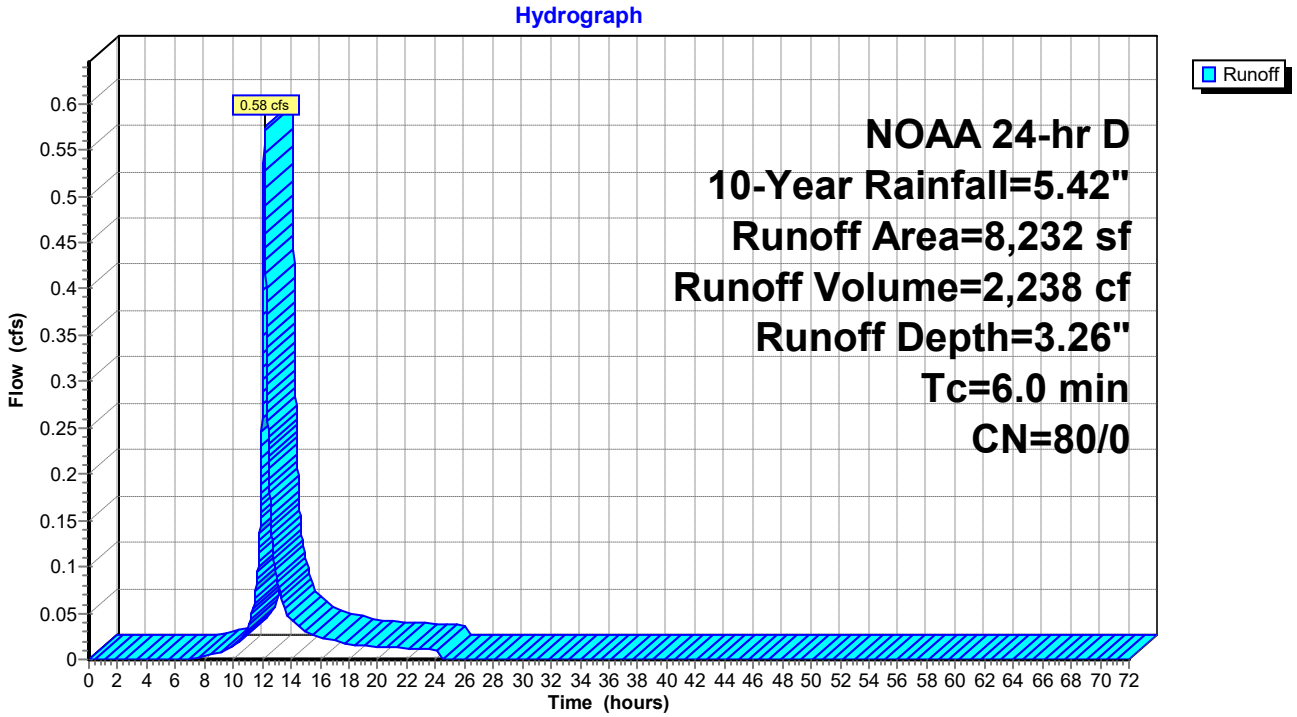
Runoff = 0.58 cfs @ 12.14 hrs, Volume= 2,238 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
8,232	80	>75% Grass cover, Good, HSG D
8,232	80	100.00% Pervious Area

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

Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.



Summary for Pond B 1C: Underground Basin 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 8.77 cfs @ 12.14 hrs, Volume= 36,815 cf
Outflow = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf, Atten= 70%, Lag= 23.2 min
Primary = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.53' @ 12.53 hrs Surf.Area= 10,459 sf Storage= 10,382 cf

Plug-Flow detention time= 66.4 min calculated for 36,788 cf (100% of inflow)
Center-of-Mass det. time= 65.9 min (820.1 - 754.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	8,886 cf	**53.78'W x 194.47'L x 3.52'H Field A** 36,868 cf Overall - 14,653 cf Embedded = 22,215 cf x 40.0% Voids
#2A	19.60'	14,040 cf	**Contech ChamberMaxx 2016** x 297 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 11 rows
		22,925 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.65 cfs @ 12.53 hrs HW=20.53' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.65 cfs of 6.17 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.64 cfs @ 4.84 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.45 fps)

Pond B 1C: Underground Basin 1C - 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 11 rows

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

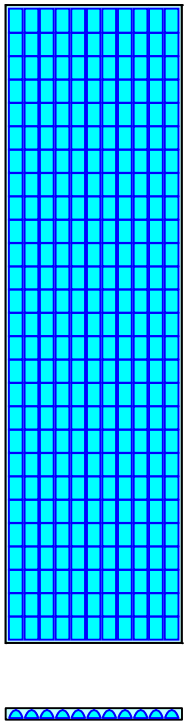
27 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 192.47' Row Length +12.0" End Stone x 2 = 194.47' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

297 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 14,039.6 cf Chamber Storage
297 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 14,653.5 cf Displacement

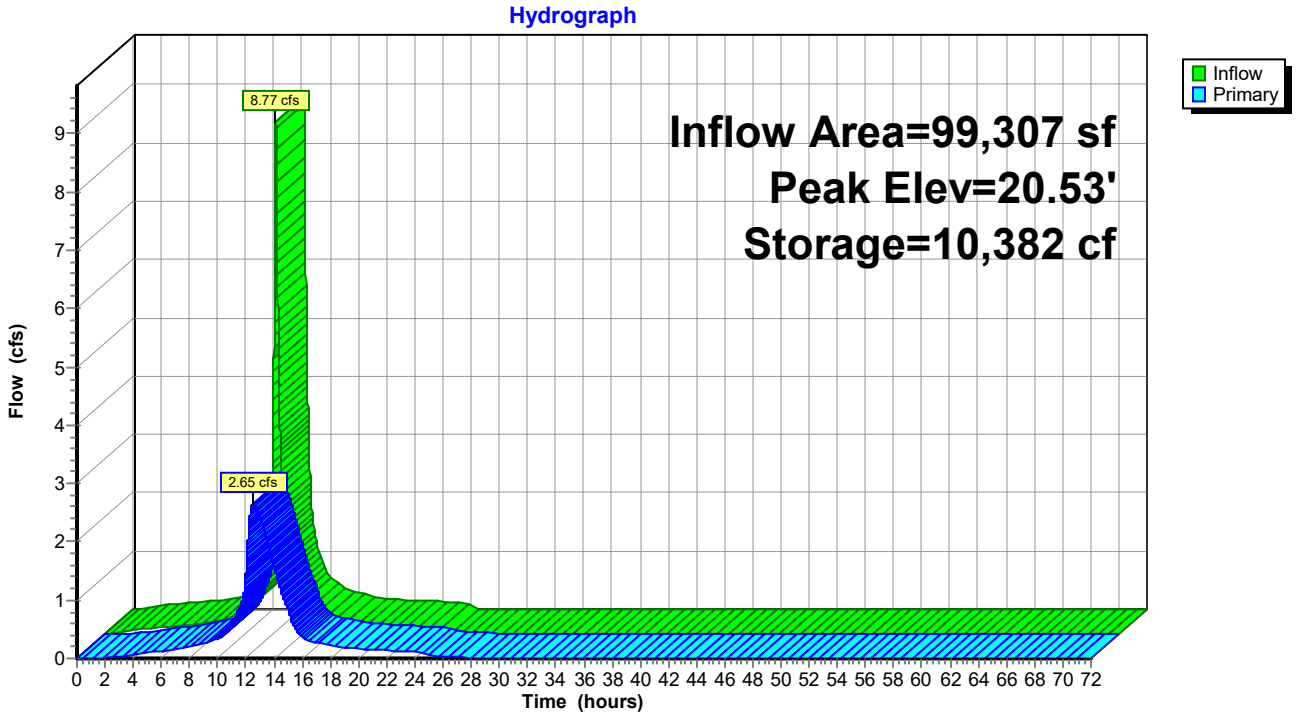
36,868.2 cf Field - 14,653.5 cf Chambers = 22,214.7 cf Stone x 40.0% Voids = 8,885.9 cf Stone Storage

Chamber Storage + Stone Storage = 22,925.5 cf = 0.526 af
Overall Storage Efficiency = 62.2%
Overall System Size = 194.47' x 53.78' x 3.52'

297 Chambers
1,365.5 cy Field
822.8 cy Stone



Pond B 1C: Underground Basin 1C



Summary for Pond DW1C: Drywell 1C

Inflow Area = 4,515 sf,100.00% Impervious, Inflow Depth = 5.18" for 10-Year event
Inflow = 0.44 cfs @ 12.14 hrs, Volume= 1,950 cf
Outflow = 0.23 cfs @ 12.33 hrs, Volume= 1,950 cf, Atten= 48%, Lag= 11.5 min
Discarded = 0.01 cfs @ 12.33 hrs, Volume= 1,455 cf
Primary = 0.21 cfs @ 12.33 hrs, Volume= 495 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.61' @ 12.33 hrs Surf.Area= 497 sf Storage= 706 cf

Plug-Flow detention time= 326.7 min calculated for 1,950 cf (100% of inflow)
Center-of-Mass det. time= 326.7 min (1,078.2 - 751.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.40'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.40' / 21.00' S= 0.0304 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.33 hrs HW=22.61' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.21 cfs @ 12.33 hrs HW=22.61' TW=20.45' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.21 cfs @ 1.56 fps)

Pond DW1C: Drywell 1C - 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 2 rows

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

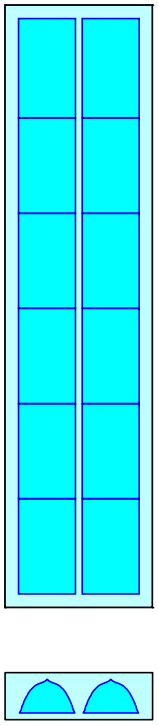
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

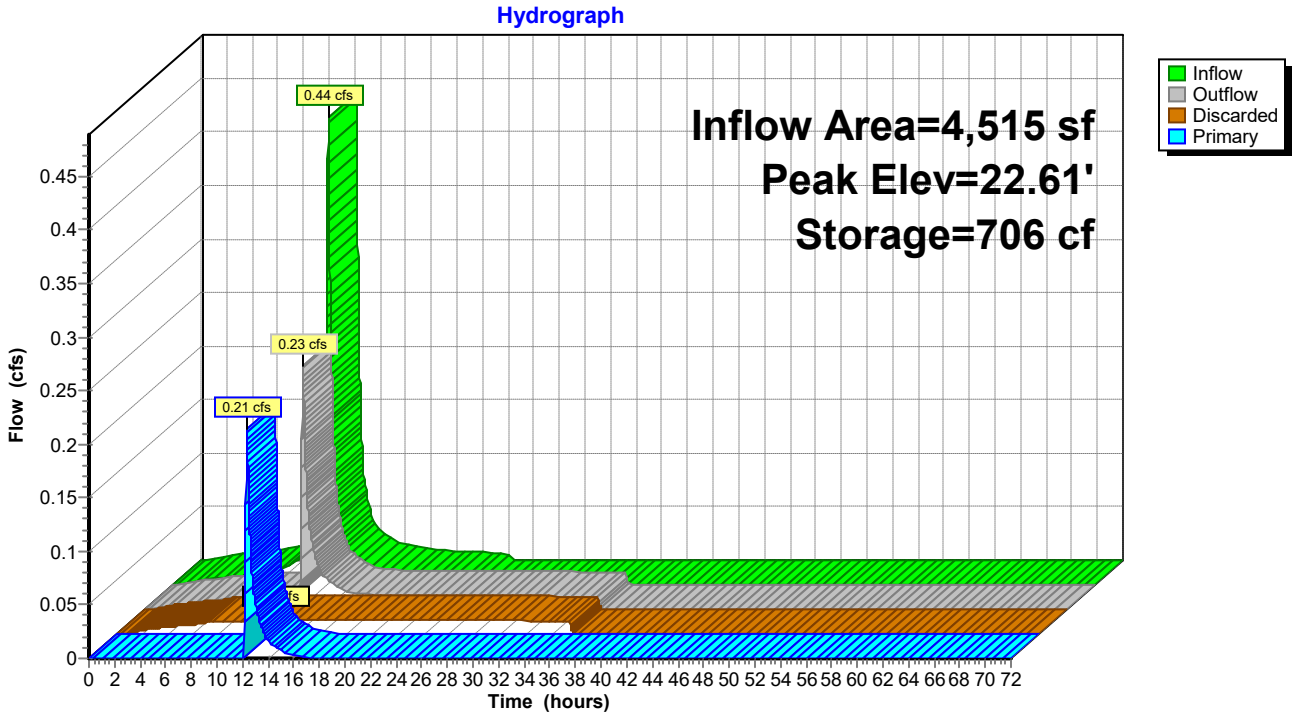
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1C: Drywell 1C



Summary for Pond RG 1C: Rain Garden 1C

Inflow Area = 15,497 sf, 46.88% Impervious, Inflow Depth = 4.16" for 10-Year event
Inflow = 1.28 cfs @ 12.14 hrs, Volume= 5,376 cf
Outflow = 1.25 cfs @ 12.16 hrs, Volume= 5,376 cf, Atten= 3%, Lag= 1.2 min
Discarded = 0.04 cfs @ 12.16 hrs, Volume= 2,886 cf
Primary = 1.20 cfs @ 12.16 hrs, Volume= 2,489 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.93' @ 12.16 hrs Surf.Area= 1,679 sf Storage= 1,163 cf

Plug-Flow detention time= 199.7 min calculated for 5,375 cf (100% of inflow)
Center-of-Mass det. time= 199.8 min (984.3 - 784.5)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	1,282 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

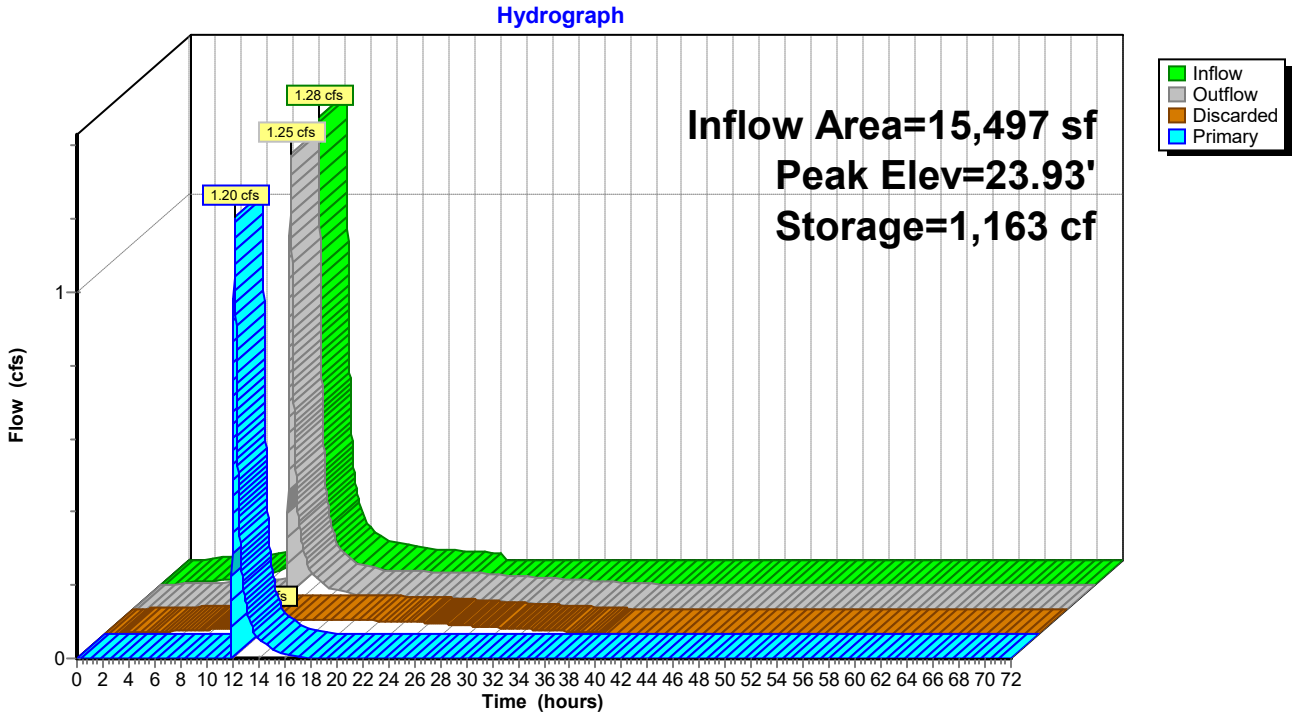
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
22.50	160	58.0	0	0	160
23.00	556	109.0	169	169	839
24.00	1,787	204.0	1,113	1,282	3,210

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Culvert** L= 37.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 20.25' S= 0.0054 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	23.85'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	22.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=23.93' (Free Discharge)
└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=1.20 cfs @ 12.16 hrs HW=23.93' TW=20.15' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.20 cfs of 9.99 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.20 cfs @ 0.93 fps)

Pond RG 1C: Rain Garden 1C

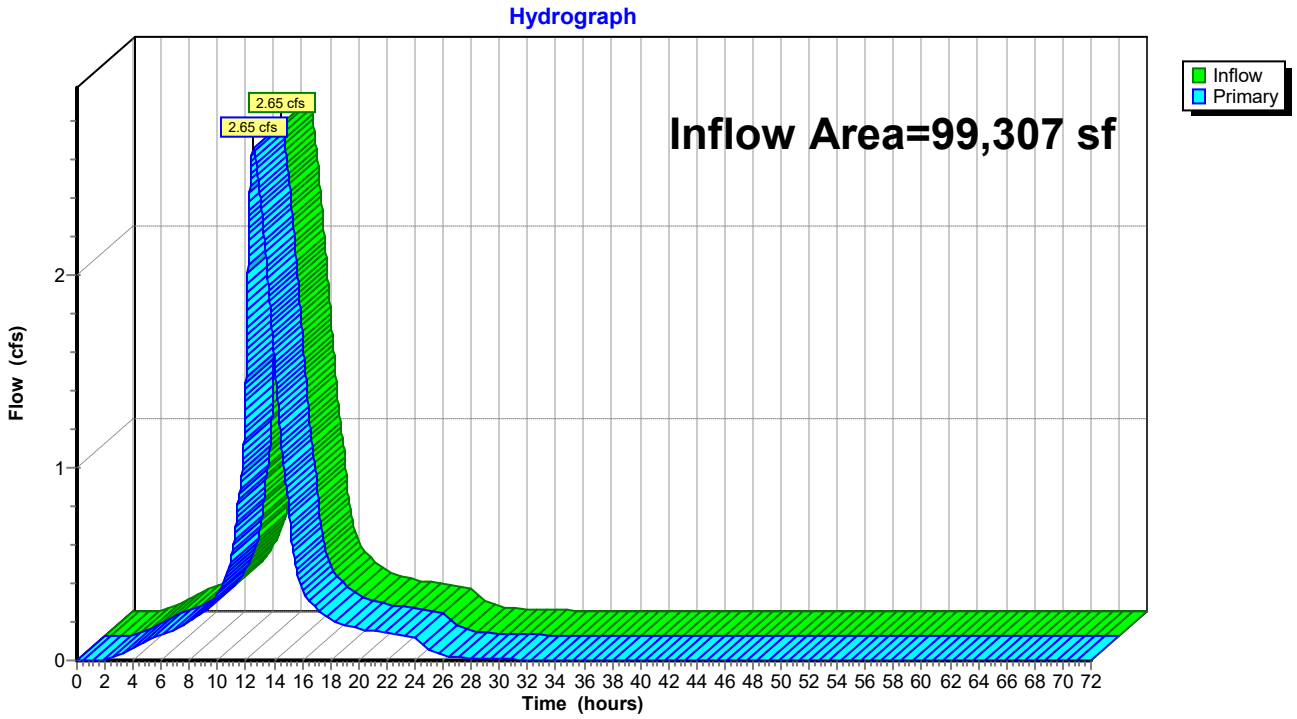


Summary for Link Pr. DA 1C: Pr. DA 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf
Primary = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf, Atten= 0%, Lag= 0.0 min

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

Link Pr. DA 1C: Pr. DA 1C



Summary for Subcatchment B1Ai: Pr. BAsin Area 1A Imp.

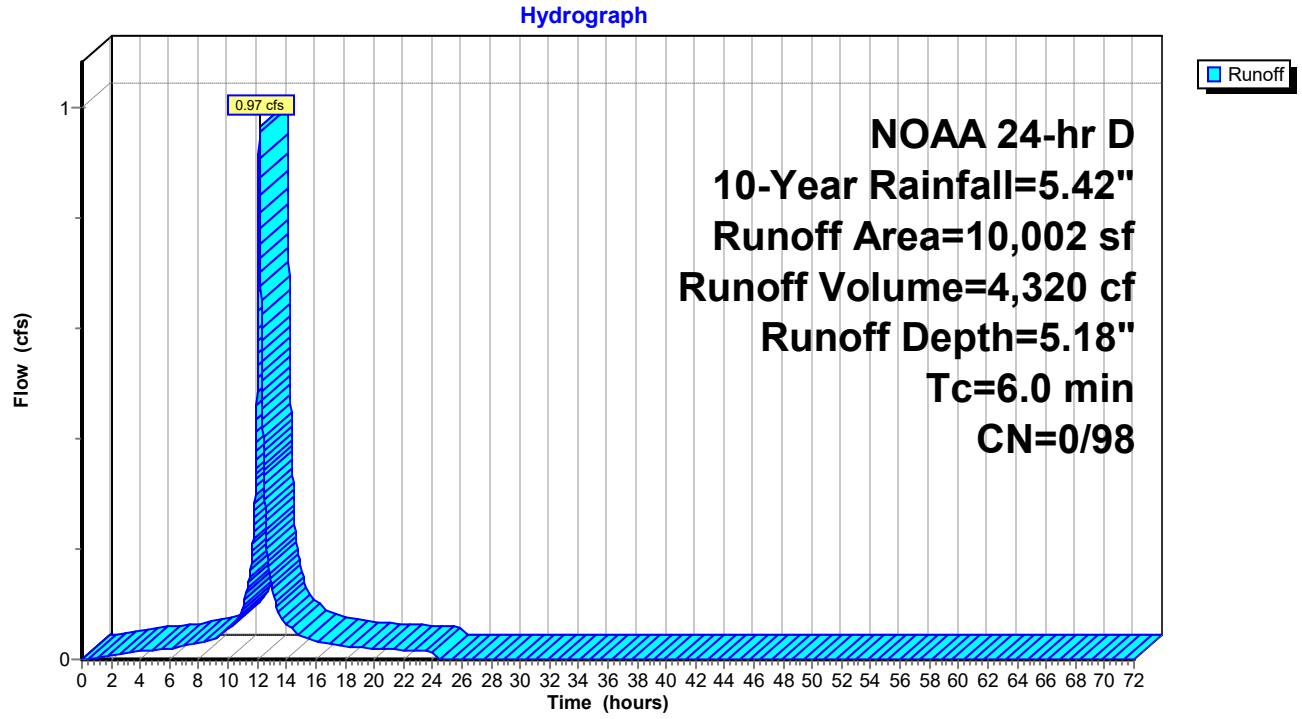
Runoff = 0.97 cfs @ 12.14 hrs, Volume= 4,320 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
10,002	98	Paved parking, HSG D
10,002	98	100.00% Impervious Area

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

Subcatchment B1Ai: Pr. BAsin Area 1A Imp.



Summary for Subcatchment B1Ap: PR. Basin Area 1A Perv.

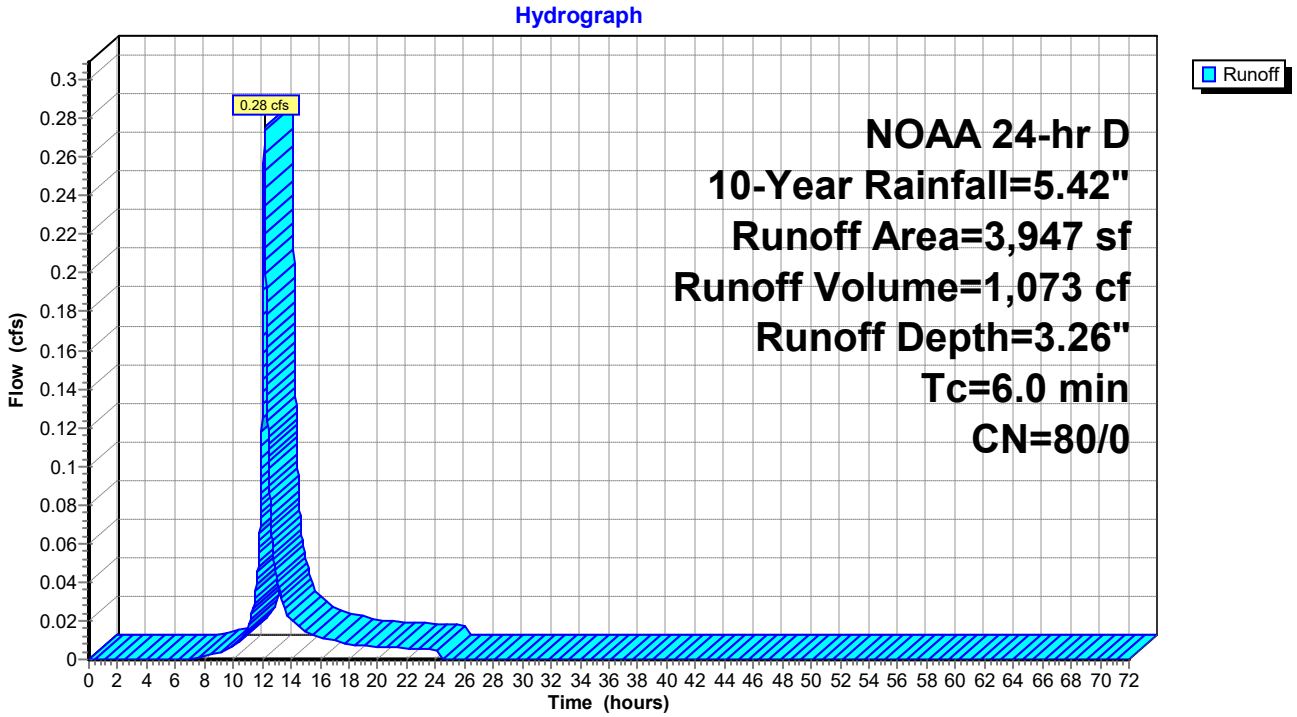
Runoff = 0.28 cfs @ 12.14 hrs, Volume= 1,073 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
3,947	80	>75% Grass cover, Good, HSG D
3,947	80	100.00% Pervious Area

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

Subcatchment B1Ap: PR. Basin Area 1A Perv.



Summary for Subcatchment B1Bi: Pr. Basin Area 1B Imp.

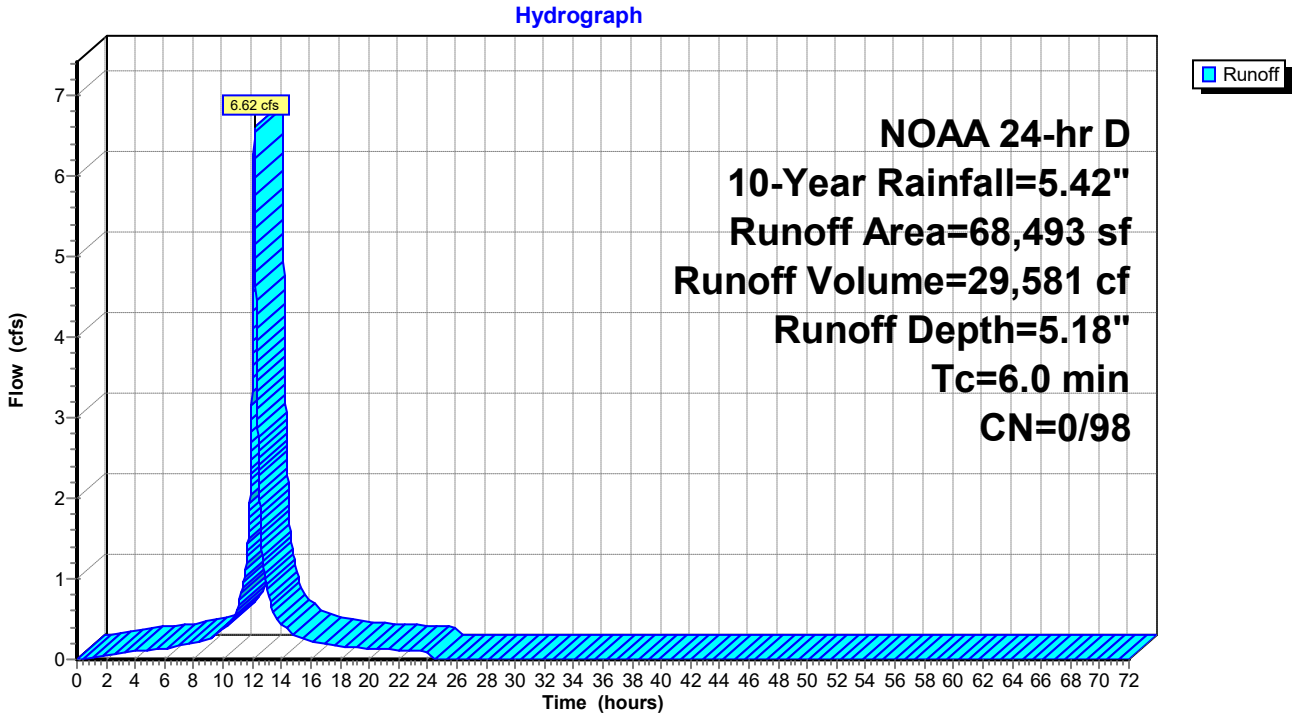
Runoff = 6.62 cfs @ 12.14 hrs, Volume= 29,581 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
68,493	98	Paved parking, HSG D
68,493	98	100.00% Impervious Area

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

Subcatchment B1Bi: Pr. Basin Area 1B Imp.



Summary for Subcatchment B1Bp: PR. Basin Area 1B Perv.

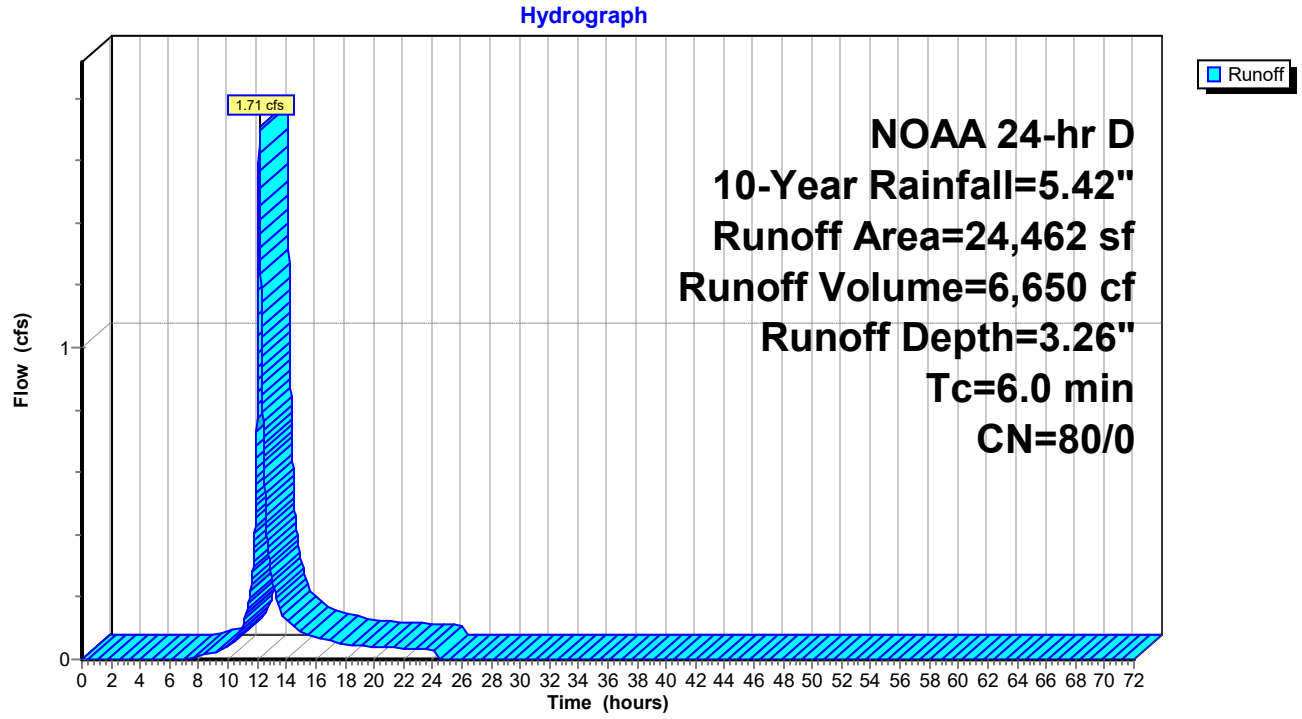
Runoff = 1.71 cfs @ 12.14 hrs, Volume= 6,650 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
24,462	80	>75% Grass cover, Good, HSG D
24,462	80	100.00% Pervious Area

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

Subcatchment B1Bp: PR. Basin Area 1B Perv.



Summary for Subcatchment DA 1Di: Pr. Bypass 1D Imp

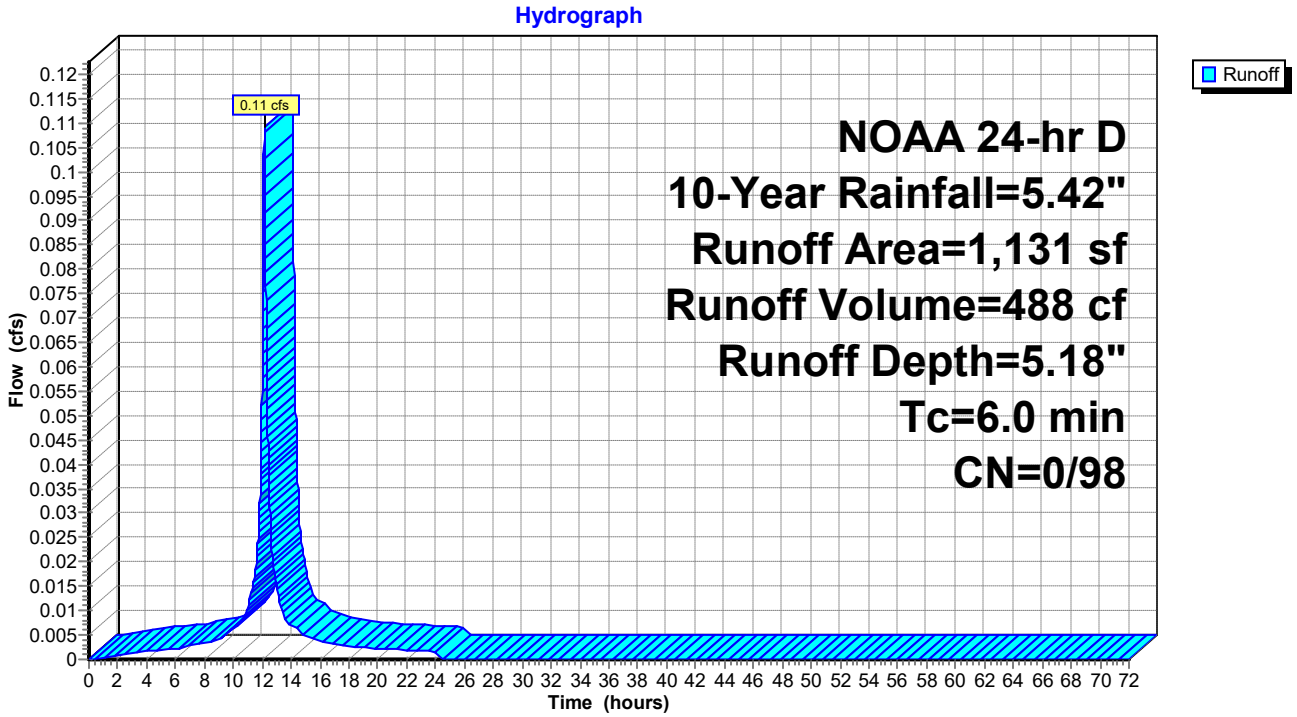
Runoff = 0.11 cfs @ 12.14 hrs, Volume= 488 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
1,131	98	Paved parking, HSG D
1,131	98	100.00% Impervious Area

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

Subcatchment DA 1Di: Pr. Bypass 1D Imp



Summary for Subcatchment DA 1Dp: Pr. Bypass 1D Per

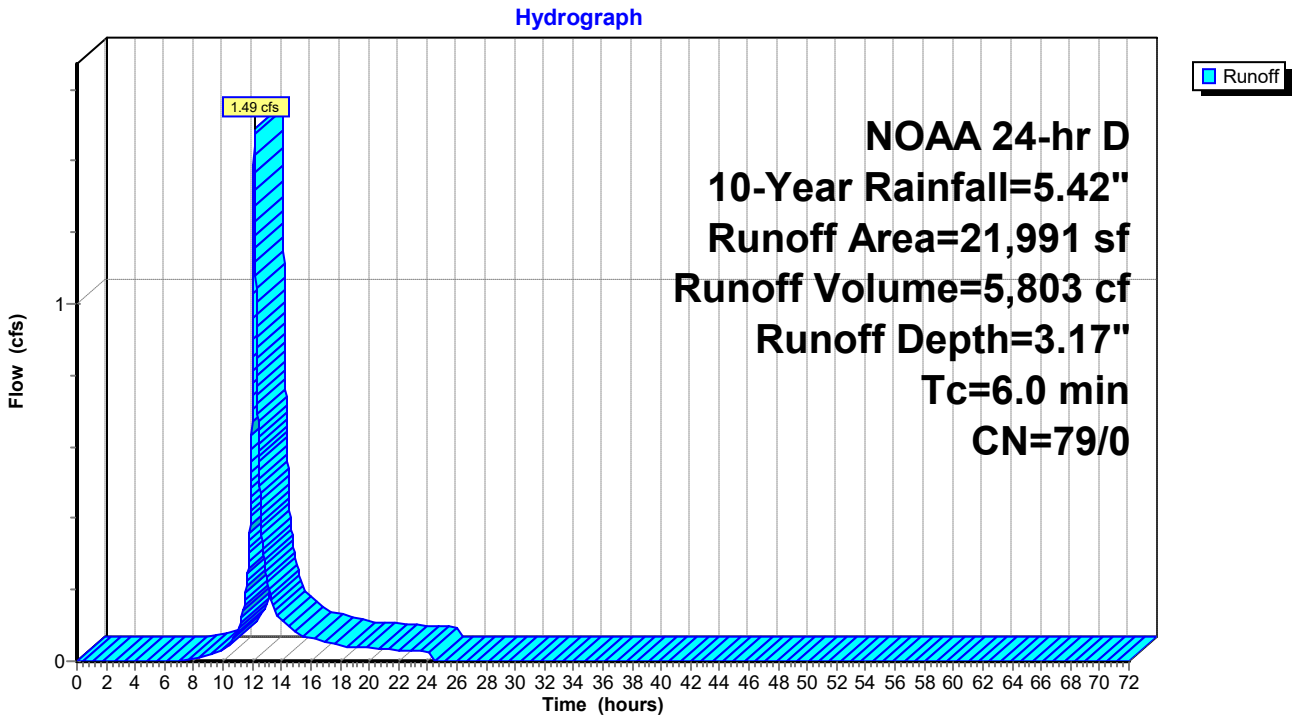
Runoff = 1.49 cfs @ 12.14 hrs, Volume= 5,803 cf, Depth= 3.17"

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=5.42"

Area (sf)	CN	Description
7,982	77	Woods, Good, HSG D
14,009	80	>75% Grass cover, Good, HSG D
21,991	79	Weighted Average
21,991	79	100.00% Pervious Area

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

Subcatchment DA 1Dp: Pr. Bypass 1D Per



Summary for Subcatchment DA 1Ei: Pr. Area 1E Imp

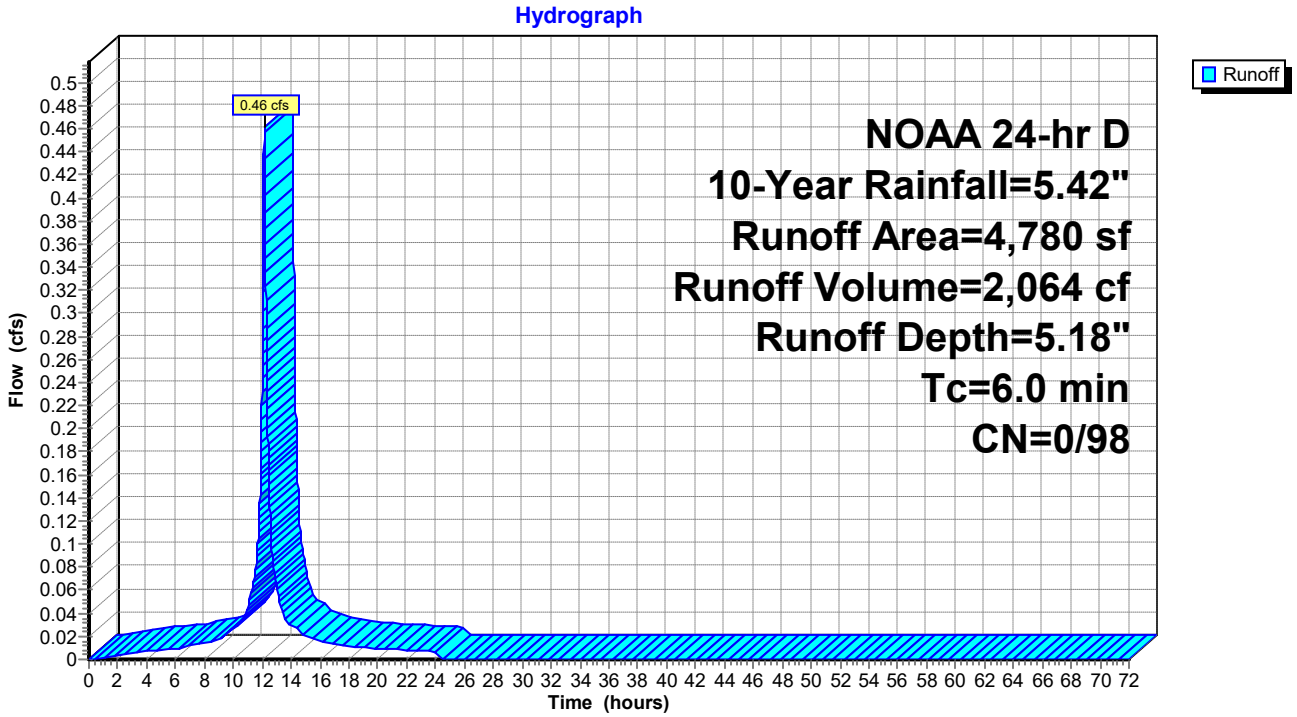
Runoff = 0.46 cfs @ 12.14 hrs, Volume= 2,064 cf, Depth= 5.18"

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=5.42"

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 DA 1Ei: Pr. Area 1E Imp



Summary for Subcatchment DA 1Ep: Pr. Area 1E Perv

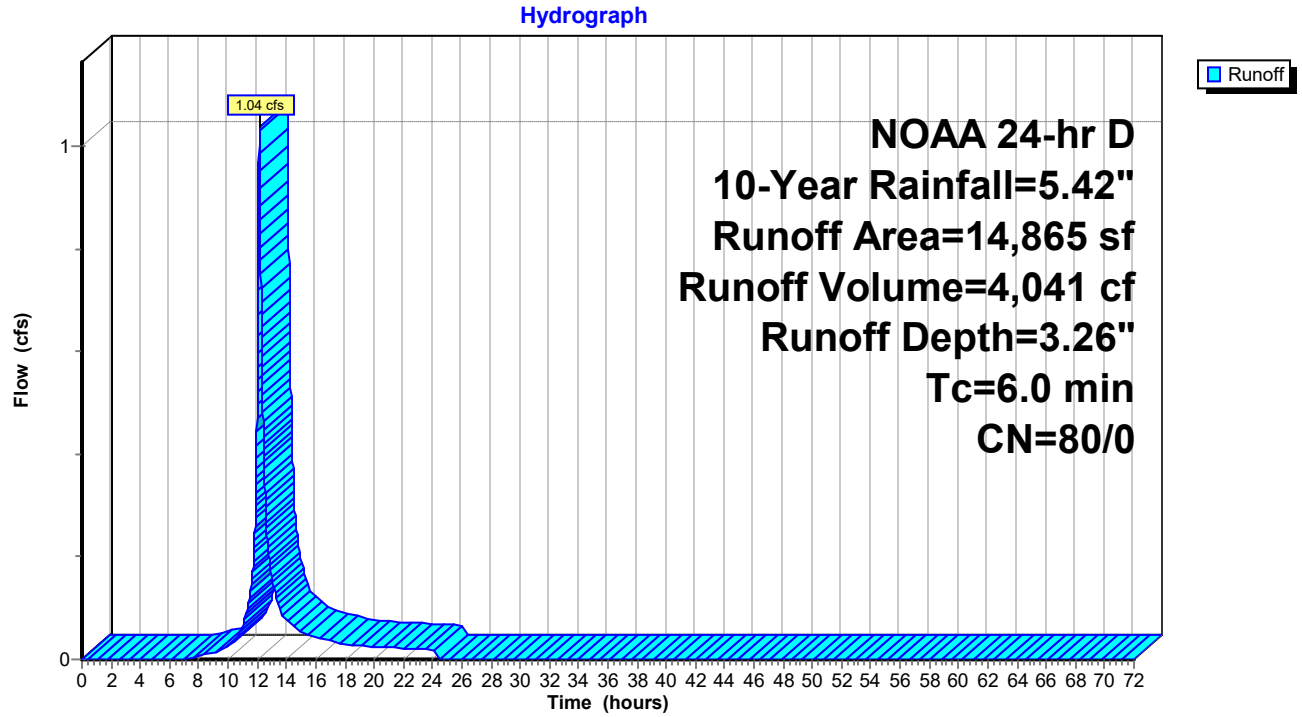
Runoff = 1.04 cfs @ 12.14 hrs, Volume= 4,041 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
14,865	80	>75% Grass cover, Good, HSG D
14,865	80	100.00% Pervious Area

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

Subcatchment DA 1Ep: Pr. Area 1E Perv



Summary for Subcatchment DW1Bi: Pr. Drywell Area 1B

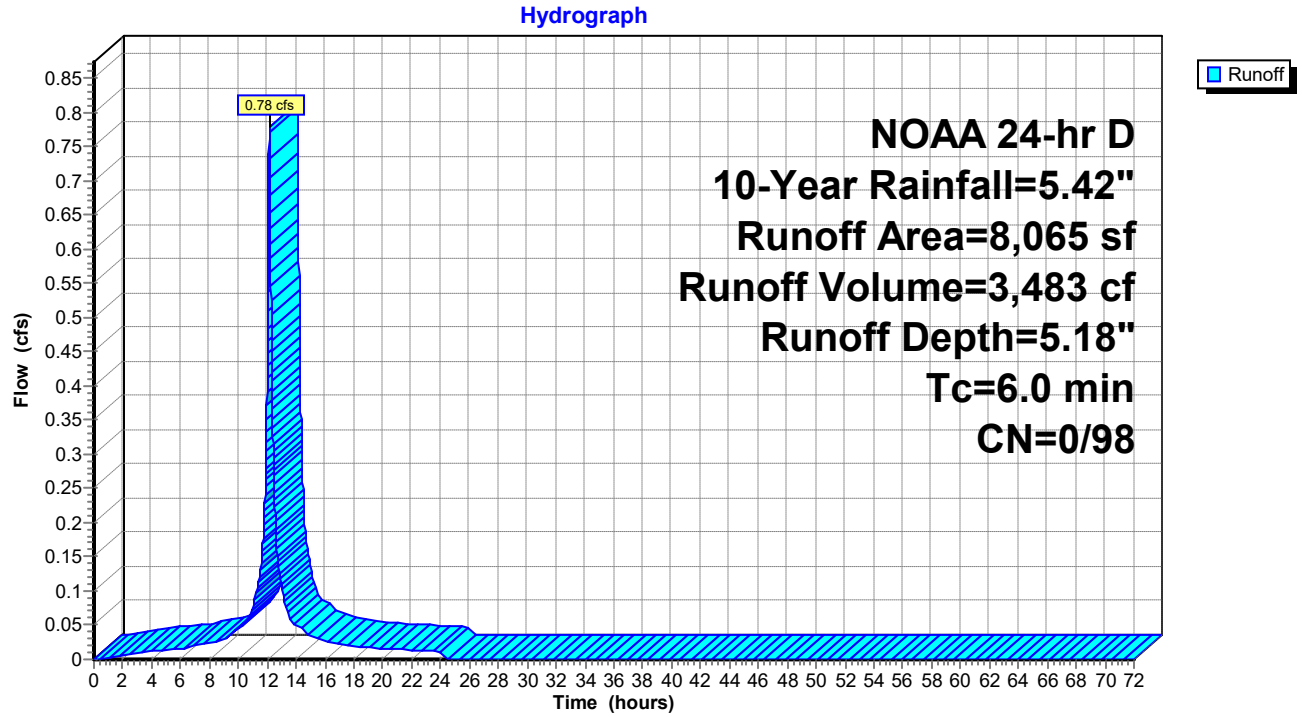
Runoff = 0.78 cfs @ 12.14 hrs, Volume= 3,483 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
8,065	98	Paved parking, HSG D
8,065	98	100.00% Impervious Area

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

Subcatchment DW1Bi: Pr. Drywell Area 1B



Summary for Subcatchment DW2Bi: Pr. Drywell Area 2B

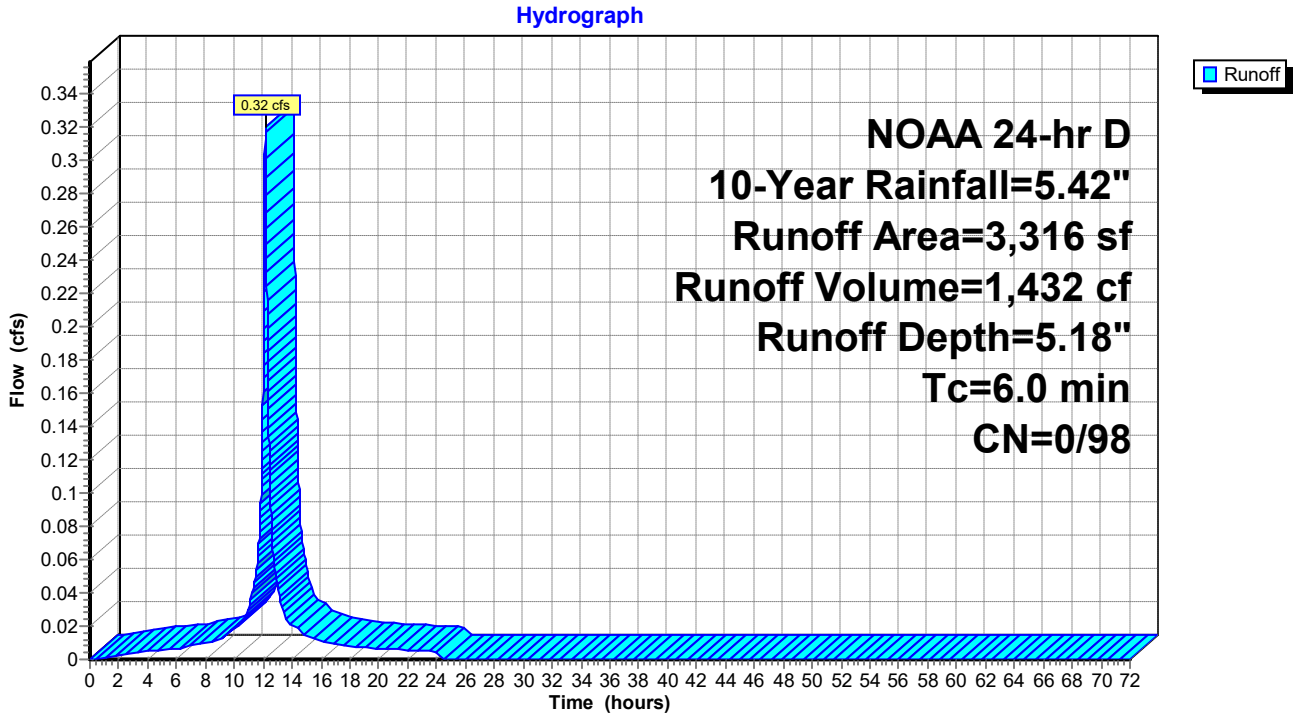
Runoff = 0.32 cfs @ 12.14 hrs, Volume= 1,432 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
3,316	98	Paved parking, HSG D
3,316	98	100.00% Impervious Area

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

Subcatchment DW2Bi: Pr. Drywell Area 2B



Summary for Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.

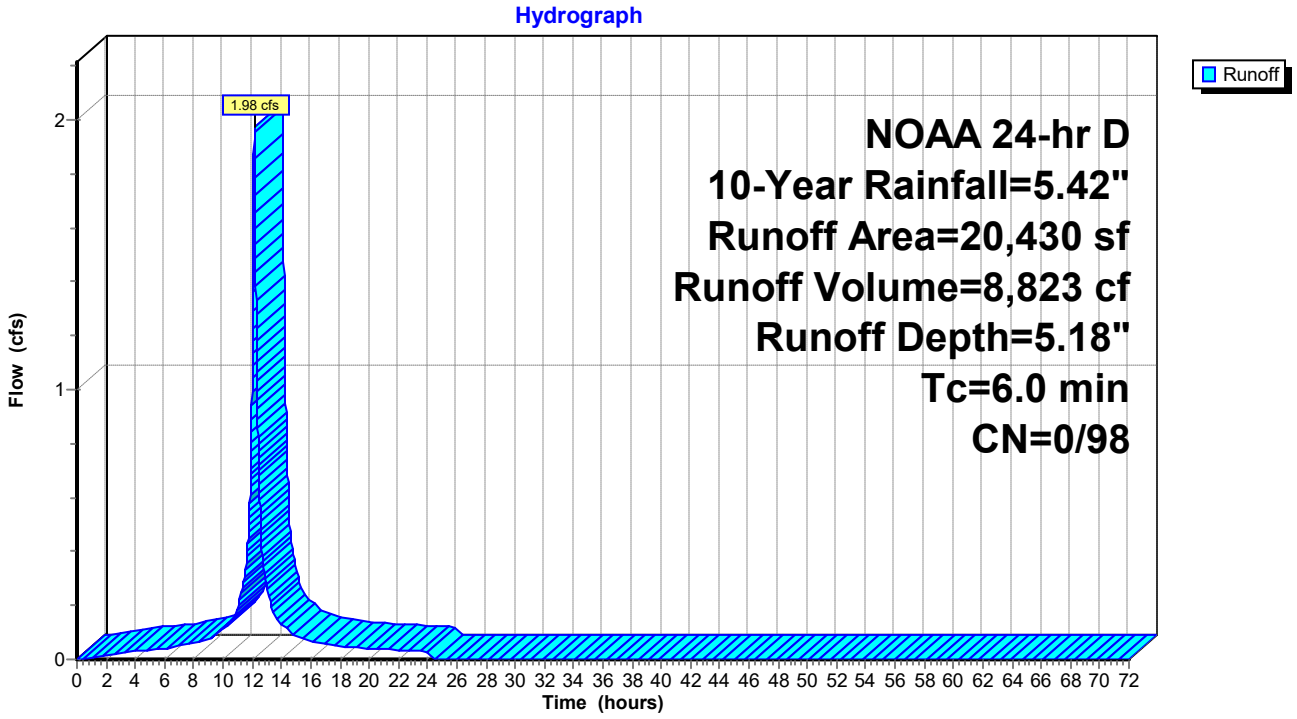
Runoff = 1.98 cfs @ 12.14 hrs, Volume= 8,823 cf, Depth= 5.18"

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=5.42"

Area (sf)	CN	Description
20,430	98	Paved parking, HSG D
20,430	98	100.00% Impervious Area

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

Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.



Summary for Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.

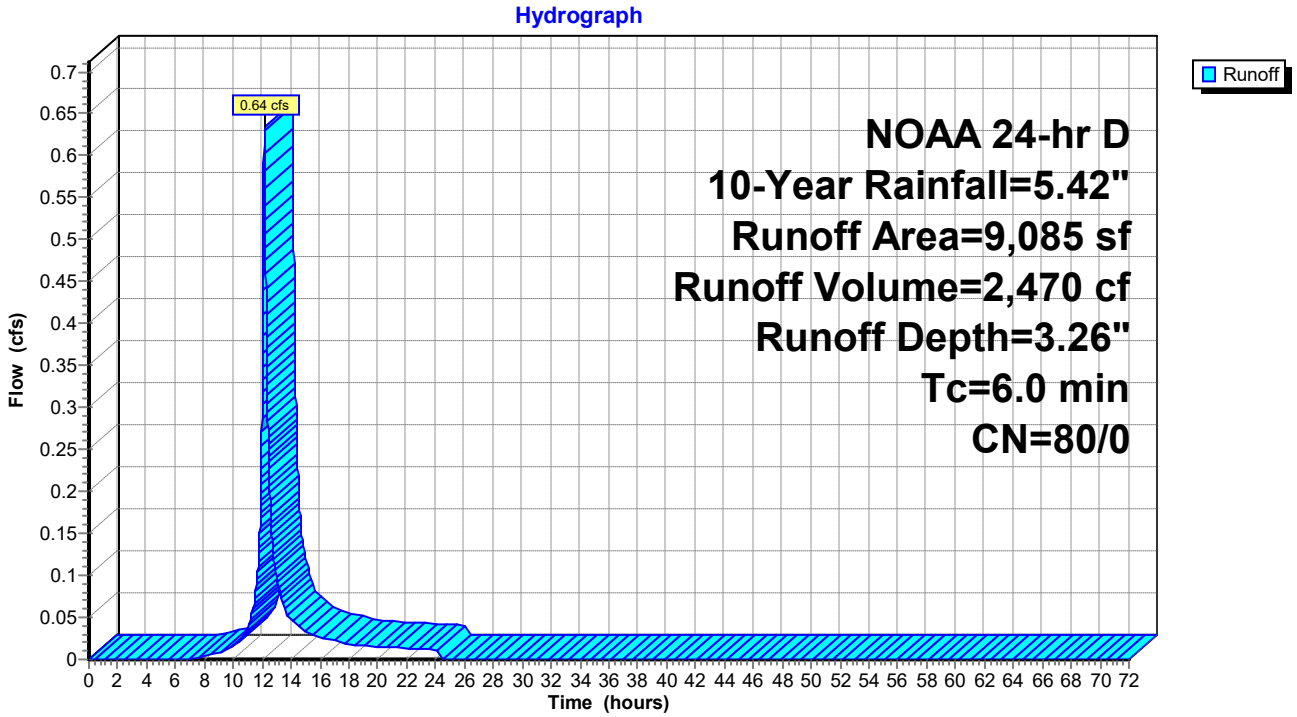
Runoff = 0.64 cfs @ 12.14 hrs, Volume= 2,470 cf, Depth= 3.26"

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 10-Year Rainfall=5.42"

Area (sf)	CN	Description
9,085	80	>75% Grass cover, Good, HSG D
9,085	80	100.00% Pervious Area

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

Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.



Summary for Pond B1A: Underground Basin 1A

Inflow Area = 43,464 sf, 70.02% Impervious, Inflow Depth = 2.72" for 10-Year event
Inflow = 3.51 cfs @ 12.16 hrs, Volume= 9,853 cf
Outflow = 1.87 cfs @ 12.37 hrs, Volume= 9,852 cf, Atten= 47%, Lag= 12.4 min
Primary = 1.87 cfs @ 12.37 hrs, Volume= 9,852 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.46' @ 12.37 hrs Surf.Area= 1,439 sf Storage= 2,305 cf

Plug-Flow detention time= 27.0 min calculated for 9,852 cf (100% of inflow)
Center-of-Mass det. time= 26.9 min (794.0 - 767.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	1,318 cf	**11.03'W x 130.42'L x 3.52'H Field A** 5,072 cf Overall - 1,778 cf Embedded = 3,295 cf x 40.0% Voids
#2A	19.60'	1,703 cf	**Contech ChamberMaxx 2016** x 36 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 2 rows
		3,021 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'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	21.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.87 cfs @ 12.37 hrs HW=21.46' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.87 cfs of 10.66 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.96 cfs @ 7.06 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.91 cfs @ 2.00 fps)

Pond B1A: Underground Basin 1A - 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 2 rows

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

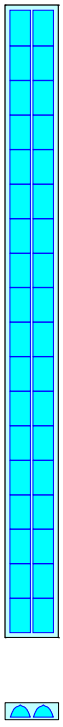
18 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 128.42' Row Length +12.0" End Stone x 2 = 130.42' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

36 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 1,703.2 cf Chamber Storage
36 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 1,777.6 cf Displacement

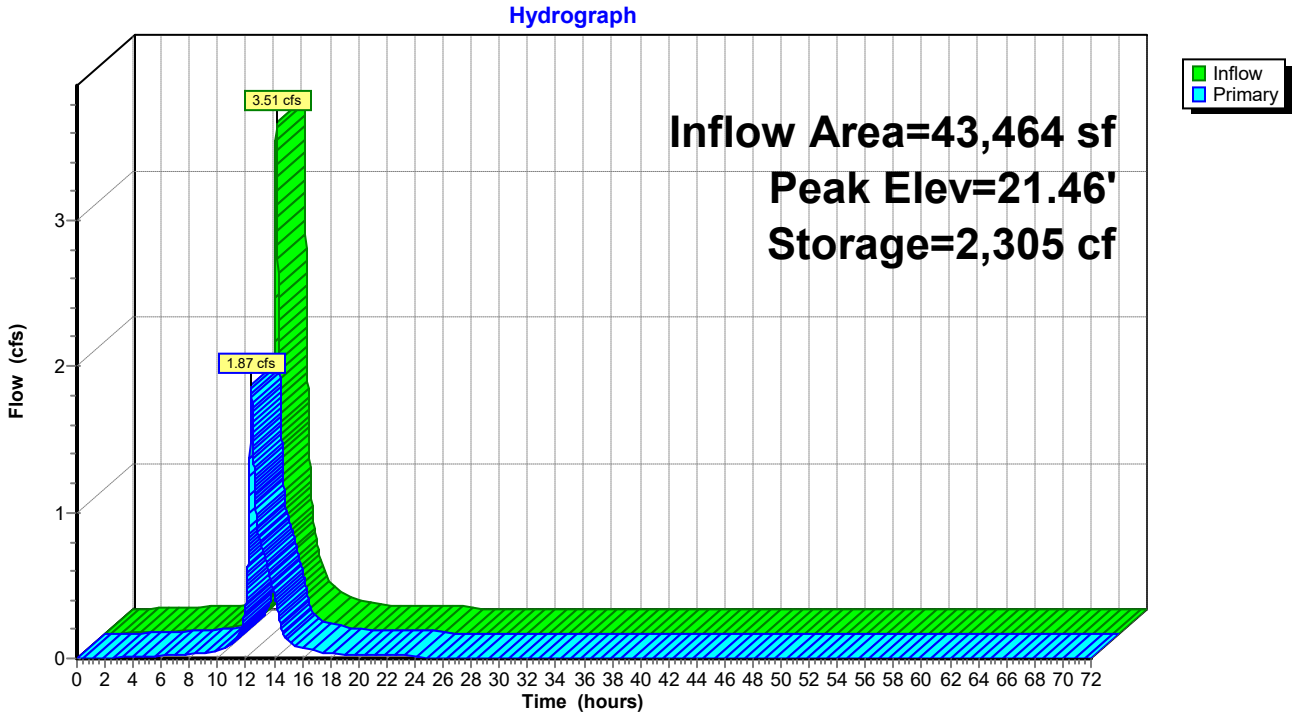
5,072.2 cf Field - 1,777.6 cf Chambers = 3,294.6 cf Stone x 40.0% Voids = 1,317.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,021.0 cf = 0.069 af
Overall Storage Efficiency = 59.6%
Overall System Size = 130.42' x 11.03' x 3.52'

36 Chambers
187.9 cy Field
122.0 cy Stone



Pond B1A: Underground Basin 1A



Summary for Pond B1B: Underground Basin 1B

Inflow Area = 104,336 sf, 76.55% Impervious, Inflow Depth = 4.39" for 10-Year event
Inflow = 9.08 cfs @ 12.14 hrs, Volume= 38,204 cf
Outflow = 3.40 cfs @ 12.44 hrs, Volume= 38,188 cf, Atten= 63%, Lag= 18.0 min
Primary = 3.40 cfs @ 12.44 hrs, Volume= 38,188 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.79' @ 12.44 hrs Surf.Area= 7,780 sf Storage= 9,334 cf

Plug-Flow detention time= 48.8 min calculated for 38,183 cf (100% of inflow)
Center-of-Mass det. time= 48.9 min (815.6 - 766.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	6,625 cf	**53.78'W x 144.65'L x 3.52'H Field A** 27,424 cf Overall - 10,861 cf Embedded = 16,563 cf x 40.0% Voids
#2A	19.60'	10,406 cf	**Contech ChamberMaxx 2016** x 220 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 11 rows
		17,031 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.40 cfs @ 12.44 hrs HW=20.79' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.40 cfs of 7.69 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.96 cfs @ 5.43 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.44 cfs @ 1.53 fps)

Pond B1B: Underground Basin 1B - 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 11 rows

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

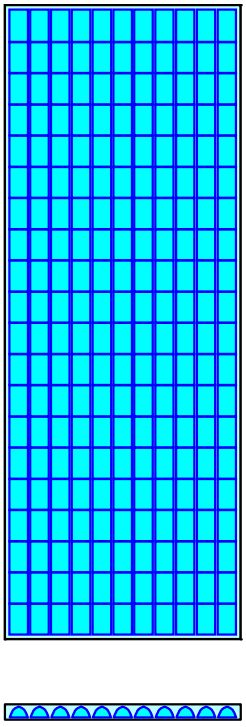
20 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 142.65' Row Length +12.0" End Stone x 2 = 144.65' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

220 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 10,405.7 cf Chamber Storage
220 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 10,860.7 cf Displacement

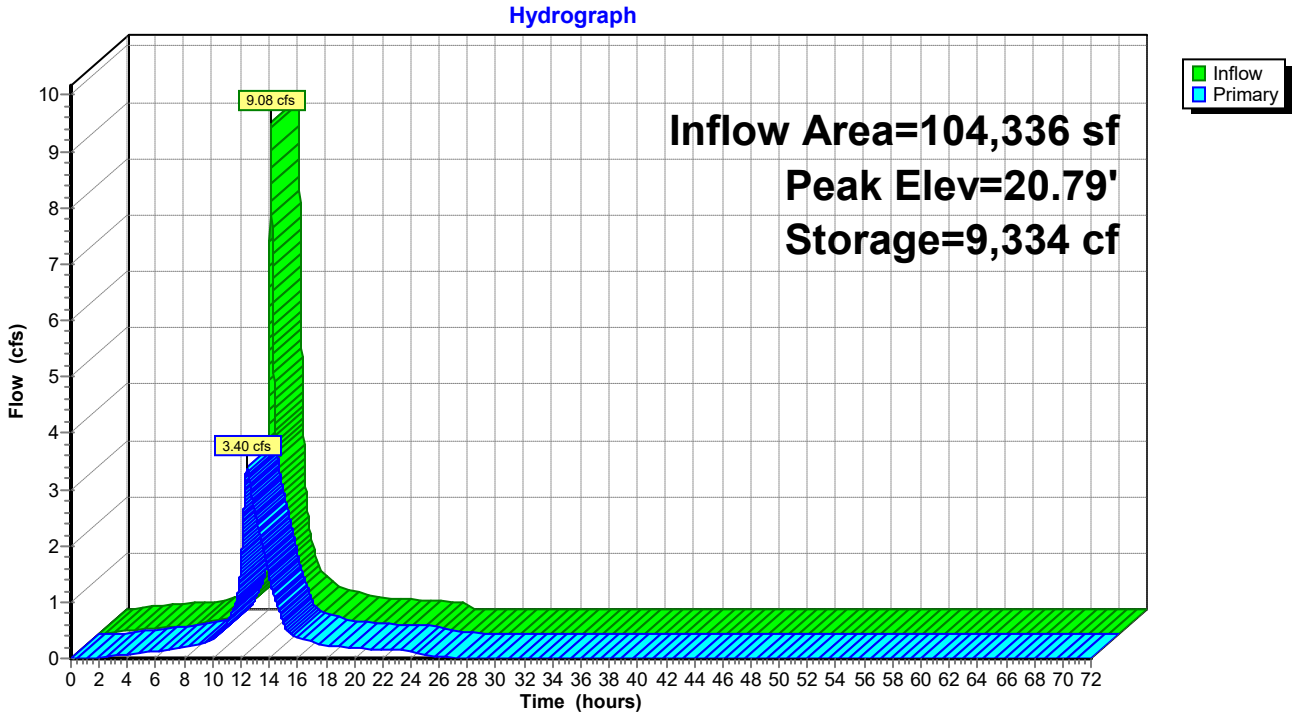
27,423.7 cf Field - 10,860.7 cf Chambers = 16,563.0 cf Stone x 40.0% Voids = 6,625.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,030.9 cf = 0.391 af
Overall Storage Efficiency = 62.1%
Overall System Size = 144.65' x 53.78' x 3.52'

220 Chambers
1,015.7 cy Field
613.4 cy Stone



Pond B1B: Underground Basin 1B



Summary for Pond DW1B: Drywell 1B

Inflow Area = 8,065 sf,100.00% Impervious, Inflow Depth = 5.18" for 10-Year event
Inflow = 0.78 cfs @ 12.14 hrs, Volume= 3,483 cf
Outflow = 0.77 cfs @ 12.15 hrs, Volume= 3,483 cf, Atten= 1%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.15 hrs, Volume= 1,857 cf
Primary = 0.76 cfs @ 12.15 hrs, Volume= 1,626 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 24.31' @ 12.15 hrs Surf.Area= 497 sf Storage= 892 cf

Plug-Flow detention time= 298.9 min calculated for 3,483 cf (100% of inflow)
Center-of-Mass det. time= 299.0 min (1,050.6 - 751.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	21.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	22.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.90'	**15.0" Round Culvert** L= 67.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 23.90' / 21.00' S= 0.0433 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	21.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 12.75' Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.15 hrs HW=24.31' (Free Discharge)
↑**2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.75 cfs @ 12.15 hrs HW=24.31' TW=20.33' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.75 cfs @ 2.17 fps)

Pond DW1B: Drywell 1B - 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 2 rows

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

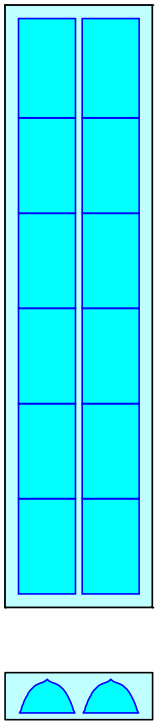
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

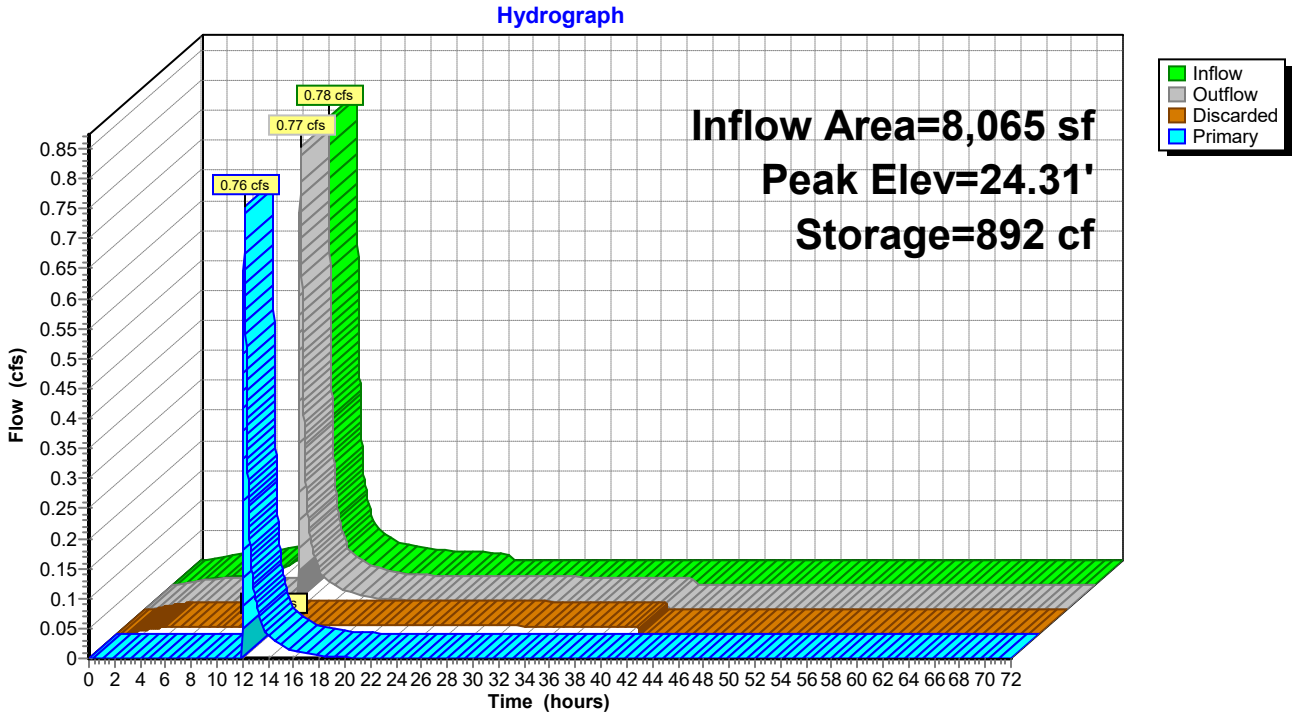
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1B: Drywell 1B



Summary for Pond DW2B: Drywell 2B

Inflow Area = 3,316 sf,100.00% Impervious, Inflow Depth = 5.18" for 10-Year event
Inflow = 0.32 cfs @ 12.14 hrs, Volume= 1,432 cf
Outflow = 0.17 cfs @ 12.33 hrs, Volume= 1,432 cf, Atten= 47%, Lag= 11.4 min
Discarded = 0.01 cfs @ 12.33 hrs, Volume= 1,086 cf
Primary = 0.16 cfs @ 12.33 hrs, Volume= 346 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.93' @ 12.33 hrs Surf.Area= 497 sf Storage= 464 cf

Plug-Flow detention time= 211.7 min calculated for 1,432 cf (100% of inflow)
Center-of-Mass det. time= 211.7 min (963.2 - 751.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.75'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.75' / 21.00' S= 0.0163 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.33 hrs HW=21.93' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.16 cfs @ 12.33 hrs HW=21.93' TW=20.74' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.16 cfs @ 1.44 fps)

Pond DW2B: Drywell 2B - 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 2 rows

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

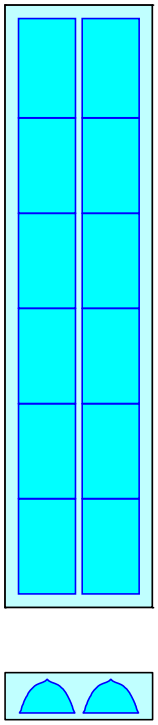
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

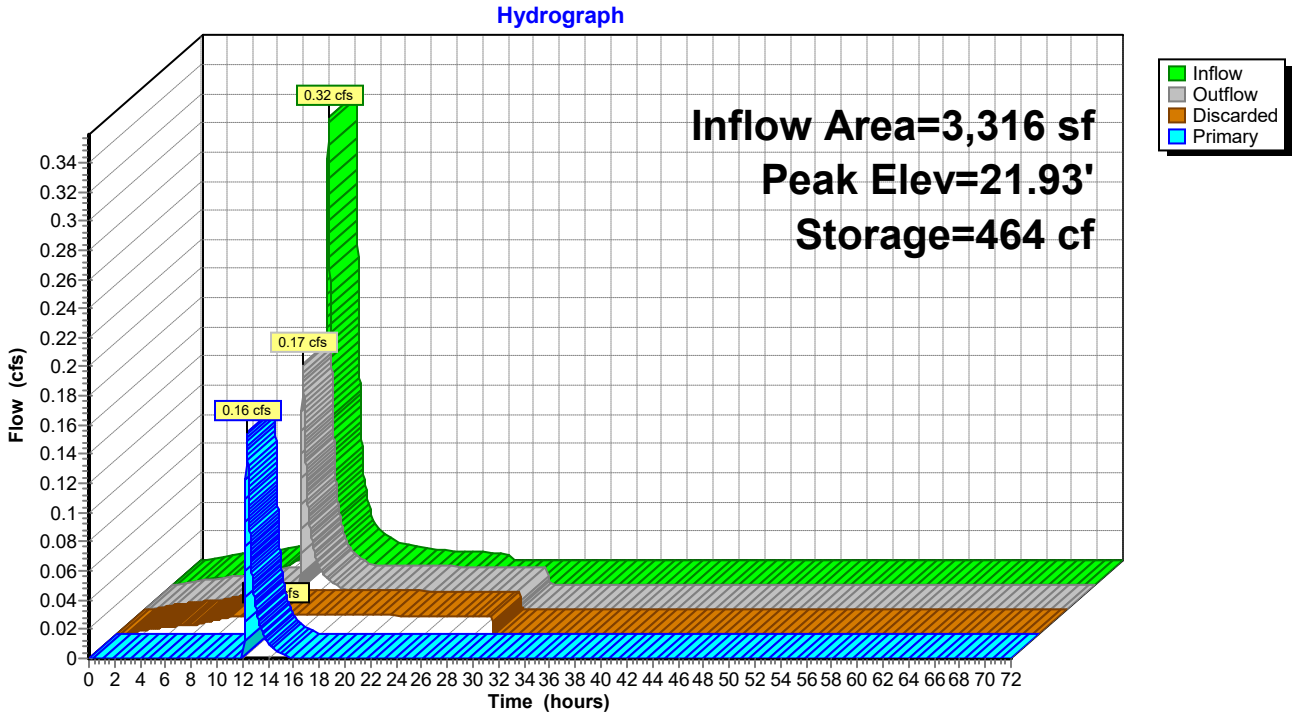
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW2B: Drywell 2B



Summary for Pond RG1A: Rain Garden 1A

Inflow Area = 29,515 sf, 69.22% Impervious, Inflow Depth = 4.59" for 10-Year event
Inflow = 2.61 cfs @ 12.14 hrs, Volume= 11,293 cf
Outflow = 2.41 cfs @ 12.18 hrs, Volume= 11,293 cf, Atten= 8%, Lag= 2.1 min
Discarded = 0.08 cfs @ 12.18 hrs, Volume= 6,833 cf
Primary = 2.33 cfs @ 12.18 hrs, Volume= 4,460 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.93' @ 12.18 hrs Surf.Area= 3,355 sf Storage= 3,433 cf

Plug-Flow detention time= 308.3 min calculated for 11,292 cf (100% of inflow)
Center-of-Mass det. time= 308.5 min (1,077.3 - 768.8)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,688 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

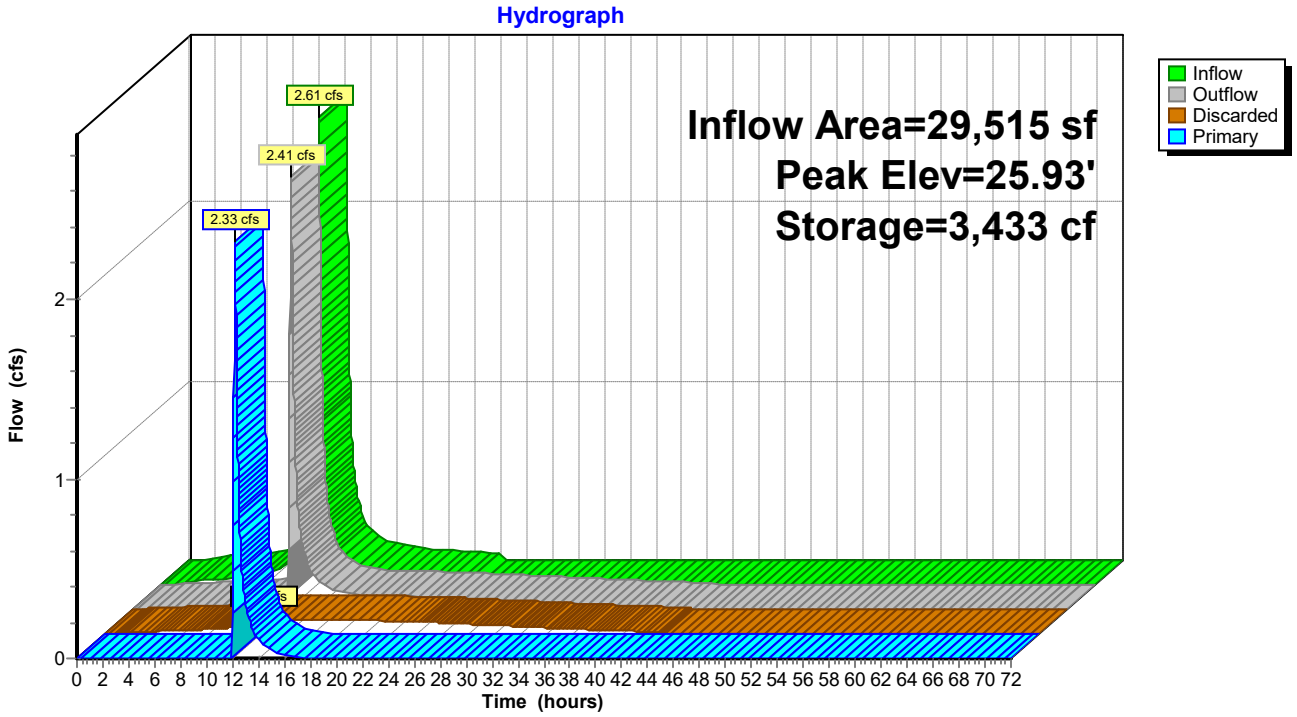
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	461	161.0	0	0	461
25.00	1,829	216.0	1,069	1,069	2,122
26.00	3,498	260.0	2,619	3,688	3,805

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 27.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 19.60' S= 0.0889 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	25.80'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	24.00'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.80' Phase-In= 0.01'

Discarded OutFlow Max=0.08 cfs @ 12.18 hrs HW=25.93' (Free Discharge)
└**3=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=2.33 cfs @ 12.18 hrs HW=25.93' TW=20.52' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.33 cfs of 10.73 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 2.33 cfs @ 1.16 fps)

Pond RG1A: Rain Garden 1A

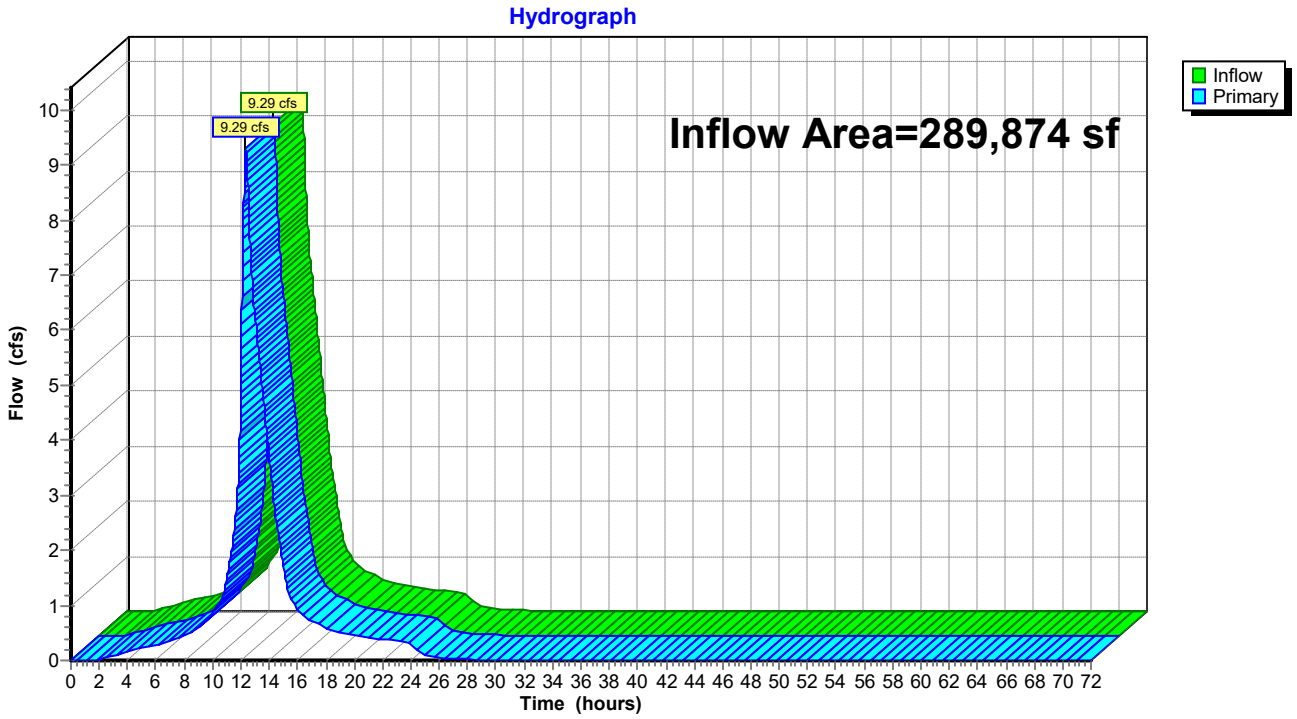


Summary for Link 3L: Pr. POA 1

Inflow Area = 289,874 sf, 70.62% Impervious, Inflow Depth = 4.02" for 10-Year event
Inflow = 9.29 cfs @ 12.35 hrs, Volume= 97,225 cf
Primary = 9.29 cfs @ 12.35 hrs, Volume= 97,225 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



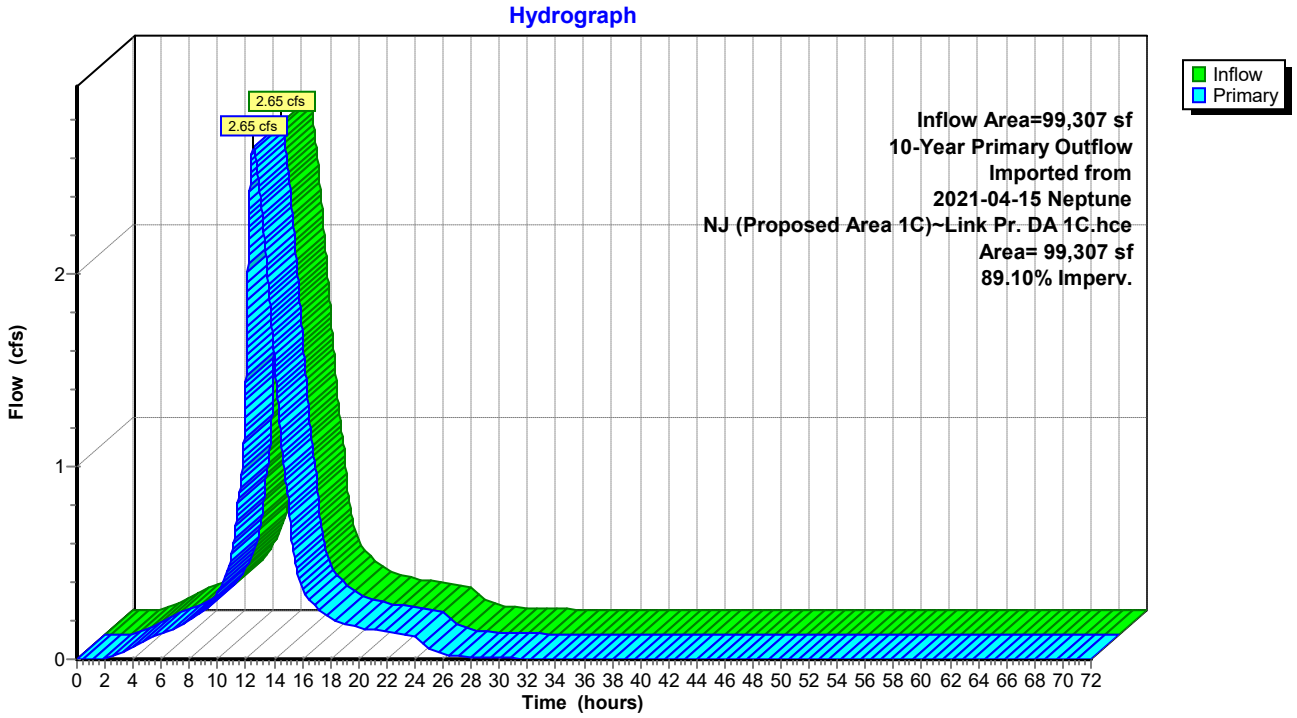
Summary for Link 4L: Pr DA 1C Total

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 4.45" for 10-Year event
Inflow = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf
Primary = 2.65 cfs @ 12.53 hrs, Volume= 36,788 cf, Atten= 0%, Lag= 0.0 min

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

10-Year Primary Outflow Imported from 2021-04-15 Neptune, NJ (Proposed Area 1C)~Link Pr. DA 1C.hce

Link 4L: Pr DA 1C Total



Summary for Subcatchment 6S: Pr. Area 2

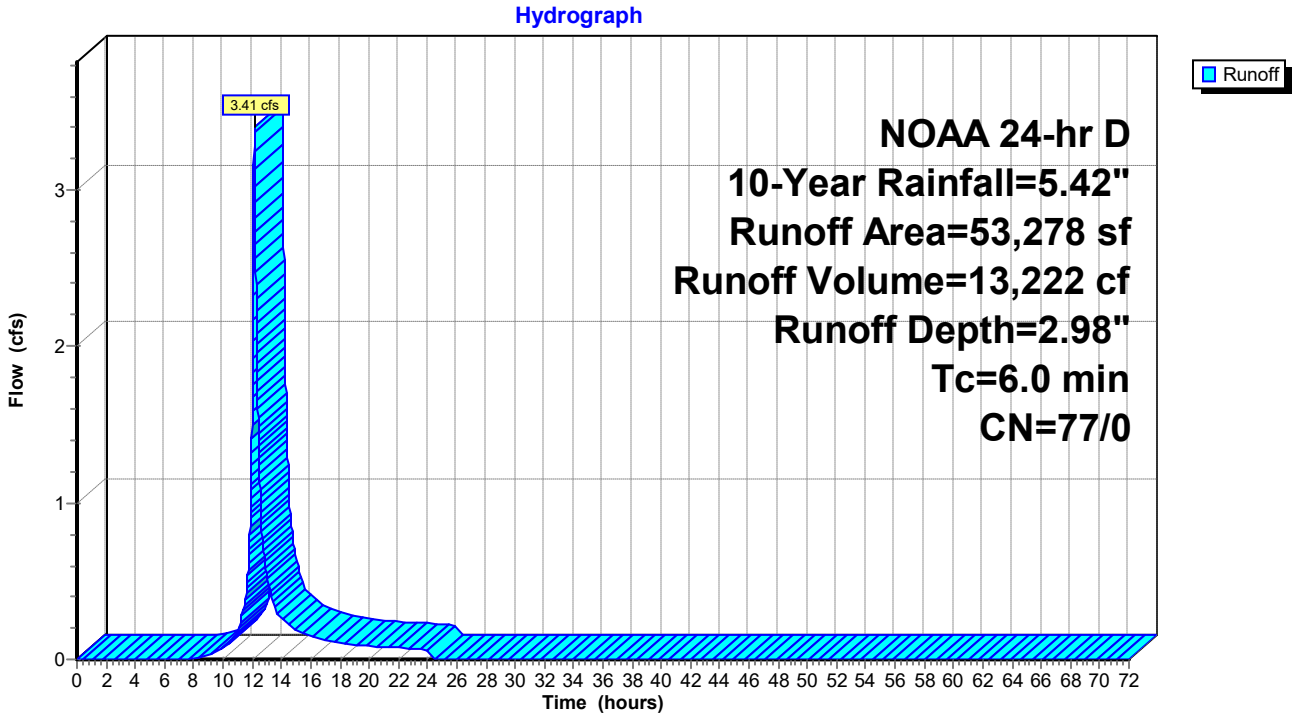
Runoff = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf, Depth= 2.98"

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=5.42"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2

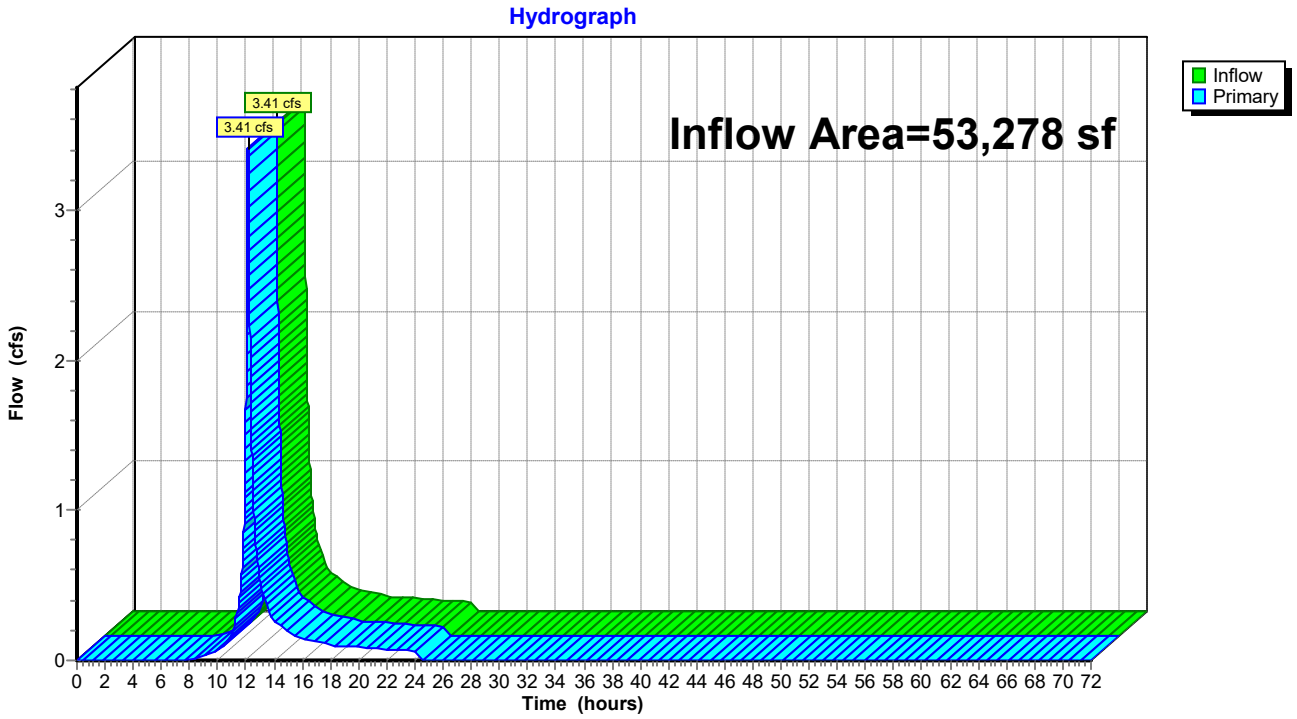


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 2.98" for 10-Year event
Inflow = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf
Primary = 3.41 cfs @ 12.14 hrs, Volume= 13,222 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



APPENDIX C-3A
25-YEAR STORM EVENT HYDROGRAPHS

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

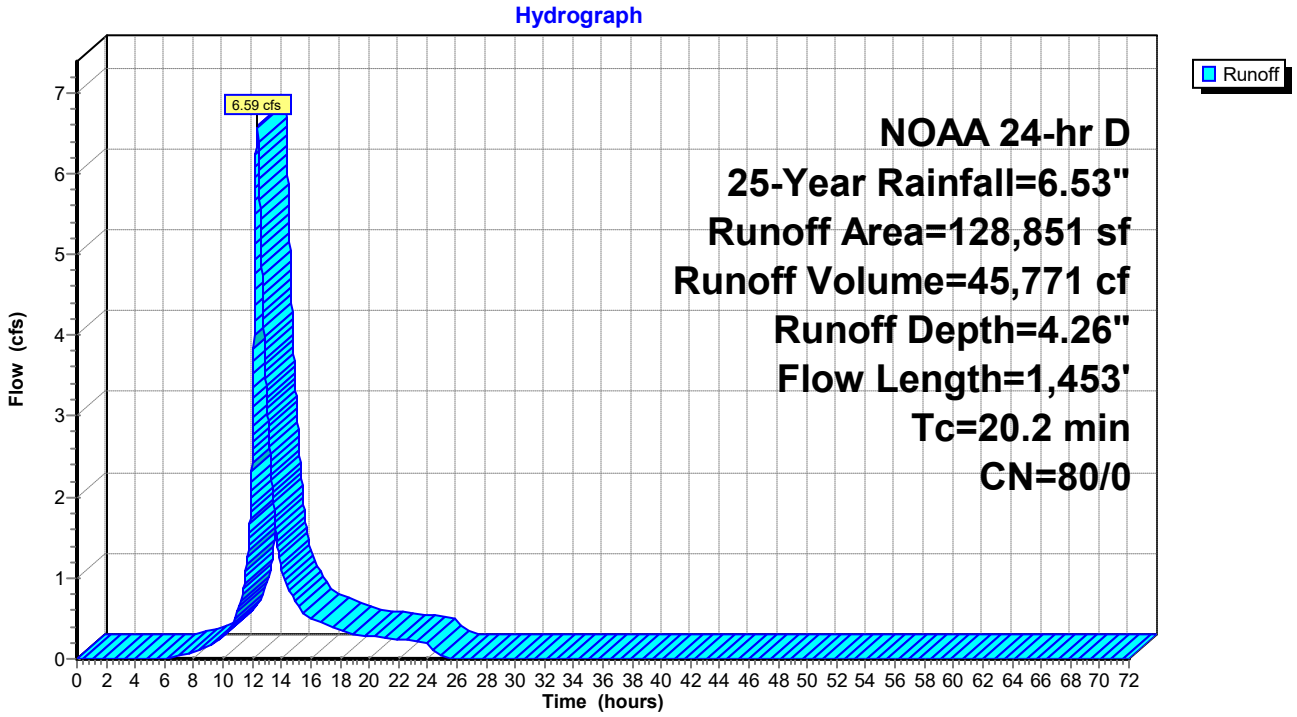
Runoff = 6.59 cfs @ 12.31 hrs, Volume= 45,771 cf, Depth= 4.26"

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
115,266	80	>75% Grass cover, Good, HSG D
13,585	77	Woods, Good, HSG D
128,851	80	Weighted Average
128,851	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
10.6	1,278		2.00		**Direct Entry, Channel Flow**
20.2	1,453	Total			

Subcatchment 1S: Ex. Area 1A Perv.



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

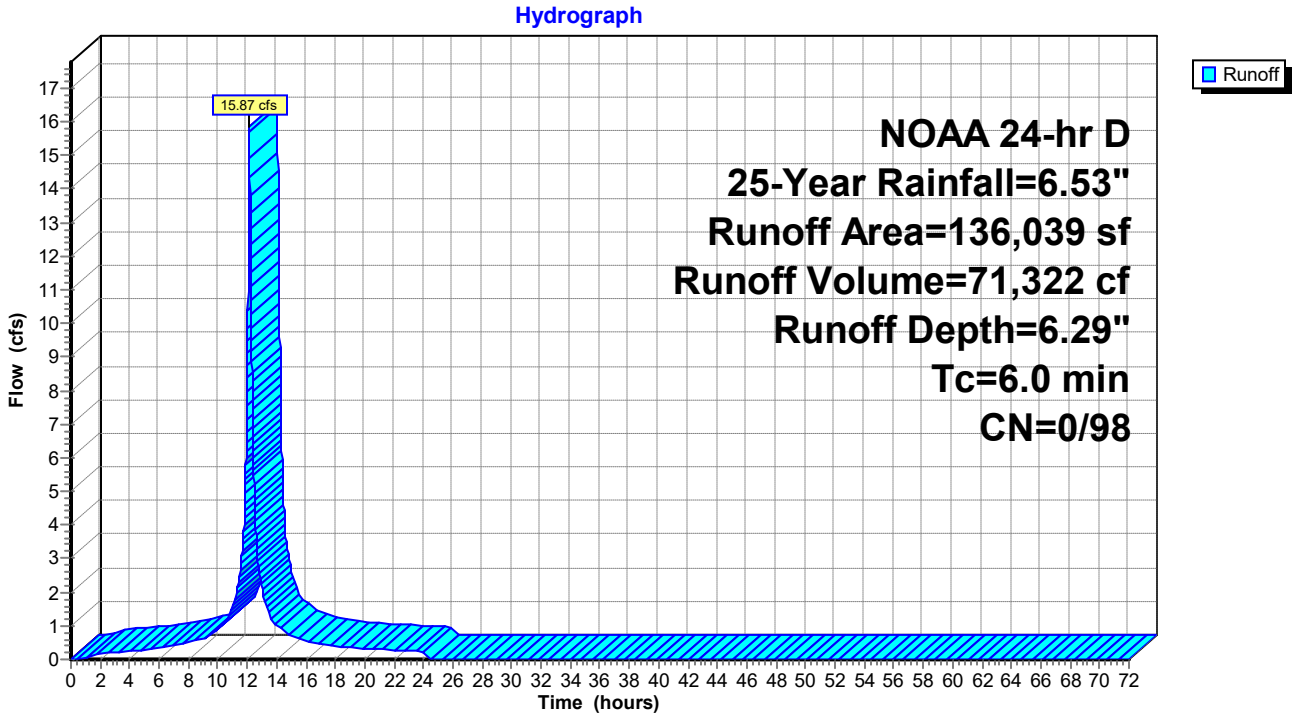
Runoff = 15.87 cfs @ 12.14 hrs, Volume= 71,322 cf, Depth= 6.29"

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
136,039	98	Paved parking, HSG D
136,039	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 1A Imp.



Summary for Subcatchment 5S: Ex. Area 2

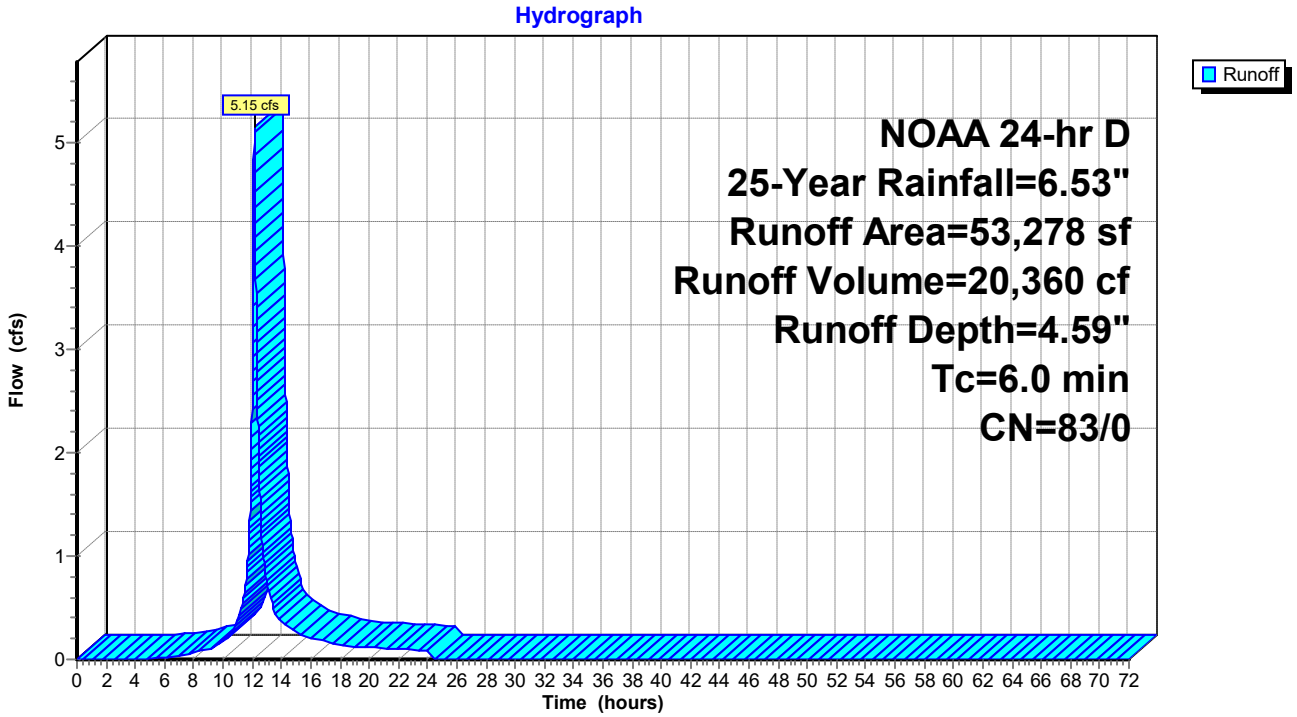
Runoff = 5.15 cfs @ 12.14 hrs, Volume= 20,360 cf, Depth= 4.59"

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
53,278	83	Woods, Poor, HSG D
53,278	83	100.00% Pervious Area

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

Subcatchment 5S: Ex. Area 2



Summary for Subcatchment 6S: Pr. Area 2

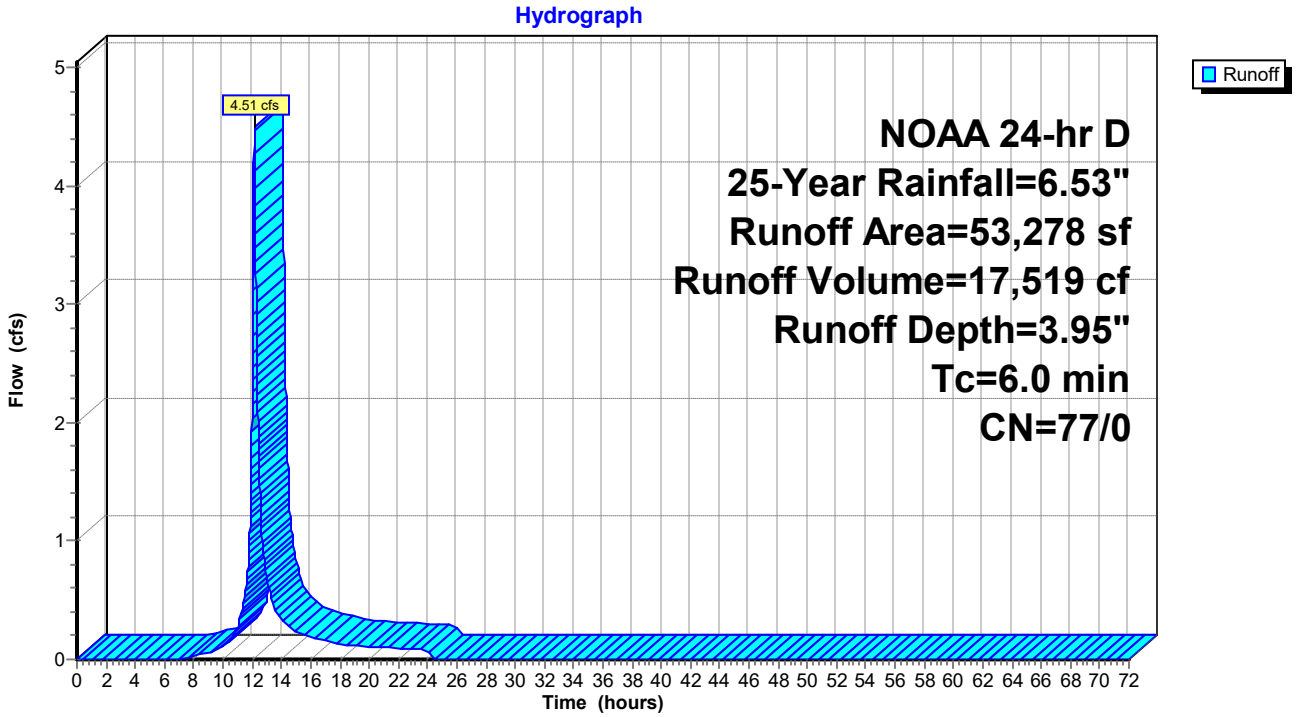
Runoff = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf, Depth= 3.95"

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
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2



Summary for Subcatchment 10S: Ex. Area 1B Perv.

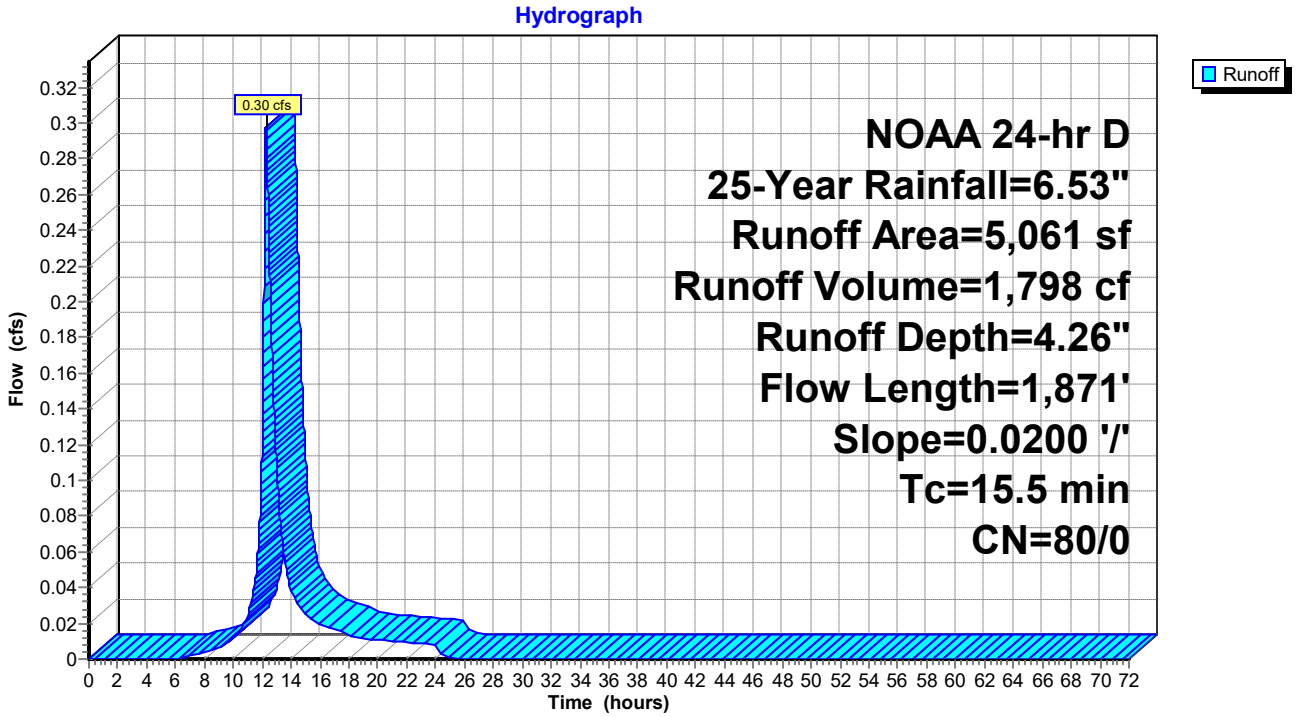
Runoff = 0.30 cfs @ 12.26 hrs, Volume= 1,798 cf, Depth= 4.26"

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
1.2	100	0.0200	1.41		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
1.1	184	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.2	1,587		2.00		**Direct Entry,**
15.5	1,871	Total			

Subcatchment 10S: Ex. Area 1B Perv.



Summary for Subcatchment 11S: Ex. Area 1B Imp.

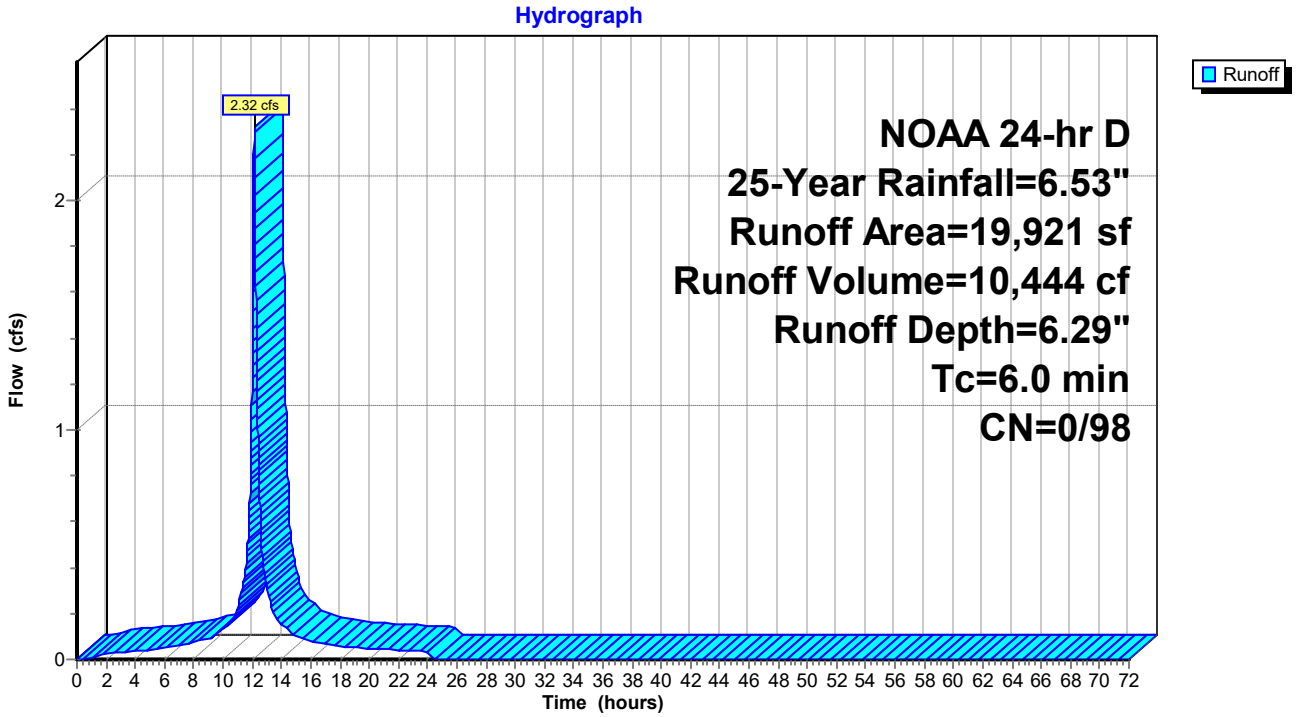
Runoff = 2.32 cfs @ 12.14 hrs, Volume= 10,444 cf, Depth= 6.29"

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 1B Imp.

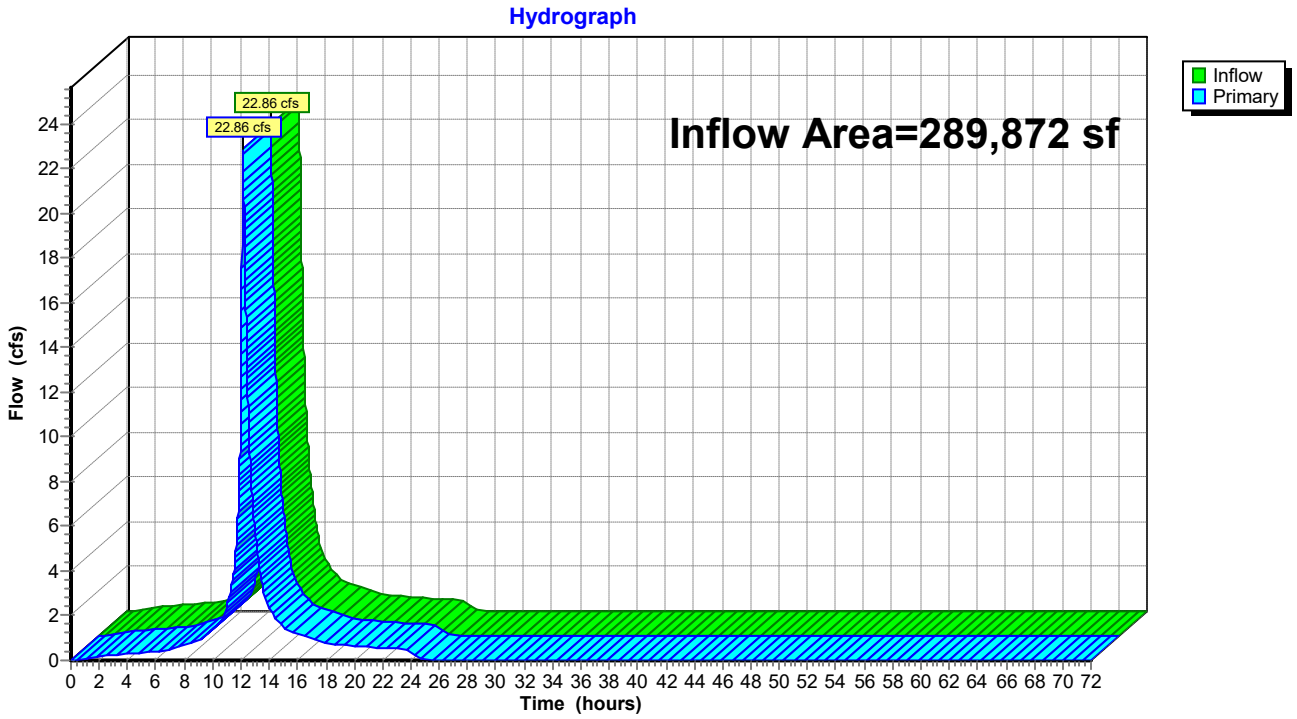


Summary for Link 3L: EX POA 1 (Construction)

Inflow Area = 289,872 sf, 53.80% Impervious, Inflow Depth = 5.35" for 25-Year event
Inflow = 22.86 cfs @ 12.15 hrs, Volume= 129,335 cf
Primary = 22.86 cfs @ 12.15 hrs, Volume= 129,335 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 (Construction)

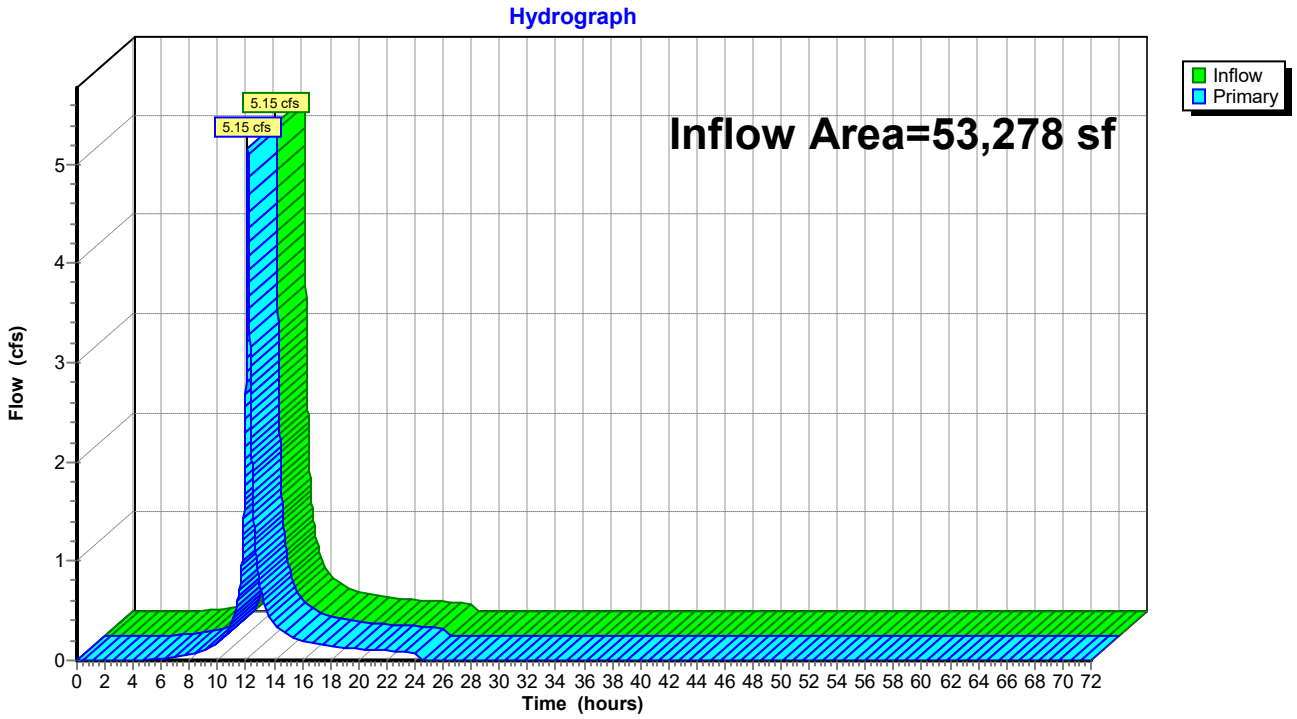


Summary for Link 4L: EX POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 4.59" for 25-Year event
Inflow = 5.15 cfs @ 12.14 hrs, Volume= 20,360 cf
Primary = 5.15 cfs @ 12.14 hrs, Volume= 20,360 cf, Atten= 0%, Lag= 0.0 min

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

Link 4L: EX POA 2 (Reforestation)

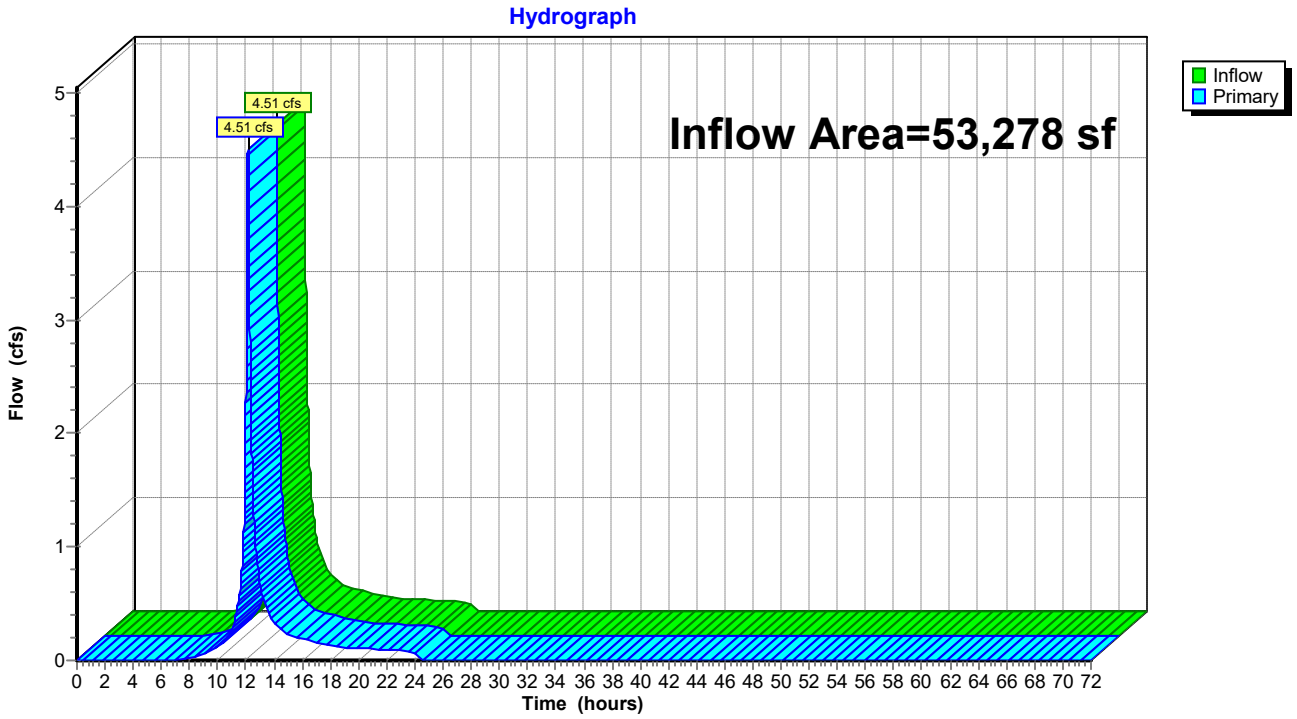


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 3.95" for 25-Year event
Inflow = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf
Primary = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



Summary for Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.

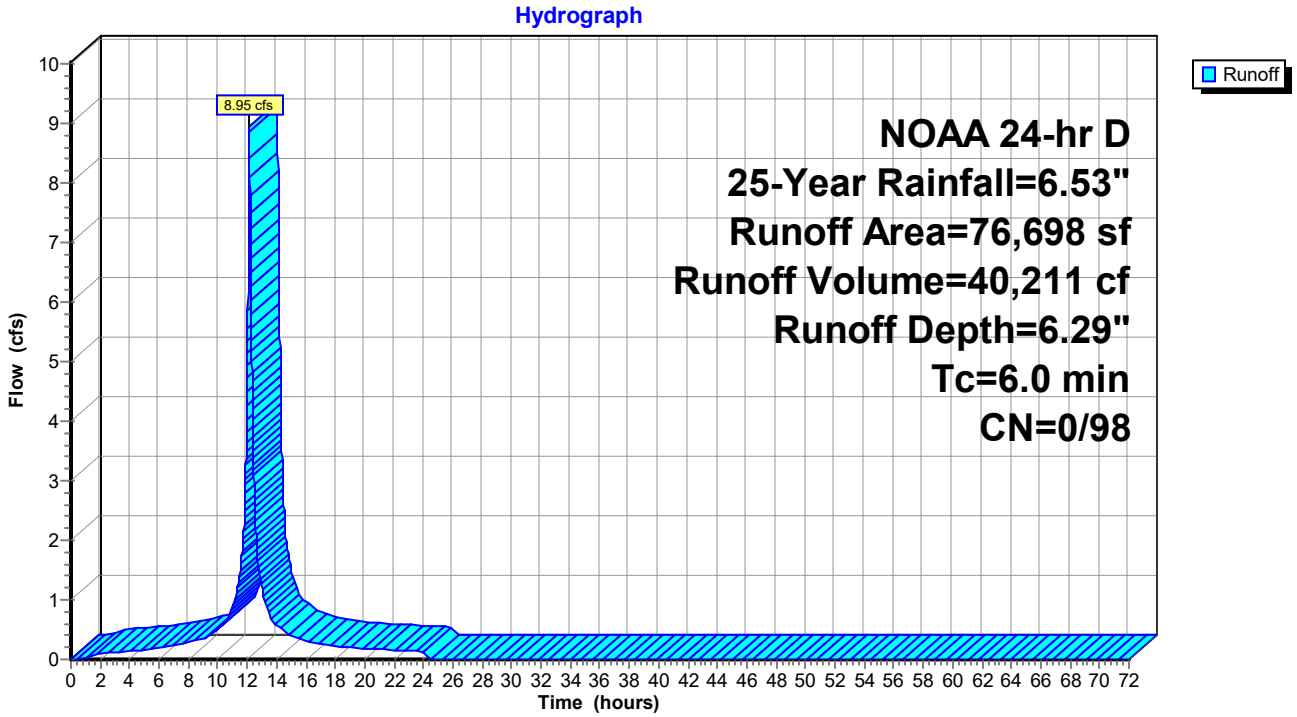
Runoff = 8.95 cfs @ 12.14 hrs, Volume= 40,211 cf, Depth= 6.29"

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
76,698	98	Paved parking, HSG D
76,698	98	100.00% Impervious Area

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

Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.



Summary for Subcatchment B 1Cp: PR. BASIN Area 1C Perv.

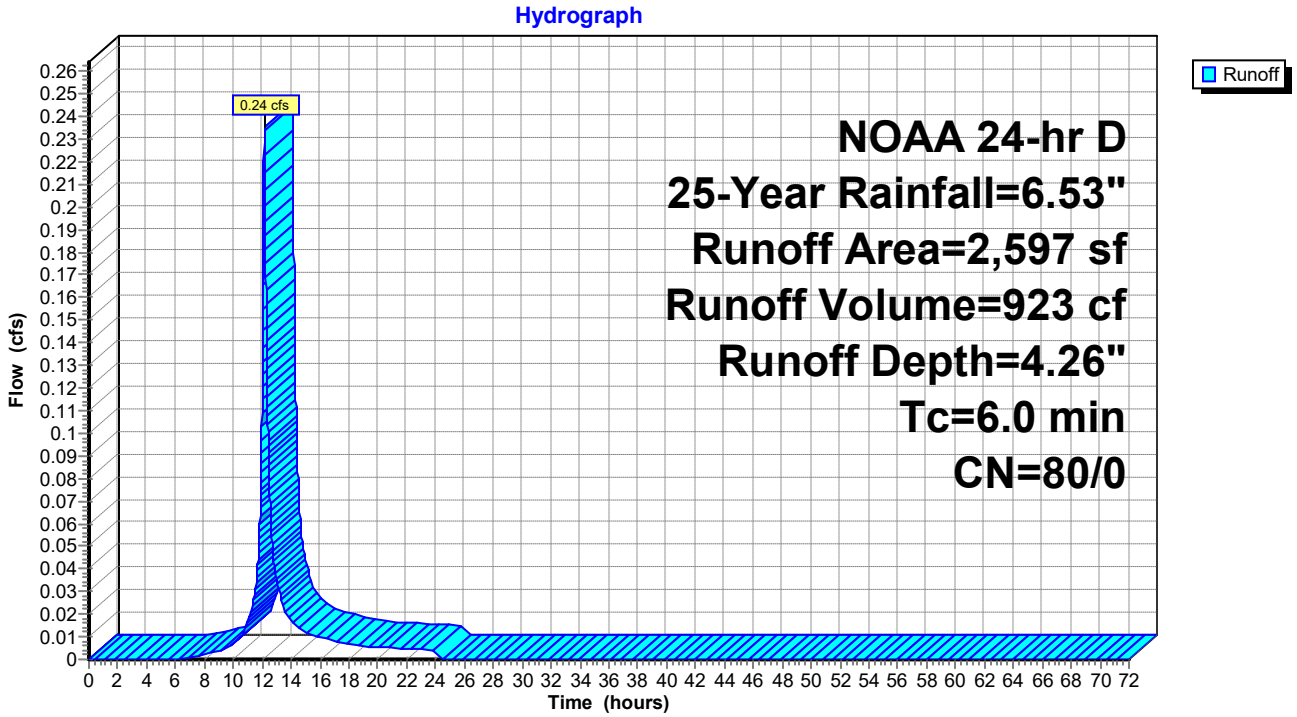
Runoff = 0.24 cfs @ 12.14 hrs, Volume= 923 cf, Depth= 4.26"

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
2,597	80	>75% Grass cover, Good, HSG D
2,597	80	100.00% Pervious Area

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

Subcatchment B 1Cp: PR. BASIN Area 1C Perv.



Summary for Subcatchment DW 1Ci: Pr. Drywell 1C Imp.

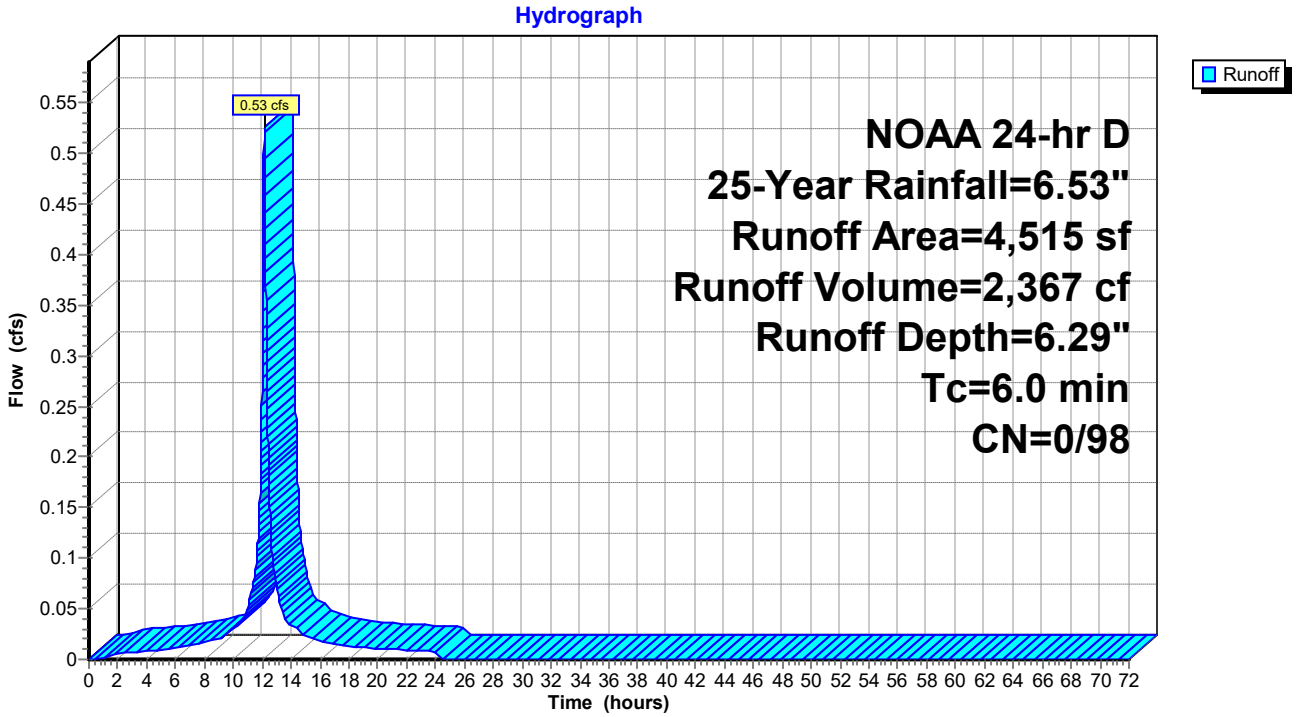
Runoff = 0.53 cfs @ 12.14 hrs, Volume= 2,367 cf, Depth= 6.29"

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
4,515	98	Paved parking, HSG D
4,515	98	100.00% Impervious Area

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

Subcatchment DW 1Ci: Pr. Drywell 1C Imp.



Summary for Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.

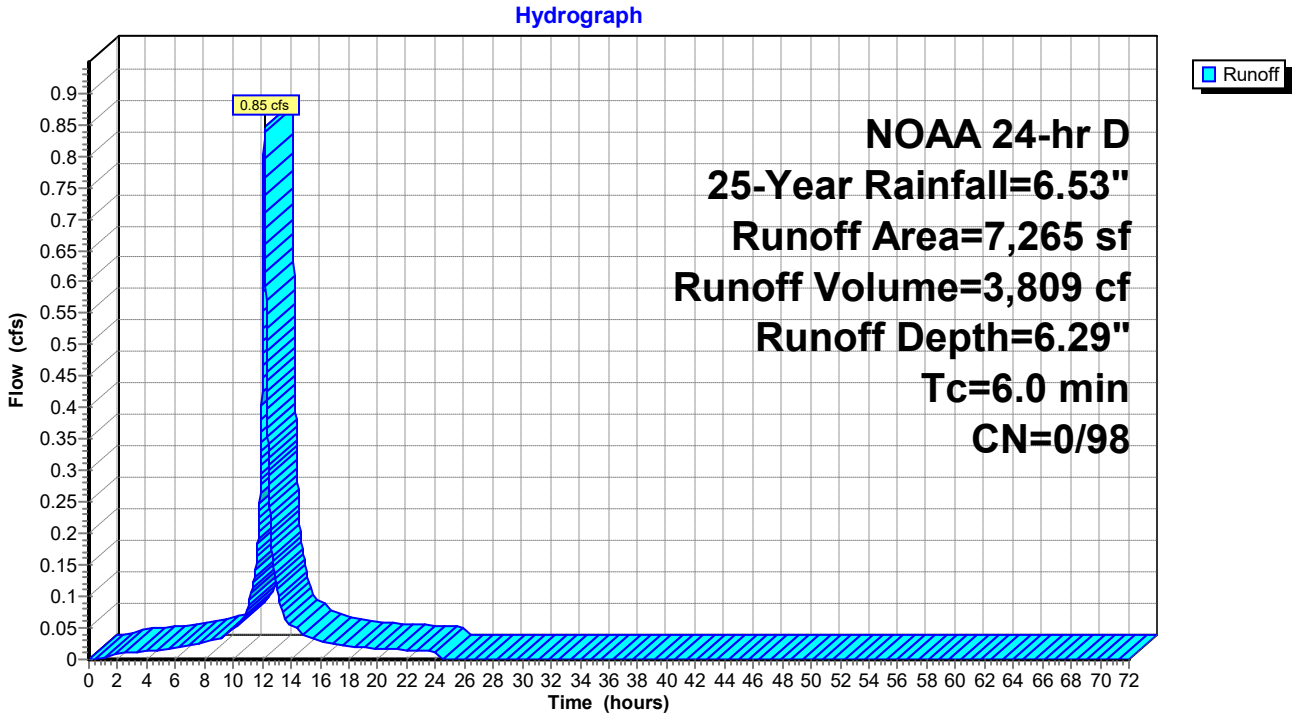
Runoff = 0.85 cfs @ 12.14 hrs, Volume= 3,809 cf, Depth= 6.29"

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
7,265	98	Paved parking, HSG D
7,265	98	100.00% Impervious Area

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

Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.



Summary for Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.

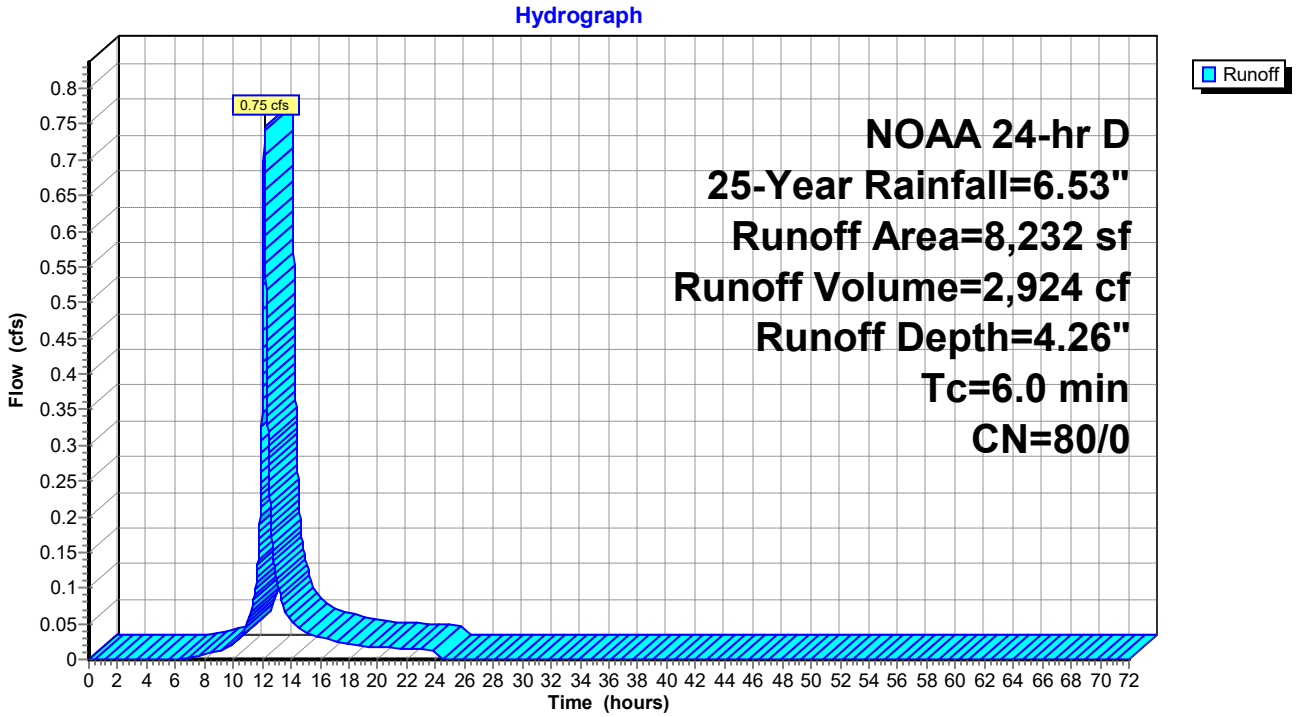
Runoff = 0.75 cfs @ 12.14 hrs, Volume= 2,924 cf, Depth= 4.26"

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
8,232	80	>75% Grass cover, Good, HSG D
8,232	80	100.00% Pervious Area

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

Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.



Summary for Pond B 1C: Underground Basin 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 5.51" for 25-Year event
Inflow = 10.90 cfs @ 12.15 hrs, Volume= 45,582 cf
Outflow = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf, Atten= 67%, Lag= 20.3 min
Primary = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 20.83' @ 12.48 hrs Surf.Area= 10,459 sf Storage= 12,929 cf

Plug-Flow detention time= 64.0 min calculated for 45,549 cf (100% of inflow)
Center-of-Mass det. time= 64.0 min (815.7 - 751.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	8,886 cf	**53.78'W x 194.47'L x 3.52'H Field A** 36,868 cf Overall - 14,653 cf Embedded = 22,215 cf x 40.0% Voids
#2A	19.60'	14,040 cf	**Contech ChamberMaxx 2016** x 297 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 11 rows
		22,925 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.56 cfs @ 12.48 hrs HW=20.83' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.56 cfs of 7.92 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.01 cfs @ 5.52 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.55 cfs @ 1.66 fps)

Pond B 1C: Underground Basin 1C - 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 11 rows

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

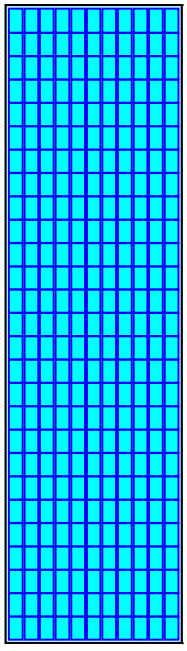
27 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 192.47' Row Length +12.0" End Stone x 2 = 194.47' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

297 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 14,039.6 cf Chamber Storage
297 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 14,653.5 cf Displacement

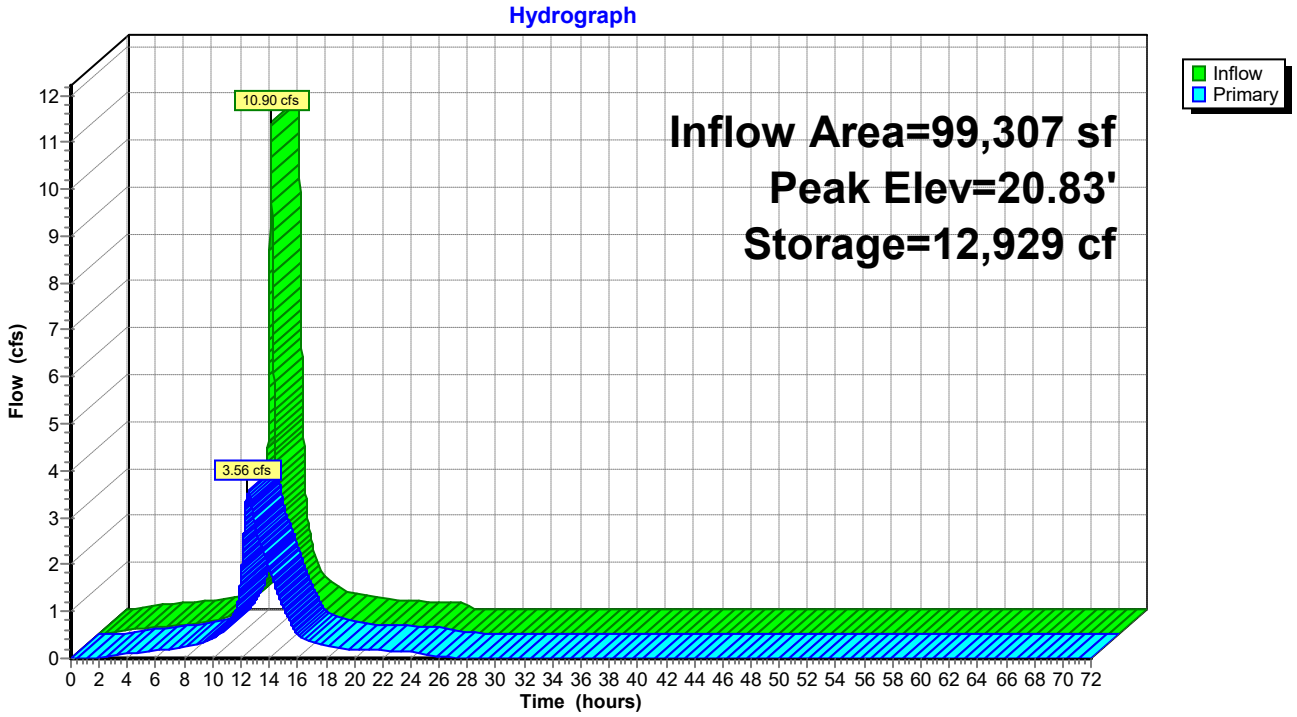
36,868.2 cf Field - 14,653.5 cf Chambers = 22,214.7 cf Stone x 40.0% Voids = 8,885.9 cf Stone Storage

Chamber Storage + Stone Storage = 22,925.5 cf = 0.526 af
Overall Storage Efficiency = 62.2%
Overall System Size = 194.47' x 53.78' x 3.52'

297 Chambers
1,365.5 cy Field
822.8 cy Stone



Pond B 1C: Underground Basin 1C



Summary for Pond DW1C: Drywell 1C

Inflow Area = 4,515 sf,100.00% Impervious, Inflow Depth = 6.29" for 25-Year event
Inflow = 0.53 cfs @ 12.14 hrs, Volume= 2,367 cf
Outflow = 0.43 cfs @ 12.21 hrs, Volume= 2,367 cf, Atten= 19%, Lag= 4.2 min
Discarded = 0.01 cfs @ 12.21 hrs, Volume= 1,539 cf
Primary = 0.41 cfs @ 12.21 hrs, Volume= 828 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.70' @ 12.21 hrs Surf.Area= 497 sf Storage= 735 cf

Plug-Flow detention time= 291.4 min calculated for 2,367 cf (100% of inflow)
Center-of-Mass det. time= 291.4 min (1,040.0 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.40'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.40' / 21.00' S= 0.0304 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.21 hrs HW=22.70' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.41 cfs @ 12.21 hrs HW=22.70' TW=20.52' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.41 cfs @ 1.85 fps)

Pond DW1C: Drywell 1C - 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 2 rows

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

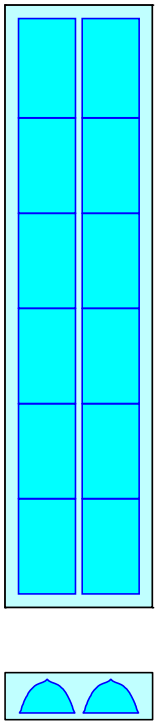
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

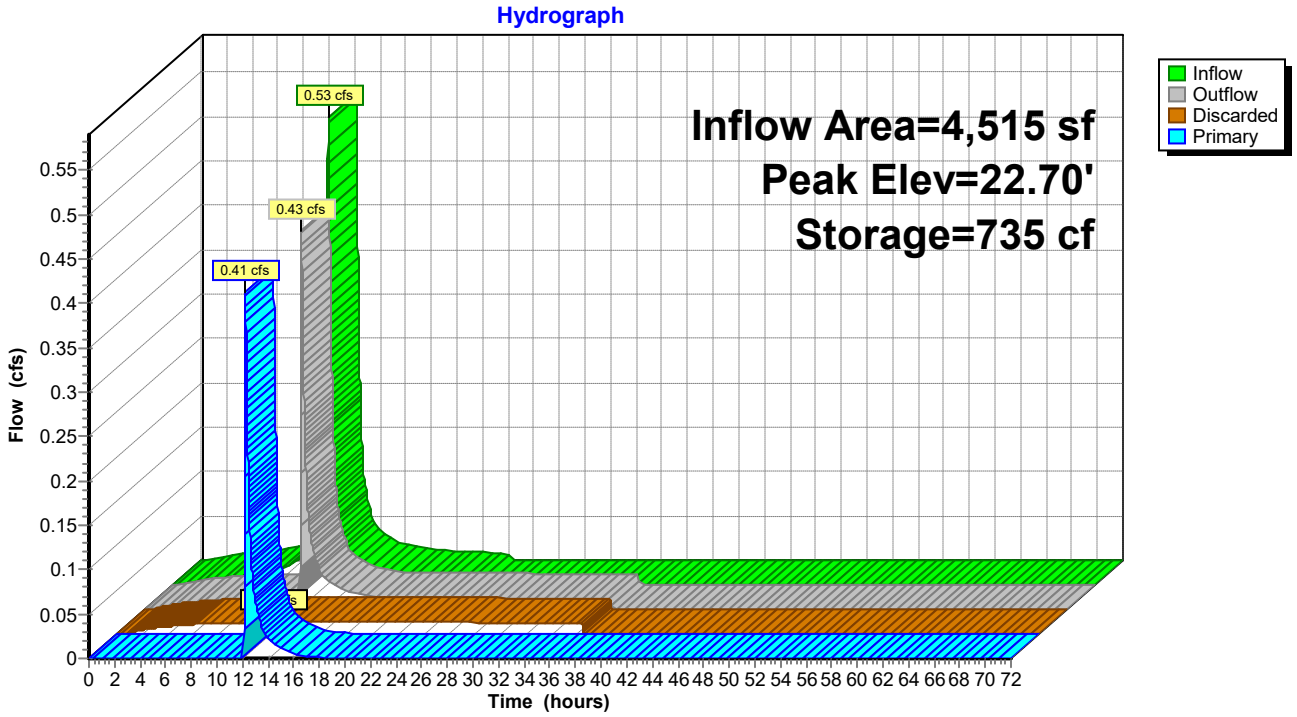
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1C: Drywell 1C



Summary for Pond RG 1C: Rain Garden 1C

Inflow Area = 15,497 sf, 46.88% Impervious, Inflow Depth = 5.21" for 25-Year event
Inflow = 1.59 cfs @ 12.14 hrs, Volume= 6,733 cf
Outflow = 1.56 cfs @ 12.16 hrs, Volume= 6,733 cf, Atten= 2%, Lag= 1.1 min
Discarded = 0.04 cfs @ 12.16 hrs, Volume= 3,112 cf
Primary = 1.52 cfs @ 12.16 hrs, Volume= 3,621 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.94' @ 12.16 hrs Surf.Area= 1,700 sf Storage= 1,185 cf

Plug-Flow detention time= 175.4 min calculated for 6,732 cf (100% of inflow)
Center-of-Mass det. time= 175.5 min (956.0 - 780.5)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	1,282 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

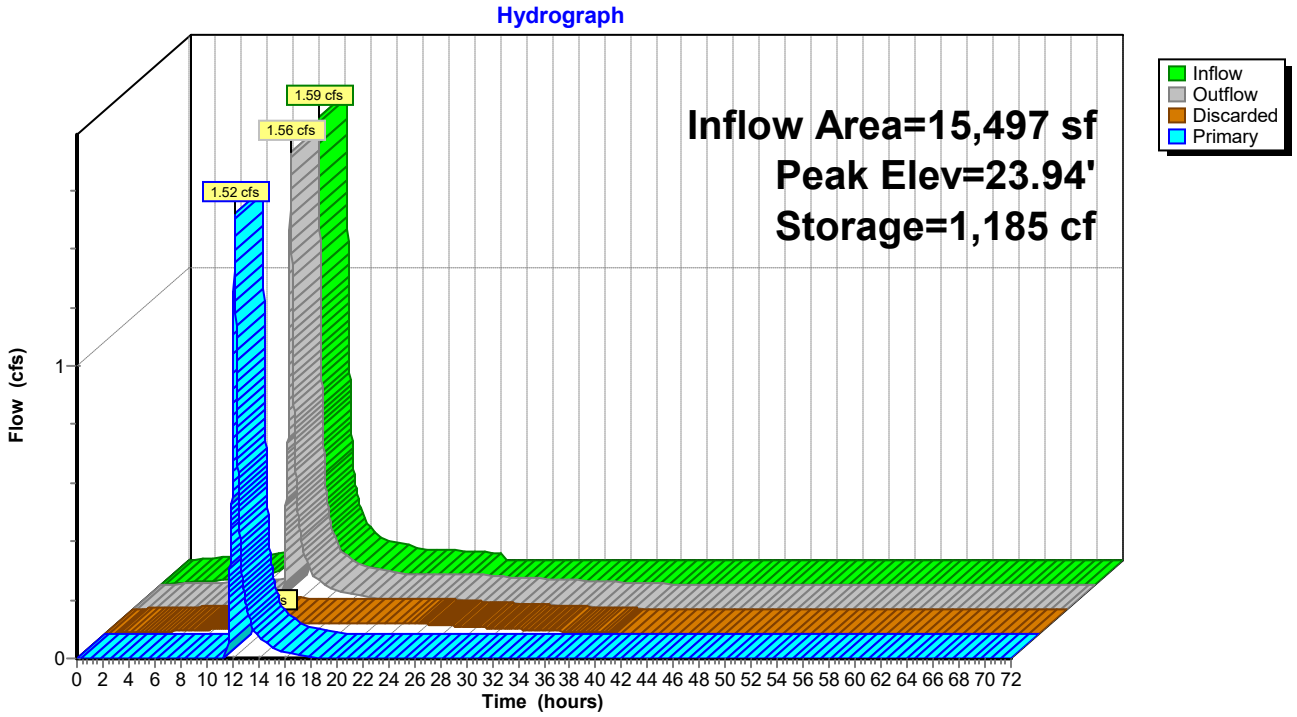
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
22.50	160	58.0	0	0	160
23.00	556	109.0	169	169	839
24.00	1,787	204.0	1,113	1,282	3,210

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Culvert** L= 37.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 20.25' S= 0.0054 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	23.85'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	22.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=23.94' (Free Discharge)
└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=1.52 cfs @ 12.16 hrs HW=23.94' TW=20.36' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.52 cfs of 10.01 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.52 cfs @ 1.00 fps)

Pond RG 1C: Rain Garden 1C

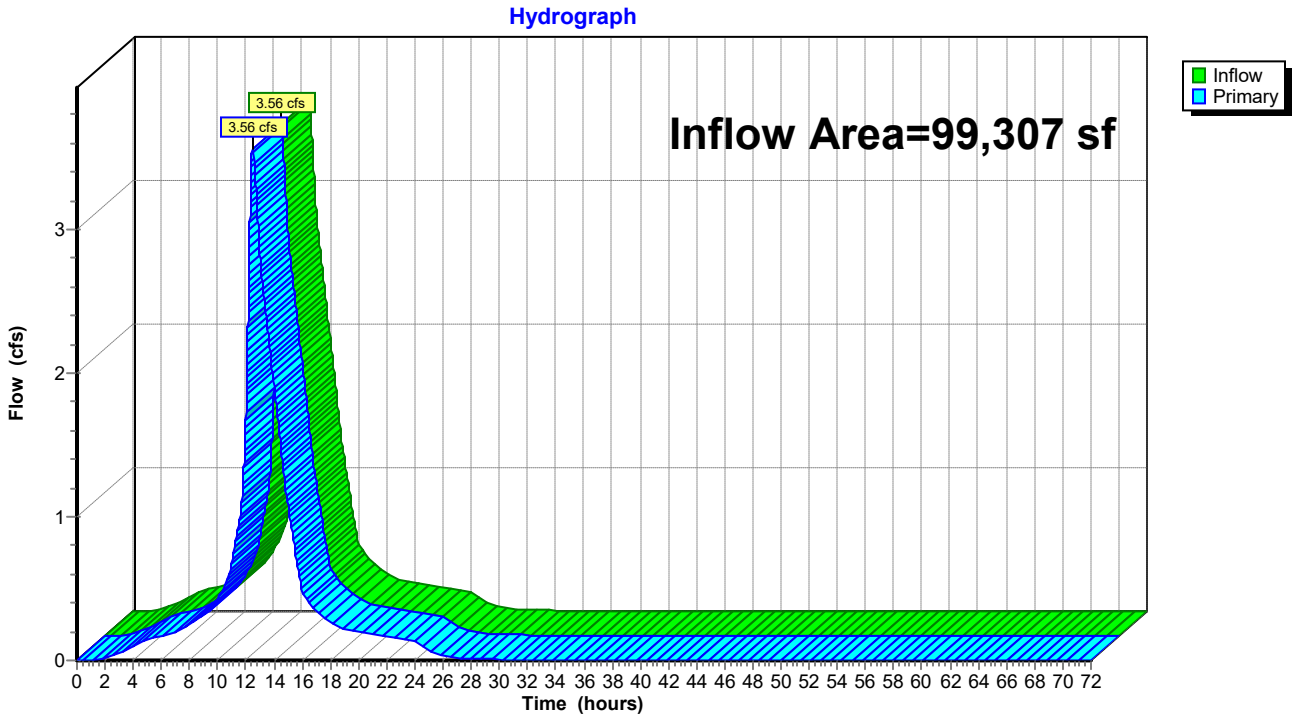


Summary for Link Pr. DA 1C: Pr. DA 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 5.50" for 25-Year event
Inflow = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf
Primary = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf, Atten= 0%, Lag= 0.0 min

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

Link Pr. DA 1C: Pr. DA 1C



Summary for Subcatchment B1Ai: Pr. BAsin Area 1A Imp.

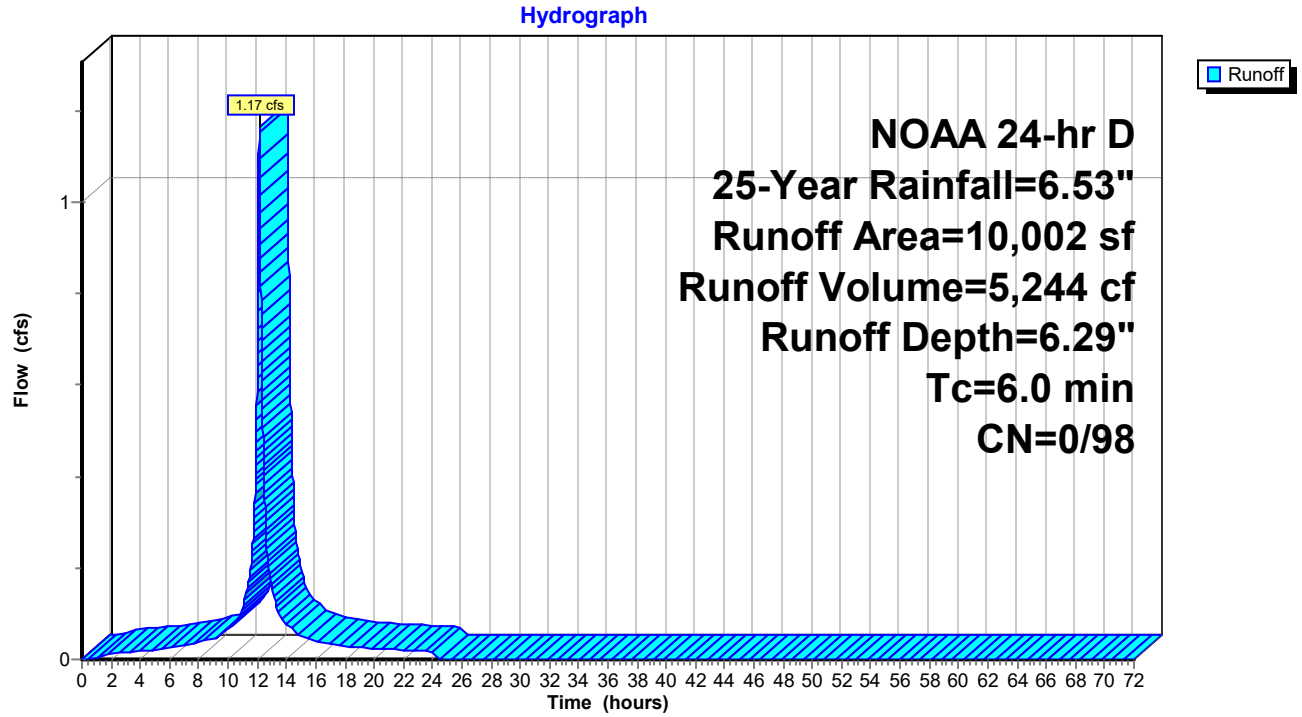
Runoff = 1.17 cfs @ 12.14 hrs, Volume= 5,244 cf, Depth= 6.29"

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
10,002	98	Paved parking, HSG D
10,002	98	100.00% Impervious Area

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

Subcatchment B1Ai: Pr. BAsin Area 1A Imp.



Summary for Subcatchment B1Ap: PR. Basin Area 1A Perv.

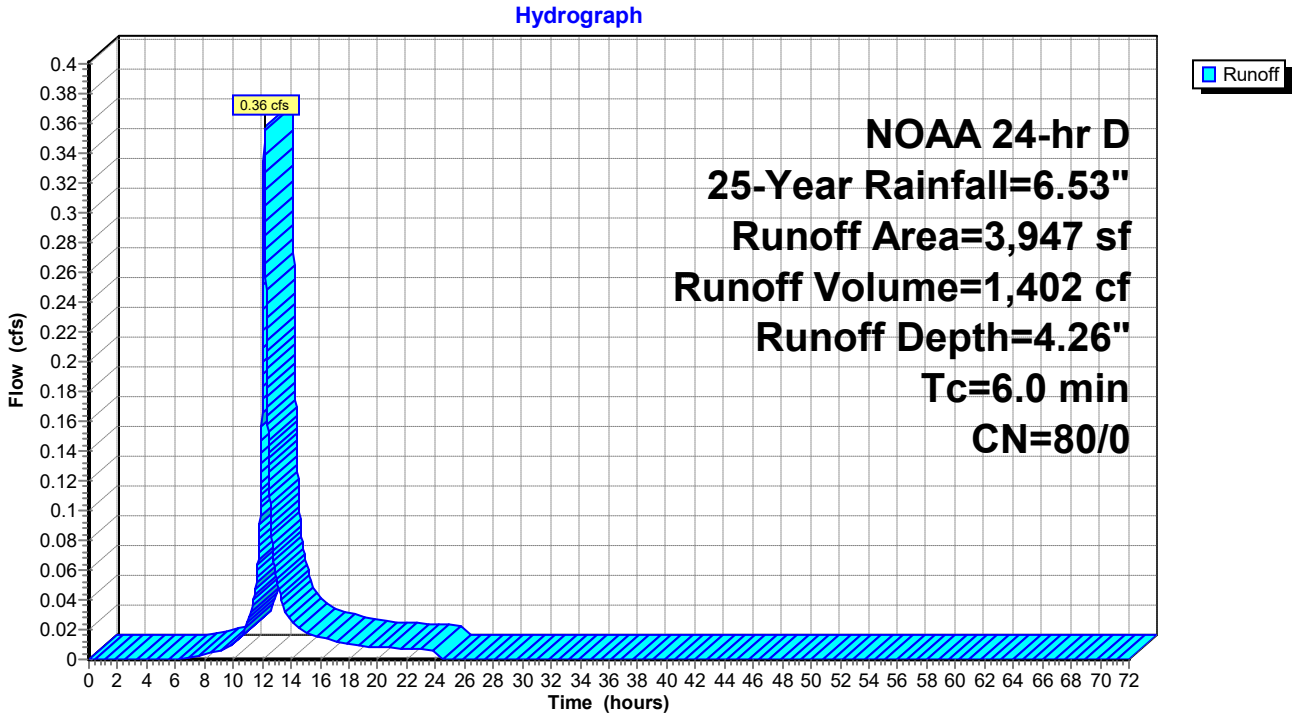
Runoff = 0.36 cfs @ 12.14 hrs, Volume= 1,402 cf, Depth= 4.26"

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
3,947	80	>75% Grass cover, Good, HSG D
3,947	80	100.00% Pervious Area

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

Subcatchment B1Ap: PR. Basin Area 1A Perv.



Summary for Subcatchment B1Bi: Pr. Basin Area 1B Imp.

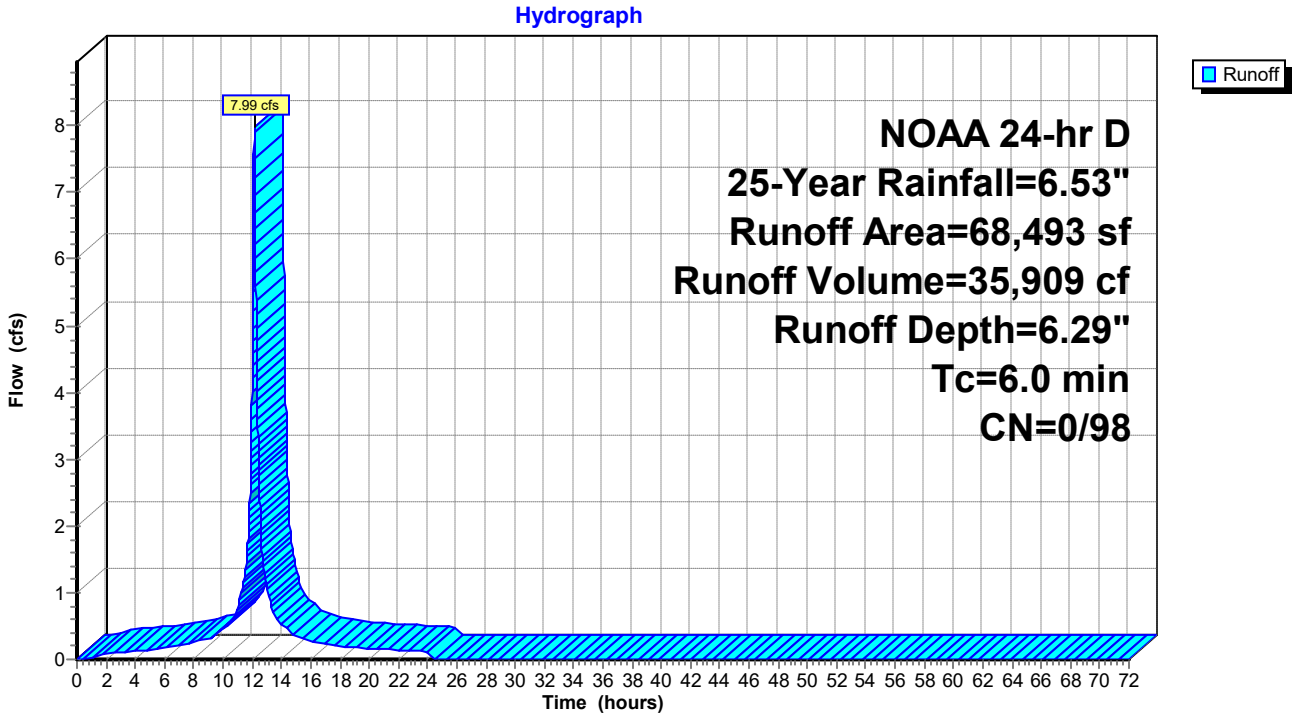
Runoff = 7.99 cfs @ 12.14 hrs, Volume= 35,909 cf, Depth= 6.29"

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
68,493	98	Paved parking, HSG D
68,493	98	100.00% Impervious Area

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

Subcatchment B1Bi: Pr. Basin Area 1B Imp.



Summary for Subcatchment B1Bp: PR. Basin Area 1B Perv.

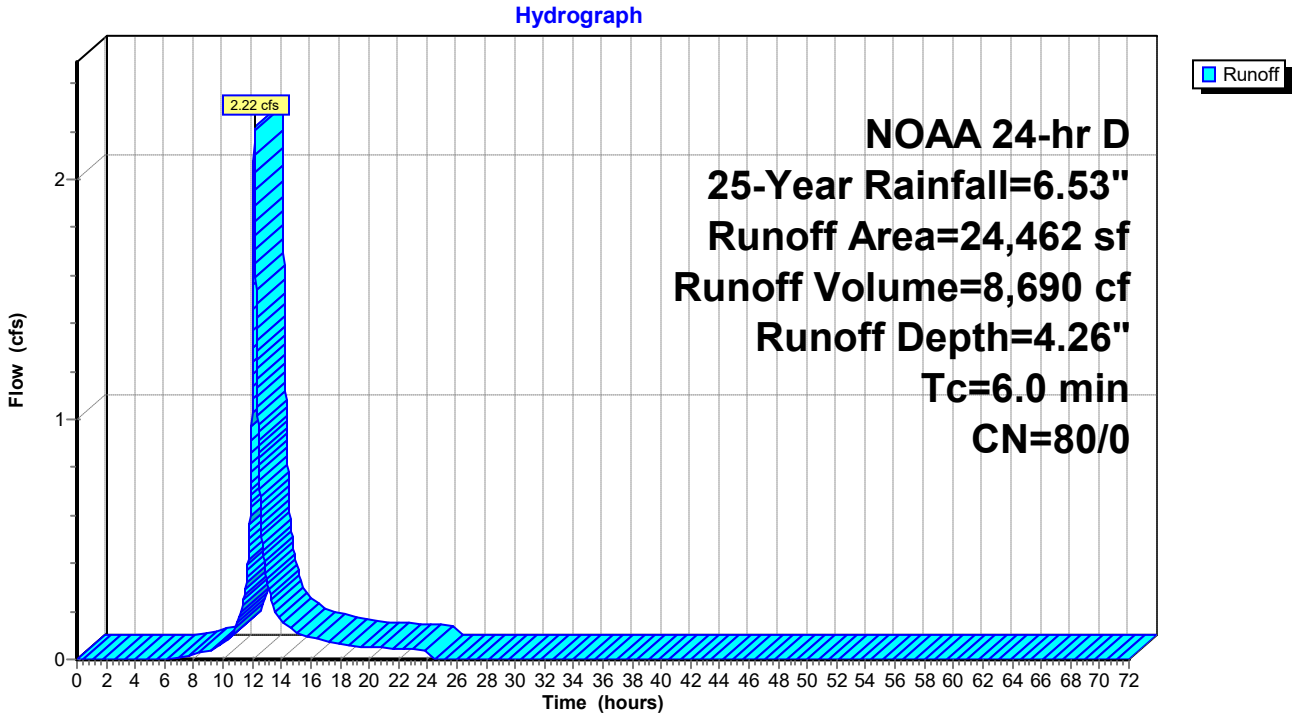
Runoff = 2.22 cfs @ 12.14 hrs, Volume= 8,690 cf, Depth= 4.26"

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
24,462	80	>75% Grass cover, Good, HSG D
24,462	80	100.00% Pervious Area

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

Subcatchment B1Bp: PR. Basin Area 1B Perv.



Summary for Subcatchment DA 1Di: Pr. Bypass 1D Imp

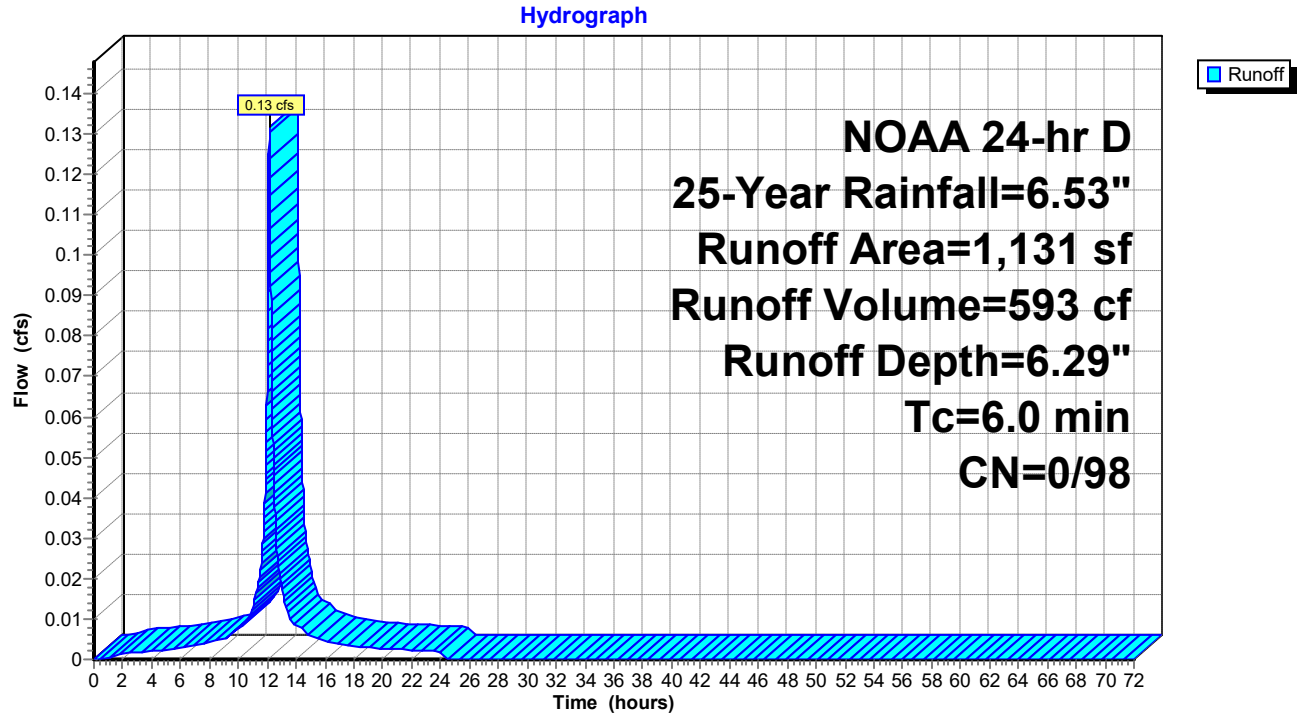
Runoff = 0.13 cfs @ 12.14 hrs, Volume= 593 cf, Depth= 6.29"

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
1,131	98	Paved parking, HSG D
1,131	98	100.00% Impervious Area

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

Subcatchment DA 1Di: Pr. Bypass 1D Imp



Summary for Subcatchment DA 1Dp: Pr. Bypass 1D Per

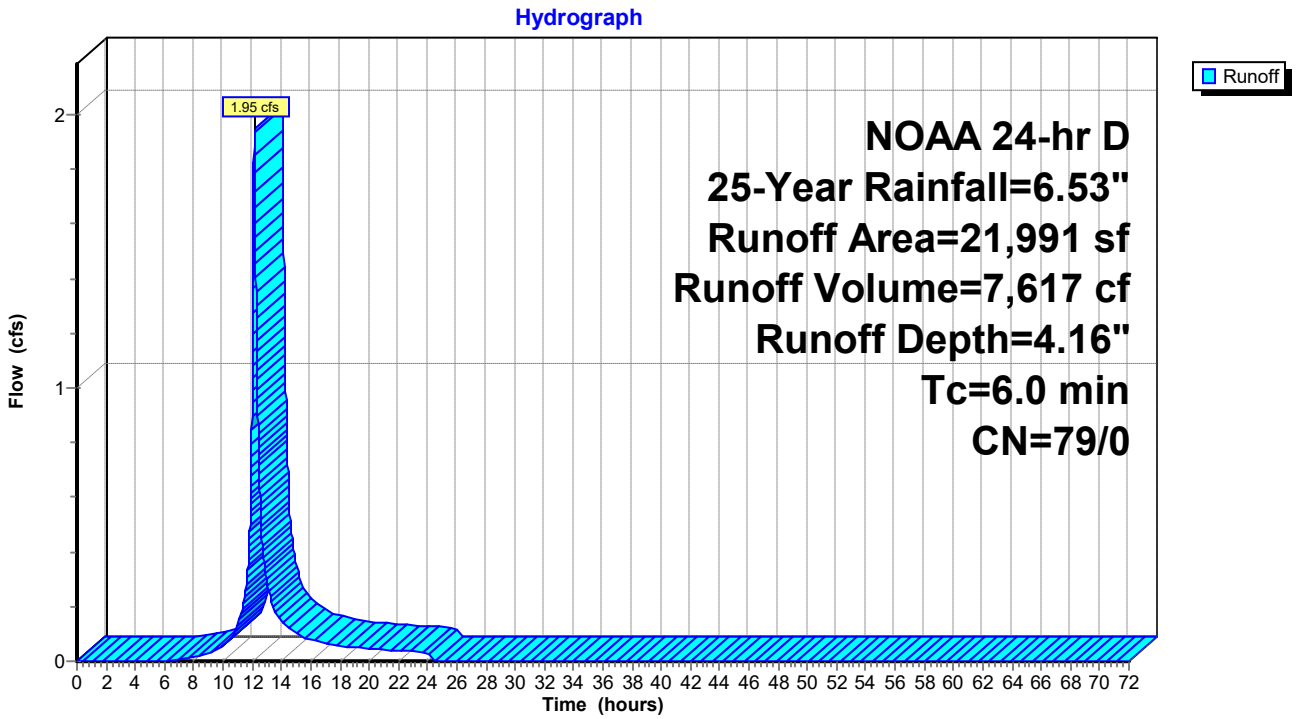
Runoff = 1.95 cfs @ 12.14 hrs, Volume= 7,617 cf, Depth= 4.16"

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
7,982	77	Woods, Good, HSG D
14,009	80	>75% Grass cover, Good, HSG D
21,991	79	Weighted Average
21,991	79	100.00% Pervious Area

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

Subcatchment DA 1Dp: Pr. Bypass 1D Per



Summary for Subcatchment DA 1Ei: Pr. Area 1E Imp

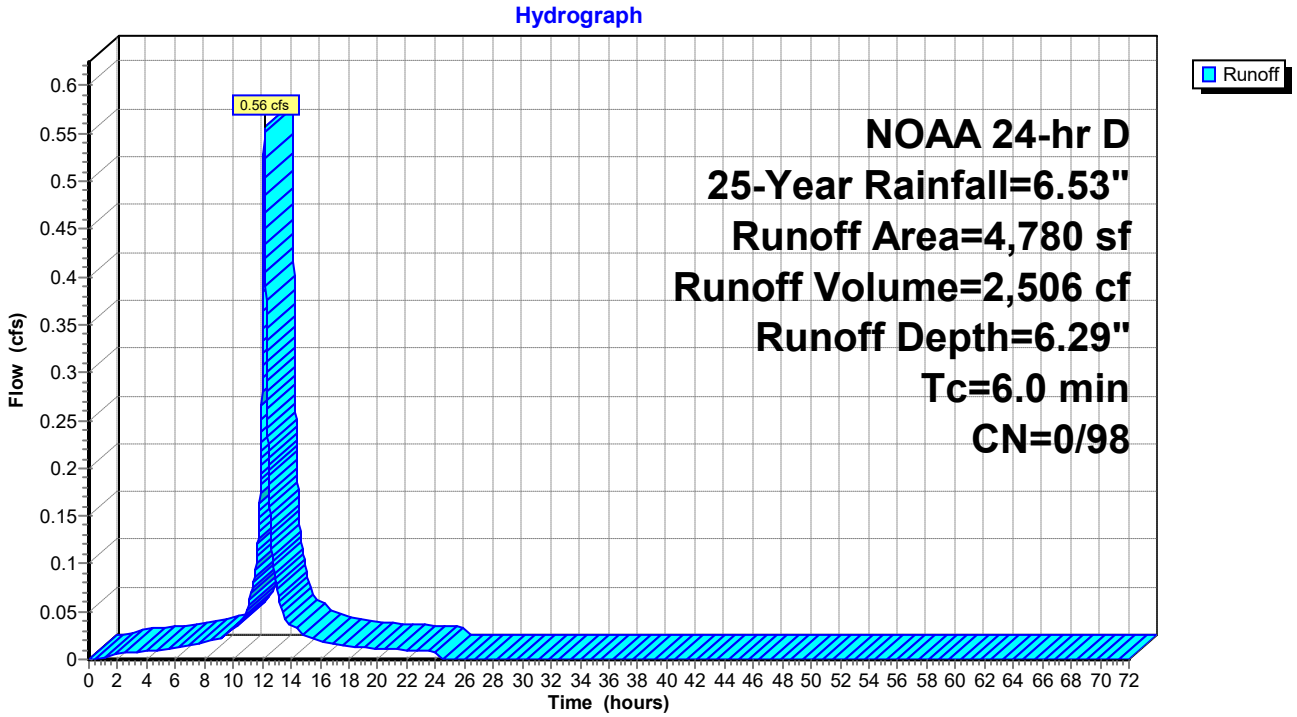
Runoff = 0.56 cfs @ 12.14 hrs, Volume= 2,506 cf, Depth= 6.29"

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 DA 1Ei: Pr. Area 1E Imp



Summary for Subcatchment DA 1Ep: Pr. Area 1E Perv

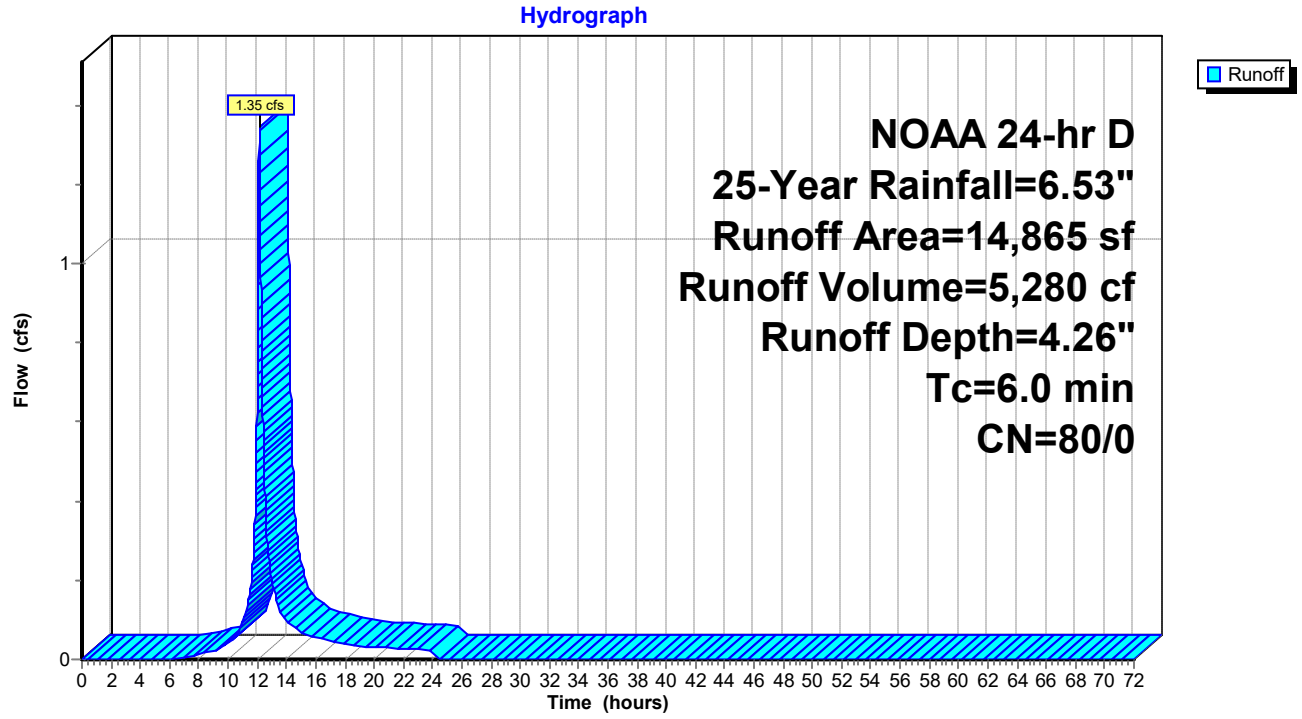
Runoff = 1.35 cfs @ 12.14 hrs, Volume= 5,280 cf, Depth= 4.26"

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
14,865	80	>75% Grass cover, Good, HSG D
14,865	80	100.00% Pervious Area

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

Subcatchment DA 1Ep: Pr. Area 1E Perv



Summary for Subcatchment DW1Bi: Pr. Drywell Area 1B

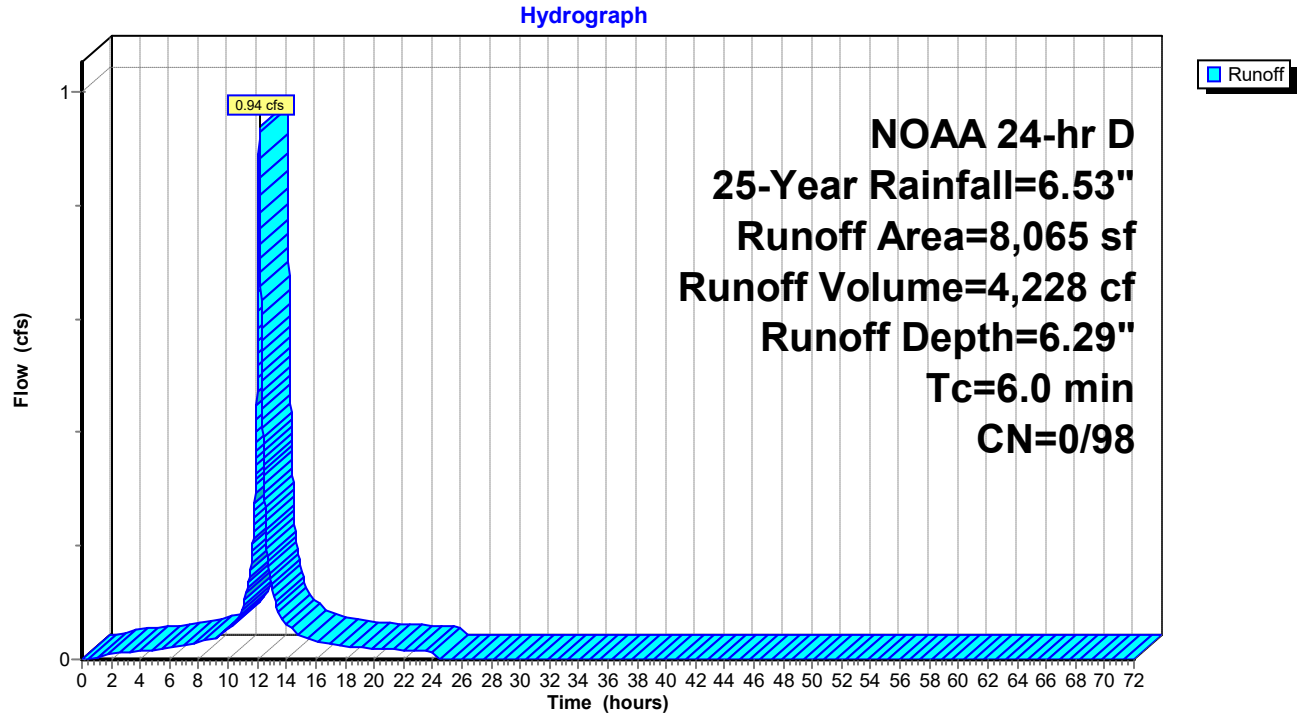
Runoff = 0.94 cfs @ 12.14 hrs, Volume= 4,228 cf, Depth= 6.29"

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
8,065	98	Paved parking, HSG D
8,065	98	100.00% Impervious Area

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

Subcatchment DW1Bi: Pr. Drywell Area 1B



Summary for Subcatchment DW2Bi: Pr. Drywell Area 2B

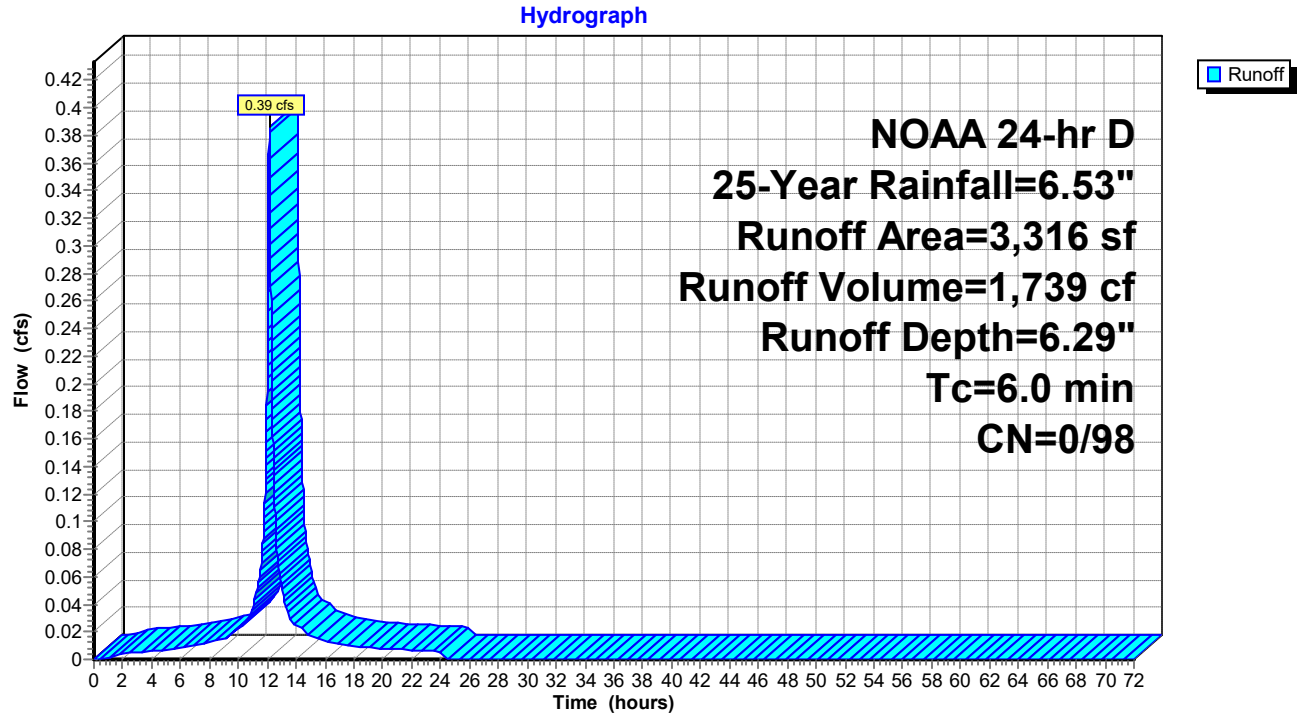
Runoff = 0.39 cfs @ 12.14 hrs, Volume= 1,739 cf, Depth= 6.29"

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
3,316	98	Paved parking, HSG D
3,316	98	100.00% Impervious Area

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

Subcatchment DW2Bi: Pr. Drywell Area 2B



Summary for Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.

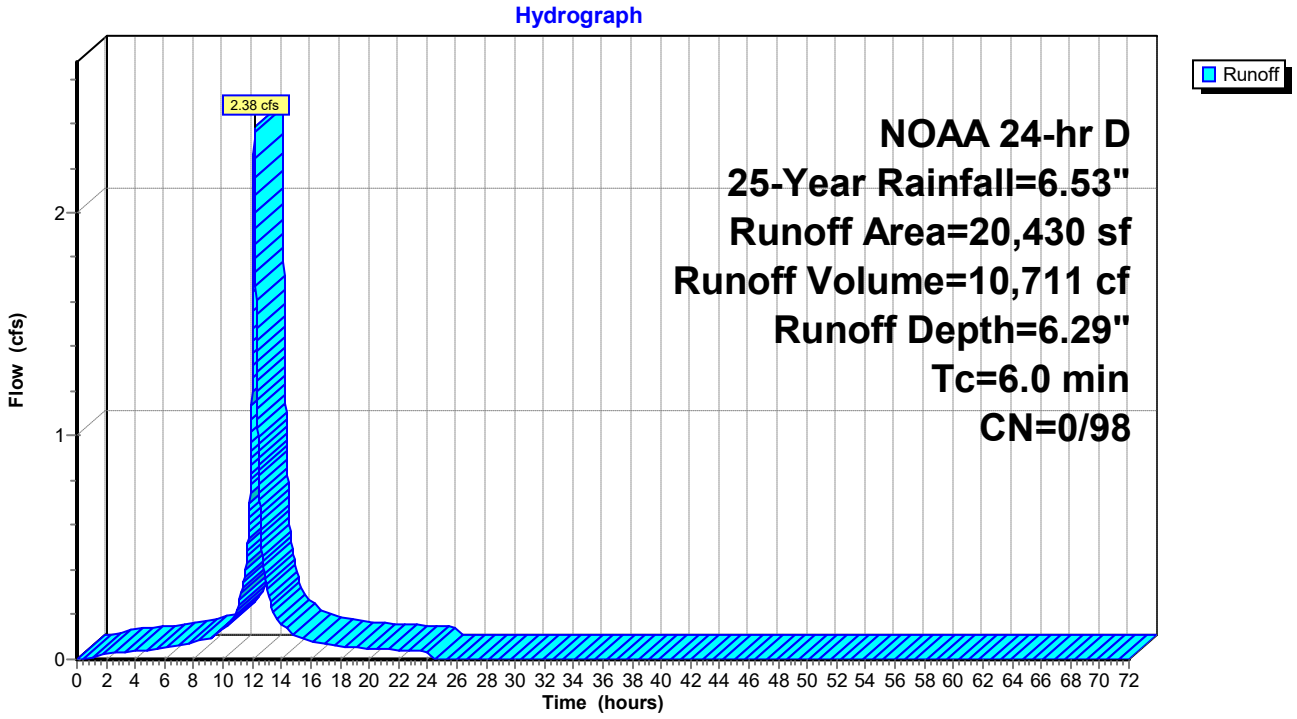
Runoff = 2.38 cfs @ 12.14 hrs, Volume= 10,711 cf, Depth= 6.29"

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
20,430	98	Paved parking, HSG D
20,430	98	100.00% Impervious Area

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

Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.



Summary for Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.

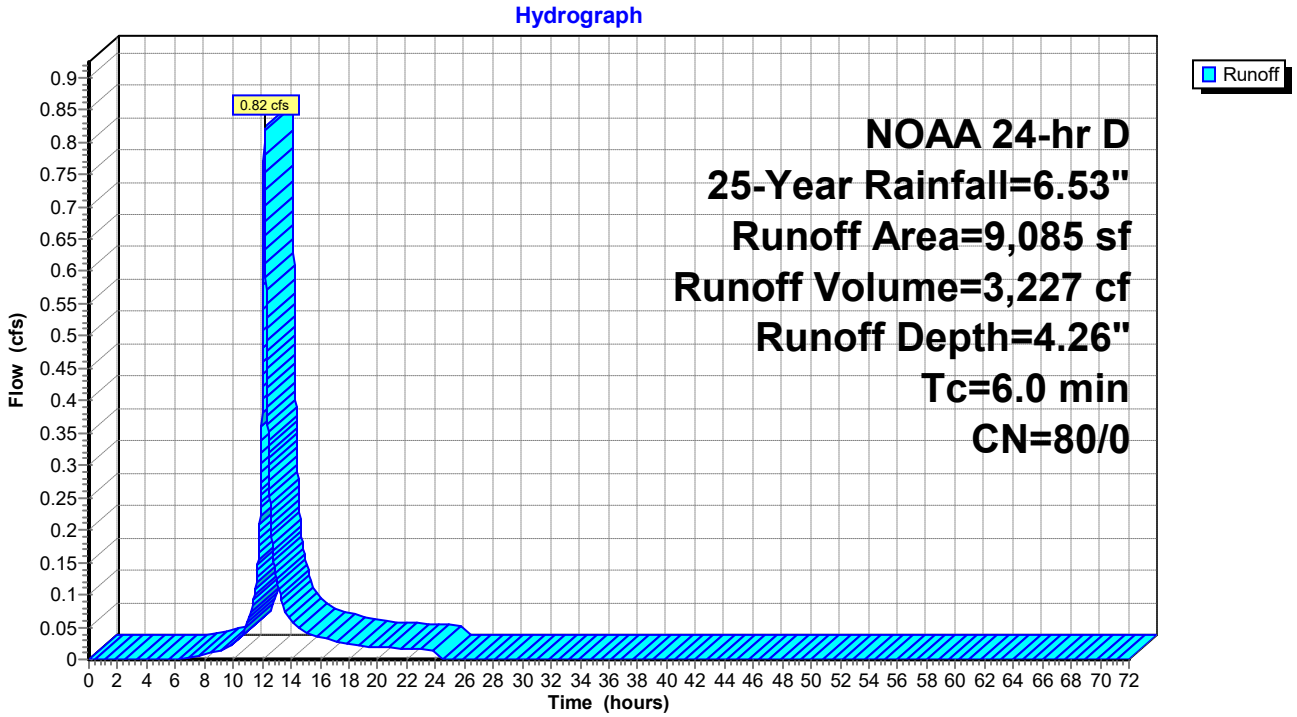
Runoff = 0.82 cfs @ 12.14 hrs, Volume= 3,227 cf, Depth= 4.26"

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
9,085	80	>75% Grass cover, Good, HSG D
9,085	80	100.00% Pervious Area

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

Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.



Summary for Pond B1A: Underground Basin 1A

Inflow Area = 43,464 sf, 70.02% Impervious, Inflow Depth = 3.67" for 25-Year event
Inflow = 4.45 cfs @ 12.16 hrs, Volume= 13,311 cf
Outflow = 3.62 cfs @ 12.24 hrs, Volume= 13,310 cf, Atten= 19%, Lag= 5.1 min
Primary = 3.62 cfs @ 12.24 hrs, Volume= 13,310 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.85' @ 12.24 hrs Surf.Area= 1,439 sf Storage= 2,584 cf

Plug-Flow detention time= 23.7 min calculated for 13,308 cf (100% of inflow)
Center-of-Mass det. time= 23.8 min (789.5 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	1,318 cf	**11.03'W x 130.42'L x 3.52'H Field A** 5,072 cf Overall - 1,778 cf Embedded = 3,295 cf x 40.0% Voids
#2A	19.60'	1,703 cf	**Contech ChamberMaxx 2016** x 36 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 2 rows
		3,021 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'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	21.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.62 cfs @ 12.24 hrs HW=21.85' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.62 cfs of 12.02 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.05 cfs @ 7.67 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 2.57 cfs @ 3.04 fps)

Pond B1A: Underground Basin 1A - 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 2 rows

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

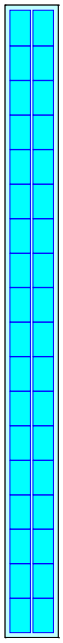
18 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 128.42' Row Length +12.0" End Stone x 2 = 130.42' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

36 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 1,703.2 cf Chamber Storage
36 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 1,777.6 cf Displacement

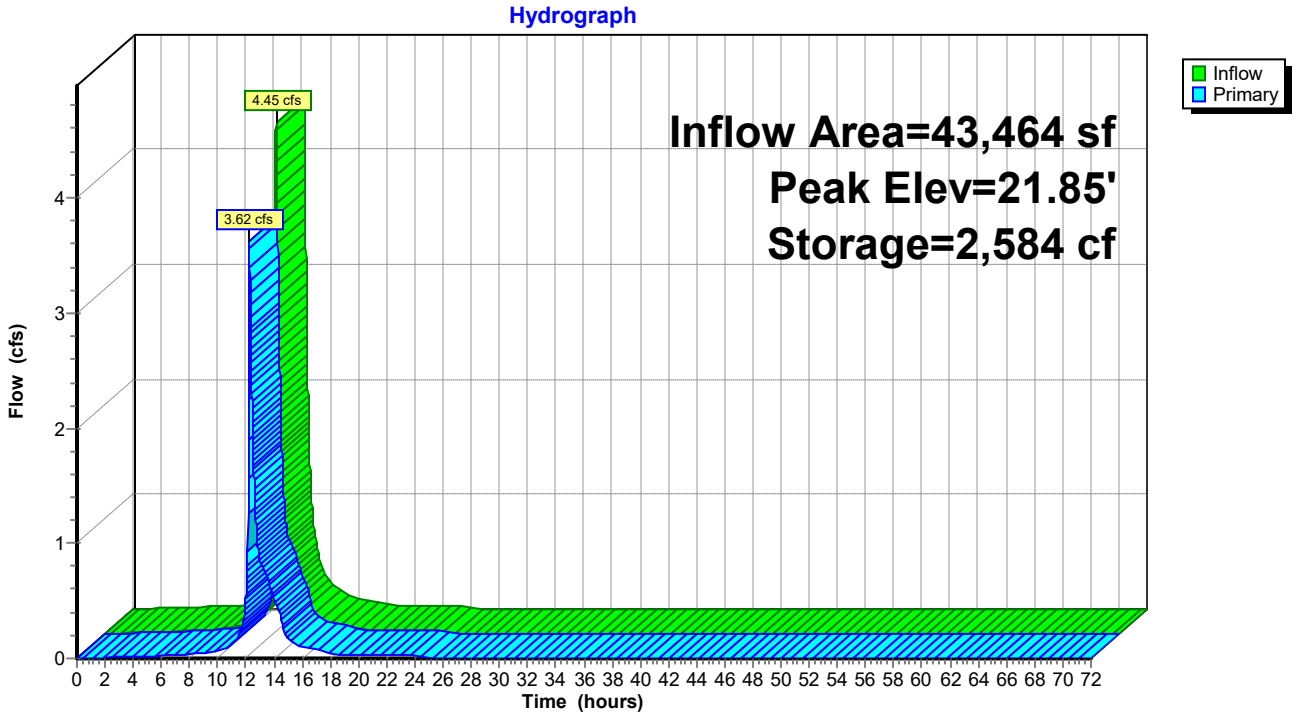
5,072.2 cf Field - 1,777.6 cf Chambers = 3,294.6 cf Stone x 40.0% Voids = 1,317.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,021.0 cf = 0.069 af
Overall Storage Efficiency = 59.6%
Overall System Size = 130.42' x 11.03' x 3.52'

36 Chambers
187.9 cy Field
122.0 cy Stone



Pond B1A: Underground Basin 1A



Summary for Pond B1B: Underground Basin 1B

Inflow Area = 104,336 sf, 76.55% Impervious, Inflow Depth = 5.46" for 25-Year event
Inflow = 11.27 cfs @ 12.14 hrs, Volume= 47,491 cf
Outflow = 4.88 cfs @ 12.39 hrs, Volume= 47,476 cf, Atten= 57%, Lag= 14.9 min
Primary = 4.88 cfs @ 12.39 hrs, Volume= 47,476 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.13' @ 12.39 hrs Surf.Area= 7,780 sf Storage= 11,335 cf

Plug-Flow detention time= 46.5 min calculated for 47,476 cf (100% of inflow)
Center-of-Mass det. time= 46.3 min (810.3 - 764.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	6,625 cf	**53.78'W x 144.65'L x 3.52'H Field A** 27,424 cf Overall - 10,861 cf Embedded = 16,563 cf x 40.0% Voids
#2A	19.60'	10,406 cf	**Contech ChamberMaxx 2016** x 220 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 11 rows
		17,031 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.88 cfs @ 12.39 hrs HW=21.13' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.88 cfs of 8.94 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.33 cfs @ 6.11 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.55 cfs @ 2.47 fps)

Pond B1B: Underground Basin 1B - 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 11 rows

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

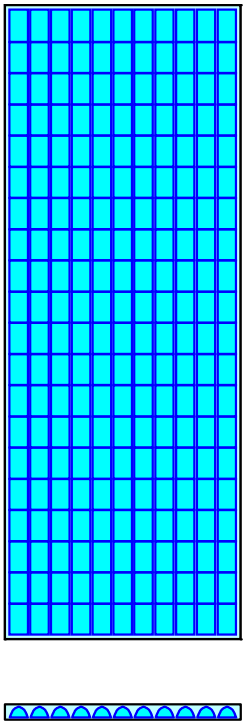
20 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 142.65' Row Length +12.0" End Stone x 2 = 144.65' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

220 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 10,405.7 cf Chamber Storage
220 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 10,860.7 cf Displacement

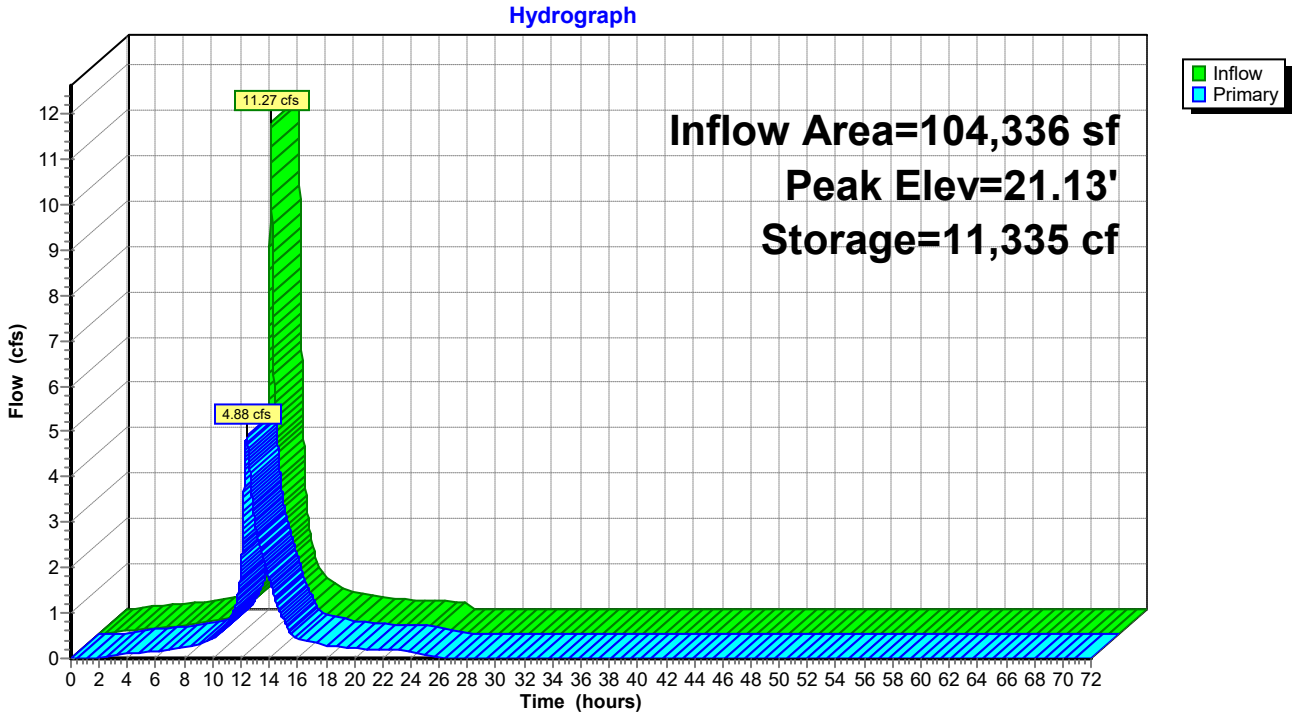
27,423.7 cf Field - 10,860.7 cf Chambers = 16,563.0 cf Stone x 40.0% Voids = 6,625.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,030.9 cf = 0.391 af
Overall Storage Efficiency = 62.1%
Overall System Size = 144.65' x 53.78' x 3.52'

220 Chambers
1,015.7 cy Field
613.4 cy Stone



Pond B1B: Underground Basin 1B



Summary for Pond DW1B: Drywell 1B

Inflow Area = 8,065 sf,100.00% Impervious, Inflow Depth = 6.29" for 25-Year event
Inflow = 0.94 cfs @ 12.14 hrs, Volume= 4,228 cf
Outflow = 0.93 cfs @ 12.15 hrs, Volume= 4,228 cf, Atten= 1%, Lag= 0.8 min
Discarded = 0.02 cfs @ 12.15 hrs, Volume= 1,906 cf
Primary = 0.92 cfs @ 12.15 hrs, Volume= 2,322 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 24.35' @ 12.15 hrs Surf.Area= 497 sf Storage= 900 cf

Plug-Flow detention time= 259.8 min calculated for 4,228 cf (100% of inflow)
Center-of-Mass det. time= 259.9 min (1,008.5 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	21.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	22.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.90'	**15.0" Round Culvert** L= 67.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 23.90' / 21.00' S= 0.0433 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	21.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 12.75' Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.15 hrs HW=24.35' (Free Discharge)
2=Exfiltration (Controls 0.02 cfs)

Primary OutFlow Max=0.91 cfs @ 12.15 hrs HW=24.35' TW=20.62' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.91 cfs @ 2.29 fps)

Pond DW1B: Drywell 1B - 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 2 rows

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

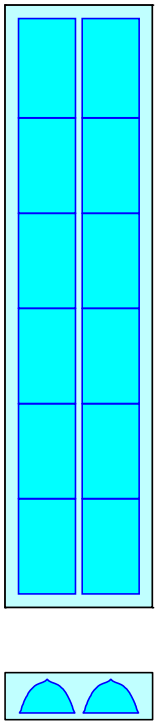
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

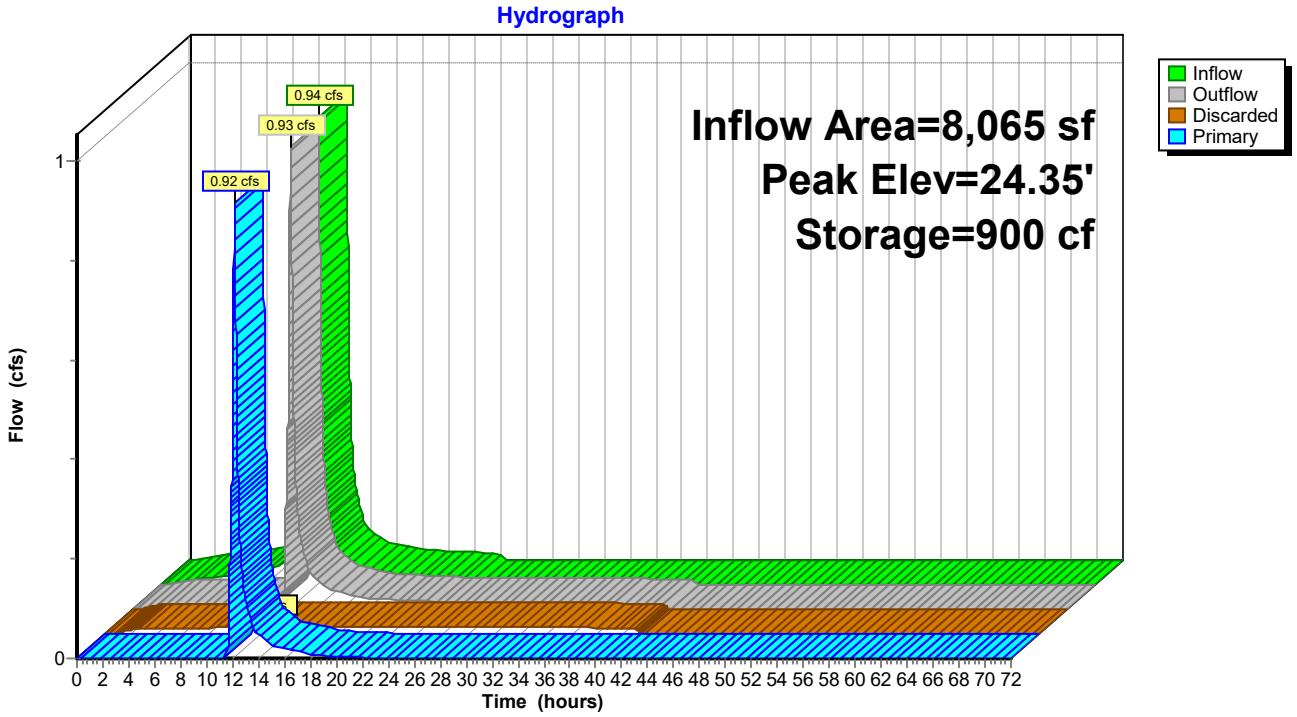
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1B: Drywell 1B



Summary for Pond DW2B: Drywell 2B

Inflow Area = 3,316 sf,100.00% Impervious, Inflow Depth = 6.29" for 25-Year event
Inflow = 0.39 cfs @ 12.14 hrs, Volume= 1,739 cf
Outflow = 0.30 cfs @ 12.22 hrs, Volume= 1,739 cf, Atten= 23%, Lag= 5.0 min
Discarded = 0.01 cfs @ 12.22 hrs, Volume= 1,168 cf
Primary = 0.29 cfs @ 12.22 hrs, Volume= 571 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.99' @ 12.22 hrs Surf.Area= 497 sf Storage= 488 cf

Plug-Flow detention time= 193.5 min calculated for 1,738 cf (100% of inflow)
Center-of-Mass det. time= 193.5 min (942.0 - 748.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.75'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.75' / 21.00' S= 0.0163 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.22 hrs HW=21.99' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.29 cfs @ 12.22 hrs HW=21.99' TW=20.90' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.29 cfs @ 1.68 fps)

Pond DW2B: Drywell 2B - 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 2 rows

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

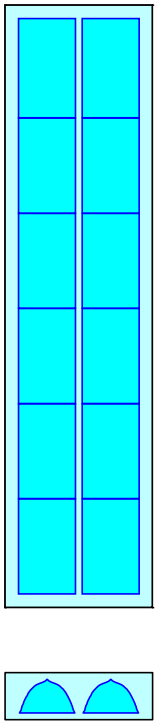
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

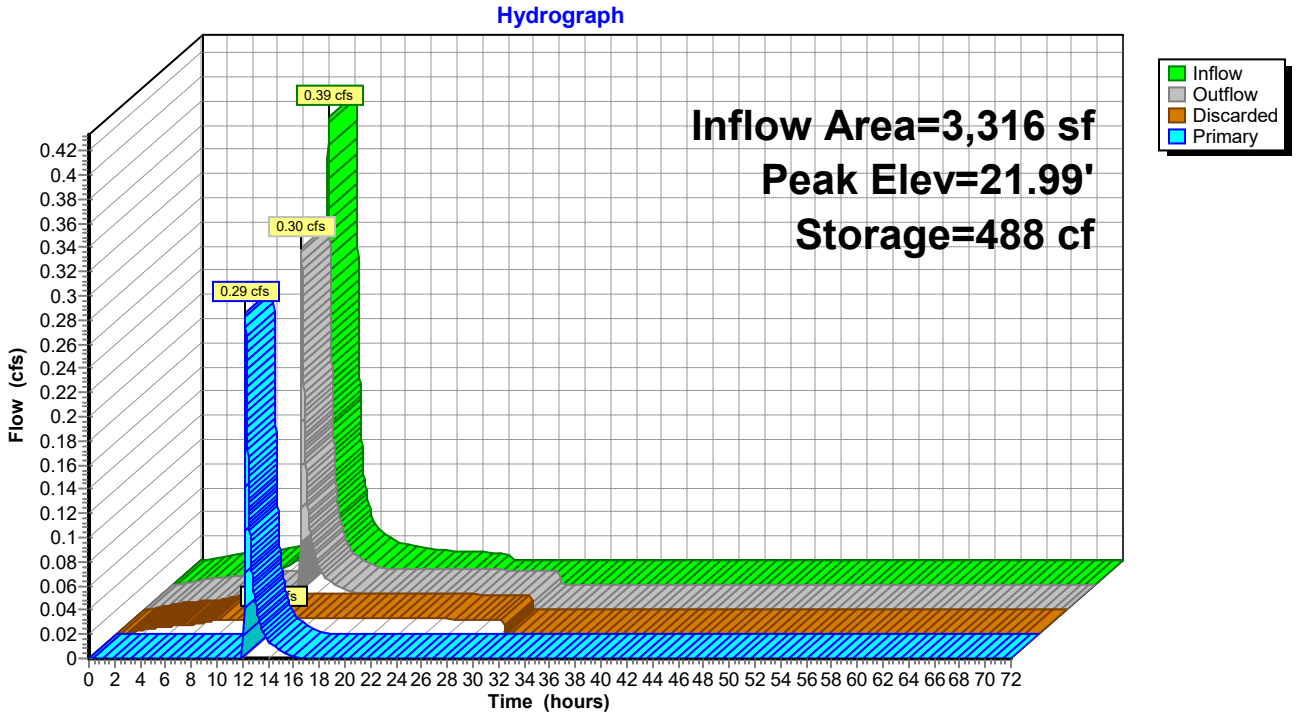
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW2B: Drywell 2B



Summary for Pond RG1A: Rain Garden 1A

Inflow Area = 29,515 sf, 69.22% Impervious, Inflow Depth = 5.67" for 25-Year event
Inflow = 3.21 cfs @ 12.14 hrs, Volume= 13,938 cf
Outflow = 3.05 cfs @ 12.17 hrs, Volume= 13,938 cf, Atten= 5%, Lag= 1.7 min
Discarded = 0.08 cfs @ 12.17 hrs, Volume= 7,273 cf
Primary = 2.97 cfs @ 12.17 hrs, Volume= 6,665 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.95' @ 12.17 hrs Surf.Area= 3,397 sf Storage= 3,508 cf

Plug-Flow detention time= 271.2 min calculated for 13,936 cf (100% of inflow)
Center-of-Mass det. time= 271.3 min (1,036.9 - 765.6)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,688 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

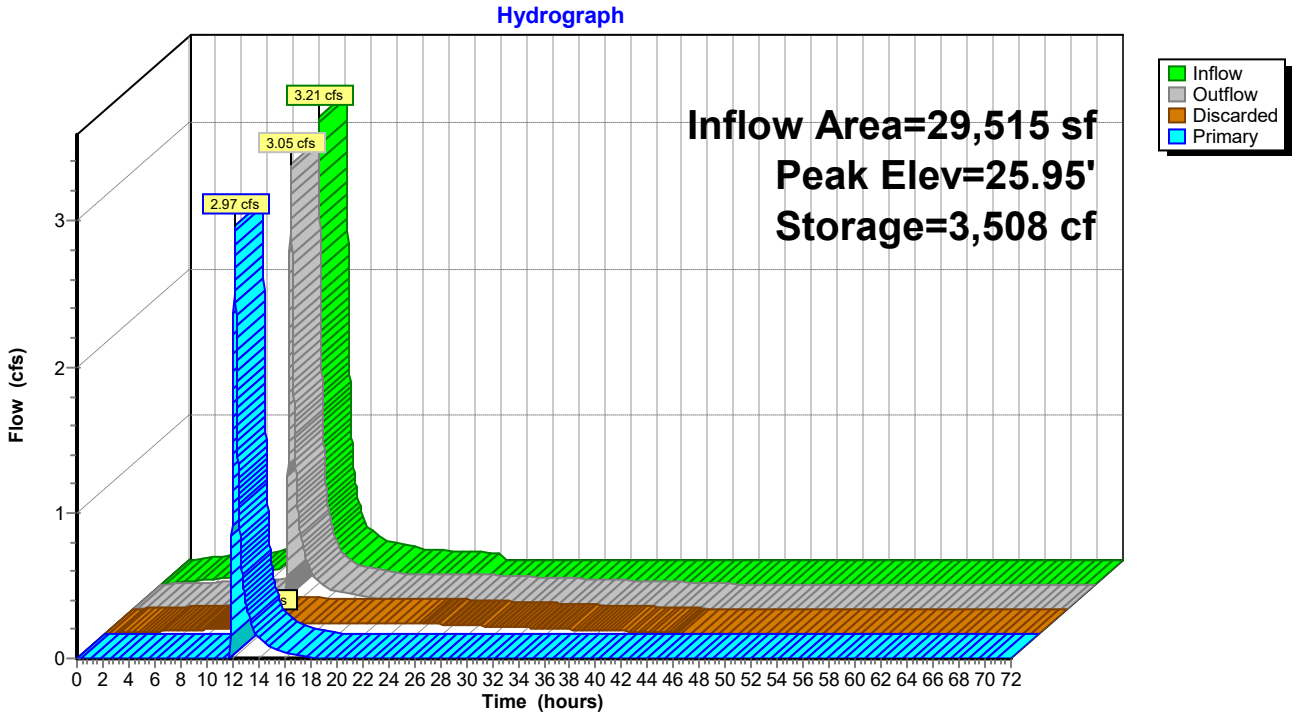
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	461	161.0	0	0	461
25.00	1,829	216.0	1,069	1,069	2,122
26.00	3,498	260.0	2,619	3,688	3,805

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 27.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 19.60' S= 0.0889 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	25.80'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	24.00'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.80' Phase-In= 0.01'

Discarded OutFlow Max=0.08 cfs @ 12.17 hrs HW=25.95' (Free Discharge)
└**3=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=2.97 cfs @ 12.17 hrs HW=25.95' TW=21.43' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.97 cfs of 10.77 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 2.97 cfs @ 1.26 fps)

Pond RG1A: Rain Garden 1A

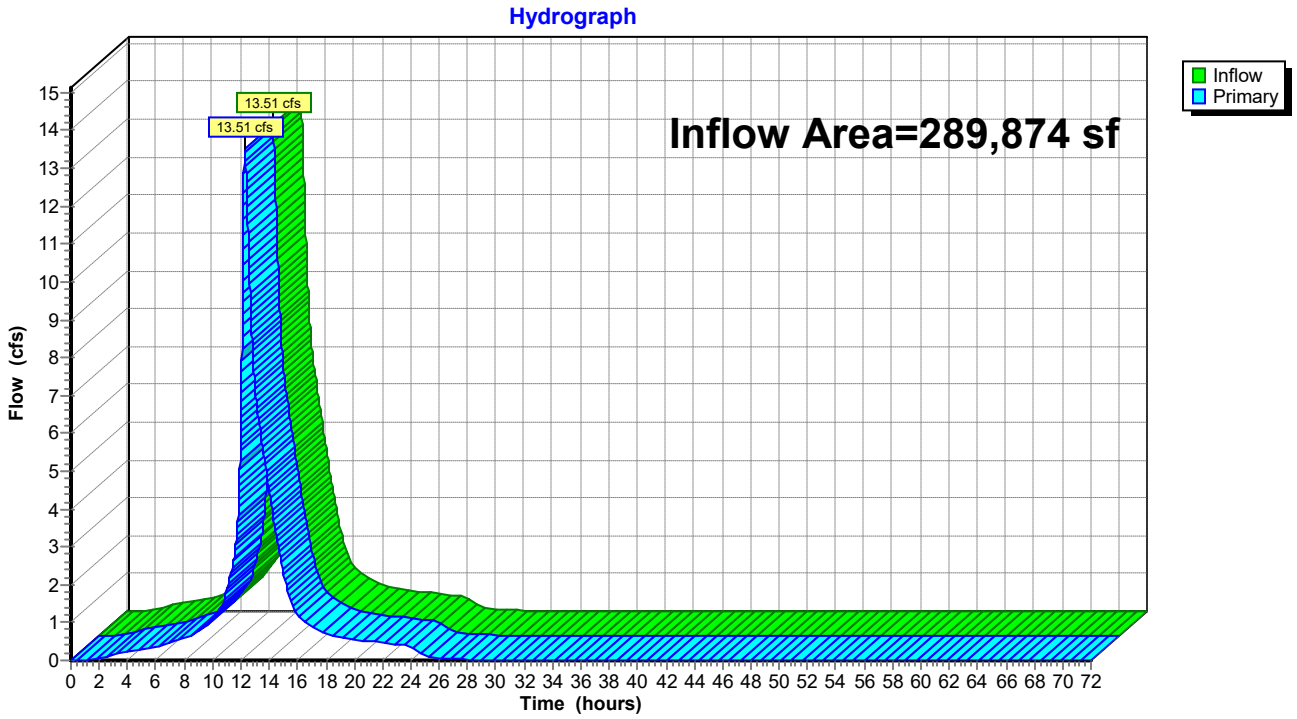


Summary for Link 3L: Pr. POA 1

Inflow Area = 289,874 sf, 70.62% Impervious, Inflow Depth = 5.06" for 25-Year event
Inflow = 13.51 cfs @ 12.26 hrs, Volume= 122,338 cf
Primary = 13.51 cfs @ 12.26 hrs, Volume= 122,338 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



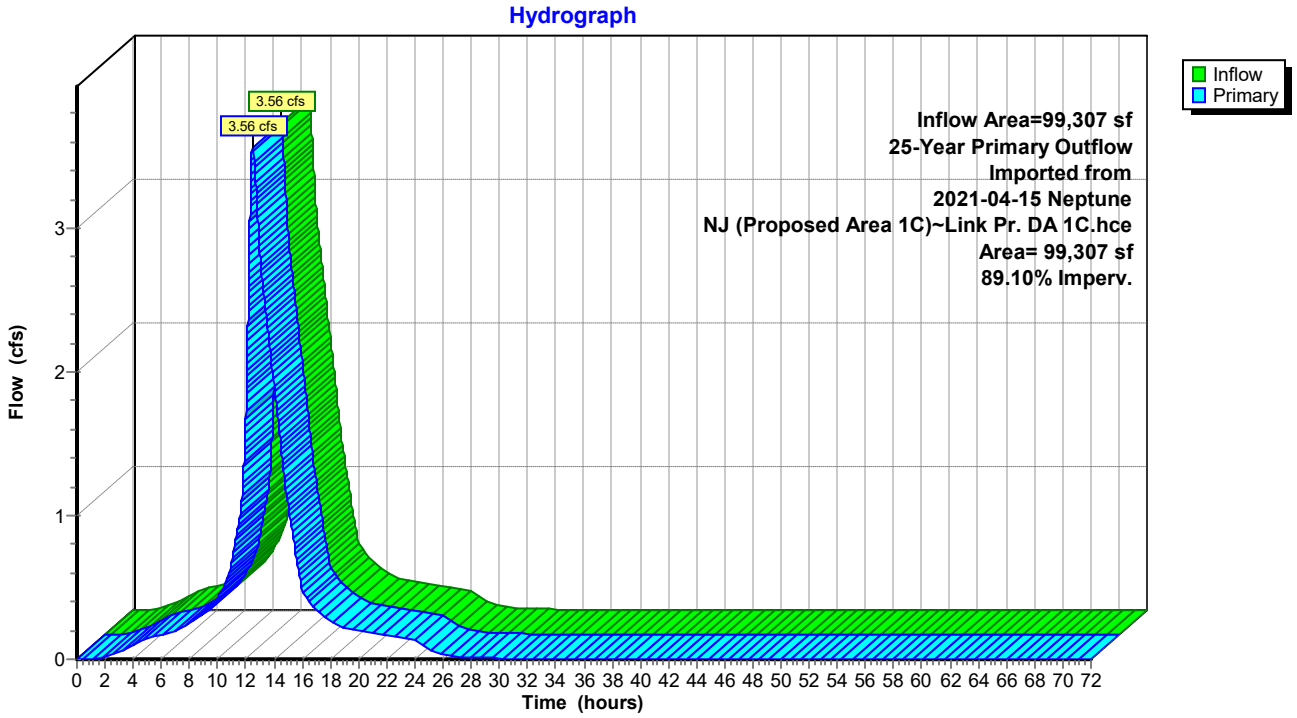
Summary for Link 4L: Pr DA 1C Total

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 5.50" for 25-Year event
Inflow = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf
Primary = 3.56 cfs @ 12.48 hrs, Volume= 45,555 cf, Atten= 0%, Lag= 0.0 min

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

25-Year Primary Outflow Imported from 2021-04-15 Neptune, NJ (Proposed Area 1C)~Link Pr. DA 1C.hce

Link 4L: Pr DA 1C Total



Summary for Subcatchment 6S: Pr. Area 2

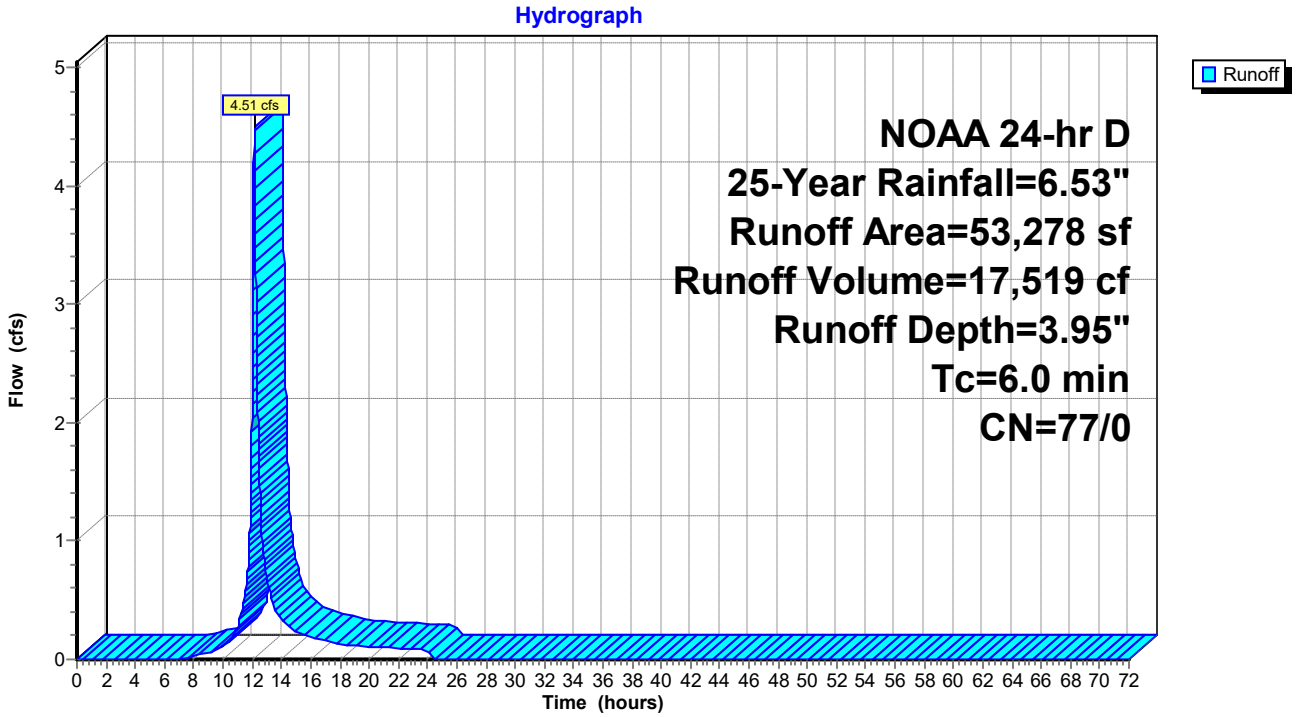
Runoff = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf, Depth= 3.95"

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
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2

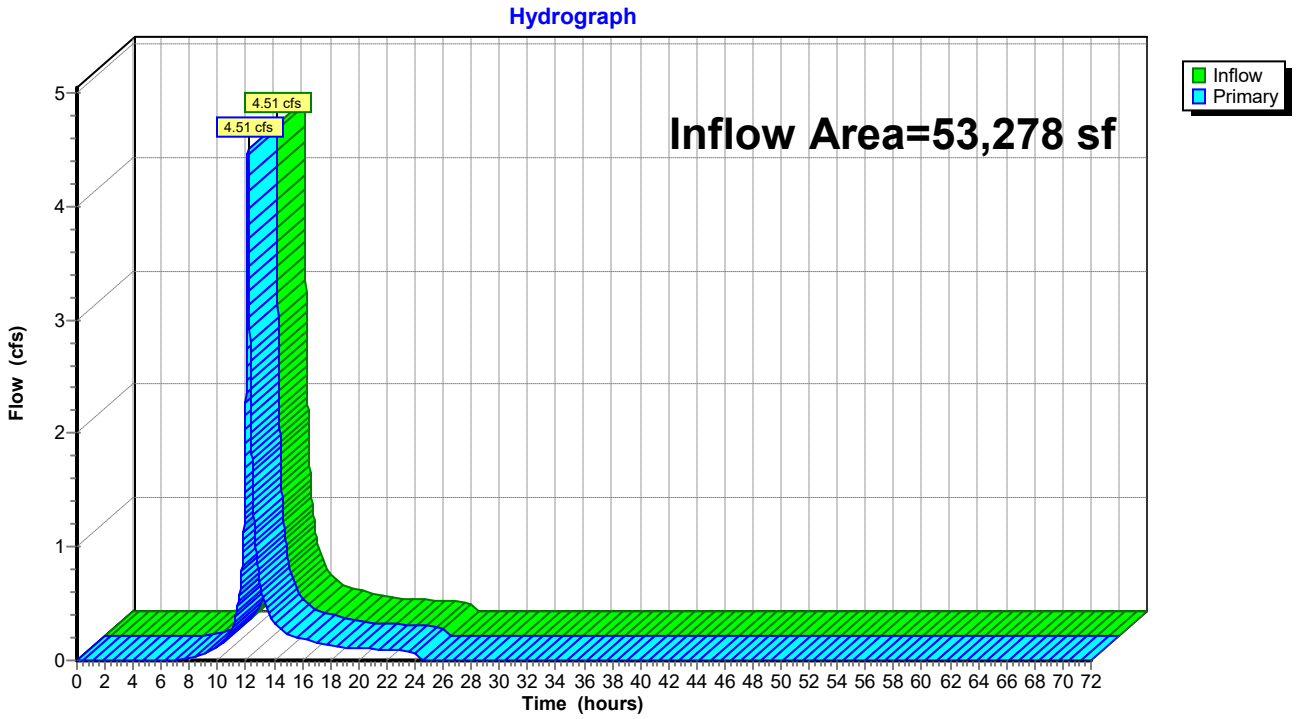


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 3.95" for 25-Year event
Inflow = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf
Primary = 4.51 cfs @ 12.14 hrs, Volume= 17,519 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



APPENDIX C-4
100-YEAR STORM EVENT HYDROGRAPHS

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

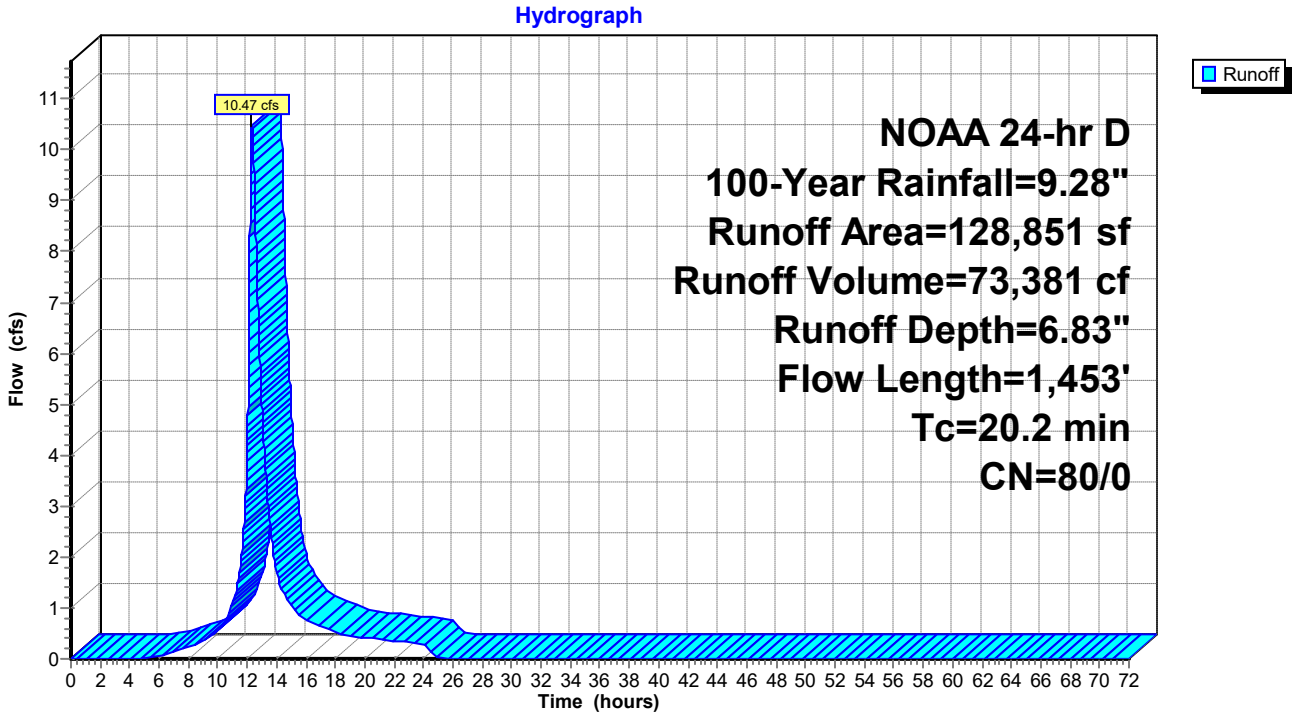
Runoff = 10.47 cfs @ 12.31 hrs, Volume= 73,381 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
115,266	80	>75% Grass cover, Good, HSG D
13,585	77	Woods, Good, HSG D
128,851	80	Weighted Average
128,851	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
10.6	1,278		2.00		**Direct Entry, Channel Flow**
20.2	1,453	Total			

Subcatchment 1S: Ex. Area 1A Perv.



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

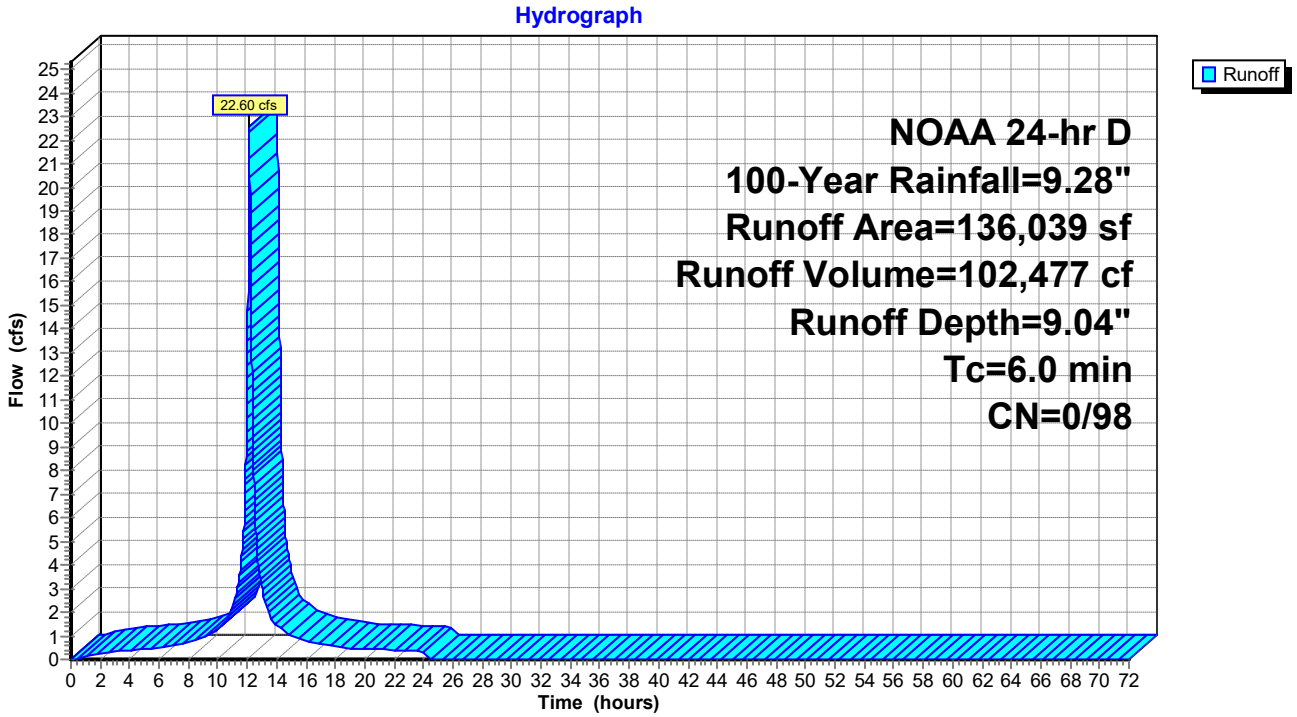
Runoff = 22.60 cfs @ 12.14 hrs, Volume= 102,477 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
136,039	98	Paved parking, HSG D
136,039	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 1A Imp.



Summary for Subcatchment 5S: Ex. Area 2

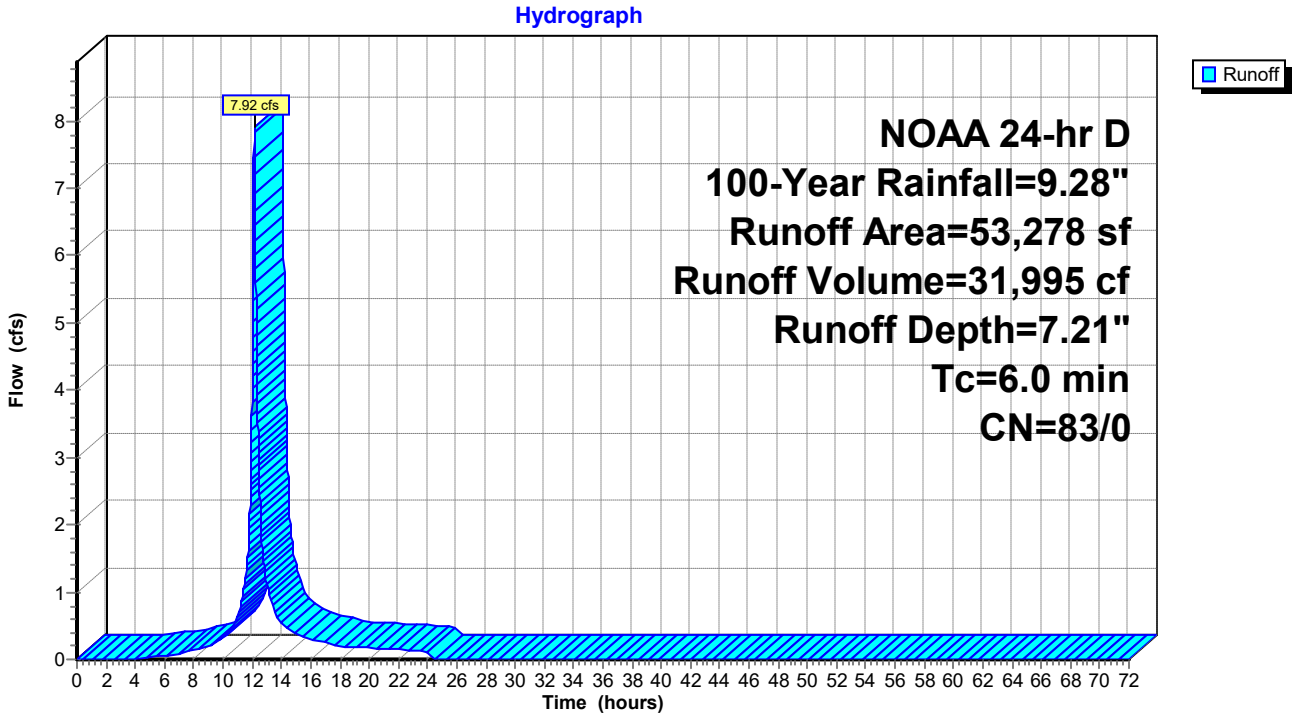
Runoff = 7.92 cfs @ 12.14 hrs, Volume= 31,995 cf, Depth= 7.21"

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=9.28"

Area (sf)	CN	Description
53,278	83	Woods, Poor, HSG D
53,278	83	100.00% Pervious Area

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

Subcatchment 5S: Ex. Area 2



Summary for Subcatchment 6S: Pr. Area 2

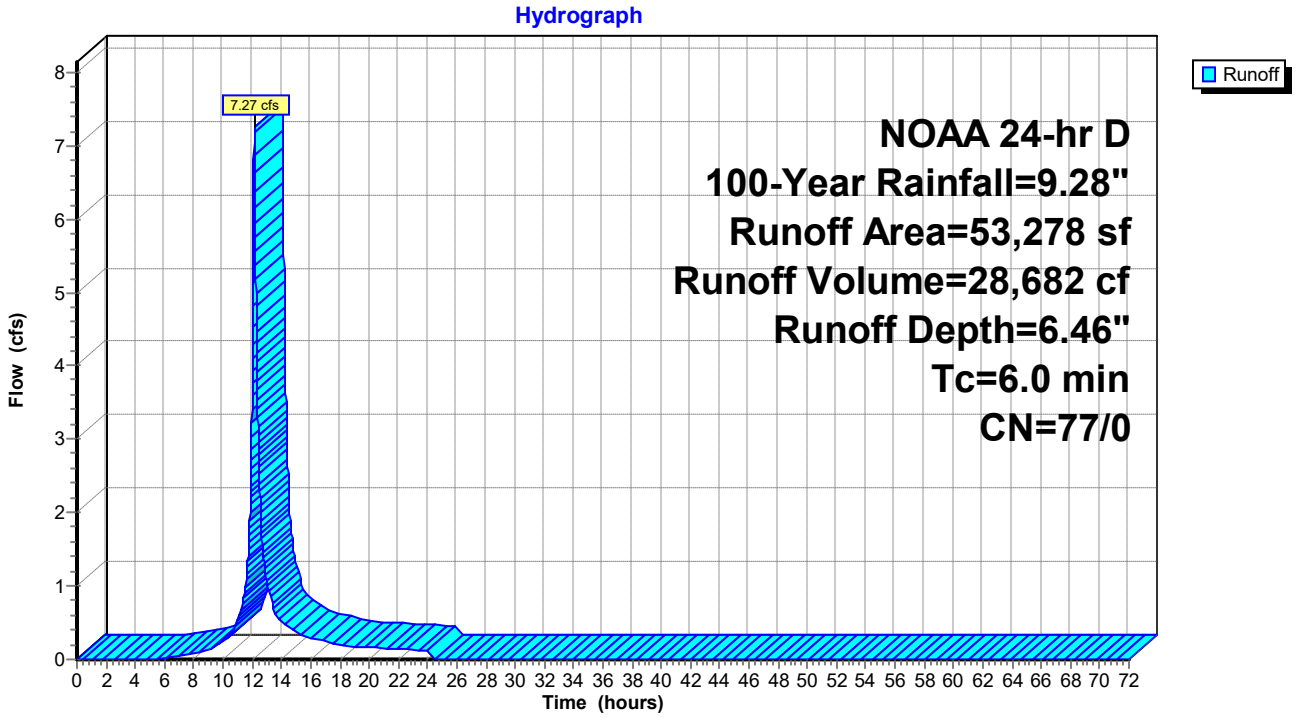
Runoff = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf, Depth= 6.46"

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=9.28"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2



Summary for Subcatchment 10S: Ex. Area 1B Perv.

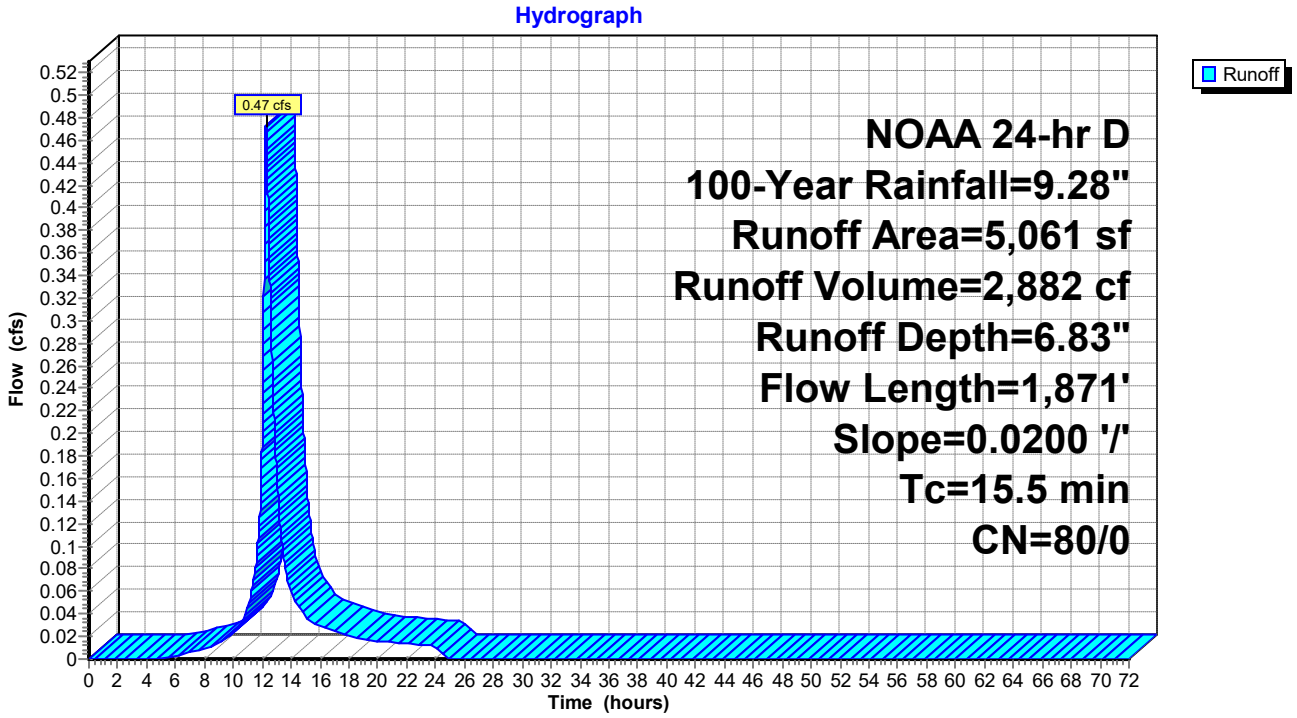
Runoff = 0.47 cfs @ 12.26 hrs, Volume= 2,882 cf, Depth= 6.83"

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=9.28"

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
1.2	100	0.0200	1.41		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.34"
1.1	184	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.2	1,587		2.00		**Direct Entry,**
15.5	1,871	Total			

Subcatchment 10S: Ex. Area 1B Perv.



Summary for Subcatchment 11S: Ex. Area 1B Imp.

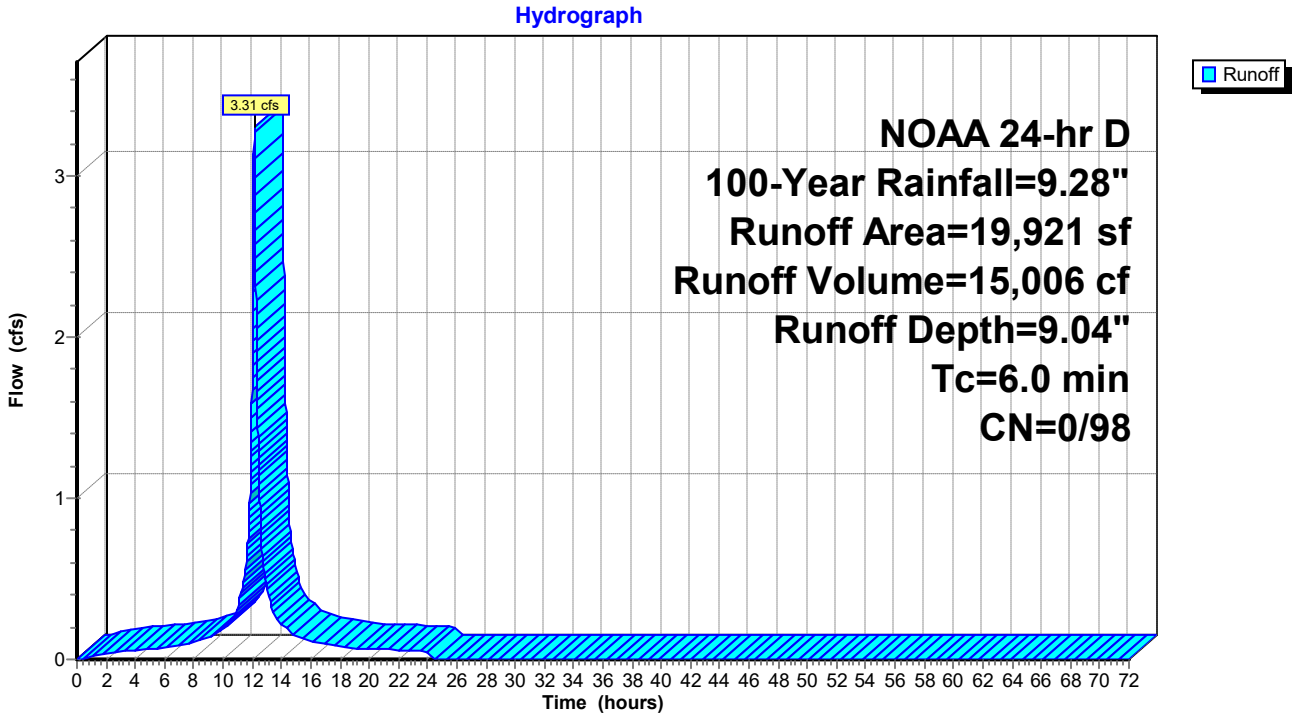
Runoff = 3.31 cfs @ 12.14 hrs, Volume= 15,006 cf, Depth= 9.04"

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=9.28"

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 1B Imp.

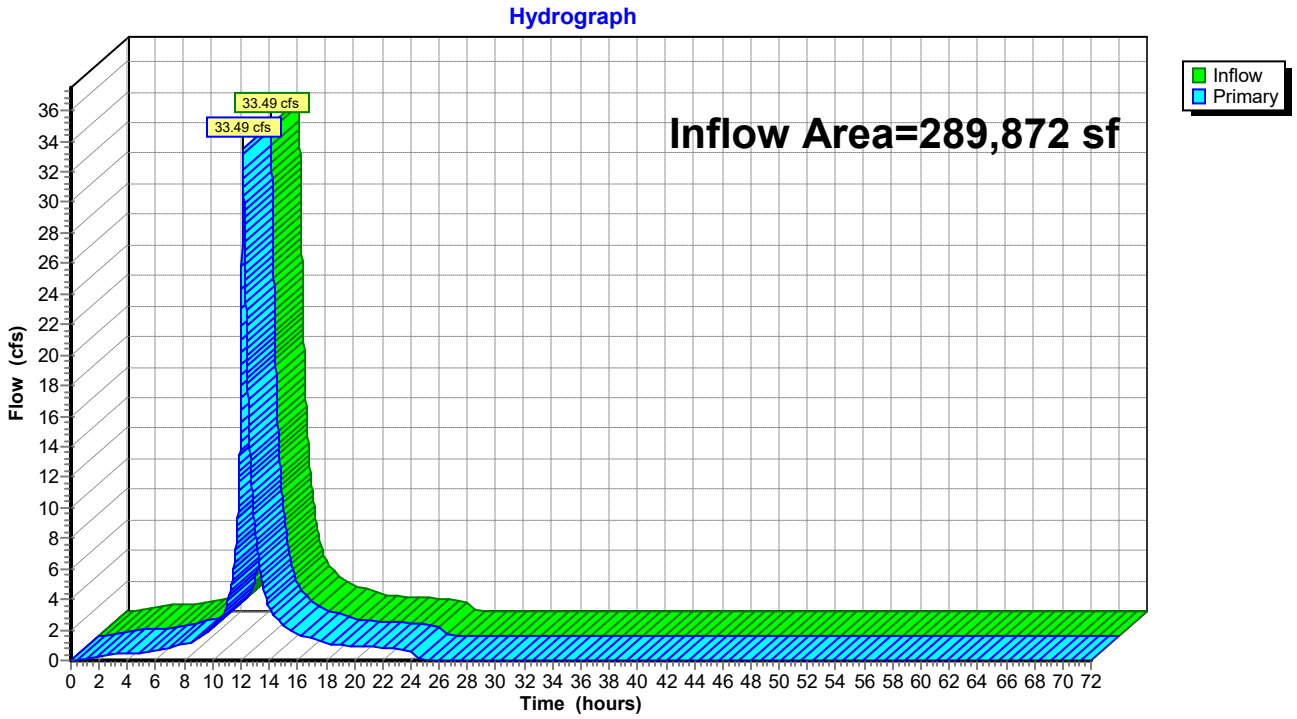


Summary for Link 3L: EX POA 1 (Construction)

Inflow Area = 289,872 sf, 53.80% Impervious, Inflow Depth = 8.02" for 100-Year event
Inflow = 33.49 cfs @ 12.15 hrs, Volume= 193,747 cf
Primary = 33.49 cfs @ 12.15 hrs, Volume= 193,747 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 (Construction)

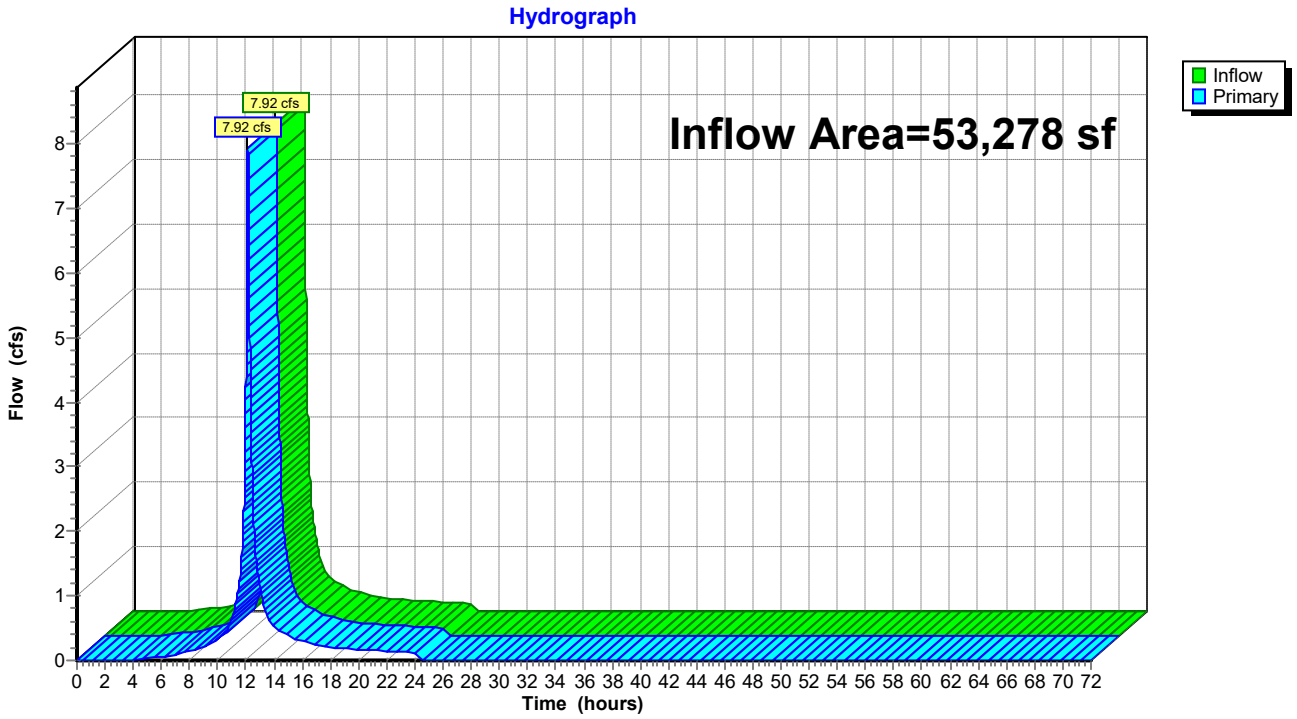


Summary for Link 4L: EX POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 7.21" for 100-Year event
Inflow = 7.92 cfs @ 12.14 hrs, Volume= 31,995 cf
Primary = 7.92 cfs @ 12.14 hrs, Volume= 31,995 cf, Atten= 0%, Lag= 0.0 min

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

Link 4L: EX POA 2 (Reforestation)

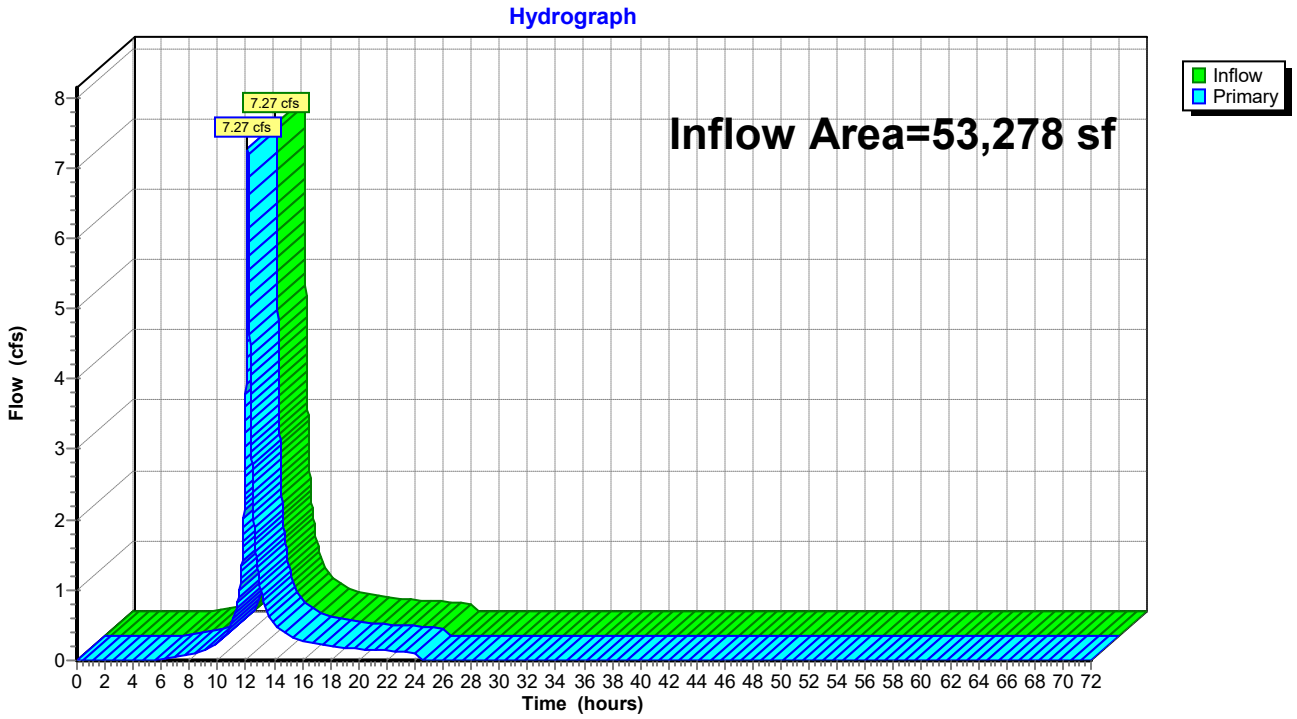


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 6.46" for 100-Year event
Inflow = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf
Primary = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



Summary for Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.

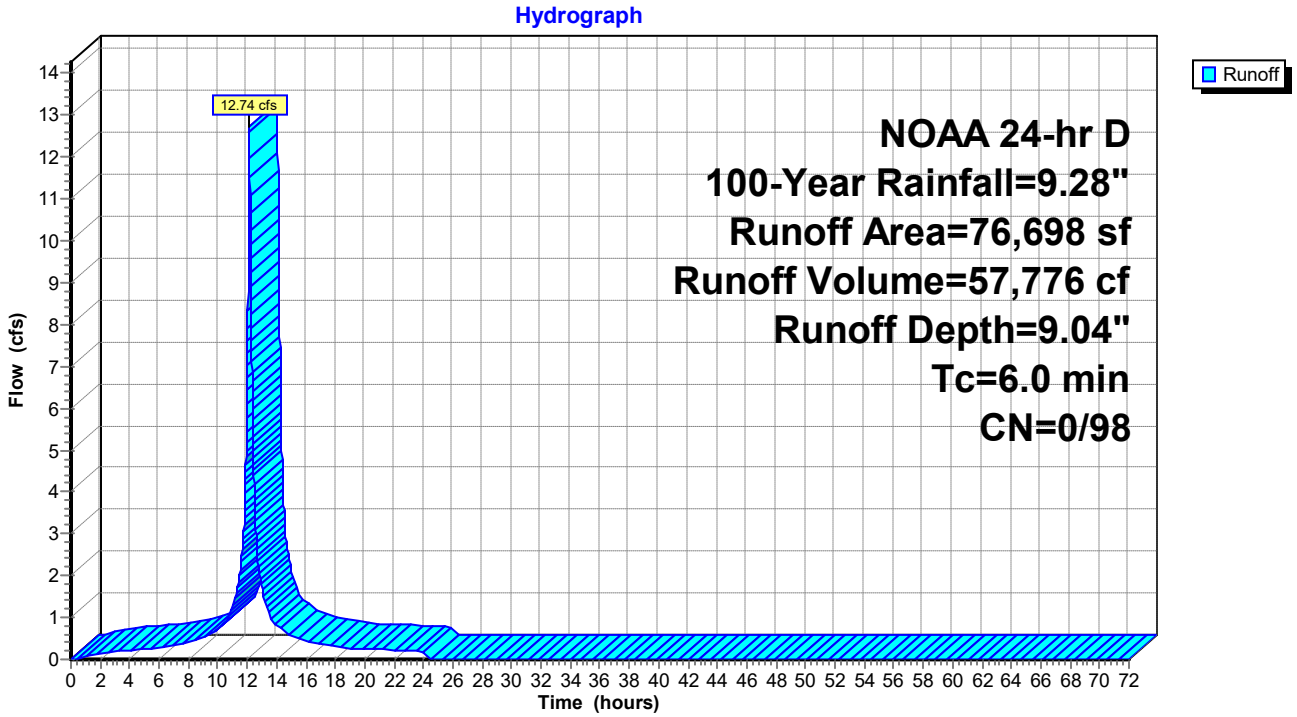
Runoff = 12.74 cfs @ 12.14 hrs, Volume= 57,776 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
76,698	98	Paved parking, HSG D
76,698	98	100.00% Impervious Area

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

Subcatchment B 1Ci: Pr. BASIN Area 1C Imp.



Summary for Subcatchment B 1Cp: PR. BASIN Area 1C Perv.

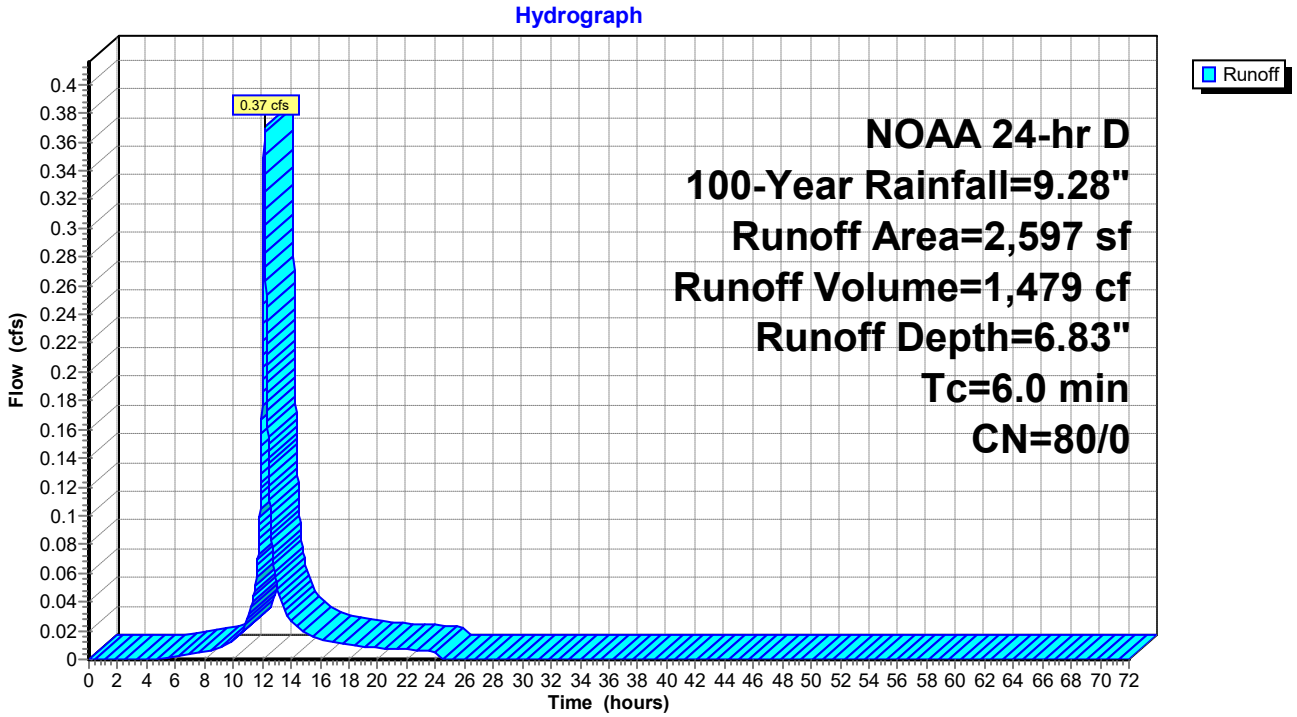
Runoff = 0.37 cfs @ 12.14 hrs, Volume= 1,479 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
2,597	80	>75% Grass cover, Good, HSG D
2,597	80	100.00% Pervious Area

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

Subcatchment B 1Cp: PR. BASIN Area 1C Perv.



Summary for Subcatchment DW 1Ci: Pr. Drywell 1C Imp.

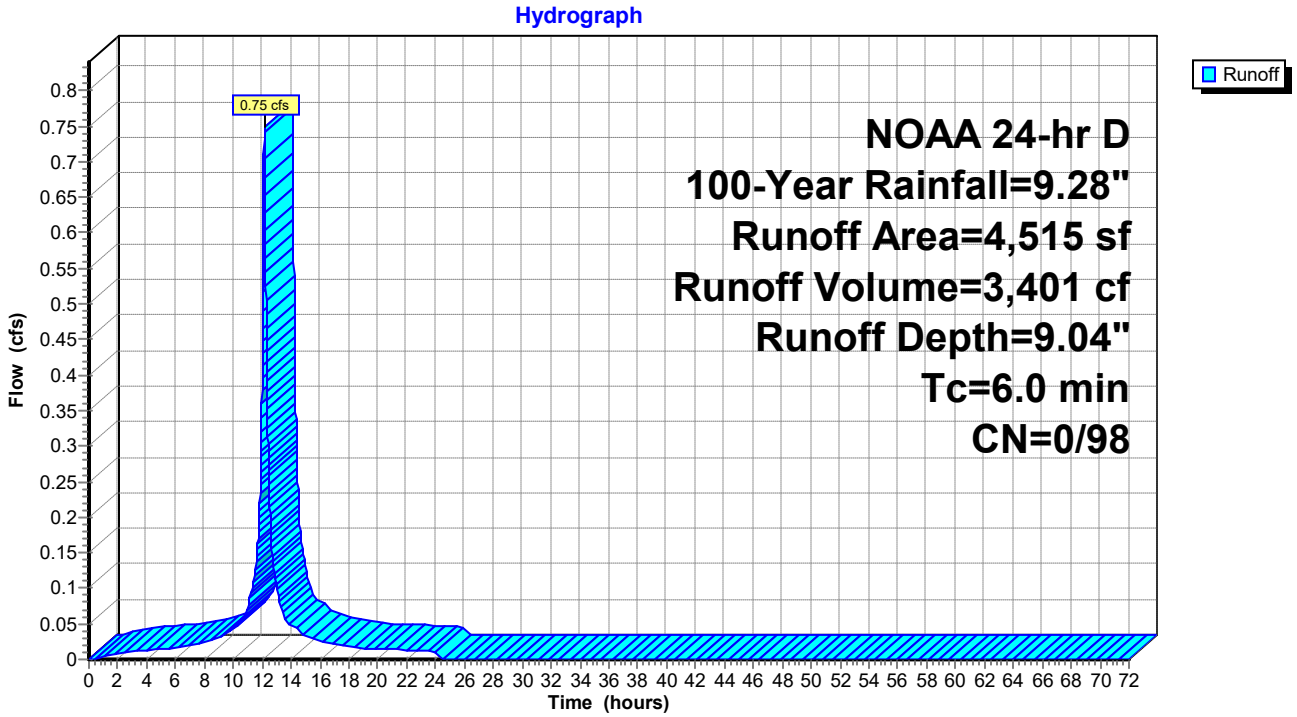
Runoff = 0.75 cfs @ 12.14 hrs, Volume= 3,401 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
4,515	98	Paved parking, HSG D
4,515	98	100.00% Impervious Area

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

Subcatchment DW 1Ci: Pr. Drywell 1C Imp.



Summary for Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.

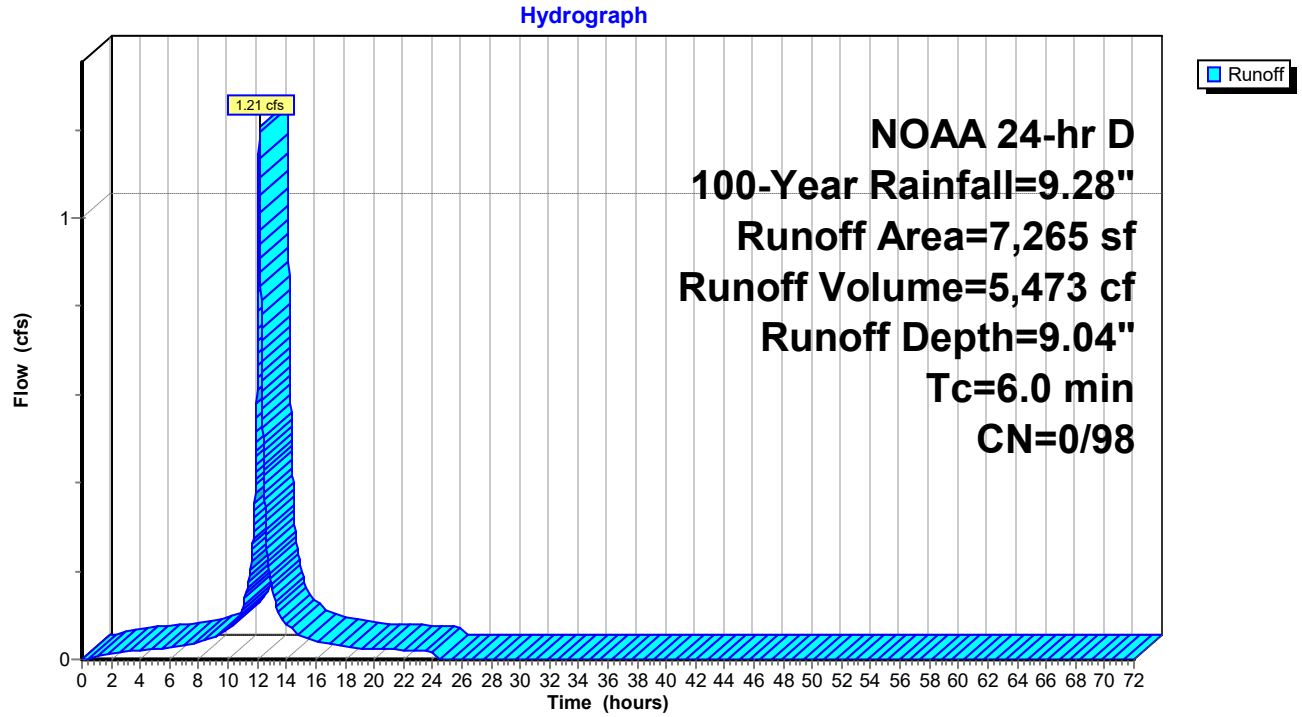
Runoff = 1.21 cfs @ 12.14 hrs, Volume= 5,473 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
7,265	98	Paved parking, HSG D
7,265	98	100.00% Impervious Area

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

Subcatchment RG 1Ci: Pr. Rain Garden Area 1C Imp.



Summary for Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.

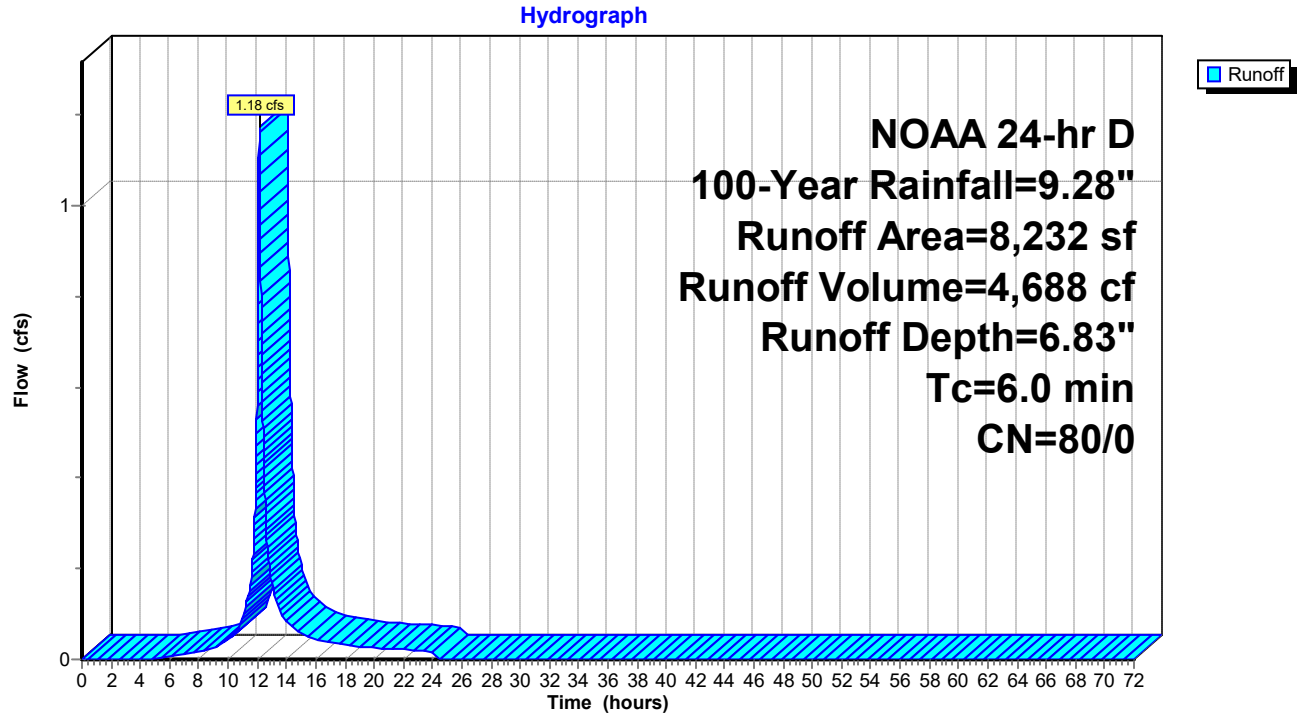
Runoff = 1.18 cfs @ 12.14 hrs, Volume= 4,688 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
8,232	80	>75% Grass cover, Good, HSG D
8,232	80	100.00% Pervious Area

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

Subcatchment RG 1Cp: PR. Rain GardenArea 1C Perv.



Summary for Pond B 1C: Underground Basin 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 8.18" for 100-Year event
Inflow = 16.06 cfs @ 12.14 hrs, Volume= 67,693 cf
Outflow = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf, Atten= 57%, Lag= 14.7 min
Primary = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.49' @ 12.39 hrs Surf.Area= 10,459 sf Storage= 17,917 cf

Plug-Flow detention time= 57.3 min calculated for 67,656 cf (100% of inflow)
Center-of-Mass det. time= 57.3 min (806.3 - 749.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	8,886 cf	**53.78'W x 194.47'L x 3.52'H Field A** 36,868 cf Overall - 14,653 cf Embedded = 22,215 cf x 40.0% Voids
#2A	19.60'	14,040 cf	**Contech ChamberMaxx 2016** x 297 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 11 rows
		22,925 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.96 cfs @ 12.39 hrs HW=21.49' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 6.96 cfs of 10.82 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 3.69 cfs @ 6.76 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 3.27 cfs @ 3.30 fps)

Pond B 1C: Underground Basin 1C - 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 11 rows

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

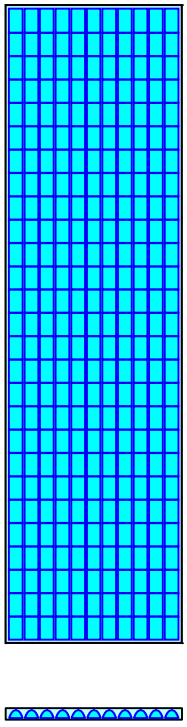
27 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 192.47' Row Length +12.0" End Stone x 2 = 194.47' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

297 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 14,039.6 cf Chamber Storage
297 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 14,653.5 cf Displacement

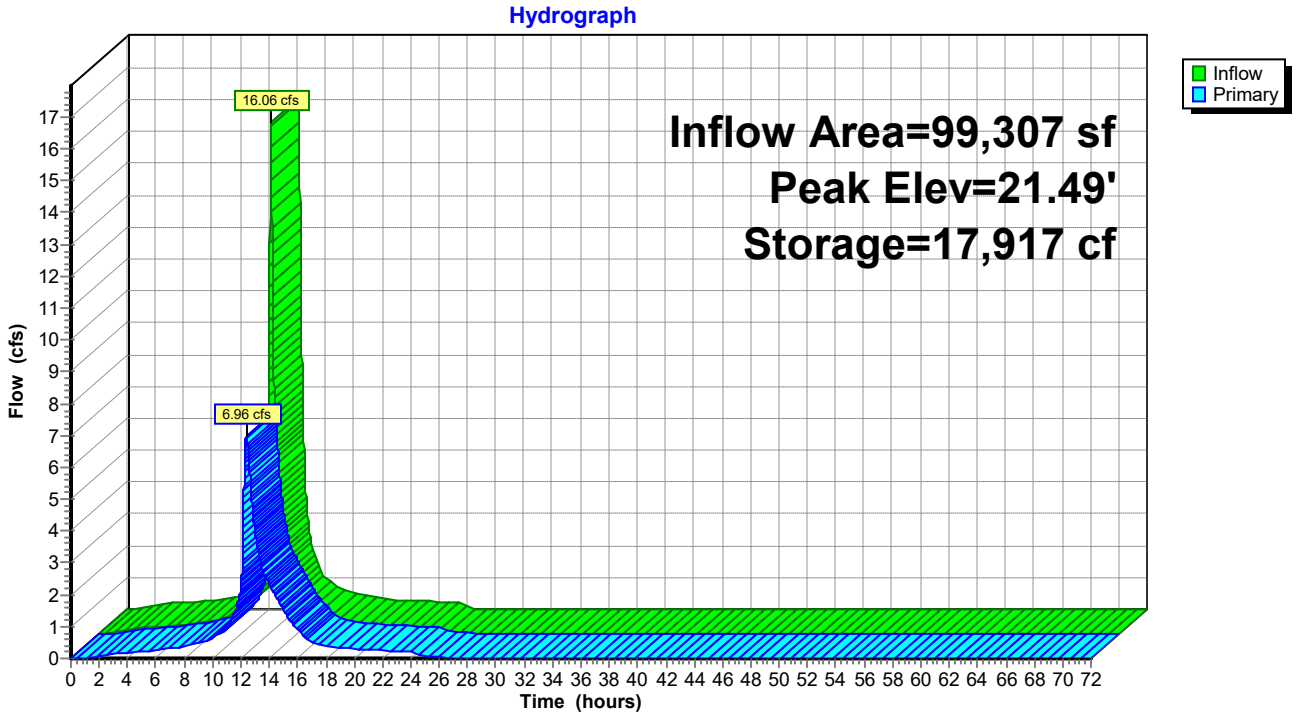
36,868.2 cf Field - 14,653.5 cf Chambers = 22,214.7 cf Stone x 40.0% Voids = 8,885.9 cf Stone Storage

Chamber Storage + Stone Storage = 22,925.5 cf = 0.526 af
Overall Storage Efficiency = 62.2%
Overall System Size = 194.47' x 53.78' x 3.52'

297 Chambers
1,365.5 cy Field
822.8 cy Stone



Pond B 1C: Underground Basin 1C



Summary for Pond DW1C: Drywell 1C

Inflow Area = 4,515 sf,100.00% Impervious, Inflow Depth = 9.04" for 100-Year event
Inflow = 0.75 cfs @ 12.14 hrs, Volume= 3,401 cf
Outflow = 0.72 cfs @ 12.16 hrs, Volume= 3,401 cf, Atten= 4%, Lag= 1.4 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 1,675 cf
Primary = 0.71 cfs @ 12.16 hrs, Volume= 1,726 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.79' @ 12.16 hrs Surf.Area= 497 sf Storage= 766 cf

Plug-Flow detention time= 234.6 min calculated for 3,401 cf (100% of inflow)
Center-of-Mass det. time= 234.7 min (978.5 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.40'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.40' / 21.00' S= 0.0304 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=22.79' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.71 cfs @ 12.16 hrs HW=22.79' TW=20.98' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.71 cfs @ 2.14 fps)

Pond DW1C: Drywell 1C - 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 2 rows

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

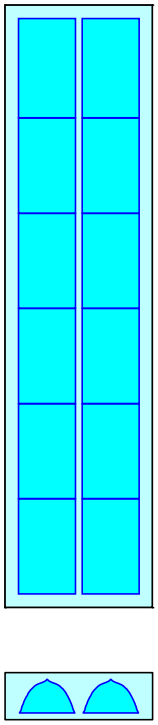
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

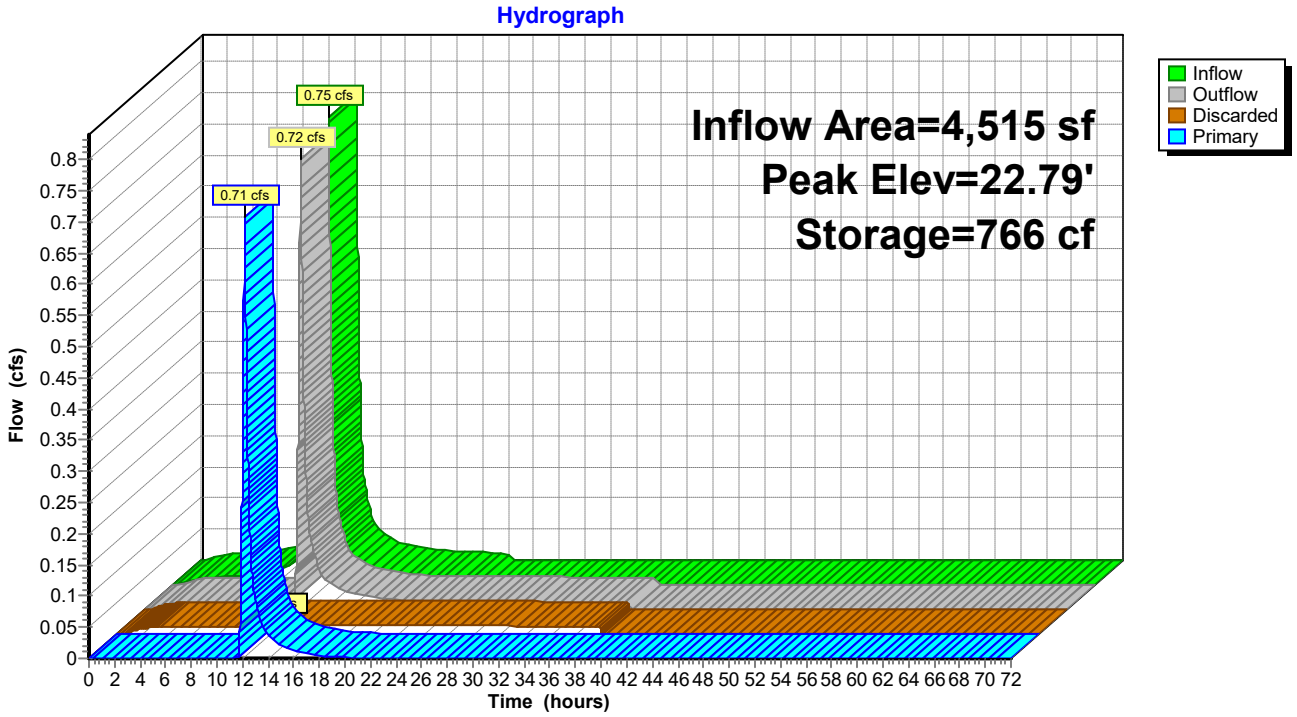
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1C: Drywell 1C



Summary for Pond RG 1C: Rain Garden 1C

Inflow Area = 15,497 sf, 46.88% Impervious, Inflow Depth = 7.87" for 100-Year event
Inflow = 2.38 cfs @ 12.14 hrs, Volume= 10,161 cf
Outflow = 2.34 cfs @ 12.16 hrs, Volume= 10,161 cf, Atten= 2%, Lag= 1.0 min
Discarded = 0.04 cfs @ 12.16 hrs, Volume= 3,449 cf
Primary = 2.30 cfs @ 12.16 hrs, Volume= 6,712 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.97' @ 12.16 hrs Surf.Area= 1,747 sf Storage= 1,237 cf

Plug-Flow detention time= 132.4 min calculated for 10,159 cf (100% of inflow)
Center-of-Mass det. time= 132.5 min (905.6 - 773.2)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	1,282 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

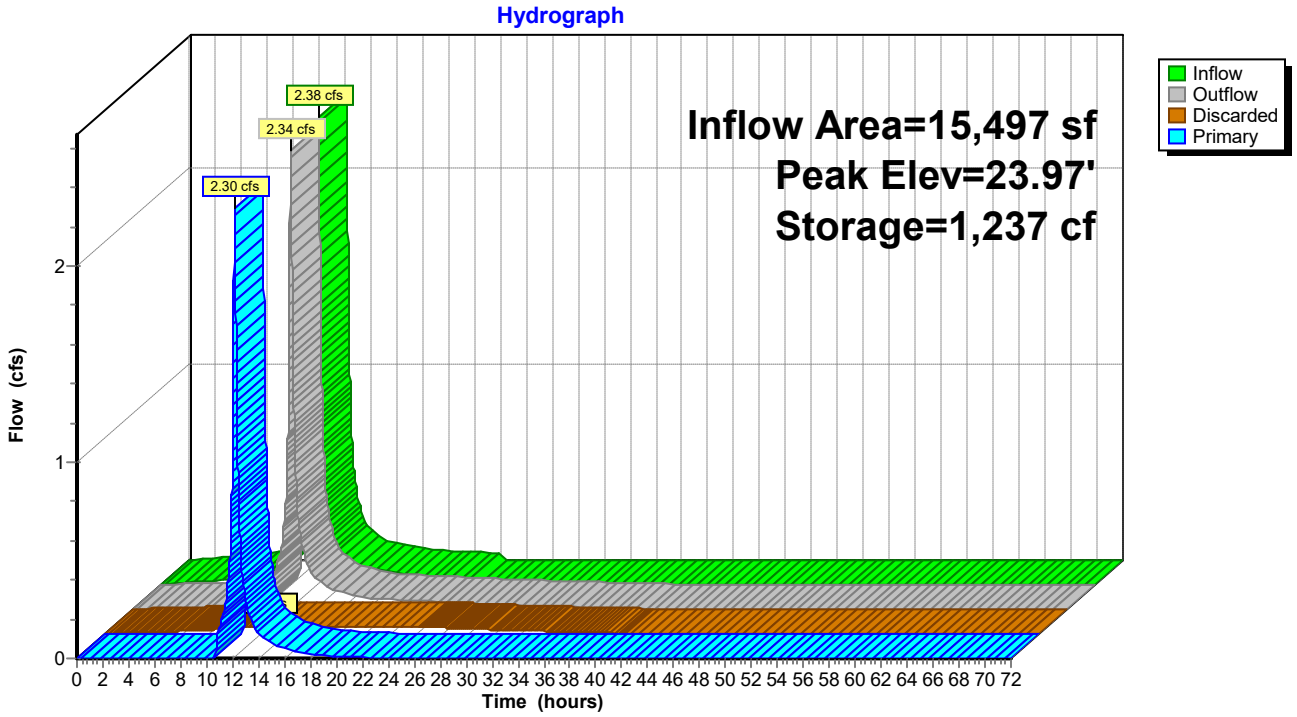
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
22.50	160	58.0	0	0	160
23.00	556	109.0	169	169	839
24.00	1,787	204.0	1,113	1,282	3,210

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Culvert** L= 37.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 20.25' S= 0.0054 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	23.85'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	22.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=23.97' (Free Discharge)
└**3=Exfiltration** (Controls 0.04 cfs)

Primary OutFlow Max=2.29 cfs @ 12.16 hrs HW=23.97' TW=20.95' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.29 cfs of 10.06 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 2.29 cfs @ 1.15 fps)

Pond RG 1C: Rain Garden 1C

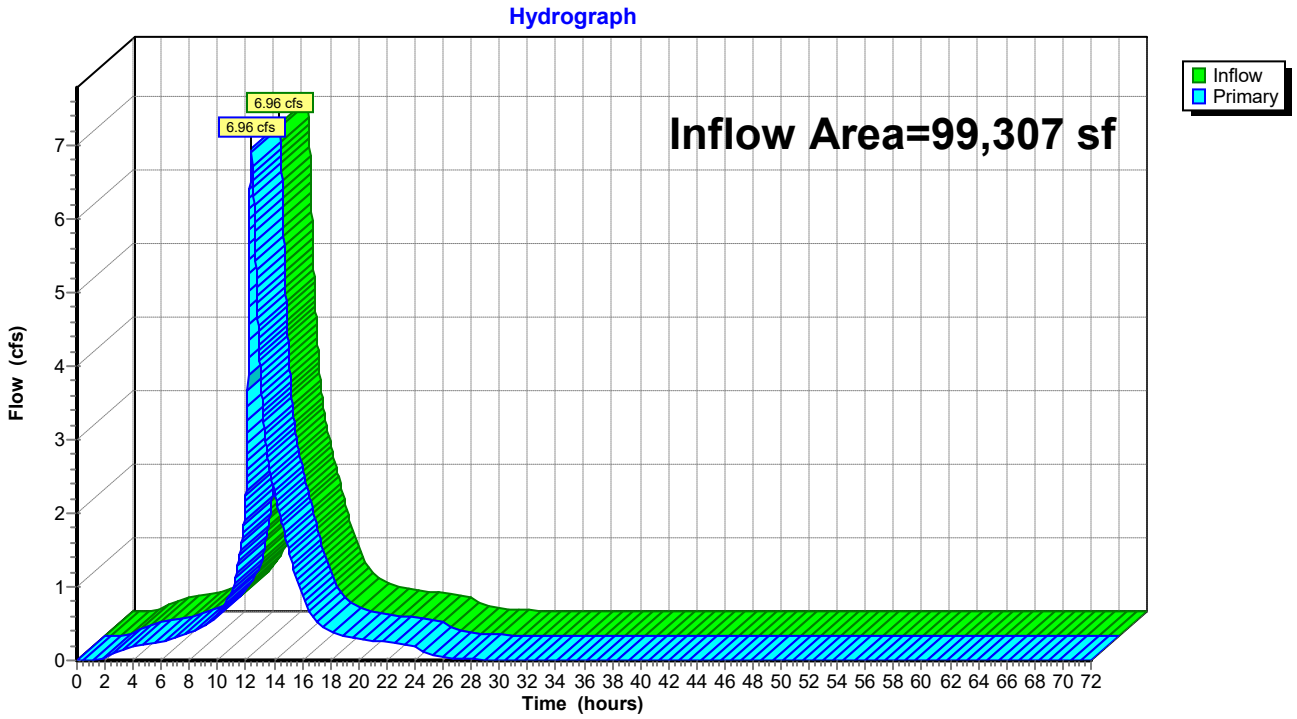


Summary for Link Pr. DA 1C: Pr. DA 1C

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 8.18" for 100-Year event
Inflow = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf
Primary = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf, Atten= 0%, Lag= 0.0 min

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

Link Pr. DA 1C: Pr. DA 1C



Summary for Subcatchment B1Ai: Pr. BAsin Area 1A Imp.

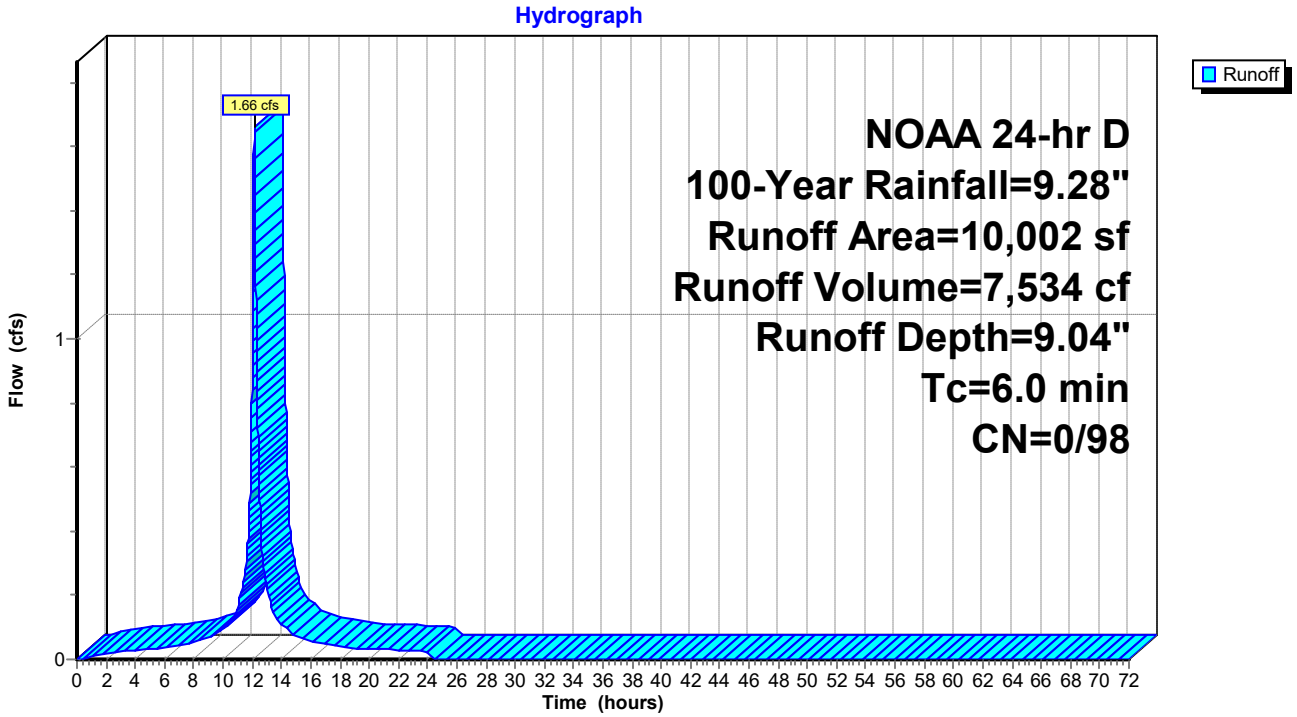
Runoff = 1.66 cfs @ 12.14 hrs, Volume= 7,534 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
10,002	98	Paved parking, HSG D
10,002	98	100.00% Impervious Area

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

Subcatchment B1Ai: Pr. BAsin Area 1A Imp.



Summary for Subcatchment B1Ap: PR. Basin Area 1A Perv.

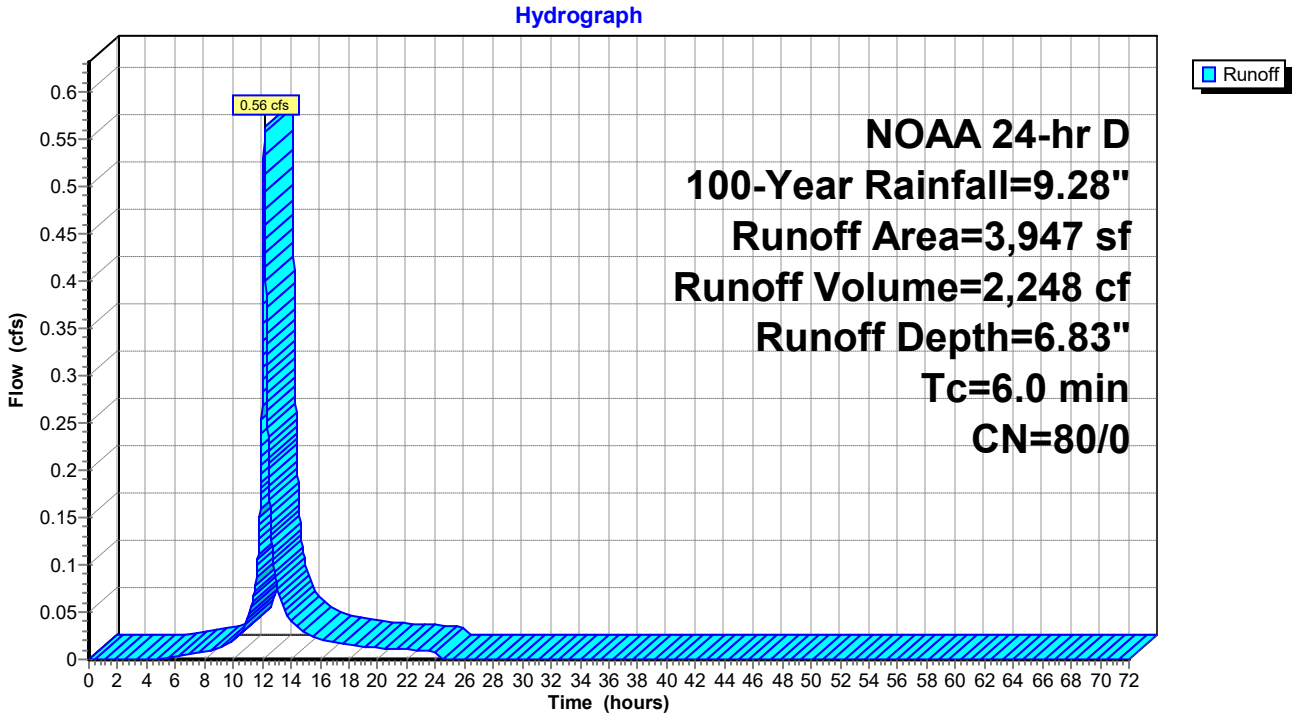
Runoff = 0.56 cfs @ 12.14 hrs, Volume= 2,248 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
3,947	80	>75% Grass cover, Good, HSG D
3,947	80	100.00% Pervious Area

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

Subcatchment B1Ap: PR. Basin Area 1A Perv.



Summary for Subcatchment B1Bi: Pr. Basin Area 1B Imp.

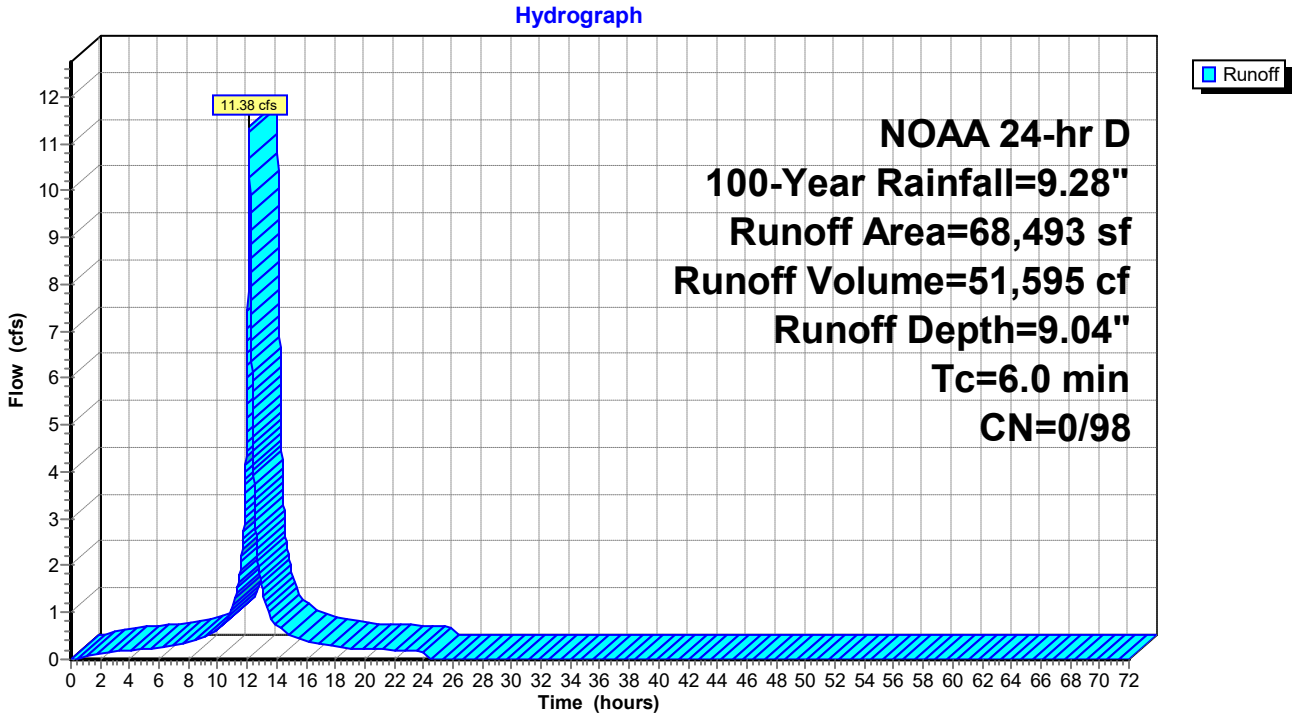
Runoff = 11.38 cfs @ 12.14 hrs, Volume= 51,595 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
68,493	98	Paved parking, HSG D
68,493	98	100.00% Impervious Area

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

Subcatchment B1Bi: Pr. Basin Area 1B Imp.



Summary for Subcatchment B1Bp: PR. Basin Area 1B Perv.

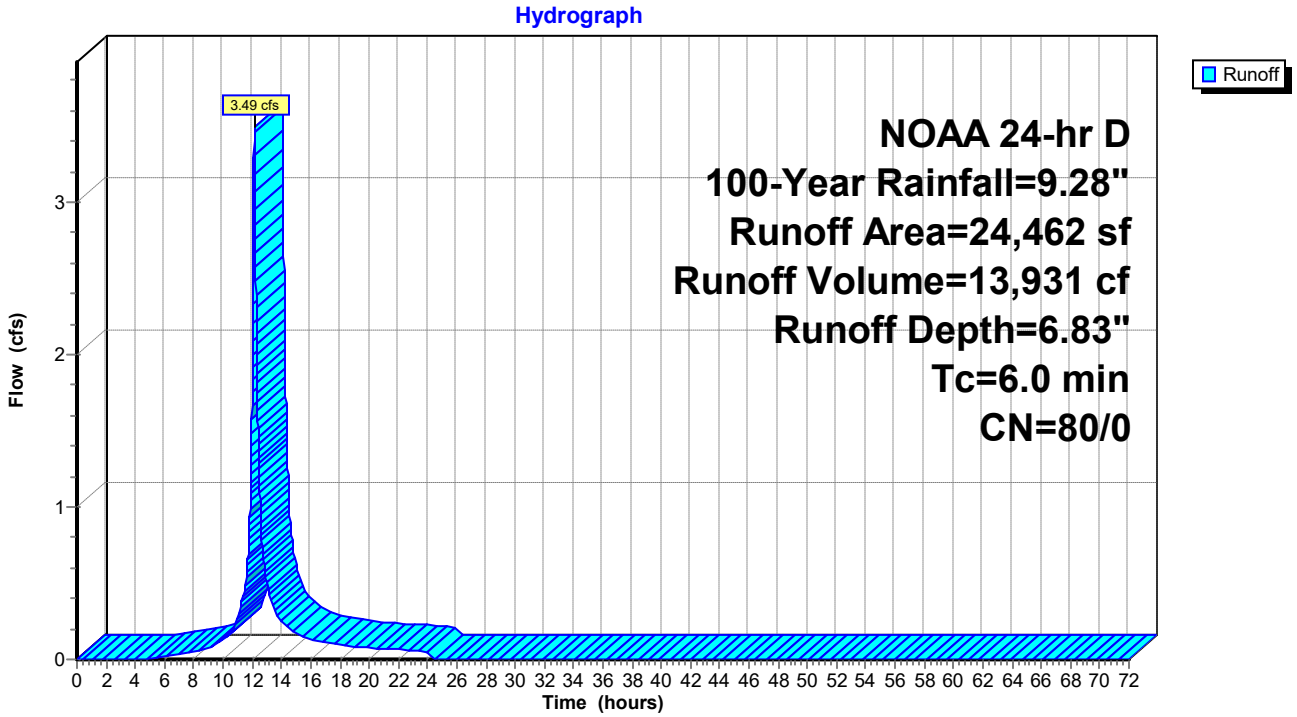
Runoff = 3.49 cfs @ 12.14 hrs, Volume= 13,931 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
24,462	80	>75% Grass cover, Good, HSG D
24,462	80	100.00% Pervious Area

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

Subcatchment B1Bp: PR. Basin Area 1B Perv.



Summary for Subcatchment DA 1Di: Pr. Bypass 1D Imp

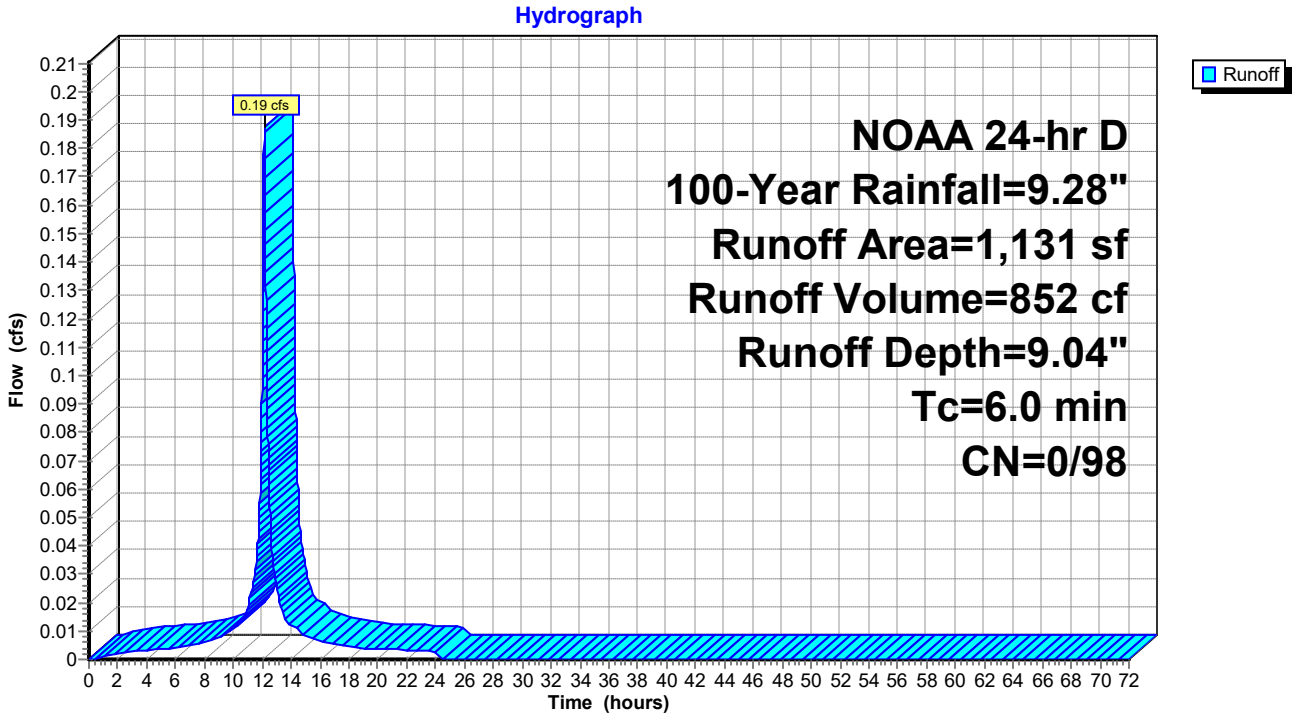
Runoff = 0.19 cfs @ 12.14 hrs, Volume= 852 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
1,131	98	Paved parking, HSG D
1,131	98	100.00% Impervious Area

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

Subcatchment DA 1Di: Pr. Bypass 1D Imp



Summary for Subcatchment DA 1Dp: Pr. Bypass 1D Per

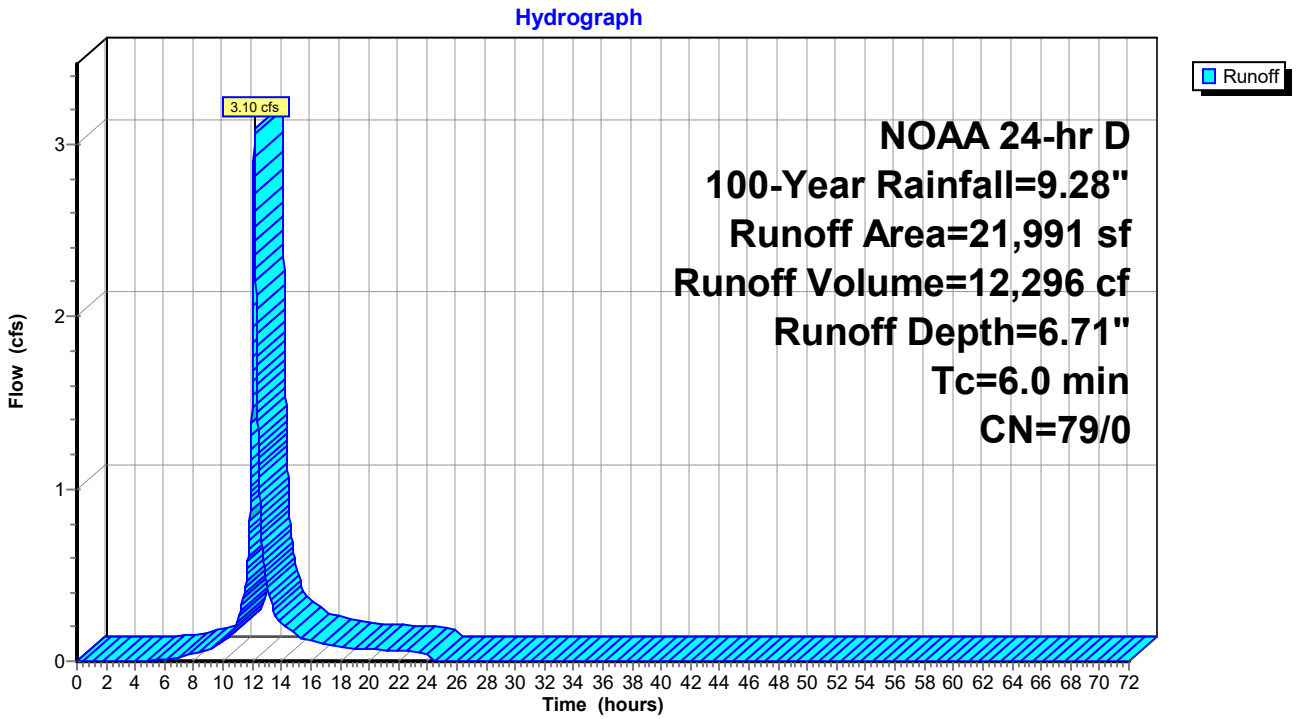
Runoff = 3.10 cfs @ 12.14 hrs, Volume= 12,296 cf, Depth= 6.71"

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=9.28"

Area (sf)	CN	Description
7,982	77	Woods, Good, HSG D
14,009	80	>75% Grass cover, Good, HSG D
21,991	79	Weighted Average
21,991	79	100.00% Pervious Area

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

Subcatchment DA 1Dp: Pr. Bypass 1D Per



Summary for Subcatchment DA 1Ei: Pr. Area 1E Imp

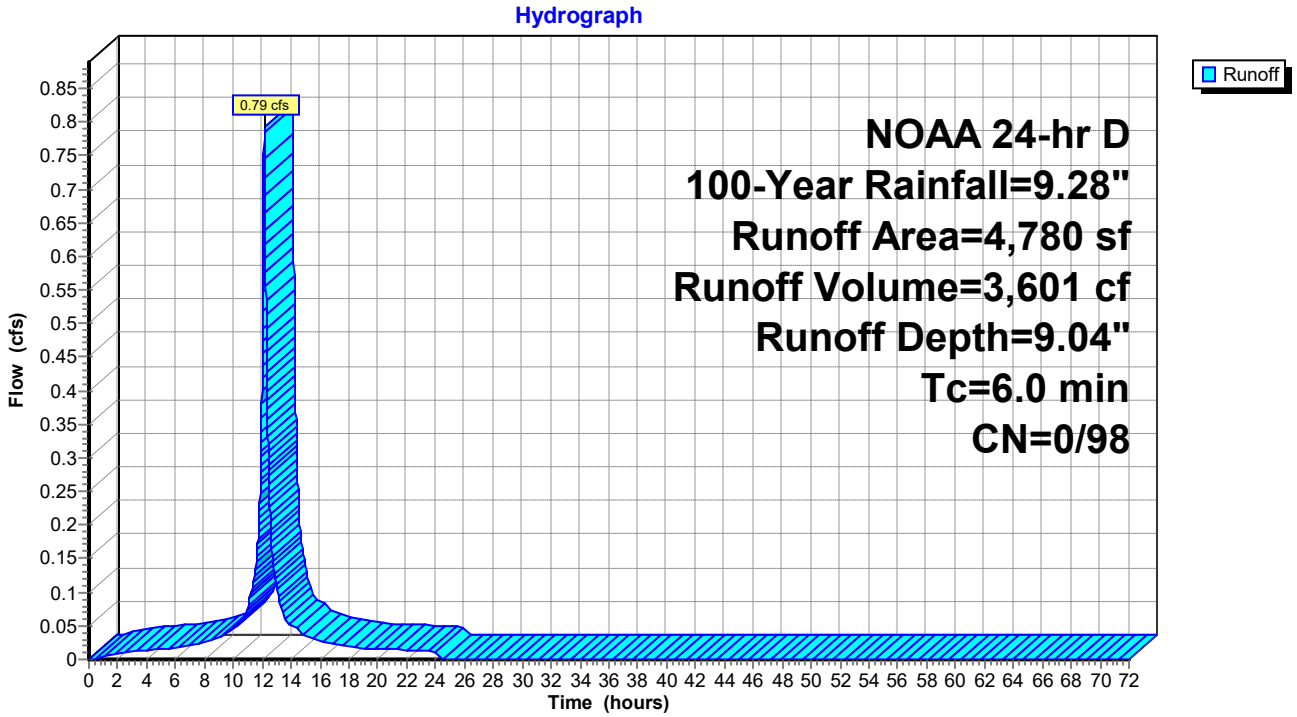
Runoff = 0.79 cfs @ 12.14 hrs, Volume= 3,601 cf, Depth= 9.04"

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=9.28"

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 DA 1Ei: Pr. Area 1E Imp



Summary for Subcatchment DA 1Ep: Pr. Area 1E Perv

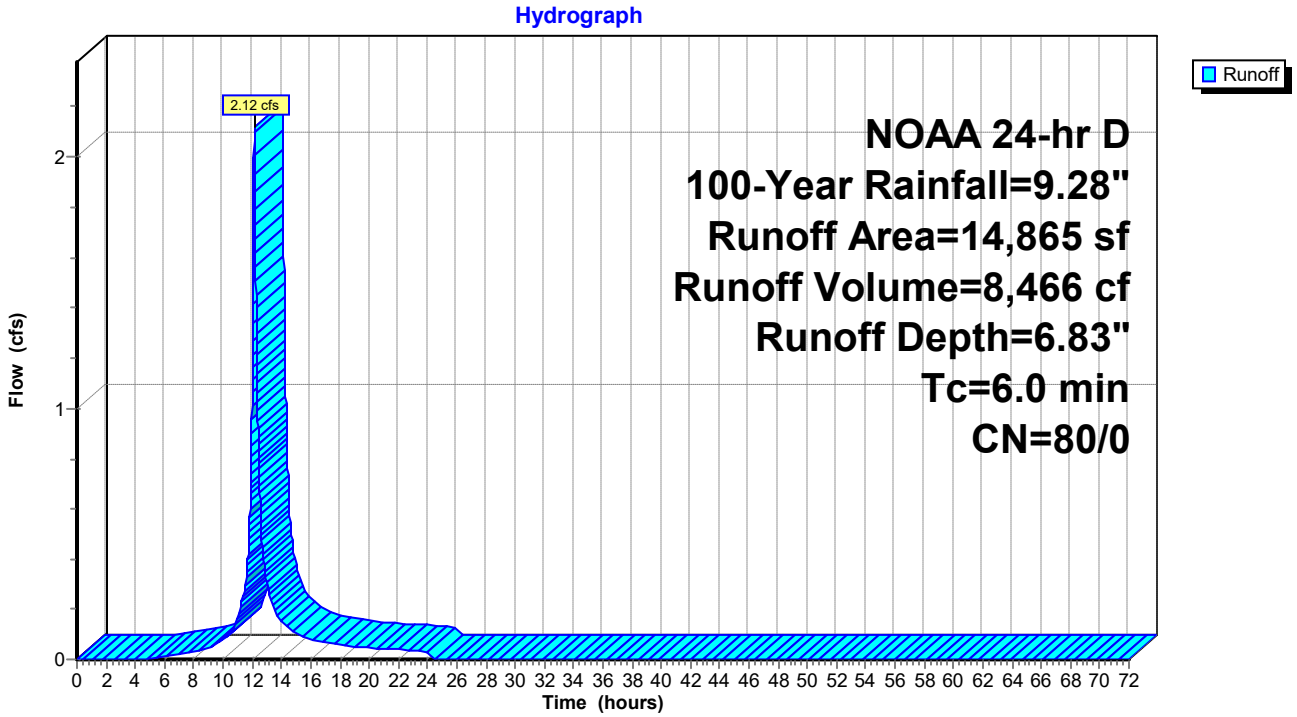
Runoff = 2.12 cfs @ 12.14 hrs, Volume= 8,466 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
14,865	80	>75% Grass cover, Good, HSG D
14,865	80	100.00% Pervious Area

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

Subcatchment DA 1Ep: Pr. Area 1E Perv



Summary for Subcatchment DW1Bi: Pr. Drywell Area 1B

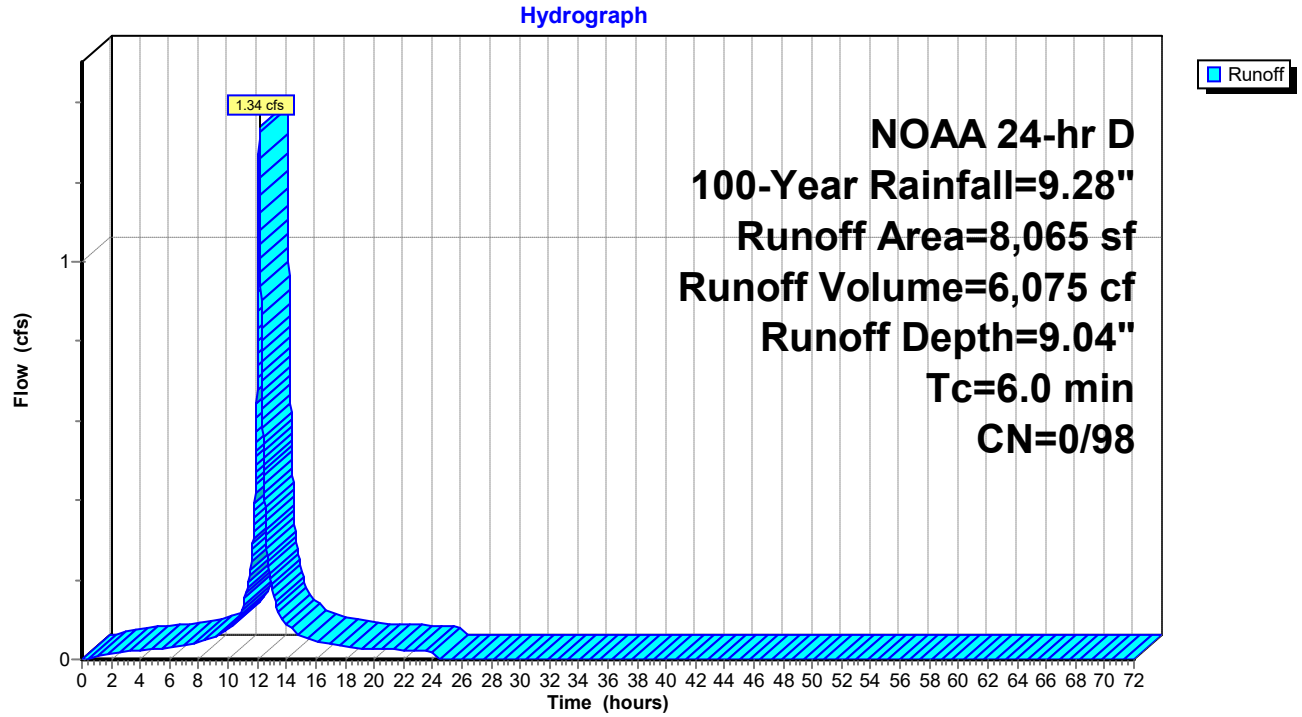
Runoff = 1.34 cfs @ 12.14 hrs, Volume= 6,075 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
8,065	98	Paved parking, HSG D
8,065	98	100.00% Impervious Area

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

Subcatchment DW1Bi: Pr. Drywell Area 1B



Summary for Subcatchment DW2Bi: Pr. Drywell Area 2B

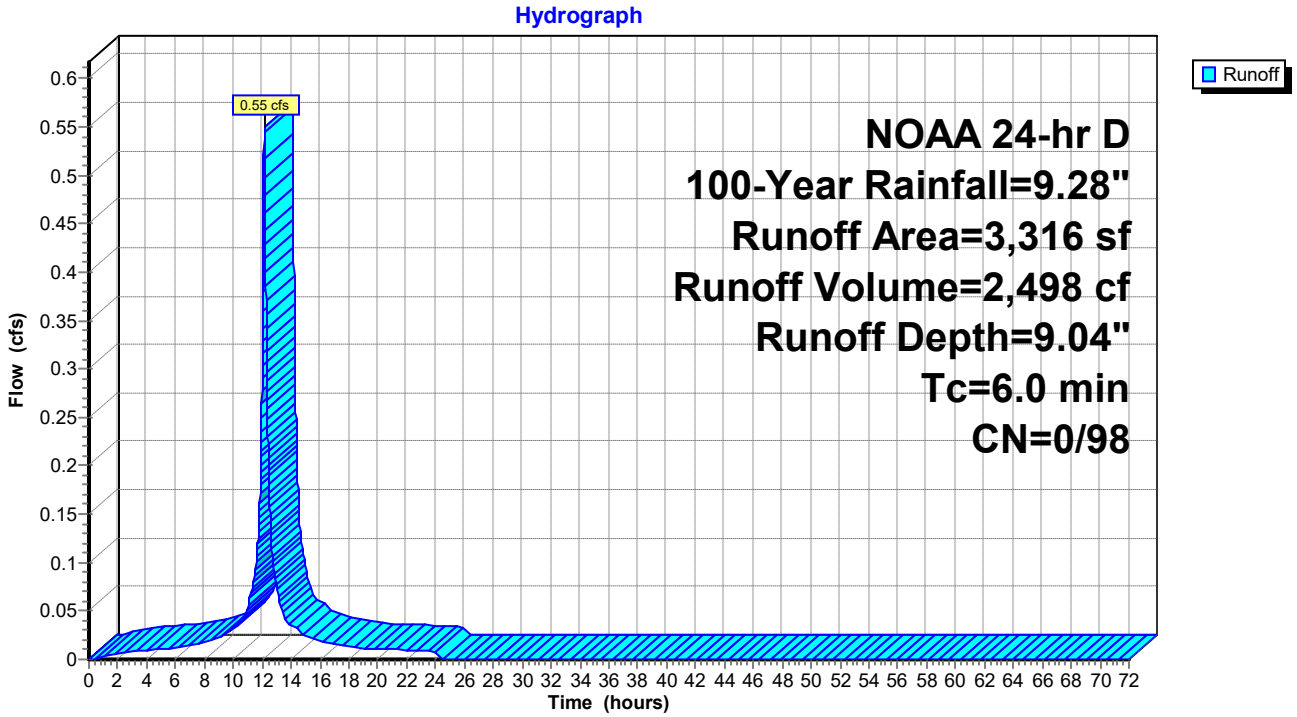
Runoff = 0.55 cfs @ 12.14 hrs, Volume= 2,498 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
3,316	98	Paved parking, HSG D
3,316	98	100.00% Impervious Area

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

Subcatchment DW2Bi: Pr. Drywell Area 2B



Summary for Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.

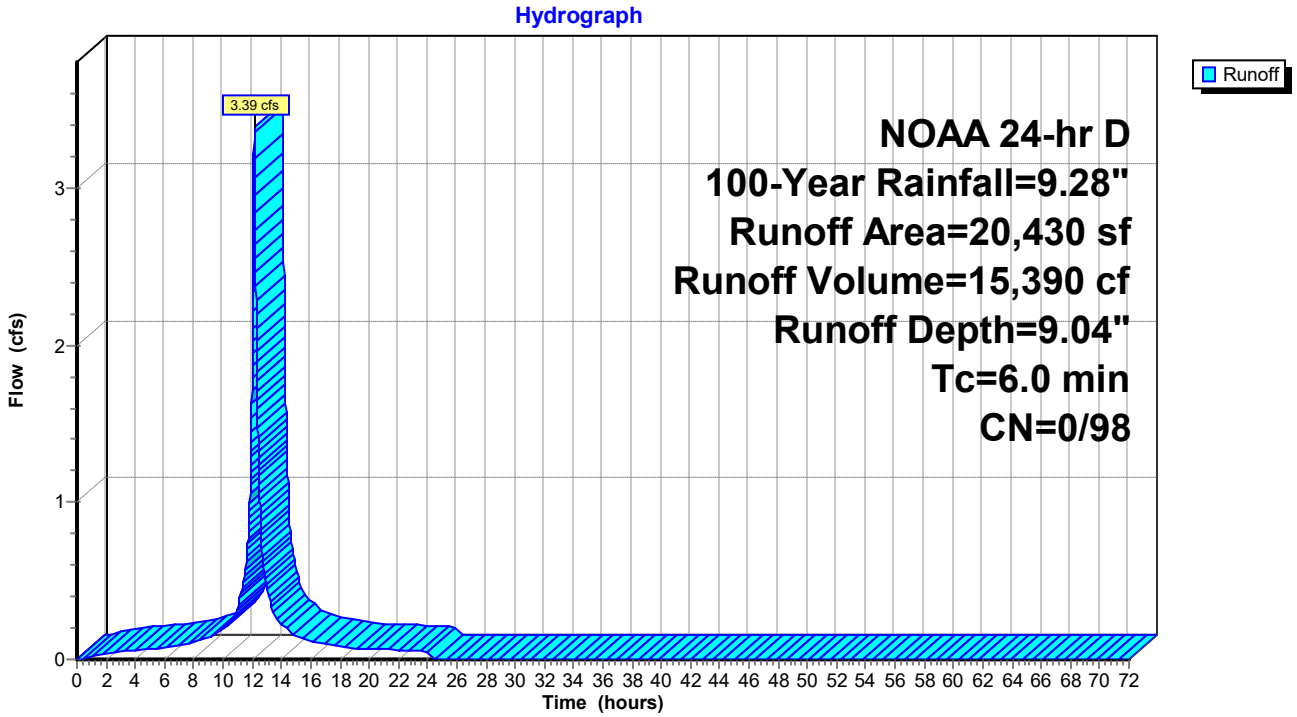
Runoff = 3.39 cfs @ 12.14 hrs, Volume= 15,390 cf, Depth= 9.04"

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=9.28"

Area (sf)	CN	Description
20,430	98	Paved parking, HSG D
20,430	98	100.00% Impervious Area

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

Subcatchment RG1Ai: Pr. Rain Garden Area 1A Imp.



Summary for Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.

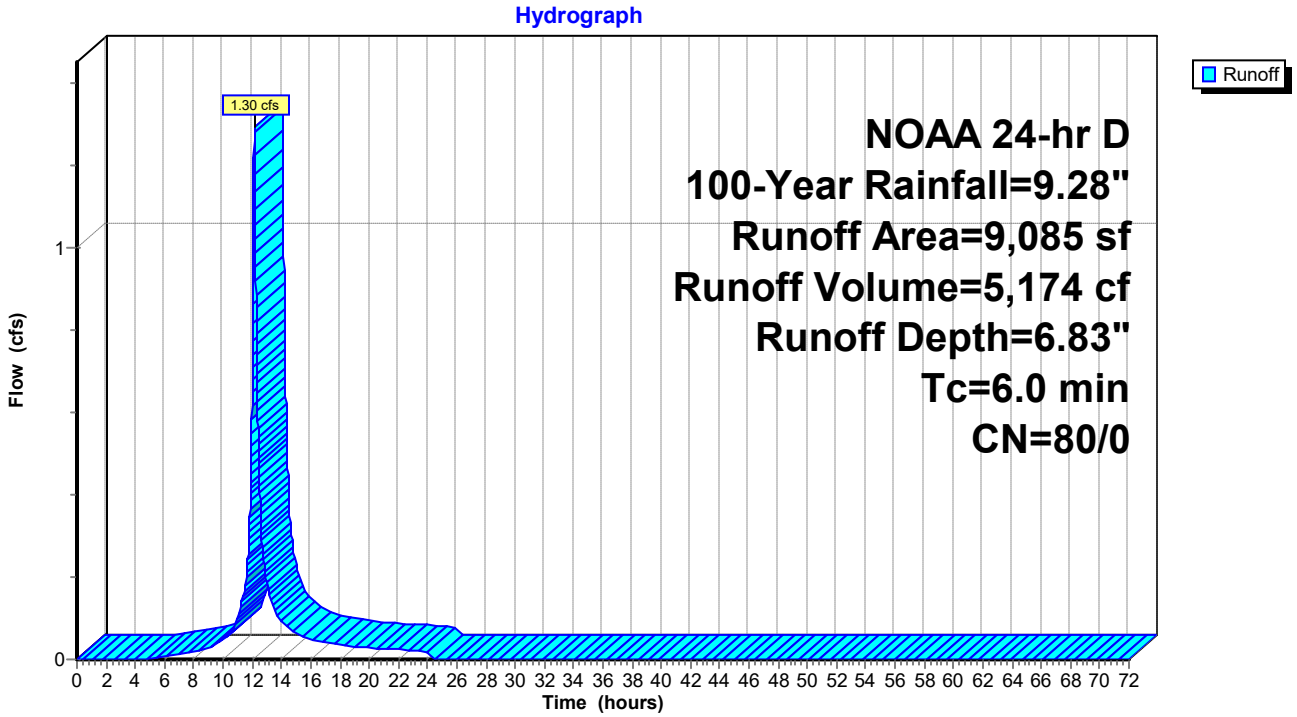
Runoff = 1.30 cfs @ 12.14 hrs, Volume= 5,174 cf, Depth= 6.83"

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=9.28"

Area (sf)	CN	Description
9,085	80	>75% Grass cover, Good, HSG D
9,085	80	100.00% Pervious Area

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

Subcatchment RG1Ap: PR. Rain Garden Area 1A Perv.



Summary for Pond B1A: Underground Basin 1A

Inflow Area = 43,464 sf, 70.02% Impervious, Inflow Depth = 6.18" for 100-Year event
Inflow = 6.58 cfs @ 12.16 hrs, Volume= 22,371 cf
Outflow = 6.35 cfs @ 12.18 hrs, Volume= 22,370 cf, Atten= 3%, Lag= 1.6 min
Primary = 6.35 cfs @ 12.18 hrs, Volume= 22,370 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.35' @ 12.18 hrs Surf.Area= 1,439 sf Storage= 2,863 cf

Plug-Flow detention time= 19.9 min calculated for 22,367 cf (100% of inflow)
Center-of-Mass det. time= 20.0 min (787.2 - 767.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	1,318 cf	**11.03'W x 130.42'L x 3.52'H Field A** 5,072 cf Overall - 1,778 cf Embedded = 3,295 cf x 40.0% Voids
#2A	19.60'	1,703 cf	**Contech ChamberMaxx 2016** x 36 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 2 rows
		3,021 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'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	21.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=6.35 cfs @ 12.18 hrs HW=22.35' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 6.35 cfs of 13.45 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.14 cfs @ 8.40 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 5.20 cfs @ 3.86 fps)

Pond B1A: Underground Basin 1A - 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 2 rows

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

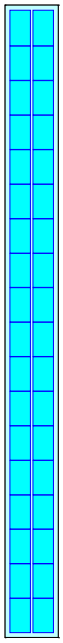
18 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 128.42' Row Length +12.0" End Stone x 2 = 130.42' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

36 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 1,703.2 cf Chamber Storage
36 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 1,777.6 cf Displacement

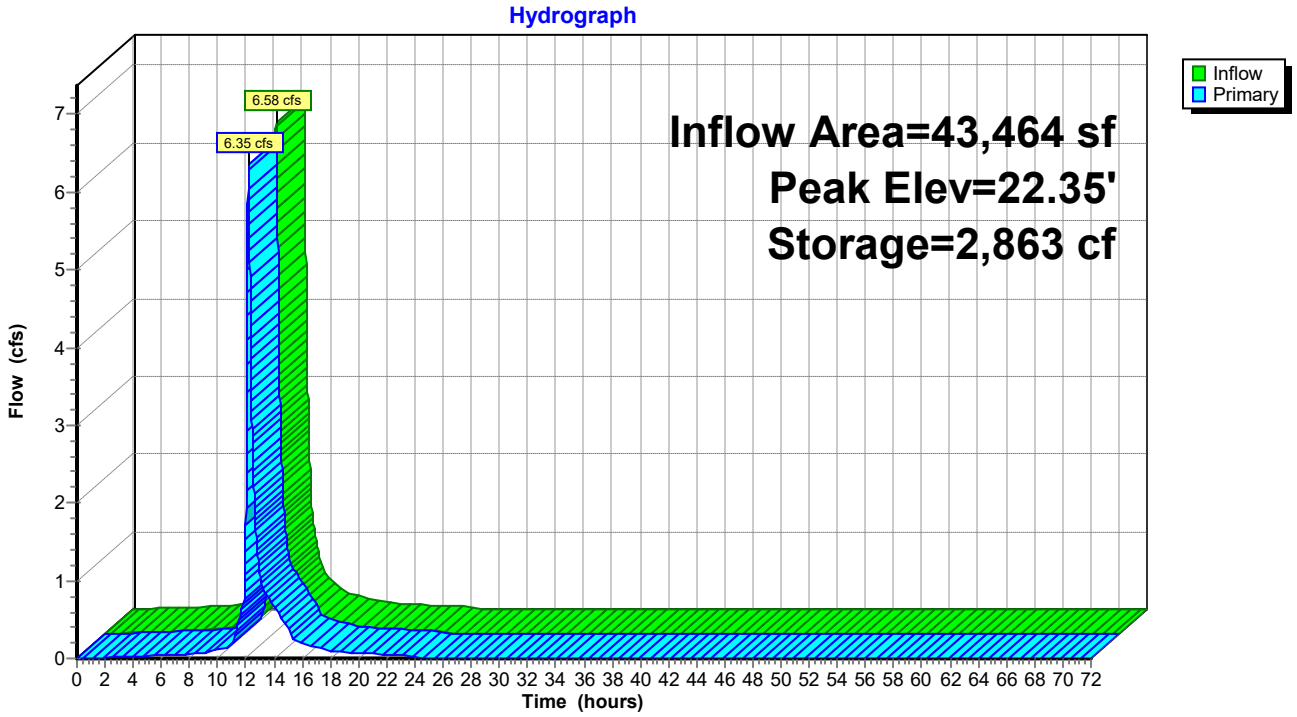
5,072.2 cf Field - 1,777.6 cf Chambers = 3,294.6 cf Stone x 40.0% Voids = 1,317.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,021.0 cf = 0.069 af
Overall Storage Efficiency = 59.6%
Overall System Size = 130.42' x 11.03' x 3.52'

36 Chambers
187.9 cy Field
122.0 cy Stone



Pond B1A: Underground Basin 1A



Summary for Pond B1B: Underground Basin 1B

Inflow Area = 104,336 sf, 76.55% Impervious, Inflow Depth = 8.14" for 100-Year event
Inflow = 16.65 cfs @ 12.14 hrs, Volume= 70,816 cf
Outflow = 9.99 cfs @ 12.29 hrs, Volume= 70,800 cf, Atten= 40%, Lag= 9.1 min
Primary = 9.99 cfs @ 12.29 hrs, Volume= 70,800 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.96' @ 12.29 hrs Surf.Area= 7,780 sf Storage= 14,990 cf

Plug-Flow detention time= 40.5 min calculated for 70,790 cf (100% of inflow)
Center-of-Mass det. time= 40.6 min (800.0 - 759.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	6,625 cf	**53.78'W x 144.65'L x 3.52'H Field A** 27,424 cf Overall - 10,861 cf Embedded = 16,563 cf x 40.0% Voids
#2A	19.60'	10,406 cf	**Contech ChamberMaxx 2016** x 220 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 11 rows
		17,031 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=9.98 cfs @ 12.29 hrs HW=21.96' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 9.98 cfs of 12.37 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 4.11 cfs @ 7.53 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 5.88 cfs @ 4.02 fps)

Pond B1B: Underground Basin 1B - 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 11 rows

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

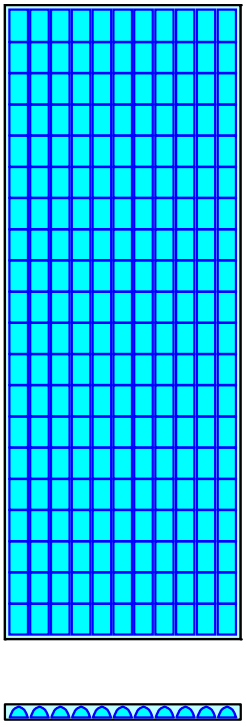
20 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 142.65' Row Length +12.0" End Stone x 2 = 144.65' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

220 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 10,405.7 cf Chamber Storage
220 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 10,860.7 cf Displacement

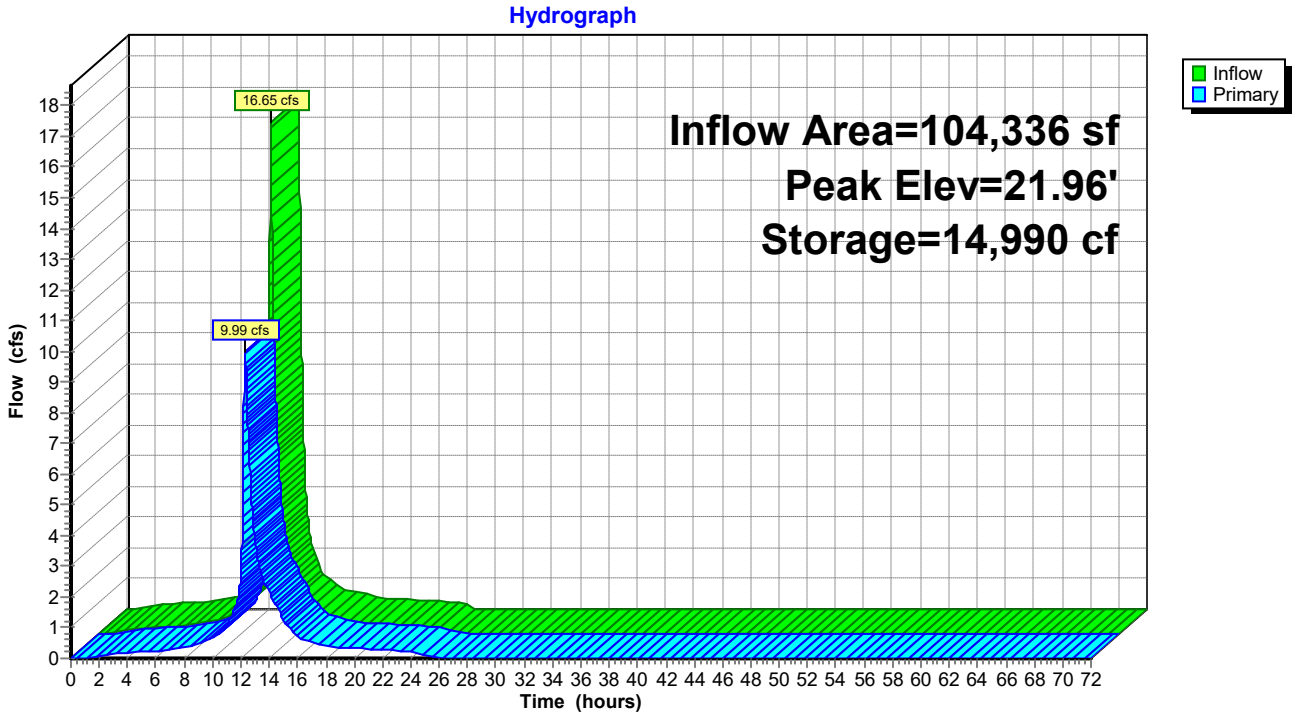
27,423.7 cf Field - 10,860.7 cf Chambers = 16,563.0 cf Stone x 40.0% Voids = 6,625.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,030.9 cf = 0.391 af
Overall Storage Efficiency = 62.1%
Overall System Size = 144.65' x 53.78' x 3.52'

220 Chambers
1,015.7 cy Field
613.4 cy Stone



Pond B1B: Underground Basin 1B



Summary for Pond DW1B: Drywell 1B

Inflow Area = 8,065 sf,100.00% Impervious, Inflow Depth = 9.04" for 100-Year event
Inflow = 1.34 cfs @ 12.14 hrs, Volume= 6,075 cf
Outflow = 1.33 cfs @ 12.15 hrs, Volume= 6,075 cf, Atten= 1%, Lag= 0.7 min
Discarded = 0.02 cfs @ 12.15 hrs, Volume= 1,963 cf
Primary = 1.31 cfs @ 12.15 hrs, Volume= 4,112 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 24.45' @ 12.15 hrs Surf.Area= 497 sf Storage= 918 cf

Plug-Flow detention time= 197.7 min calculated for 6,074 cf (100% of inflow)
Center-of-Mass det. time= 197.8 min (941.7 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	21.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	22.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.90'	**15.0" Round Culvert** L= 67.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 23.90' / 21.00' S= 0.0433 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	21.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 12.75' Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.15 hrs HW=24.45' (Free Discharge)
↑**2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.31 cfs @ 12.15 hrs HW=24.45' TW=21.37' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.31 cfs @ 2.52 fps)

Pond DW1B: Drywell 1B - 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 2 rows

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

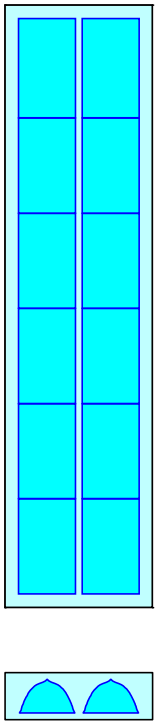
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

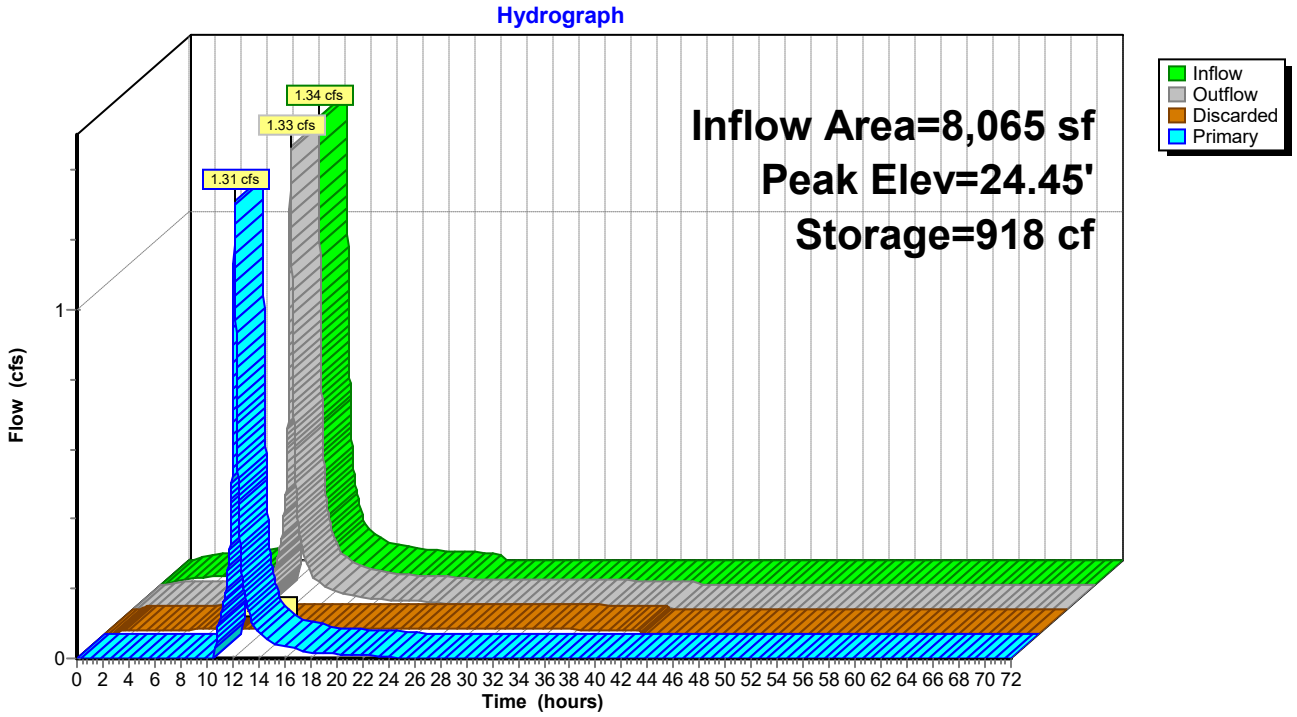
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1B: Drywell 1B



Summary for Pond DW2B: Drywell 2B

Inflow Area = 3,316 sf,100.00% Impervious, Inflow Depth = 9.04" for 100-Year event
Inflow = 0.55 cfs @ 12.14 hrs, Volume= 2,498 cf
Outflow = 0.52 cfs @ 12.17 hrs, Volume= 2,498 cf, Atten= 6%, Lag= 1.8 min
Discarded = 0.01 cfs @ 12.31 hrs, Volume= 1,321 cf
Primary = 0.51 cfs @ 12.17 hrs, Volume= 1,177 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 22.11' @ 12.31 hrs Surf.Area= 497 sf Storage= 530 cf

Plug-Flow detention time= 163.7 min calculated for 2,498 cf (100% of inflow)
Center-of-Mass det. time= 163.8 min (907.6 - 743.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.75'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.75' / 21.00' S= 0.0163 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 12.31 hrs HW=22.11' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.50 cfs @ 12.17 hrs HW=22.08' TW=21.49' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.50 cfs @ 1.95 fps)

Pond DW2B: Drywell 2B - 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 2 rows

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

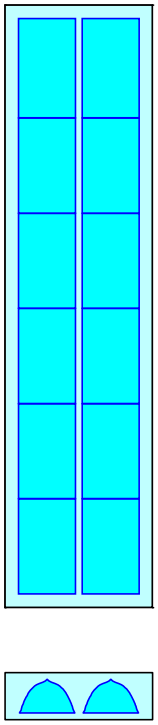
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

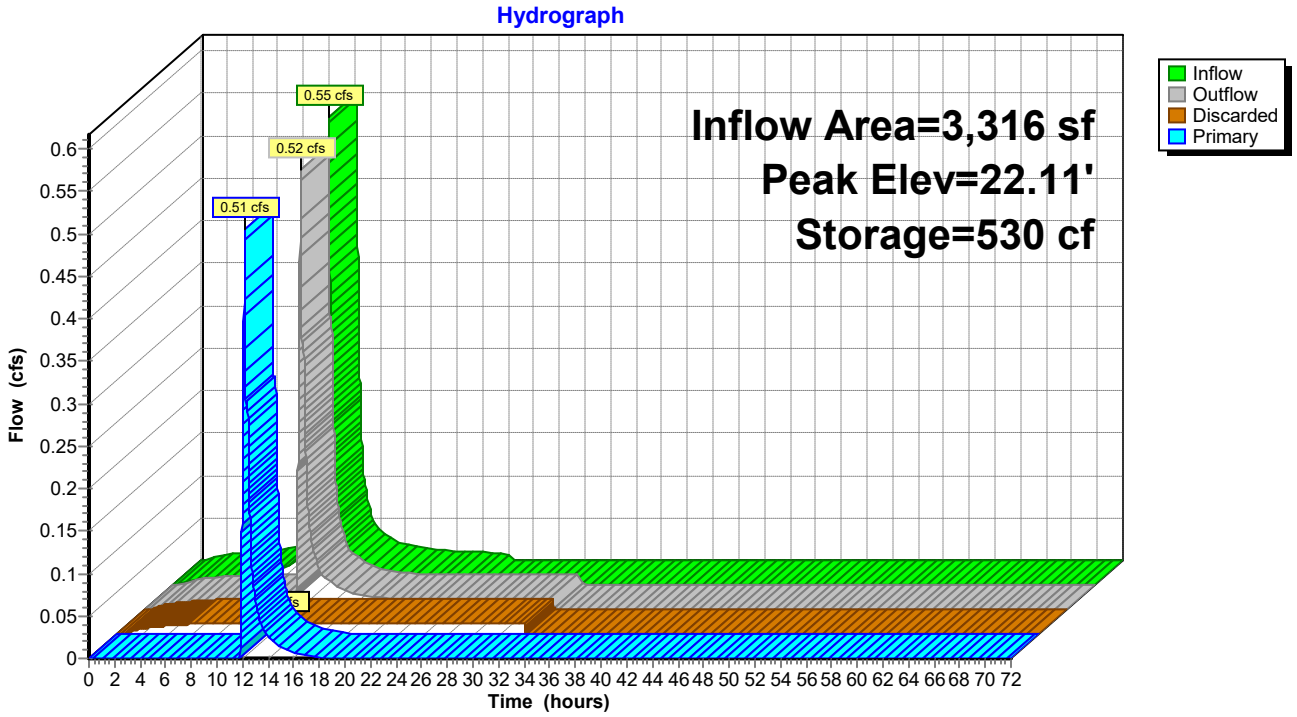
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW2B: Drywell 2B



Summary for Pond RG1A: Rain Garden 1A

Inflow Area = 29,515 sf, 69.22% Impervious, Inflow Depth = 8.36" for 100-Year event
Inflow = 4.69 cfs @ 12.14 hrs, Volume= 20,564 cf
Outflow = 4.50 cfs @ 12.16 hrs, Volume= 20,564 cf, Atten= 4%, Lag= 1.5 min
Discarded = 0.09 cfs @ 12.16 hrs, Volume= 7,975 cf
Primary = 4.42 cfs @ 12.16 hrs, Volume= 12,589 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.99' @ 12.16 hrs Surf.Area= 3,483 sf Storage= 3,662 cf

Plug-Flow detention time= 208.1 min calculated for 20,564 cf (100% of inflow)
Center-of-Mass det. time= 208.1 min (967.9 - 759.8)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,688 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

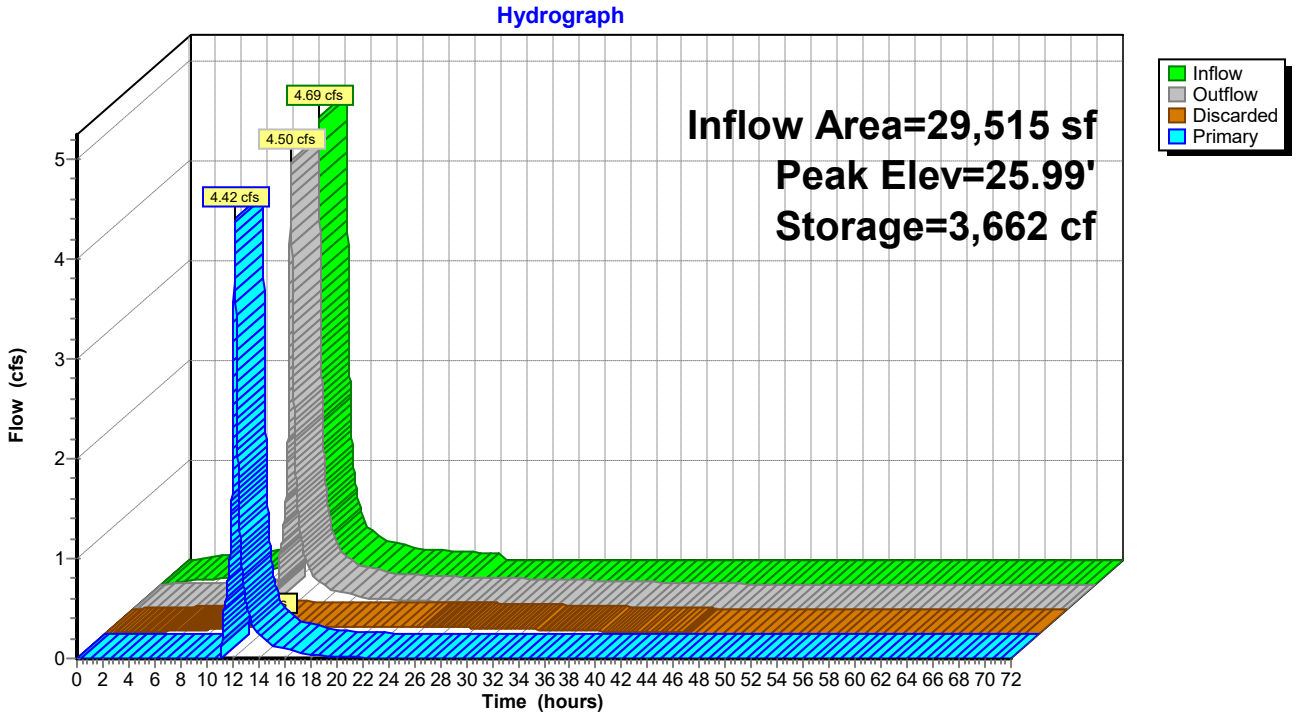
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	461	161.0	0	0	461
25.00	1,829	216.0	1,069	1,069	2,122
26.00	3,498	260.0	2,619	3,688	3,805

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 27.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 19.60' S= 0.0889 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	25.80'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	24.00'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.80' Phase-In= 0.01'

Discarded OutFlow Max=0.09 cfs @ 12.16 hrs HW=25.99' (Free Discharge)
└**3=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=4.41 cfs @ 12.16 hrs HW=25.99' TW=22.33' (Dynamic Tailwater)
└**1=Culvert** (Passes 4.41 cfs of 10.84 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 4.41 cfs @ 1.43 fps)

Pond RG1A: Rain Garden 1A

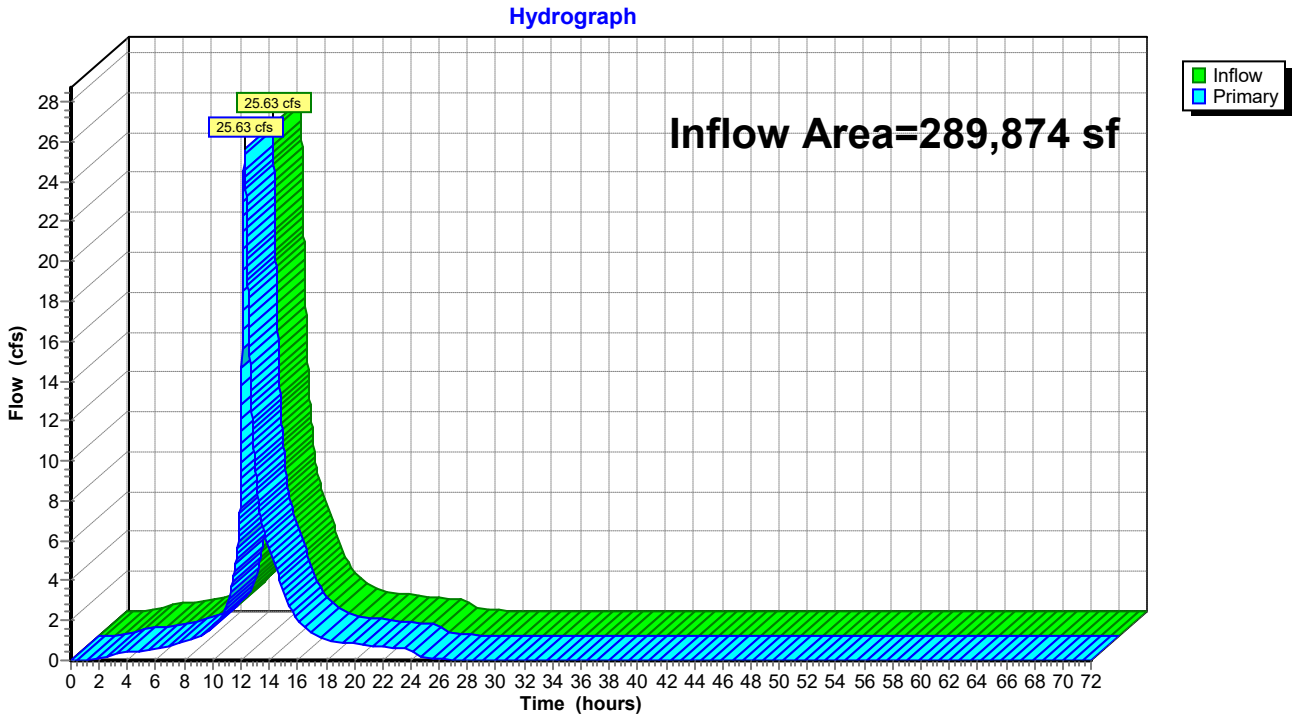


Summary for Link 3L: Pr. POA 1

Inflow Area = 289,874 sf, 70.62% Impervious, Inflow Depth = 7.70" for 100-Year event
Inflow = 25.63 cfs @ 12.25 hrs, Volume= 186,050 cf
Primary = 25.63 cfs @ 12.25 hrs, Volume= 186,050 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



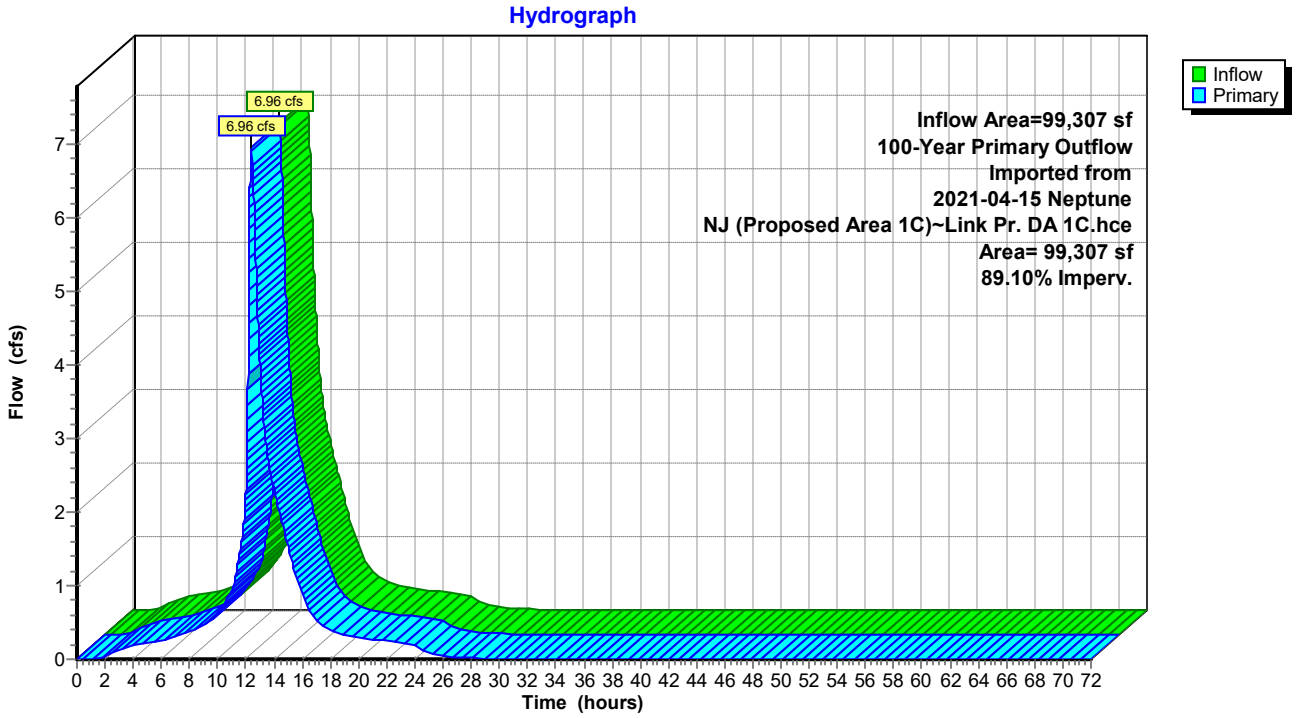
Summary for Link 4L: Pr DA 1C Total

Inflow Area = 99,307 sf, 89.10% Impervious, Inflow Depth = 8.18" for 100-Year event
Inflow = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf
Primary = 6.96 cfs @ 12.39 hrs, Volume= 67,666 cf, Atten= 0%, Lag= 0.0 min

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

100-Year Primary Outflow Imported from 2021-04-15 Neptune, NJ (Proposed Area 1C)~Link Pr. DA 1C.hce

Link 4L: Pr DA 1C Total



Summary for Subcatchment 6S: Pr. Area 2

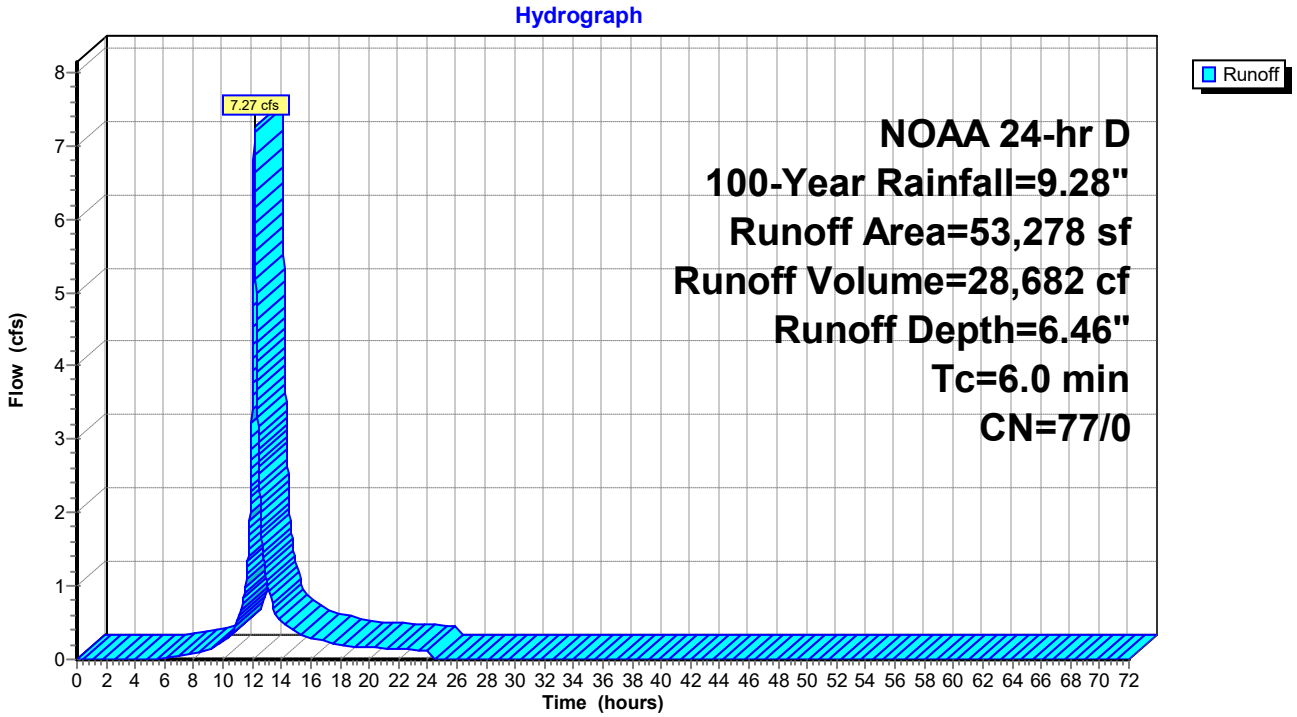
Runoff = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf, Depth= 6.46"

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=9.28"

Area (sf)	CN	Description
53,278	77	Woods, Good, HSG D
53,278	77	100.00% Pervious Area

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

Subcatchment 6S: Pr. Area 2

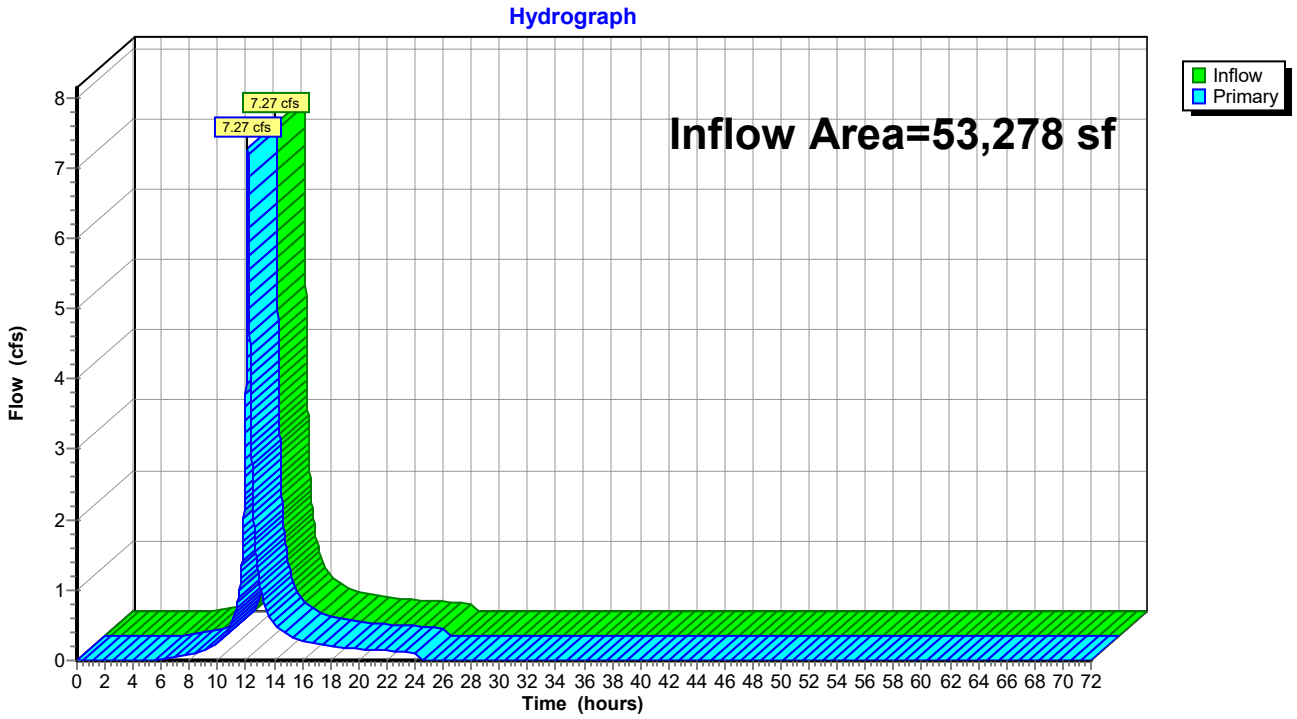


Summary for Link 7L: Pr. POA 2 (Reforestation)

Inflow Area = 53,278 sf, 0.00% Impervious, Inflow Depth = 6.46" for 100-Year event
Inflow = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf
Primary = 7.27 cfs @ 12.14 hrs, Volume= 28,682 cf, Atten= 0%, Lag= 0.0 min

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

Link 7L: Pr. POA 2 (Reforestation)



APPENDIX C-5
BMP DISCHARGE & STORAGE TABLES

Hydrograph for Pond B 1C: Underground Basin 1C

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	0.01	3	19.10	0.00
0.80	0.04	21	19.11	0.00
1.00	0.06	57	19.11	0.00
1.20	0.08	109	19.13	0.00
1.40	0.10	171	19.14	0.01
1.60	0.11	241	19.16	0.01
1.80	0.13	315	19.18	0.02
2.00	0.14	389	19.19	0.03
2.20	0.15	462	19.21	0.05
2.40	0.16	532	19.23	0.06
2.60	0.16	596	19.24	0.08
2.80	0.17	654	19.26	0.10
3.00	0.18	706	19.27	0.11
3.20	0.19	753	19.28	0.13
3.40	0.19	794	19.29	0.14
3.60	0.20	830	19.30	0.15
3.80	0.20	862	19.31	0.16
4.00	0.21	890	19.31	0.17
4.20	0.21	915	19.32	0.18
4.40	0.22	937	19.32	0.19
4.60	0.22	957	19.33	0.20
4.80	0.23	975	19.33	0.21
5.00	0.23	992	19.34	0.21
5.20	0.24	1,007	19.34	0.22
5.40	0.24	1,021	19.34	0.22
5.60	0.25	1,035	19.35	0.23
5.80	0.25	1,048	19.35	0.24
6.00	0.26	1,060	19.35	0.24
6.20	0.27	1,073	19.36	0.25
6.40	0.28	1,090	19.36	0.25
6.60	0.29	1,112	19.37	0.26
6.80	0.31	1,136	19.37	0.27
7.00	0.32	1,162	19.38	0.29
7.20	0.34	1,190	19.38	0.30
7.40	0.35	1,219	19.39	0.31
7.60	0.37	1,248	19.40	0.33
7.80	0.38	1,277	19.41	0.34
8.00	0.40	1,306	19.41	0.36
8.20	0.41	1,336	19.42	0.37
8.40	0.43	1,365	19.43	0.38
8.60	0.44	1,393	19.43	0.40
8.80	0.45	1,422	19.44	0.41
9.00	0.47	1,450	19.45	0.43
9.20	0.50	1,482	19.45	0.45
9.40	0.55	1,530	19.47	0.47
9.60	0.60	1,590	19.48	0.51
9.80	0.73	1,693	19.50	0.57
10.00	0.79	1,805	19.53	0.64
10.20	0.89	1,914	19.56	0.71

Hydrograph for Pond B 1C: Underground Basin 1C (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.40	0.97	2,046	19.59	0.79
10.60	1.06	2,177	19.61	0.85
10.80	1.27	2,381	19.63	0.91
11.00	1.50	2,688	19.66	1.00
11.20	1.83	3,111	19.71	1.13
11.40	2.24	3,694	19.77	1.31
11.60	2.92	4,462	19.86	1.54
11.80	4.24	5,748	20.00	1.82
12.00	**8.95**	8,599	20.32	2.35
12.20	**14.11**	**15,957**	**21.22**	**5.39**
12.40	6.83	**18,309**	**21.55**	**7.30**
12.60	3.95	17,095	21.37	6.28
12.80	2.77	15,400	21.15	4.98
13.00	2.24	13,954	20.96	4.08
13.20	1.82	12,704	20.80	3.46
13.40	1.53	11,586	20.67	3.01
13.60	1.28	10,550	20.55	2.69
13.80	1.12	9,541	20.43	2.51
14.00	1.04	8,569	20.32	2.35
14.20	0.97	7,659	20.21	2.19
14.40	0.90	6,812	20.12	2.03
14.60	0.83	6,027	20.03	1.88
14.80	0.76	5,303	19.95	1.73
15.00	0.69	4,635	19.87	1.58
15.20	0.63	4,030	19.81	1.42
15.40	0.60	3,512	19.75	1.26
15.60	0.58	3,082	19.71	1.13
15.80	0.56	2,726	19.67	1.01
16.00	0.54	2,427	19.64	0.92
16.20	0.52	2,175	19.61	0.85
16.40	0.51	1,969	19.57	0.74
16.60	0.48	1,827	19.54	0.65
16.80	0.47	1,724	19.51	0.59
17.00	0.45	1,647	19.49	0.54
17.20	0.43	1,585	19.48	0.51
17.40	0.41	1,533	19.47	0.48
17.60	0.39	1,486	19.46	0.45
17.80	0.37	1,443	19.45	0.43
18.00	0.35	1,403	19.44	0.41
18.20	0.33	1,364	19.43	0.38
18.40	0.32	1,330	19.42	0.37
18.60	0.32	1,303	19.41	0.35
18.80	0.31	1,281	19.41	0.34
19.00	0.31	1,262	19.40	0.33
19.20	0.30	1,246	19.40	0.33
19.40	0.30	1,232	19.39	0.32
19.60	0.29	1,219	19.39	0.31
19.80	0.29	1,207	19.39	0.31
20.00	0.29	1,195	19.39	0.30
20.20	0.28	1,184	19.38	0.30
20.40	0.28	1,173	19.38	0.29
20.60	0.27	1,162	19.38	0.29

Hydrograph for Pond B 1C: Underground Basin 1C (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
20.80	0.27	1,152	19.38	0.28
21.00	0.26	1,141	19.37	0.28
21.20	0.26	1,130	19.37	0.27
21.40	0.25	1,119	19.37	0.27
21.60	0.25	1,109	19.37	0.26
21.80	0.24	1,098	19.36	0.26
22.00	0.24	1,087	19.36	0.25
22.20	0.23	1,077	19.36	0.25
22.40	0.23	1,066	19.35	0.24
22.60	0.22	1,055	19.35	0.24
22.80	0.22	1,044	19.35	0.23
23.00	0.21	1,033	19.35	0.23
23.20	0.21	1,022	19.34	0.22
23.40	0.20	1,011	19.34	0.22
23.60	0.20	1,000	19.34	0.22
23.80	0.19	989	19.34	0.21
24.00	0.19	978	19.33	0.21
24.20	0.04	921	19.32	0.18
24.40	0.01	817	19.30	0.15
24.60	0.00	724	19.27	0.12
24.80	0.00	649	19.26	0.09
25.00	0.00	588	19.24	0.08
25.20	0.00	537	19.23	0.06
25.40	0.00	494	19.22	0.06
25.60	0.00	457	19.21	0.05
25.80	0.00	425	19.20	0.04
26.00	0.00	397	19.19	0.04
26.20	0.00	373	19.19	0.03
26.40	0.00	351	19.18	0.03
26.60	0.00	332	19.18	0.03
26.80	0.00	315	19.18	0.02
27.00	0.00	299	19.17	0.02
27.20	0.00	285	19.17	0.02
27.40	0.00	272	19.17	0.02
27.60	0.00	260	19.16	0.02
27.80	0.00	249	19.16	0.01
28.00	0.00	239	19.16	0.01
28.20	0.00	230	19.16	0.01
28.40	0.00	222	19.15	0.01
28.60	0.00	214	19.15	0.01
28.80	0.00	206	19.15	0.01
29.00	0.00	199	19.15	0.01
29.20	0.00	193	19.15	0.01
29.40	0.00	187	19.14	0.01
29.60	0.00	181	19.14	0.01
29.80	0.00	176	19.14	0.01
30.00	0.00	171	19.14	0.01
30.20	0.00	166	19.14	0.01
30.40	0.00	162	19.14	0.01
30.60	0.00	157	19.14	0.01
30.80	0.00	153	19.14	0.01
31.00	0.00	149	19.14	0.01

Hydrograph for Pond B1A: Underground Basin 1A

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	0.00	0	19.10	0.00
0.80	0.01	3	19.11	0.00
1.00	0.01	8	19.11	0.00
1.20	0.01	14	19.12	0.00
1.40	0.01	22	19.14	0.00
1.60	0.02	28	19.15	0.01
1.80	0.02	34	19.16	0.01
2.00	0.02	39	19.17	0.01
2.20	0.02	43	19.18	0.02
2.40	0.02	47	19.18	0.02
2.60	0.02	49	19.19	0.02
2.80	0.02	51	19.19	0.02
3.00	0.02	53	19.19	0.02
3.20	0.03	54	19.19	0.02
3.40	0.03	55	19.20	0.03
3.60	0.03	57	19.20	0.03
3.80	0.03	58	19.20	0.03
4.00	0.03	58	19.20	0.03
4.20	0.03	59	19.20	0.03
4.40	0.03	60	19.20	0.03
4.60	0.03	61	19.21	0.03
4.80	0.03	62	19.21	0.03
5.00	0.03	63	19.21	0.03
5.20	0.03	64	19.21	0.03
5.40	0.04	65	19.21	0.03
5.60	0.04	66	19.21	0.04
5.80	0.04	67	19.22	0.04
6.00	0.04	68	19.22	0.04
6.20	0.04	69	19.22	0.04
6.40	0.04	71	19.22	0.04
6.60	0.04	72	19.23	0.04
6.80	0.05	75	19.23	0.04
7.00	0.05	77	19.23	0.05
7.20	0.05	79	19.24	0.05
7.40	0.05	81	19.24	0.05
7.60	0.06	83	19.24	0.05
7.80	0.06	85	19.25	0.06
8.00	0.06	88	19.25	0.06
8.20	0.07	90	19.26	0.06
8.40	0.07	92	19.26	0.07
8.60	0.07	94	19.26	0.07
8.80	0.07	96	19.27	0.07
9.00	0.08	98	19.27	0.07
9.20	0.08	101	19.27	0.08
9.40	0.09	105	19.28	0.08
9.60	0.10	110	19.29	0.09
9.80	0.11	116	19.30	0.10
10.00	0.12	122	19.31	0.11
10.20	0.13	128	19.32	0.12

Hydrograph for Pond B1A: Underground Basin 1A (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.40	0.14	133	19.33	0.13
10.60	0.15	139	19.34	0.14
10.80	0.18	151	19.36	0.16
11.00	0.21	167	19.39	0.19
11.20	0.26	187	19.43	0.22
11.40	0.31	215	19.47	0.27
11.60	0.41	255	19.54	0.32
11.80	1.64	699	19.95	0.52
12.00	**3.41**	**1,871**	**21.01**	**0.86**
12.20	**6.02**	**2,858**	**22.34**	**6.30**
12.40	2.95	2,550	21.77	3.26
12.60	1.68	2,333	21.49	1.99
12.80	1.14	2,143	21.28	1.35
13.00	0.91	2,017	21.16	1.07
13.20	0.73	1,907	21.05	0.89
13.40	0.61	1,773	20.92	0.83
13.60	0.50	1,591	20.74	0.79
13.80	0.43	1,378	20.55	0.73
14.00	0.40	1,170	20.36	0.67
14.20	0.37	979	20.19	0.62
14.40	0.34	809	20.04	0.56
14.60	0.31	656	19.91	0.51
14.80	0.28	520	19.79	0.46
15.00	0.25	400	19.69	0.41
15.20	0.23	296	19.61	0.36
15.40	0.21	223	19.49	0.28
15.60	0.20	191	19.43	0.23
15.80	0.19	178	19.41	0.21
16.00	0.19	171	19.40	0.19
16.20	0.18	166	19.39	0.18
16.40	0.17	161	19.38	0.18
16.60	0.16	157	19.37	0.17
16.80	0.15	152	19.36	0.16
17.00	0.15	148	19.36	0.15
17.20	0.14	143	19.35	0.14
17.40	0.13	138	19.34	0.14
17.60	0.12	133	19.33	0.13
17.80	0.11	129	19.32	0.12
18.00	0.11	124	19.31	0.11
18.20	0.10	119	19.31	0.10
18.40	0.09	115	19.30	0.10
18.60	0.09	112	19.29	0.09
18.80	0.09	110	19.29	0.09
19.00	0.09	109	19.29	0.09
19.20	0.08	107	19.29	0.09
19.40	0.08	106	19.28	0.08
19.60	0.08	105	19.28	0.08
19.80	0.08	103	19.28	0.08
20.00	0.08	102	19.28	0.08
20.20	0.07	100	19.27	0.08
20.40	0.07	99	19.27	0.07
20.60	0.07	97	19.27	0.07

Hydrograph for Pond B1A: Underground Basin 1A (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
20.80	0.07	96	19.27	0.07
21.00	0.07	94	19.26	0.07
21.20	0.06	93	19.26	0.07
21.40	0.06	91	19.26	0.06
21.60	0.06	90	19.26	0.06
21.80	0.06	88	19.25	0.06
22.00	0.06	87	19.25	0.06
22.20	0.05	85	19.25	0.06
22.40	0.05	84	19.25	0.05
22.60	0.05	82	19.24	0.05
22.80	0.05	80	19.24	0.05
23.00	0.05	79	19.24	0.05
23.20	0.04	77	19.23	0.05
23.40	0.04	75	19.23	0.05
23.60	0.04	73	19.23	0.04
23.80	0.04	72	19.22	0.04
24.00	0.04	70	19.22	0.04
24.20	0.01	60	19.20	0.03
24.40	0.00	46	19.18	0.02
24.60	0.00	36	19.16	0.01
24.80	0.00	30	19.15	0.01
25.00	0.00	25	19.14	0.01
25.20	0.00	22	19.14	0.00
25.40	0.00	19	19.13	0.00
25.60	0.00	17	19.13	0.00
25.80	0.00	15	19.13	0.00
26.00	0.00	14	19.12	0.00
26.20	0.00	13	19.12	0.00
26.40	0.00	12	19.12	0.00
26.60	0.00	11	19.12	0.00
26.80	0.00	10	19.12	0.00
27.00	0.00	10	19.12	0.00
27.20	0.00	9	19.12	0.00
27.40	0.00	9	19.12	0.00
27.60	0.00	8	19.11	0.00
27.80	0.00	8	19.11	0.00
28.00	0.00	7	19.11	0.00
28.20	0.00	7	19.11	0.00
28.40	0.00	7	19.11	0.00
28.60	0.00	7	19.11	0.00
28.80	0.00	6	19.11	0.00
29.00	0.00	6	19.11	0.00
29.20	0.00	6	19.11	0.00
29.40	0.00	6	19.11	0.00
29.60	0.00	5	19.11	0.00
29.80	0.00	5	19.11	0.00
30.00	0.00	5	19.11	0.00
30.20	0.00	5	19.11	0.00
30.40	0.00	5	19.11	0.00
30.60	0.00	5	19.11	0.00
30.80	0.00	5	19.11	0.00
31.00	0.00	4	19.11	0.00

Hydrograph for Pond B1B: Underground Basin 1B

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	0.01	3	19.10	0.00
0.80	0.04	20	19.11	0.00
1.00	0.06	55	19.12	0.00
1.20	0.08	103	19.13	0.00
1.40	0.10	161	19.15	0.01
1.60	0.11	223	19.17	0.02
1.80	0.12	286	19.19	0.03
2.00	0.13	347	19.21	0.05
2.20	0.14	404	19.23	0.07
2.40	0.15	455	19.25	0.08
2.60	0.16	499	19.26	0.10
2.80	0.16	537	19.27	0.12
3.00	0.17	570	19.28	0.13
3.20	0.18	598	19.29	0.14
3.40	0.18	621	19.30	0.15
3.60	0.19	642	19.31	0.16
3.80	0.19	660	19.31	0.17
4.00	0.20	675	19.32	0.18
4.20	0.20	689	19.32	0.19
4.40	0.21	702	19.33	0.19
4.60	0.22	715	19.33	0.20
4.80	0.22	728	19.33	0.21
5.00	0.23	740	19.34	0.21
5.20	0.24	752	19.34	0.22
5.40	0.24	764	19.35	0.23
5.60	0.25	775	19.35	0.23
5.80	0.25	786	19.35	0.24
6.00	0.26	797	19.36	0.25
6.20	0.27	810	19.36	0.25
6.40	0.29	826	19.37	0.26
6.60	0.30	846	19.37	0.27
6.80	0.32	868	19.38	0.29
7.00	0.34	892	19.39	0.30
7.20	0.35	918	19.39	0.32
7.40	0.37	943	19.40	0.34
7.60	0.39	969	19.41	0.35
7.80	0.41	995	19.42	0.37
8.00	0.42	1,021	19.43	0.39
8.20	0.44	1,047	19.44	0.41
8.40	0.46	1,072	19.44	0.43
8.60	0.48	1,097	19.45	0.44
8.80	0.50	1,122	19.46	0.46
9.00	0.52	1,147	19.47	0.48
9.20	0.56	1,177	19.48	0.50
9.40	0.61	1,221	19.49	0.54
9.60	0.67	1,278	19.51	0.58
9.80	0.73	1,342	19.53	0.64
10.00	0.79	1,409	19.55	0.69
10.20	0.85	1,478	19.57	0.75

Hydrograph for Pond B1B: Underground Basin 1B (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
10.40	0.91	1,547	19.60	0.81
10.60	1.00	1,629	19.61	0.85
10.80	1.27	1,801	19.64	0.92
11.00	1.52	2,099	19.68	1.04
11.20	1.86	2,494	19.74	1.21
11.40	2.27	3,027	19.81	1.43
11.60	2.97	3,729	19.92	1.67
11.80	4.28	4,944	20.10	2.00
12.00	**9.03**	7,662	20.52	2.63
12.20	**14.07**	**14,126**	**21.66**	**7.96**
12.40	6.90	**14,529**	**21.79**	**8.81**
12.60	4.00	12,890	21.41	6.49
12.80	2.82	11,245	21.11	4.80
13.00	2.28	9,998	20.90	3.82
13.20	1.86	8,970	20.73	3.20
13.40	1.57	8,064	20.58	2.78
13.60	1.32	7,205	20.45	2.53
13.80	1.16	6,334	20.31	2.34
14.00	1.08	5,523	20.19	2.15
14.20	1.01	4,792	20.08	1.96
14.40	0.94	4,143	19.98	1.78
14.60	0.87	3,567	19.89	1.62
14.80	0.80	3,062	19.82	1.44
15.00	0.73	2,637	19.76	1.27
15.20	0.67	2,279	19.70	1.12
15.40	0.64	1,987	19.66	1.00
15.60	0.62	1,756	19.63	0.90
15.80	0.60	1,571	19.60	0.83
16.00	0.58	1,438	19.56	0.72
16.20	0.56	1,356	19.54	0.65
16.40	0.54	1,301	19.52	0.60
16.60	0.52	1,260	19.50	0.57
16.80	0.50	1,226	19.49	0.54
17.00	0.48	1,197	19.48	0.52
17.20	0.46	1,169	19.48	0.50
17.40	0.44	1,142	19.47	0.48
17.60	0.42	1,116	19.46	0.46
17.80	0.40	1,089	19.45	0.44
18.00	0.38	1,063	19.44	0.42
18.20	0.36	1,037	19.43	0.40
18.40	0.36	1,014	19.43	0.38
18.60	0.35	997	19.42	0.37
18.80	0.35	983	19.42	0.36
19.00	0.34	973	19.41	0.36
19.20	0.34	963	19.41	0.35
19.40	0.33	954	19.41	0.34
19.60	0.33	946	19.40	0.34
19.80	0.32	939	19.40	0.33
20.00	0.32	931	19.40	0.33
20.20	0.31	924	19.40	0.32
20.40	0.31	916	19.39	0.32
20.60	0.30	909	19.39	0.31

Hydrograph for Pond B1B: Underground Basin 1B (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
20.80	0.30	902	19.39	0.31
21.00	0.29	894	19.39	0.30
21.20	0.29	887	19.38	0.30
21.40	0.28	879	19.38	0.29
21.60	0.28	872	19.38	0.29
21.80	0.27	864	19.38	0.29
22.00	0.27	857	19.38	0.28
22.20	0.27	849	19.37	0.28
22.40	0.26	841	19.37	0.27
22.60	0.26	833	19.37	0.27
22.80	0.25	826	19.37	0.26
23.00	0.25	818	19.36	0.26
23.20	0.24	810	19.36	0.25
23.40	0.24	802	19.36	0.25
23.60	0.23	794	19.36	0.24
23.80	0.23	786	19.35	0.24
24.00	0.22	778	19.35	0.23
24.20	0.06	720	19.33	0.20
24.40	0.01	613	19.30	0.15
24.60	0.00	522	19.27	0.11
24.80	0.00	454	19.25	0.08
25.00	0.00	401	19.23	0.07
25.20	0.00	358	19.22	0.05
25.40	0.00	324	19.20	0.04
25.60	0.00	296	19.19	0.04
25.80	0.00	272	19.19	0.03
26.00	0.00	251	19.18	0.03
26.20	0.00	234	19.18	0.02
26.40	0.00	218	19.17	0.02
26.60	0.00	205	19.17	0.02
26.80	0.00	193	19.16	0.02
27.00	0.00	182	19.16	0.01
27.20	0.00	173	19.16	0.01
27.40	0.00	164	19.15	0.01
27.60	0.00	157	19.15	0.01
27.80	0.00	149	19.15	0.01
28.00	0.00	143	19.15	0.01
28.20	0.00	137	19.14	0.01
28.40	0.00	132	19.14	0.01
28.60	0.00	127	19.14	0.01
28.80	0.00	122	19.14	0.01
29.00	0.00	117	19.14	0.01
29.20	0.00	113	19.14	0.01
29.40	0.00	110	19.14	0.01
29.60	0.00	106	19.13	0.00
29.80	0.00	103	19.13	0.00
30.00	0.00	100	19.13	0.00
30.20	0.00	97	19.13	0.00
30.40	0.00	94	19.13	0.00
30.60	0.00	91	19.13	0.00
30.80	0.00	89	19.13	0.00
31.00	0.00	87	19.13	0.00

APPENDIX C-6

C.R. 16 25-YEAR STORM EVENT HYDROGRAPH

Summary for Subcatchment 14S: Pr. Area R.O.W. Imp.

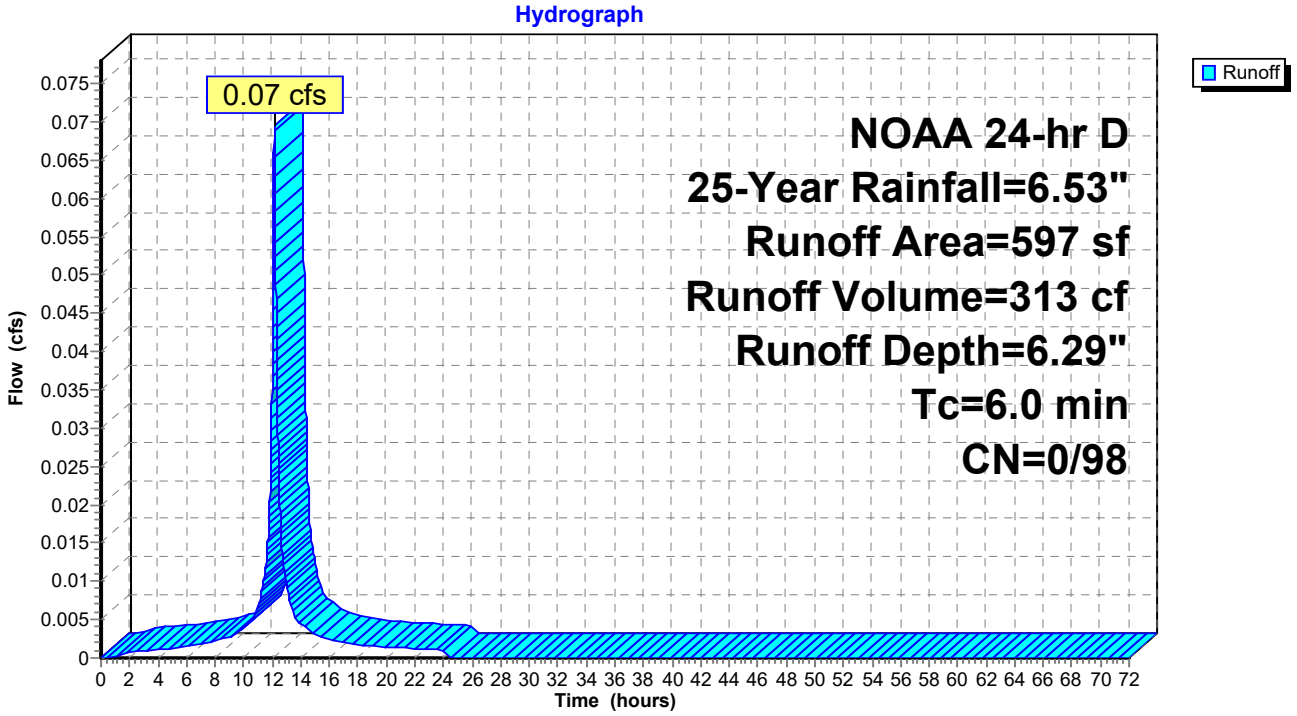
Runoff = 0.07 cfs @ 12.14 hrs, Volume= 313 cf, Depth= 6.29"

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
597	98	Paved parking, HSG A
597	98	100.00% Impervious Area

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

Subcatchment 14S: Pr. Area R.O.W. Imp.

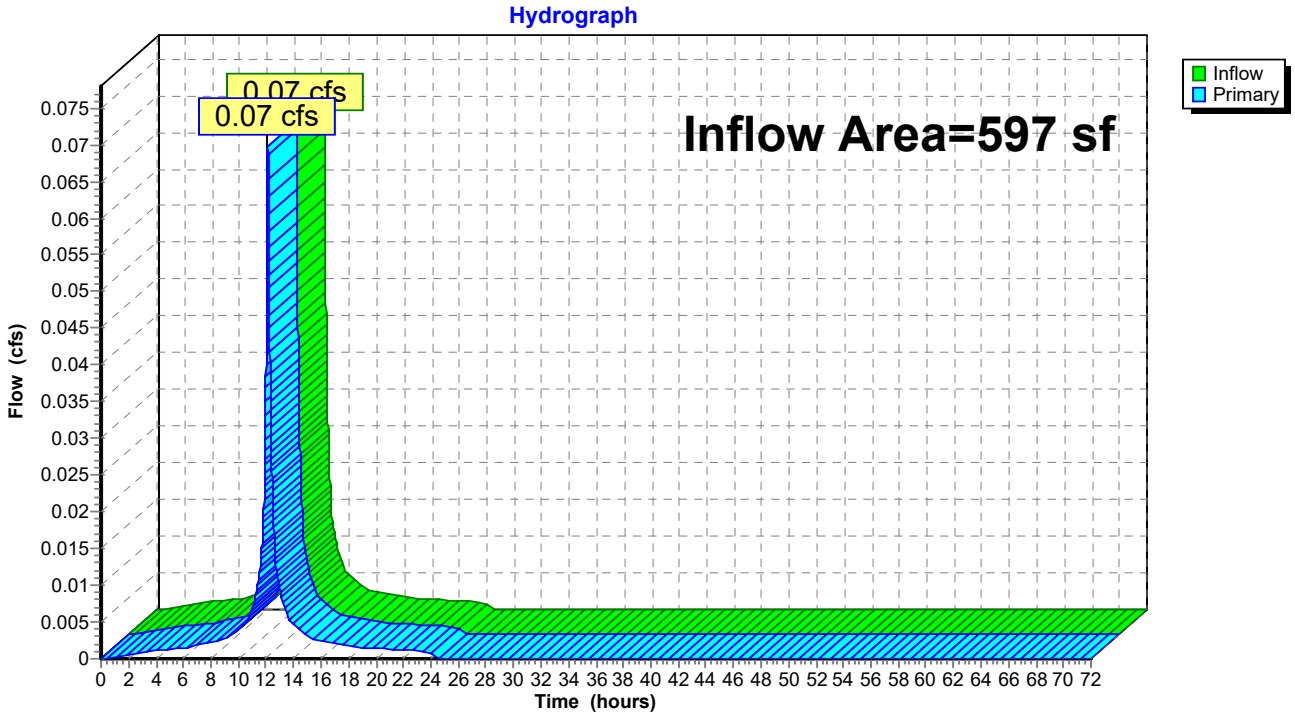


Summary for Link 13L: Pr. POA R.O.W.

Inflow Area = 597 sf,100.00% Impervious, Inflow Depth = 6.29" for 25-Year event
Inflow = 0.07 cfs @ 12.14 hrs, Volume= 313 cf
Primary = 0.07 cfs @ 12.14 hrs, Volume= 313 cf, Atten= 0%, Lag= 0.0 min

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

Link 13L: Pr. POA R.O.W.



APPENDIX C-7
BMP WQ EVENT HYDROGRAPHS

Summary for Pond B 1C: Underground Basin 1C

Inflow Area = 102,591 sf, 86.24% Impervious, Inflow Depth = 0.73" for WQ Storm event
Inflow = 3.93 cfs @ 1.12 hrs, Volume= 6,216 cf
Outflow = 1.24 cfs @ 1.40 hrs, Volume= 6,197 cf, Atten= 68%, Lag= 16.4 min
Primary = 1.24 cfs @ 1.40 hrs, Volume= 6,197 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 19.75' @ 1.40 hrs Surf.Area= 10,459 sf Storage= 3,466 cf

Plug-Flow detention time= 76.2 min calculated for 6,196 cf (100% of inflow)
Center-of-Mass det. time= 76.5 min (150.5 - 74.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	8,886 cf	**53.78'W x 194.47'L x 3.52'H Field A** 36,868 cf Overall - 14,653 cf Embedded = 22,215 cf x 40.0% Voids
#2A	19.60'	14,040 cf	**Contech ChamberMaxx 2016** x 297 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 11 rows
		22,925 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.24 cfs @ 1.40 hrs HW=19.75' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.24 cfs of 1.72 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.24 cfs @ 2.74 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B 1C: Underground Basin 1C - 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 11 rows

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

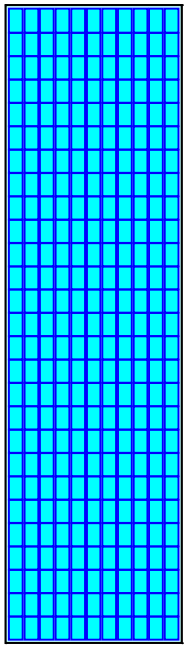
27 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 192.47' Row Length +12.0" End Stone x 2 = 194.47' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

297 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 14,039.6 cf Chamber Storage
297 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 14,653.5 cf Displacement

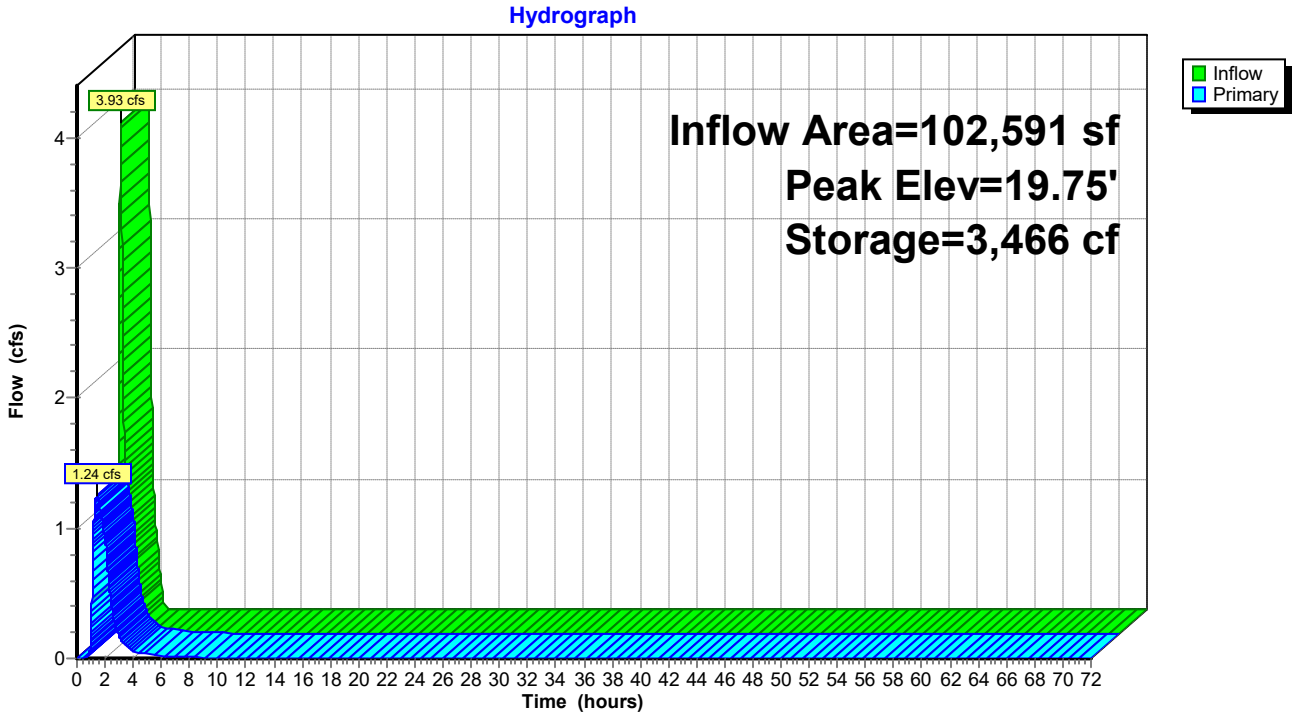
36,868.2 cf Field - 14,653.5 cf Chambers = 22,214.7 cf Stone x 40.0% Voids = 8,885.9 cf Stone Storage

Chamber Storage + Stone Storage = 22,925.5 cf = 0.526 af
Overall Storage Efficiency = 62.2%
Overall System Size = 194.47' x 53.78' x 3.52'

297 Chambers
1,365.5 cy Field
822.8 cy Stone



Pond B 1C: Underground Basin 1C



Summary for Pond DW1C: Drywell 1C

Inflow Area = 4,515 sf,100.00% Impervious, Inflow Depth = 1.03" for WQ Storm event
Inflow = 0.25 cfs @ 1.12 hrs, Volume= 389 cf
Outflow = 0.01 cfs @ 2.03 hrs, Volume= 389 cf, Atten= 95%, Lag= 54.3 min
Discarded = 0.01 cfs @ 2.03 hrs, Volume= 389 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.55' @ 2.03 hrs Surf.Area= 497 sf Storage= 319 cf

Plug-Flow detention time= 221.8 min calculated for 389 cf (100% of inflow)
Center-of-Mass det. time= 221.8 min (295.7 - 73.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	22.40'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.40' / 21.00' S= 0.0304 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 2.03 hrs HW=21.55' (Free Discharge)
2=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.50' TW=19.10' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond DW1C: Drywell 1C - 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 2 rows

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

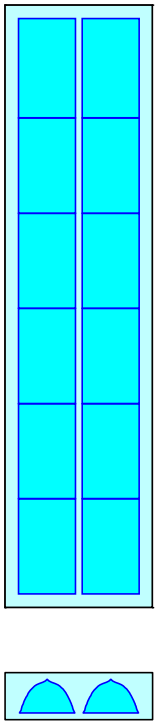
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

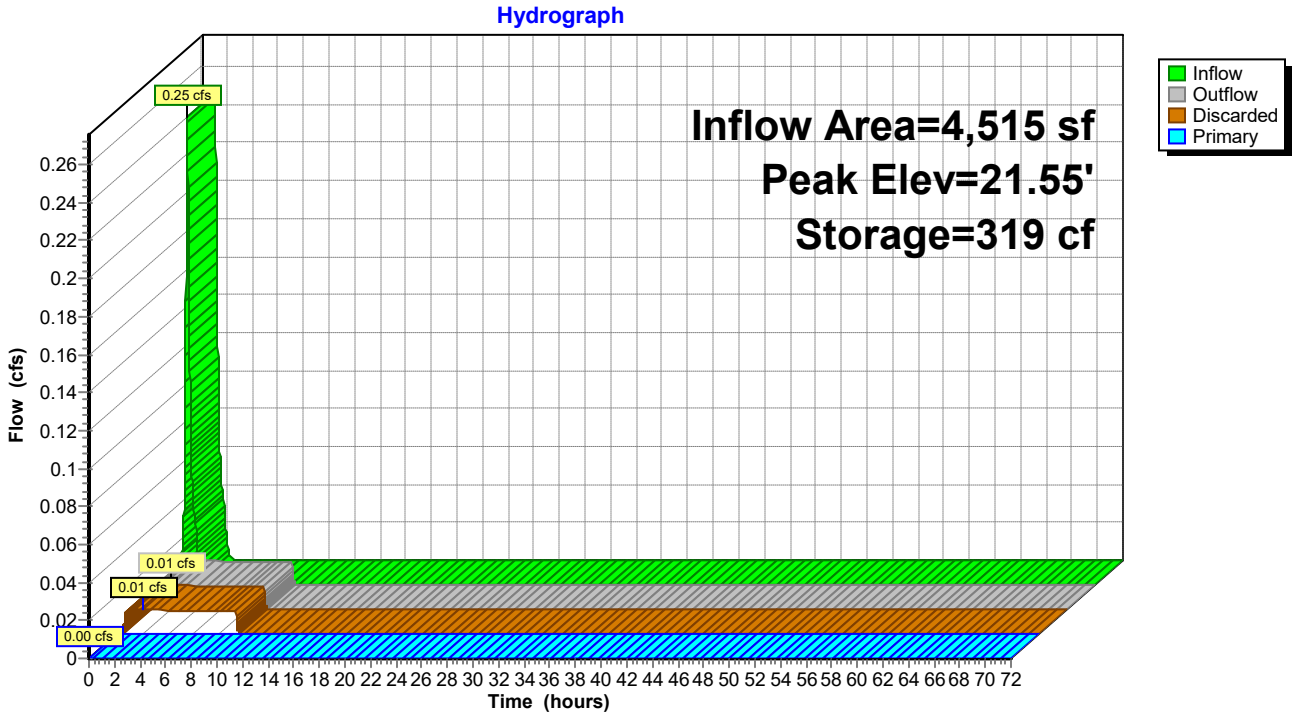
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1C: Drywell 1C



Summary for Pond RG 1C: Rain Garden 1C

Inflow Area = 15,497 sf, 46.88% Impervious, Inflow Depth = 0.58" for WQ Storm event
Inflow = 0.45 cfs @ 1.13 hrs, Volume= 745 cf
Outflow = 0.03 cfs @ 2.04 hrs, Volume= 745 cf, Atten= 94%, Lag= 54.9 min
Discarded = 0.03 cfs @ 2.04 hrs, Volume= 745 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.56' @ 2.04 hrs Surf.Area= 1,155 sf Storage= 635 cf

Plug-Flow detention time= 274.4 min calculated for 745 cf (100% of inflow)
Center-of-Mass det. time= 274.4 min (350.3 - 75.9)

Volume	Invert	Avail.Storage	Storage Description
#1	22.50'	1,282 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

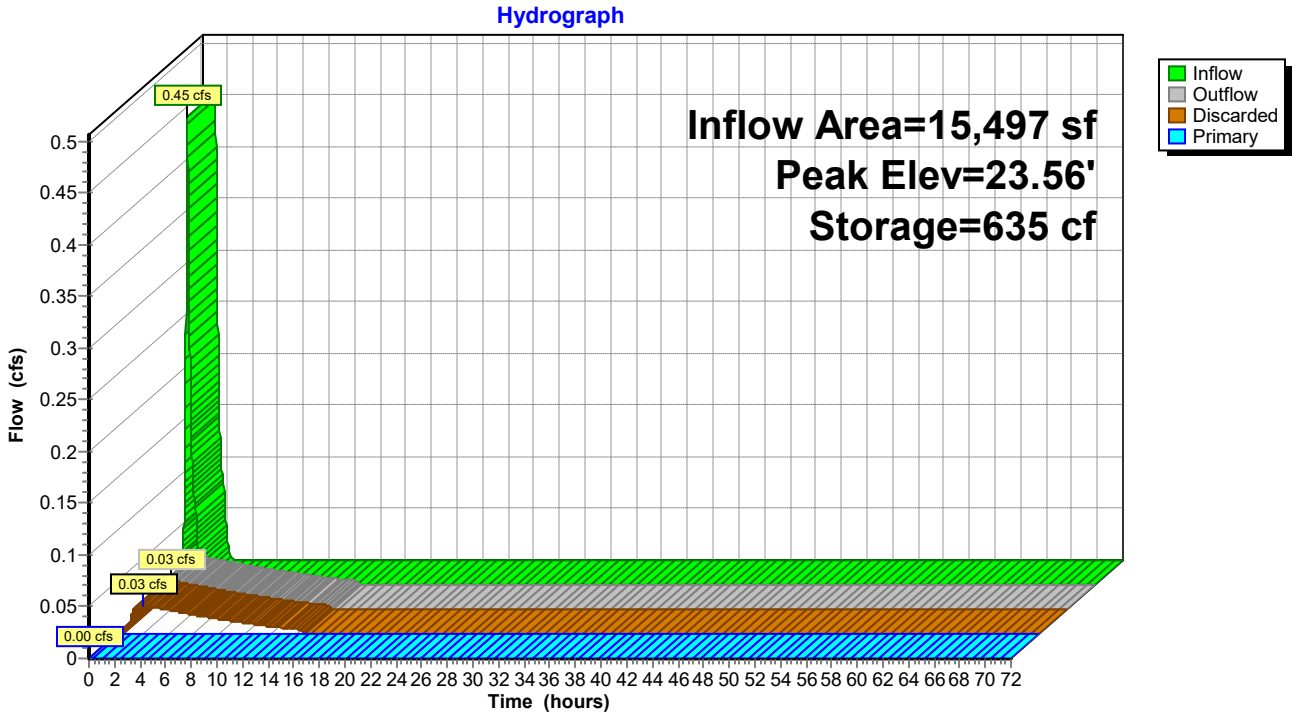
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
22.50	160	58.0	0	0	160
23.00	556	109.0	169	169	839
24.00	1,787	204.0	1,113	1,282	3,210

Device	Routing	Invert	Outlet Devices
#1	Primary	20.45'	**15.0" Round Culvert** L= 37.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 20.45' / 20.25' S= 0.0054 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	23.85'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	22.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.03 cfs @ 2.04 hrs HW=23.56' (Free Discharge)
↑**3=Exfiltration** (Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.50' TW=19.10' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.00 cfs of 6.41 cfs potential flow)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond RG 1C: Rain Garden 1C



Summary for Pond B1A: Underground Basin 1A

Inflow Area = 43,464 sf, 70.02% Impervious, Inflow Depth = 0.25" for WQ Storm event
Inflow = 0.57 cfs @ 1.12 hrs, Volume= 919 cf
Outflow = 0.36 cfs @ 1.26 hrs, Volume= 919 cf, Atten= 37%, Lag= 8.2 min
Primary = 0.36 cfs @ 1.26 hrs, Volume= 919 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 19.61' @ 1.26 hrs Surf.Area= 1,439 sf Storage= 296 cf

Plug-Flow detention time= 23.2 min calculated for 919 cf (100% of inflow)
Center-of-Mass det. time= 23.1 min (97.8 - 74.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	1,318 cf	**11.03'W x 130.42'L x 3.52'H Field A** 5,072 cf Overall - 1,778 cf Embedded = 3,295 cf x 40.0% Voids
#2A	19.60'	1,703 cf	**Contech ChamberMaxx 2016** x 36 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 2 rows
		3,021 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'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	21.00'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.36 cfs @ 1.26 hrs HW=19.61' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.36 cfs of 1.11 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 2.63 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1A: Underground Basin 1A - 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 2 rows

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

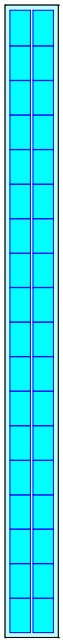
18 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 128.42' Row Length +12.0" End Stone x 2 = 130.42' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

36 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 1,703.2 cf Chamber Storage
36 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 1,777.6 cf Displacement

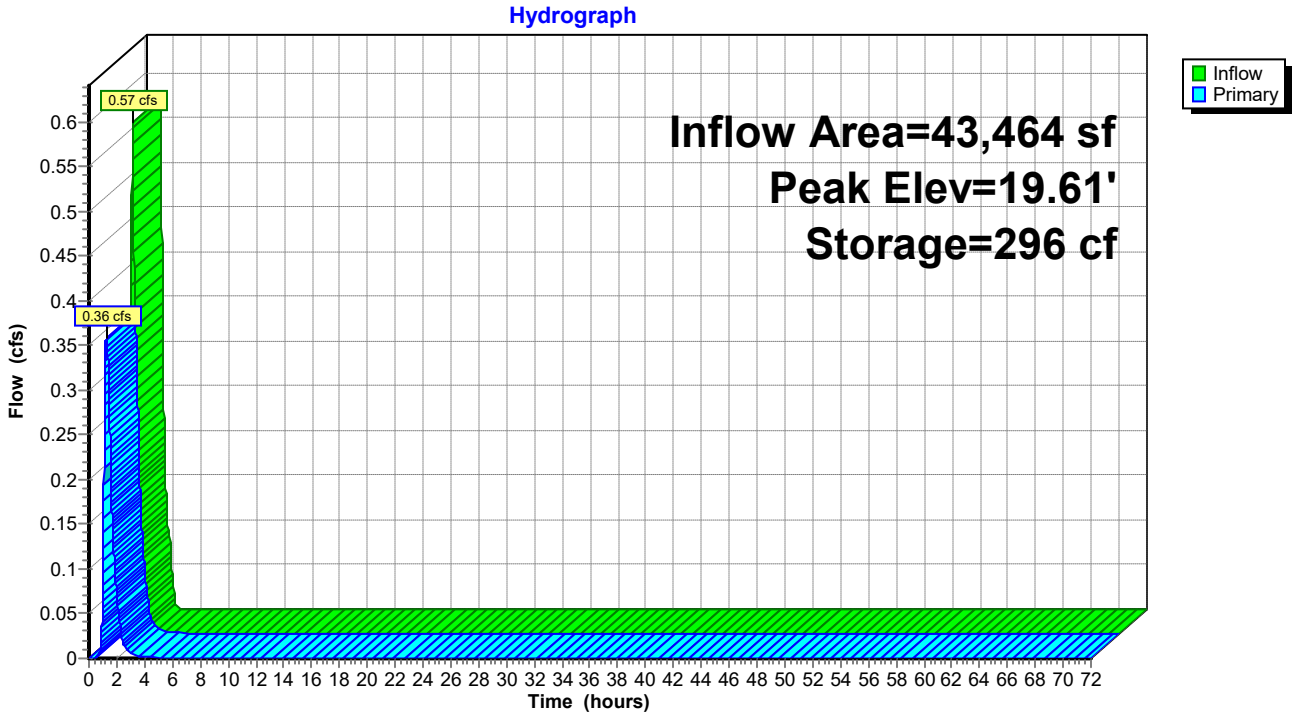
5,072.2 cf Field - 1,777.6 cf Chambers = 3,294.6 cf Stone x 40.0% Voids = 1,317.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,021.0 cf = 0.069 af
Overall Storage Efficiency = 59.6%
Overall System Size = 130.42' x 11.03' x 3.52'

36 Chambers
187.9 cy Field
122.0 cy Stone



Pond B1A: Underground Basin 1A



Summary for Pond B1B: Underground Basin 1B

Inflow Area = 104,336 sf, 76.55% Impervious, Inflow Depth = 0.72" for WQ Storm event
Inflow = 3.90 cfs @ 1.12 hrs, Volume= 6,258 cf
Outflow = 1.46 cfs @ 1.37 hrs, Volume= 6,247 cf, Atten= 62%, Lag= 14.6 min
Primary = 1.46 cfs @ 1.37 hrs, Volume= 6,247 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 19.83' @ 1.37 hrs Surf.Area= 7,780 sf Storage= 3,119 cf

Plug-Flow detention time= 53.0 min calculated for 6,246 cf (100% of inflow)
Center-of-Mass det. time= 53.5 min (128.1 - 74.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	19.10'	6,625 cf	**53.78'W x 144.65'L x 3.52'H Field A** 27,424 cf Overall - 10,861 cf Embedded = 16,563 cf x 40.0% Voids
#2A	19.60'	10,406 cf	**Contech ChamberMaxx 2016** x 220 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 11 rows
		17,031 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'	**1.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.46 cfs @ 1.37 hrs HW=19.83' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.46 cfs of 2.10 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.46 cfs @ 2.90 fps)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond B1B: Underground Basin 1B - 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 11 rows

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

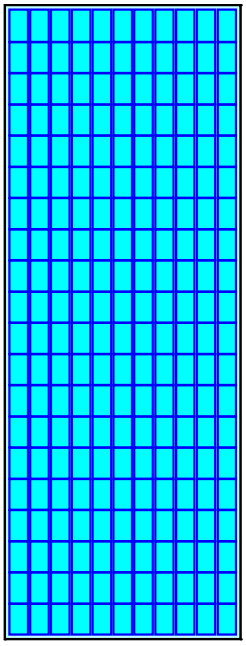
20 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 142.65' Row Length +12.0" End Stone x 2 = 144.65' Base Length
11 Rows x 51.4" Wide + 5.6" Spacing x 10 + 12.0" Side Stone x 2 = 53.78' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

220 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 11 Rows = 10,405.7 cf Chamber Storage
220 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 11 Rows = 10,860.7 cf Displacement

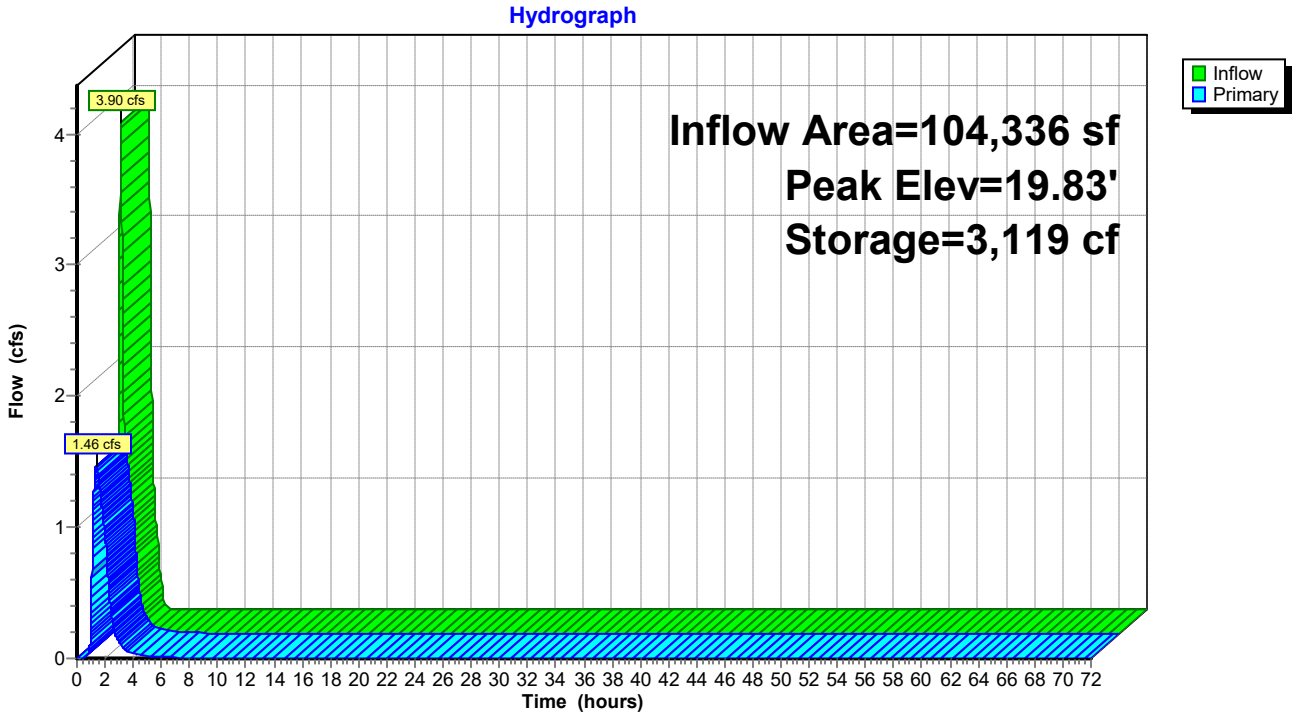
27,423.7 cf Field - 10,860.7 cf Chambers = 16,563.0 cf Stone x 40.0% Voids = 6,625.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,030.9 cf = 0.391 af
Overall Storage Efficiency = 62.1%
Overall System Size = 144.65' x 53.78' x 3.52'

220 Chambers
1,015.7 cy Field
613.4 cy Stone



Pond B1B: Underground Basin 1B



Summary for Pond DW1B: Drywell 1B

Inflow Area = 8,065 sf,100.00% Impervious, Inflow Depth = 1.03" for WQ Storm event
Inflow = 0.44 cfs @ 1.12 hrs, Volume= 695 cf
Outflow = 0.01 cfs @ 2.10 hrs, Volume= 695 cf, Atten= 97%, Lag= 58.5 min
Discarded = 0.01 cfs @ 2.10 hrs, Volume= 695 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 23.35' @ 2.10 hrs Surf.Area= 497 sf Storage= 616 cf

Plug-Flow detention time= 397.3 min calculated for 695 cf (100% of inflow)
Center-of-Mass det. time= 397.3 min (471.3 - 73.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	21.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	22.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	23.90'	**15.0" Round Culvert** L= 67.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 23.90' / 21.00' S= 0.0433 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	21.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 12.75' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 2.10 hrs HW=23.35' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=21.50' TW=19.10' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond DW1B: Drywell 1B - 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 2 rows

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

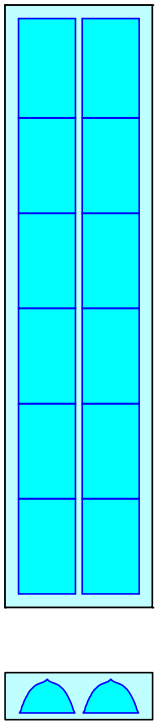
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

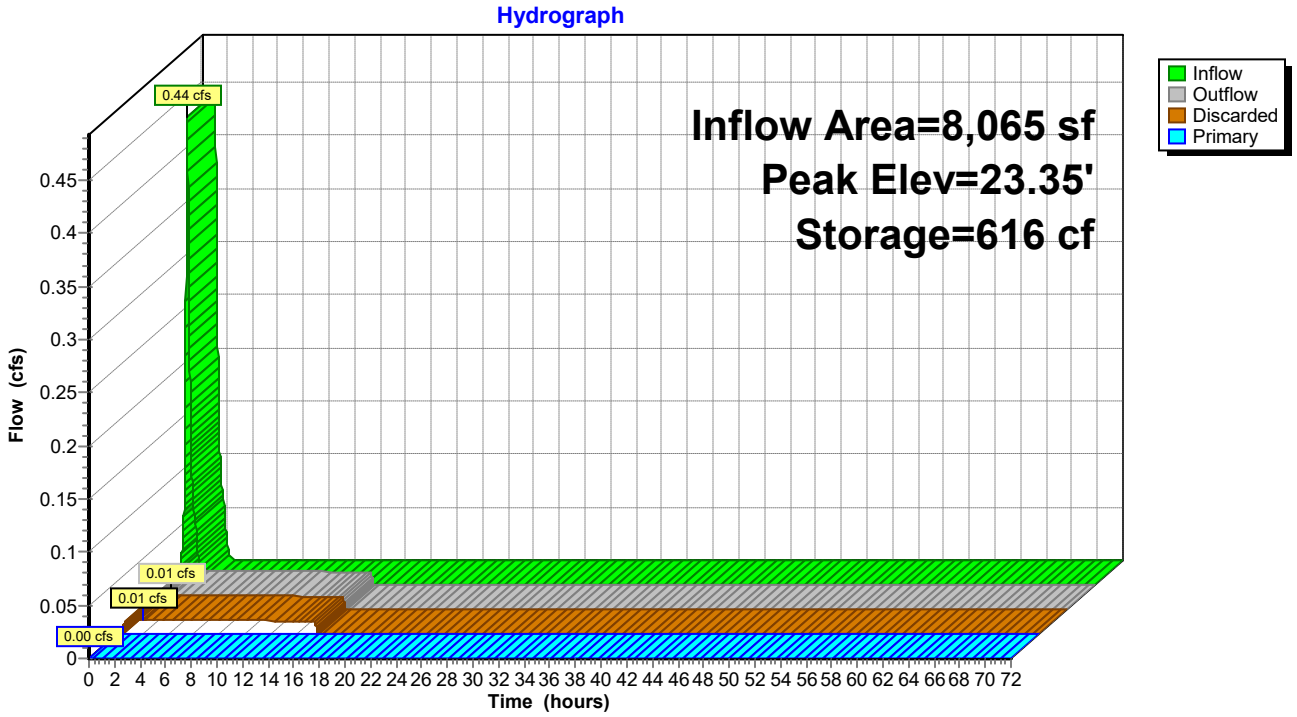
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW1B: Drywell 1B



Summary for Pond DW2B: Drywell 2B

Inflow Area = 3,316 sf,100.00% Impervious, Inflow Depth = 1.03" for WQ Storm event
Inflow = 0.18 cfs @ 1.12 hrs, Volume= 286 cf
Outflow = 0.01 cfs @ 1.93 hrs, Volume= 286 cf, Atten= 93%, Lag= 48.3 min
Discarded = 0.01 cfs @ 1.93 hrs, Volume= 286 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 21.30' @ 1.93 hrs Surf.Area= 497 sf Storage= 220 cf

Plug-Flow detention time= 157.2 min calculated for 286 cf (100% of inflow)
Center-of-Mass det. time= 157.2 min (231.1 - 73.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	20.50'	462 cf	**11.03'W x 45.02'L x 3.52'H Field A** 1,751 cf Overall - 595 cf Embedded = 1,155 cf x 40.0% Voids
#2A	21.00'	571 cf	**Contech ChamberMaxx 2016** x 12 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 2 rows
		1,033 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	21.75'	**15.0" Round Culvert** L= 46.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 21.75' / 21.00' S= 0.0163 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Discarded	20.50'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.54' Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 1.93 hrs HW=21.30' (Free Discharge)
↑**2=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=20.50' TW=19.10' (Dynamic Tailwater)
↑**1=Culvert** (Controls 0.00 cfs)

Pond DW2B: Drywell 2B - 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 2 rows

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

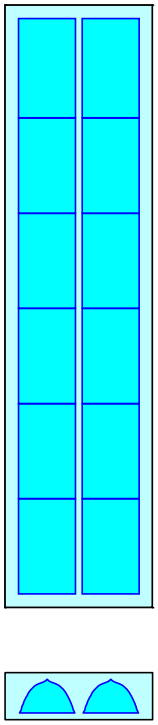
6 Chambers/Row x 7.12' Long +0.32' Row Adjustment = 43.02' Row Length +12.0" End Stone x 2 = 45.02' Base Length
2 Rows x 51.4" Wide + 5.6" Spacing x 1 + 12.0" Side Stone x 2 = 11.03' Base Width
6.0" Base + 30.3" Chamber Height + 6.0" Cover = 3.52' Field Height

12 Chambers x 47.2 cf +0.32' Row Adjustment x 6.63 sf x 2 Rows = 570.5 cf Chamber Storage
12 Chambers x 49.3 cf +0.32' Row Adjustment x 6.92 sf x 2 Rows = 595.5 cf Displacement

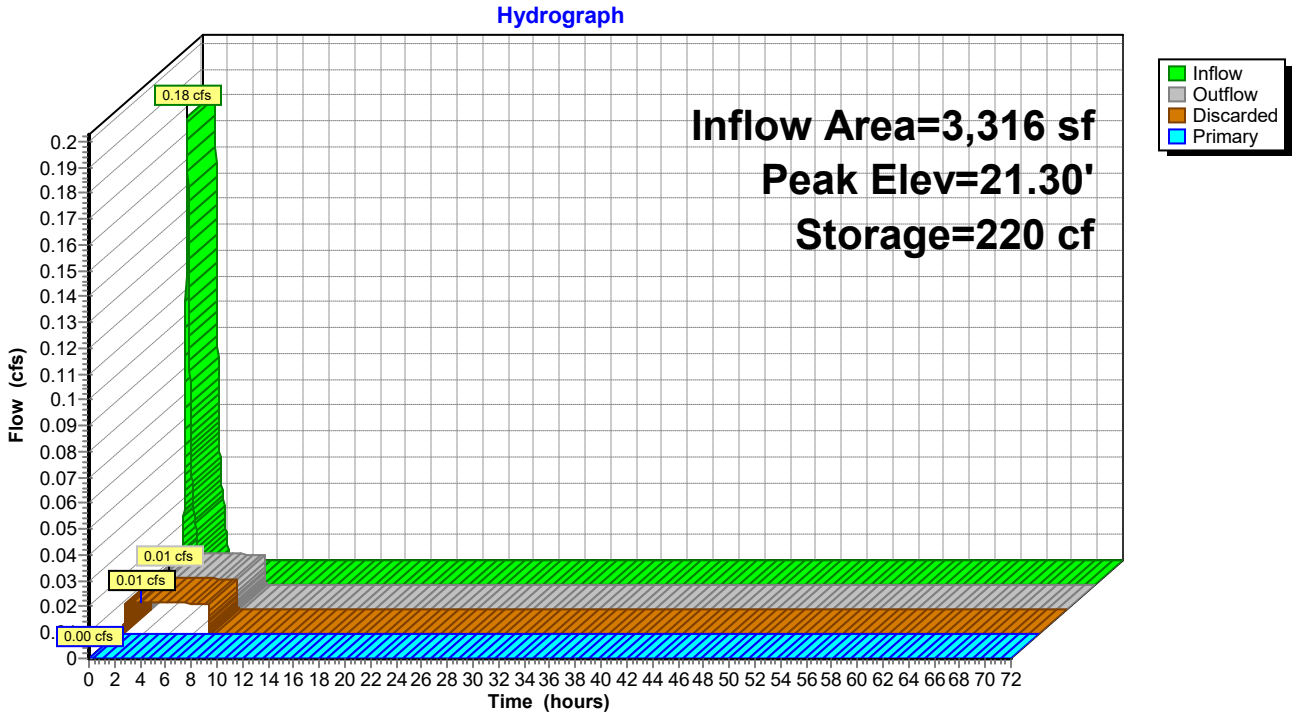
1,750.8 cf Field - 595.5 cf Chambers = 1,155.3 cf Stone x 40.0% Voids = 462.1 cf Stone Storage

Chamber Storage + Stone Storage = 1,032.7 cf = 0.024 af
Overall Storage Efficiency = 59.0%
Overall System Size = 45.02' x 11.03' x 3.52'

12 Chambers
64.8 cy Field
42.8 cy Stone



Pond DW2B: Drywell 2B



Summary for Pond RG1A: Rain Garden 1A

Inflow Area = 29,515 sf, 69.22% Impervious, Inflow Depth = 0.77" for WQ Storm event
Inflow = 1.18 cfs @ 1.12 hrs, Volume= 1,892 cf
Outflow = 0.06 cfs @ 2.06 hrs, Volume= 1,892 cf, Atten= 95%, Lag= 56.4 min
Discarded = 0.06 cfs @ 2.06 hrs, Volume= 1,892 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 25.29' @ 2.06 hrs Surf.Area= 2,259 sf Storage= 1,662 cf

Plug-Flow detention time= 348.7 min calculated for 1,892 cf (100% of inflow)
Center-of-Mass det. time= 348.7 min (423.5 - 74.8)

Volume	Invert	Avail.Storage	Storage Description
#1	24.00'	3,688 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

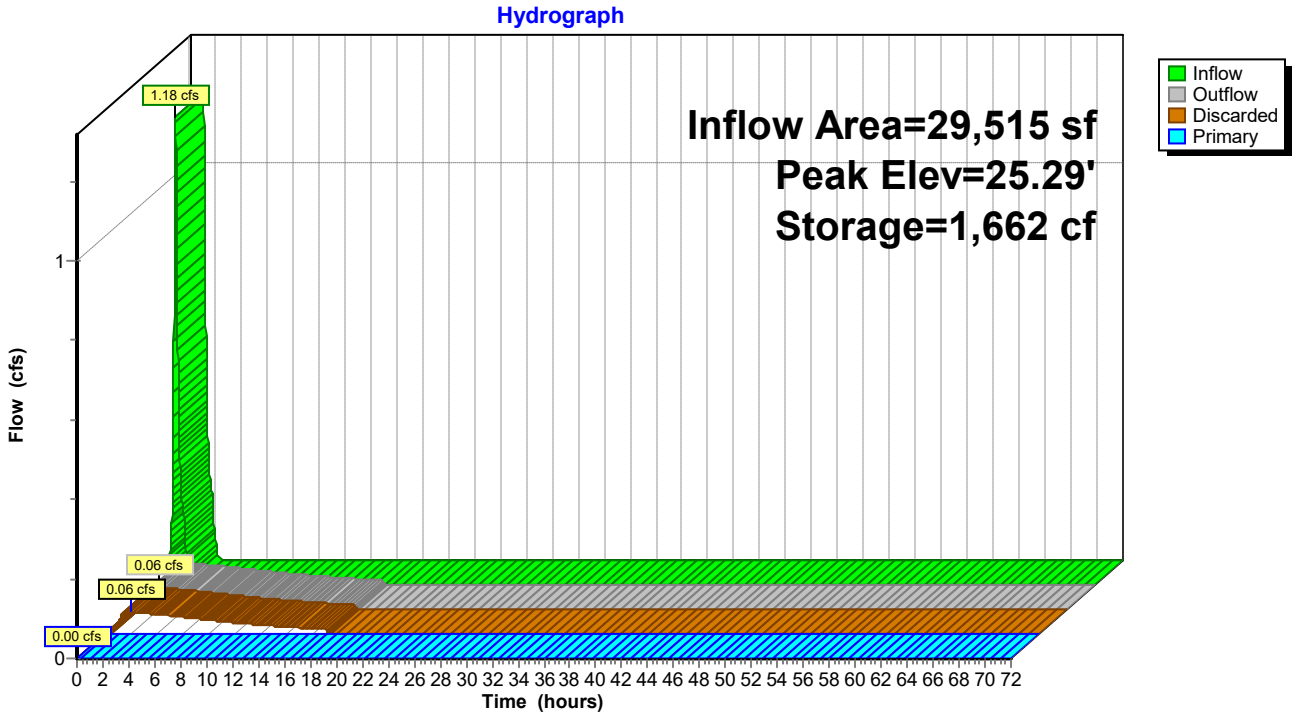
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
24.00	461	161.0	0	0	461
25.00	1,829	216.0	1,069	1,069	2,122
26.00	3,498	260.0	2,619	3,688	3,805

Device	Routing	Invert	Outlet Devices
#1	Primary	22.00'	**15.0" Round Culvert** L= 27.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 22.00' / 19.60' S= 0.0889 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	25.80'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Discarded	24.00'	**1.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.80' Phase-In= 0.01'

Discarded OutFlow Max=0.06 cfs @ 2.06 hrs HW=25.29' (Free Discharge)
└**3=Exfiltration** (Controls 0.06 cfs)

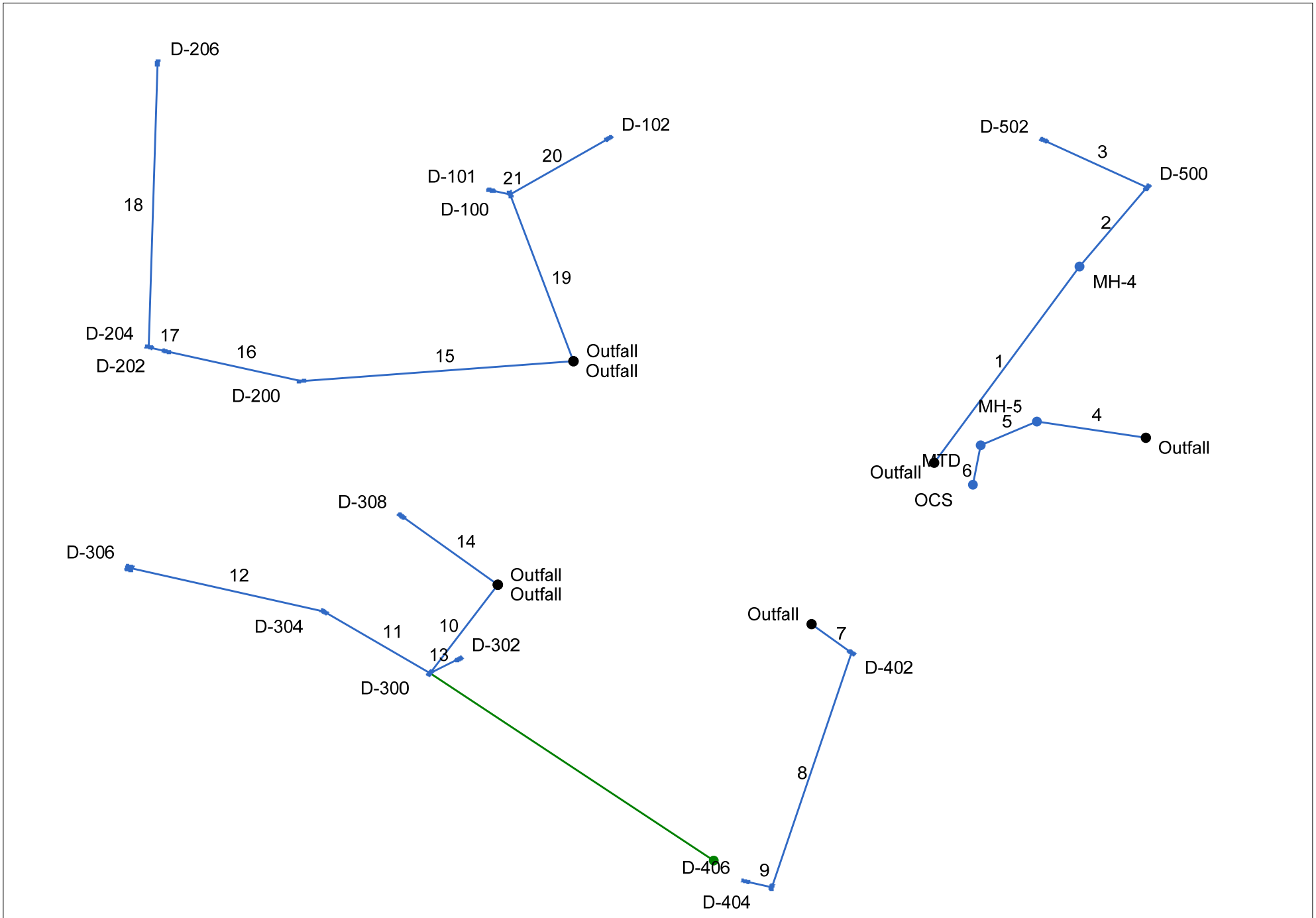
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=24.00' TW=19.10' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 6.93 cfs potential flow)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond RG1A: Rain Garden 1A



APPENDIX C-8
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-9
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

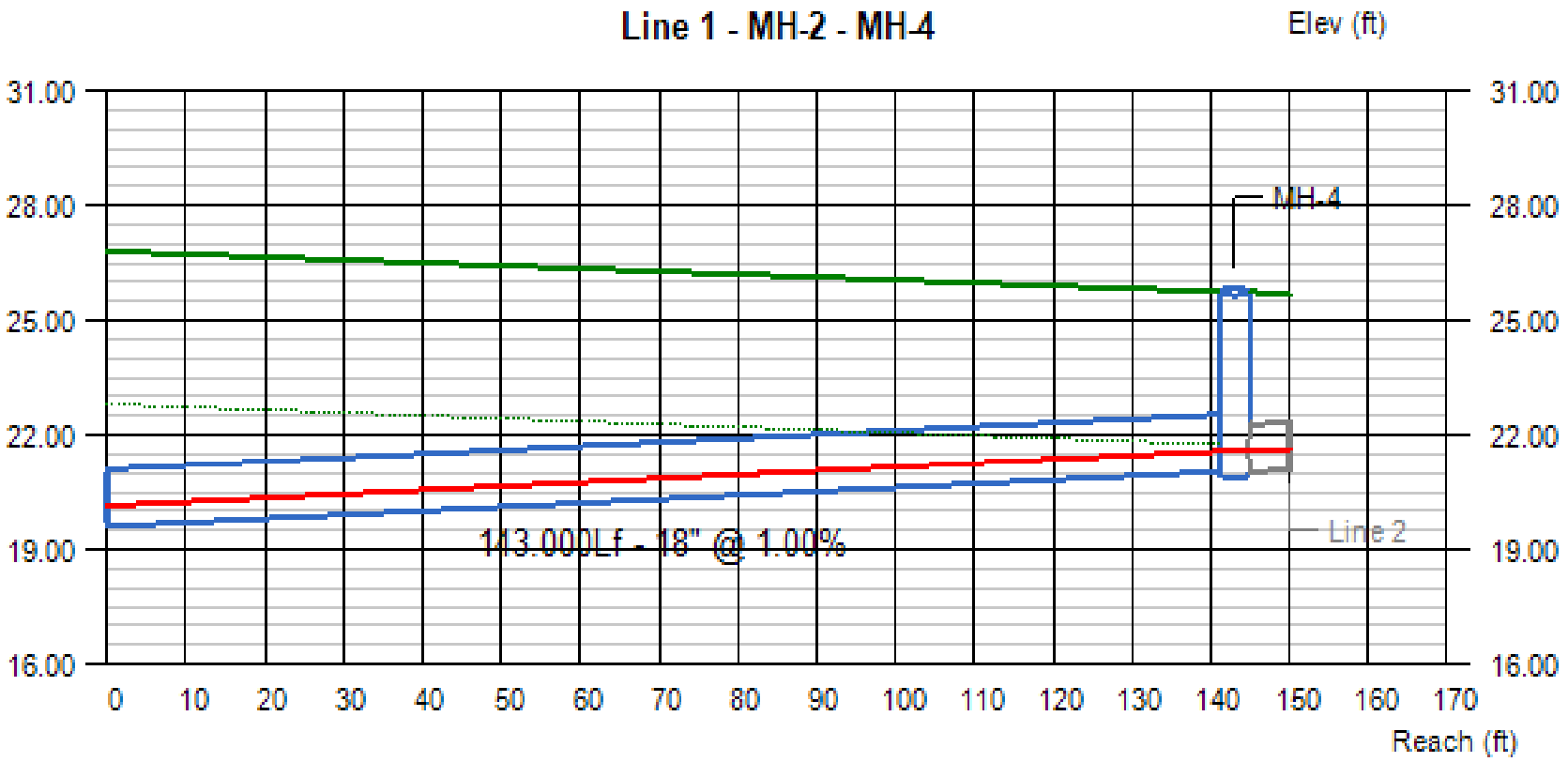
Project File: 2020-12-27_Hydroflow Design.stm | Number of lines: 21 | Date: 12/29/2020

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

APPENDIX C-10

PIPE PROFILES

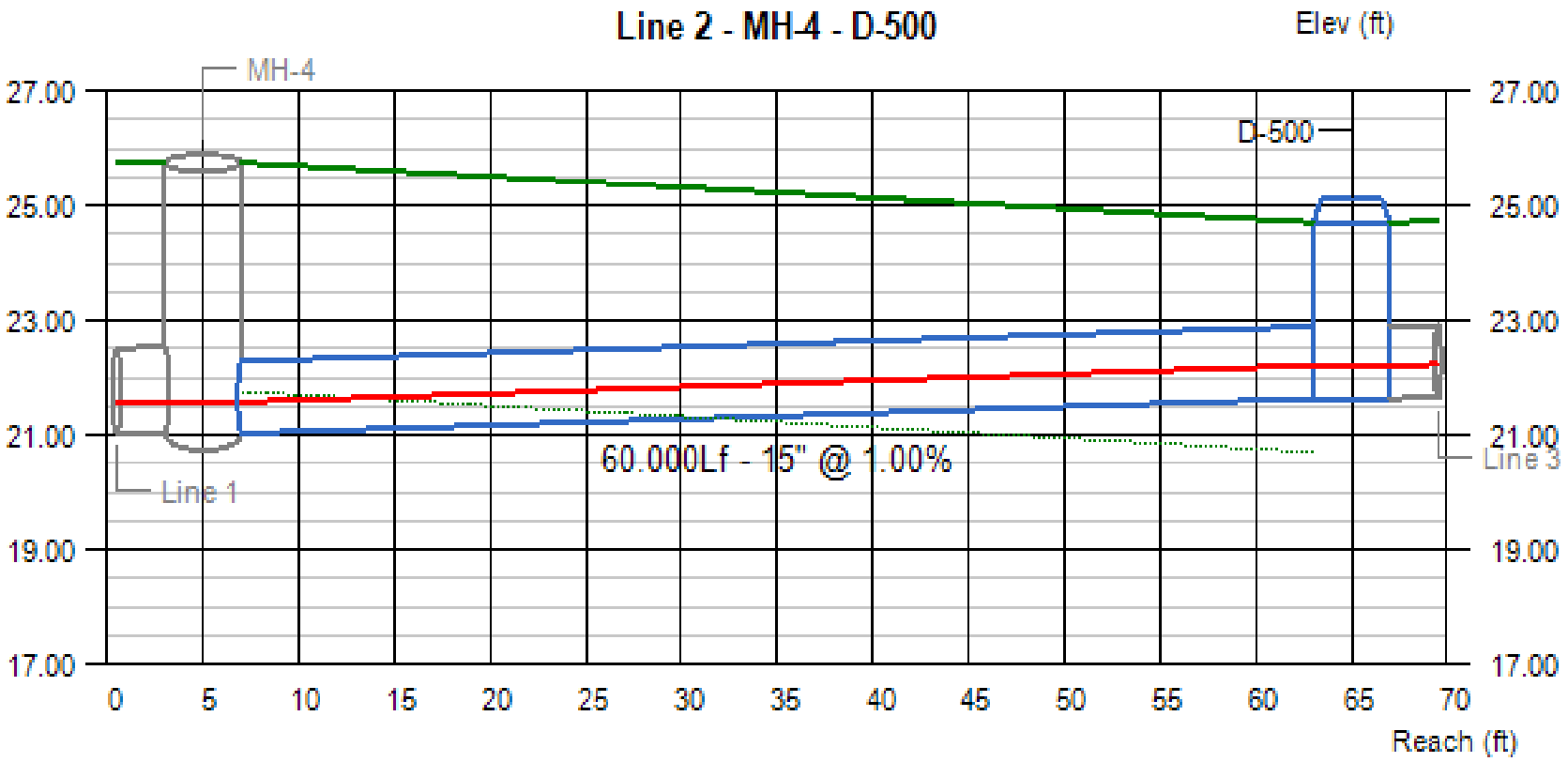
Line Profile (Line 1) - MH-2 - MH-4



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

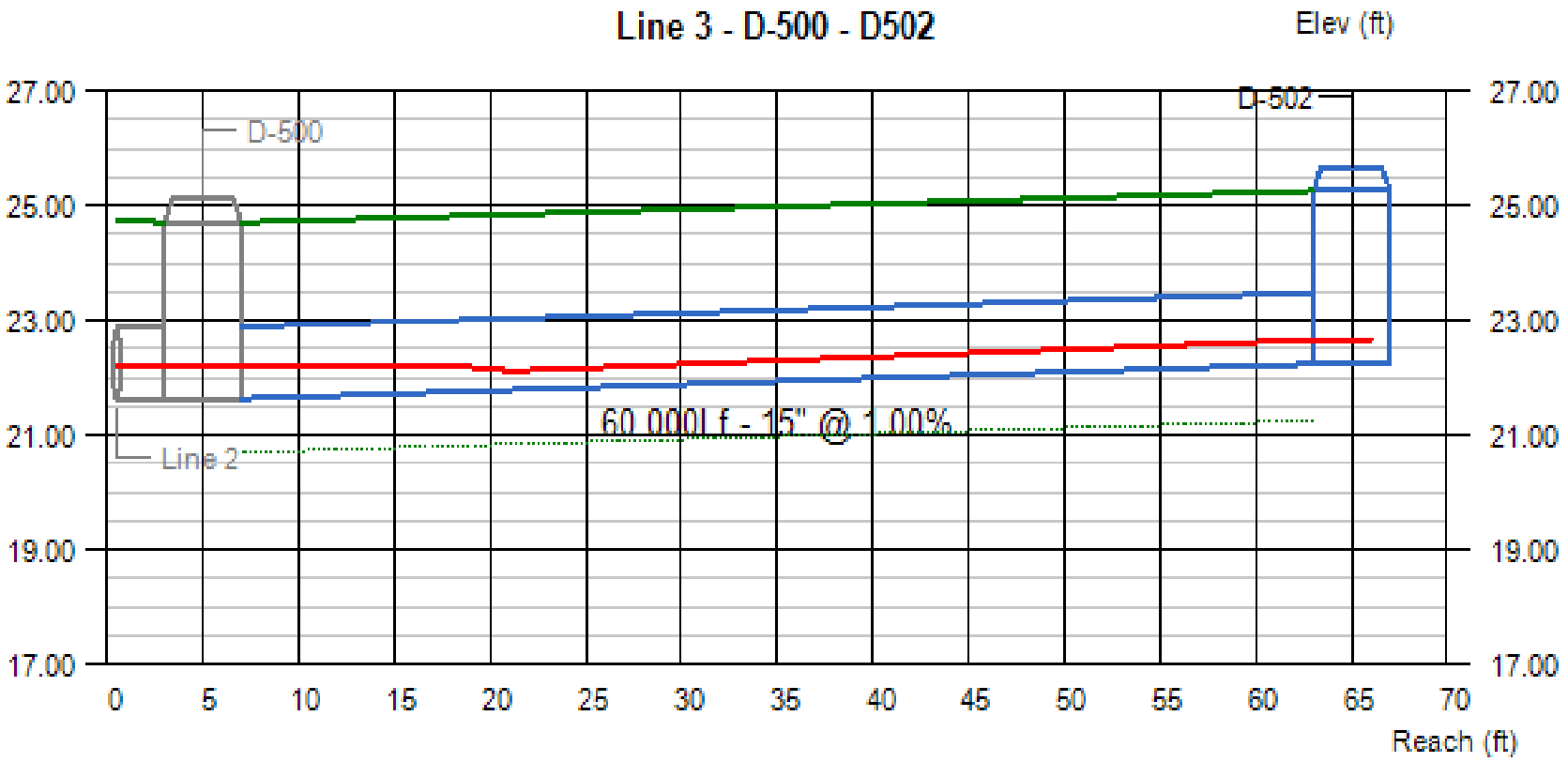
Line Profile (Line 2) - MH-4 - D-500



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

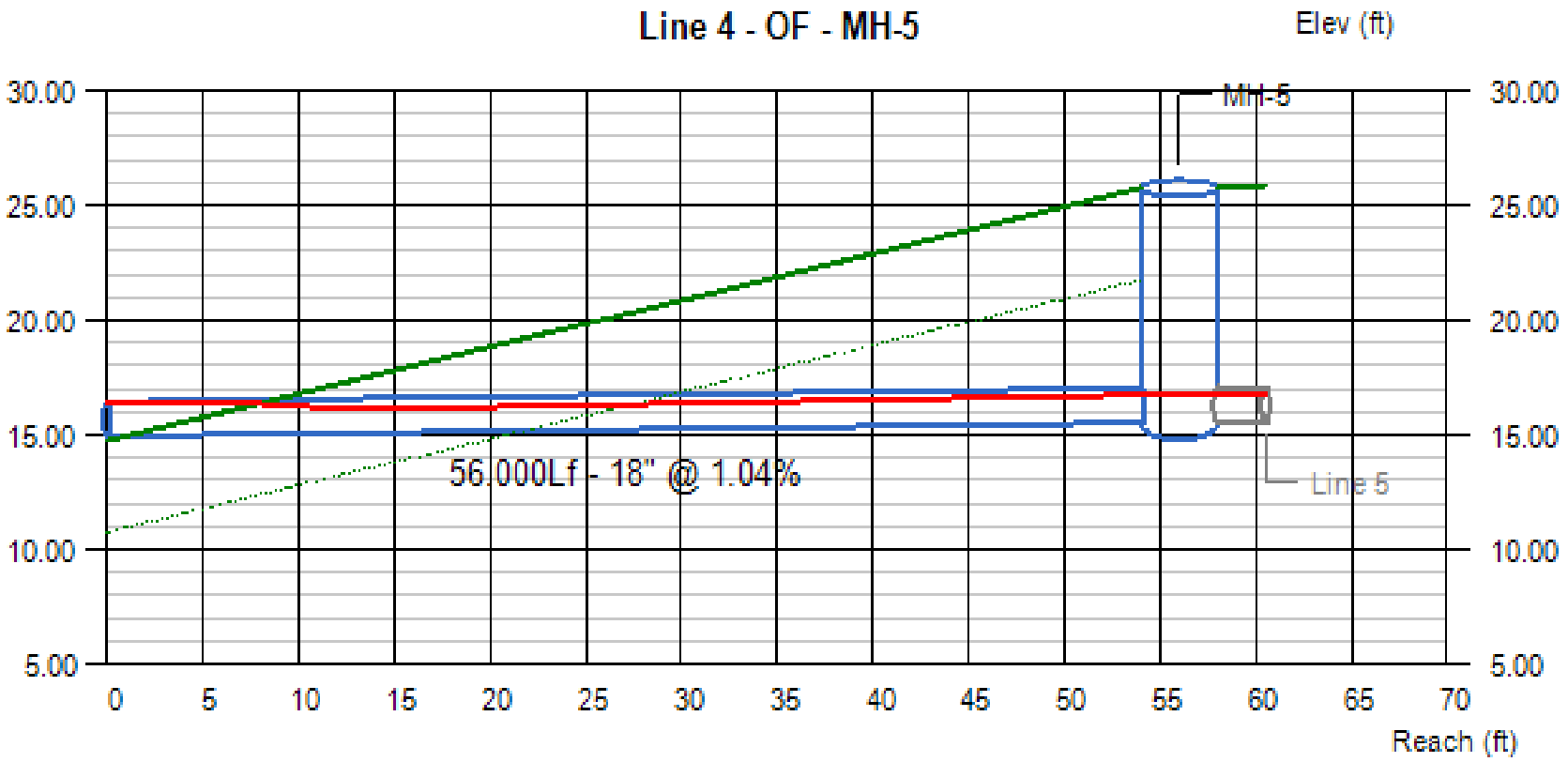
Line Profile (Line 3) - D-500 - D502



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

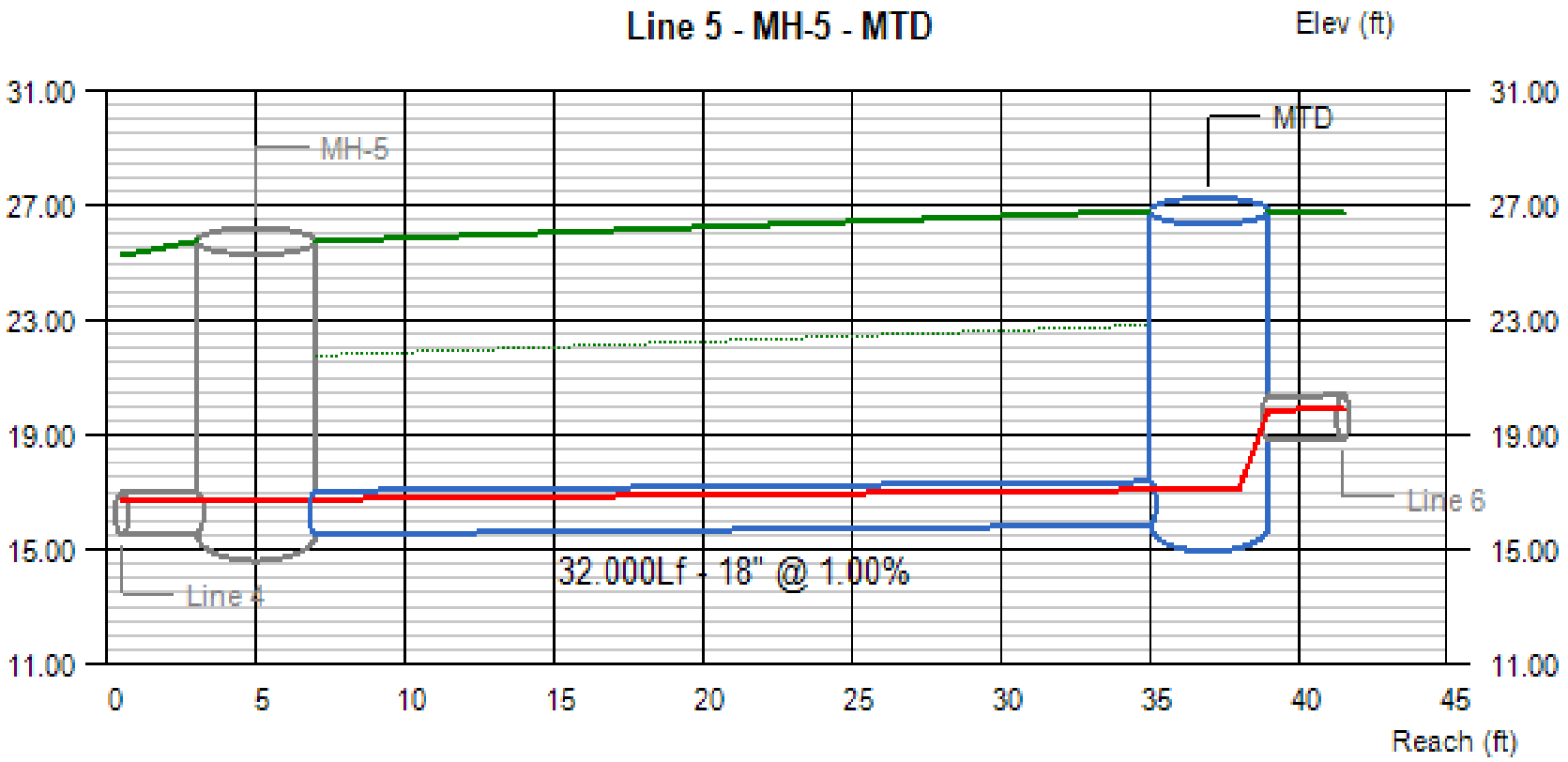
Line Profile (Line 4) - OF - MH-5



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

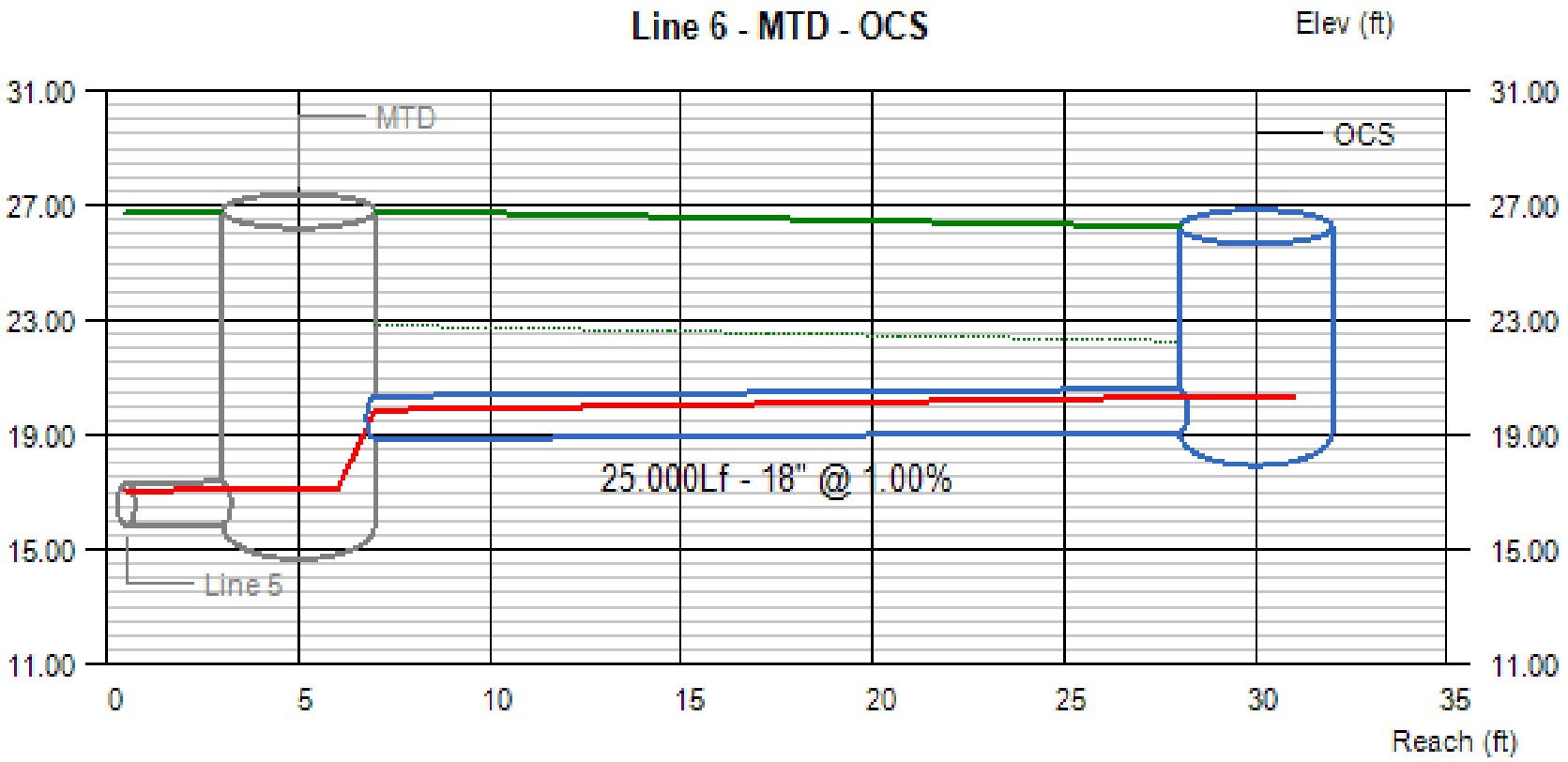
Line Profile (Line 5) - MH-5 - MTD



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

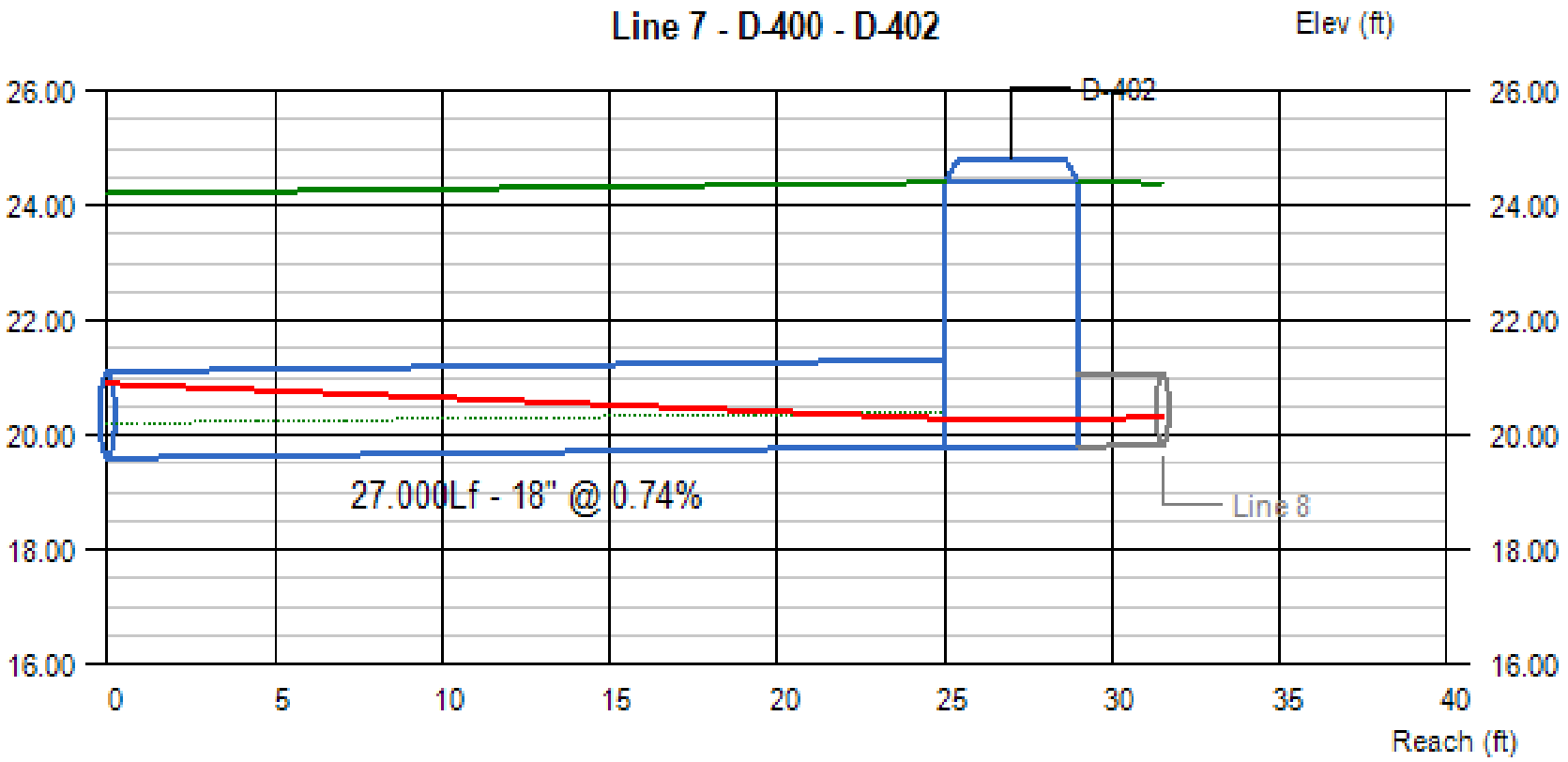
Line Profile (Line 6) - MTD - OCS



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

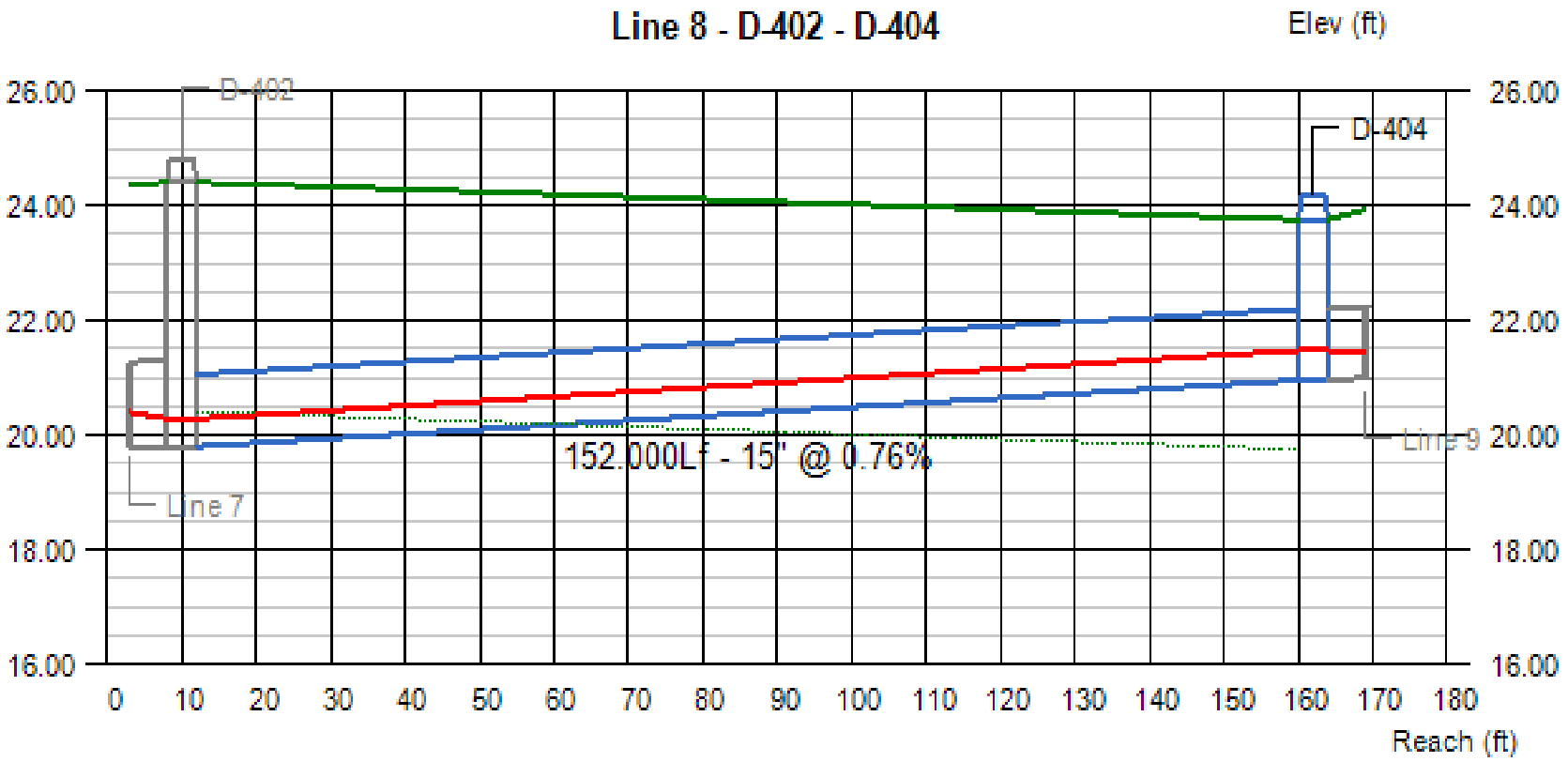
Line Profile (Line 7) - D-400 - D-402



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

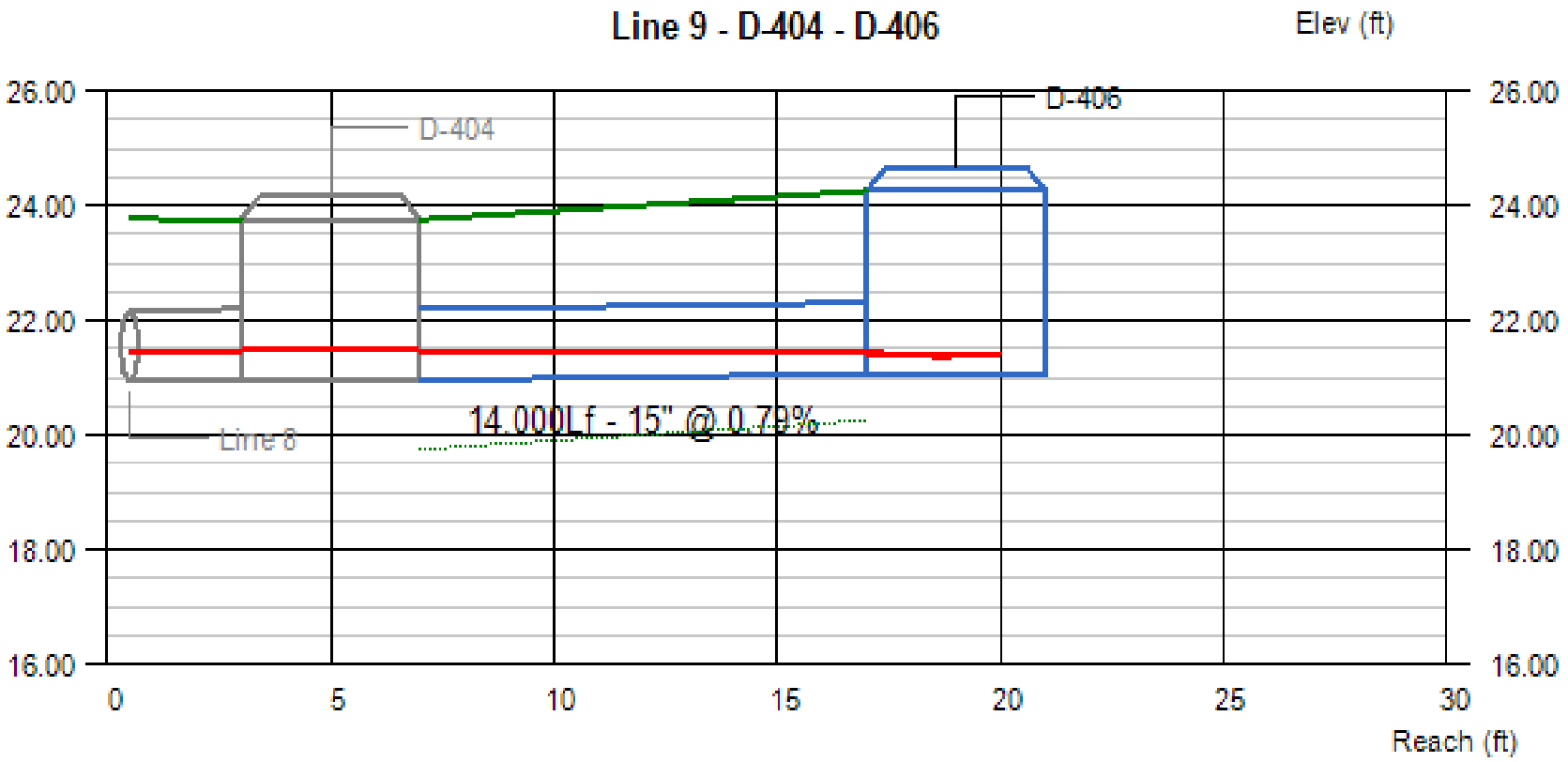
Line Profile (Line 8) - D-402 - D-404



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

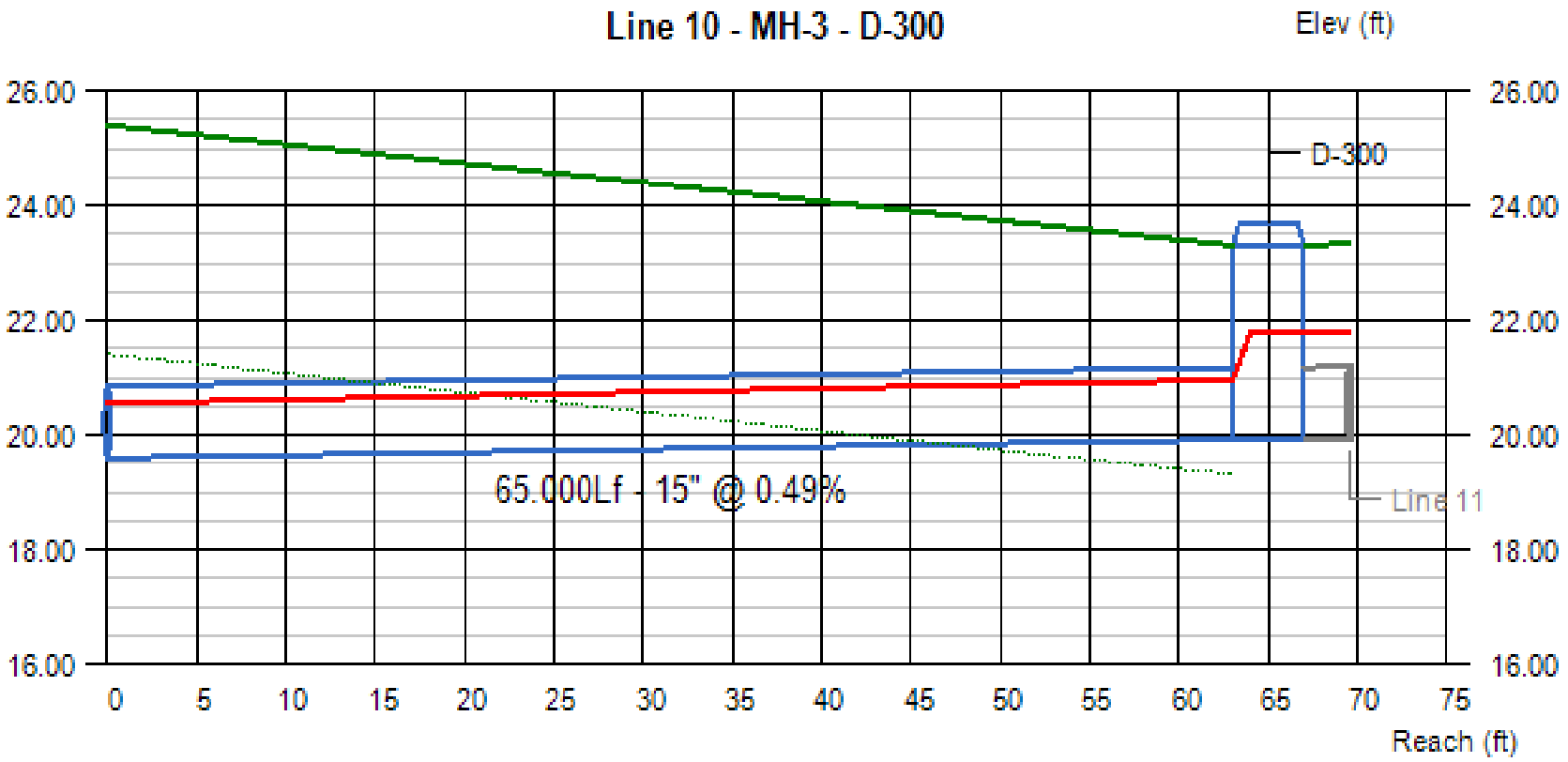
Line Profile (Line 9) - D-404 - D-406



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

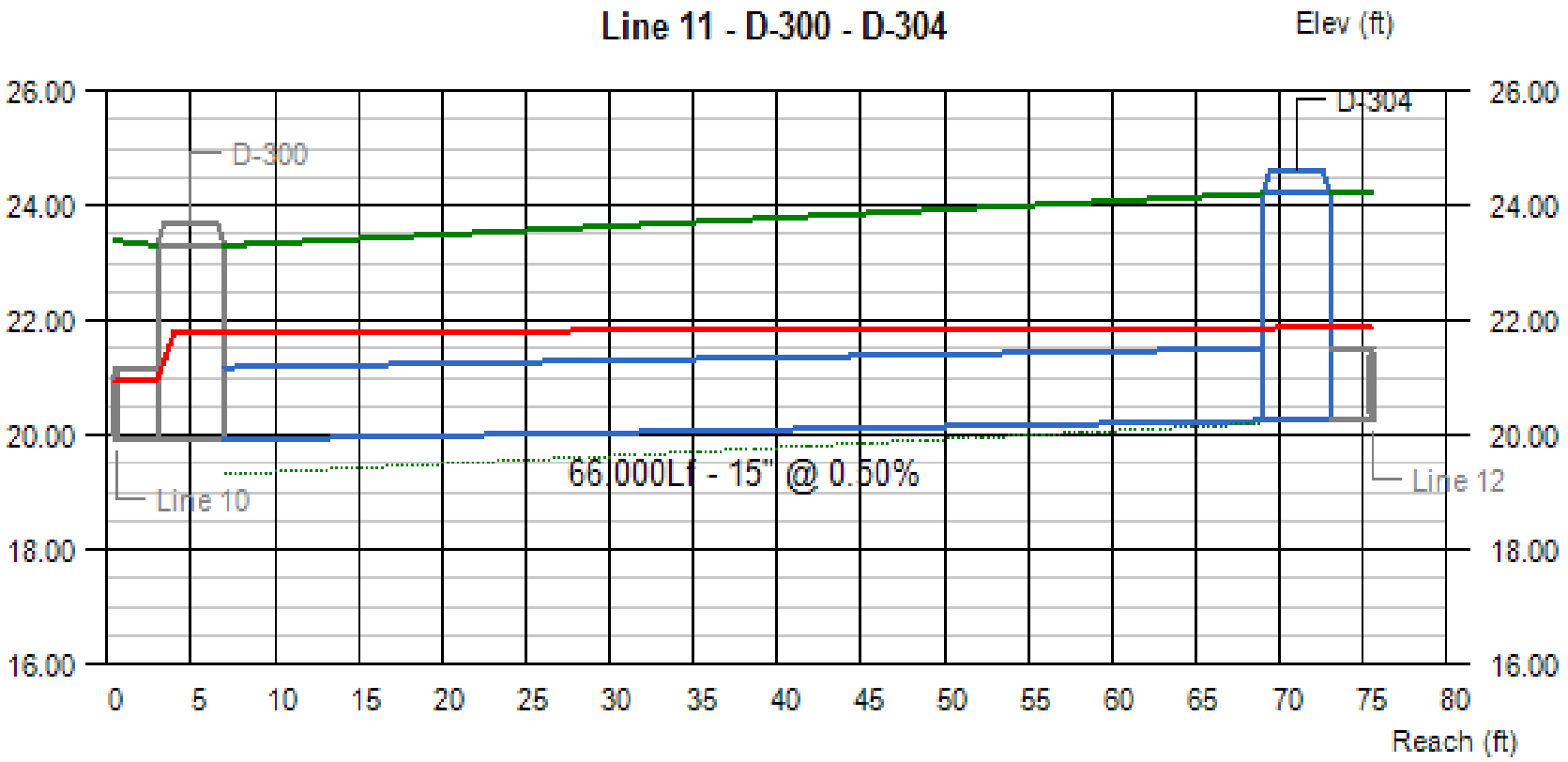
Line Profile (Line 10) - MH-3 - D-300



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

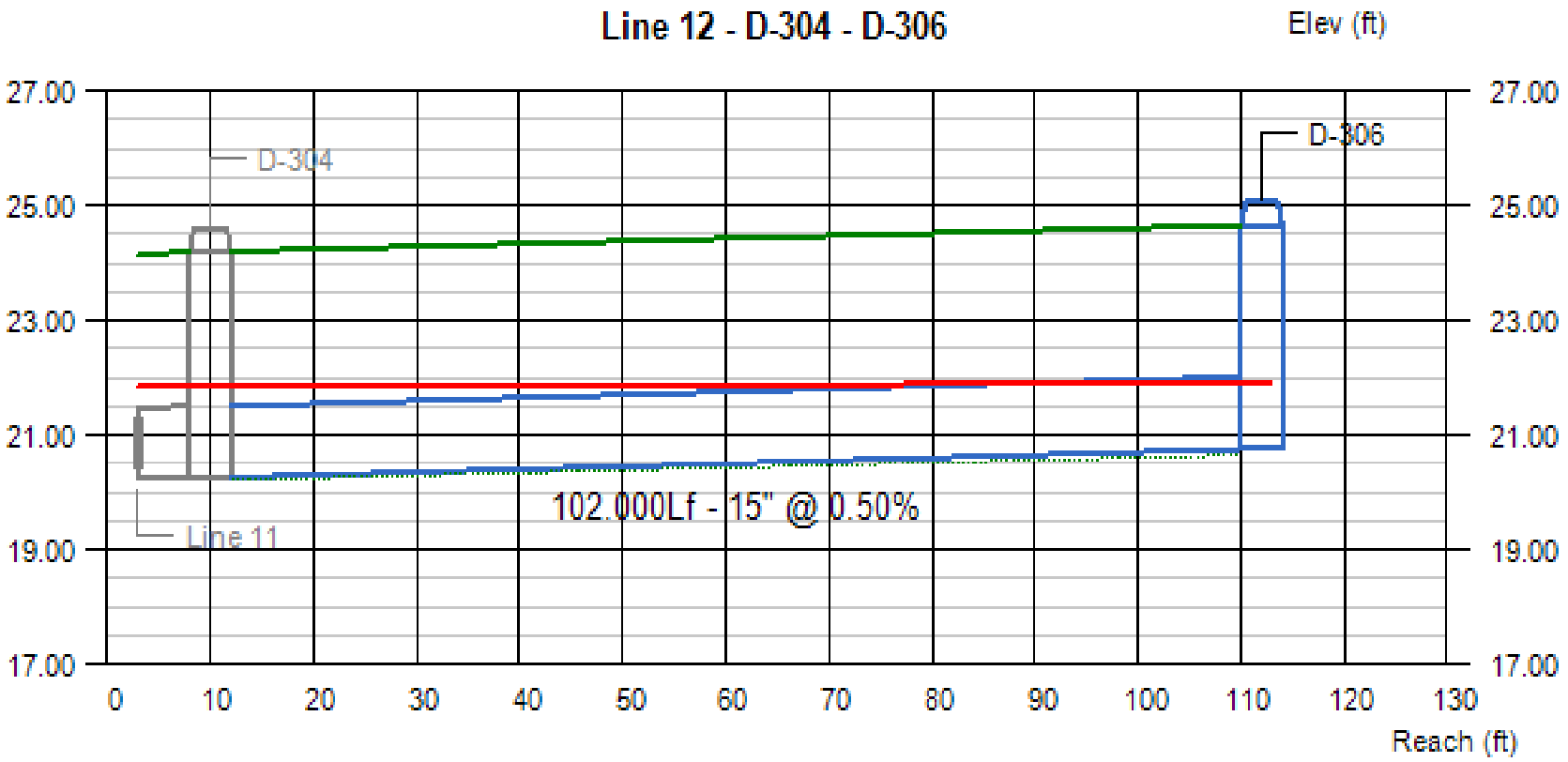
Line Profile (Line 11) - D-300 - D-304



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

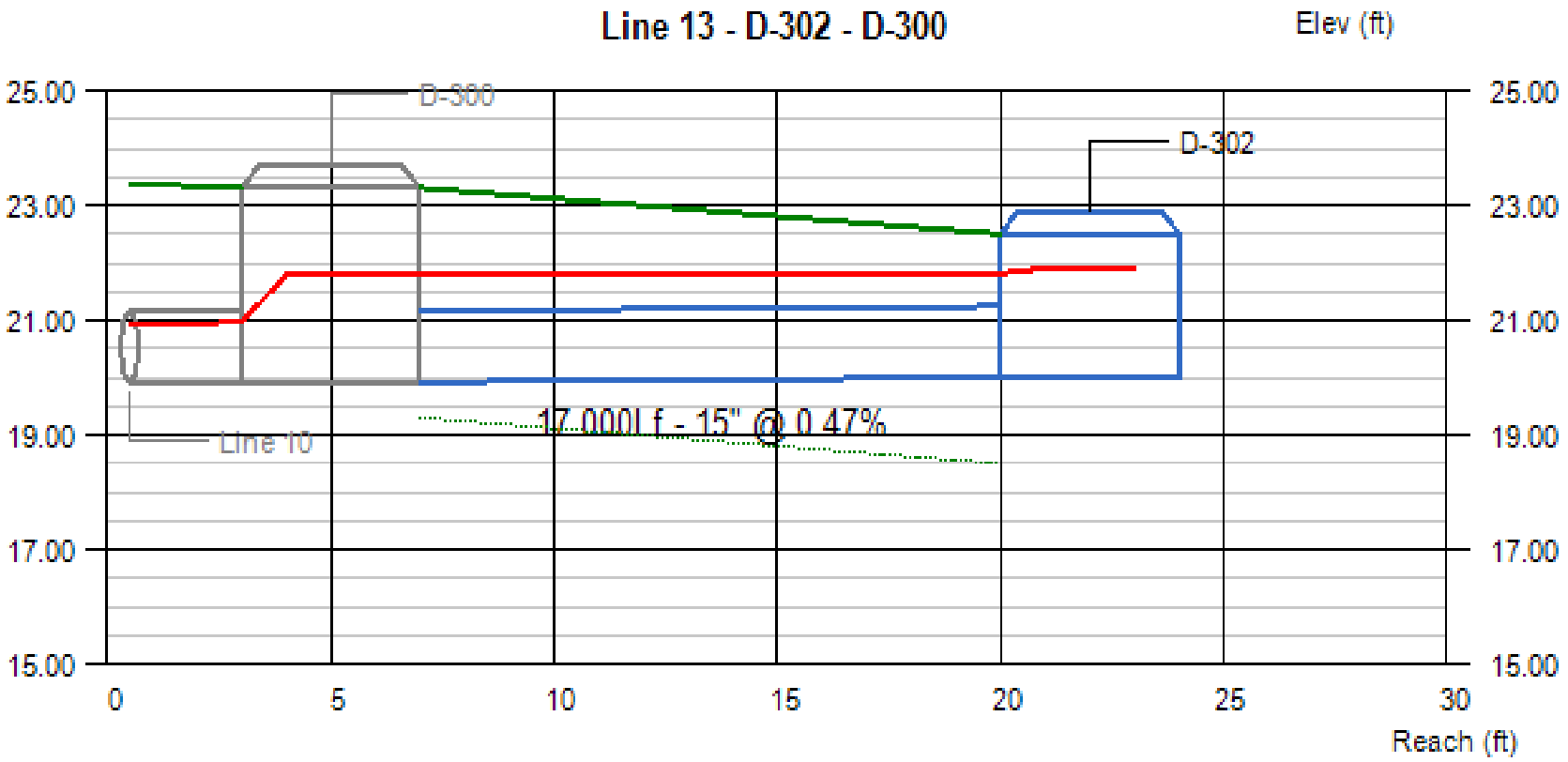
Line Profile (Line 12) - D-304 - D-306



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

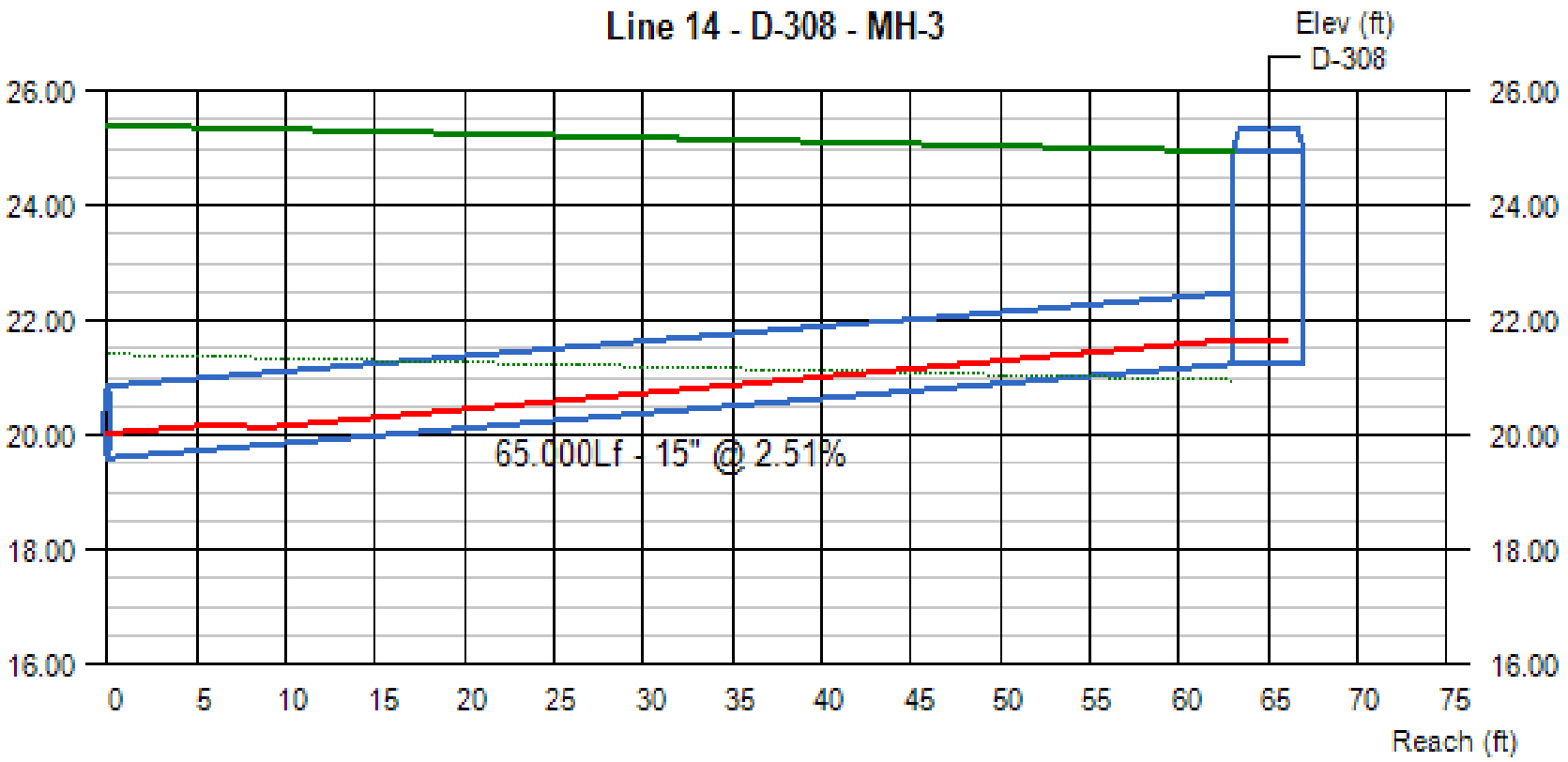
Line Profile (Line 13) - D-302 - D-300



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

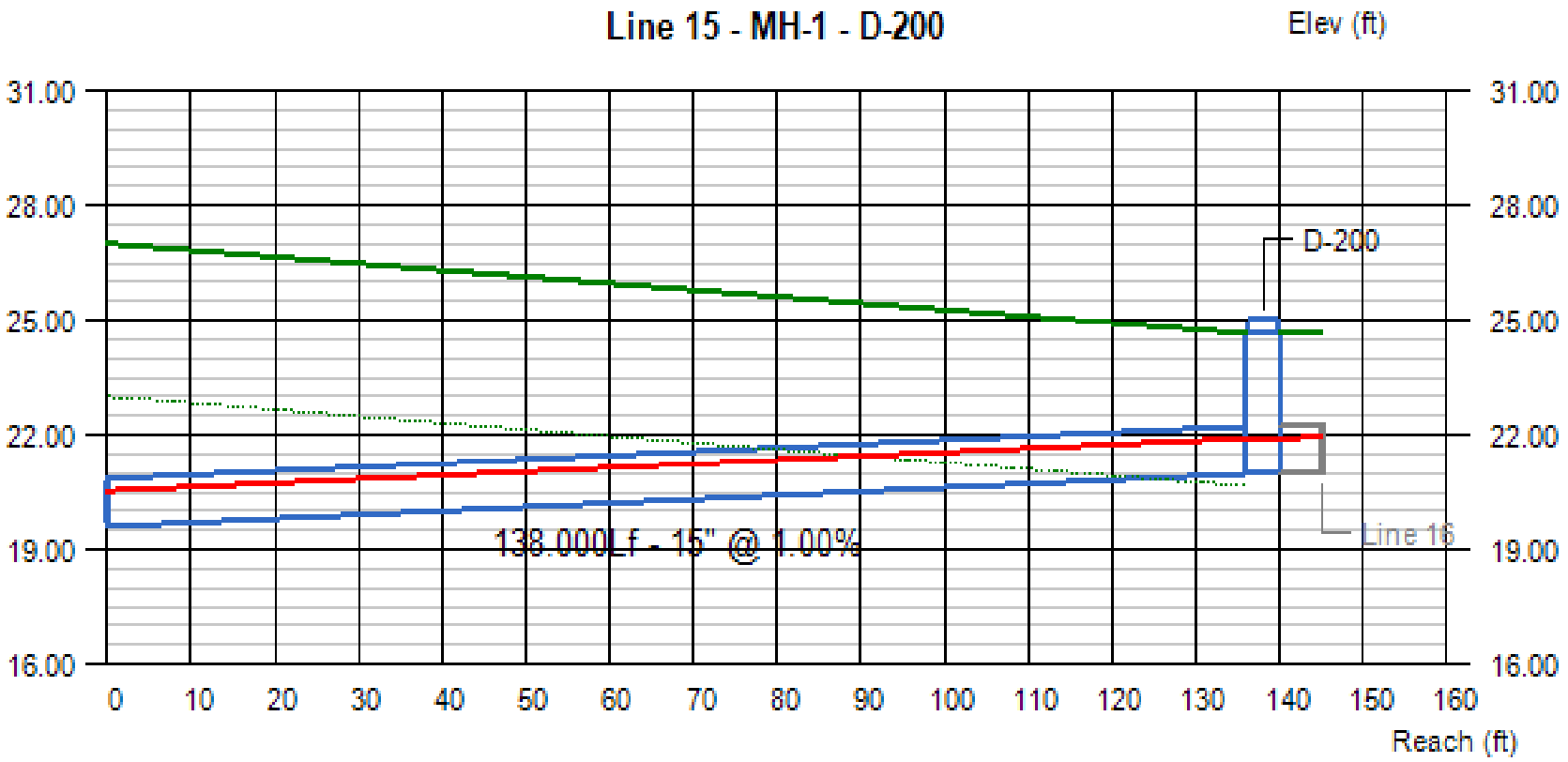
Line Profile (Line 14) - D-308 - MH-3



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

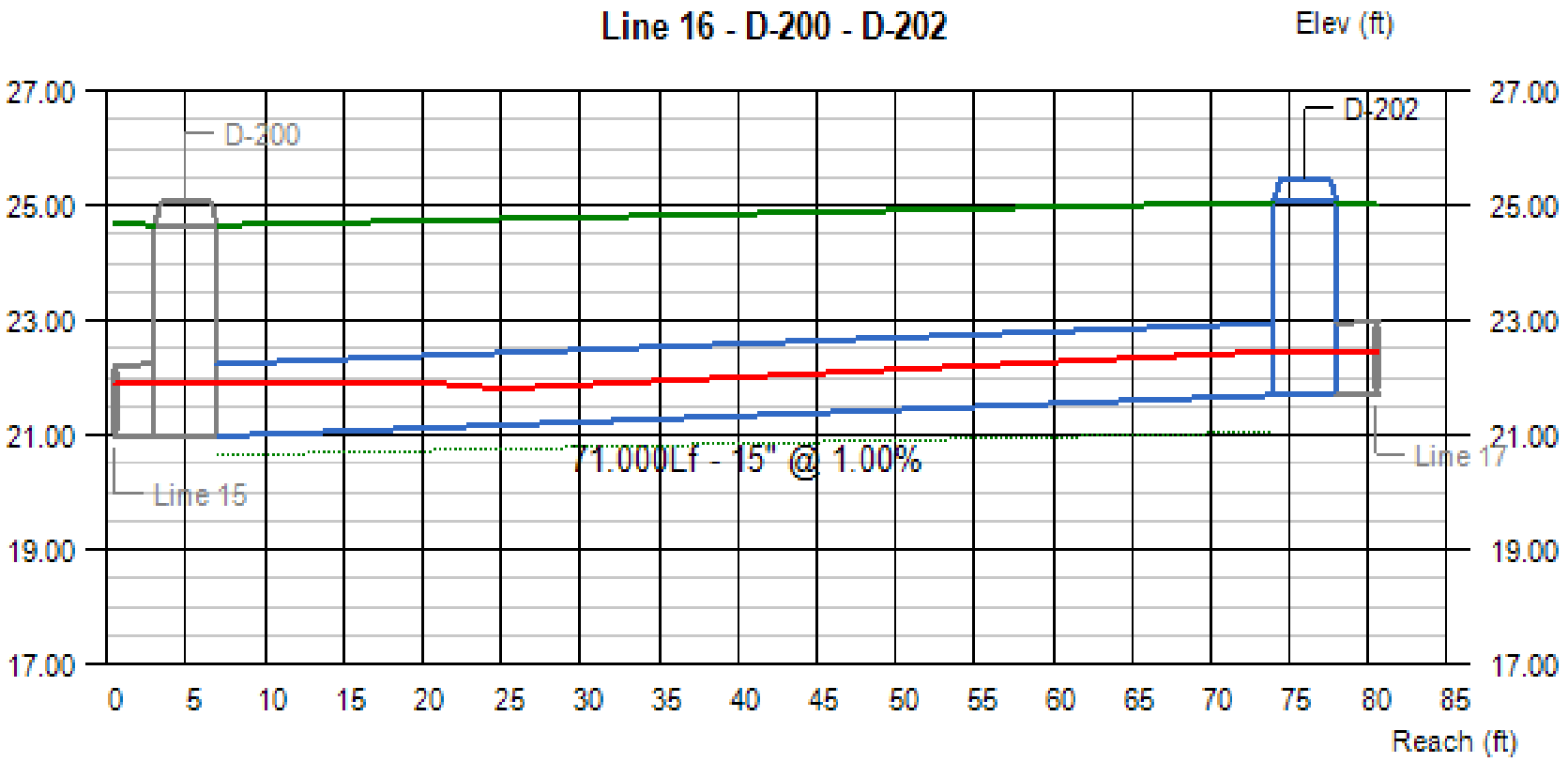
Line Profile (Line 15) - MH-1 - D-200



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

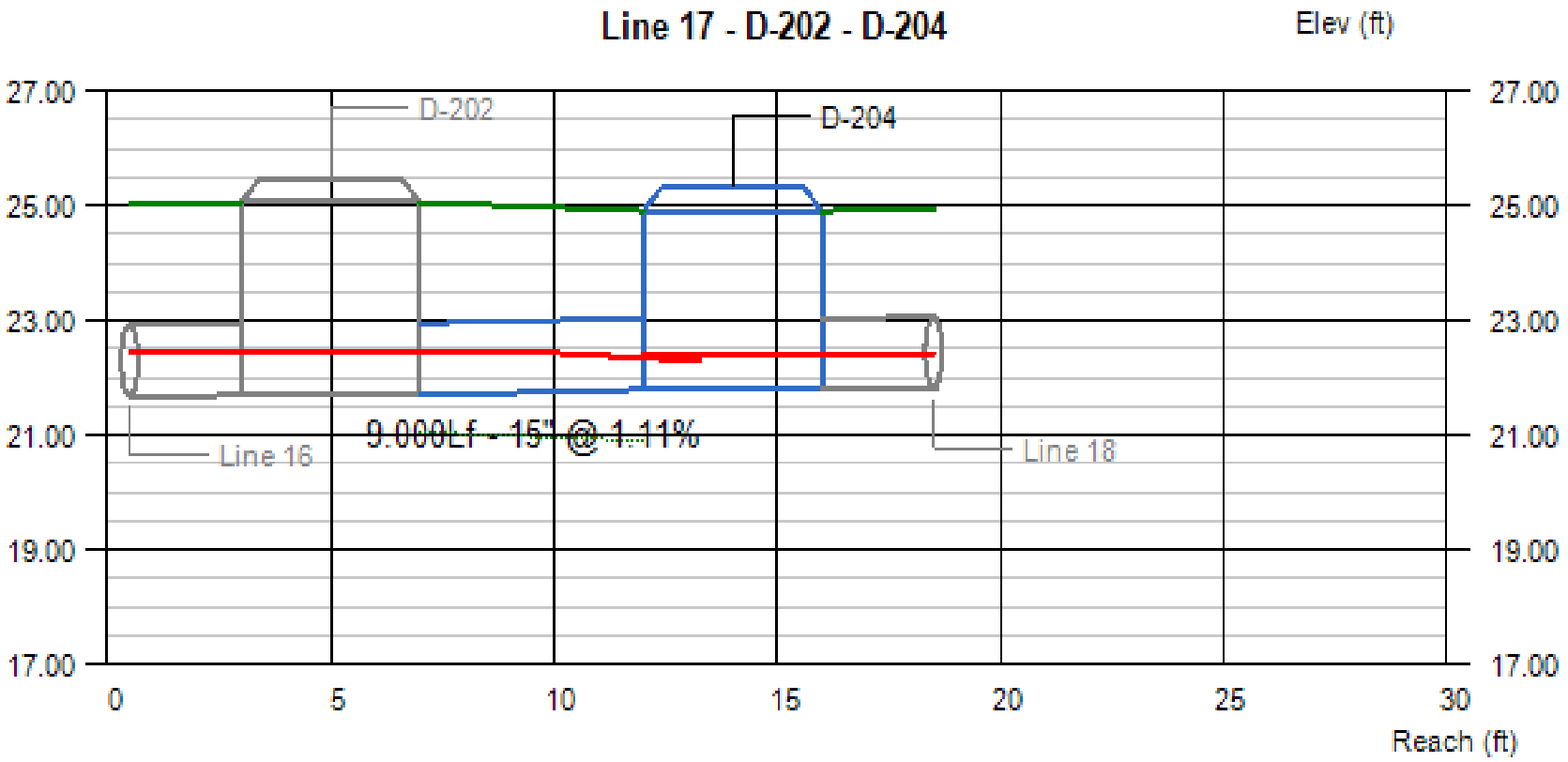
Line Profile (Line 16) - D-200 - D-202



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

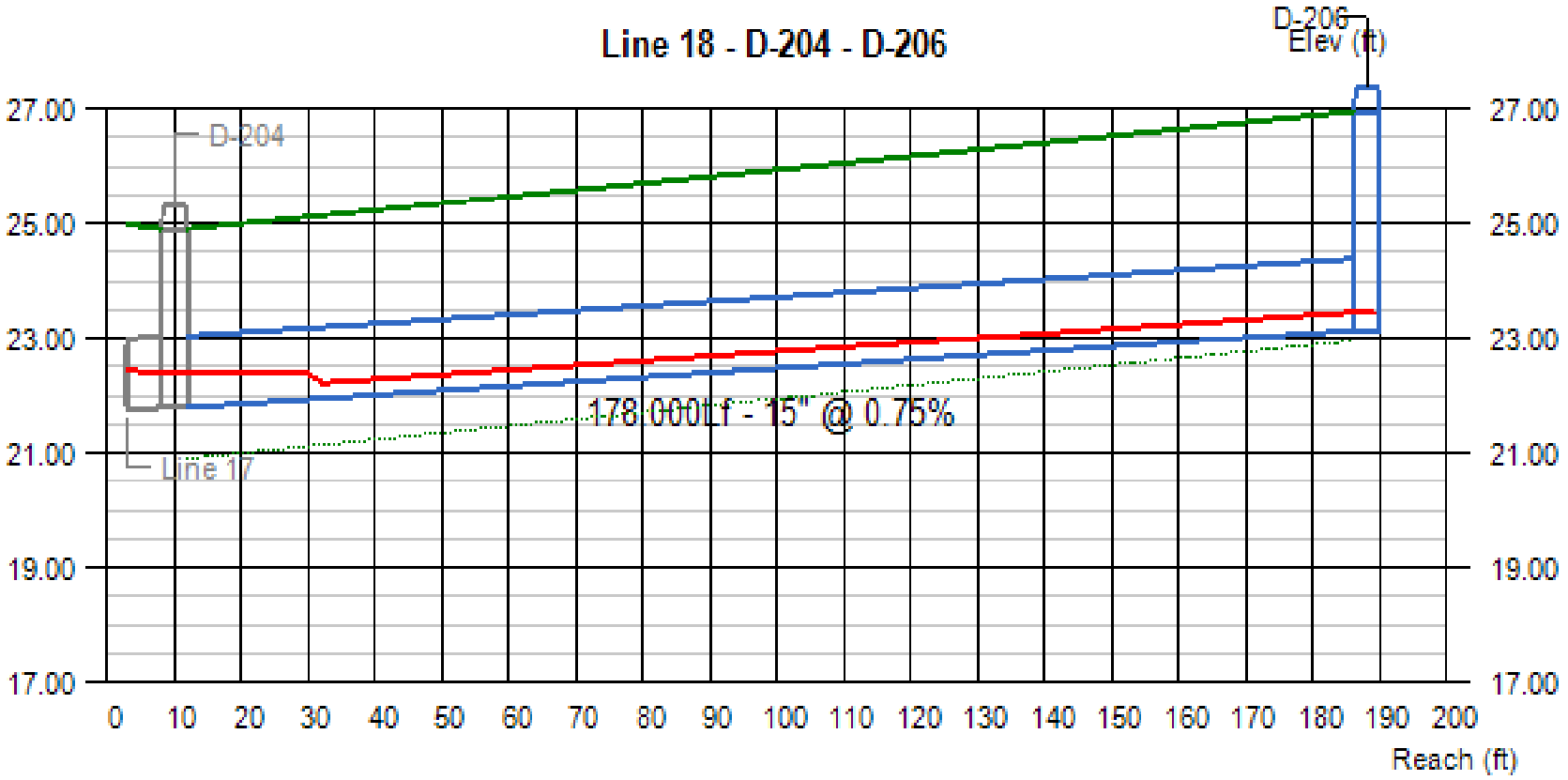
Line Profile (Line 17) - D-202 - D-204



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

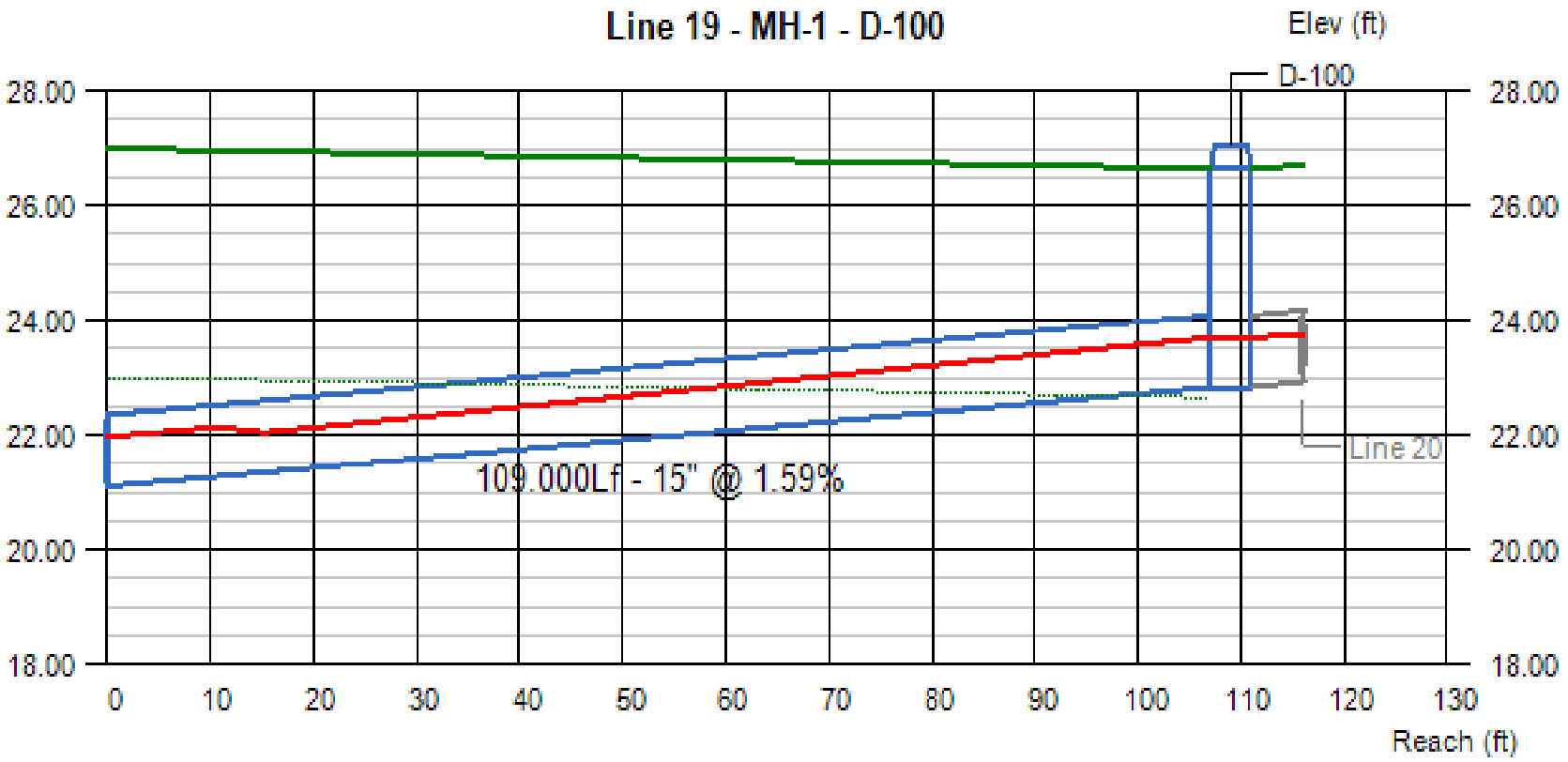
Line Profile (Line 18) - D-204 - D-206



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

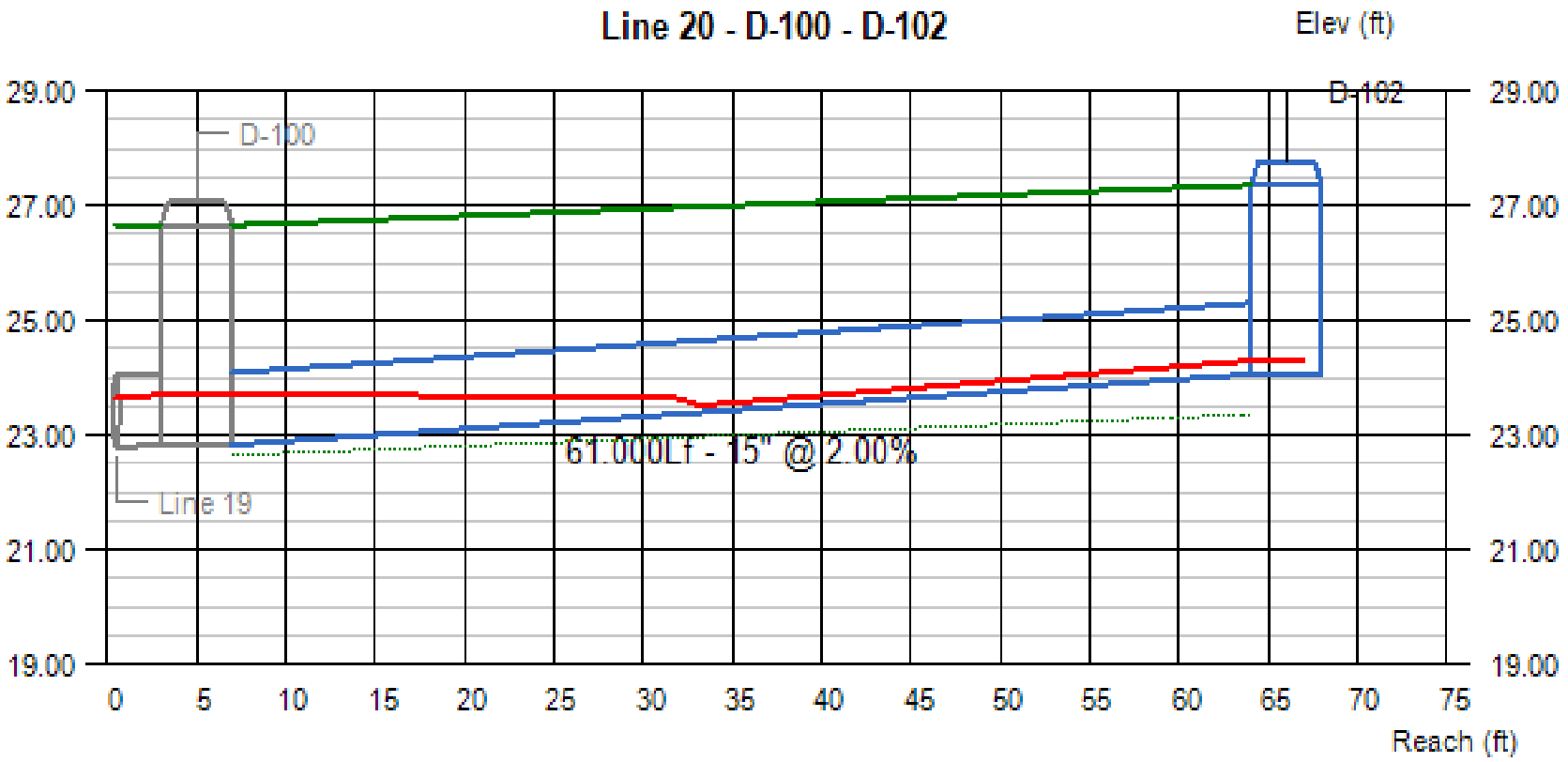
Line Profile (Line 19) - MH-1 - D-100



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

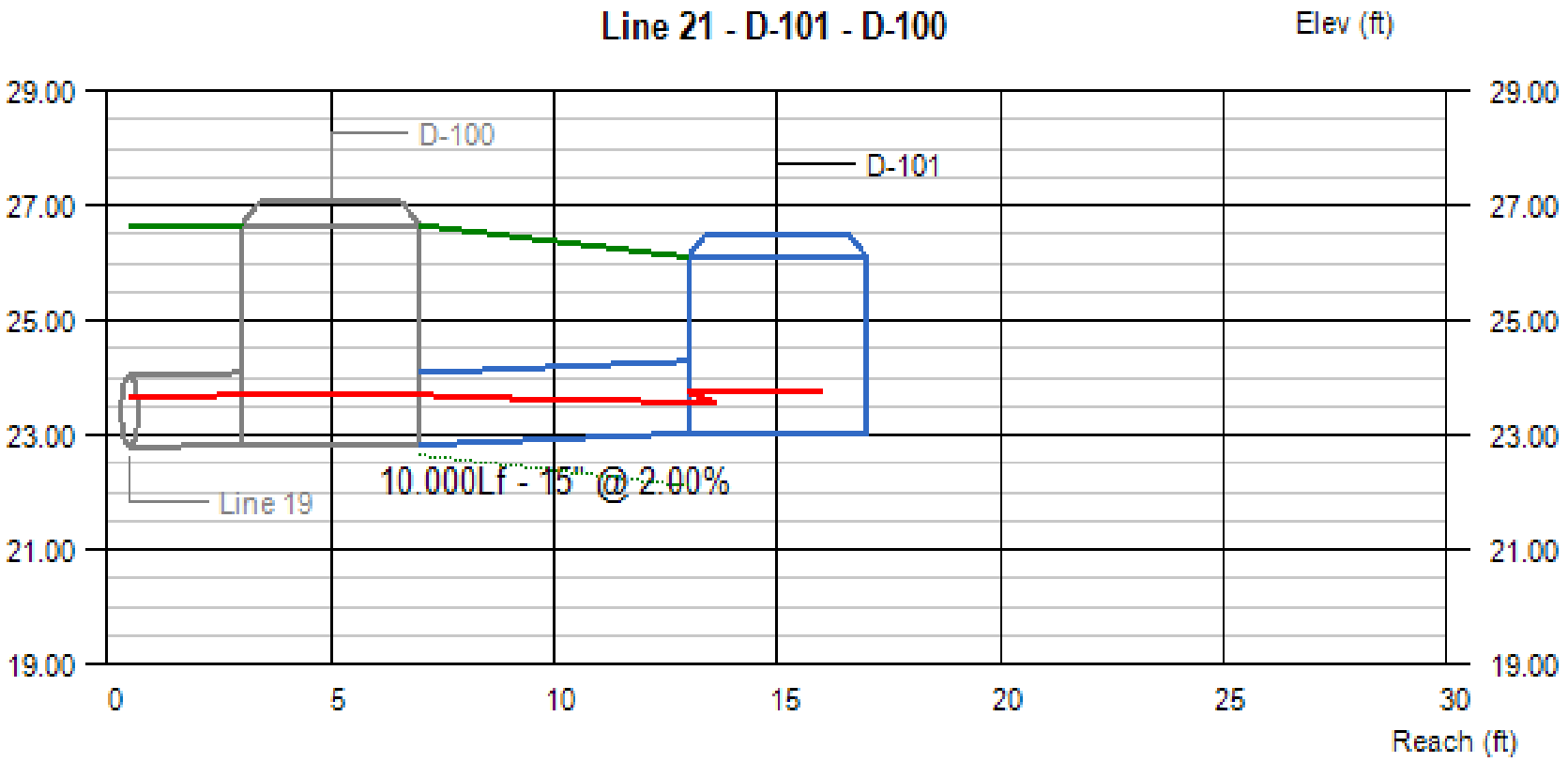
Line Profile (Line 20) - D-100 - D-102



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

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5.0 SUBSURFACE CONDITIONS 3
6.0 SOIL INFILTRATION EVALUATION 4
7.0 DISCUSSION 5
8.0 CLOSING 6
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APPENDIX B ……Tube Permeameter Test Results

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.

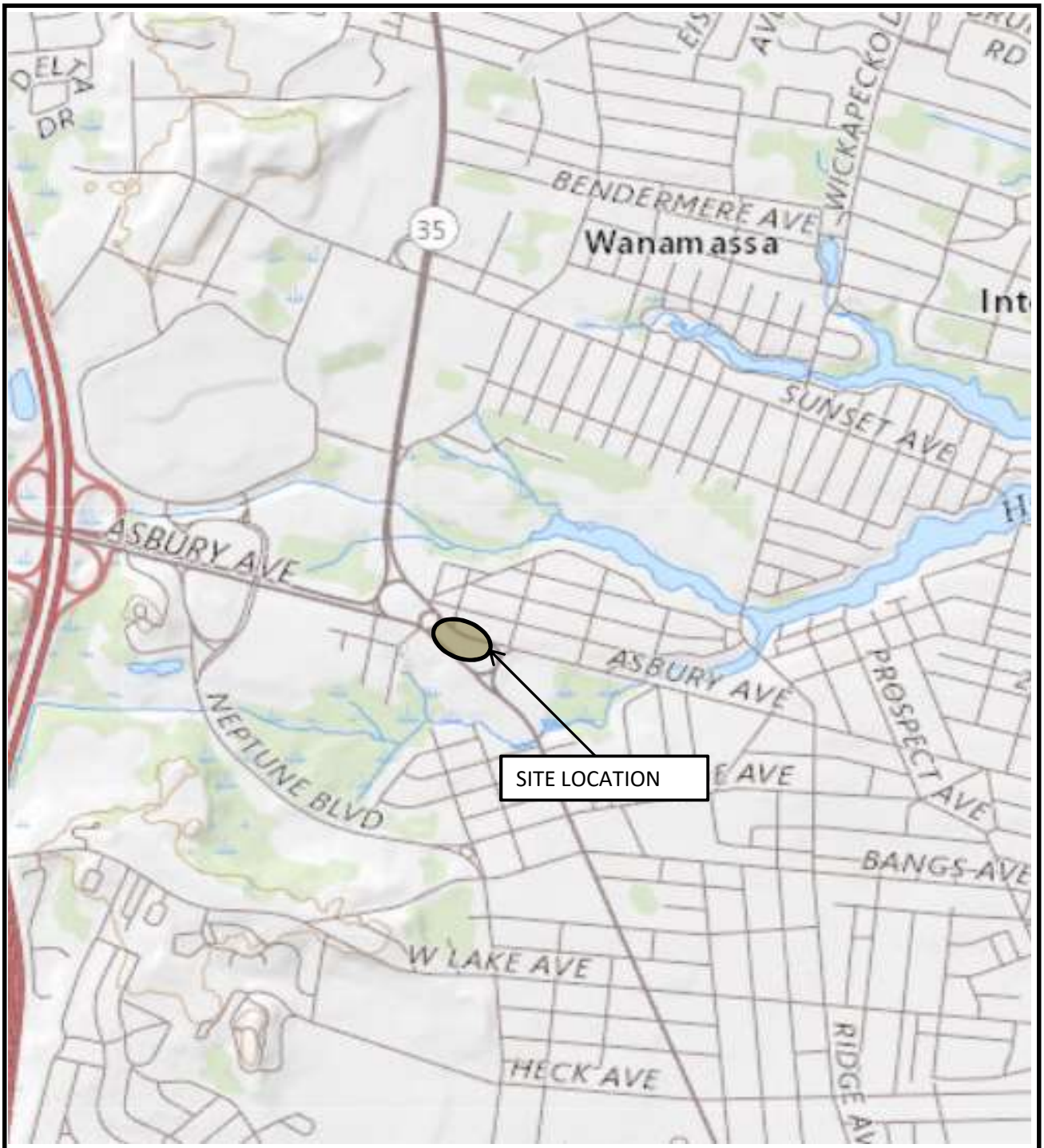
8.0 CLOSING

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
Planners ▪ Surveyors ▪ Landscape Architects

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)

OVERBROOK RD

NJ STATE HIGHWAY ROUTE 35
(WIDTH VARIES)

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)

POND

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

FIRE LANE

STOP

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

APPENDIX A

TEST PIT LOGS

MASER CONSULTING P.A.
Consulting, Municipal & Environmental Engineers
Planners ■ Surveyors ■ Landscape Architects

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Red Bank, N.J. 07701
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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).	
10	120, 132		138"
	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

MASER CONSULTING P.A.
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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

MASER CONSULTING P.A.
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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	(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	(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").	
	84, 96		
	108"		
10	120	(10YR 7/1) Light Gray Clay Loam. Massive, Firm. (Wet).	
	132, 144		
		END OF TEST PIT AT 144 INCHES SEEPAGE AT 47 INCHES	
	156, 168		
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

MASER CONSULTING P.A.
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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

MASER CONSULTING P.A.
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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	(7.5YR 6/1) Gray Sand. Single Grain, Loose. (Wet).	
	144		
		END OF TEST PIT AT 144 INCHES	
		SEEPAGE FROM 20 TO 31 INCHES	
	156		
	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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E-mail - geotech@maserconsulting.com

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

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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:	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.

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

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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-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.

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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.

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APPENDIX E
DRAINAGE AREA MAPS

INVENTORY

EXISTING DRAINAGE AREA MAP

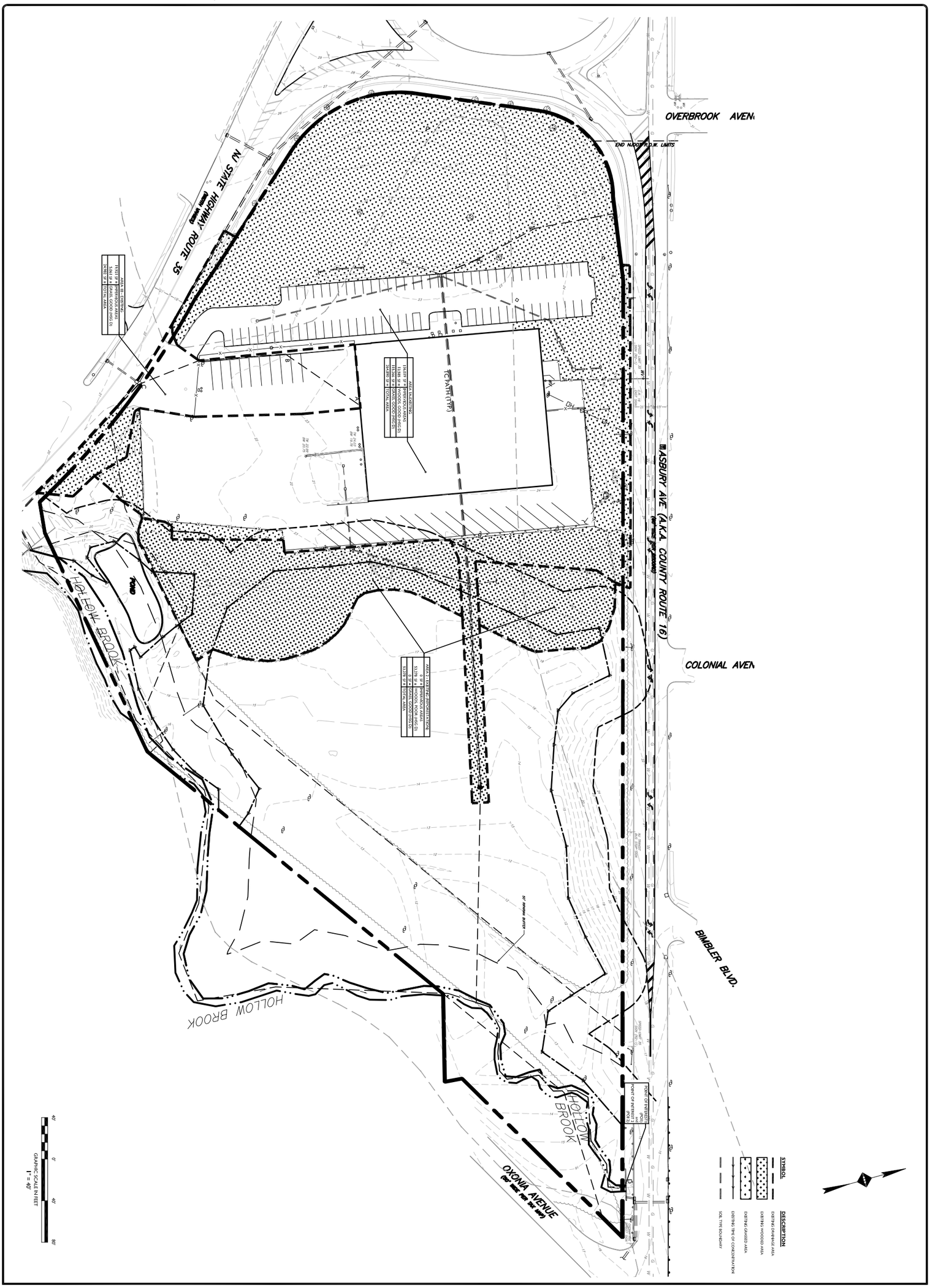
PROPOSED DRAINAGE AREA MAP

PROPOSED INLET DRAINAGE AREA MAP

PROPOSED POROUS PAVEMENT DRAINAGE AREA MAP

DRAINAGE AREA TO DEAL LAKE

\\US.STONEFIELDENG.COM\SHARES\PRINCETON\PROJ\2020\PRJ-200142 EDGEWOOD PROPERTIES - 704 ROUTE 35, NEPTUNE, NJ\CADD\EXHIBITS\2021-04-13_DRAINAGE AREA MAPS.DWG



GRAPHIC SCALE IN FEET
1" = 40'

DRAINAGE AREA MAPS

M&M NEPTUNE, LLC

PROP IMPROVEMENTS

BLOCK 701, LOT 1 (TAX MAP SHEET 7)
704 N.J. ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47791
LICENSED PROFESSIONAL ENGINEER

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Princeton, NJ · Tampa, FL · Detroit, MI
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15 Spring Street, Princeton, NJ 08542
Phone 609.362.6900

NOT APPROVED FOR CONSTRUCTION

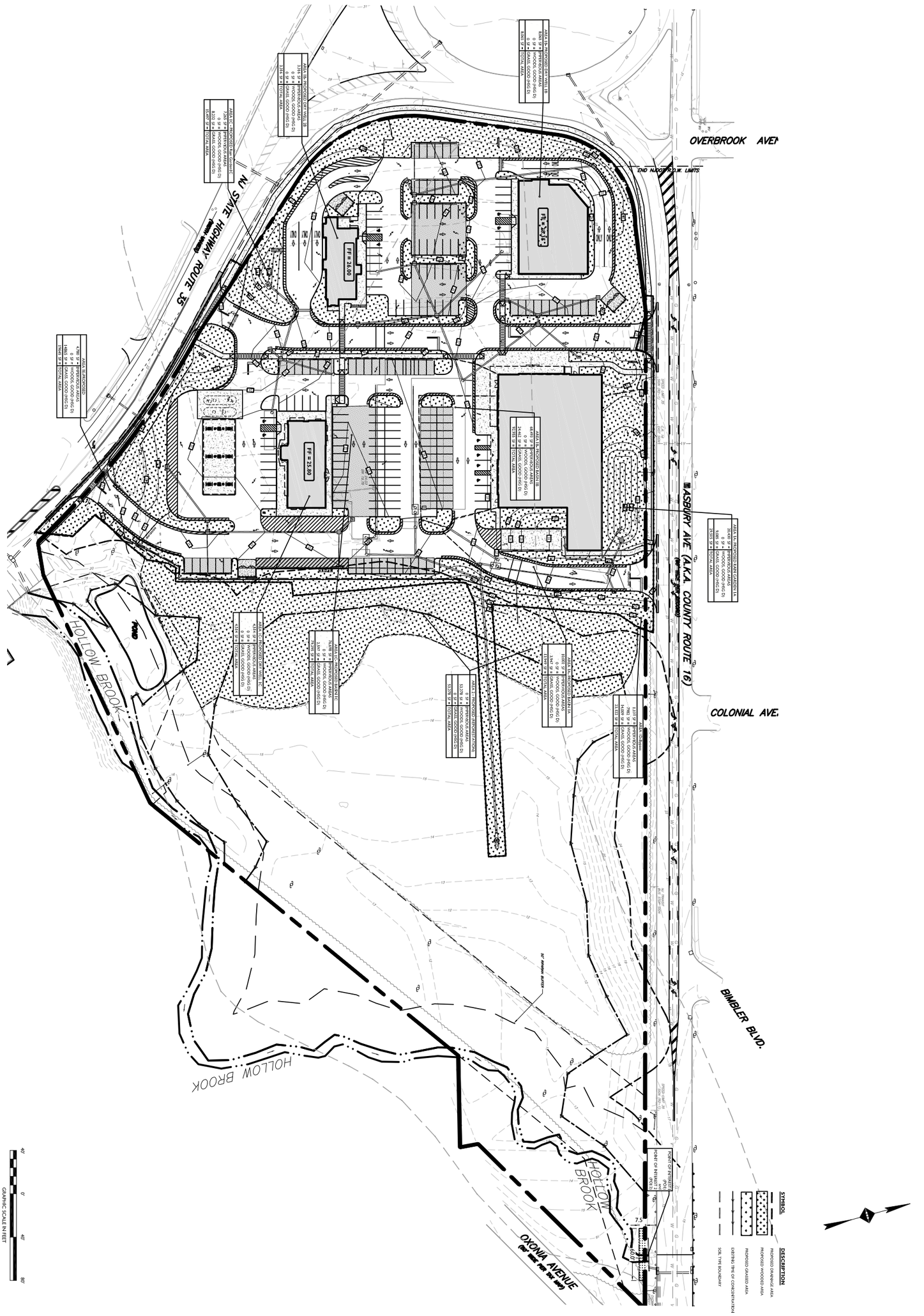
ISSUE	DATE	BY	DESCRIPTION
5	06/03/2021	PAC	PER TOWNSHIP COMMENTS
4	05/10/2021	PAC	PER NJDEP COMMENTS
3	04/13/2021	JCL	PER COUNTY COMMENTS
2	03/10/2021	AMB	TOWNSHIP SUBMISSION
1	12/29/20	PC	FIRST SUBMISSION

STONEFIELD engineering & design

SCALE: 1" = 40' | PROJECT ID: PRJ-200142

TITLE: EXISTING DRAINAGE AREA MAP

DRAWING: 1 of 4



DRAINAGE AREA MAPS

M&M NEPTUNE, LLC

PROP IMPROVEMENTS

BLOCK 701, LOT 1 (TAX MAP SHEET 7)
704 N.J. ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

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NOT APPROVED FOR CONSTRUCTION

ISSUE	DATE	BY	DESCRIPTION
5	06/03/2021	PAC	PER TOWNSHIP COMMENTS
4	05/10/2021	PAC	PER NJDEP COMMENTS
3	04/13/2021	JCL	PER COUNTY COMMENTS
2	03/10/2021	AMB	TOWNSHIP SUBMISSION
1	12/29/20	PC	FIRST SUBMISSION

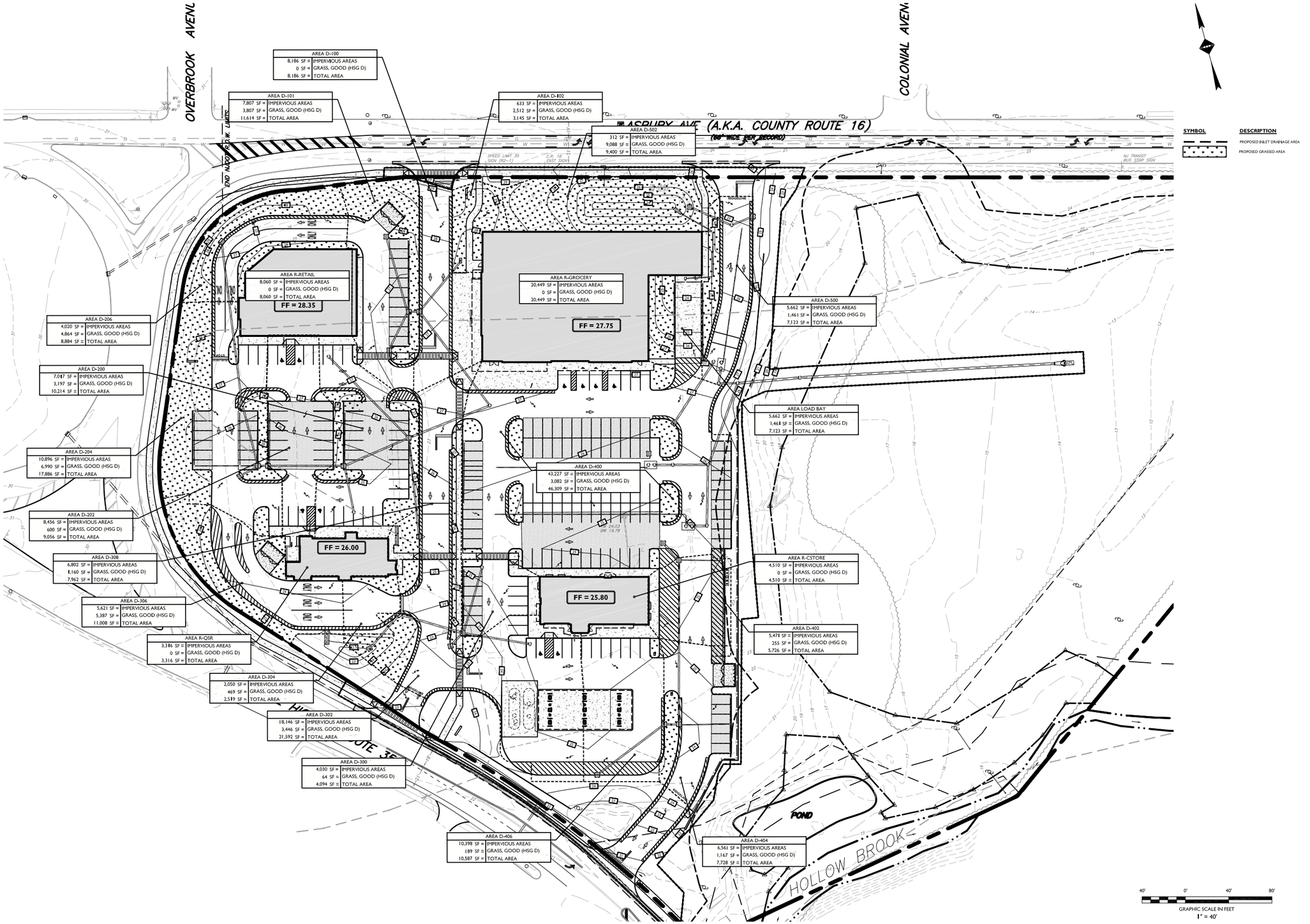
JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47291
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 40' | PROJECT ID: PRI-20014

TITLE: **PROPOSED DRAINAGE AREA MAP**

DRAWING: **2 of 4**



ISSUE	DATE	BY	DESCRIPTION
5	06/03/2021	PAC	PER TOWNSHIP COMMENTS
4	05/10/2021	PAC	PER NJDEP COMMENTS
3	04/13/2021	JCL	PER COUNTY COMMENTS
2	03/10/2021	AMB	TOWNSHIP SUBMISSION
1	12/29/20	PC	FIRST SUBMISSION

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
Rutherford, NJ · New York, NY · Boston, MA
Princeton, NJ · Tampa, FL · Detroit, MI
www.stonefieldeng.com
15 Spring Street, Princeton, NJ 08542
Phone 609.362.6900

DRAINAGE AREA MAPS

M&M NEPTUNE, LLC

PROP IMPROVEMENTS

BLOCK 701, LOT 1 (TAX MAP SHEET 7)
704 N.J. ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47290
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

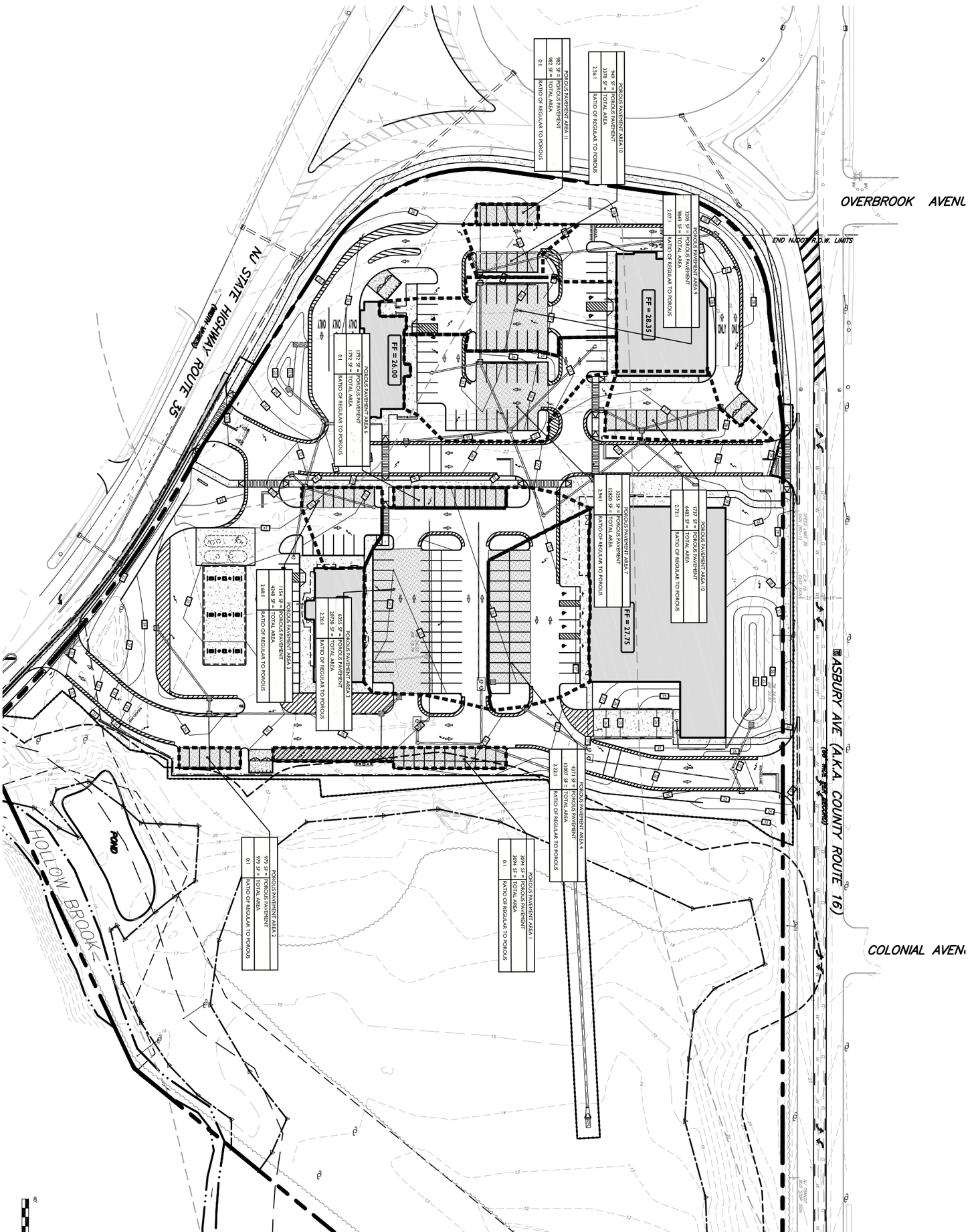
SCALE: 1" = 40' | PROJECT ID: PRI-200142

TITLE:

PROPOSED INLET AREA MAP

DRAWING:

3 of 4



DRAINAGE AREA MAPS

M&M NEPTUNE, LLC

PROP IMPROVEMENTS

BLOCK 701, LOT 1 (TAX MAP SHEET 7)
704 N.J. ROUTE 35
TOWNSHIP OF NEPTUNE
MONMOUTH COUNTY, NEW JERSEY

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NOT APPROVED FOR CONSTRUCTION

ISSUE	DATE	BY	DESCRIPTION
5	06/03/2021	PAC	PER TOWNSHIP COMMENTS
4	05/10/2021	PAC	PER NJDEP COMMENTS
3	04/13/2021	JCL	PER COUNTY COMMENTS
2	03/10/2021	AMB	TOWNSHIP SUBMISSION
1	12/29/20	PC	FIRST SUBMISSION

JEFFREY A. MARTELL, P.E.
NEW JERSEY LICENSE No. 47791
LICENSED PROFESSIONAL ENGINEER

STONEFIELD engineering & design

SCALE: 1" = 40' | PROJECT ID: PRJ-200142

TITLE: PROPOSED POROUS PAVEMENT DRAINAGE AREA MAP

DRAWING: 4 of 4

NO.	ISSUE	DATE	BY	DESCRIPTION
	1	03-10-21	PC	PER TOWNSHIP

NOT APPROVED FOR CONSTRUCTION

STONEFIELD engineering & design
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Princeton, NJ · Tampa, FL · Detroit, MI
www.stonefieldeng.com
15 Spring Street, Princeton, NJ 08542
Phone 609.362.6900

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 (MTD 1A)

Neptune, NJ
4/30/21

Information Provided by Engineer:

- Required TSS removal rate = 80%
- Water quality flow rate = 0.36 cfs
- 25-YR peak flow rate = 2.65 cfs
- Motor vehicle impervious area = 0.23 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 **8 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends a 6'x12' precast Peak Diversion StormFilter.

$$N_{cartridges\ hyd.load} = \frac{Q_{treat}\ X\ 449\ {}^{gpm}/_{cfs}}{Q_{cartridge}} = \frac{0.36\ cfs\ X\ 449\ {}^{gpm}/_{cfs}}{22.5\ {}^{gpm}/_{cartridge}} = 7.18\ \Rightarrow\ (8)\ 27"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{0.23\ acre}{0.136\ {}^{acres}/_{cartridge}} = 1.69\ \Rightarrow\ (2)\ 27"\ Cartridges$$

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492

StormFilter Design Summary

Maintenance:

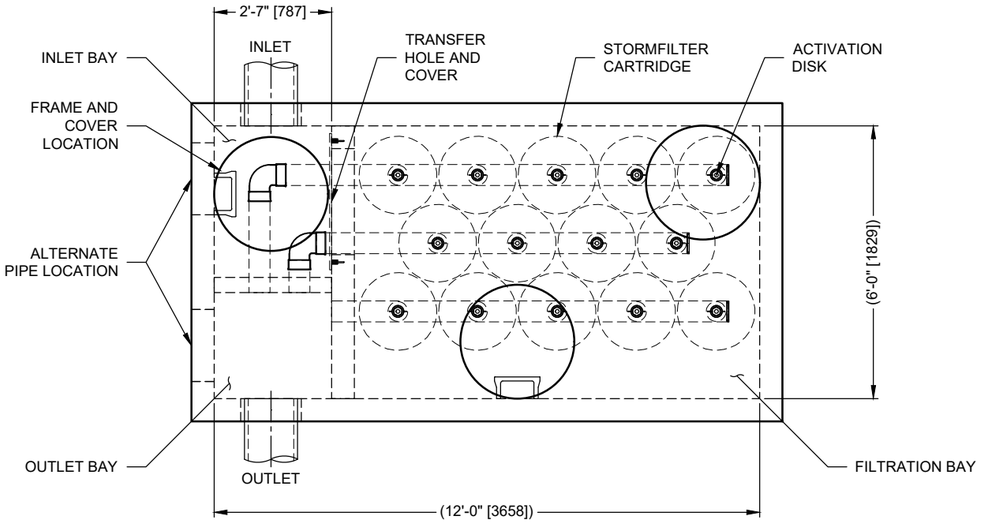
Maintenance of Stormwater best management practices is required per the New Jersey Administrative Code 7:8-5.8. Recommendations for maintenance are included in chapters 8 & 9 of the New Jersey Stormwater Best Management Practices Manual. To comply with requirements, CONTECH offers a network of Preferred 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).

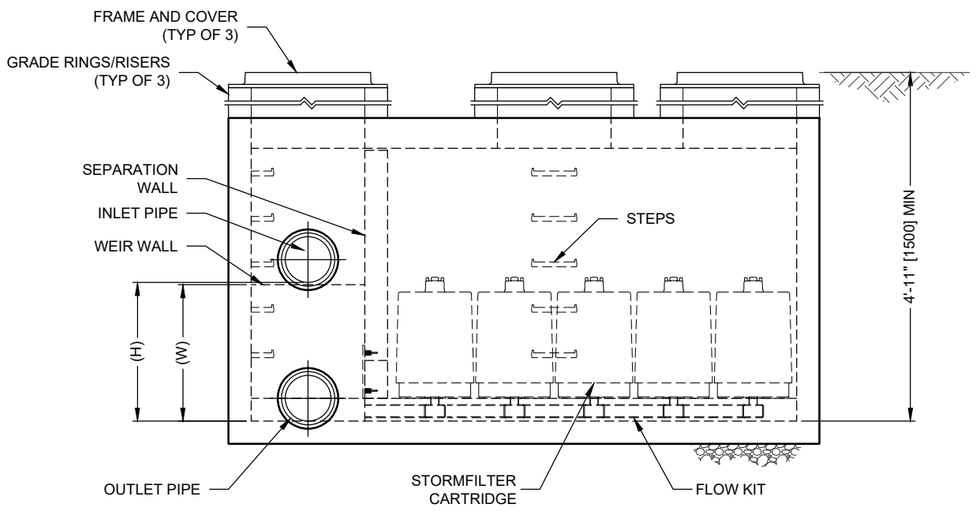
Sincerely,

Taylor Murdock
Contech Engineered Solutions LLC

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492



PLAN



ELEVATION

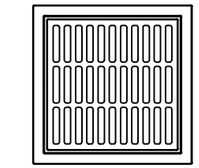
The Stormwater Management StormFilter®

STORMFILTER DESIGN NOTES

- STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 12' [1829 x 3658] PEAK DIVERSION STYLE STORMFILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (14) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

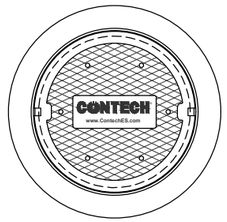
CARTRIDGE SIZE (in. [mm])	27 [686]			18 [457]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H) (ft. [mm])	3.05 [930]			2.3 [701]			1.8 [549]		
HEIGHT OF WEIR (W) (ft. [mm])	3.00 [914]			2.25 [686]			1.75 [533]		
SPECIFIC FLOW RATE (gpm/sf [L/s/m^2])	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]	2 [1.36]	1.67* [1.13]*	1 [0.68]
CARTRIDGE FLOW RATE (gpm [L/s])	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.47]	10 [0.63]	8.35 [0.53]	5 [0.32]

* 1.67 gpm/sf [1.13 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND GRATE

(24" SQUARE)
(NOT TO SCALE)



FRAME AND COVER

(30" ROUND)
(NOT TO SCALE)

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
CARTRIDGE FLOW RATE	
CARTRIDGE SIZE (27, 18, LOW DROP (LD))	
MEDIA TYPE (PERLITE, ZPG, PSORB)	
NUMBER OF CARTRIDGES REQUIRED	
INLET BAY RIM ELEVATION	
FILTER BAY RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES/SPECIAL REQUIREMENTS:

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7" [178].** FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF [1.36 L/s/m^2] (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 [13.39 L/s/m^3] OF MEDIA (MAXIMUM).**

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. ALTERNATE DIMENSIONS ARE IN MILLIMETERS [mm] UNLESS NOTED OTHERWISE.
4. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
5. 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.
6. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' [3048] 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.

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.
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 OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-526-3999 513-645-7000 513-645-7993 FAX

SFPD0612 (6' x 12')
PEAK DIVERSION STORMFILTER
STANDARD DETAIL

StormFilter Design Summary

Mixed Use (MTD 1B)

Neptune, NJ
4/30/21

Information Provided by Engineer:

- Required TSS removal rate = 80%
- Water quality flow rate = 1.46 cfs
- 25-YR peak flow rate = 4.88 cfs
- Motor vehicle impervious area = 1.57 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 **30 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends an 8'x20' precast Peak Diversion StormFilter.

$$N_{cartridges\ hyd.load} = \frac{Q_{treat}\ X\ 449\ {}^{gpm}/_{cfs}}{Q_{cartridge}} = \frac{1.46\ cfs\ X\ 449\ {}^{gpm}/_{cfs}}{22.5\ {}^{gpm}/_{cartridge}} = 29.14\ \Rightarrow\ (30)\ 27"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{1.57\ acre}{0.136\ {}^{acres}/_{cartridge}} = 11.54\ \Rightarrow\ (12)\ 27"\ Cartridges$$

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).

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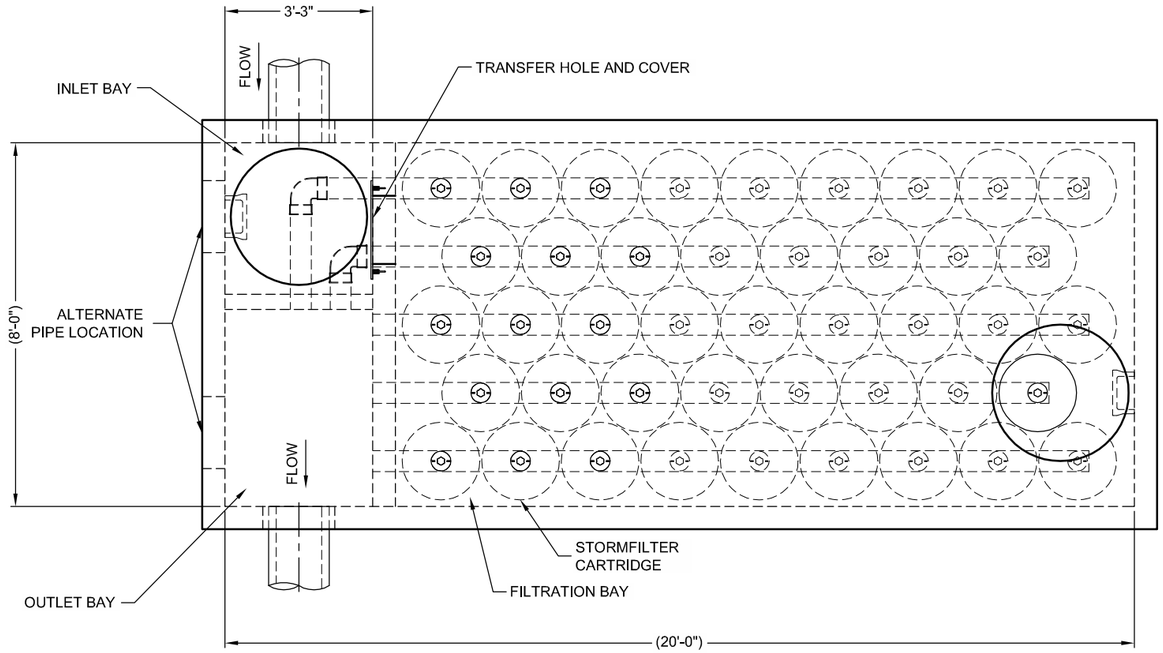
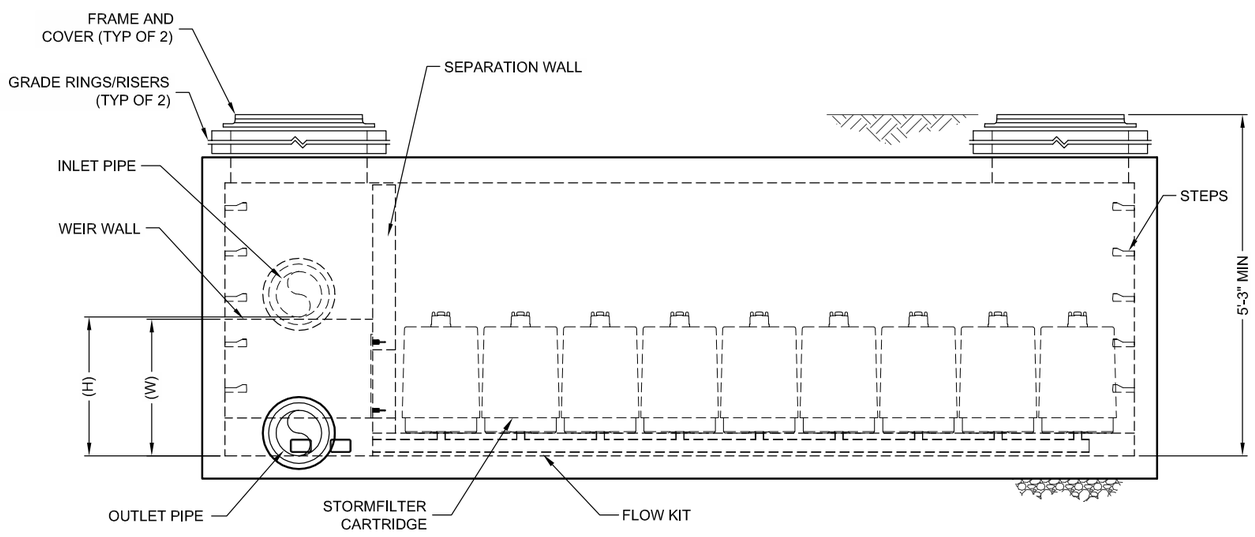


PLAN



ELEVATION

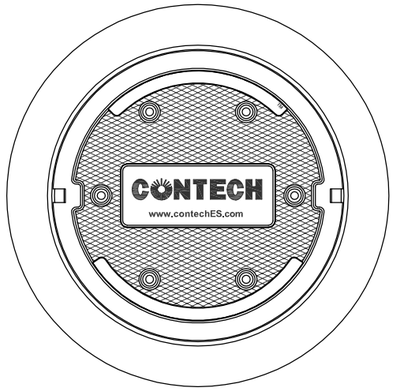
The Stormwater Management StormFilter®

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,536,519; 5,707,527; 5,788,797; 5,827,429; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN TABLE

- THE 8' x 20' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.
- THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION.
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'	
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (CSF, PERLITE, ZPG)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*

INLET BAY RIM ELEVATION	*
FILTER BAY RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

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

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4. 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.
5. 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.

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.

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800-338-1122 513-645-7000 513-645-7993 FAX

THE STORMWATER MANAGEMENT STORMFILTER 8' x 20' PEAK DIVERSION STORMFILTER STANDARD DETAIL

StormFilter Design Summary

Mixed Use (MTD 1C)

Neptune, NJ
4/30/21

Information Provided by Engineer:

- Required TSS removal rate = 80%
- Water quality flow rate = 1.24 cfs
- 25-YR peak flow rate = 3.75 cfs
- Motor vehicle impervious area = 1.65 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 **25 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends an 8'x18' precast Peak Diversion StormFilter.

$$N_{cartridges\ hyd.load} = \frac{Q_{treat}\ X\ 449\ {}^{gpm}/_{cfs}}{Q_{cartridge}} = \frac{1.24\ cfs\ X\ 449\ {}^{gpm}/_{cfs}}{22.5\ {}^{gpm}/_{cartridge}} = 24.74\ \Rightarrow\ (25)\ 27"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{1.65\ acre}{0.136\ {}^{acres}/_{cartridge}} = 12.13\ \Rightarrow\ (13)\ 27"\ Cartridges$$

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.

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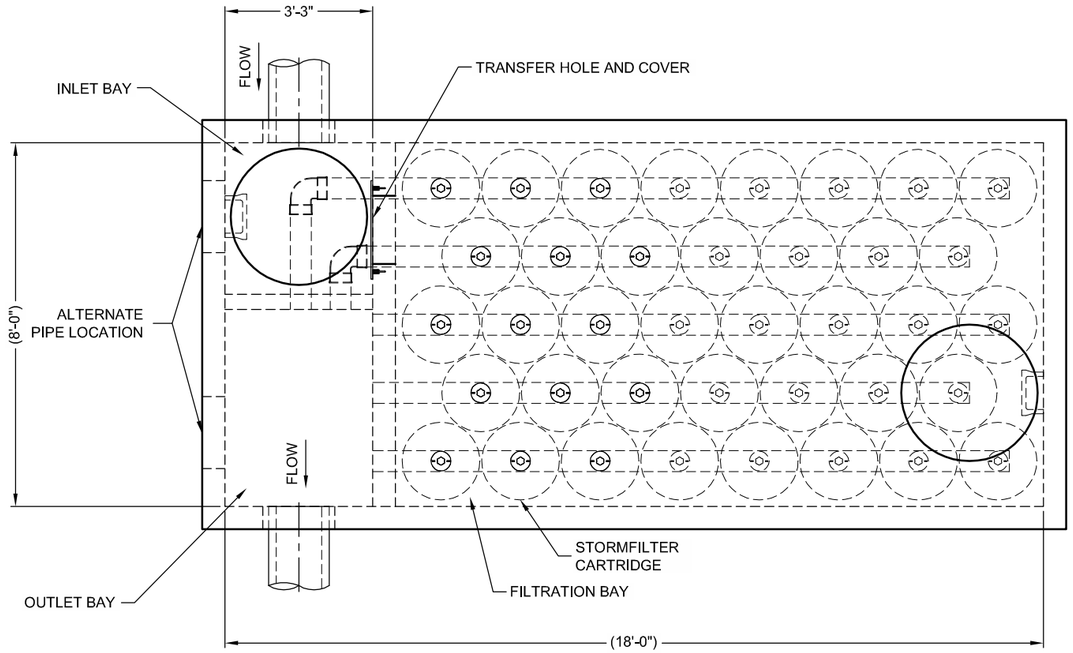
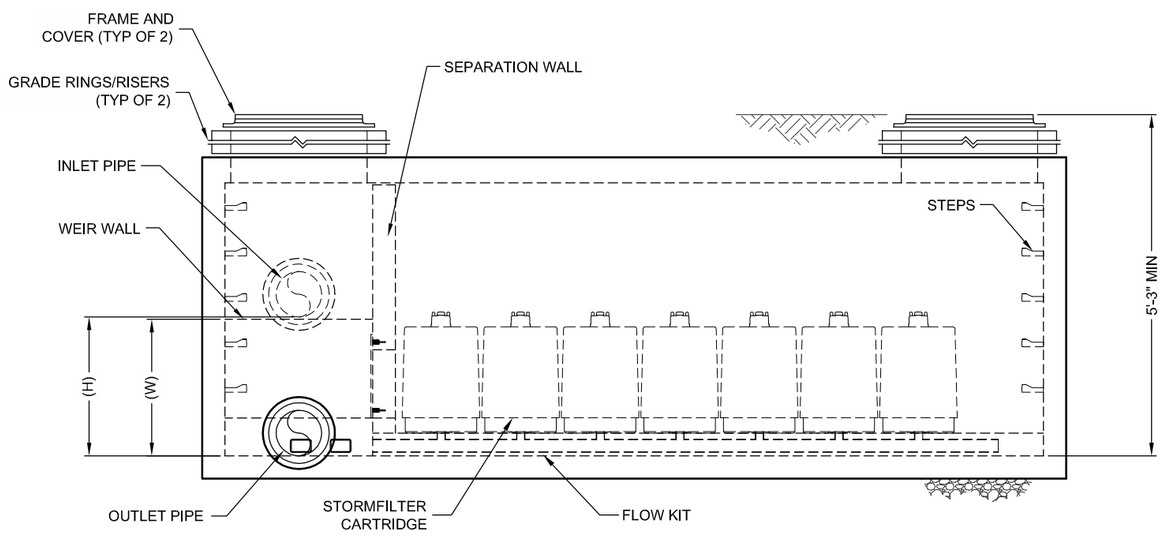
7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492



PLAN



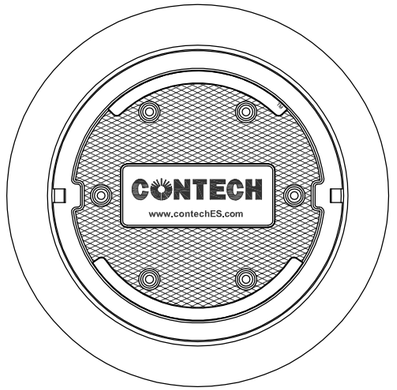
ELEVATION

The Stormwater Management StormFilter®
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,322,629; 5,536,519; 5,707,527; 5,788,criminal; 5,527,099; 6,649,048; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN TABLE

- THE 8' x 18' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.
- THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION.
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'	
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²	2 gpm/ft²	1 gpm/ft²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs)	*
PEAK FLOW RATE (cfs)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
# OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (CSF, PERLITE, ZPG)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*

INLET BAY RIM ELEVATION	*
FILTER BAY RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

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. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. 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.
5. 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.

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.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

THE STORMWATER MANAGEMENT STORMFILTER 8' x 18' PEAK DIVERSION STORMFILTER STANDARD DETAIL

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:

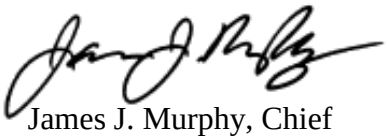
1. *MTFR calculated based on 4.72x10-3 cfs/sf (2.12 gpm/sf) of effective filtration treatment area.*
2. *Based upon the equation found in the NJDEP Filter Protocol Maximum Inflow Drainage Area (acres) = weight of TSS before 10% loss in MTFR (lbs)/600 lbs/acre of drainage area annually.*

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